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Climate Governance and the Paris Agreement

Editors

Jon Hovi and Tora Skodvin

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Table of Contents

Politics and Governance (ISSN: 2183-2463)
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Editorial

Editorial to the Issue on Climate Governance and the Paris Agreement

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Abstract
This thematic issue of *Politics and Governance* serves as a Festschrift in honor of Professor Dr. Philos. Arild Underdal on his 70th birthday. In this editorial, the guest editors summarize a few of Professor Underdal's many academic merits and achievements. They also provide a synopsis of each of the ten contributions to the Festschrift, which focuses on climate governance in general and the 2015 Paris Agreement in particular.

Keywords
Arild Underdal; climate governance; Festschrift; the Paris Agreement

Issue
This editorial is part of the issue "Climate Governance and the Paris Agreement", edited by Jon Hovi and Tora Skodvin (University of Oslo, Norway).

Professor Dr. Philos. Arild Underdal is a remarkable academic. Not only is he an excellent political science scholar, he is also a very skillful administrator. In addition, Arild is a cherished teacher, supervisor, colleague, and collaborating partner. He has contributed to the recruitment of a number of skilled master and PhD students, included them in his wide academic network, inspired them to embark on an academic career, and thus still plays a major role in the continuous development of the IR and climate-change social-science research communities in the Oslo area. This thematic issue of *Politics and Governance* is a Festschrift to our friend and colleague, Arild Underdal, to honor him on his 70th birthday.

Based in the Oslo region, Arild has had an astonishing career both as a scholar and administrator. He was awarded his doctoral degree in 1982 and became a full professor at the Department of Political Science, University of Oslo, in 1988. He has also been affiliated with other institutions in the Oslo region, including the BI Norwegian Business School, the Fridtjof Nansen Institute (FNI), and the Centre for International Climate and Environmental Research—Oslo (CICERO). At all of these institutions, Arild has inspired and greatly influenced a large number of younger colleagues, including the guest editors and several other contributors to this volume. He has done so through his excellent teaching and supervision, as well as through his widely cited scholarly work. Some of this scholarly work has been co-authored with younger Oslo-based colleagues, with internationally renowned scholars from Arild's impressive international network, or—on occasion—both. Several of these internationally renowned scholars are also contributors to this volume and many others have served as anonymous reviewers.

Arild's administrative skills were acknowledged when he first served as prorector (1993–1995) and then as rector (2002–2006) of the University of Oslo (UiO). Many other academic institutions in Norway and abroad have sought his advice, as has also the Norwegian government. In 2006, he was awarded the high-ranking distinction of Commander of the Royal Order of St. Olav.

Important instruments for developing Arild's scholarly network domestically and internationally have been a set of large-scale research projects, often

funded by the Research Council of Norway. The most recent—and one of the most important—of these projects has been *Strategic Challenges in International Climate and Energy Policy* (CICEP), a centre for environmentally friendly energy. This centre is located at CICERO, while the FNI and the Department of Political Science, UiO, serve as research partners. Arild lead the application process and also served as CICEP's director for the first two and a half years of its existence.

Cooperating with Arild is very inspiring and enjoyable; however, it is also slightly depressing. It is enjoyable because of his modest, friendly and patient appearance, because he invariably delivers top-quality work, and because he is always careful to keep deadlines. It is slightly depressing because no matter how hard you work, he works even harder. The following anecdote may illustrate the point. During his period as rector at UiO, the local student newspaper, Universitas, asked him to give an interview. To avoid wasting time, Arild requested that the interview be conducted while he had breakfast. Having granted Arild's wish, the journalist was astonished to learn that Arild had breakfast at 4am! The interview reveals that a typical work day for Arild lasts 12 to 15 hours—including Saturdays and Sundays. Between Christmas and New Year's Eve he works only 10–12 hours a day, which Arild characterizes as "pure relaxation".[1]

During the last couple of decades, climate change has been a major area of research for Arild. Therefore, a natural focus of this Festschrift is climate governance in general and the 2015 Paris climate change agreement in particular. The festschrift includes 10 contributions.

Norway's lead climate negotiator Aslak Brun (2016) provides an insider's account of the Paris negotiations and the resulting agreement. He argues that the shift from a top-down to a bottom-up approach has helped spur participation, that the Paris agreement has established a new and clearer "direction of travel", and that its provisions may be expected to generate increased national mitigation efforts over time.

Oran R. Young (2016) considers whether the Paris Agreement is "destined to succeed or doomed to fail". He argues that to avoid dangerous climate change, major emitters such as China, the United States, the European Union, and India will have to deepen their current emissions reduction or limitation pledges by 2030 at the latest. Moreover, other important countries such as Brazil, Indonesia, Japan, and Russia must avoid taking action that would aggravate the problem. Without making a firm prediction, Young discusses whether fulfilling these two conditions might be feasible.

David Victor (2016) reviews what scholars and practitioners working on climate change cooperation have learnt as their efforts have co-evolved over the past two decades. He finds that until Paris, very few lessons offered by scholars have had much influence on climate change negotiations. Moreover, cooperation theory and insights from case studies largely explain why those two decades achieved little progress. However, he also finds that the Paris agreement much better reflects insights from scholars about how to build effective international environmental institutions. He concludes that there is nevertheless no guarantee that Paris will eventually prove successful.

Robert O. Keohane and Michael Oppenheimer (2016) offer a preliminary assessment of the achievements of the Paris negotiations and of the conditions under which the Paris Agreement might generate policies and actions that can significantly influence global climate change. Having carefully reviewed the pledge and review system instituted at Paris, the authors analyze post-Paris climate politics as a strategic game. They conclude that the Paris Agreement merely creates an opening for effective action on climate change. To make Paris work, political action by domestic and transnational organized groups and a willingness to pay the economic price are required.

Thomas Bernauer, Liang Dong, Liam Francis McGrath, Irina Shaymerdenova and Haibin Zhang (2016) consider the prospects for deep emissions reductions in China—the world's biggest emitter of greenhouse gases—based on the Paris agreement's internationally coordinated and monitored unilateralism. In particular, they examine how Chinese citizens view the shift in climate policy from the reciprocal approach characteristic of Kyoto to the unilateralist approach inherent in Paris. Based on a survey experiment, the authors find forceful and robust public support for unilateral and non-reciprocal Chinese climate policy. Thus, their results suggest that China's government can rely on solid public support should it want to move forward with ambitious (i.e., costly) emissions reductions.

Detlef Sprinz, Bruce Bueno de Mesquita, Steffen Kallbekken, Frans Stokman, Håkon Sælen, and Robert Thomson (2016) report and compare three different attempts at predicting the outcome of the Paris negotiations. All of these three predictions were published several weeks ahead of the Paris meeting. One prediction was based on expert assessments, whereas the other two were based on two different formal models. The results show that the experts—on average—performed somewhat better than the formal models did. However, the results also suggest that "combining experts' predictions to reach a collective expert prediction makes for significantly more accurate predictions than individual experts' predictions". The authors find no significant difference between the predictive accuracy of the two formal models.

Steinar Andresen, Torbjørg Jevnaker, Jon Birger Skjærseth, and Jørgen Wettestad (2016) analyze the

[1] See http://universitas.no/magasin/5437/morgenstund-med-rektor

Paris agreement's potential effects on the European Union and on international carbon markets, paying particular attention to the EU emissions trading system (EU ETS). Concerning the EU, the authors argue that Paris might—through various political, legal and bureaucratic-administrative pathways—increase pressure on current EU laggards. Regarding the EU ETS, they conclude that Paris might help further tighten this system and boost the carbon price; however, they add that it will likely be challenging to use the Paris Agreement in such internal processes.

Dag Harald Claes and Helge Hveem (2016) consider the likely effect of the Paris agreement on the global oil system. They maintain that the relevant causal chain is long and subject to several intervening factors. Therefore, the effect that Paris will have on oil is extremely difficult to predict. Discussing several factors that might influence the outcome, the authors argue that some of these factors are likely to support the Paris agreement. In contrast, other factors will likely have a neutral effect or may even work against it. They also present various scenarios for how Paris might influence different parts of the global oil system.

Guri Bang, Jon Hovi, and Tora Skodvin (2016) assess the potential effectiveness of Paris in the short and the long term. Concerning short-term effectiveness, they contend that while Paris scores high on participation and reasonably high on the depth of the parties' commitments, its Achilles' heel will likely be compliance. Concerning long-term effectiveness, they argue that Paris does little to restructure states' incentives so as to avoid free riding. However, depending on factors such as technological progress and major emitters' willingness to take the lead, domestic and international norms could continue to develop in a direction that makes it more and more difficult to ignore the plea to limit and reduce carbon footprints.

The Festschrift ends with a commentary by Miranda Schreurs (2016). She explores the domestic developments that led the EU, the United States and China to adopt the emissions reduction targets they agreed to in Paris and discusses whether a strengthening of these actors' climate action commitments can be expected in the coming period. She comments that while China may be best positioned to further strengthen its climate targets, the political situation in the EU and the U.S. will make it challenging, although not impossible, to strengthen their climate action commitments in the coming period. She cautions, moreover, that more ambitious climate commitments in the EU and the United States requires that climate skeptics are convinced of the benefits of early action.

Acknowledgments

We are grateful to Arild Underdal for everything he has done for us over the years, to the contributors to this Festschrift for accepting our invitation and conscientiously keeping the many (often tight) deadlines, to the many anonymous reviewers for their willingness to help out, to the editorial team of *Politics and Governance* for their cooperation, and to Rodrigo Gomes Quintas da Silva for his friendly and efficient handling of the entire process.

Conflict of Interests

The authors declare no conflict of interests.

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Article

Conference Diplomacy: The Making of the Paris Agreement

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Abstract
The article offers an insider's account of how the Paris Agreement on climate change was reached. Focusing on participation and ambition, it describes the efforts to include a long-term temperature goal, expectations for regular ratcheting up of climate efforts, and provisions for tracking global progress. The author argues that a shift from the earlier top-down approaches to setting targets, to a bottom-up, self-determined approach has spurred participation and made it easier to reach agreement. In addition, the Paris Agreement anchors a clearer direction of travel than before. The article also discusses the negotiations of the provisions in the Agreement to drive increased national climate mitigation efforts over time. Finally, the author considers the role of conference diplomacy, particularly the need for inclusive leadership. It is argued that the French Presidency combined a transparent negotiations process with a clear sense of direction that helped achieve a comprehensive and ambitious outcome. The role of back-channel talks as part of effective conference diplomacy is also discussed.

Keywords
back-channel negotiations; climate change; cooperation; diplomacy; international negotiations; participation; UN

Issue
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1. Introduction

In the 25 years of UN climate change negotiations we have known that we can address global warming effectively only if all countries with significant greenhouse gas emissions participate in a collective effort. Nevertheless, until Paris, all such attempts had been inadequate.

The challenge in Paris was twofold: To *ensure universal participation* in a climate change agreement and to *enhance climate efforts* significantly (if not presently, then at least over time). An effective agreement would need to enhance both participation and ambition.

Previous climate agreements have failed to deliver on both counts. The United Nations Framework Convention on Climate Change (UNFCCC) from 1992 is universal but includes no quantitative emissions limitation targets. The Kyoto Protocol (1997) includes jointly determined and legally binding targets, but only for industrialized countries. The Copenhagen Accord (2009) entails self-determined and nonbinding targets, but lacks a mechanism to assess the overall adequacy of efforts or to ratchet up efforts.

There has therefore been an inherent contradiction between participation and ambition in the climate change negotiations.

The Paris Agreement meets the two criteria better than all previous attempts do. The Conference President, Laurent Fabius, the French Foreign Minister at the time of the Paris Conference, has characterized it as 'the most balanced, comprehensive and ambitious result that we could hope to achieve' (UNFCCC, 2016a).

It is an agreement with universal participation.[1] The Paris Agreement is legally binding; all parties have obligations and rights. The core of the commitment is that all parties that join the Agreement will be legally bound to regularly prepare, update, and report on national mitigation targets and other contributions. The Agree-

[1] Only one party, Nicaragua, objected to the adoption of the Paris Agreement on 12 December 2015.

ment is durable and dynamic and works to progressively strengthen the global effort. All parties commit to pursue domestic mitigation measures with the aim of meeting their targets. Unlike commitments under the Kyoto Protocol, however, parties' reduction or limitation targets in the Paris Agreement are not legally binding.

I will discuss the provisions in the Paris Agreement to create conditions for an international regime that promotes the evolution of voluntary, cooperative behaviour in the absence of a strong UN authority to enforce cooperation. The focus is on the so-called ambition mechanism in the Agreement. Conference President Fabius coined that term to include the provisions for a long-term direction of travel, building expectations of progressive ratcheting up of national climate efforts and tracking global progress.

Norway was deeply involved in the Paris end-game negotiations over these issues, following a request from the French Presidency. Fabius asked about a dozen of his ministerial colleagues to help facilitate the negotiation of some key political issues in the final high-level week of the Paris meeting. Typically, a pair of ministers, one from a developed country and one from a developing country, would co-chair such negotiations. One such pair was Norway's then Minister of Climate and Environment, Tine Sundtoft, and Saint Lucia's Minister for Sustainable Development and Energy, James Fletcher. They both had high credibility after participating in a large number of ministerial meetings leading up to Paris.

The purpose of the Paris Agreement is to increase individual and global efforts on three fronts simultaneously: to mitigate emissions, to adapt to adverse effects of climate change, and to mobilize finance and support for the necessary transformation. In this article, the focus is on mitigation.

Section 2 looks into the issue of participation. I argue that the principle of 'self-determination' helped attract wider participation. Section 3 discusses the implications of this principle for the possibility of enhancing collective climate efforts. Section 4 provides a more detailed account of how the so-called ambition mechanism was built into the Agreement, drawing on my own involvement in the negotiations in Paris, Section 5 discusses how effective conference diplomacy can significantly influence negotiation outcomes. The intense diplomatic engagement prior to and during the Paris Conference is highlighted. I argue that the French Presidency helped secure an ambitious outcome. Back-channel talks and informal coalitions were also instrumental in this regard. Finally, section 6 concludes.

2. Attracting Participation through Self-Determination

The main obstacle to universal participation in climate change agreements is widely seen to be the bifurcated nature of obligations for parties.

The Convention and follow-up decisions place much stronger obligations on industrialized countries to reduce greenhouse gas emissions. It has proven impossible to update the annexes that group countries by differentiated obligations, despite that both economic capabilities and emissions patterns have evolved dramatically over the last 25 years.[2] In the 1990s, emissions by traditional industrialized countries still represented more than half of global emissions. Since then, global emissions have grown by more than 40%. OECD countries emit one third of the total, whereas developing countries account for the rest. The bifurcation and changing emission trends were at the core of previous negotiation rounds, such as the failed round in Copenhagen in 2009.

Hence, overcoming bifurcation was seen as a critical condition to secure universal participation in the Agreement. In fact, this obstacle was actually addressed well ahead of the Paris Conference. The key to attracting broad participation was to introduce the principle of 'self-determination'.

Kallbekken, Sælen and Underdal (2014) have discussed why it is difficult to reach agreement on what constitutes an equitable and ambitious contribution from individual parties. What is fair and ambitious to one party might be seen as unjust and inadequate to another.

A more flexible approach was widely seen as the viable way forward. In the lead-up to Paris, there was a growing understanding that the approach needed to shift from what Liebreich (2015) has coined 'top-down absolutism to bottom-up flexibility'. The jointly determined and legally binding emissions reduction targets in the Kyoto Protocol were replaced by bottom-up, non-binding targets in Paris. The principle of self-determination was anchored already two years ahead of Paris at the Climate Conference in Warsaw in 2013, where parties agreed that countries' individual climate efforts under the new agreement should be prepared as 'nationally determined contributions' (UNFCCC, 2013).

This shift helped unleash an almost universal participation. By the opening of the Paris Conference, 186 of the 196 parties had presented their nationally determined contribution. This is about twice the number of parties that presented voluntary pledges in Copenhagen in 2009 and Cancun in 2010. Taking into account the different national circumstances of parties, the

[2] The United Nations Framework Convention on Climate Change (UNFCCC) has two annexes. Annex 1 is the developed country Party list—the 1992 OECD countries, the European Commission, and economies in transition (Russia, Ukraine, Belarus, and some Eastern European states). Annex 2 is the donor country Party list, a subset of Annex 1 consisting of the then OECD countries and the European Commission. These annexes have not been updated since the Convention was adopted in 1992.

bottom-up approach made it possible to arrive at more flexible and varied provisions than those in earlier agreements. The principle of self-determination contributed to attracting wider participation in the climate change agreement than ever before.

3. Driving Ambition Over Time

Climate mitigation involves a free-rider problem. As Hovi, Skodvin and Aakre (2013, p. 140) argue, 'actors have strong incentives to enjoy the benefits of other actors' mitigation efforts while not contributing to mitigation themselves. Climate mitigation will thus likely be provided only in suboptimal quantities'. Thus, while self-determination facilitates wider participation, it cannot guarantee sufficient collective action.

The trend of the contributions presented in Paris is that all parties pledge to do more than they have done before. Nevertheless, the individual plans do not add up to adequate mitigation efforts.

The UNFCCC (2015, 2016b) found that aggregate global emissions levels resulting from what parties presented before the Paris Conference[3] would overshoot the least-cost 2 °C scenario. The UNFCCC expects that the current contributions—if implemented as planned—will slow down emissions growth by a third in the 2010–2030 period, compared to the 1990–2010 period.

If fully implemented, the pledges that governments made before the opening of the Paris Conference would limit warming to about 2.7 °C above pre-industrial levels in 2100, according to the independent research consortium Climate Action Tracker (2015).[4] This compares to 3.6 °C by 2100, projected to result from current policies. Other studies have estimated higher temperature increases and it should be noted that aggregations are associated with uncertainty.[5]

The situation before the opening of the Paris Conference was that broad participation seemed to be within reach, while it was clear that the national targets put forward were inadequate. The main challenge for the end-game negotiations in Paris, therefore, was to find a way to build into the Agreement expectations that parties would significantly increase their climate efforts over time.

Mosa and Dovland (2015, p. 1) noted an emerging consensus before Paris among key negotiators concerning what was needed, that is, a 'hybrid agreement combining top-down and bottom-up elements with the aim of both broad participation and strong ambition' [6]

Many delegations, including my own, saw the following elements as fundamental to a mechanism that could drive up ambitions over time: Firstly, securing a clear direction of travel in the Paris Agreement for a transition to low-emission societies. A long-term, global goal could provide such clarity. Secondly, capturing expectations that all parties need to enhance climate actions over time. Without progression, the long-term goal would not be credible. Thirdly, assurances that parties will actually do what they have pledged. Good reporting systems on progress towards meeting collective goals[7] are essential to provide credibility to the long-term goal and to ensure transparency.

This set of issues is referred to as the 'ambition mechanism' of the Paris Agreement.

4. The Ambition Mechanism in the Paris Agreement

Norway and Saint Lucia's roles as deal brokers on the ambition mechanism in Paris proved to be as demanding as we had expected. If taken at face value, the negotiation positions revealed that there was no common ground between the 'must haves' of some countries and the 'red lines' of others. In the end, consensus was reached through several late-stage night sessions, closed for all but country representatives. Closed night sessions are less crowded—only those parties with the keenest interest participate. Building consensus first among a few, representative participants before reporting to the full group can be an effective dealmaking strategy. Willingness to compromise often increases as the deadline nears, as no party wants to be blamed for a failure.

4.1. The Temperature Goal

The Paris Agreement entails a sharpened long-term direction of travel than previous agreements do. In Copenhagen in 2009, parties agreed to limit global warming to 2 °C above pre-industrial levels. This goal is also reflected in the nonbinding Cancun Agreement (2010). In Paris, the goal was sharpened to keeping the increase in global average temperature to *well below* 2 °C, while pursuing efforts to further limit the temperature increase to 1.5 °C.

The question of how to reflect the temperature goal proved perhaps the most difficult single issue that

[3] The updated UNFCCC synthesis report covers 189 countries, representing 95.7% of global emissions.

[4] Climate Action's Tracker Consortium consists of four research organizations: Climate Analysis, Ecofys, the New Climate Institute, and the Potsdam Institute for Climate Impact Research.

[5] Estimates are uncertain for a number of reasons: National pledges vary considerably in form and content, and many are difficult to quantify. It is not known whether pledges will be fully implemented or overachieved (several developing countries have stated in their pledges that they can do more with external support). Future climate efforts later in the century, after the current pledges, are hard to predict.

[6] Mosa and Dovland co-chaired an informal dialogue—'Towards 2015'—with key negotiators from more than 20 countries. I write more on this dialogue in Section 5.

[7] Transparency and reporting on individual targets are also important, but was not covered by the set of issues faciliated by Norway and Saint Lucia.

Norway and Saint Lucia facilitated. Two negotiating groups, the alliance of small island states and of the least developed countries, had halting global warming at 1.5 °C as their top demand (Ousman Jarju, 2016). For the low-lying islands, rapid reduction of global emissions is a matter of survival. However, both developed and developing countries voiced strong opposition to including a reference to 1.5 °C. Some of the oil-producing developing countries were particularly hardline, as they perceived a more ambitious temperature goal as detrimental to their main export industry. The compromise came as part of an agreement on a separate issue, the treatment of loss and damage resulting from the adverse effects of climate change. The United States and other OECD countries agreed to 1.5 °C as an aspirational goal in return for an explicit reference that provisions on loss and damage should not constitute any new liability or right to compensation.

Paris represents an advance over previous agreements also because the temperature goal is operationalized. Parties aim to reach global peaking as soon as possible and undertake rapid reductions thereafter. The aim is to achieve climate neutrality[8] in the second half of this century.[9]

Many parties argued in favour of a clearer time-bound climate neutrality target. Some wanted both a short-term target year for global peaking and a long-term target year for climate neutrality. They argued that it would be beneficial to agree on definite target years, as such agreement would facilitate the tracking of progress towards achieving the objectives of an agreement. However, ultimately parties did not feel comfortable about setting a short-term target year for global peaking for two reasons: because the scientific basis was unclear and because the question of how to deal with the understanding that developing countries would peak later was difficult to resolve. Similar concerns hindered agreement on a definite target year for climate neutrality.

It was nevertheless possible to agree on a stronger long-term goal than previously. Both the sharpened temperature goal and its operationalization in the Paris Agreement provide a clearer direction of travel.

4.2. Enhancing Climate Action over Time

An ambitious temperature goal is a necessary, but not sufficient condition to spur ambition. As noted, the first-round national pledges presented before Paris are inadequate to keep the temperature increase well below 2 °C. To become more credible, the regime should encourage progressively more ambitious climate action over time.

The Paris Agreement delivers to some degree on that expectation. The Agreement states that successive rounds of national pledges will represent a progression beyond the current efforts. Furthermore, it also states that each party's pledge will 'reflect its highest possible ambition'. An update of self-determined climate pledges should take place every five years, starting in 2020.

From the outset, opposition was widespread against both of these elements. The principle of progression beyond current efforts was first agreed at the UN Climate Conference in Lima in 2014 (UNFCCC, 2014). It was seen as a necessary assurance to balance the principle of self-determined contributions. However, several parties were sceptical that this progression principle would apply also for future rounds of national pledges, perceiving that as too much interference in future national sovereign decisions. Others voiced concerns about 'gaming', that is, they feared that governments would present a low pledge because they would be expected to increase their efforts every five years. Ahead of the Paris Conference, only two countries, Switzerland and Norway, were clearly in favour of including a 'highest possible ambition' principle. They saw this principle as essential in a regime with self-determined climate targets.

Eventually, the principle provides assurances to all negotiation groups. Developing countries perceived it as a reassurance that countries with the highest capabilities should continue to take the lead. Many developed countries welcomed it because it builds into the Agreement the expectation that all parties will undertake their best efforts. This group includes a number of countries that so far had no quantitative mitigation pledge under the UNFCCC.

The principle was ultimately accepted. Its inclusion provides a dynamic element in the Paris Agreement. It encapsulates expectations that parties will regularly increase their national climate actions, according to their best efforts.

4.3. Taking Stock of Collective Progress

Tracking global progress is the third element of the ambition mechanism. Transparency is essential to build trust and confidence in a multilateral regime. In an effective regime, one of the functions of a transparency system is to promote implementation and to monitor progress towards the objectives.

While Norway and Saint Lucia did not facilitate the negotiations on the transparency of individual efforts, they were in charge of the negotiations on tracking collective progress.

[8] Defined in the Agreement as 'a balance between anthropogenic greenhouse gas emissions by source and removal by sinks'.

[9] Assurances are provided to developing countries. In particular, it is acknowledged that peaking will take longer for developing countries and that the efforts should be undertaken on the basis of equity and in the context of sustainable development and efforts to eradicate poverty.

In Paris, it was agreed to periodically take global stock of the implementation of the Agreement. These stocktakes will assess the collective progress towards achieving the Agreement's purpose and long-term goals.[10] Furthermore, it was agreed that the outcome of the global stocktakes shall inform parties in updating and enhancing their subsequent national pledges. The global stocktakes will occur two years ahead of each new national pledging cycle. Thereby, the latest available data will be available when formulating new, individual climate action. The first report on global emissions will be presented in 2018, followed by global stocktakes every five years.

The system of regular global stocktakes was a controversial one in the negotiations. Major developing countries were sceptical; they perceived this system as infringing on their national sovereignty. It was possible to reach agreement only by emphasizing the *collective* nature of the stocktakes. The adequacy of countries' *individual* climate efforts will not be assessed.

The inherent conflict between participation and ambition is therefore not fully resolved in the Paris Agreement. Nevertheless, the conflict is addressed more successfully than in previous agreements. Ultimately, there was no direct trade off: Wide participation was secured without weakening expectations about future enhancement of national climate efforts.

Taken together, the elements of the ambition mechanism could become a vehicle to progressively drive ambitions. If implemented, enhanced climate action will follow from the obligation of regular ratcheting up of self-determined efforts. The principles of progression and highest possible ambition anchor clear expectations. The regular stocktakes of collective efforts will further guide future individual actions. Thereby, the ambition mechanism offers an opportunity for a 'virtuous cycle' for progression over time.

The inherent free-riding problem is not resolved in the Paris Agreement: There is no guarantee that parties will actually undertake what they commit to, that is to increase their efforts significantly over time. However, the Paris Agreement makes it is harder for the free rider to carry on unnoticed. In the absence of a strong UN authority to enforce cooperation, the ambition mechanism will be a political norm. The ambition mechanism provides a yardstick to measure performance and progress (or lack thereof), including a commonly agreed benchmark for informal 'blaming and shaming'. Nevertheless, in any international regime that promotes voluntary, cooperative behaviour, the future effectiveness in largely determined by political will.

[10] The global stocktakes will also include an assessment of progress towards the adaptation and climate finance objectives, not discussed here.

5. Conference Diplomacy: Negotiating the Climate Deal

Climate diplomacy rose to unprecedented levels in the two years prior to the Paris Conference. There was a plethora of diplomatic initiatives. France launched a number of events, individually and together with Peru, the preceding Presidency of UN Climate Conference. The United States, Germany, the European Union, and many others held high-level workshops and dialogues. The US–China presidential summits in 2014 and 2015, which led to a crucially important agreement between the two countries (White House, 2015), were but two of many bilateral meetings on climate change. Several countries instructed their embassies to file weekly reports on climate-related developments in their hosts' countries.

Such climate diplomacy efforts were geared towards exploring possible compromises prior to the final negotiations rounds. Back-channel negotiations outside the formal UN setting were critical to understand the concerns of others and to construct elements of comprehensive consensus solutions.

Such initiatives also included unofficial dialogues providing a more secure environment for frank, off-the-record exchanges. This environment resembles so-called Track 2 Diplomacy, which is 'a process designed to assist official leaders…by exploring possible solutions out of the public view and without the requirements of formal negotiations or bargaining for an advantage' (Montville, 2006, p. 16). Gambia's minister of the environment, Pa Ousman Jarju (2016), has highlighted the contributions of one such unofficial initiative, the *Towards 2015 International Climate Dialogue*. This initiative assembled key negotiators from more than 20 countries in an 18-month sequence of meetings. Diringer (2015) has analysed how this dialogue reached broad consensus on many of the concepts that later were included in the Paris Agreement.

5.1. The Role of the French Presidency

The timing of the Conference was opportune for a successful result. There was a growing appreciation about the urgency. A 'now or never' sensation increased political will. In addition, reports such as the ones from the Global Commission on Economy and Climate underscored the opportunities for green transformation (New Climate Economy, 2014, 2015).

The French Presidency cleverly enhanced these favourable trends at the Paris Conference. Together with Peru, they launched a high level 'action agenda' where solutions were demonstrated and new partnerships were developed. In addition, France invited heads of states and governments to the opening of the Conference. At previous conferences, ministers had come only towards the end. Building political momentum at the opening of the Conference was a novel idea, and one

that proved successful.[11] It resulted in an unprecedented manifestation of political will.

The French Presidency also prepared parties well before the Conference. A series of high-level meetings were organized on specific themes. The Presidency introduced a new procedure at these pre-meetings. Ministers would only be allowed short general remarks in a plenary setting (drawing mostly from written statements). Then, ministers were divided into break-out groups and asked to answer pointed questions which had not been circulated in advance. This setting spurred more focused discussions and true dialogue. This innovative organization of pre-meetings contributed to better understanding of parties' concerns and explored bridging proposals. In many ways, these pre-meetings mirrored the end-game negotiations and paved the way for the compromises made at the Paris Conference.

At the Conference itself, President Fabius and his team shepherded the process inclusively and transparently. In Paris, before presenting the final text for adoption, the Presidency had extensive consultations with major countries and all negotiating groups. I witnessed this impressive conference diplomacy first-hand as I had the privilege to work on some last-minute textual solutions together with members of the French team.

Another factor was that the Presidency managed to transcend any perceptions that France was firmly in the EU camp. The French team convincingly portrayed themselves as open to all parties, understanding the concerns of all. French politicians and officials undertook impressive diplomatic efforts leading up to Paris. France had strategic dialogues with all critical countries well ahead of the Conference. Members of the French government crisscrossed the world. This huge and critical diplomatic effort helped lay the foundation for an outcome that exceeded the expectations of many observers and negotiators.[12]

In addition, the Presidency consistently communicated a clear sense of direction. They showed clear leadership. It was clear to all that France did not want merely an agreement with universal participation, but a comprehensive and ambitious one. At one point in their roles as facilitators, Norway and Saint Lucia had to report to the Presidency that if a consensus text on the temperature goal were to be presented at that time, the high-ambition option would have to be taken off the negotiating table. Conference President Fabius strongly advised us to keep the high-end options in the revised text. Behind the scenes, France worked successfully to get the strongest opponents on board, among them three G20 countries. Whenever the limited leverage of small-power facilitators such as Norway and Saint Lucia became obvious, France and other major powers employed high-level diplomacy to secure a comprehensive and ambitious deal.

5.2. A New Force in the Negotiations: The High Ambition Coalition

Several back-channel groups across the negotiation blocks underpinned the leadership of the French Presidency. The most influential turned out to be a group very few had heard of before Paris. It became known as the High Ambition Coalition.[13] In a situation where region and development levels define the formal negotiating blocks, this group was inclusive yet remained small for most of the Conference. The core group consisted of about a dozen countries. Apart from the European Union, small countries originally made up the group.[14]

The High-Ambition Coalition became a game changer through a remarkable snowball effect in Paris. At a press conference two days before the end of the Conference, the United States for the first time emerged publicly as part of the group, and was followed by Brazil the following day. Before the end of the Conference, over a hundred countries supported the messages of this loose coalition calling for a comprehensive and strong agreement (Climate Change News, 2015).

Tony de Brum, Foreign Minister of the Republic of the Marshall Islands at the time, masterfully led the High Ambition Coalition. In the lead-up to the Paris Climate Conference, he called meetings in the core ministerial group four times, on the margins of other climate-related meetings.[15] The Marshall Islands was an ideal champion, with an exceptionally experienced minister and resourceful negotiation team. The country is also a 'moral superpower'. Consisting of low-lying coral atolls rising only a few feet above sea level, it is more vulnerable to the adverse effects of climate change than most other countries are.

The European Commission (EC) and Norway played key roles in building this back-channel diplomacy. Commissioner Arias Canete has called it 'the masterplan

[11] In Copenhagen in 2009, heads of states and governments arrived towards the end of the conference, complicating the end-game negotiations.

[12] The author participated in the "Predicting Paris: Multi-Method Approaches to Forecast the Outcomes of Global Climate Negotiations" study discussed by Sprinz et al. (2016) in this volume. My own predictions were on the low side of the outcome.

[13] Former US Climate Envoy Todd Stern came up with this name in the first full meeting of the group the United States attended, a working dinner in Paris, 6 December 2015.

[14] The last ministerial meeting Norway and the EU Commission organised, held on 17 May 2015 in Berlin, had representatives from 13 parties: Angola, the EU Commission, Gambia, Germany, Grenada, the Republic of the Marshall Islands, Mexico, Norway, Peru, Saint Lucia, Switzerland, and the United Kingdom.

[15] The 2015 progressive ministerial meetings took place as follows: 17 May in Berlin, 20 July in Paris, 28 September in New York, and 8 November in Paris. There were also several meetings during the Paris Conference itself.

of Europe and its allies conceived over the year' and argues that the first meeting of the group was held on 17 May 2015 (EC, 2015, p. 1). In fact, the basis of the coalition was established already during the Climate Conference in Durban in 2011. The group was the brainchild of Connie Hedegaard (personal communication, 21 February 2016), the energetic former EU Commissioner for Climate Action. She saw the need to bring together ministers from ambitious countries. Erik Solheim (personal communication, 23 February 2016), then Norway's Minister of the Environment, was also enthusiastic about the idea of bringing together ministers with similar mindsets across different negotiation groups to help find ambitious compromises. The EU Commission and Norway continued to convene ministers from 'progressive countries' from 2011 onwards. They typically funded and co-chaired such informal ministerial meetings twice a year. The coalition continued despite changes of ministers. Norway's minister Tine Sundtoft co-chaired several meetings in this format, both with Connie Hedegaard and with her successor, Miguel Arias Canete. Norway and the EU Commission invited the Marshall Islands to co-chair a meeting in May 2015 in Berlin,[16] after which Foreign Minister Tony de Brum took over as convener.

Outside the limelight of official meetings, the coalition had met at both the ministerial and the lead negotiator levels throughout the year. In the lead-up to Paris, the group discussed what strategies to pursue to get a strong agreement. Members of the group tried to create mutual trust and to find common ground. They worked on concrete language solutions on some of the politically most contested issues. Positions were aligned, where possible. In the negotiation rooms, delegates from the coalition pushed for ambitious outcomes. They echoed and supported each other, even before other parties realized that views had been aligned through back-channel diplomacy over the course of the year. The outcome regarding the ambition mechanism eventually was very close to the demands by the coalition: 'A firm recognition of the below 1.5 degrees temperature goal; a collective mitigation pathway entailing deep cuts by mid-Century and five-yearly common political moments to revisit mitigation targets, informed by five-yearly global stocktakes' (Bialek, 2015).

The informal coalition was instrumental in keeping the more ambitious options on the table in the final round of negotiations. The group created 'a political space' for the French Presidency to ensure ambition in the final draft Agreement. Some of the major developing countries had long argued in favour of a limited agreement. Such an agreement would have few details and very little guidance on how to enhance efforts in the future. These developing countries could no longer hide behind poorer developing countries with little capacity, because many of the most vulnerable countries had become vocal champions of high ambition.

The High Ambition Coalition contributed to the making of a comprehensive and strong agreement. In the closing days in Paris, the narrative was changing: The divide was not so much between North and South, but rather between those who wanted a strong and ambitious deal and those who did not. The coalition helped bridge the unhelpful and rigid bifurcation between developed and developing countries. In the areas facilitated by Norway and Saint Lucia,[17] this back-channel dialogue clearly helped tip the balance and influenced the final outcome.

6. Conclusion

The Paris Agreement represents the culmination of years of climate diplomacy. From my vantage point as Chief Negotiator of Norway, I am convinced that the comprehensive outcome in Paris may in part be attributed to the unpreceded diplomatic efforts during and prior to the Paris Conference. Conference diplomacy impacted negotiation outcomes.

In this article, the importance of inclusive leadership is emphasized. I argue that the French Presidency combined a transparent negotiations process with a clear sense of direction that helped navigate the Paris Agreement into the more ambitious end of the spectrum of possible results. An illustration is offered where the Presidency refused a middle-ground compromise and instead pursued bilateral high-level diplomacy to secure the high-ambition options.

I also discuss the important role of back-channel negotiations. Effective conference diplomacy must cut across formal negotiation blocks and build bridges. I particularly look at the emergence and impact of one informal group, the High Ambition Coalition. Its formation softened the rigid divide between North and South and helped forge compromises.

The Paris Agreement has mobilized almost universal participation through nationally determined contributions. Self-determination is at the heart of many provisions. This shift from previous top-down approaches has spurred participation.

In addition, the Agreement anchors a clearer direction of travel than before. Provisions are built into the Agreement to enhance national climate efforts progressively over time. Thereby, the inherent conflict between broad participation and ambition in climate change negotiations has been resolved in the Paris Agreement more successfully than in previous agreements.

[16] Mary Robinson, UN Special Envoy for Climate Change at the time, advised us to include a developing country in the leadership of the progressive ministerial meetings.

[17] Worth noting is that the Presidency chose ministers in this core group of the coalition to facilitate the ambition mechanism.

The first round of self-determined climate action does not add up to what is needed to meet global targets. However, the Paris outcome cannot be judged solely by looking at the emissions reduction targets that were put forward prior to the Paris Conference. The Paris Agreement is a hybrid between bottom-up flexibility and top-down guidance. One of the keys to bringing both developed and developing countries into legally bound provisions is the self-determined nature of several provisions, combined with a mechanism to regularly ratchet up efforts. Given future political will, that combination could become a vehicle to increase climate ambitions significantly over time.

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Conflict of Interests

The author declares no conflict of interests.

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Article

The Paris Agreement: Destined to Succeed or Doomed to Fail?

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Abstract
Is the 2015 Paris Agreement on climate change destined to succeed or doomed to fail? If all the pledges embedded in the intended nationally determined contributions (INDCs) are implemented fully, temperatures at the Earth's surface are predicted to rise by 3–4 °C, far above the agreement's goal of limiting increases to 1.5 °C. This means that the fate of the agreement will be determined by the success of efforts to strengthen or ratchet up the commitments contained in the national pledges over time. The first substantive section of this essay provides a general account of mechanisms for ratcheting up commitments and conditions determining the use of these mechanisms in international environmental agreements. The second section applies this analysis to the specific case of the Paris Agreement. The conclusion is mixed. There are plenty of reasons to doubt whether the Paris Agreement will succeed in moving from strength to strength in a fashion resembling experience with the Montreal Protocol on ozone depleting substances. Nevertheless, there is more room for hope in this regard than those who see the climate problem as unusually malign, wicked, or even diabolical are willing to acknowledge.

Keywords
commitments; INDCs; Montreal Protocol; national pledges; Paris Agreement; ratcheting up

Issue
This article is part of the issue "Climate Governance and the Paris Agreement", edited by Jon Hovi and Tora Skodvin (University of Oslo, Norway).

1. Introduction

Opinions differ sharply regarding the fate of the agreement on climate change adopted on 12 December 2015 at the close of the Conference of the Parties to the UN Framework Convention on Climate Change (UNFCCC COP 21) in Paris (UNFCCC, 2015). Those who are optimistic about the Paris Agreement point to: (i) the explicit reference to the desirability of limiting temperature increases to 1.5 °C, (ii) the inclusion of Intended Nationally Determined Contributions (INDCs) for most countries rather than just those developed countries listed in Annex 1 of the UNFCCC, (iii) the legal character of the agreement, and (iv) the commitment to review pledges periodically with a view toward strengthening them over time. Pessimists, by contrast, note that (i) national INDCs are often vague, highly aspirational, and fundamentally unenforceable, (ii) the provisions dealing with monitoring, reporting, and verification are far from watertight, (iii) the mechanism regarding support for developing countries is underdeveloped, and (iv) the agreement lacks explicit compliance mechanisms. So, the question is: Does the Paris Agreement represent a major step forward by comparison with the outcome of COP 15 in 2009 or is this new agreement simply the Copenhagen Accord redux or, worse yet, Copenhagen lite?

There is one thing we can say with certainty. The national pledges that countries have made in the INDCs they submitted in preparation for the Paris negotiations are not sufficient to prevent a rise in temperatures at the Earth's surface beyond 2 °C, much less beyond 1.5 °C, even if all parties implement their pledges fully and faithfully. Even optimistic assessments of the

pledges conclude that their fulfillment would lead to temperature increases on the order of 3.5 °C (see Figure 1). This means that the critical determinant of the success of the Paris Agreement will be whether the agreement sets in motion a process that leads step-by-step and sooner rather than later to what analysts describe as a ratcheting up of the pledges embedded in the INDCs. Realistically, to achieve the target articulated in Art. 2(1) of the Paris Agreement (UNFCCC, 2015), the major emitters (China, the United States, the European Union, India) would need to raise their pledges to reduce emissions substantially or, in some cases, to commit to making serious reductions by 2025 or by 2030 at the latest. At the same time, other countries (especially important ones like Brazil, Indonesia, Japan, and Russia) would need to avoid taking steps that would exacerbate the problem. Is this within the realm of the possible?

In this article, I take up this question and examine it from several angles. I start by identifying the mechanisms through which the commitments of individual members of international regimes can be strengthened. I then consider the conditions likely to determine the success or failure of efforts to make use of these mechanisms to strengthen international commitments in specific cases. With the insights generated from this analysis in hand, I turn to the question of whether the Paris Agreement is destined to succeed or doomed to fail. In assessing the link between general observations about ratcheting up international commitments and the specific case of the climate regime, I draw on a number of lines of analysis, including several arguments that Arild Underdal has played a key role in developing over the course of his career (Underdal, 2002, 2008, 2010). In conclusion, I offer a tentative response to the question posed in the article's title.

2. Strengthening International Regimes: Mechanisms and Conditions

International regimes commonly (perhaps even typically) start out as relatively modest arrangements that do not make demands on their members that will prove difficult to implement. Some go from strength to strength, adopting more ambitious commitments and becoming increasingly effective over time. But others do not grow stronger with the passage of time. The Montreal Protocol on ozone-depleting substances (ODSs), often thought of as the gold standard in these terms, has been able to ratchet up commitments both by accelerating phaseout schedules for those chemicals already covered and by adding more chemicals to the list of those covered under the terms of the agreement (Andersen & Sarma, 2002; Parson, 2003). Although the

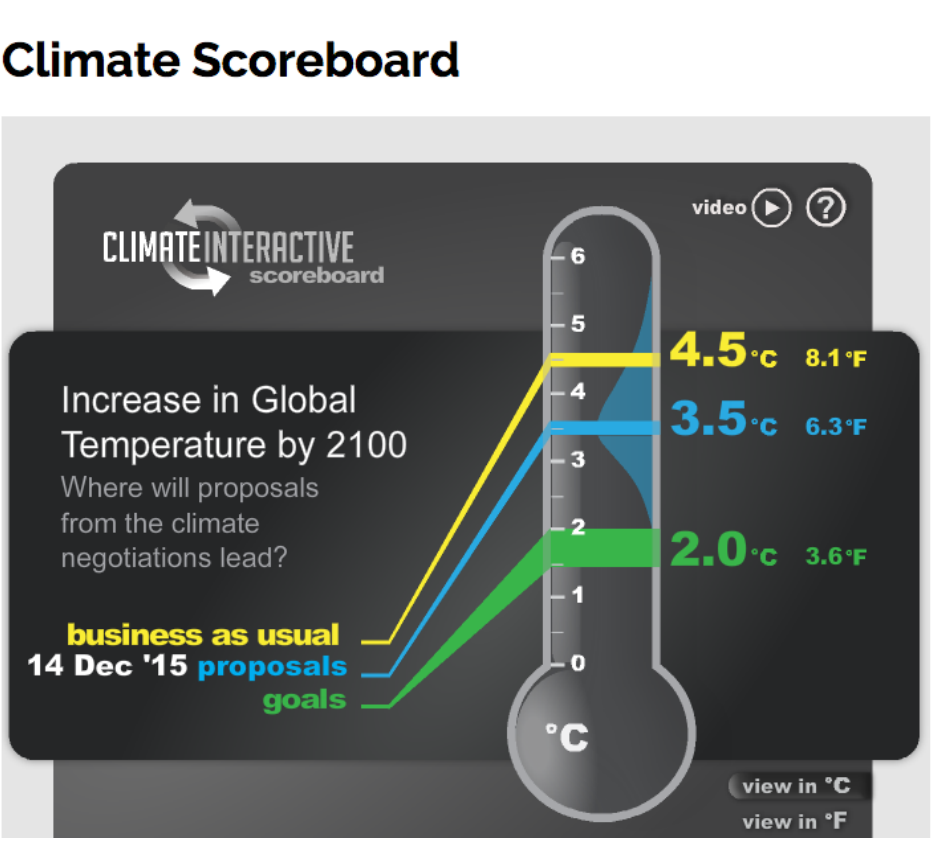

Figure 1. Temperature increases as a function of greenhouse gas emissions. Source: ClimateInteractive (www.climateinteractive.org/tools/scoreboard).

stratospheric ozone layer still shows signs of the impacts of ODSs, the problem of ozone depletion is well on its way to being solved. By contrast, few if any countries were prepared to ratchet up their commitments to reducing greenhouse gas emissions under the terms of the Kyoto Protocol at the close of the first commitment period in 2012. Several parties had withdrawn from the protocol entirely; those that remained were in no mood to accept more stringent reduction targets. This suggests that the trick is to craft arrangements allowing for step-by-step strengthening of initial commitments and to muster the political will needed to make use of these procedures effectively. This leads to a review of various mechanisms that can play this role followed by an examination of the conditions governing success in efforts to make use of these mechanisms.

2.1. Mechanisms

There are a number of distinct mechanisms that can produce a progressive dynamic regarding the strength of commitments embedded in international governance systems. Not all regimes are alike in this regard. The relevance of specific mechanisms depends both on the nature of the problem at stake and the general character of the regime created to deal with it. In the final analysis, individual cases must be considered on their own terms. Nevertheless, some concrete examples will serve to provide an overview of the range of mechanisms available in this context.

One of the simplest mechanisms for ratcheting up commitments is to grant authority to the conference/meeting of the parties to amend existing provisions without requiring formal ratification on the part of the member states. Under the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer, for example, the Meeting of the Parties has acted repeatedly to accelerate phaseout schedules for individual ODSs, as it has become clear that more ambitious goals have entered the realm of what is economically and politically feasible. Similarly, the International Maritime Organization, acting as the agency responsible for the 1973/1978 International Convention for the Prevention of Pollution from Ships (MARPOL), can make decisions involving amendments to the convention's annexes dealing with various types of discharges (e.g. noxious substances, sewage, garbage). These decisions are assumed to become legally binding on member states that do not object to them within a specified period of time.

Another mechanism involves adding chemicals or other substances to the list of those banned or controlled under the terms of an international regime. Adding new families of chemicals to the list of those scheduled for phaseout under the Montreal Protocol, for instance, requires not only a decision on the part of the MOP but also acceptance on the part of member states. This is a more stringent requirement. But it need not be a barrier to strengthening commitments. The Montreal Protocol now covers almost 100 hazardous chemicals. A similar mechanism occurs in the case of the 2001 Stockholm Convention on Persistent Organic Pollutants. At the outset, the convention focused on banning or limiting the use of the so-called "dirty dozen" (e.g. chlordane, dieldrin, heptachlor). But there are thousands of industrial chemicals that belong to the category of persistent organic pollutants (POPs); more are being developed all the time. The convention sets up a Persistent Organic Pollutants Review Committee to make recommendations to the parties regarding the elimination or regulation of additional POPs. In fact, the parties have added chemicals to the list of regulated POPs on several occasions, though this has proved to be a complex and difficult mechanism to use successfully under the terms of the Stockholm Convention.

A different mechanism comes into play where the parties initially establish a framework convention that becomes a constitutive platform on which to develop protocols dealing with a variety of more specific concerns. A prominent case is the 1979 Geneva Convention on Long-range Transboundary Air Pollution (LRTAP). Operating under the auspices of the UN Economic Commission for Europe, LRTAP has spawned seven protocols dealing initially with key pollutants like sulfur and nitrogen but expanding over time to encompass a range of additional pollutants including volatile organic compounds, heavy metals, and persistent organic pollutants. While this mechanism requires parties to agree to individual protocols on a case-by-case basis, it has the virtue of allowing parties to make progress in dealing with specific pollutants without renegotiating constitutive or foundational arrangements or waiting until the member states are prepared to agree on the terms of measures dealing with a sizable collection of pollutants taken together.

Yet another mechanism for strengthening commitments occurs in regimes that establish procedures for setting quotas or allowable harvest levels for harvesting of living resources. What is known as the schedule under the 1946 International Convention for the Regulation of Whaling provides a prominent example. In the early years, the parties adopted relatively high annual quotas to avoid forceful opposition on the part of key whaling states, despite the objections of both scientists and environmentalists concerned about declining stocks of great whales. Over time, however, the International Whaling Commission took decisions to lower the quotas step-by-step. In 1982, the commission adopted a moratorium on whaling by setting the quotas for individual species at zero. Initially presented as an arrangement that would last for ten years, the commission has never been able to muster the three-fourths majority required to reach agreement on the replacement of the moratorium with some alternative system for setting quotas. In effect, this mechanism in-

volves a process of ratcheting down quotas in contrast to the effort to ratchet up commitments in the context of regimes dealing with air pollution.

A mechanism that is often deployed in conjunction with other mechanisms centers on the provision of financial assistance to member states that agree to strengthen their commitments under the terms of a particular regime. Financial arrangements may be embedded within the provisions of individual regimes or take the form of external mechanisms that can provide assistance to those willing to strengthen their commitments under a particular regime. A prominent example of the first option is the Montreal Protocol Multilateral Fund, added to the regime under the terms of a 1990 amendment as a means of helping developing countries (known as Art. 5 parties) to shift to non-ODSs or to pursue development without relying on ODSs. The Global Environment Facility (GEF) provides an example of the second option. The GEF is a separate body sponsored jointly by the UN Development Programme, the UN Environment Programme, and the World Bank. The Facility serves as a financial mechanism for a number of conventions, including the 1992 Convention on Biological Diversity, the 1995 Convention to Combat Desertification, and the 2013 Minamata Convention on Mercury as well as the UNFCCC and the Stockholm Convention. The point of this mechanism is to strengthen commitments associated with specific regimes by providing ways to alleviate financial problems that may make it hard for parties to live up to commitments they have made or to accept new commitments regarding specific problems.

2.2. Conditions

Thus, numerous mechanisms are available to those seeking to strengthen commitments embedded in international regimes. The selection of a mechanism for strengthening commitments in a specific case will depend on the character of the regime in question. Accelerating phaseout schedules for individual chemicals is one thing; reducing quotas for harvested species is another. At the same time, it is important to note that the selection of a suitable mechanism for strengthening commitments does not guarantee success. Some international environmental regimes do make a significant contribution to problem solving (Underdal, 2008). Although many observers regard the ozone regime as the gold standard in these terms, there are other success stories, including the Antarctic Treaty System and the combination of agreements dedicated to cleaning up the Rhine River. Still, governance failure is common in this realm. Even in the case of ozone, drastic reductions in the production and consumption of ODSs have yet to eliminate annual ozone holes, particularly in the high latitudes.

This makes it essential to think about conditions likely to determine the success or failure of efforts to make use of strengthening mechanisms in connection with specific regimes. What is it that produces success in ratcheting up commitments in some regimes but failure in other cases? Clearly, complex causality is the order of the day in this context. Numerous conditions, typically interacting with one another, come into play in determining outcomes in specific cases. Even so, it is possible to identify some key conditions that are relevant to efforts to strengthen a variety of specific regimes.

Regimes may incorporate provisions automatically strengthening commitments over the course of time. An agreement calling for additional reductions in a given pollutant every five or ten years in the absence of a decision to the contrary, for instance, exemplifies this possibility. But at the international level, there are few examples of arrangements of this sort. The course of least resistance is almost always to maintain the status quo until and unless an explicit decision is taken to strengthen existing commitments. This creates a bias against the operation of the sorts of mechanisms described in the preceding subsection. Policy agendas are always crowded, and political capital is limited (Kingdon, 1995). Once a concerted effort is made to establish specific commitments to address a given problem, there is a natural tendency for policymakers to move on to address other issues clamoring for attention on relevant policy agendas. Nevertheless, ratcheting up does occur in some cases. So, the question becomes: What does it take to overcome the force of inertia or path dependence in situations of this sort? Are there specific conditions that are sufficient to overcome this natural tendency toward stasis?

One prominent example centers on the configuration of the interests of a regime's member states. In cases where there are clear asymmetries in the sense that some members stand to benefit from strengthening commitments while others expect to lose, any effort to ratchet up initial commitments will prove difficult, requiring hard bargaining at a minimum. Even in cases where all parties can expect to benefit from ratcheting up commitments, what Underdal has described as the law of the least ambitious program may make progress slow (Underdal, 1981). That is, it is hard to proceed more quickly than those who are reluctant to embrace new commitments are willing to move. In real world cases, things are apt to become considerably more complex. Individual members may benefit from the implementation of some features of a regime, while losing from the implementation of others. Uncertainty may make it difficult to determine the incidence of benefits and costs, a factor that leaves a lot of room for the application of competing but untestable narratives or ideologies on the part of those responsible for ratcheting up commitments. Vigorous debates regarding such matters may occur among policymakers within individual regime members. In situations of this kind,

seemingly authoritative reports about the impacts of a particular problem can have a big impact. Reports regarding the probable health impacts of the loss of stratospheric ozone appearing during the mid-1980s, for example, had a dramatic effect on the negotiations leading initially to agreement on the terms of the 1987 Montreal Protocol and subsequently to agreement on amendments accelerating phaseout schedules for a variety of ODSs. Current reports documenting the health impacts of the airborne particulates known as PM2.5, especially in major players like China, may play a parallel role in the ongoing debates about efforts to control severe air pollution.

Beyond this lies the influence of particularly influential actors or what we can think of as "veto players" located or based within individual member states. In the case of ozone depletion, the decision by DuPont, an American chemical company that produced ODSs accounting for some 25% of the global market in the mid-1980s, to become an active supporter of phasing out many chlorofluorocarbons and halons made a big difference in efforts to accelerate phaseout schedules under the terms of the Montreal Protocol. Conversely, veto players may emerge as entrenched sources of opposition to efforts to strengthen national commitments under the terms of specific regimes, especially in cases where such players are in a position to exercise direct influence over policymaking processes at the national level. The example of the coal industry is particularly interesting in this connection. Whereas there is some reason to believe that the industry is losing strength as a veto player in China, it is hard to find evidence of such a decline in the United States. The US Supreme Court's unprecedented February 2016 order suspending the implementation of the regulations associated with President Obama's Clean Power Plan pending a final determination regarding the legality of these regulations is a striking indicator of the ability of the coal industry to wield influence over the American policymaking process (Liptak & Davenport, 2016).

Shifts in the fortunes of relevant industries may also affect efforts to strengthen commitments regarding specific environmental problems. In 1946 at the time of the negotiation of the International Convention for the Regulation of Whaling, for example, most member states had an active and influential whaling industry. But with the passage of time, substitutes for whale products developed for most uses, and whaling became a dying industry. By 1982, when the International Whaling Commission adopted the moratorium on harvesting great whales, many key states (e.g. Australia, the Netherlands, the UK, the US) no longer had active whaling industries. Today, even the Japanese whaling industry is a vestige of its former self, though the government of Japan continues to fight a rearguard action against anti-whaling forces. Whale-watching, a new industry that has a powerful interest in keeping whales alive, has become increasingly influential in many of the regime's member states. Under the circumstances, the 1982 decision to strengthen commitments by setting quotas to zero was much easier in political terms than it would have been in earlier times. Interestingly, the three-fourths decision rule has served as an effective barrier to the success of efforts to reverse or amend the 1982 decision. The case of whaling is undoubtedly an extreme example. But it is not unique. Shifts in the structure of those industries that have major stakes in the concerns of specific regimes can play a key role in determining the fate of efforts to strengthen commitments.

Another condition centers on the magnitude and the incidence of the costs involved in taking the actions required to solve the problems that regimes address. Costs are difficult both to calculate in advance and to document over time. But a common occurrence in this context is that the actual costs of solving environmental problems turn out to be a fraction of the costs projected by opponents during the negotiations leading to the creation of regimes in the first place. This is partly a matter of the politics of environmental negotiations. Those who are opposed to the creation of a regime regularly exaggerate the costs that will be involved in efforts to implement the terms of a proposed agreement. In part, however, it is a matter of technological innovation. Once a regime is in place and those whose actions are affected focus their attention on the process of implementation, innovations begin to emerge that make compliance with the terms of a regime less costly than initially expected. Once again, the ozone regime provides a clearcut example. Not only did producers find affordable alternatives for many uses of ODSs; the alternatives sometimes turned out to be more cost effective than the chemicals they replaced. When this occurs, it becomes easier, sometimes dramatically easier, to strengthen commitments that had been the subject of hard bargaining at the outset.

Another condition that comes into play in some settings involves the content, intensity, and arousal of public concern. Sometimes this is a matter of more or less far-reaching shifts in public attitudes and values. It is hard to deny, for example, that a broad swath of the public has come to accept the proposition that nonhuman species are sentient beings endowed with a right to life, a normative position that complicates the situation of industries that are predicated on the consumptive use of animals. Obviously, there are limits to this line of thinking; no one advocates acknowledging a right to life for disease-bearing insects. But in the cases of charismatic megafauna (e.g. elephants, polar bears, whales), shifting public attitudes have played an important role in strengthening the arguments of those favoring the tightening of the rules embedded in regimes dedicated to the conservation of wildlife (Safina, 2015). In extreme cases, the force of this development

has triggered a shift from conservation (e.g. achieving maximum sustainable yields on an ongoing basis) to preservation (e.g. minimizing all intentional killing of individual members of key species) as the fundamental goal of relevant regimes.

In other cases, the role of public attitudes is more a matter of framing issues in such a way as to tap into intense concerns that can lead to the mobilization of public interest in an issue and the growth of pressure on policymakers to take action to address specific problems. In many societies, success in framing an issue as a matter of public health can have this effect. Turning to the example of ozone depletion again, it is hard to overestimate the importance of the specter of a dramatic rise in the incidence of melanomas and glaucoma arising from increased exposure to solar radiation caused by the seasonal thinning of the stratospheric ozone layer. Balanced assessments of benefits and costs may or may not favor the case of those calling for the ratcheting up of commitments that lie at the heart of environmental regimes. But success in framing issues in ways that activate deeply held and intense public concerns can make a critical difference to the outcome of efforts to strengthen commitments embedded in specific regimes.

Cutting across these concerns is the role of leadership or what some analysts refer to as championship as a condition affecting efforts to strengthen the commitments of environmental regimes (Litfin, 1994). Leadership can take a number of forms (Young, 1991). Intellectual leadership is a matter of creativity in finding new and effective ways to characterize a problem. Entrepreneurial leadership involves the ability to put together coalitions of the willing to support the strengthening of international commitments. Structural leadership centers on the capacity to bring to bear material resources (e.g. financial assistance or rewards) in a manner that helps to persuade reluctant parties to join coalitions supporting the strengthening of commitments. In all its forms, leadership can be idiosyncratic. It is hard to forecast the emergence of effective leaders in a given issue area, much less to predict whether their efforts will succeed in bringing about major advances in the strength of commitments in specific cases. Nevertheless, case studies show repeatedly that leaders play key roles with regard to the evolution of those regimes that do become stronger with regard to the content and extent of their commitments.

It is easy to identify synergies regarding the operation of many of these conditions. When relative symmetry in the interests of member states is combined with veto players willing to engage actively in problem-solving behavior and with technological advances that lower the costs of addressing a problem significantly, for example, there are good reasons to be optimistic. If effective leadership emerges in such cases, there is all the more reason to anticipate success. A combination of this sort accounts for the success of the ozone regime, widely regarded as the preeminent example when it comes to the progressive development of stronger commitments needed to solve a major international problem.

3. Strengthening the Paris Agreement

Many observers regard the problem of climate change as particularly intractable in these terms. They see climate change as what Underdal and his colleagues have called a malign problem and what others have characterized as a wicked or diabolical problem that does not lend itself to progress in the form of strengthening commitments over time (Miles et al., 2002; Steffen, 2011). But this intuitively appealing assessment needs to be subjected to critical evaluation. What light does the preceding section's analysis of mechanisms and conditions shed on prospects for strengthening international commitments regarding climate and, more specifically, on the likely fate of the Paris Agreement?

The mechanisms for strengthening commitments embedded in the Paris Agreement are considerably less straightforward than those described in the preceding section. Strengthening must take the form, first and foremost, of ratcheting up the commitments articulated in the INDCs. But this is hardly a matter of simply accelerating phaseout schedules as in the case of ozone depletion, adding chemicals to the proscribed list as in the case of persistent organic pollutants, or changing quotas as in the case of whaling. There is no common currency underlying the INDCs as formulated by individual countries. Each country has formulated its INDC in its own terms. Even in cases where they refer to quantified reductions in greenhouse gas (GHG) emissions, there are different base years and different procedures for measuring or verifying progress. Whereas the European Union has pledged to reduce domestic emissions across the full set of 28 member countries by 40% relative to the base year of 1990 by 2030, for example, the United States has promised to reduce emissions by 26–28% relative to the base year of 2005 by 2025. And some of the INDCs are not formulated in terms of quantified reductions at all. China, for instance, has pledged to reach peak GHG emissions no later than 2030, to make a good faith effort to begin to reduce emissions sooner, and, in the meantime, to reduce the carbon intensity of goods and services by 60–65% relative to 2005 by 2030. India has promised to lower energy intensity by 33–35% relative to 2005 by 2030 and to increase the proportion of non-fossil fuel based power generation to 40% by 2030. Under the circumstances, strengthening the INDCs would amount to a collection of national formulas that would not be easy to evaluate in aggregate terms.

A second mechanism for strengthening commitments embedded in the Paris Agreement involves the provision of funding to help developing countries to

find ways to grow their economies without increasing emissions of GHGs and to adapt to the impacts of climate change. But here, too, it is difficult to understand exactly what the strengthening of commitments would entail. In some respects, the terms of the Paris Agreement regarding funding backtrack from the commitments articulated in the 2009 Copenhagen Accord. In Copenhagen, the parties pledged to mobilize new and additional funding approaching $30 billion during 2010–2012 and to make an effort to raise this to $100 billion per year by 2020. By contrast, the Paris Agreement says simply that "[d]eveloped country Parties shall provide financial resources to assist developing country Parties with respect to both mitigation and adaptation in continuation of their existing obligations under the Convention" (Art. 9.1). The developed countries are clearly expected to increase their contributions along these lines over time. But because there is no explicit baseline regarding the scale of these contributions, it is difficult to say what a strengthening of the commitments regarding funding would entail.

One way to think about the Paris Agreement is to treat it as a system of pledge and review. The parties agree to engage in what the agreement describes as a "global stocktake" from time to time in order "to assess collective progress towards achieving the purpose of this Agreement" with the intention of strengthening their commitments as needed to fulfill the goals of the agreement (Art. 14). They plan to "undertake the first global stocktake in 2023 and every five years thereafter unless otherwise decided by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement" (Art. 14.2). Informally, there has been discussion of accelerating this schedule, carrying out the first of these assessments as early as 2020.

This is a hopeful sign with regard to the prospects for strengthening commitments under the Paris Agreement. As evidence regarding the reality of climate change becomes more clearcut and undeniable, the parties may realize that they must make a good faith effort to strengthen their commitments. Still, it would be risky to set too much store by this mechanism. If key countries (e.g. China and the United States) take the lead, others may feel an obligation to follow suit. But there is nothing mandatory about the pledge and review process. Efforts to strengthen the commitments of the Paris Agreement through this process could easily break down in mutual recriminations, with individual parties accusing each other of bad faith due to their failure to take strong stands in favor of strengthened commitments needed to fulfill the goal of holding temperature increases to 2 °C, much less the more demanding goal of holding the line at 1.5 °C.

What, then, of the conditions that will determine whether there is progress toward strengthening the Paris commitments during the coming years? Is the problem of climate change extremely malign, diabolical, or super-wicked as many observers have suggested? The case for answering this question in the affirmative rests on several distinct propositions. Energy derived from fossil fuels is deeply embedded in all aspects of industrialized economies. The principal beneficiaries of this system (e.g. the coal companies, the multinational oil companies) wield enormous power in major political systems that allows them to stymie efforts to transition away from dependence on fossil fuels. The character of climate change as a collective-action problem encourages individual countries to hang back, waiting to see if others will take the lead before adopting major steps to address the problem on their own.

Still, this reasoning is by no means the whole story regarding efforts to address the problem of climate change. The configuration of national interests relating to climate change is not as antithetical to progress as in the case of truly asymmetrical situations where one party's gains are matched by another party's losses. Everyone stands to lose from severe changes in the Earth's climate system (though not necessarily to the same extent), and everyone stands to benefit from maintaining what analysts now call a "safe operating space for humanity" (Rockström et al., 2009). As with all collective-action problems, it may prove difficult to induce key states to act as first movers when it comes to reducing GHG emissions. But as the recent collaborative initiatives of China and the United States (together accounting for over 40% of global emissions) suggest, leadership on the part of key states in this realm is not beyond the realm of the possible. More generally, this may be a case that lends itself to treatment in terms of what Schelling calls a "k group" or a like-minded coalition of leading players (Schelling, 1978). Certainly, a coalition encompassing China, the European Union, India, and the United States could put the international community on a path toward solving the problem of climate change.

Veto players within individual member states (e.g. coal companies, oil companies) are able to exert great influence regarding the fate of efforts to take effective steps to curb GHG emissions. The political power of the coal interests in opposing President Obama's Clean Power Plan, for example, offers a compelling recent illustration of this proposition. But it would be a mistake to exaggerate the significance of veto players. It is probable that the actual costs of reducing GHG emissions will turn out to be much lower than the projections made by opponents of current policy initiatives (Stern, 2009). Technological innovations are likely to prove highly important, and there is every reason to expect that many new companies will arise that stand to make profits from the production and distribution of alternative sources of energy. Firm commitments to the reduction of GHG emissions may trigger a dynamic under which those who are able to profit from this development gain the upper hand.

The critical factor may turn out to be shifts in public attitudes and values or what some have characterized as the rise of a new consciousness regarding human-environment relations. So long as environmental issues in general and climate change in particular remain matters of marginal concern to broad segments of the public in key countries, those who stand to gain from opposing serious efforts to reduce GHG emissions are likely to be able to maintain a stranglehold over policy initiatives needed to make a difference regarding the problem of climate change. But an aroused public in a few key countries might change this picture dramatically. How might such a development come about? One possibility is some sort of climate shock that jolts wide swaths of the public into taking climate change seriously. A less dramatic possibility is the development over time of a social movement that succeeds in framing climate change in compelling terms (perhaps as a public health crisis) and in finding ways to mobilize opinion leaders within various strata of the population (McKibben, 2013). Will some such development occur during the foreseeable future? It is difficult to provide a straightforward answer to this question. But it is well within the realm of the possible that what seems like a malign or even a wicked or diabolical problem today will give way to far-reaching social changes that produce profound alterations in our understanding of the nature of this seemingly intractable problem.

4. Conclusion: And the Answer Is…?

So, is the Paris Agreement destined to succeed or doomed to fail? The critics of the agreement have a strong case. Temperatures at the Earth's surface have already risen by an average of 1 °C. The mechanisms for strengthening commitments under the terms of the agreement seem ill-defined and weak. As the recent experiences of the United States make clear, efforts to implement the pledges embedded in the INDCs may run into serious roadblocks within individual member countries. In many cases, it will not be easy to monitor or verify the actual progress of individual countries. The review procedure sketched out in the Paris Agreement may prove ineffective. In the absence of a real sense of crisis, the global stocktake procedure may prove desultory and generally unpersuasive. Thus, it would not be surprising if the Paris Agreement becomes another in a long list of failed attempts to come to terms with the problem of climate change.

Yet I do not want to end this essay with a simple statement that the Paris Agreement is doomed to fail. There is no basis for making firm predictions about such matters. But in thinking about pathways to success for the agreement, I believe we need to differentiate two distinct scenarios. One scenario features a severe climate shock, something far more disruptive than hurricanes Katrina or Sandy. Think of events on the order of the disintegration of the Greenland Ice Sheet or the shutting down of the thermohaline circulation in the North Atlantic as possibilities (Lenton et al., 2008). Shocks or crises of this magnitude create rare windows of opportunity during which far-reaching changes in institutional arrangements can occur at what seems like lightning speed compared with normal times. Such windows do not stay open long, and it is essential to be prepared for such opportunities with well-developed options that can be put into place quickly. While we cannot estimate the probability of a shock of this magnitude occurring in the next decade or two with precision, I regard this scenario as plausible. It is well worth taking seriously in planning for the future. Under the right circumstances, the Paris Agreement might thrive in the wake of such a crisis.

The other scenario focuses on the prospects for the success of the Paris Agreement in the absence of a severe climate shock. The critical issues here, in my judgment, involve efforts to break the political grip of the forces of business as usual (and especially the fossil fuel industry) and to foster a revolution in public consciousness in which new attitudes and values regarding human well-being take hold on a widespread basis. Breaking the grip of entrenched industries is difficult. But as Oreskes and Conway have shown, it can be done (Oreskes & Conway, 2010). Particularly important in this regard is the promotion of shifts in underlying perspectives and attitudes of the sort that Pope Francis has articulated in his 2015 encyclical entitled *Laudato si'* (Laudato Si, 2015). What is at stake here is the transformation of our vision of the good life rather than the selection of one or another policy instrument on the basis of calculations of benefits and costs. It is easy to become cynical about the prospects for real change in situations of this sort. But fundamental shifts of this type do occur under some conditions, and it may well be that developments of this sort will determine the fate of the Paris Agreement.

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Conflict of Interests

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Article

What the Framework Convention on Climate Change Teaches Us About Cooperation on Climate Change

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Abstract
Arild Underdal has been at the center of an important community of scholars studying global environmental governance. Since the 1990s that community, along with many other scholars globally, has offered important insights into the design and management of international institutions that can lead to more effective management of environmental problems. At the same time, diplomats have made multiple attempts to create institutions to manage the dangers of climate change. This essay looks at what has been learned by both communities—scholars and practitioners—as their efforts co-evolved. It appears that despite a wealth of possible insights into making cooperation effective very few of the lessons offered by scholars had much impact during the first two decades of climate change diplomacy. Indeed, basic concepts from cooperation theory and evidence from case studies—many developed in Arild's orbit—can explain why those two decades achieved very little real cooperation. The new Paris agreement may be changing all that and much better reflects insights from scholars about how to build effective international institutions. Success in the Paris process is far from assured and scholars can contribute a lot more with a more strategic view of when and how they have an impact.

Keywords
climate change; compliance; effectiveness; international cooperation; United Nations

Issue
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1. Introduction

From the early 1990s a large and growing community of scholars interested in the effectiveness of international cooperation has been orbiting around Arild Underdal. I consider myself one of the orbiters, dating from our joint work at the International Institute for Applied Systems Analysis (IIASA) and from many projects since.

Many other scholars have created their own orbits as well, and most of us have found ourselves circling many planets. But Arild's gravitational force has been intellectually strong for at least two reasons. One is that the Underdalian solar system has now been around and productive for a long time—perhaps longer than any other sustained research program on international environmental governance. Arild's planets have multiplied and colonized globally. The other is that Arild has held firm with a beautiful ascetic approach to theory. Whenever complex environmental issues are at stake it is easy to identify hundreds of variable and causal mechanisms that may be at work. But starting with Arild's work on fisheries (Underdal, 1980) where

the core, important variables were the numbers of players in a negotiation and conflicts in their preferences—one of his intellectual gravitational forces has been a focus on what matters most.

In parallel with the emergence of a global research program on environmental governance the world's diplomats have also tried their hand at governance. What can be learned from the parallel efforts at scholarship and practice? Have the diplomats learned anything from the community of scholars who are studying systematically the business of diplomacy? Have the scholars learned anything from the diplomats?

In this essay—which is more of a thinkpiece than a tightly wound set of hypotheses tested with data—I aim to offer some answers to those questions. My focus is on the problem of global climate change—one that was just taking shape as a serious global problem around the same time that numerous research programs aimed at studying global governance were getting started in the early 1990s. Climate change is a good case for looking at whether theory and practice learn from each other because the problem itself has a deeply malign structure—serious solutions require sustained cooperation over many decades with strong incentives to defect (Keohane & Victor, 2016). And precisely because of that malign structure, diplomatic efforts have been ongoing for many decades with, at best, mixed results.

I'll look at these questions from three perspectives. First, and briefly, what's gone wrong in the first two decades of multilateral cooperation? Second, what's new in the current efforts under the Paris accord—and why are these new efforts so promising after decades of gridlock and inaction? Third, what have we learned from all this for the study and practice of global environmental governance.

2. What Went Wrong with Global Cooperation on Climate Change?

A decade ago many of us in Arild's orbit took stock of what he had taught us. At that time, I wrote about the lessons learned from Arild's research for global climate change (Victor, 2006). At that time, my task was that of an intellectual coroner—probing why efforts to promote cooperation on climate change had, so far, achieved almost nothing. My assessment then still holds today, and it comes straight from work done in the Underdalian solar system.

Global efforts to address climate change were attempting to involve all nations on the planet in the crafting of universal agreements that would be legally binding. The inflexibility of binding law—backed by strict emission targets and timetables—was seen by many policy makers as a virtue because that would guarantee, they thought, that all nations' feet would be held to the fire. And the United Nations Framework Convention on Climate Change (UNFCCC) operated as a monopoly—it was the only forum for talking about multilateral actions on climate change.

It was not hard—from basic theory as well as the accumulated insights from research on the effectiveness of international environmental cooperation—to predict that this system would fail. Indeed, all the warning signs were found in the work of Underdal and his colleagues, among others. As I see it, the existing social scientific research on the effectiveness of international environmental agreements offered three warning signs to the architects of climate change diplomacy. And on all three of these warning signs the policymakers basically ignored everything we had to say.

First, a universal agreement amongst countries with wildly different preferences would be fantastically difficult to achieve. Indeed, success would be possible only by watering down the content to reflect the interests of the least ambitious actors (Underdal, 1980)—a strategy reflected in the UNFCCC itself. Or the participants could be narrowed to just a subset of supposedly more ambitious actors—as was done in the Kyoto Protocol—but that strategy would not work for the long term since most growth in emissions was from the other, excluded nations (Victor, 2001). Or, as in Copenhagen, gridlock would emerge.

A second warning sign concerned flexibility. An agreement that offered very little flexibility was also likely to yield the lowest common denominator or gridlock. As a practical matter, the question of flexibility arose most centrally around the policy decision of whether to make international agreements on climate change legally binding. Many of Arild's students who were engaged in the IIASA project in the 1990s were working on this question; my read of their research is an unambiguous endorsement for the merits of nonbinding agreements under special circumstances. I learned a lot, in particular, from research on the European acid rain regime which showed that binding commitments made countries wary about offering commitments that they weren't sure they could honor, but nonbinding commitments allowed them to offer "stretch" goals there were often very important (Wettestad, 1998). Research on the North Sea regime came to a similar conclusion, with the added insight that a regular set of high-level conferences backed by implementation review could turn those stretch goals into pragmatic action plans that governments would actually follow (Skjærseth, 1998). Implementation review helped keep governments accountable for their commitments and forced them to explain when they fell short—as often happened when governments adopted stretch goals. Across a wide array of other case studies, we saw similar patterns in our research, with a pretty clear trade-off between the legal status of an agreement and the possible impacts of that agreement on how countries managed very complex environmental problems (Victor, Raustiala, & Skolnikoff, 1998). Since then, scholars working on

similar topics have developed a more systematic set of insights around the relationship between hard law and soft law (Abbott & Snidal, 2000).

The third warning sign was not so crisply developed in the 1990s when we were all working together at IIASA, although the elements of what has become a very interesting research program were beginning to take shape. Looking across many international environmental agreements, it is striking that some are highly integrated and centralized. The Montréal protocol on the ozone layer is a good example. Many others, however, are much more decentralized.

Working in the 1990s as part of the IIASA research project, I became interested in how governments were crafting international agreements on plant genetic resources. This is an area where governments and firms and NGOs all were trying to get things done, but nobody could agree on exactly the right course of action. Plant genetic resources were also intrinsically decentralized, as they implicate the international trade regime, many environmental regimes, and the industrial structure of important yet diverse industries. Decentralization in the legal regime helped these many diverse actors and institutions experiment with different ideas and figure out what works. The paper that came out about activity called these decentralized regulatory systems a "regime complex" (Raustiala & Victor, 2004). Other people have applied other concepts to the same idea, notably Lin Ostrom's work on "polycentrism" (Ostrom, 2009). When I look back on that period I realize that we were grappling with the issues of decentralization and experimentation in many other areas of environmental regulation as well, such as whaling and protection of the oceans (Andresen, 1998; Stokke, 1998). Certainly I would not have been working on the idea of regime complexes if it had not been for the joint research with Arild in his solar system in the 1990s.

Certainly others will look back on the history of the first two decades of international diplomacy on the climate change issue and come to other conclusions. But when I look back on it what I see is a growing array of insights about how to make international cooperation on difficult topics such as more highly effective, and no relationship between those insights and what the diplomats were actually doing. What's different about the Paris approach is that it is much more reflective of some of the fundamental insights about bargaining, starting with the merits of allowing small groups to work on problems rather than just big universal agreements. That's an insight that I many others first learned from Arild.

3. Why Was Paris Different[1]

Why did Paris work when almost everything before it failed? Here I'd like to offer some answers to that question and then explore how we academics who have been in Arild's orbit might help the Paris process become more effective.

My answer to the question of why Paris "worked" lies centrally with how commitments are being negotiated in the Paris process. Instead of setting commitments through centralized bargaining, the Paris approach lets countries set their own commitments. These "nationally determined contributions" are a starting point for deeper cooperation that will unfold over time. Once the Paris agreement enters into force and is fully in motion each nation will be expected to adopt a new pledge every 5 years in tandem with periodic overall efforts to take stock of how the group of nations is doing.

The flexibility of this pledge-and-review system helped transform climate diplomacy from the gridlock and impotence of the past. It makes it easier for national governments to tailor their commitments to what they know they can deliver at home. Frankly, most of the world's emissions come from countries that aren't centrally worried (yet) about global climate change. Take China, the world's biggest emitter. Its leaders have learned more about the dangers of unchecked climate warming, and that has made the country a bit more willing to act. But the nation still has other much more pressing priorities—like clearing the urban air of smog. Or India, another big emitter, which is also mainly focused on priorities other than global warming, such as making the nation's power grid more reliable.

The pledging approach lets these countries offer packages of policies that align with their self-interests while also doing something to slow the growth of global climate pollution. The same is true of most of the United States—outside the environmentally conscious coastal states, most of the nation is not centrally seized by fear of global climate change. When asked general questions by pollsters about climate change most Americans say they believe the science, but the best polling shows that people still aren't willing to spend much to combat this global problem (e.g., Ansolabehere & Konisky, 2014). One of the reasons that past efforts to address this problem failed is that they were orchestrated around the idea that fixing global warming requires a treaty focused on strict limits on emissions of greenhouse gases. The new approach, by contrast, is organized around the idea that every country has its own national interests and needs the flexibility to align what it does globally with what is doable locally.

Eventually a much more integrated global treaty will be needed to make major cuts in greenhouse gas emissions—one directly focused on the global goals. But flexibility offers a way to get started and build confidence that, in time, will beget more confidence and a willingness to do more. This is the same theory—with a similar dose of flexibility—that guided the creation of the highly effective system for international coordina-

[1] See Victor (2015). This section draws largely from that piece.

tion of trade policy through the General Agreement on Tariffs and Trade (GATT), and since 1995 the World Trade Organization (WTO). Trade diplomacy began in the 1940s with simple, self-enforcing agreements that aligned with national interests; through successive rounds of bargaining those national policies were ratcheted forward and integrated. Easier problems were tackled first, building confidence that made it possible to tackle harder diplomatic challenges. The Paris agreement is intended to move the world in that direction.

There were many other sources of flexibility that also helped. Much of what was agreed in Paris, including notably the national pledges, is not strictly binding. Quite apart from whether the concept of binding international law is an oxymoron, the nonbinding status of commitments has been liberating for the reasons that academics already understood in the 1990s. There is a tradeoff between the rigor of the legal commitments and the level of ambition that countries are willing to offer, especially when governments are highly unsure about exactly what is feasible for them to implement at home

Another source of flexibility was the fact that many countries, long before Paris, were already working on the climate problem in smaller groups outside the United Nations. There were small groups of countries focused on forests—the area where the most progress in cutting emissions has been made in recent years. Other groups worked on the Arctic. Still others, with overlapping membership, are making tangible progress in cutting short-lived climate pollutants, such as soot and methane. There has been striking progress in regulating powerful heat trapping gases through the Montreal Protocol. Norway's role in all this is worth mentioning, in particular. There is no "small" country that has done more to advance cooperation on climate change than Norway.

All this flexibility didn't clear the political land mines of past efforts to cooperate on climate change. The least developed and most vulnerable countries in Paris were still rightly concerned that they get special treatment since they are bearing the brunt of climate impacts that they did not cause. The oil exporting countries, led by Saudi Arabia, still appear keen to make this agreement as ineffective as possible, since success could spell trouble for their lifeblood. These landmines sit armed and ready to explode at every large diplomatic meeting on climate change; flexibility makes it a bit easier to keep them from blowing up the whole process.

Division of the world into developed and developing countries—a concept enshrined in the 1992 Framework Convention on Climate Change and a regular feature of most modern global environmental agreements—cast a shadow over almost every discussion in Paris, since developing countries are determined to see developed nations bear most of the cost. But flexible pledges meant that nations from both sides of the divide could continue to hold their views about the right ways to categorize countries even though the categories are increasingly meaningless. The emergence of rapidly growing "middle-income" countries—such as China, Brazil, and Korea—has changed the facts on the ground. The world has moved on, and the flexibility in the Paris process has made it easier for climate diplomacy to reflect those realities.

This shift from an integrated "top down" style of climate bargaining to a more flexible pledge and review system has its roots, in part, in academic thinking—including the work that began in Paris. However, there were many other handmaidens of success in Paris, especially the French hosts who made success a national priority. They adopted a strategy for success—one that revolved around flexibility rather than trying to shoehorn a lot of complex bargaining into a single, centralized binding agreement—but they also backed that strategy with massive diplomatic resources. They had a realistic sense of what was feasible along with a plan B (and plans that ran deeper in the alphabet) in case things turned sour. They as diplomatic hosts were well integrated with the climate change secretariat, which also had a sober vision for what was feasible as a pragmatic strategy for obtaining that outcome. The contrast with the Danish hosts and the secretariat that managed the Copenhagen process could not have been starker.

Good hosting by the French helped to build good will—and focused minds on the harmful consequences of failure—and that was on display in many ways. A deal on climate finance—which in Copenhagen had been set at $100 billion per year of new money by 2020—could have easily blown up the talks, with both donors and recipients having strong incentives to hold out for the best deal. Good will and the costs to all sides from failure helped focus minds on an agreement that did little beyond what was already happening—with $100 billion per year as the floor for new money. All the details that would make these commitments workable, such as accounting systems, were pushed into the future.

To be sure, some of the bargaining behaviors that have plagued international climate agreements in the past were still on display. One was revealed by the so-called "ambition coalition"—a big group of nations that pretended to seek the most ambitious agreement possible when, in fact, little held them together except slogans. This coalition favored strong language around the goal of stopping warming at well below 2 degrees Celsius above pre-industrial levels, ideally at 1.5 degrees. Looking at the feasibility of these goals was one of the tasks of the Intergovernmental Panel on Climate Change (IPCC) panel on which I served for the last five years. That experience convinced me that warming probably can't be stopped at those levels—the world has dithered for too long and must now brace for the consequences. Even a realistic crash program to cut emissions will blow through 2 degrees; 1.5 degrees is

ridiculous. New goals are needed (Briggs, Kennel, & Victor, 2015).

As academics, we need to avoid getting sucked into diplomatic debates that are, by design, fruitless. A flood of papers is being written about the Paris goals, and now that the IPCC has agreed to write a special report on 1.5 degrees even more papers will be written with the aim of being cited in that report. But the goals demanded by the "ambition coalition" have not been achievable for some time. Yet nobody within the official process has an incentive to state the truth about what is achievable because no single country is accountable for reaching these bold collective goals. Even in the IPCC, which should have been speaking truth to policy in its final Summary for Policy Makers, has no blunt statements about the impracticality of these goals (Edenhofer et al., 2014). That's because the IPCC's summary, like the Paris Agreement itself, is approved essentially by consensus—a method for making decisions that favors oblique language and a high ratio of bold pronouncements to practical realities. Yet the truth matters, because this agreement is now organized around goals that are not achievable, which will make the periodic stocktaking difficult to do with honesty. It will also make it harder for policy makers to put the needed focus on the huge needs for adaptation that are on the horizon.

On balance, all of this is encouraging news. A new process is under way, and it has many of the elements of success. What can we as academics do to help?

We in the academic community need to avoid getting drawn into debates that are structurally fruitless. But we should let ourselves play a bigger role in other aspects of the Paris process where hard-nosed social science of the Underdalian type is badly needed. Let me highlight two.

One is the question of how nations will actually know what each other is doing. Early in the planning process for the IIASA project we focused on this topic—on what arms controllers called "verification"—as an area where more research was needed. Our advisors, such as Arild, guided us to research that would help explain the incentives for cooperation. And absent verification and eventually enforcement systems there were many kinds of malign problems for which cooperation would be impossible.

That logic now applies to climate change. Pledge and review is a long overdue way to get started with cooperation, but making that cooperation much deeper—with much costlier controls on emissions—will require the ability to assess whether each nation is doing its part and to link together the different national efforts into a more integrated, collaborative set of international agreements. Most of the details for how that will be done were deferred in Paris, and fleshing out a system for transparency is one reason why most observers think the "after Paris" process will be more important than the Paris meeting itself. Getting consensus on a serious review mechanism is all but impossible, which is why it will be important for some countries to volunteer themselves for careful review—to lead the way. A good model for this lies in the systems of ambitious commitments backed by implementation review that the IIASA team studied in the North Sea and other locales.

A robust review system would create much higher levels of transparency. That, in turn, could lower the transaction costs for more complicated and detailed integrated agreements. We in the social science community should develop some insights and predictions for exactly when and how those expectations will actually be realized.

Political scientists need to get more centrally involved in the debate about the role of markets in creating incentives to deepen international cooperation after Paris. Already many analysts are excited by what they see in Article 6 of the Paris agreement, which includes the provision for "internationally transferred mitigation outcomes," a clunky concept that surely will become known as ITMOs in the acronym riddled world of climate diplomacy. For many economists, ITMOs will be seen as an open door for international trading of emission credits—a concept that, in theory, could link national policy schemes into a more efficient, integrated global effort. From the first paper I wrote on this topic in the late 1980s I have been skeptical that international emission trading systems will work well because creating carbon credits is like creating a new form of money—a money that is only as good as the institutions that back it (Victor, 2009; Victor et al., 2014). Even in highly developed countries that is hard to do, a point that the Greek debt crisis has underscored for the Euro. Whether and how international trading will really work is an ongoing debate among analysts, and I expect that debate will now move into higher gear. This question of how different national regulatory and market systems will become interconnected over time—which will be essential to creating a more integrated approach to deep decarbonizaiton that eventually affects the whole world economy—is pivotal to the success of Paris. And it is an area where social science theory and empirical research have a lot to contribute.

Eventually, these efforts at building transparency will become a verification system—a topic that hasn't received much attention in most international environmental agreements where diplomats seem almost scared to talk about verification and enforcement, in contrast with arms control diplomacy where these topics usually occupy center stage (Ausubel & Victor, 1992). Within the Paris process, where consensus is required, verification is a dirty word. Outside Paris, however, many countries, firms and NGOs are building the technologies—including satellite systems—that will be needed to make verification a reality. These facts on the ground will matter a lot more than the legal language in global agreements. Inside the Paris meeting

halls the United States argued vehemently against strict monitoring and verification systems because it did not want the encumbrances of a global treaty. Up in space, however, the U.S. and other space leaders such as the European Space Agency are already testing the elements of a robust satellite monitoring system.

I don't see how robust new systems for review and verification will emerge from the global forum of the United Nations. More interesting, however, is the prospect for cooperation emerging in smaller groups—"clubs." Once again, Arild colleagues are helping to show the way and steer other scholars to this important topic. Their work is aimed at trying to understand how different configurations of clubs can lead to deeper cooperation as well as the configurations that might get stuck with shallow cooperation (Hovi, Sprinz, Sælen, & Underdal, 2016). A central issue will be the incentive structures and institutions for delivering penalties and rewards (Sælen, 2015).

The other area where the academic community could become more engaged with the after Paris process concerns the machinery of institutional design. Fundamentally, most of research on environmental cooperation in the Underdalian orbit has been institutional. It has been focused on how institutions can help decentralized parties realize collective interests. Looking to the future, this kind of research remains crucially important and will take us ever closer into collaboration with scholars in other disciplines, such as law.

For example, consider the topic of what international lawyers call "entry into force." Ambitious agreements usually don't enter into force automatically. Countries must sign and ratify them to signal that they, individually, will adhere. In addition, a big-enough group must join so that the agreement, as a whole, is triggered. In serious agreements, these triggers serve an important function: to prevent a nation that goes first with ratification from getting stuck inside an agreement when its competitors stay outside and gain advantages from free riding. In arms control diplomacy these provisions were the stuff of high politics, with extremely sophisticated entry-into-force provisions.

The entry-into-force trigger in Paris is anything but sophisticated. It simply requires ratification by 55 countries accounting for 55 percent of world emissions. Meeting those thresholds will be easy—especially the country trigger since there are already more than a 100 countries immediately eager and willing to sign and ratify. That threshold gives no small group the ability to block the agreement. Countries like Saudi Arabia and Russia, which are in the carbon-exporting business, account for only one-tenth of world emissions, so they alone can't be spoilers.[2] All the richest industrialized countries (about one-quarter of world emissions) won't be enough to bring the treaty into force. Even if those countries team up with the poorest countries, including the vulnerable low-lying island nations, they can't reliably cross the 55 percent threshold. And if just one big nation is flaky—say, the United States, where the fate of the agreement is hardly certain—then that group certainly falls short.[3]

Ultimately, the "middle-income" countries will be the king-makers. They, led by China (23 percent of global emissions), account in total for about 37 percent of world emissions. Even the U.S. and China, together, can neither block the Paris agreement nor assure its success. Countries must work together to bring this agreement into force or block it. This reality reflects the dispersion of power in the world system. That dispersion that is forcing nations to create new systems of governance that are more decentralized. It has also has removed the obvious leader (the United States) from its role as the planet's only leader. In Paris, leadership came not just from American diplomats but also billionaire philanthropists who pledged more patient capital support for new technologies and leaders of progressive cities and states. Perhaps the most pivotal nation in making Paris feasible was China: a nation that has now become much more willing to engage with global agreements if they are framed in China-friendly ways. Leadership came, as well, from smaller entrepreneurial countries—such as France that held the process together and Norway, which has done so much to fund new schemes to protect forests.

To me, the 55% emissions threshold reveals that the Paris agreement, for all the hoopla, is far from a serious scheme for deep international cooperation. It is a down payment on that system that is designed to come into force rapidly, and that's the best that can be hoped for right now. In future agreements one of the quickest ways to assess the depth of the effort maybe to look at the entry into force provisions—if they are sophisticated and difficult to satisfy then they will reveal a real concern by countries for creating an agreement that holds all its members accountable. Creating that kind of cooperation in a forum of nearly 200 countries will be hard, which is why most serious efforts are

[2] My calculations on the most recent set of 2012 emissions data from EDGAR, probably the most reliable source with global coverage of all warming pollutants. Also see Olivier, Janssens-Maenhour, Muntean and Peters (2015, p. 80).

[3] Numerically, the entry-into-force provisions for the Kyoto Protocol were identical (55%). However, there are two big differences that determined why the Kyoto system created stronger veto rights for a small group of countries. Kyoto's entry into force was calculated against a 1990 baseline when emissions were more highly concentrated around a few large countries—notably the U.S. and Soviet Union (Russia). And the Kyoto emission control (and entry-into-force) rules only applied to a core group of highly industrialized countries. Thus, de facto, two countries working together could block Kyoto: the U.S. and Russia.

still likely to come from smaller groups—such as the US-China bilateral process announced in November 2014. We in the political science community along with scholars in international law should be working more on how these kinds of institutional designs intersect with countries' willingness to cooperate.

4. What Is Being Learned?

Looking back at the last 25 years of research and diplomacy related to global climate governance is sobering. For most of that time, the diplomatic efforts achieved very little. Moreover, the impact of systematic research about governance on the actual process of governance was tiny as well.

Paris may mark a turning point in which some of the ideas about how to create more effective governance—such as ideas about the benefits of working in small groups, about the utility of flexible legal instruments rather than just binding targets and timetables, and the ideas about how decentralized "polycentric" or "regime complex" systems function—are starting to have an impact.

I see at least three sets of insights into the learning process that might be relevant as we in the academic community plan our next phases of research.

First, at best, academics are just one set of actors in the broad contest to shape the choices about how to govern global problems. The history of climate change diplomacy suggests that our influence has been greatest when the system is in shock—as happened in the aftermath of the spectacular failure of the 2009 Copenhagen Conference. Had that conference been seen as a success then the evolution from the older, integrated and more top-down system of negotiating climate commitments might have been much slower. But failure animated a search for new ideas.

Put differently, Copenhagen opened a "window of opportunity" that allowed entrepreneurs to combine the problem of inadequate governance with the stream of "solutions" coming from political science and other social sciences (Kingdon, 2011). But this shock did not erase the role of basic politics. Powerful countries needed to favor new models—as happened when China, the US, France and many others favored a more flexible pledge and review system.

One implication of this first set of insights about "what is being learned" is that we must be patient. We in the academic community will develop dozens of ideas for improved governance. At best, only a few will be selected. Another implication is that the selection process is something we should learn more about. My view is that we have under-appreciated the role of knowledge brokers inside governments and international institutions—people who are trained in or well versed in the social science research yet have direct responsibilities for decisions (or at least how the preferences of their countries are articulated) that relate to institutional design.

In this respect, there is an interesting disciplinary divide that may be muting our ability to have a greater impact. Most diplomats are lawyers. Yet despite an effort that is nearly thirty years old to promote communication between international law and the social sciences the track record of that communication is erratic. There are periodic review papers on what scholars have learned in one discipline that might be relevant to the other (e.g., Hafner-Burton, Victor, & Lupu, 2012; Shaffer & Ginsburg, 2012). But we aren't actually working well together, for the most part, and that probably has muted the impact of social science research on real world legal design.

Second, we should have a debate within our field about why we weren't more relevant during the first two decades of climate diplomacy. Back in the early 1990s there was no shortage of diverse ideas about how the climate problem might be governed. But the ideas adopted by diplomats were deeply rooted in one model: the Montreal Protocol. Is this choice simply the power of the idea of "Montreal" or were there other forces at work? There is a big literature on the role of ideas in foreign policy (Goldstein & Keohane, 1993). Perhaps that literature can help us sort out the answers here.

My candidate for the leading answer is that the groups that were best organized and most committed to advancing the cause of climate protection—the major environmental NGOs (ENGOs) along with the European Union (EU)—were deeply committed to Montreal because it offered a clear example of a swift success. If so, this raises for us a big challenge in making the Paris model effective. There is a deep tension between the forces that are centrally motivated to address climate change and those that are willing to act on climate change if agreements are flexible and reflective on a broad array of other interests. The Underdalian insight in all of this—that is, the insight that is a bare bones reflection of the most important factor at work—is that the actors that are most highly motivated to make emission controls effective are a small and shrinking part of the global total while the countries whose own emission-controlling behavior matters most are all less motivated.

If this logic is right, then we need to learn how quickly the Paris process can be pushed without losing the support (and impact within) the countries that actually matter the most for solving the global problem. Ideally we would quantify that insight and share it with our colleagues in the climate modeling community so they can tell us more about the likely level of climate change that the real world will experience. I expect that likely real level of climate change will be a lot more than the aspirational goals set in Paris.

If this logic is right, then we also need to learn more about what is motivating the skeptical actors to control their emissions. Most of that answer lies in "co-

benefits" that tend to accompany climate policy. For example, a big shift from coal to gas or other clean fuels lowers emissions of warming gases but can also help control local pollution.

Most social scientists working on this important problem want to find ways to help countries and ENGOs be more effective in pushing for deep global cuts in emissions. As part of that, we need to take a fresh look at how the rest of the world learns about what we do. Some of us have participated in the IPCC process, but that has been a clumsy way to get most insights from the social sciences into broader discussion because most of those insights are controversial and thus hard for the IPCC to synthesize.

A third insight about what's being learned concerns the right models for governance and expectations about rates of change. As noted above, I think the kind of model being developed here is similar to the "rounds" approach used in trade (Victor, 2011). Countries begin rounds with pledges and then stitch them together through lots of negotiations. That "rounds" process has become quite cumbersome as the membership of the GATT/WTO system has risen, which is a reminder that the basic "laws of numbers" about bargaining that Arild worked on decades ago still holds (Underdal, 1980). Big agreements are harder to reach than smaller ones—and the outcome will gravitate toward the least ambitious actor who is allowed in the room. Active tailoring of the "geometry" of the negotiations is needed.

We as a community should probably help diplomats understand the practical implications of different models. When viewed from a distance it will be clear that the Paris agreement was actually relatively easy to reach. Most of the work was done in the last 6 months—especially in the month or so prior to the conference and at many espresso-fueled meetings in the cloisters of the Paris conference center. Many of the disagreements in Paris were about process—questions such as the timing and frequency for stock-taking and fresh pledges, as well as language around the level of transparency and commitment—rather than substance, which was largely deflected through the pledge and review system. Most things that were hard to agree were set-aside for the future.

I have always found it amazing that environmental diplomats think they can get a lot done over short periods of time. When you look at other areas where cooperation is much deeper—like on economic matters and arms control—negotiation rounds run much longer and are more focused on substance. After Paris it will be very hard yet essential for diplomats to build the machinery that will make deeper cooperation possible in the future.

5. Conclusion

Over the last year there has been a lot written in anticipation and assessment of Paris. Most of it is highly positive—correctly pointing to the possibility that Paris has turned a corner. Gone, perhaps, are the days when diplomats attended endless COP and other intergovernmental meetings and make decisions that have little practical impact on the world.

The next few years are crucial in determining whether Paris was a flash in the pan or a real shift toward a more effective strategy. Too much attention has been focused on the agreement itself, a modest but useful 11-page document. More should concentrate on the 20-page detailed decision that was adopted alongside it and that outlines what countries should do once their diplomats get some sleep.

I am optimistic that Paris has turned the corner. That optimism is an unusual sentiment for me since, for twenty years, I have written a lot about why serious climate cooperation is hard to achieve and why most of what's been tried was bound to fail. Paris is different. That sobriety about what is possible has come from a few mentors, Arild notably among them, who have helped strip away all the complexity of international bargaining and focus on the core variables that explain most of the outcomes.

The good news in Paris is that diplomats, led by the French, have now done the same thing. Success in making that new vision a reality is far from assured. It must be earned. Confidence in the process is rising, but it can easily shatter.

For academics, there is a fresh opportunity to look closely at what the Paris process is trying to achieve and offer insights into how these new institutions can be designed and function. We were poised to do the same thing in the 1990s as the UNFCCC and then the Kyoto Protocol took shape, but the system was not interested in much advice then. Today is different.

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Conflict of Interests

The author declares no conflicts of interests.

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Article

Paris: Beyond the Climate Dead End through Pledge and Review?

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Abstract
The Paris Climate Agreement of December 2015 marks a decisive break from the unsuccessful Kyoto regime. Instead of targets and timetables, it established a Pledge and Review system, under which states will offer Nationally Determined Contributions (INDCs) to reducing emissions that cause climate change. But this successful negotiation outcome was achieved at the price of vagueness of obligations and substantial discretion for governments. Many governments will be tempted to use the vagueness of the Paris Agreement, and the discretion that it permits, to limit the scope or intensity of their proposed actions. Whether Pledge and Review under the Paris Agreement will lead to effective action against climate change will therefore depend on the inclination both of OECD countries and newly industrializing countries to take costly actions, which for the OECD countries will include financial transfers to their poorer partners. Domestic politics will be crucial in determining the attitudes of both sets of countries to pay such costs. The actual impact of the Paris Agreement will depend on whether it can be used by domestic groups favoring climate action as a point of leverage in domestic politics—that is, in a "two-level game" simultaneously involving both international and domestic politics.

Keywords
climate change; climate cooperation; pledge and review; Paris agreement

Issue
This article is part of the issue "Climate Governance and the Paris Agreement", edited by Jon Hovi and Tora Skodvin (University of Oslo, Norway).

1. Introduction

Climate change policy is a frustrating issue both for students of international cooperation and for scientists who have studied what is happening to the global climate system. Scientific evidence about the seriousness of the problem continues to accumulate but little effective action has been taken. However, at the 21st Conference of Parties of the UN Framework Convention on Climate Change (UNFCCC), almost all the world's states agreed to a new Paris Agreement on Climate Change (2015). The purpose of this article is to provide a preliminary—and therefore tentative—assessment of the accomplishments achieved at Paris and the conditions under which the Paris Agreement can generate policies and actions that make a significant impact on global climate change.

Note that we don't ask whether the mere existence of the Paris Agreement will make a significant impact on global climate change. It won't. Such an international agreement can only be effective if it generates changes in the behavior of actors with resources that can be allocated and reallocated: that is, in the long term behavior of states, non-state actors such as business corporations, and individuals. A few such changes may occur because people recognize the severity of the climate issue, but most of them will come because leaders of states, publics, leaders of non-state actors, and billions of people have *incentives*—economic, political, or social—to do so. These incentives will be generated by political interactions in which states will play the leading roles, as well as in gradual normative shifts

that influence individual behavior. We therefore focus in this article on the politics of climate change policy after the Paris Agreement, and in particular on the incentives faced by states and the strategies that they are likely to pursue.

For context, even given full implementation of the emissions reduction plans tabled at Paris (Intended Nationally Determined Contributions, see Section II) and continued pursuit of emissions reductions with the same level-of-effort throughout this century, avoidance of the benchmark two-degree warming would be very unlikely. However, the chances of a disastrous four-degree warming would shrink materially (Fawcett et al., 2015).

We begin in Section 2 by exploring the reasons for *inaction* so far on climate issues. Why has it been so difficult to make progress on this issue despite its severity and the threats it poses to ecological systems and human welfare? And how did these problems affect the negotiations surrounding the Kyoto Protocol to the UN Framework Convention on Climate Change (UNFCCC) and its fate after 1997? In Section 3 we will discuss the key provisions of the Paris Agreement, with some discussion of the political alignments observed during this process. Since the key innovation in approaches to the climate problem is the system of "Pledge and Review" instituted at Paris, we will focus our attention there. Section 4 of the paper will analyze climate politics post-Paris as a strategic game, in which outcomes result from an intersection of the strategies pursued by the various major players, in particular states. The conclusion will emphasize the main point: the Paris Agreement merely creates an opening for effective action on climate change. Political action by organized groups, domestic and transnational, will be essential to make Paris work; and this action will have to be accompanied by the willingness to pay the economic price.

2. The Difficulty of Action on Climate Change and the Dead-End of Kyoto

The Intergovernmental Panel on Climate Change has been convening natural scientists, economists, and other experts to write a comprehensive assessment report every 5–7 years since 1990. Each assessment has strengthened the message: anthropogenic climate change is significant, growing rapidly, and in many respects accelerating. Climate change poses a growing and in some respects an imminent threat not only to fragile ecosystems but to the livelihoods and lives of billions of human beings.

2.1. Inherent Difficulties of Climate Change Action

If the lack of an effective policy response to climate change seems strange in view of scientific findings, it is all too easy to understand from a political point of view. World politics is a decentralized realm, with no common government capable of deciding on a course of action and of implementing it through an organized hierarchy. Furthermore, climate change is a public bad. Almost all countries will suffer from climate change—some much more than others—but with the exception of a very few large entities, the future actions of each political unit will contribute only a negligible amount to its own suffering. So the incentives to ignore the climate externalities of one's own decisions—that is, to ignore the negative effects on others—are very large. Every country has an incentive to shirk, to free-ride on the efforts of others. In simplified form, the climate problem resembles the classic Prisoners Dilemma (Barrett, 2003), in which the option of not cooperating typically is more attractive than cooperation.

Compounding this difficulty is the issue of burden-sharing. Any international agreement must pass a basic test of fairness, a reasonably equitable apportionment of the costs and benefits of implementation. The climate problem is plagued by multiple difficulties in determining what is fair: the disconnection created by the decades-long lags between costly emissions abatement and measurable reduction of climate impacts, the multiple frames for perceiving and assessing equity (e.g., total emissions, per capita emissions, historical emissions, national wealth), and the persistent scientific uncertainty in determining benefits to specific states and future generations that would accrue from near –term global action. Naturally, leaders and publics in each set of countries have distinctive conceptions of fairness, which often more or less coincide with their own interests in not accepting what seem to them disproportionate burdens. And countries and blocs have unequal power, deriving both from their different levels of emissions (making their participation more or less critical to an agreement) and from their different degrees of asymmetrical vulnerability to the actions of other states in domains other than climate (Keohane & Nye, 1977).

International agreements have been feasible, and international institutions have had some impact, on a wide variety of issues, ranging from trade to human rights. These are also difficult issues, implicating entrenched economic interests and threatening the political control of governments. Some of them involve global public goods. Notably, the Montreal Protocol on Substances that Deplete the Ozone Layer was negotiated in 1987, went into force at the beginning of 1989, and is already having a marked impact on the ozone layer. "Why," one could ask, "is climate change any harder?"

The answer to this question begins by recognizing two key variables that affect the efficacy of global institutions: the benefits and costs of cooperation, on the one hand, and whether the agreement can be enforced, on the other. The ratio of benefits to costs is obviously important: the higher the ratio, the more the incentive to find some way to collaborate in order to

secure these gains. This will be true of states, subnational governments, firms, and individuals. But the absolute level of costs is also important, since cooperation is risky, and when costs are high, states undertaking costly action risk being seriously disadvantaged if their partners do not fulfill their side of the agreement.

Due to the decentralization of world politics, hierarchical enforcement of agreements through global government is not feasible. To effectively bind states, agreements must be self-enforcing. Grundig, Hovi, Underdal and Aakre (2012, p. 527), drawing on work by Barrett (1994) and Telser (1980), have defined self-enforcing agreements in terms of three conditions: "1) no member can benefit by withdrawing; 2) no member can benefit by being noncompliant; 3) conditions 1 and 2 hold without external enforcement." An example of external enforcement, rare in world politics, would be UN Security Council enforcement of a resolution passed under Chapter VII of the United Nations Charter such as sanctions against Iraq in the 1990s or North Korea now.

Some self-enforcing agreements pertain essentially to coordination games, like the common understanding in the United States that one drives on the right-hand side of the road or many industrial standard-setting arrangements. Once an equilibrium is reached, parties have no incentive to deviate from it. But with respect to many other agreements, including major climate change agreements, participants have an incentive to do as little as possible, thereby reaping gains from others' contributions (Keohane & Victor, 2016). For such agreements to be self-enforcing, reciprocity typically needs to be part of the process. Reciprocity involves *contingent exchanges* so that failure to meet one's obligation by one party can be expected to lead to adverse actions by its partners. As a result, the benefits that each partner receives from the interaction tend to depend on its own performance (Keohane, 1986).

Global negotiations are typically characterized by reciprocity: bargaining inherently involves exchanges of promises, or commitments, so that each party's concessions are matched with gains from the concessions of others. This form of reciprocity is as important in generating climate change agreements as in other international negotiations. But reciprocity is even more important at the enforcement stage: in this form of reciprocity, states that fail to fulfill their commitments face withdrawal by others.

Trade agreements typically rest on such enforcement reciprocity: a state that violates World Trade Organization (WTO) rules can be punished by withdrawal of the benefits it receives from the WTO. Indeed, the adjudication institutions of the WTO are designed to facilitate such enforcement reciprocity. Similar processes are observed on other issues. Failure to abide by aviation safety and security rules may be punished by withdrawal of landing privileges, or refusal by airlines to fly into certain destinations. Reneging on debts, or expropriating private property without compensation, often entails penalties, either in accordance with international agreements or simply by abstaining from future investments. In situations like these, states have incentives to withhold benefits from treaty partners that renege on their agreements, since their domestic interests will have suffered from reneging and are likely to support action. Exporters will support trade retaliation insofar as its purpose is to deter protection by others that adversely affects them, airlines will avoid flying into dangerous airspace, and investors are likely to shun jurisdictions with a record of expropriation without compensation. As a result, when the goods being exchanged provide specific and easily identifiable benefits for particular countries and interests, enforcement reciprocity will be specific and relatively easy to implement, and is likely to be effective.

Other factors may also affect support for global institutions. For instance, sometimes the *symbolism* of multilateral agreements is so important that it can be used by political actors, usually operating at the domestic level, to achieve outcomes in line with the agreements' objectives. Human rights institutions do not rest on reciprocity, are not enforceable, and their rules are frequently violated. But they are not costly to their sponsors, and groups within countries where human rights are contested can sometimes use these institutions as "hooks" to grab onto, calling attention to international norms and seeking to shame their compatriots into conforming more closely to them (Simmons, 2009). These efforts are not always successful, but the international norms provide some leverage for domestic political actors. Sometimes a norm is so pervasive and strong that it turns an activity into a taboo (e.g., slavery), making adherence to international agreements easier although still not necessarily universal (Keck & Sikkink, 1998). The practice of international election monitoring provides another case in point: the result may be "D-elections" rather than failures (Kelley, 2009), but there is often some impact. Climate change has considerable symbolic importance, which could enhance the likelihood that domestic political actors would use international climate change norms effectively to influence domestic politics.

When institutions involving global *public* goods are concerned, it is difficult to employ enforcement reciprocity directly: the good (such as less climate change) cannot be withheld from free riders precisely because it is public. Sometimes enforcement reciprocity can be provided through sanctions, especially trade sanctions, but such sanctions will not only damage their targets but will also harm importing or exporting interests at home in the short term. Although as noted above, exporters may support such sanctions for reasons of deterrence, they may be inhibited from doing so by the short-term costs. Finally, providing public goods can

have symbolic benefits for providers; but these benefits are only likely to make an impact when material costs are low. For instance, it turned out that the Montreal Protocol was not costly to states: cheap substitutes for the offending ozone-depleting chemicals were rapidly found. Furthermore, the favorable benefit-cost ratio of Montreal provided incentives for governments to threaten trade sanctions against states that violated its provisions—and since potentially noncomplying or non-participating states were few and the costs of sanctions low, these threats were effective. And the costs of monitoring compliance were low as well.

Unfortunately for efforts to protect the global climate, actions to reduce climate change are costly, requiring major changes in carbon-based economies. If technological progress continues rapidly, these costs should not be so great as to require major changes in life-styles, but they will be considerable, and will require a shift of resources toward climate action, leading to higher energy costs, higher taxes, and probably reduced services to citizens. For example, the IPCC calculates that a cumulative reduction in global consumption of 3–11% by 2100 is necessary to achieve an emissions pathway which has a high probability of avoiding a two-degree warming, the currently accepted benchmark for a dangerous warming (IPCC AR5, 2014, WGIII Figure SPM.2). Accepting the costs of actions to limit climate change will be difficult for democratic publics and unpopular with authoritarian leaders striving to gain in wealth and power. States will therefore seek when possible to employ bargaining power to shift these costs onto others. Reciprocity will be essential to making agreements self-enforcing but will be difficult to implement.

2.2. Pathologies of the Kyoto Process

The inherent difficulty of slowing climate change and eventually stabilizing the climate has discouraged states from taking costly actions on this issue, since it has seemed doubtful that others will follow. In addition, the structural problems we have mentioned have been compounded by differences among countries in the costs of action, as a result of diverse energy mixes and endowments, and differential views on impacts and adaptation possibilities. For instance, pathways characterized by stringent emissions reduction would result in reductions in investment in fossil fuel extraction of about $0–90B for OECD countries vs $0–280B for non-OECD countries per year for the period 2010–2029 while requiring increases in annual investments in energy efficiency of about $0-300B and $0–330B for OECD and non-OECD countries respectively over the same period (IPCC AR5 WGIII Figure TS-39). Not only do these potentially massive shifts bear significant implications for the relative status of domestic interests and for the relative economic position of each country vs others. They also reveal the huge uncertainties that decision makers face.

As a result, only the European Union (EU)—whose publics were most committed and whose political systems included Green parties either in government or contending for power—was willing to take the lead. In the Kyoto agreement, the EU offered a larger percentage reduction from 1990 levels than the United States or other OECD countries—although using 1990 enabled it to incorporate emissions-heavy East Germany in its baseline while the US was faced with a projection of more rapid emissions growth above the 1990 baseline. But in recent negotiations, since the EU was already committed to very large reductions in emissions, it had little reciprocity-based leverage in bargaining with other countries and groups. Due to domestic politics, and in contrast to many countries, the EU cannot credibly threaten to do less in response to non-performance by others.

International cooperation is typically slow and incremental, reflecting governments' unwillingness to commit substantial resources without an assurance of a supportive coalition. But such incremental action can have a substantial impact over time insofar as it builds on past achievements. The World Trade Organization, for instance, built on the General Agreements on Tariffs and Trade, which also pushed toward liberal trade policy and was also rooted in reciprocity, but which did not have the dispute settlement provisions established under the WTO. However, in the climate change arena previous agreements did not provide a firm foundation for incremental progress. On the contrary, they incorporated three fatal flaws that generated a dead-end instead of a foundation for progress.

The first flaw was that no agreement was ever reached in the UNFCCC process on how to utilize voting to decide issues, so the default rule of consensus was used. Naturally, this rule gave disproportionate power in the decision-making process to states that sought to block or disrupt the effective action, even if they were small and weak. In Copenhagen in 2009, a proposed final document was blocked by a small number of opposing states, none of which was a major emitter.

The second flaw was that the Kyoto Protocol relied on a "top-down" model of targets and timetables. At the 1997 meeting in Kyoto that produced the Protocol, states had agreed to specific emissions reductions, using 1990 as a base year and extending out to the end of an initial commitment period in 2012. These reductions were meant only as a first step and were not intended to be sufficiently steep to halt anthropogenic climate change. But they were generated through an international negotiating process that had little input from domestic politics, and they were quite precise. As a result, the United States refused to ratify the Protocol; Russia held out opportunistically for favorable treatment on other international issues when its adherence

became crucial to Kyoto's entry into force; Australia delayed ratification for ten years despite a favorable emissions allotment compared to other OECD countries; and some ratifying countries, notably Canada, failed to comply with their commitments or even to come close (and Canada eventually withdrew from the Kyoto Protocol).

The third flaw was that the UNFCCC process, as specified in the Berlin Mandate of 1995 and institutionalized in the Kyoto Protocol, exempted developing countries from any emissions reduction obligations. In this respect, Kyoto was a step backward from Montreal, which had included developing countries under its mandatory provisions reducing production of ozone-depleting substances but had allowed them much more time to meet the obligations and offered them financial compensation for doing so. Yet it turned out that major developing countries such as China and India grew rapidly after 1995 and therefore quickly became major sources of annual emissions. The exemption of developing countries—with China becoming a major exporter of goods to the United States—became a key reason for the reluctance of the United States to ratify the Protocol. Kyoto therefore accomplished the perverse double trick of imposing politically unsustainable burdens on wealthy democracies while avoiding putting any constraints on countries that were becoming major sources of emissions and were their trade competitors (Victor, 2011).

For these reasons, by 2010, after the unsuccessful Copenhagen conference of 2009, it had become clear that Kyoto, though not necessarily the UNFCCC, was a dead-end.

3. Pledge and Review at Paris and in the Future

Instead of trying to confront the realities of international climate change policy head-on, as Kyoto did, the Paris Agreement represents an "end-run" around these constraints, using *discretion and vagueness* rather than mandates and simplicity.

3.1. Discretion and Vagueness

Discretion was incorporated into the negotiation process at COP19 in 2013, by deciding that each state was to submit its Intended Nationally Determined Contribution, specifying what it intended to do. As of December 15, 2015, 160 submissions, covering 187 countries accounting for 95% of total global greenhouse gas emissions, had been submitted, with the remainder of emissions coming from bunker fuels and from countries not part of the UNFCCC (*Climate Tracker*, March 14, 2016). Each state could submit INDCs of whatever format and detail they preferred. As a result, INDCs present a wide variety of levels of ambition and types of action; so it was virtually impossible to refuse to submit them. All states had at minimum an interest in an agreement in Paris that would validate their INDCs as acceptable opening bids. The incentives were therefore the opposite of those facing states whose negotiators had agreed to Kyoto targets and timetables, which might possibly be difficult to meet and (even without credible enforcement arrangements) embarrassing to miss. At Paris, it would have been embarrassing *not* to submit an INDC.

Such discretion was clearly advantageous for facilitating negotiations, since the most contentious issue of all—how to share the international emissions reduction burden corresponding to avoidance of a dangerous climate change— was simply not grappled with, nor was any date for this reckoning set. (This burden-sharing problem can be viewed, equivalently as the problem of how to allocate the limited remaining emissions headroom between today's atmospheric levels of greenhouse gases and that corresponding to a two-degree warming.) Postponing a decision on this crucial issue could be viewed as the ultimate act of kicking-the-can-down-the road, enabling politicians to avoid paying the cost of their declared commitment to moving toward a stable global climate. But in view of the political constraints at Paris it was an essential decision that needed to be made for some progress to take place. We should not, however, pretend that the problem was by any means solved; we can only hope that the next few years will be used well, enabling technologies, practices, and international relationships to adjust to an emissions-constrained world.

The INDCs range from ambitious in terms of what states may be reasonably able to achieve given focused national action to resembling business-as-usual, that is, requiring little additional effort. They also span a range from being highly specific about actions needed to being disturbingly vague. The US INDC is very specific in term of regulatory actions and some observers regard it as highly ambitious, especially given the contentious US political scene. With China's carbon dioxide emissions from fossil fuel combustion apparently decreasing between 2014 and 2015 (Jackson et al., 2015) and coal use probably having peaked, its plan may not be highly ambitious but it is, like the US plan, very specific as to anticipated actions. Russia's plan is neither ambitious nor specific. For states having the capacity to forecast emissions and implement policies to influence their economic development, these diverse approaches to INDCs are strategic choices that bear implications for the outcomes discussed in Section 4.

National discretion also enabled countries to develop their INDCs in a manner that enabled them to respond to the interests and views of domestic constituencies. Their implementation is therefore likely to be somewhat easier than otherwise, and seems unlikely to face the same level of domestic opposition that resulted in the refusal of the United States to ratify the Kyoto Protocol and Canada's withdrawal from its Kyoto

commitments. When a state submits its instrument of ratification, its INDC's become its "Nationally Determined Contributions" (NDCs) unless superseded by an updated filing. Some NDCs (particularly those of China and the US) are already well along in implementation.

Another feature of the Pledge and Review process that was attractive both to governments that were reluctant to make commitments, and to governments uncertain about their ability to meet targets, was its v*agueness.* For instance, there is no binding obligation actually to implement the plans indicated in the NDCs. Article 4, paragraph 2, of the Paris Agreement states as follows: "Each Party shall prepare, communicate and maintain successive nationally determined contributions that it intends to achieve. Parties shall pursue domestic mitigation measures, with *the aim of* achieving the objectives of such contributions" (emphasis ours). The 'aim of' phrase is reminiscent of language in Article 4 of the original UNFCCC in 1992 that turned out to be entirely ineffective. Furthermore, the key Pledge and Review provisions in Articles 13 (on transparency) and 14 (periodic review) are also vague.

Article 14 is short and merely provides for a global stocktaking of implementation every five years beginning in 2023. The first three paragraphs of Article 13 emphasize the flexibility of the process as opposed to demands placed on states. Most of the remaining ten paragraphs provide general justifications for transparency (Paragraphs 5 and 6), general statements about decision-making (Paragraph 4), instructions or requests to states to provide information (Paragraphs 7–10), or discussions of the technical expert reviews of information provided by states (Paragraphs 11–12). Even the requests for information in Paragraphs 9 and 10 differentiate between developed country Parties, which "shall" provide information, and developing country Parties, which "should" do so. The last two paragraphs (14 and 15) emphasize the support to be provided for developing countries to implement Article 13. Finally, the key procedural provision for transparency procedures (Paragraph 13) does not specify such procedures but is only an injunction to the Conference of Parties itself to make a decision in the future. In other words, Article 13 elevates vagueness to an art form.

Pledge and Review will only work if there is transparency, so that governments have a reputational stake in taking costly actions; otherwise we can expect a pattern of unobserved reneging, accompanied by misleading governmental statements. Yet there is no strong textual or legal basis for confidence that transparency will be implemented or that Pledge and Review will therefore be important. The value of the Pledge and Review process will therefore depend on whether governments make it more transparent and demanding; and these actions will depend on the incentives that they face. To assess the value of COP 21, therefore, we need to analyze these incentives.

3.2. Incentives for Governments for Transparency or Opaqueness

Governments have many demands on them, and always have constrained resources. Whether democratic or not, they respond to pressure from influential interest groups. So why should they act on climate change? Apart from a sense of altruism toward future generations on the part of societies or their leaders, five specific purposes can be distinguished:

1) To achieve domestic purposes, such as to reduce air pollution (including soot/black carbon) emissions or to achieve energy system changes that are not directly related to climate change;
2) To respond to pressure from domestic constituencies. If such pressure is sufficiently strong, domestic motivations are sufficient and internationally-based incentives to act are redundant;
3) To gain specific benefits from other states—especially in this case, specific reciprocity in terms of greenhouse gas reductions;
4) To gain diffuse benefits from other states and perhaps from civil society elsewhere. For example, if a small state supports a climate change treaty that is strongly endorsed by the United States and China, it could expect to receive a more sympathetic hearing for its own requests of these great powers for aid or diplomatic support than if it opposed such a treaty;
5) To impress domestic constituencies, or avoid blame, by cultivating international reputation, or otherwise to leverage international negotiations for domestic political purposes, as in our discussion of two-level games below.

Agreeing to Paris was consistent with these incentives for all 187 states submitting INDCs because the agreement places only modest burdens on states and, as we have seen, is vague at key points. The symbolic reputational gain of adherence, and the advantage of having one's own non-enforceable pledges acknowledged in the agreement, exceeded the costs. On the other side of the ledger, the reputational costs of opposition would have been high for most states.

The same reputational logic does not apply to forthcoming decisions: specifying what Article 13 on Pledge and Review means and following up by fostering transparency; meeting the NDC targets and enhancing targets progressively as called for in the Agreement. Unlike the promises incorporated in the NDCs, these decisions will be costly. How will governments think about them?

4. Post-Paris Climate Politics as a Two-Level Game

What the Paris Agreement will lead to is uncertain,

since its provisions are so vague and many decisions on making them more specific will be the result of a decentralized political process. But what is certain is that climate outcomes after Paris will follow from what can be characterized as a "two-level game" (Putnam, 1988), involving a combination of international strategic interaction and domestic politics. One level is that of international negotiation; the other level pertains to coalition-building in domestic politics.

One way of thinking about such a situation—which admittedly simplifies but may also clarify—is to begin by analyzing it as a strategic game with a limited number of key actors. In deciding on the specific provisions for Pledge and Review, states will be crucial; so we can begin with an interstate game, with three types of players, each type having a distinctive strategy. In reality, none of these three groups is unified: individual countries within each of the three types of players have somewhat different interests, and even when their interests overlap, they may have difficulty concerting policy with one another, partly because they compete in policy dimensions other than climate. And we do not mean to imply that the negotiations that will take place all occur within the framework of the COP meetings. Many of them will take place in meetings of groups such as the G-20, and even more may be bilateral or "minilateral," involving a small number of countries. And some bargaining is implicit.

Committed governments in OECD countries need to act in a way that enhances their ability to persuade other states to make commitments, principally through negotiation reciprocity—tit for tat bargaining. But they also must maintain or bolster domestic support, and for their long-term commitments to be credible they need to limit the freedom of action of future governments of their own countries. Yet they are constrained by the public goods nature of the problem: as we have seen, climate agreements cannot be enforced through simple reciprocity, involving threats or actions to stop reducing one's own emissions. Instead, enforcement reciprocity must be indirect, through sanctions on trade or financial flows, which may widen the sphere of conflict as well as generating domestic opposition from affected interests. So maintaining domestic support for costly climate change actions that go beyond what the state would do in the absence of an agreement is not easy.

Governments of major emerging market countries (BRICs) are affected by climate change and therefore have some reason to act on these issues, and they may have domestic groups that favor action, either because they are concerned about climate change or because they see industrial opportunities—for example, the construction of solar panels in China—arising from global action. Their interest in climate change action varies; India and Russia are notably more reluctant to act than Brazil and China. Yet all of them want other states, in particular the major OECD countries, to act, and they know that OECD actions will depend on their own commitments. But the principal focus of BRIC governments is economic growth. And they want to minimize costs for themselves and to maximize flexibility in fulfilling their own commitments. They therefore find themselves in a negotiation reciprocity game, seeking to do enough to induce action by others and avoid sanctions against themselves, but not so much that they bear heavy burdens that seriously affect economic growth or reduce domestic public support for the ruling group. Some BRIC countries also seek financial and technological assistance, which will help to relax their own domestic constraints.

Finally, *governments in small, poor states* have an interest in free riding without detection or at least punishment. Their major liability is that they lack the capacity to influence the policies of powerful states; but their corresponding advantage is that no one can expect them to contribute much, except symbolically, to solving the climate problem. They are therefore unlikely to be the principal targets of committed states and non-state actors seeking to ensure that climate agreements are effective. These small, poor states will seek a Pledge and Review scheme that is focused on the major polluters and that provides flexibility in the demands imposed on them and monetary compensation in one form or another—once again, to maintain domestic support as well as to achieve a variety of other objectives.

In this perspective, the critical question is whether there is a zone of agreement that would be beneficial, compared to the status quo of no agreement and independent national action, in these three sets of interactions.

The two most important negotiating assets of rich OECD countries are their ability to limit, or fail to limit, their emissions and their willingness to provide financial and technical assistance. The BRICs' most important negotiating asset is generated by their huge current and prospective emissions and their ability to decide to what extent to reduce them. The poor countries' chief asset is their ability to appeal to the principle of fairness and, if they are unsatisfied, to deny legitimacy to any deals that are made.

All sources of leverage are constrained by domestic politics. A critical factor, therefore, in whether a zone of agreement for specific Pledge and Review provisions will be reached, is how strongly domestic publics and elites—whose relative importance varies with the political system of the country—will support expensive measures designed to reduce climate change. As usual, domestic politics is crucial in determining whether multilateral institutions can be effective.

The OECD countries need the BRICs to accept relatively tight limits on their emissions, such that their growth in emissions stops within ten or fifteen years and their absolute emissions curves turn downward

shortly thereafter. Policies of the BRICs vary considerably so it is a deliberate oversimplification to treat them as a bloc for the sake of analysis. For example, China's Paris commitment, largely embodied in its 2014 bilateral agreement with the United States, foresees an emissions peak by 2030. This is not a difficult target for China, given that many observers believe that China actually reached it in 2014 after a period of extraordinarily rapid emissions growth. India, which has been slower than China to adopt serious emissions reductions, now looms as the most important new source of rapid emissions growth. OECD countries hope to see a rapid turnaround not only by BRICs but also by other countries whose economies similarly emerge over time (Richels, Rose, Blanford, & Rutherford, 2015). The BRIC countries' willingness to accept clear procedures for Pledge and Review, with expectations of enhanced pledges on their own parts along with provisions for transparency, will depend on their willingness to accept such objectives. Their basic decisions on this issue will depend in the first instance on their own calculations about their own interests. Apart from concessions they receive from the OECD countries, what will be the costs (especially to economic growth) of action, on the one hand, compared to climate-related costs of inaction, on the other?

Since climate change is a public goods problem, we know that these calculations alone will not yield vigorous action on emissions limitations by the BRICs. They will need concessions of three types by the OECD countries: on emissions, on technical assistances, and on financial aid. That is, the BRICs will calculate what their prospective willingness to accede to strict Pledge and Review procedures will gain them in negotiations with the OECD countries. They will seek to assure that their current competitive economic advantages over the OECD countries are not sacrificed in a climate agreement and that they are offered access to markets for new climate change-related products that they would have a comparative advantage in making. It follows that an OECD-BRIC climate agreement will turn on how forthcoming the OECD countries will be about emissions limits, technical assistance, flexibility on trade (such as the emerging agreement of trade in green goods and services), and financial aid.

For the OECD-poor country negotiations, the game is simpler. The OECD countries needed the consent of poor countries to the Paris Agreement, due to UNFCCC rules, but it is not very important to them what the small, poor countries actually do, since their emissions are so small. They need these countries not *flagrantly* to increase emissions, in a way that leads BRICs to do the same. For their part, the poor countries seek to avoid being targets of sanctions by OECD countries, and to obtain more funding for adaptation and technical aid. They would also like to have an amplified "loss and damage" provision, but since the large-emitter countries adamantly resisted such a commitment at Paris and in fact imposed a ban on liability or compensation from damages in this context, any such deal will instead emphasize adaptation funding. A deal between the OECD countries and the small, poor countries that provides for lax reporting requirements (already foreshadowed in language agreed at Paris) and substantial adaptation aid seems feasible. These concessions would be justified by the low incomes, and state capacity, of these poor countries.

At the moment, the BRICs-poor country bargaining game is the least important, since the poor countries—reluctant to make costly commitments themselves—are therefore disinclined to press the BRICs to reduce emissions; and the BRICs (with the exception of China) are only reaching the point of being able to give sufficient financial aid to induce greater effort from the poor countries. As the BRICs become richer, this bargaining game is likely to become more important, insofar as the BRICs take mitigating climate change seriously.

If the OECD countries are sufficiently committed to slowing and stopping climate change, there seems to be room for OECD-BRIC and OECD-poor country deals that, in both strategic games, make both parties better off than in the *status quo.* The OECD countries would secure some otherwise unavailable contributions to reducing emissions—some of which can be reduced relatively cheaply in the BRICs and poor countries. The BRICs and poor countries would gain technical and/or financial benefits that are easier for the OECD states to provide than for the BRICs and poor countries to generate for themselves.

What is less clear is whether the resulting deals will enhance the effectiveness of the COP-21 Pledge and Review process in helping the world limit climate change. We can imagine high-level equilibria of these games that would do so. These equilibria would induce substantial cuts in emissions by the BRICs and would avoid explicit and coordinated opposition to the agreement by poor countries. They will be costly for OECD countries and their domestic publics but their costs may be spread over a diverse set of objectives, both climate and non-climate. At the same time, cooperative mechanisms for achieving these multiple objectives may operate in a range of venues, for example current negotiations under the Chicago Convention to reduce emissions from aviation and under the Montreal Protocol, to control production of hydrofluorocarbons (Stewart, Oppenheimer, & Rudyk, 2015). Finally, finding a satisfactory equilibrium will depend heavily on technological progress aimed at moderating the cost of alternative energy.

We can also imagine low-level equilibria: an OECD-BRIC deal that enables both sides to pursue essentially business as usual under the cover of an agreement (thereby protecting their reputations) and an OECD-poor country deal that essentially exempts poor coun-

tries from effective emissions reductions. In such a low-level equilibrium, poor countries and some of the BRICs will pretend to combat climate change and the rich countries will pretend to pay them for doing so.

What is clear is that whether negotiations lead to substantial emissions cuts will not depend chiefly on the text of the Paris Agreement. It will depend much more on domestic and transnational politics within and between the OECD countries and the BRICs. This is to say that by itself the Paris Agreement accomplishes little—but it opens what was a locked door. That door is now a little bit ajar –pushing hard could carry us through it to a better outcome, but nothing will be accomplished at the international negotiation level alone. There will have to be pressure within the OECD countries for vigorous emissions action by wealthy states and for financial support for effective action in poorer countries. And that pressure will have to entail willingness to pay.

5. Conclusion: Climate Change Politics and Transnational Civil Society

The Paris Agreement is less an accomplishment than part of an ongoing process. It opens the door to progress on climate but does not assure it. For Pledge and Review to work there will have to be clear expectations that pledges will be regularly upgraded, and substantial transparency so that compliance with pledges can be monitored. There may also have to be willingness on the part of those countries most committed to climate change to punish those states that fail to make serious commitments or renege—although as we have seen, such enforcement reciprocity is difficult on issues involving public goods.

We have emphasized the importance of domestic politics in affecting the outcomes of the interstate strategic games on climate change policy. But in the era of the internet and social media, domestic politics is closely linked to transnational interactions. Transnational movements and organizations can play an important role in mobilizing support within countries for costly climate change action. Such movements will be most important not when they simply point to the failure of others—their targets—to support climate change action, but when they mobilize support for costly action by their own supporters, and the countries in which they are based.

For the Paris Agreement to put the world on a path toward limiting climate change to acceptable levels, publics, organized and mobilized in many countries and transnationally, will need to act politically, and will need to make their political actions credible by being willing to pay the necessary economic price.

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Conflict of Interests

The authors declare no conflict of interests.

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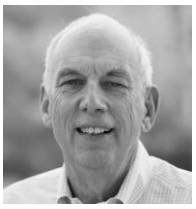

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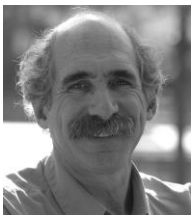

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Article

Unilateral or Reciprocal Climate Policy? Experimental Evidence from China

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Abstract
The traditional political economy account of global climate change governance directs our attention to fundamental collective action problems associated with global public goods provision, resulting from positive or negative externalities as well as freeriding. The governance architecture of the 1997 Kyoto Protocol uses the traditional approaches of international diplomacy for addressing such challenges: legally binding commitments based on principles of reciprocity and (fair) cost/burden sharing via formalized carbon-budgeting. Yet, the 2015 Paris Agreement has essentially abandoned this approach, as it now operates on the basis of internationally coordinated and monitored unilateralism. On the presumption that public opinion matters for government policy, we examine how citizens view this shift in climate policy from reciprocity to unilateralism, after many years of exposure to strong reciprocity rhetoric by governments and stakeholders. To that end, we fielded a survey experiment in China, the world's largest greenhouse gas (GHG) emitter. The results show that there is, perhaps surprisingly, strong and robust public support for unilateral, non-reciprocal climate policy. To the extent China is interested in pushing ahead with ambitious and thus costly GHG reduction policies, our results suggest that China can leverage segments of public support in order to overcome domestic obstacles to GHG mitigation policies.

Keywords
China; climate policy; reciprocity; unilateralism

Issue
This article is part of the issue "Climate Governance and the Paris Agreement", edited by Jon Hovi and Tora Skodvin (University of Oslo, Norway).

1. Introduction

Most global governance efforts take the form of government representatives negotiating an international agreement that specifies the rights and obligations of participating countries. Such agreements are then taken back home and, depending on the characteristics of the agreement and national political institutions, are then subject to approval (or ratification) by government and/or the legislature before being implemented. The 1992 UNFCCC and its 1997 Kyoto Protocol, which are at the center of the global climate governance system, follow exactly that approach. Yet, efforts to negotiate a successor agreement to the Kyoto Protocol, which ended in 2012, failed and the more than 190 countries involved opted for a radical departure from the hitherto practiced governance approach: through the 2015 Paris Agreement they moved away from legally binding emissions targets, set at the global level, and opted for a much more flexible system. This new

system bundles unilateral promises by individual countries to engage in greenhouse gas (GHG) emission reductions. In the jargon of the UNFCCC these promises, which are voluntary and not legally binding, are called INDC, Intended Nationally Determined Contribution.

The Kyoto Protocol approach was motivated by a global public goods logic. Greenhouse gases (GHG) emitted by human or other (e.g. volcanic) activity accumulate in the atmosphere, no matter from where they originate. They then affect all countries via implications for temperature and the hydrological cycle, albeit to different degrees. These geo-physical properties and the associated structure of the collective action problem imply that, in principle, international collaboration is made difficult by positive and negative externalities problems. Reducing GHG emissions in a given country benefits that country in the medium to long term by reducing climatic risks, but also benefits all other countries in that respect. This means that there is a positive externality problem. Since virtually all countries and their political leaders tend to put national benefits (interests) first, positive externalities discourage contributions (GHG emission reductions) to the global public good of climate risk mitigation. Conversely, countries that do not reduce their emissions create additional climatic risks not only for themselves, but also offload parts of those risks or costs on other countries (negative externality). Yet, such countries can still benefit from GHG reductions by other countries. This means that they can freeride on the efforts of others.

Strong concerns over externality and freeriding problems, which can be found in many international policy areas, such as arms control, trade, finance, and the environment, tend to push global governance efforts towards agreements based on legally binding, reciprocal commitments that are subject to monitoring (verification) and to some form of decentralized enforcement. That is, countries tend to contribute in costly ways to such governance efforts only if other countries are equally (legally) committed and bound to do their "fair share". A large body of academic literature shows that reciprocity is required for cooperation in many different types of social, economic, and political settings, from the micro- to the global level (Falk & Fischbacher, 2006; Fehr & Gächter, 2000; Fehr, Gächter, & Kirchsteiger, 1997; Milinski, Semmann, Krambeck, & Marotzke, 2006).

The 2015 Paris Agreement departs from the idea of a global climate governance architecture based on jointly agreed, legally binding reciprocal commitments. It compiles unilateral, voluntary pledges (INDCs) of individual governments and subjects them to a review process, without any formal penalties (sanctions) for non-compliance. This new climate governance system still has some elements of reciprocity. Presumably, the idea is to "cycle" through repeated rounds of INDCs and their reviews. Each country can then decide (on its own) whether it wants to raise or lower the ambition level of past and upcoming pledges, contingent on whether other countries have actually implemented their previous pledges, and what their INDC for the coming years looks like.

Despite these elements of informal or vague reciprocity, the Paris Agreement approach is primarily a system of internationally coordinated unilateralism. One key issue in this context is how far, in terms of trying to meet the 1.5 or 2 degrees Celsius target, governments will be willing and able to take this approach, particularly in view of two types of uncertainty: first, uncertainty about the extent to which other countries will implement their INDCs (the traditional reciprocity and freerider problem); second, uncertainty about the extent to which the pledging country itself will be able to implement its INDCs in view of domestic political, economic, and technical obstacles.

In this paper, we examine the latter issue (domestic uncertainty and constraints) from a public opinion perspective, with an empirical focus on China. Public opinion has previously been shown to affect government policy choices in other countries (Burstein, 2003, 2014; Guisinger, 2009; Hicks, Milner, & Tingley, 2014; Hornbeck, 2008; Kono, 2008; Mansfield & Milner, 2012; Shapiro, 2011; Stimson, MacKuen, & Erikson, 1995; Urbatsch, 2013; Wlezien, 1995). However the political system of China tends to make political decision-makers somewhat less sensitive to public demands, in a median-voter model sense. Nevertheless, previous research shows that Chinese leaders are in fact quite responsive to public demands, particularly in the area of environmental policy (Johnson, 2010; Yang, 2005). While the presumption that the government of China is influencing or even shaping public opinion is quite plausible (but not empirically demonstrated), it is also plausible to assume that public opinion has some effect on what the government does in climate policy and other domains, given the research noted previously.

Analysis of public opinion on climate policy in China can thus serve two purposes: first, to understand potential limitations of unilateral climate policy emanating from constraints imposed on decision-makers by mass public opinion; second, to understand whether the departure from international reciprocity and the shift towards unilateralism, after years of strong reciprocity rhetoric by policy-makers, lines up with or conflicts with the views of citizens. The latter purpose is important, no matter whether mass public opinion in fact has an influence on government policy choices, and whether the government shapes public opinion, rather than public opinion shaping government policies, or vice versa. Moreover, in practical terms, understanding public opinion on this issue in China is relevant also because China accounts for 11% of total historical CO_2 emissions since 1850, and 30% of global emissions in 2014 (PBL Netherlands Environmental As-

sessment Agency, 2015; World Resources Institute, 2013).

To shed light on the extent to which the public in China supports unilateral climate policy we use two experiments embedded in a survey using an online convenience sample. In one experiment we randomly assigned different frames to an item measuring respondents' attitudes towards reciprocal vs unilateral climate policy. In the other experiment we primed respondents with positive or negative information about the climate policies of other countries. Overall, we find surprisingly robust support for unilateral climate policy in China within our sample, reinforcing previous surveys that find the Chinese population believes China has a responsibility to take unilateral steps against climate change (World Bank, 2010). This leaves some room for optimism about Chinese policy-makers being willing and able, despite strong countervailing pressure by polluting industries, which tend to demand "softer" policies justified by international level playing field and cost arguments, to set up ambitious INDCs and effectively implement them.

2. Argument

Ever since negotiations on a global climate governance system began in the early 1990s, government representatives have demanded reciprocity, in the sense of requesting a "fair" contribution from each country involved. The 1997 Kyoto Protocol with its formal reduction targets and monitoring mechanism reflects these demands. This rhetoric and its legal and organizational reflection in the UNFCCC and Kyoto Protocol process is somewhat at odds with the many local, national, and regional climate policy initiatives, which are predominantly non-reciprocal, that is unilateral and not explicitly contingent on what other political units (notably, countries) do. Moreover, information from the very few surveys that have examined citizens' attitudes towards unilateral vs reciprocal climate policy (Bernauer & Gampfer, 2015; World Bank, 2010) observe rather high levels of support for unilateral climate policy.

Have governments actually missed out on opportunities to install more ambitious climate policies unilaterally, while global climate negotiations were stalling over the past 10–15 years, due to polluting industry pressure or other reasons (e.g. ignorance of governments about citizens' attitudes)? Or is there something wrong with survey measurement instruments that made them overstate public support for unilateral climate policy, due to social desirability bias or other factors?

Using a framing experiment embedded in a population based survey in the United States and India, Bernauer and Gampfer (2015) found that mass public support for unilateral climate policy was stronger than expected. Or, conversely, citizens appear to be surprisingly non-reciprocal, relative to what government rhetoric in climate negotiations would suggest. The study also shows that strong support for unilateral climate policy, which is incompatible with standard theory on global public goods, is not the result of citizens being poorly informed about climate policy and its cost implications, which might lead to inflated support due to social desirability bias in survey responses. We build on that work, add another experiment, and focus on China, for which there is very little information on public opinion concerning climate change and climate change policy.

The arguments to be tested in our two experiments center on how strong public support for unilateral climate policy actually is, and whether it is susceptible to framing and priming effects. In the first experiment, we expect information about ambitious GHG mitigation measures in other key countries to increase support for unilateral climate policy, and information about non-ambitious measures in other key countries to have a negative effect. Taken together, the two experiments provide insights into how strong public support for unilateral climate policy in China is. In the second experiment, we expect support for unilateral climate policy to increase with positive frames: co-benefits, such as green jobs and technological innovation, effectiveness of unilateral policies in helping to solve the climate change problem, adaptation focus of climate policy, safeguards provisions for responding to "abstinence" or "free-riding" of other countries, leading by example (positive diffusion effect), and demonstrating global leadership. Conversely, we expect negative frames to reduce support for unilateral climate policy: high costs, freeriding by others, and mitigation (as opposed to adaptation measures).

3. China's Climate Policy

Before turning to the experimental design, we provide a very brief summary of China's climate change policy in order to contextualize our study and its results. In particular, we focus on how China's climate policy relates to its participation in international climate negotiations.

Within global climate change negotiations China has long taken the position that any international climate agreement should be based on the principles of historical and differentiated responsibility. In this context China considers itself to be a developing country (Pan, Chen, Zhang, Bao, & Zhang, 2015; Xie, 2010). Therefore, it has taken the position that it should incur less of the burden for climate change mitigation, compared to developed countries with long histories of large-scale GHG emissions. Nevertheless, maintaining such a position has turned out to be more difficult in recent years, as China has become the second largest economy in the world and the world's largest (current) GHG emitter (http://www.wri.org/publication/assessing-implementation-chinas-climate-policies-12th-5-year-period).

Furthermore, a key stance in China's international climate policy position has been opposition to accepting internationally set and legally binding GHG reduction obligations. Although China has often called on developed countries to agree to legally binding commitments to reduce GHG emissions and provide financial support for developing countries, it has argued that developing countries' efforts to deal with climate change should be voluntary and reflect current capacity (Xie, 2010; Zhang, 2013). As China considers itself a developing country in this case, it has been unwilling to accept legally binding commitments through international negotiations.

Even though China has long opposed mandatory international GHG emissions targets for developing countries, including China, it has in recent years made important pledges and has adopted substantial measures to unilaterally tackle climate change. Most notably, in 2015 the Chinese government announced that it plans to reduce CO_2 emissions per unit of GDP by 60–65% over the period of 2005 to 2030 (Climate Action Tracker, 2014; Energy Research Institute 2015; Green & Stern, 2015). This pledge has been coupled with large investments into energy production from renewables (Energy Research Institute, 2015; World Resources Institute, 2015).

4. Study Design

4.1. Sampling

We recruited 1067 participants through social media networks, including WeChat (Weixin in Mandarin) and Sina Weibo. WeChat is a mobile text and voice messaging and communication service developed by Tencent.[1] Sina Weibo is a Chinese microblogging (weibo) website developed by SINA Corporation.[2] It is somewhat similar to Twitter or Facebook. While our sample is a convenience sample, this does not affect the internal validity of our estimated treatment effects, in which we are interested in this paper. However, it does mean that we cannot generalize the description of attitudes and treatment effects to the general Chinese population.

The socio-demographics of our sample are shown in the Appendix 1. These statistics show that our sample is younger and better educated, relative to the overall distribution in China. For example, approximately 60% of our sample is aged between 20 and 30, compared to approximately 9% of the population (CIA, 2016). Approximately 90% is currently attending university or has a university degree, compared to 17.95% of people aged 25–34 in the population (OECD, 2016). Our survey can thus be regarded as some form of elite survey.

While this sample bias and the opt-in approach to sampling does not allow for representative inferences about what the Chinese populations' attitudes are, this limitation is not relevant in our case, because it still allows us to identify average treatment effects within our sample. In addition, it offers insights into the attitudes and preferences of relatively well-educated Chinese citizens, whose opinions are more likely to affect policy-making than opinions among less educated parts of the population.

4.2. Survey Instrument and Embedded Experiments

The survey[3] into which the experiments were embedded has the following structure:

1. Socio-Demographic items
2. Items about interest and belief in global warming/climate change
3. Survey experiment 1
4. Items for the outcome measures for experiment 1
5. Survey experiment 2
6. Items for the outcome measures for experiment 2

The first experiment exposed respondents to information about ambitious or non-ambitious GHG mitigation policies of other countries that are, from the viewpoint of their emissions, important to the long-term success of global climate risk mitigation, notably the United States, the European Union (EU), and India. Participants were randomly assigned to one of the 6 treatments (i.e., short pieces of information) shown in Table 1, which comes in the form of a piece of text before moving on to the outcome questions. We designed the treatment texts so that they include information on pledges to reduce GHG emissions (which correspond to pledges the respective country [or EU] has actually made), and also (fictional) information on what (unnamed) experts think about the respective pledge, in terms of it being fair and corresponding to the respective country's (or EU) capability and responsibility. This treatment design makes the treatments as homogenous as possible in terms of their structure (though not content in terms of negative or positive priming).

After randomly assigned exposure to one of the treatments (or control) shown in Table 1, we measured each respondent's attitudes towards China's climate policy, based on a wide range of survey items. These are displayed in Table 2. In order to avoid social desirability bias, we emphasize cost implications at the national and individual level in many of the listed survey items.

[1] https://web.wechat.com

[2] http://weibo.com

[3] The survey instrument in Mandarin is available from the authors on request.

Table 1. Treatment conditions for experiment 1.[4]

USA Positive	The United States has promised that it will reduce its greenhouse gas emissions by 14–17% below 1990 levels by 2025. Most experts think this is a fair contribution by the United States to reducing greenhouse gas emissions worldwide, since it reflects the United States' capability and responsibility.
USA Negative	The United States has promised that it will reduce its greenhouse gas emissions by 14–17% below 1990 levels by 2025. Most experts think this is not a fair contribution by the United States to reducing greenhouse gas emissions worldwide, since it does not reflect the United States' capability and responsibility.
India Positive	India has promised that it will reduce the greenhouse gas emissions intensity of its GDP by 20–25% by 2020 compared to 2005 levels. Most experts think this is a fair contribution by India to reducing greenhouse gas emissions worldwide, since it reflects India's capability and responsibility.
India Negative	India has promised that it will reduce the greenhouse gas emissions intensity of its GDP by 20–25% by 2020 compared to 2005 levels. Most experts think this is not a fair contribution by India to reducing greenhouse gas emissions worldwide, since it does not reflect India's capability and responsibility
EU Positive	The European Union has promised that it will reduce its greenhouse gas emissions by 40% below 1990 levels by 2030. Most experts think this is a fair contribution by the European Union to reducing greenhouse gas emissions worldwide, since it reflects the European Union' capability and responsibility.
EU Negative	The European Union has promised that it will reduce its greenhouse gas emissions by 40% below 1990 levels by 2030. Most experts think this is not a fair contribution by the European Union to reducing greenhouse gas emissions worldwide, since it does not reflect the European Union' capability and responsibility.
Control group	(no information treatment)

Table 2. Attitudes towards climate policy.

People hold different views about whether China should give priority to measures against global warming, even if such measures have a negative effect on the Chinese economy. What is your view?	1 Should give priority to measures against global warming 2 Should not give priority to measures against global warming 3 Don't know
To deal with global warming, do you think China is doing…	1 Too much 2 About the right amount 3 Not enough 4 Don't know
Do you favor or oppose preserving or expanding forested areas in China, even if this means less land for agriculture or construction in China?	1 Favor strongly 2 Favor somewhat 3 Oppose somewhat 4 Oppose strongly 5 Don't know
Do you favor or oppose increasing the requirements for fuel efficiency of automobiles in China, even if this raises the cost of cars and bus fares in China?	1 Favor strongly 2 Favor somewhat 3 Oppose somewhat 4 Oppose strongly 5 Don't know

[4] We provide the English translation here.

Imagine that if China took effective steps against global warming, this would increase electricity costs to the average household in China by 30 RMB per month. Would you be willing or not be willing to pay this additional cost as part of taking steps against global warming?	1 Would be willing 2 Would not be willing 3 Don't know
Could you please tell us to what extent you personally agree or disagree with the following statements?	
If I had to reduce my energy consumption and carbon dioxide emissions this would reduce my quality of life too much.	1 Strongly agree 2 Mostly agree 3 Mostly disagree 4 Strongly disagree
If I avoid activities that emit carbon dioxide I contribute to solving the problem of global warming.	1 Strongly agree 2 Mostly agree 3 Mostly disagree 4 Strongly disagree
I prefer to enjoy life without having to worry about how much energy I consume and how much carbon dioxide I emit.	1 Strongly agree 2 Mostly agree 3 Mostly disagree 4 Strongly disagree
Imagine you were buying a car and you had to choose between a larger, more powerful car that consumes more fuel, and a smaller and less powerful car that consumes less fuel. Assume that this would be the only car you own, and that both the large and the small car cost exactly the same. Which car would you buy?	1 Larger, more powerful car consuming more fuel 2 Smaller, less powerful car consuming less fuel
Which of the following statements comes closest to your own point of view? China should reduce its carbon dioxide emissions…	1 regardless of what other countries do 2 only if industrialized countries (such as the United States, Germany, Japan) reduce their emissions 3 only if industrialized countries (such as the United States, Germany, Japan) as well as developing countries (such as India, Brazil) reduce their emissions 4 China should not reduce its carbon dioxide emissions

To minimize measurement errors, and because it seems impossible to capture preferences concerning climate policy with one single survey item, we aggregated the answers to these 10 survey items into a single scale using Bayesian ordinal factor analysis. The posterior median of the latent variable is used as the outcome measure for each respondent. This dependent variable is standardized to have a mean of zero and standard deviation equal to one, for ease of interpretation. In the analysis that follows we only include respondents who answered all of these 10 questions in the survey. This leaves 758 respondents for the statistical analysis, with similar numbers of respondents in each treatment condition.

The second experiment is a framing experiment, where the frame (a piece of text) is inserted into a baseline survey item. This baseline item asks respondents whether they believe China should reduce its carbon dioxide emissions (identical to the final question used for the first experiment):

- regardless what other countries do
- only if industrialized countries (such as the United States, Germany, Japan) reduce their emissions
- only if industrialized countries (such as the United States, Germany, Japan) as well as developing countries (such as India, Brazil) reduce their emissions

"China should not reduce its carbon dioxide emissions" was also added as a response category to take care of the possibility that some respondents may prefer China not to reduce its emissions, no matter what

other countries do. 35 respondents did not answer this question, leaving 1032 respondents for the statistical analysis.

Survey participants were then randomly assigned to one of the following frames, with the baseline item (not including a frame) serving as the control group:

- Many experts argue, however, that emission reductions by China would be very costly and would hurt the Chinese economy. (Expected framing effect: negative)
- Many experts argue, however, that emission reductions by China could also contribute to technological innovation and create more jobs in China. (Expected framing effect: positive)
- Many experts argue, however, that reducing carbon dioxide emissions in China would also help reduce local air pollution, which is severe in many Chinese cities. (Expected framing effect: positive)
- Many experts argue, however, that emission reductions by China would motivate other countries to follow the Chinese example and reduce their emissions as well. (Expected framing effect: positive)
- Many experts argue, however, that emission reductions by China are required to demonstrate China's global political leadership. (Expected framing effect: positive)
- Many experts argue, however, that China is responsible for only around 29% of total carbon dioxide emissions worldwide. Hence they argue that the global warming problem cannot be solved if China reduces its emissions on its own, but other countries do not do the same. (Expected framing effect: negative)
- Many experts argue, however, that reducing carbon dioxide emissions is expensive. Therefore, if China reduces its emissions, but other countries do not, Chinese businesses and their exports to other countries will become less competitive and jobs in China may be lost. (Expected framing effect: negative)
- At recent international climate conferences, the political leaders of industrialized countries have agreed to provide large amounts of funding and technology to facilitate the reduction of carbon dioxide emissions in developing countries, including China. (Expected framing effect: positive)

5. Results

5.1. Experiment 1

For experiment 1, which focuses on information about other countries mitigation efforts, we start by examining the distribution of the outcome measure (dependent variable) across each of the experimental conditions. The results show that the variance in support for climate policy, as captured by our composite measure based on 11 survey items, is similarly dispersed across all experimental conditions. However, the mean tends to be lower in the control group compared to the treatment conditions (see Figure 1).

We then estimated the average treatment effects using ordinary least squares regression. Figure 2 presents these treatment effects.

Surprisingly, the results show positive treatment effects for all treatment conditions. Thus any information about GHG reduction policy in other key countries, no matter whether positive or negative, tends to induce more climate policy support. However the 90% confidence intervals for these treatment effects do not include zero only for the United States treatments, when not including demographic controls, and for the positive United States treatment, when including demographic controls.

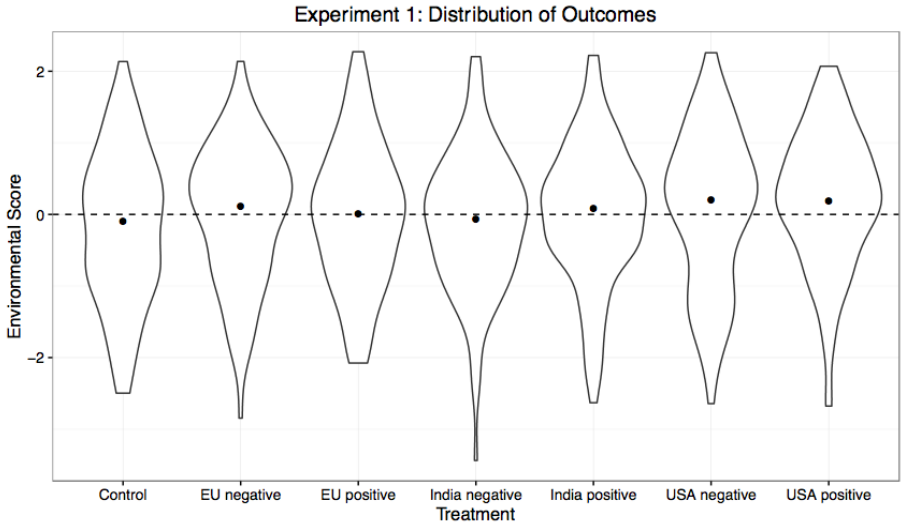

Figure 1. Distribution of outcome measure by treatment condition, experiment 1. Notes: Points indicate the mean score on the outcome variable. The horizontal dashed line indicates the global mean.

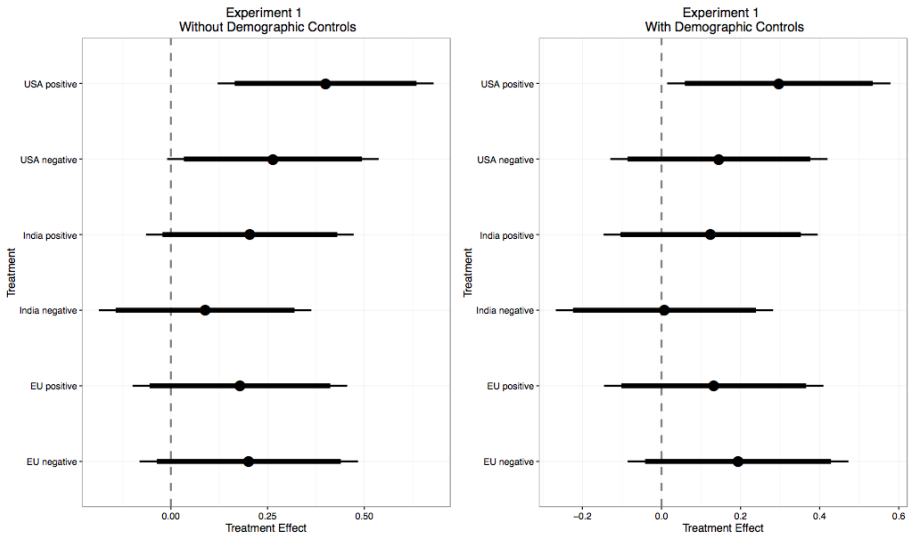

Figure 2. Estimated treatment effects, experiment 1. Note: The panel on the left shows the estimates without demographic controls, the panel on the right shows the estimates with demographic controls (age, region, education, profession, and gender). The bullet points on the wiskers indicate the average treatment effects. Broad horizontal wiskers indicate 90% and narrower wiskers 95% confidence intervals. If confidence intervals intersect with the dotted vertical line the estimated treatment effect is not statistically significant.

The direction of these results suggests that any information on emission reductions increases support climate policy in our sample. This is particularly the case for the United States treatments, where the negative information on climate policy by the United States has a similarly sized effect to that of the positive information concerning climate policy by India. One interpretation of this result is that respondents take the 14–17% GHG reductions noted in the US treatment condition to be, overall, a good thing, even though the treatment also states that experts consider the size of reduction not to be a fair contribution in view of US capacity and historical emissions.

Next we focus on the comparison between the positive and negative treatment effects for a given country. These results are more in line with our theoretical expectations. For both India and the United States, positive treatments are associated with more climate policy support than negative treatments. Yet, contrary to our expectations the difference in climate policy support between the positive and negative EU treatments is slightly negative.

While the effect of the positive treatment concerning the United States is statistically significantly different from the control group, we would like to compare also if it is statistically significantly different from the effect of the associated negative treatment. Therefore, in Figure 3 we plot the estimated differences between the positive and negative treatments, for each country/group of countries. This is the average treatment effect of having received a positive treatment relative to a negative treatment.

The results shown in Figure 3 indicate that the effect of receiving a positive treatment compared to a negative treatment is similarly positive when the reference country is the United States or India. These effects lead to an approximate increase of 15% of a standard deviation in climate policy support. In contrast, the effect of a positive treatment compared to a negative treatment when the reference countries are the EU, is very close to zero and in fact slightly negative. None of these differences in treatment effects are statistically significant at conventional levels, however.

5.2. Experiment 2

We now turn to experiment 2, which provides respondents' positive or negative views about reducing emissions without any information about other countries. Figure 4 displays the distribution of responses to the survey item that forms the basis of the second experiment.

Visual inspection of Figure 4 shows that the share of strong supporters of unilateral climate policy (the black parts of the bars) remains in the order of 50–65%. The distribution of responses in China is thus similar to those found for India by Bernauer and Gampfer (2015), with very low support for not reducing GHG emissions at all and similar levels of support for unilateral climate policy across treatment and control conditions. A key difference, however, is the nature of reciprocity preferences exhibited between the two samples. For instance, in Bernauer and Gampfer (2015), of those respondents from India who support climate policy only if other countries act as well, the vast majority are primarily concerned with whether industrialized countries reduce their GHG emissions too. In contrast, within the China sample, those respondents

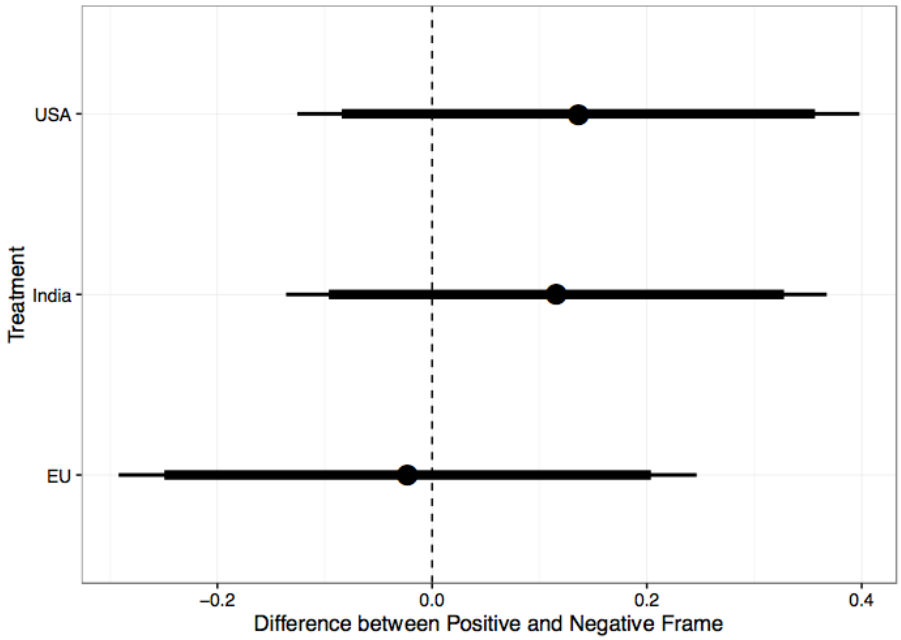

Figure 3. Estimated differences in climate policy support between positive and negative treatments for a given reference country/group of countries. Notes: see notes for Figure 2 on how to read and interpret Figure 3.

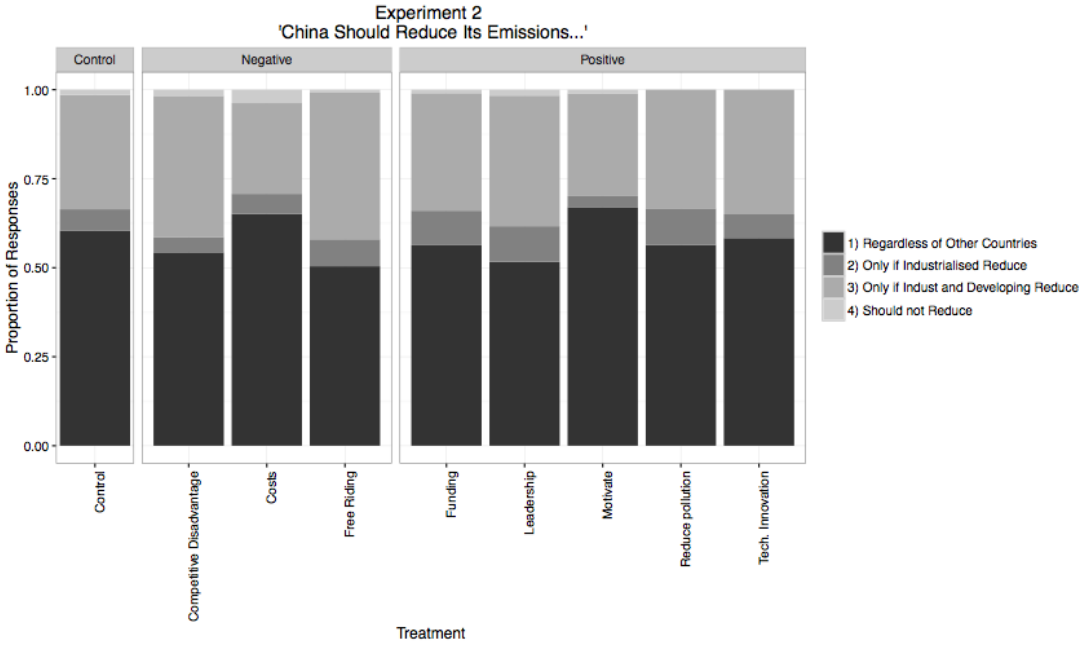

Figure 4. Distribution of responses, by treatment condition, in experiment 2.

focus on both the actions of industrialized and developing countries.

We again estimate average treatment effects for this outcome measure using ordinary least squares regression both with and without demographic controls. Thus for this present analysis we treat the ordinal dependent variable as if it were measured on the interval level.[5] These estimates can be interpreted as how the mean response differs between a given treatment condition and the control group. Figure 5 displays the results.

The results shown in Figure 5 do not support the expectations outlined above. None of the frames are statistically significant at conventional levels. In terms of the direction of the treatment effect, for the five frames we expected to have a positive treatment effect (technological innovation, reducing pollution, motivating other countries, leadership, and improved funding prospects), only the motivation frame has a positive effect. The others have either very small negative effects that are close to zero, or in the case of leadership have

[5] Results are similar when using an ordinal logit estimator. The predicted probabilities generated from doing so are displayed in figure 6 of the appendix.

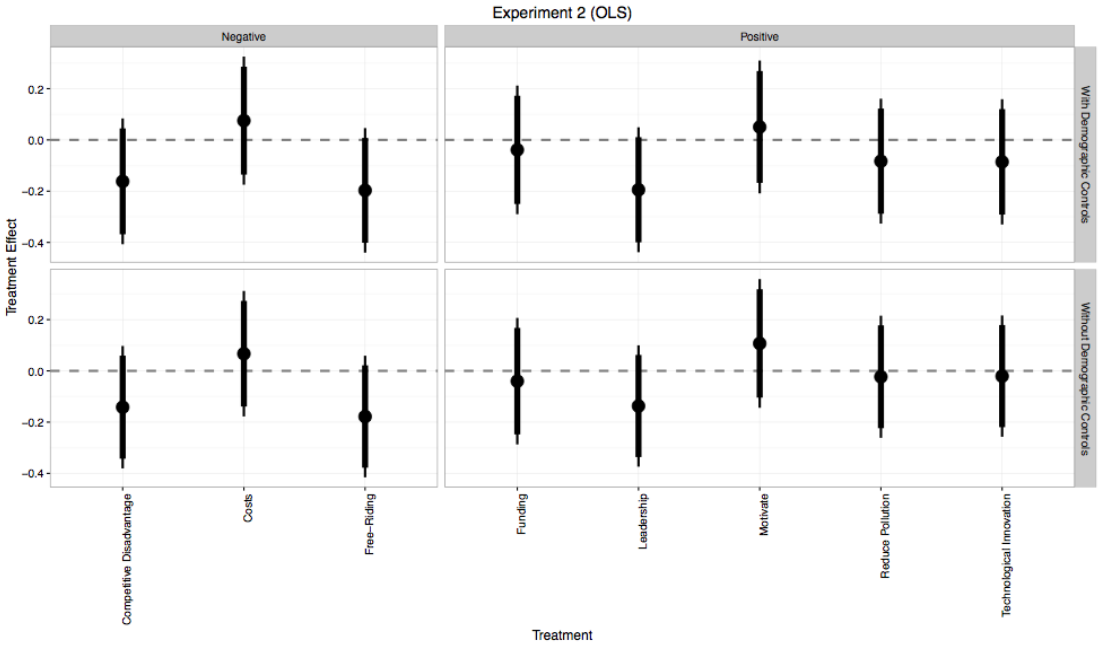

Figure 5. Estimated treatment effects, experiment 2. Notes: see notes for Figure 2 on how to read and interpret Figure 5. Treatment effects are grouped by whether we expected positive or negative effects, and whether demographic controls are included or not.

fairly strong negative effects. For those frames we expected to have negative treatment effects (free-riding, costs, and competitive disadvantage) two of the three do indeed have relatively strong negative effects on support for unilateral climate policy. However, the costs frame has a slightly positive effect, again running counter to our expectations.

In brief, support for unilateral climate policy, within our sample, is quite high and changes little across the particular frames we randomly allocated participants to.

6. Discussion and Conclusion

The main purpose of the research presented in this paper was to explore the extent to which citizens support what has recently become the new overall approach to global climate change governance, namely internationally coordinated unilateralism, in the form of INDCs. Conventional political economy accounts of global public goods provision as well as strong reciprocity rhetoric by most governments and stakeholders over the past two to three decades should make us skeptical about whether public support for unilateral climate policy lines up well with the recent shift in the global climate governance architecture. Moreover, even though existing survey data on unilateral climate policy preferences, which is very scarce, suggests rather high level of support, there is a possibility that measured support levels are inflated because of social desirability bias.

To assess how strong public support for unilateral climate policy really is we implemented a survey experiment in China, the world's largest GHG emitter. In experiment 1 we find that information treatments classing GHG emission reduction policies of the USA as positive have a statistically significant effect in increasing support for climate policies. However all of the treatment conditions, whether framing emission reductions in a positive or negative light, also lead higher average levels of support relative to the control group, although not statistically significantly so. In experiment 2 we find results similar to those for India in a recent publication by Bernauer and Gampfer (2015). Specifically, we observe high levels of support for unilateral climate policy in our Chinese sample, and very low levels of support for never reducing carbon dioxide emissions. In addition, we find that framing of GHG emission reductions in positive or negative lights does not significantly alter levels of support. In other words, we find that support for unilateral climate policy is rather strong and also robust, in the sense of not changing significantly even when participants are treated with information on positive or negative consequences of unilateral climate policy, or with negative news on GHG reduction policies of other key countries.

The main policy implication we can draw from this evidence is that, to the extent the Chinese government is interested in pushing ahead with ambitious and thus costly GHG reduction policies, it should be able to leverage segments of public support in order to overcome domestic obstacles to GHG mitigation policies.

We conclude with two caveats and options for further research. To start with, we opted for a convenience sampling approach because we were mainly interested in studying experimental treatment effects. However, it would also be useful to describe and explain unilateral or reciprocal climate policy preferences

of the mass population in China. Related to that, it would be interesting to find out whether preferences differ between the country's elite (in terms of education levels and income) and the mass public, and if so why. Furthermore, the weak treatment effects found may be a result of ceiling effects due to our sample likely over representing individuals with strong prior support for climate policy. Another caveat is that limited knowledge of climate policy issues combined with the cost implications of ambitious climate policy being hard to anticipate might create a risk of social desirability bias and inflated levels of support for unilateral climate policy. We think that our experimental designs are able to deal with this challenge quite effectively. However, further research could make treatment conditions (e.g. those focusing on what other countries do) even more explicit and go further in increasing the personal stakes associated with responses (e.g. in terms of using substantive willingness to pay, rather than willingness to support measures).

These caveats notwithstanding, the research presented here offers interesting starting points for inquiries into the potential and limitations of non-reciprocal (i.e. unilateral) climate policy. At least for the time being, it appears unlikely that the global climate governance architecture will revert to a formalized, top–down target setting and cost- and burden-sharing approach. Because of that, it is important to understand how far citizens, who are asked to shoulder the costs of GHG reductions, are willing to accept costly unilateral climate policies.

Acknowledgments

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Conflict of Interests

The authors declare no conflict of interests.

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PBL Netherlands Environmental Assessment Agency. (2015). *Emissions database for global atmospheric*

research (EDGAR). Retrieved from http://edgar.jrc.ec.europa.eu/news_docs/jrc-2015-trends-in-global-co2-emissions-2015-report-98184.pdf

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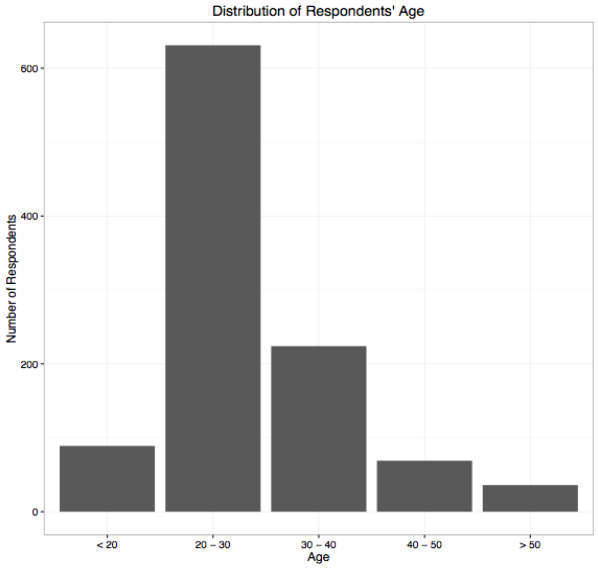
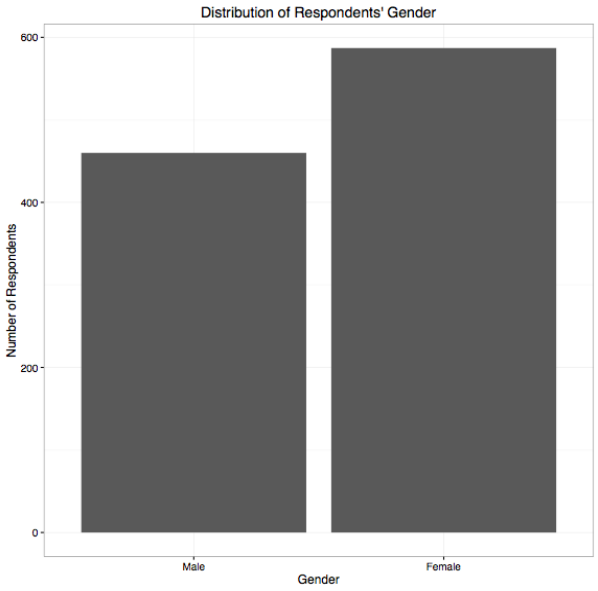
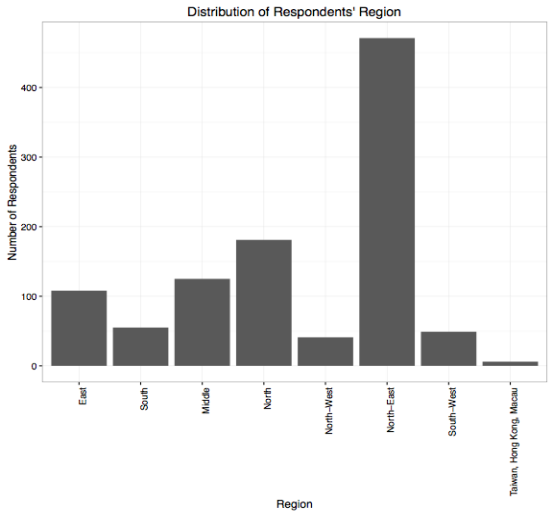
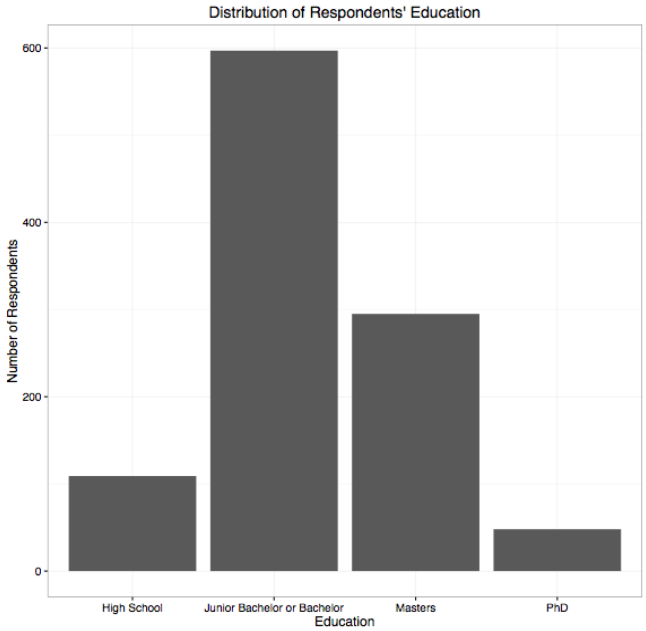
Appendices

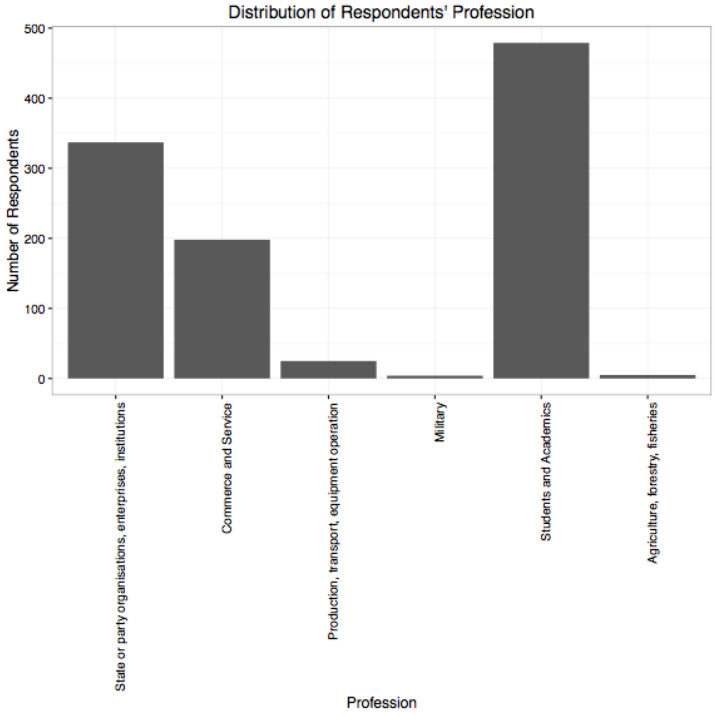
Appendix 1. Distribution of socio-demographic information in our sample.



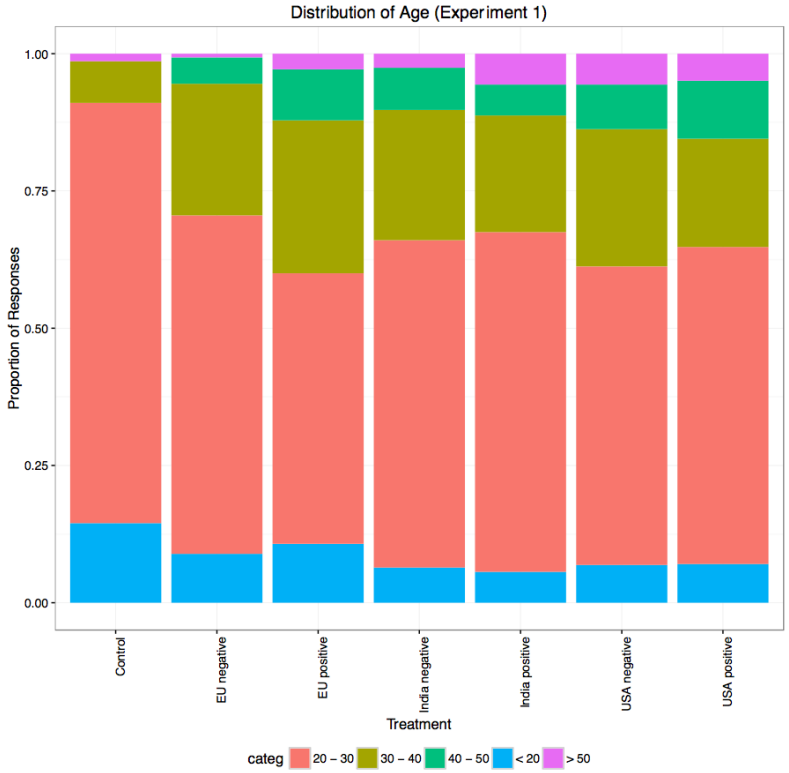


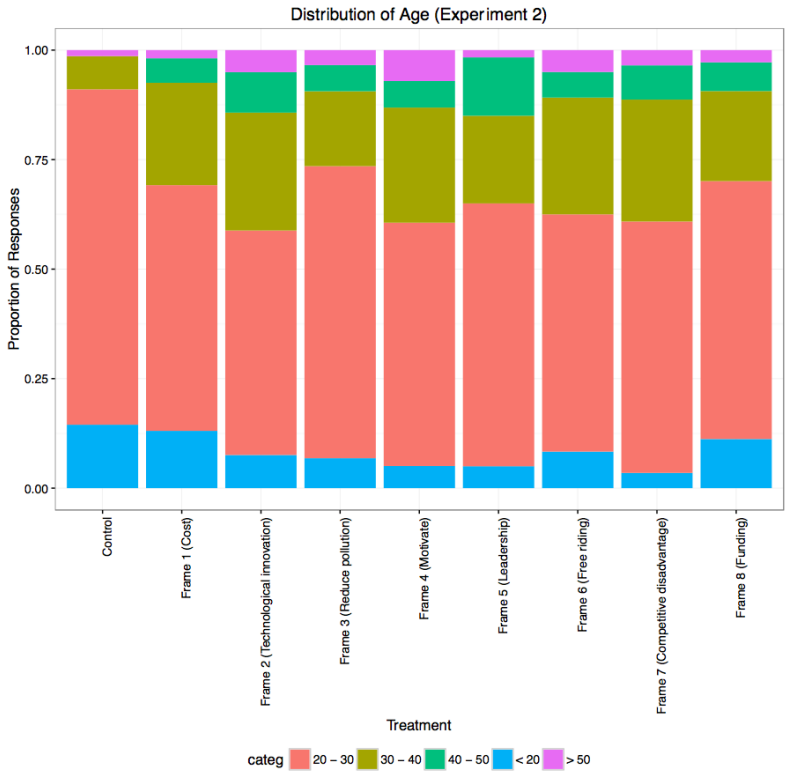


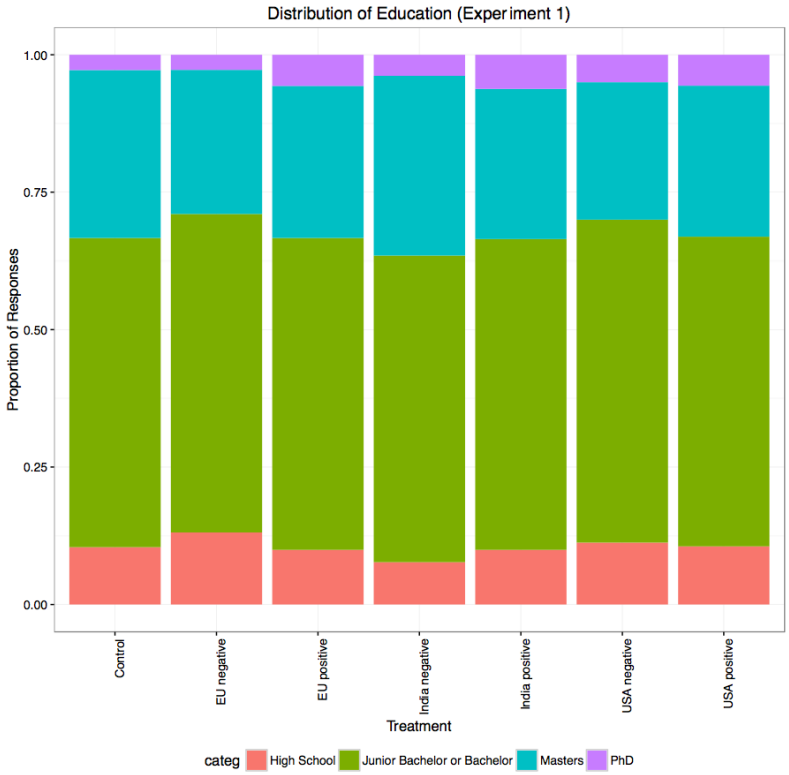

Distribution of Respondents' Education
Number of Respondents
600
400
200
0
High School
Junior Bachelor or Bachelor
Masters
PhD
Education

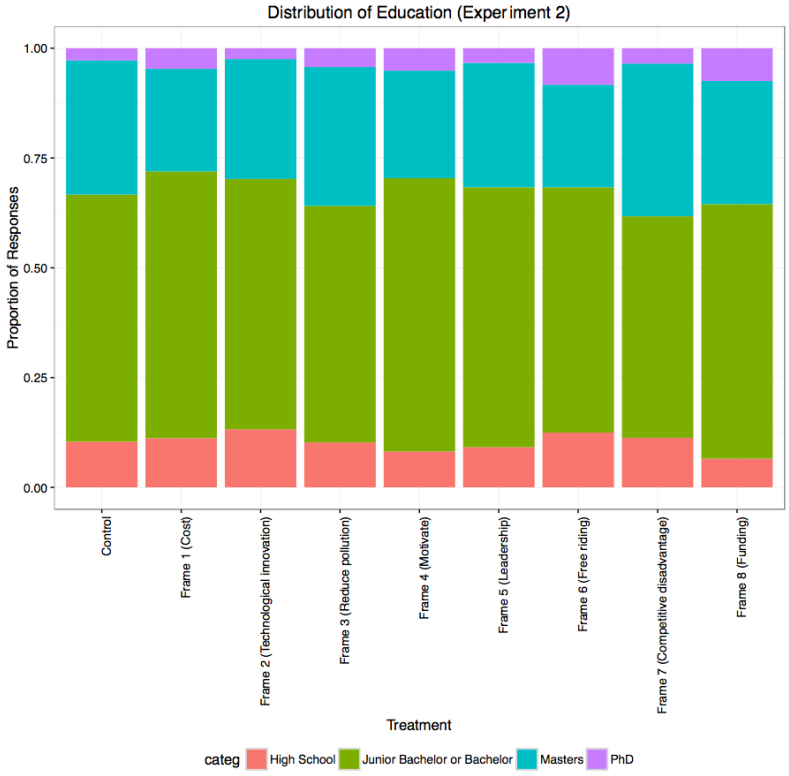

Distribution of Respondents' Profession
Number of Respondents
500
400
300
200
100
0
State or party organisations, enterprises, institutions
Commerce and Service
Production, transport, equipment operation
Military
Students and Academics
Agriculture, forestry, fisheries
Profession

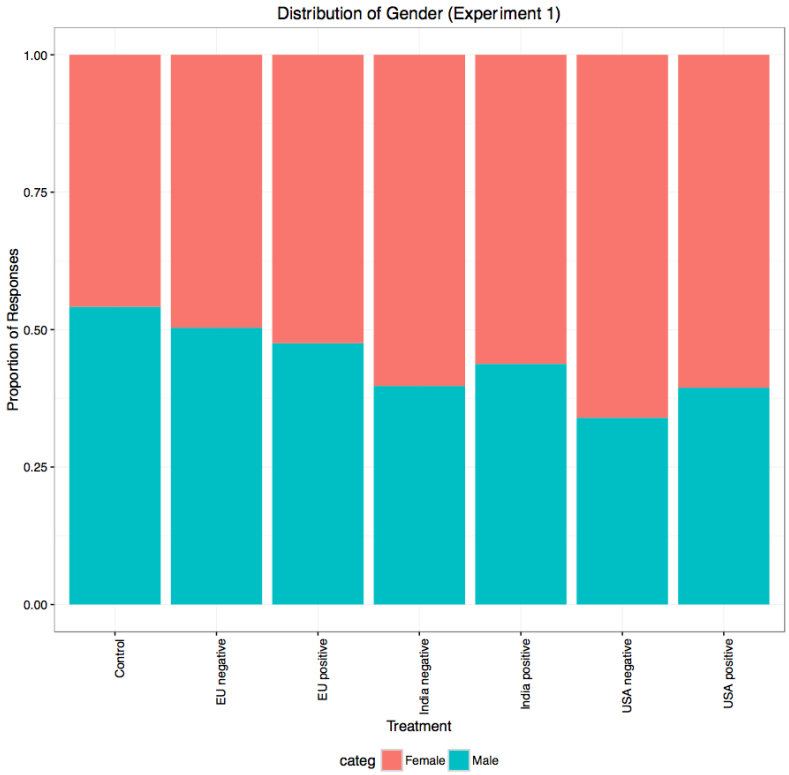
Appendix 2. Distribution of socio-demographic information across treatment conditions.

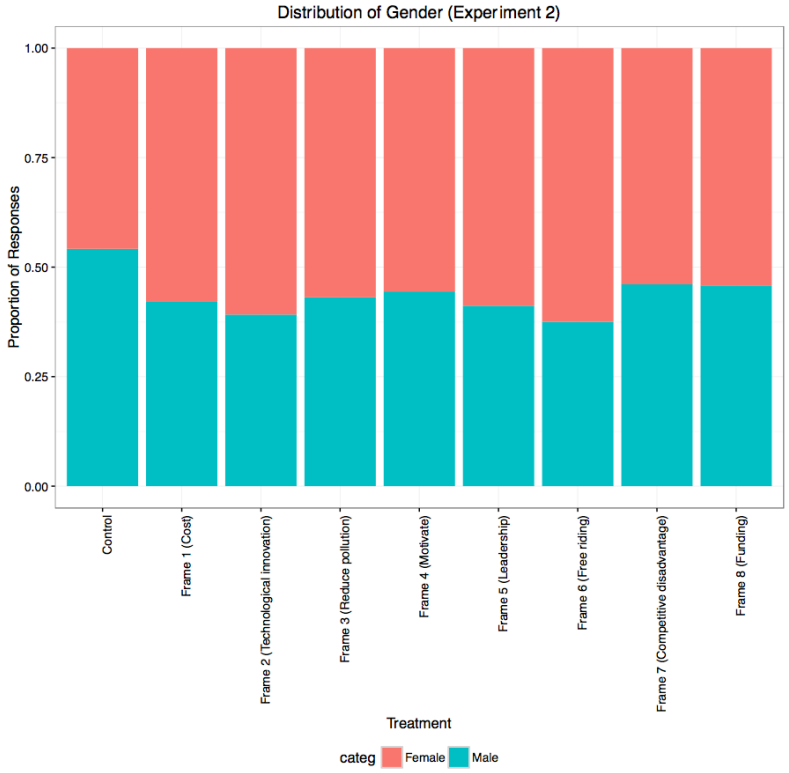


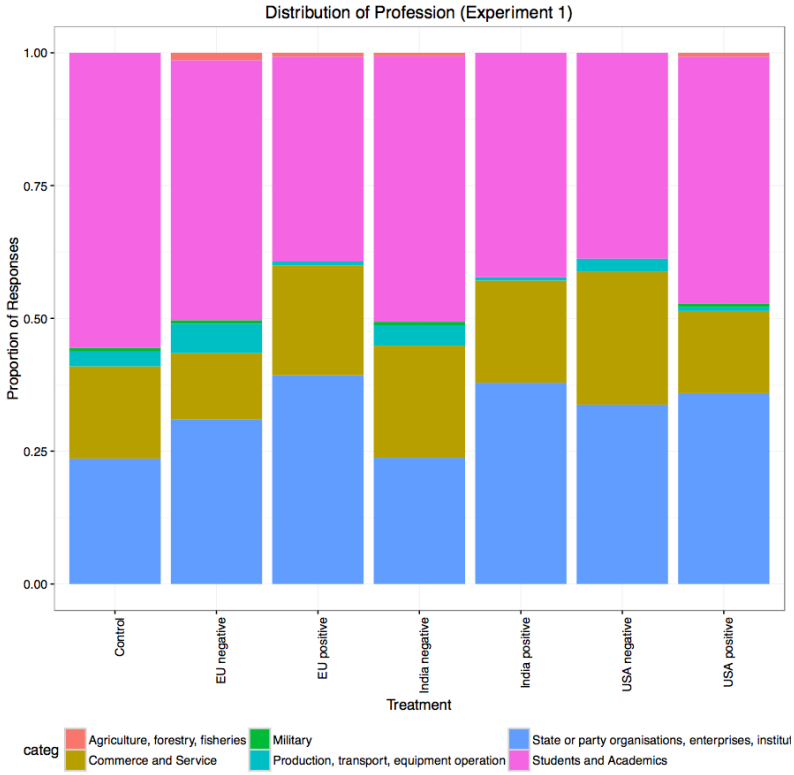


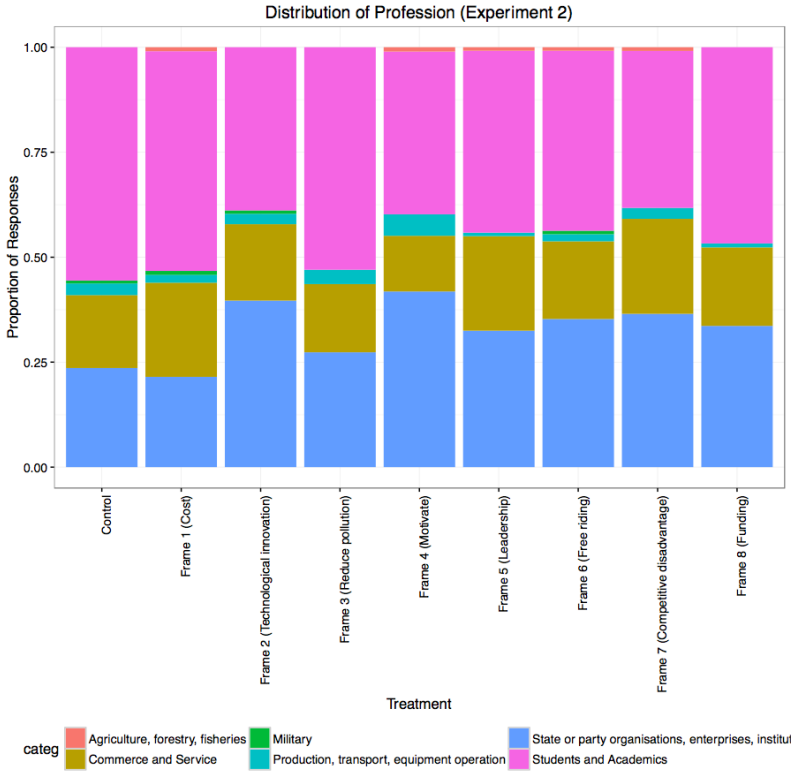

Distribution of Education (Experiment 1)
Proportion of Responses
1.00
0.75
0.50
0.25
0.00
Control
EU negative
EU positive
India negative
India positive
USA negative
USA positive
Treatment
categ
High School
Junior Bachelor or Bachelor
Masters
PhD

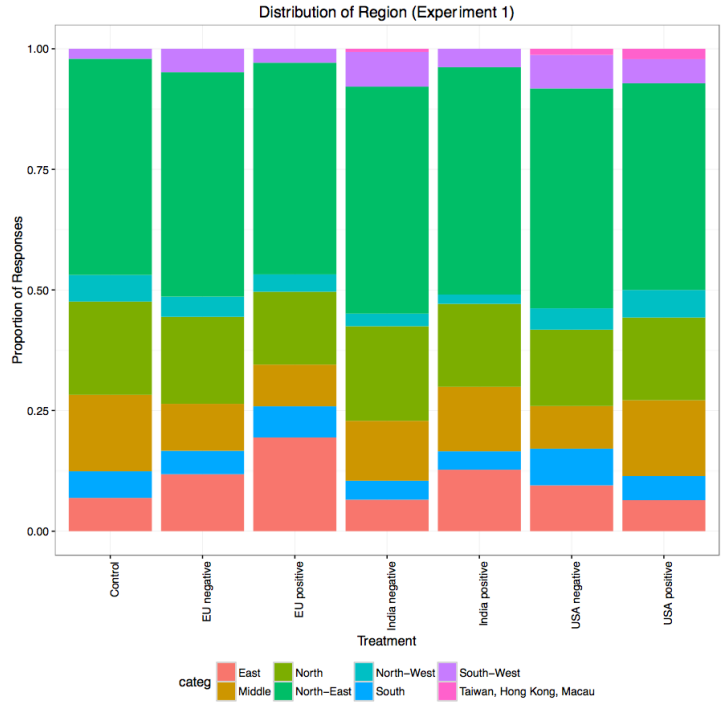

Distribution of Education (Experiment 2)
Proportion of Responses
1.00
0.75
0.50
0.25
0.00
Control
Frame 1 (Cost)
Frame 2 (Technological innovation)
Frame 3 (Reduce pollution)
Frame 4 (Motivate)
Frame 5 (Leadership)
Frame 6 (Free riding)
Frame 7 (Competitive disadvantage)
Frame 8 (Funding)
Treatment
categ
High School
Junior Bachelor or Bachelor
Masters
PhD

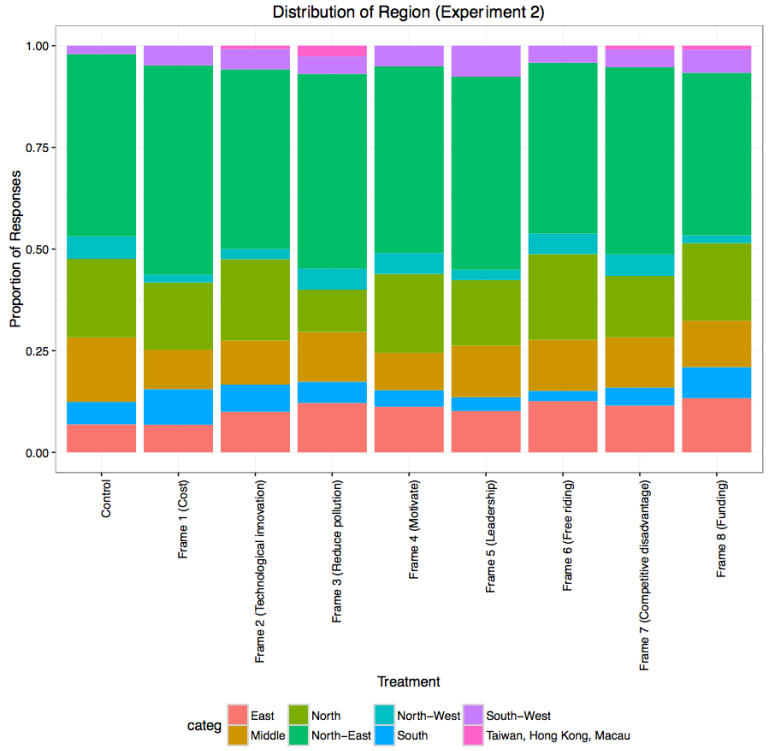

Distribution of Gender (Experiment 1)
Proportion of Responses
1.00
0.75
0.50
0.25
0.00
Control
EU negative
EU positive
India negative
India positive
USA negative
USA positive
Treatment
categ
Female
Male


Distribution of Gender (Experiment 2)
Proportion of Responses
1.00
0.75
0.50
0.25
0.00
Control
Frame 1 (Cost)
Frame 2 (Technological innovation)
Frame 3 (Reduce pollution)
Frame 4 (Motivate)
Frame 5 (Leadership)
Frame 6 (Free riding)
Frame 7 (Competitive disadvantage)
Frame 8 (Funding)
Treatment
categ
Female
Male


Distribution of Profession (Experiment 1)
Proportion of Responses
1.00
0.75
0.50
0.25
0.00
Control
EU negative
EU positive
India negative
India positive
USA negative
USA positive
Treatment
categ
Agriculture, forestry, fisheries
Commerce and Service
Military
Production, transport, equipment operation
State or party organisations, enterprises, institut
Students and Academics


Distribution of Profession (Experiment 2)
Proportion of Responses
1.00
0.75
0.50
0.25
0.00
Control
Frame 1 (Cost)
Frame 2 (Technological innovation)
Frame 3 (Reduce pollution)
Frame 4 (Motivate)
Frame 5 (Leadership)
Frame 6 (Free riding)
Frame 7 (Competitive disadvantage)
Frame 8 (Funding)
Treatment
categ
Agriculture, forestry, fisheries
Commerce and Service
Military
Production, transport, equipment operation
State or party organisations, enterprises, institut
Students and Academics


Distribution of Region (Experiment 1)
Proportion of Responses
1.00
0.75
0.50
0.25
0.00
Control
EU negative
EU positive
India negative
India positive
USA negative
USA positive
Treatment
categ
East
Middle
North
North–East
North–West
South
South–West
Taiwan, Hong Kong, Macau


Distribution of Region (Experiment 2)
Proportion of Responses
1.00
0.75
0.50
0.25
0.00
Control
Frame 1 (Cost)
Frame 2 (Technological innovation)
Frame 3 (Reduce pollution)
Frame 4 (Motivate)
Frame 5 (Leadership)
Frame 6 (Free riding)
Frame 7 (Competitive disadvantage)
Frame 8 (Funding)
Treatment
categ
East
Middle
North
North–East
North–West
South
South–West
Taiwan, Hong Kong, Macau

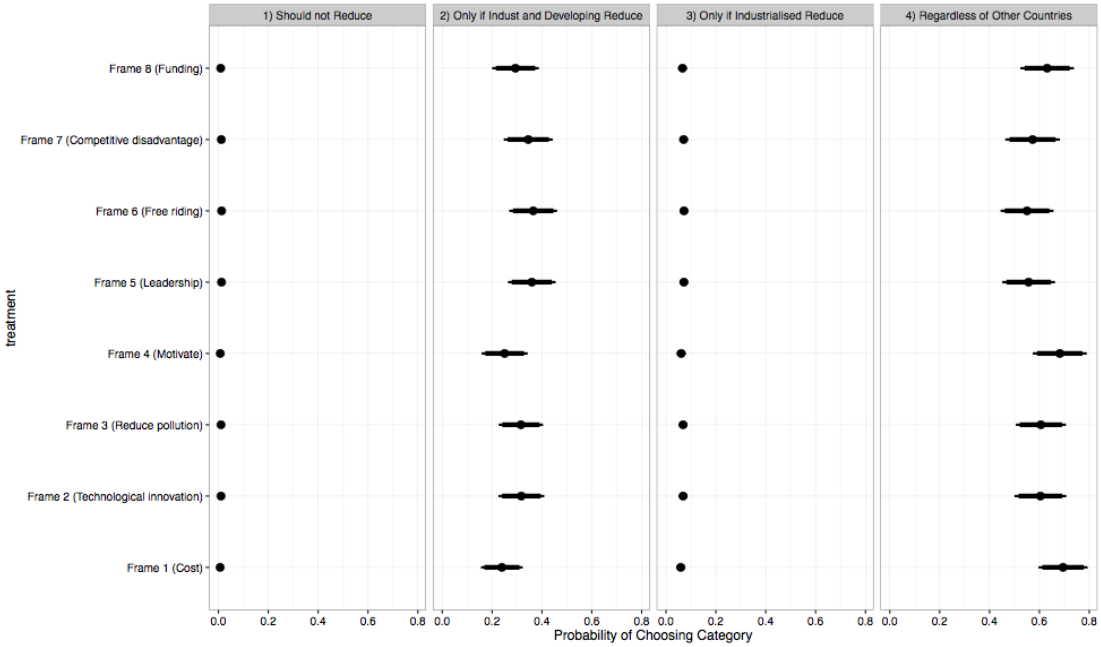


Figure 6. How the probability of response for each category of the outcome measure varies by treatment condition, for experiment 2. Dots indicate point estimates, thick and thin horizontal lines indicate 90% and 95% confidence intervals respectively.

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Article

Predicting Paris: Multi-Method Approaches to Forecast the Outcomes of Global Climate Negotiations

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Abstract
We examine the negotiations held under the auspices of the United Nations Framework Convention of Climate Change in Paris, December 2015. Prior to these negotiations, there was considerable uncertainty about whether an agreement would be reached, particularly given that the world's leaders failed to do so in the 2009 negotiations held in Copenhagen. Amid this uncertainty, we applied three different methods to predict the outcomes: an expert survey and two negotiation simulation models, namely the Exchange Model and the Predictioneer's Game. After the event, these predictions were assessed against the coded texts that were agreed in Paris. The evidence suggests that combining experts' predictions to reach a collective expert prediction makes for significantly more accurate predictions than individual experts' predictions. The differences in the performance between the two different negotiation simulation models were not statistically significant.

Keywords
climate policy; climate regime; expert survey; forecasting; global negotiations; Paris agreement; prediction; simulation

Issue
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1. Negotiating and Predicting the Paris Climate Agreement

In the first half of 2015, the global climate negotiations arrived at a crossroads. Would the high expectations for an international agreement by the end of 2015 at Paris be met? And if an agreement were reached, what would be the contents of such a global climate treaty? There was a great deal of uncertainty regarding the answers to these questions before the Paris negotiations were concluded. Amid this uncertainty, we generated forecasts of the negotiation outcomes based on three distinct approaches: an Ex Ante Expert Survey of expected results and two negotiation simulation models. Each of these approaches produced forecasts well in advance of the start of the final round of the Paris negotiations. In this

article we report on the relative accuracy of the predictions generated by each of the three approaches.

The global climate regime originates from scientific efforts to elevate the issue of climate change to the global, diplomatic level in the 1980s, which ultimately culminated in the 1992 United Nations Framework Convention on Climate Change (UNFCCC) (Luterbacher & Sprinz, 2001, in press). The UNFCCC enjoys universal support, perhaps because it is mostly declaratory. By contrast, the 1997 Kyoto Protocol to the UNFCCC has been marked by more controversy. The Kyoto Protocol mandated all industrialized countries to manage their absolute emissions and to reduce greenhouse gas (GHG) emissions by about 5% between 1990 and 2012. Developing countries were not obliged to undertake mitigation obligations. The USA signed, but never ratified the Kyoto Protocol due to fears regarding the impacts on its domestic economy and the lack of emission-reducing obligations for emerging economies (Bang, Hovi, & Sprinz, 2012; Hovi, Sprinz, & Bang, 2012). Canada left the Kyoto Protocol just before the end of the first compliance period of 2008-2012. While a second compliance period of the Kyoto Protocol was ultimately agreed in 2012, it obliges only European countries and Australia to reduce emissions until 2020. The limitations of the Kyoto Protocol meant that the urgency of formulating a new global climate agreement grew.

A first attempt to agree on a successor to the Kyoto Protocol with universal participation was scheduled for December 2009 in Copenhagen (Dimitrov, 2010). Those hoping for a global agreement were bitterly disappointed. Before the Copenhagen conference took place, Stokman (2009, 2015) conducted an analysis of the negotiations similar to the one we perform here. He applied the Exchange Model, which correctly predicted that two issues would block a comprehensive agreement in Copenhagen, namely whether or not the proposed treaty would be an extension of the Kyoto Protocol and whether or not developing countries would be obliged to reduce CO_2 in a measurable, reliable, and verifiable way. A similarly pessimistic prediction was made by Bueno de Mesquita (2009). Regrettably these pessimistic predictions were borne out by the 2009 Conference of the Parties at Copenhagen.

The period prior to the Paris conference in December 2015 was characterized by considerable uncertainty about whether more progress would be made this time. There were some signs to warrant optimism. Notwithstanding the failure to reach an agreement in Copenhagen, those talks did lead to a new bottom-up approach, which arguably laid the foundations for a future agreement. Since Copenhagen, countries have been strongly encouraged to develop Intended Nationally Determined Contributions (INDCs),[1] which are essentially national climate policy plans to be shared with the UNFCCC's membership. Furthermore, the failure at Copenhagen led to an impetus to avoid a repeat. The United States' government also took a markedly different approach in the preparations for the Paris Conference of the Parties (COP) compared to the Copenhagen COP, displaying a greater commitment to making multilateral negotiations work. This stronger commitment to reaching an agreement at Paris was shared with the Chinese government, and embodied in a joint US-China presidential statement in September 2015, in which Presidents Obama and Xi emphasized their personal commitment to finding an agreement.[2] Despite these positive signs, large differences remained between the negotiating positions of the world's largest countries and regions.

It was in this uncertain context that we began a study in early 2015 with a view to predicting the outcomes of the Paris negotiations. We employed three distinct methods for generating these predictions, one based on experts' predictions, and two based on negotiation simulation models, all of which will be described in more detail below. Our research team consists of researchers from two international climate institutes (CICERO—Center for International Climate and Environmental Research—Oslo, and PIK—Potsdam Institute for Climate Impact Research) and three universities (New York University, University of Groningen, and University of Strathclyde). To ensure the comparability of the predictions from these three different approaches, it was important to identify and assess a common set of issues, and to design the study in such a way that the analyses could be performed using a common set of inputs into the simulation models. We published our predictions in October and November 2015 on an academic, open access internet platform—well before the final round of global climate negotiations—which were concluded by 12 December 2015 (Kallbekken & Sælen, 2015; Sprinz & Bueno de Mesquita, 2015; Stokman & Thomson, 2015). Here, we revisit the methods for predicting the Paris outcomes, which is a combination of a decision of the Conference of the Parties of the UNFCCC and the annexed legally binding Paris international agreement.[3]

Arild Underdal's contribution to the study of international climate policy is profound and our work has been clearly influenced by his contributions. In effect, Underdal was "present at the creation" of this article on at least two occasions. First, in the early 2000s, Harold K. Jacobson suggested using simulation models to forecast global climate negotiations, and Underdal, Bueno de Mesquita, and Sprinz were part of the team that further developed the idea; yet progress at the

[1] Future national commitments will be laid down in Nationally Determined Contributions (NDCs).

[2] US-China Joint Presidential Statement on Climate Change: https://www.whitehouse.gov/the-press-office/2015/09/25/us-china-joint-presidential-statement-climate-change

[3] See FCCC/CP/2015/L.9/Rev.1 (http://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf).

time was stalled by the untimely passing away of Jacobson. Second, Underdal served as chief applicant of the Centre for International Climate and Energy Policy (CICEP), and Sprinz approached him in late 2014 with the idea to follow up on the earlier ambition. As a result, Arild Underdal and other CICEP members[4] contributed to the derivation of the scales employed in this article. This approach to employing multiple methods to predict the outcomes of multilateral negotiations represents a novel approach to research on global climate change negotiations, which with some notable recent exceptions (e.g., Genovese, 2014; Michaelowa & Michaelowa, 2012; Weiler, 2012), has been characterized by qualitative case studies.

In the following, we provide brief overviews of the approaches used (Section 2) and the assessment of the results (Section 3), while the final section offers concluding observations.

2. Three Approaches

In this section, we outline the procedure for identifying the substantive issues to be predicted and the three methodological avenues chosen to make predictions on these issues. In addition, we describe the procedure for obtaining the input information for the negotiation simulation models, which consists of the list of main stakeholders and several key attributes of each of these stakeholders.

2.1. The Issues at Stake and Scaling

We identified 13 key negotiation issues that together address the main components of the global climate change regime. The negotiation issues fall under the headings of the mitigation of greenhouse gases (reducing emissions), adaptation (coping with damages due to climate change), and compensation. In addition, the issues address the overarching question of differentiation of obligations, and issues concerning climate finance as well as legal form. For each issue, a range of possible outcomes was identified and placed on a scale from 0–100. This was undertaken based on interviews with UNFCCC negotiators, the initial draft negotiation text for the Paris Agreement as of 25 February 2015,[5] parties' submissions to the negotiations process, consultation with scholars, and the authors' knowledge of the process. The 13 issues were labelled as follows:

- differentiation (of obligations)
- mitigation—monitoring, review, and verification (MRV) as well as compliance arrangements
- the legal form of obligations on mitigation
- the legal form of adaptation
- institutional setup for adaptation
- climate finance—volume
- climate finance—who is obliged to contribute?
- adaptation reserved finance
- loss & damage
- the mechanism to determine future mitigation obligations (progression principle)
- mitigation goal for 2050
- mitigation goal for 2100 and
- ex ante assessment of future Nationally Determined Contributions.

The scaling of possible outcomes on each issue implies that alternatives are ranked on a single dimension (e.g., from least to most ambitious). The numerical difference between alternative outcomes is assumed to be interval scale and related to the political difference between them. All issues and respective scales can be found in Appendix 1.

In the first of the three approaches to generating predictions, we conducted an Ex Ante Expert Survey (see below), in which we asked experts to make straightforward predictions of the outcome on each of these 13 scales. The simulation models, however, require more information. They generate predictions of outcomes using information on the main stakeholders and some of their key attributes, including stakeholders' positions on each of the issues. Our first task was to identify the relevant stakeholders. While we recognize the importance of NGOs in the global governance of climate change, the consensus among the experts and participants we consulted is that the COPs are primarily intergovernmental affairs. We therefore decided to focus on major countries and groups of countries as stakeholders. A range of negotiating groups are formally recognized by the UNFCCC secretariat.[6] We followed these groupings, while recognizing the political reality that major countries have to be included separately from their groups. The resulting 16 stakeholders were chosen to include the most prominent individual countries and negotiating blocks within the UNFCCC. To the list of major emitters, we added country groups based around regional affiliation or shared interests so that virtually every Party to the UNFCCC is represented and overlap avoided. We do not include the G77 as a separate actor, for instance, because its members are represented by other stakeholders, and the G77 does not take a coherent position on all issues. Our stakeholders consist of the following:

- African Group

[4] We greatly appreciate the guidance offered by Guri Bang and Jon Hovi.

[5] See FCCC/ADP/2015/1 (http://unfccc.int/resource/docs/2015/adp2/eng/01.pdf)

[6] See http://unfccc.int/parties_and_observers/parties/negotiating_groups/items/2714.php

- AILAC—Association of Independent Latin American and Caribbean States
- ALBA—Bolivarian Alliance for the Peoples of Our America
- AOSIS—Alliance of Small Island States
- the Arab Countries
- Bangladesh/LDCs—Least Developed Countries
- Brazil
- China
- EIG—Environmental Integrity Group
- the EU28
- India
- Indonesia[7]
- Umbrella group ([Australia, Canada, Japan, New Zealand, Kazakhstan, Norway, the Russian Federation, Ukraine, and the USA] minus [Japan, Russia, USA])
- Japan
- Russia and the
- USA.

The selection of these stakeholders implies the assumption that all domestic and transnational actors influence the international negotiations by way of these 16 stakeholders. By necessity, this simplifies the more complex reality, including the fact that each of these stakeholders includes several factions. This is a defendable simplification in that each stakeholder can only represent a single negotiating position on each issue. However, the lack of information on each faction's position means that the information is less nuanced than recommended by the proponents of the negotiation simulation models.

We gathered estimates of the negotiation positions of each of the stakeholders on each of the 13 issues, and in doing so placed each of the stakeholders on a position (between 0 and 100) on each of the issues. These position estimates were based on analysis of stakeholders' submissions and statements to the negotiations on the Paris Agreement since the launch of that process in 2011—in total 185 documents. This analysis was supplemented with interviews of key negotiators, and the authors' experience from closely following the negotiations process. Not all stakeholders took a position on each of the issues. For instance, neither Brazil nor China had a clear position on the issues concerning mitigation goals for 2050 and 2100. In their working paper published prior to the Paris conference, Sprinz and Bueno de Mesquita (2015) applied the Predictioneer's Game to the set of issues excluding the 2050 and 2100 issues, arguing that the data on these issues are incomplete. For the purposes of comparison, we include these two issues but note their earlier concern and the fact that the substantive findings are the same regardless of whether these issues are included.

We derived estimates of the level of salience that each stakeholder attached to each issue and the flexibility of each stakeholder on each issue. Again, these salience and flexibility estimates were quantified on 0–100 scales. These judgements were derived from assessments by the authors, which were informed by how often and strongly stakeholders had expressed positions in their submissions and statements, and on interviews with negotiators. Finally, the models also require estimates of the relative influence of each of the stakeholders. We formulated two sets of influence scores, which turned out to be highly correlated: one from a team of negotiators and one from a subgroup of the authors based on their own scholarly judgement. In the working papers published prior to the Paris conference, Stokman and Thomson (2015) applied the Exchange Model based on the influence scores from negotiators, while Sprinz and Bueno de Mesquita (2015) applied the Predictioneer's Game based on the influence scores from the authors. Here, we compare the predictions using the authors' set of influence scores, but note that the main findings remain the same regardless of which set of influence scores we use.

2.2. The Expert Survey

The first approach to prediction was based on a survey of experts, which was held during 9–20 September 2015, more than two months before the Paris conference began on 30 November 2015. We issued an online survey to a convenience sample of 104 experts whom the authors identified though several scholarly projects and events that closely followed the then current negotiations. Although previous experiments (Tetlock, 2005; Tetlock & Gardner, 2015) have shown that experts perform no better—sometimes even worse—than amateurs, we selected experts because our survey focused on detailed sub-topics in the negotiations, meaning that a substantial knowledge of the process was required to provide well-formed predictions. A total of 38 respondents (36.5%) provided predictions, and almost all respondents gave predictions on all of the issues. The survey questionnaire used the same issue scales that were used for the input data for the negotiation simulation models (Appendix 1). Respondents were asked to give their expectations on outcomes of the Paris negotiations as positions on each of the 13 scales, employing the ordinal scale points mentioned in Appendix 1. We emphasized that they should enter the outcome they expected even if it deviated from the positions they advocated. We assured the respondents that their responses would be anonymized. We refer to these experts as the "Ex Ante Experts."

[7] Due to varying data availability, Indonesia was excluded from the simulations of the Exchange Model whereas the simulations of the Predictioneer's Game allowed for inclusion of Indonesia whenever data were available.

In addition to the 13 substantive questions, we also asked respondents about their regional affiliation and their role in the global climate negotiations. While we did not expect to obtain a representative sample, it is useful to know whether the responses might be biased in any particular direction. The invited experts were fairly well distributed across regions, but those who responded were primarily (82%) from the UNFCCC region "Western Europe and others (including the USA)". Simple tests indicate that responses of the predicted outcomes per issue do not differ between this dominant group and respondents from other regions. One third of respondents were researchers, and one quarter were country delegates (negotiators). The rest consisted of consultants, NGO representatives, former country delegates, and journalists.

The respondents were also given the opportunity to provide comments on each question and to the overall survey. Many of the comments expressed a desire for more nuanced response options. These responses are understandable given that the set of alternatives had to conform to a monotonically increasing scale to ensure comparability with the two simulations models, thereby imposing some limitations on the range of possible alternatives. The questionnaire informed respondents about this limitation and asked them to pick the alternative corresponding most closely to their expectation in cases where none of the labeled scale points fitted perfectly.

2.3. The Simulation Models

Collective decision-making is the process in which stakeholders have to transform different preferences into a single collective decision that binds all actors within a social system. In doing so, all actors try to influence the decision outcome, including efforts by some to prevent decision-making and maintain the status quo. The dynamics in collective decision-making processes result from the simultaneous efforts of stakeholders with different policy positions to build coalitions in support of their own positions. This implies that stakeholders may be willing or forced to support positions that differ from those they advocated at the outset of the negotiations. In the literature, such shifts in positions are attributed to three main processes: *persuasion, logrolling,* and *enforcement* (Stokman, Van der Knoop, & Van Oosten, 2013), and each of these processes is associated with a specific type of network (Stokman, 2014). Previous research has applied models that are representative of these processes to international negotiations in the context of EU decision-making (Thomson, Stokman, Achen, & Koenig, 2006). The present study extends this work to the global level by applying two such models: the Exchange Model, which represents the logrolling process; and the Predictioneer's Game, which represents the enforcement process.

2.3.1. Exchange Model

The Exchange Model encapsulates the intuitively plausible idea that negotiations are driven by a process of political exchange, whereby stakeholders make concessions on some issues in return for concessions on other issues. The result is that stakeholders are willing to support another position on an issue that is of relatively less importance to them in exchange for support from another stakeholder on an issue that is relatively more important to them. The model formalizes the conditions under which political exchanges take place and provides a tool for analyzing complex negotiations in which many stakeholders and issues are involved.

The Exchange Model assumes that each stakeholder has complete knowledge of the positions, issue saliences, and influence of all other stakeholders. We further assume that all stakeholders share a common view on what the expected outcome on each issue will be if each issue were considered separately. This expected outcome is a variant of the Nash Bargaining Solution (NBS), which is approximated by the average of the initial policy positions of the stakeholders, weighted by the product of each stakeholder's influence and salience (Achen, 2006). This expected outcome can be considered a collectively optimal outcome for all actors if each issue is considered separately. Position exchanges link pairs of issues and provide pairs of stakeholders with opportunities to reach decision outcomes that they prefer to the expected outcome. Therefore, position exchanges allow the actors involved in those exchanges to optimize the expected decision outcomes in line with their own individual interests.

Each stakeholder may have one or more possible exchange opportunities. If a stakeholder has more than one opportunity, it must select the one it tries to realize. A potential exchange is realized only if both stakeholders agree to realize it. This will happen only if neither of them has a better alternative exchange. When an exchange is realized, both stakeholders may make deals with other stakeholders only if the outcomes of such deals have no negative effects for the first exchange partner. This condition, of course, limits future exchange possibilities in the bargaining process. In other words, when stakeholders realize an opportunity for an exchange they enter into a binding commitment, which is what makes the Exchange Model a cooperative bargaining model. Within each round of the simulated negotiations, the model works through each exchange opportunity and calculates the resulting shifts in stakeholders' positions. The round ends after all exchanges have been realized. At the end of a round, there usually remain differences among actors' positions. The expected outcome based on actors' revised positions is taken as the predicted outcome after that round of exchanges. The model assumes that the stakeholders then commence a subsequent round of negotia-

tions, starting with initial positions somewhere between their initial positions in the previous round and their negotiated positions at the end of the previous round. The higher the salience of an issue to an actor, the greater is the weight of the former initial position relative to the negotiated position. Extensive experience in applying the Exchange Model shows that ten rounds give a good estimate of final positions and outcomes in negotiations (Stokman & Van Oosten, 1994).

Modeling position exchanges requires careful consideration of the nature of these exchanges. In particular, a choice has to be made about which exchange rate to use. The exchange rate determines the extent to which each stakeholder shifts its position. The present Exchange Model uses an equal, absolute utility gain for both exchange partners. This has the advantage that exchanges have the same utility for both partners, and that the exchanges can be ordered in terms of their relative attractiveness to both exchange partners. The disadvantage of the equal utility gain assumption is that it involves an intersubjective comparison of utility, which is theoretically problematic (Arrow 1951/1963). Roth and Malouf (1979, pp. 580-581), however, review several studies that report a strong tendency for outcomes of bargaining games to give players equal payoffs when those outcomes differ from the Nash prediction. More recent evidence results from splitting resource pool experiments (Dijkstra & Van Assen, 2008). Furthermore, alternative solutions for the exchange rate lead to different orderings of exchanges for each stakeholder, facing the problem of deadlock, whereby no two stakeholders prefer, and therefore can realize, the same exchange.

Bilateral exchanges also have important side effects or externalities with respect to the utilities of other stakeholders as exchanges result in shifts in the expected outcomes on issues. Externalities arise when stakeholders who are not involved in an exchange are either positively or negatively affected by it (Dijkstra, Van Assen, & Stokman, 2008; Van Assen, Stokman, & Van Oosten, 2003). If over all simulated exchanges between stakeholders, the positive externalities for each stakeholder are greater than the negative ones, we may expect overall agreement. If, however, important stakeholders experience substantively higher negative externalities of other stakeholders' exchanges than positive ones, including their own exchanges, this may result in opposition to the negotiated outcomes. In such cases, the final interests of the stakeholders are likely to be insufficiently complementary to reach overall agreement.

2.3.2. The Predictioneer's Game

The Predictioneer's Game is a model designed to address policy problems for which there is the possibility of a negotiated compromise but there is also the possibility of threat or actual use of costly, coercive pressure (Bueno de Mesquita, 2011). The model is not appropriate, however, for market-driven decisions since these do not involve either negotiation or coercion. The Predictioneer's Game assumes that people are rational in the sense that they do what they believe is in their best interest. They may learn later that the negotiations lead to different results. The model is both predictive and prescriptive. For instance, one feature of the model as a practical tool is that its output can also help decision makers better anticipate what would happen if they alter their pattern of action in specific ways designated through the model's logic. Based on hundreds of applications in peer-reviewed outlets (and many more in confidential settings), the evidence shows that this model and its predecessors accurately predicts issue outcomes over ninety percent of the time (e.g., Ray & Russett, 1996). Hence, it is a reliable and practical tool for policy analysis.

The Predictioneer's Game solves N(N—1) two-player games for t-periods of play where N is the number of players, with third-party interests included in each player's calculations. The game assumes two dimensions of uncertainty for each player. Each player is uncertain regarding each other player's type on two dimensions. Specifically, is another player the type that, given the opportunity, prefers to coerce or negotiate and, if coerced, prefers to retaliate or give in? Players update beliefs about each other's types following Bayes Rule and is solved for the Perfect Bayesian Equilibria for each stage game. The stage games are repeated t times, where t, the number of iterations, can be selected by the user. The model signals the period when the "super" game for all players is expected to end based on two conditions: (1) looking ahead one period, the average player expects her welfare to decline or, (2) if there are veto players, at least one of them believes it is better to stop the game than to continue to the next "round."

The sequence of play for player pair i,j when i moves first is as follows:

(1) Player i decides whether to make a proposal whose content is endogenously derived. A proposal requests a shift in j's position on the issue in dispute;
(2) If a proposal was made, then the recipient chooses to accept or make a strategically chosen counter-proposal. If no proposal was made, then j has the opportunity to follow the sequence of moves initially available to i (following the sequence described for i);
(3) Following a proposal and counter-proposal, player i can offer a compromise settlement with j or i can coerce j, imposing costs;
(4) If a compromise offer was made, then j can negotiate, producing an expected agreement, or j can coerce i;
(5) Following any coercive move, the target can re-

taliate or capitulate to the other player's demanded outcome.

The model relies on the mean voter theorem to generate estimated predicted outcomes in each round, using the average of the mean-voter prediction in the first round in which one of the game-ending conditions has been met plus the average of the mean predicted outcome in the round before (if there is one) and the round after. Unlike the Exchange Model, the Predictioneer's Game is a non-cooperative bargaining model and relies on the assumption of issue-by-issue decisions rather than concessions across issues.

3. Overview of Results

In the following, we report our results for the three approaches used to predict the outcomes of the climate negotiations and the accuracy of each of these approaches. The information on the point predictions derived from each of the three approaches to predicting the outcomes of the Paris negotiations is provided in Table 1. From the first approach to prediction, which is based on the 38 Ex Ante Experts, we take the average of these 38 predictions as the collective prediction of our group of experts. We are also, however, interested in the predictive accuracy of individual experts compared to predictions from the other approaches. The information in Table 1 shows not only the average of the Ex Ante Experts' predictions, but also the range and standard deviations of the experts' predictions. This information clearly shows a great deal of variation among experts in their expectations about the outcomes of the negotiations. Note that it is entirely possible for individual experts' predictions to be far from the actual outcome, while the average of their predictions is close to the actual outcome: For example, if two experts predict 0 and 100 on a policy scale while the actual outcome is 50. This is a possibility we examine below.

Table 1. Ex Ante predictions and Ex Post assessments.

	Ex Ante Predictions				**Ex Post Assessment**
Issue	Average of Ex Ante Experts (range; s.d.)	Inclusive Exchange Model	Restrictive Exchange Model	Predictioneer's Game	Our Coding of COP-21 Texts
Differentiation	39 (0-75; 23.03)	38	35	58	50
Mitigation—MRV & Compliance	43 (0-75; 27.54)	44	58	50	70
Mitigation—Legal Form	60 (0-70; 19.42)	45	51	53	70
Adaptation—Legal Framework	44 (0-100; 18.76)	79	79	60	50
Adaptation—Institutions	52 (0-60; 20.55)	65	65	67	50
Climate Finance—Volume	17 (0-100; 17.10)	60	41	55	20
Climate Finance—Who Pays?	33 (0-80; 20.49)	39	21	27	20
Adaptation Reserved Finance	30 (0-100; 27.54)	53	68	66	40
Loss & Damage	29 (0-70; 16.63)	10	15	45	30
Ambition Level—Mitigation Mechanism	42 (0-100; 21.68)	30	43	35	65
Mitigation—2050	29 (0-100; 25.39)	69	58	47	10
Mitigation—2100	33 (0-100; 35.10)	91	86	85	80
Ex Ante Assessment of Future (I)NDCs	42 (0-100; 29.15)	7	9	47	20

Note: The Ex Ante Expert survey contains responses from 38 experts, each of whom predicted the outcomes on almost all of the 13 issues.

From the second approach to prediction, which is based on the Exchange Model, we derive two sets of predictions. These two sets of predictions differ with respect to the assumption about which issues are linked to each other in the process of negotiations, which in effect leads to two distinct variants of the Exchange Model. In the Inclusive Exchange Model, we assume that exchanges are possible across all 13 issues. The Restrictive Exchange Model by contrast assumes that exchanges can only be made across issues within substantively related subsets of issues. From Table 1, these groups are:

(1) mitigation and adaptation issues: Differentiation, Mitigation-MRV & Compliance, Mitigation-Legal Form, Adaptation-Legal Framework, Adaptation-Institutions, and Ambition Level-Mitigation Mechanism
(2) finance issues: Climate Finance-Volume, Climate Finance-Who Pays?, Adaptation-Reserved Finance, and Loss & Damage and
(3) ambition issues: Mitigation 2050, and Mitigation 2100.

The reason for specifying these distinct variants of the Exchange Model was that both before and after the Paris negotiations we obtained evidence that the financial issues were negotiated relatively independently from the rest of issues. For that reason, we published predictions from both the Inclusive and Restrictive Exchange Models before the Paris conference (Stokman & Thomson 2015; Tables 2 and 3). By contrast, in the third approach to prediction, based on the Predictioneer's Game, issues are not linked with each other at all. We therefore present only one set of predictions from that approach. The various predictions shown in Table 1 should be interpreted in light of the issue-specific scales reported in Appendix 1. As noted earlier, the predictions we assess here differ marginally from those we published prior to the Paris conference because we revised the input data to ensure that the analyses are as comparable as possible.[8]

[8] As noted earlier, the predictions of the Exchange Model published prior to the conference were based on estimates of influence provided by negotiators, while the predictions of the Predictioneer's Game were based on similar estimates from a subgroup of authors. Here we use the estimates from our authors. The predictions from the Predictioneer's Game excluded the issues of mitigation goals for 2050 and 2100 due to concerns about missing data, while those presented here include these issues. The results are substantively the same if we exclude the two ambition issues. Using our own coding of the COP-21 texts as the benchmark, we obtain the following mean errors (and standard deviations) for the remaining 11 issues: Average Ex Ante Experts 11.64 (8.90); Individual Ex Ante Experts 21.45 (14.65); Inclusive Exchange Model 22.45 (9.43); Restrictive Exchange Model 17.10 (7.99); Predictioneer's Game 18.02 (7.45).

Table 1 also contains our coding of the actual outcomes of the Paris negotiations. Initially, we asked 12 independent experts from around the world, across a broad range of disciplinary backgrounds, to individually score the outcomes of the Paris negotiations in an email survey. This ex post sample of experts did not overlap with the ex ante sample. Half of the invited experts scored the outcomes on the scales reprinted in Appendix 1. This Ex Post Expert Survey unexpectedly generated considerable variance across experts for a broad range of issues. Since the range of responses was very substantial, we ourselves undertook two complete codings of the outcomes of the issues. Our two codings produced nearly identical results, and we retained one of them as our ex post assessment of the negotiated outcomes (Table 1), substantiated, by direct reference—for each issue—to the core UNFCCC COP-21 decision and the Paris Agreement (see Appendix 2).

To assess the accuracy of our predictions across three approaches, Table 2 contains the mean absolute errors across the 13 issues as the benchmark for assessing the accuracy of the predictions given in Table 1. To calculate the errors of the predictions of "Average Ex Ante Experts," we first calculated the average prediction made by the 38 Ex Ante Experts on each of the 13 issues. We then calculated the absolute difference between this average (collective) prediction and the actual outcomes, and then calculated the average of these absolute differences across the 13 issues. By contrast, to calculate the error of the predictions of "Individual Ex Ante Experts," we first calculated the absolute difference between each of the 38 Ex Ante Experts' predictions and the actual outcomes. We then computed the average error across the 38 experts, before calculating the average error across the 13 issues. A comparison of the errors from the Average and Individual Ex Ante Experts shows that the Average predictions are considerably more accurate than the Individual predictions: The Average Ex Ante Expert prediction has an error of 14.92 compared to Individual Ex Ante Experts of 20.75.

Table 2 also shows that the errors of the models' predictions are generally somewhat higher than the errors of the Average Ex Ante Experts' predictions, but not necessarily higher than the Individual Ex Ante Experts' predictions. The Inclusive Exchange Model makes the least accurate predictions. However, the average errors of the Restrictive Exchange Model are slightly lower than those of the Predictioneer's Game.

Another perspective on accuracy of predictions can be gained by focusing on the degree of accuracy, i.e., by grouping the magnitude of errors into absolute errors that are 10 points or less, more than 10 and up to 20 points, more than 20 and up to 30 points, and more than 30 points (see Table 3). Focusing on rather accurate predictions with an average error of up to ten points, the Average Ex Ante Experts perform best (six

Table 2. Mean errors of each of the predictions (13 issues).

	Our Coding of COP-21 Texts
Average of Ex Ante Experts	14.92 (12.77)
Individual Ex Ante Experts	20.75 (10.79)
Inclusive Exchange Model	24.38 (13.87)
Restrictive Exchange Model	18.62 (11.86)
Predictioneer's Game	19.54 (10.71)

Note: Standard deviations in brackets.

Table 3. Distribution of errors by magnitude.

	Our Coding of COP-21 Texts
Average Ex Ante Experts	6 3 3 1
Individual Ex Ante Experts	1 6 5 1
Inclusive Exchange Model	0 7 3 3
Restrictive Exchange Model	2 6 4 1
Predictioneer's Game	4 4 3 2

Note: The four entries per cell reflect the distribution of absolute errors: ≤ 10, > 10–20, > 20–30, > 30.

Table 4. Pairwise comparison of predictive accuracy.

		Individual Ex Ante Experts	**Inclusive Exchange Model**	**Restricted Exchange model**	**Predictioneer's Game**
Average Ex Ante Experts	Better	13	10	8	9
	Worse		3	5	4
	Same				0
	p	.00	.09	.58	.27
Individual Ex Ante Experts	Better		7	6	8
	Worse		6	7	5
	Same				
	p		.99	.99	.58
Inclusive Exchange Model	Better			2	3
	Worse			9	10
	Same			2	
	p			.07	.09
Restricted Exchange model	Better				6
	Worse				6
	Same				1
	p				.99

Note: Figures refer to the numbers of issues on which the row prediction is better, worse, or the same as the column prediction in terms of predictive accuracy. P-values are from the non-parametric Wilcoxon-Cox sign test; two-sided tests that the medians of the errors are equal.

issues), followed by the Predictioneer's Game (four issues), the Restrictive Exchange Model (two issues), and Individual Ex Ante Experts (one issue) - while the Inclusive Exchange Model performed worst (zero issues). If we instead focus on major mispredictions exceeding 30 points, the Inclusive Exchange Model shows the most pronounced weakness (3 issues), followed by the Predictioneer's Game (two issues), while all other approaches only generate one major misprediction each.

In addition, Table 4 presents pairwise comparisons of the accuracy of each of the predictions with a simple non-parametric test (the sign test). A non-parametric test is arguably appropriate given both the small numbers of observations and the fact that the issues are interdependent. The sign test allows us to test the hypothesis that the difference between the median of the two sets of prediction errors is zero. A small p-value (by convention when $p \leq .05$) allows us to reject the null hypothesis, thereby inferring that one set of predicted errors is significantly lower than the other. The first inference to draw from Table 4 is that the predictions of the Average Ex Ante Experts are "better" (i.e., more accurate) than the Individual Ex Ante Experts on all 13 issues. This difference is highly significant ($p = .00$). Moreover, there are no significant differences between the accuracy of the Individual ex ante predictions and those of the three sets of predictions from the negotiation simulation models.

The predictions of the Inclusive Exchange Model are worse than those of the Restrictive Exchange Model, but this finding is not statistically significant at conventional levels. Thus, there is limited evidence in favor of exchanges within substantively related subsets of issues. The remaining pairwise comparison between the Inclusive Exchange Model and the Predictioneer's Game is insignificant. Finally, there is no substantive or statistically significant evidence of differences in the performance of the Restricted Exchange Model and the Predictioneer's Game.

4. Concluding Remarks

We conclude with several noteworthy observations from our investigation. Although the Paris agreement has been widely lauded as a great success for the global governance of climate change, the evidence suggests that the contents of the agreement reached is highly ambiguous. For each of the 13 main controversial issues that formed the agenda in Paris, we went to considerable lengths to describe in detail the possible different outcomes that might be reached to resolve the differences among the stakeholders' positions. In early 2016, we held an online survey of a small group of highly expert observers to assess what had been agreed in Paris a few months earlier, and found substantial differences among their answers in eight of the 13 issues (their answers ranged more than 20 points on the 100-points issue scales). This may partly reflect the limitations of an email survey. But it also points to the inherent ambiguity in the Paris texts that were agreed. One member of a large negotiating team stated that much of the subsequent conference held in Bonn in May 2016 focused on figuring out exactly what had been decided the previous year (personal interview, 28 June 2016). Introducing ambiguity in negotiation outcomes is one way of achieving the semblance of agreement and progress, which allows a broad range of participants to claim victory. However, in this policy area where countries need to make specific commitments to mitigate, adapt to or compensate for the effects of climate change, ambiguity is highly problematic. We decided to offer our substantiated assessment of the agreement reached at Paris (Appendix 2). Future efforts to conduct a large-scale survey on interpreting the outcomes agreed at Paris in late 2015 might be instructive.

The main finding from comparing the predictions with the actual outcomes is that the Average (collective) predictions of the Ex Ante Experts are significantly more accurate than the predictions of Individual experts. In other words, prior to the COP, individual experts tended to either under- or overestimate the ambitiousness of the outcomes that would be reached in Paris. However, on average their over-pessimistic and over-optimistic expectations cancelled each other out in the average predictions. This finding resonates with de Caricat's classic jury theorem (de Caricat, 1785/1994); loosely stated, the theorem proves that as the size of a jury increases from one to infinity, the likelihood that it will reach a correct verdict by collective majority vote approaches one. Similarly, public opinion researchers have found that public opinion at large appears to be better informed than individual voters, because errors of judgement made by individual voters cancel each other out in the process of aggregation (e.g., Page & Shapiro, 1992). The average predictions of the Ex Ante Experts also performed well in comparison to the predictions of the negotiation simulation models, but not significantly better. While experts' predictions are a relevant benchmark for comparison, they offer no theoretical insights into the processes through which negotiations took place.

By contrast, the Exchange Model and Predictioneer's Game give detailed accounts of the negotiation process based on cooperative and possibly coercive negotiation processes, and our model comparisons provide some insight into the negotiations that took place in Paris. We found evidence that the Inclusive Exchange Model (which posits that all issues can be combined with each other in profitable exchanges) performed somewhat worse than the Restrictive Exchange Model (which posits that exchanges take place only within substantively related subsets of issues). This

points into the direction that logrolling takes place, and it is limited to subsets of substantively related issues. This challenges the idea that the COPs are forums in which "thinking is joined up" (Schroeder & Lovell, 2012, p. 26), by suggesting that there are constraints to making such linkages. One of these constraints may lie in the structure of the negotiating teams, which given the complexity of the negotiations typically involve subgroups of officials working on different topics. These officials are often located in different ministries at the national level, such as foreign affairs, environment, and finance departments. Future research might examine the effects of such institutional constraints on both the ways in which delegations formulate their negotiating positions and the process of negotiations at the global level.

The limitations of the present study highlight opportunities for future research. The evidence did not enable us to make statistically significant distinctions between the accuracy of most of the predictions we assessed. It is noteworthy that the evidence from the negotiated outcomes is consistent with predictions from two quite different negotiation models: the Restrictive Exchange Model and the Predictioneer's Game. The former model offers a cooperative account based on limited logrolling across issues, while the latter offers a non-cooperative account in which issues are dealt with separately and actors may attempt to coerce others. Developing research designs to test the micro-level predictions of these models is still largely open ground for future research. Unlike the Ex Ante Experts, these models make not only predictions of the decision outcomes, but also of actors' behavior and perceptions during the negotiation process, including predictions of changes in the negotiating positions of each actor over time. Given the largely closed negotiations at Paris, systematic outside observation of relevant processes was not practically feasible, yet we hope that future research will overcome such limitations.

Future research should also consider more refined designs that depart from our simplifying assumption that countries and groups of countries are unitary actors. This simplification was arguably justified by the fact that these actors take partially coherent positions in the UNFCCC negotiations. However, some authors would have preferred a more disaggregated approach that tried to identify factions within countries as the relevant actors. Further, we focused squarely on governmental actors, agreeing with participants who observed that COPs are primarily intergovernmental affairs. However, the lobbying efforts of environmental and business interests are undoubtedly also worth to be explicitly included in the analyses. We recommend that future research in this area is explicitly comparative in design, which means that it makes comparisons involving different theoretical approaches, different COPs, and possibly also negotiations in other settings. A degree of quantification strengthens our ability to make such comparisons. This represents a radical departure from common research practice in this field, which as noted in a recent review by Genovese (2014) is dominated by qualitative case studies with some notable exceptions. The strength of qualitative case studies lies in the richness of the substantive knowledge they convey. By combining this strength with the comparative method and a degree of quantification, we will be able to generate cumulative knowledge about the conditions under which distinct negotiation processes are triggered and under which progress in international negotiations is achieved.

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Conflict of Interests

The authors declare no conflict of interests.

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Appendices

Appendix 1. Issue and issue scales.

1. Differentiation
What will be the main principle(s) for differentiating efforts?
0: No explicit differentiation (self-differentiation)
25: National circumstances
50: CBDR—Respective Capabilities in light of national circumstances
75: CBDR—Respective Capabilities (with no direct reference to the Convention's Annexes or Articles referring to those Annexes)
100: Annexes I and II of the Convention

2. Mitigation MRV and compliance
Regarding mitigation, what will be the minimum MRV and compliance provisions any country faces?
0: International Consultation and Analysis (ICA)
45: ICA plus multilateral consultative process
65: International Assessment and Review (IAR)
75: IAR plus committee on implementation and/or compliance
100: Kyoto compliance regime

3. Mitigation legal form
To what extent will the agreement and its components relating to mitigation targets be internationally legally binding?
0: No binding agreement or binding country-specific targets
30: Binding agreement without country-specific targets
50: Binding agreement plus obligation to have a (nonbinding) country-specific target (NDC)
70: The above plus obligation to do measuring, reporting and verification
100: Binding agreement plus binding, country-specific targets and obligation to do measuring, reporting and verification

4. Adaptation legal framework
Regarding adaptation, to what extent will targets be country-specific and internationally legally binding?
0: No new commitments on adaptation
40: Collective, non-binding provisions (e.g., "all parties are encouraged to integrate adaptation into their national plans")
80: Non-binding country-specific commitments
100: Legally binding country-specific commitments

5. Adaptation institutions
To what extent will the institutional framework for adaptation be strengthened?
0: No strengthening
60: Strengthen present institutions (e.g., stronger mandate, funding, and knowledge platform)
80: Establish new institutions stronger than present ones
100: Establish subsidiary body on adaptation

6. Climate Finance (Volume)
What will the size of agreed finance volume to be mobilized (private and public) by 2020 (per annum)?
0: No new target (i.e., $100b p.a.)
20: Unspecified increase above $100 billion
40: $ 200 billion
60: $ 300 billion
80: $ 400 billion
100: ≥ $500 billion or more

7.Climate Finance (Who Pays?)
Who will be requested to pay for climate finance?
0: Only developed countries required to contribute
20: Developed countries required to contribute, and other countries invited to contribute voluntarily
60: Developed countries and certain other countries required to contribute (e.g. "countries in a position to do so" or emerging economies)
80: All countries minus LDCs and SIDS required to contribute
100: All countries required to contribute

8. Adaptation reserved financing
Will there be new guidance on earmarking funds for adaptation?
0: No new guidance
50: Approximately 50% earmarked for adaptation
100: Dedicated levy for adaptation

9. Loss and Damage
To which degree will loss & damage (L&D) be included in the agreement?
0: No mention of L&D
10: Preambular reference only
20: Reference to Warsaw International Mechanism (WIM) (in the main text)
30: Separate chapter on L&D with little substance
40: Separate chapter on L&D and new institutional arrangements with little substance
50: Separate chapter on L&D and new institutional arrangements with new non-financial elements (such as coordination and capacity-building)
70: Separate chapter on L&D and new mechanism with new non-financial and financial elements (such as insurance) but no compensation regime
100: Separate chapter on L&D and new non-financial and financial elements, including a compensation regime

10. Ambition level – mitigation mechanism
Will there be a mechanism for strengthening commitments over time?
0: No ambition mechanism
30: "No backsliding" principle
40: Non-binding progression principle
65: Binding progression principle
100: Binding commitment to strengthen targets in line with the 2 degrees goal

11. Ambition 2050
What (if any) goal will be set for reducing emissions by 2050?
0: No 2050 goal
20: Qualitative goal
30: Qualitative goal with a roadmap
40: 40% reduction relative to 2010 (or a roughly equivalent reduction relative to another base year)
50: 50%
60: 60%
70: 70%
80: 80%
90: 90%
100: Goal of zero net emissions

12. Ambition 2100
What (if any) goal will be set for reducing emissions by 2100?
0: No 2100 goal
20: Qualitative goal
30: Qualitative goal with a roadmap
80: Goal of zero net emissions
100: Goal of negative net emissions

13. Ex-ante assessment (EAA) of future (I)NDCs
Will the agreement include provisions for ex-ante assessment (EEA) of INDCs in future contribution periods?
0: No EAA
20: EAA of aggregate ambition
60: EAA of aggregate ambition and technical EAA of individual INDCs (for transparency, clarity, comparability, etc.)
90: EAA of aggregate ambition and technical EAA of individual INDCs plus a political assessment of individual INDCs (for ambition and equity/fairness)
100: Alternative 4 and a formal mechanism for involving inputs from civil society

Note: We reprint the text as submitted to ex ante experts in September 2015 for the coding of the expected outcomes of UNFCCC COP-21 at Paris, France (Kallbekken & Sælen, 2015). Our Coding of the Main COP-21 Decision & Paris Agreement (Appendix 2) in early 2016 uses a backward looking perspective on identical scales.

Appendix 2. Our coding of the main COP-21 decision & Paris Agreement.

Issue	**Our Coding of COP-21 Decision & Paris Agreement**	**Textual Basis for Assessment**
Differentiation	50	Preamble; Art. 2.2, 4.3, 4.4, 4.19
Mitigation—MRV & Compliance	70	Art. 13 (in particular 13.4, 13.11, 13.12); Art. 15
Mitigation—Legal Form	70	Art. 4.2 (NDC); Art 13 (reporting and MRV)
Adaptation—Legal Framework	50	Art. 7.9
Adaptation—Institutions	50	Art. 7.7 (in particular b)
Climate Finance—Volume	20	Decision 115
Climate Finance—Who Pays?	20	Art. 9.1, 9.2
Adaptation Reserved Finance	40	Art. 9.4
Loss & Damage	30	Art. 8
Ambition Level—Mitigation Mechanism	65	Art. 4.3
Mitigation—2050	10	Art. 4.1
Mitigation—2100	80	Art. 4.1
Ex Ante Assessment of Future (I)NDCs	20	Decision 20, Art. 14

Source: FCCC/CP/2015/L.9/Rev.1 (http://unfccc.int/resource/docs/2015/cop21/eng/l09r01.pdf). See Appendix 1 for scaling.

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Article

The Paris Agreement: Consequences for the EU and Carbon Markets?

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Abstract
Most observers argue that this agreement is a step in the right direction. However, we do not know how effective it will be in terms of reducing emissions. We therefore discuss its potential effectiveness regarding EU climate policies and carbon markets. We argue that the Paris Agreement may have a positive effect but uncertainties abound.

Keywords
carbon markets; effectiveness, EU; leadership; Paris Agreement

Issue
This article is part of the issue "Climate Governance and the Paris Agreement", edited by Jon Hovi and Tora Skodvin (University of Oslo, Norway).

1. Introduction

The Paris Agreement attracted unprecedented media attention and was hailed by its creators as well as many observers as a watershed event, instrumental in contributing to a much-needed green global transition. Meeting in New York on April 22, the countries of the world demonstrated their overwhelming support for the Agreement—a strong signal of growing international commitment. It remains to be seen, however, whether these good intentions will translate into actual emissions reductions. Experiences from more than 25 years of UN climate diplomacy indicate that this is by no means self-evident: greenhouse gas (GHG) emissions today are more than 50% higher than when the UNFCCC was adopted in 1992 (Andresen, 2015). Will the Paris Agreement be able to break this trend?

That gives rise to the tricky question of how to measure the effects of international institutions—how and to what extent do they contribute to problem-solving effectiveness (Underdal, 2002)? Careful process-tracing is required, as behavior may be the result of various other factors than the regime in question. This methodological approach can be applied when analyzing the climate regime from its initiation until the present. But, with the ink hardly dry on the Paris Agreement (hereafter: PA), the best we can do now is to discuss its potential effectiveness.

Here we have chosen to discuss the potential effect on the EU and international carbon markets, with specific attention to the EU emissions trading system (EU ETS) as the biggest market so far. While the former case illustrates the impact on climate policy in general, the latter case shows how this plays out as to a specific policy-instrument. Our choice of the EU may be considered a "critical case", given its role as front-runner in the UN process. The PA can be expected to have effects on most states that had no previous emissions commitments. Will it also have effects on the most ambitious actor in the process, the EU? Regarding international carbon markets, the increased involvement and pressure on various business and industry actors have been hailed as major elements of the PA (Haas, 2015). Can we expect a further boost in carbon markets in its wake?

Potential effectiveness will depend on at least two conditions: a certain "distance" between PA requirements and the status quo; and influence through polit-

ical, legal, and administrative/bureaucratic pathways (Cortell & Davis, 1996). These pathways are by no means mutually exclusive and may very well co-exist. First, there is the *legal pathway* whereby international rules and procedures become incorporated in domestic law; this may affect the interactions between governmental and societal actors. Second, the *political pathway* directs attention to how government officials and societal actors can invoke international political declarations to further their own specific interests in domestic policy debates. Hence, international institutions or regimes may serve as "agents of internal realignments" (Levy, Young, & Zurn, 1995, p. 307). In essence, international institutions might affect the alignment of domestic groups endeavoring to influence a government's behavior. Consequently, institutions can heighten state concern by magnifying public pressure in reluctant states (Haas, Keohane, & Levy, 1993, p. 22). Similarly, governments may also be empowered to take action. The existence of international rules may be utilized for purposes of justifying own actions, or to question the legitimacy of the actions of others. In particular, governmental officials may cite international rules to legitimate unpopular decisions on stringent regulations. Finally, international institutional procedures may become enmeshed domestically through the standard operating procedures of bureaucratic agencies (Young, 1989, pp. 78-79). This third pathway—the "*bureaucratic/administrative*" pathway—indicates how international institutional procedures may affect domestic institutional procedures.

Key observers have given generally positive evaluations of the Paris Agreement, although they tend to underline different aspects. Bodansky (2015) stresses how the Agreement has injected new hope for the UN climate regime. Such increased legitimacy of the UN process may contribute to strengthen the legal pathway through rapid ratification. Haas (2015) argues that the PA represents a new political approach, one in which the focus of attention is private sector innovation and is subject to pressure from a constellation of other actors, including nongovernmental organizations (NGOs), social movements and the scientific community as well as the UN itself. If this rather optimistic scenario unfolds, it may contribute significantly to strengthening the political pathway. Victor (2015) strongly endorses the new hybrid architecture, arguing it will have a real impact on emissions, and that the PA will contribute to deeper commitments over time. However, he adds more detailed regulations are needed to secure an effective and dynamic review system that can serve to increase incentives for continued emissions reductions. van Assselt (2016) underlines the key role non-state actors may play in this regard. If this can be achieved, it will also help to strengthen the bureaucratic/administrative pathway by increasing non-state actors' access to decision-making.

2. The Paris Agreement: A Brief Evaluation

Prior to the adoption of the Paris Agreement, the main legal instrument was the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol with its two commitment periods. The UNFCCC represented a necessary start of the process through its framework approach. The Kyoto Protocol was an innovative instrument with novel characteristics, the flexible mechanisms. It also represented a step forward, with legally binding emission targets for the Annex 1 countries. At the time this made sense, as the countries of the Global North had main responsibility for creating the problem, and they were also the main emitters. However, since the Kyoto Protocol was adopted in 1997, emissions have been reduced in the North, while rising by some 160% in the South. Today, the industrialized countries with targets inscribed for the second commitment period account for only 15% of total global emissions (Andresen, 2015). For the UN climate regime to enhance its problem-solving effectiveness, the regulatory scope would have to be increased.

This was the background for radical new approach set forth in the 2009 Copenhagen Accord: a bottom–up approach based on a system of national pledges of non-binding character without legal enforcement. Pledges were to be made by all countries, in contrast to the binary approach of the Kyoto Protocol. The Paris Agreement builds on and specifies this new approach. Considering the strong similarities between these two instruments, Bodansky (2015) has introduced the term "Copenparis". Why was the former regarded as a fiasco, while Paris has been considered a success? Observers have pointed to the stark difference in process between the two events (see Haas, 2015; Victor, 2015). In Copenhagen, the Danish leadership was considered weak and even counterproductive. In contrast, the French leadership is seen to have facilitated agreement though clever diplomacy before and during the negotiations. This helped to create broad ownership to the process and to build trust among parties. Bodansky (2015) agrees this may have had some positive effect. However, he claims, other factors are more important in explaining why a "Copenhagen look-alike treaty" was adopted in Paris. First, the main elements of the Accord had in practice been codified in the COPs between Copenhagen and Paris, so most parties had gradually realized this would be the main architecture of the new treaty. In this regard Oberthur and Groen (2016) add that no main actor wanted to take the blame for failure and that the US as well as China and lesser climate powers were aligned towards the goal of reaching agreement. Secondly, key emerging countries had de facto accepted that in practice the Kyoto track was a dead issue —unlike in Copenhagen, where they still anticipated a continuation of the Kyoto Protocol. Finally, expectations were far more realistic in Paris. In Copenhagen many still hoped for an agreement with

strong legal bite. This was no longer the case. We can add a fourth reason: the vagueness of the Paris Agreement made it easy to accept. This is reflected by the fact that all major parties, from the USA to the Alliance of Small Island States (AOSIS), with widely different interests and preferences, embraced the PA as a success.

These factors explain why the Paris Agreement was widely accepted, but will this 'Copenhagen look-alike' set the world on a path to reduce emissions? That calls for a focus on aspects that set the Paris Agreement apart from the Copenhagen Accord. While the latter was a soft political document, the former is a treaty in the meaning of the Vienna Convention on the Law of Treaties. Legal treaties can be expected to have more significance for the behavior of their members than soft political documents, although this is a complex question (Skjærseth, Schram Stokke, & Wettestad, 2006). However, the practical significance of the PA's legal force should not be exaggerated. For example the US administration firmly opposed being bound to the achievement of its declared target. Still, the PA is a treaty under international law and we argue that it is an advantage that the Paris Agreement is a legal treaty.

While the Copenhagen Accord had entailed an almost pure "bottom–up" approach, in Paris agreement was reached on a more hybrid architecture. The parties are required to provide information about their pledges to track progress as regards implementation. Of particular importance is that the parties are taking on Nationally Determined Contributions (NDCs) when they ratify the PA. Furthermore it establishes a regular five-yearly "stock-take" to be provided every five years from 2023 to be progressively more ambitious over time. This dynamic and transparent element is promising, but is also vulnerable, as much depends on the will and ability of countries to deliver on their pledges. Also, a soft (top–down) approach has been chosen, as the PA has weak compliance mechanisms and no sanctions. That makes it weaker than the Kyoto Protocol, but was probably necessary to get key actors on board.

While the PA copies the Copenhagen goal of not exceeding a temperature increase of 2°C, it also adds the aspirational 1.5 °C target. As a point of departure, an ambitious goal is preferable to no goals or a goal than can be very easily reached. Ideally it may help members to the agreement to stretch further than they would otherwise do. However, it is important to have a match between the goal and the institutional underpinning necessary to reach the goal adopted. Judging from the pledges made so far, neither of these goals will be attained, so the Parties will have to expand their ambitions considerably in the future if the Paris Agreement is to live up to expectations.

3. The EU: Before, in and after Paris

Before Paris: Since the 1990s, the EU has aimed at showing leadership by example in the international climate regime. The credibility of this ambition has been strengthened by adding increasingly more ambitious targets and policies and actual results on the ground. In 2007 and 2008, the EU leaders agreed on climate and related energy targets and binding policies for 2020, including cutting GHG emissions by 20 *percent* by 2020 compared to 1990 levels. Targets and policies for 2020 spurred the first step towards a long-term strategy when, in 2009, the EU leaders agreed to support an EU goal of reducing GHG emissions between 80% and 95% by 2050 against 1990 levels (European Council, 2009).

The European Commission used the 2009 "decarbonizing" by 2050 agreement as a foundation for stepping up long-term climate strategies. In 2011, it issued a roadmap for moving towards a competitive low-carbon economy by 2050, showing that GHG emissions would have to be reduced by 40% by 2030 and 60% by 2040, compared to 1990 levels (European Commission, 2011). In October 2014, the 28 EU leaders apparently delivered on the low-carbon strategy by adopting a climate and energy policy framework for 2030, including a new goal of domestic GHG reductions of at least 40% compared to 1990 (European Council, 2014). They also agreed to "revert to" the issue after the Paris Conference, indicating that the EU targets might be adjusted in light of the outcome. By 2015, total EU GHG emissions were already 23% below 1990 levels—which also reflected various factors not directly related to climate policy, such as the activity-dampening effects of the economic crisis.

Climate policies and achievements underpinned the leadership-by-example ambition when the EU prepared for the Paris Conference. The 40% by 2030 target served as the EU's proposed NDC for the upcoming Paris meeting. In September 2015, EU ministers adopted the EU's negotiating mandate that also included preferences for an ambitious, transparent, dynamic, and legally binding agreement (including the NDCs) based on science. For the EU, "science" means the 2007 fourth assessment report of the IPCC, which indicates that developed countries should reduce emissions by 80–95% by 2050 to limit global warming to 2°C. For poor countries, financial support should be stepped up.

While EU climate ambitions may appear impressive, they mask significant political tension and differing interests within the EU. Poland and a group of Central and Eastern European countries dependent on domestically produced coal do not favor the EU's long-term climate ambitions. More concerned with energy security, they have been playing along for the time being as a result of political pressure, derogations, and financial support. Another line of diverging interests goes between the energy-intensive industries that argue for a level playing field between the EU and major competitors, and the electric power industry shielded from

competition outside Europe (Skjærseth, Eikeland, Gulbranden, & Jevnaker, 2016). It has also been argued that the EU's climate strategy does not add up to the EU's 2050 target (Dimantchev & Schjølset, 2016), but relies on uncertain technological improvements and the progressive up-scaling of efforts after 2030.

In Paris: Internal political tensions represented a real risk of EU division during the Paris Conference. Poland had vetoed the 2050 strategy and opposed the EU's negotiating mandate for COP21, but became isolated after being granted concessions regarding some changes in wording that made no substantial difference (EurActive, 2015). Poland's new, climate-skeptical conservative government initially also threatened to torpedo COP21, but changed its stance conditional on an outcome that would protect the interests of the Polish economy (Politico, 2015). That meant protection of coal—nearly 90% of Poland's electricity is produced by mainly indigenous coal that feeds 53 coal-fired plants, with a dozen new ones expected to come online before 2020 (Skjærseth, 2014). Despite initial opposition, the EU managed to maintain considerable political unity throughout the Paris Conference, helping to build a "high-ambition coalition" that proved instrumental in achieving a dynamic agreement with all big emitters on board. Poland was pleased when references to "phasing out of fossil fuel subsidies" were deleted from the PA text (CAN Europe, 2015). The Paris Agreement became more ambitious than the EU position with its aspirational goal of limiting the temperature increase to 1.5°C. The dynamic element was, as noted, adopted with the addition of a "global stocktaking" every five years from 2023 to consider progress in emissions reductions. The NDCs were not made binding, but the parties are legally obliged to pursue measures for meeting their contributions.

After Paris: The 1.5 °C aspirational goal created a "distance" between the PA outcome and EU targets, policies, and position, which are based on the 2.0 °C goal. This gap provides the PA with the *potential* to affect EU climate policy. Politically, the EU institutions responded immediately and enthusiastically to the Paris outcome. European Commission President Juncker described the deal as "robust" and as a success for the EU. EU Climate and Energy Commissioner Cañete followed up by praising the EU efforts to build a high-ambition alliance, characterizing the deal as a major win for Europe (European Commission, 2015a). The European Parliament delegation to COP21 called it an "unprecedented breakthrough in the fight against climate change" and emphasized the need to follow up the 1.5 °C goal by concrete policies (European Parliament, 2015). Non-state actors with varying climate-policy interests were supportive as well. BusinessEurope, with national business federation members across Europe, described the deal as a "major step forward," but voiced concern that the agreement did not solve the issue of competitiveness for European industries in highly competitive global markets (BusinessEurope, 2016). The electric power industry, represented by EURELECTRIC, firmly welcomed the outcome, describing the deal as a "major landmark" (Eurelectric, 2015). The European oil industry, and one of the least climate-enthusiastic energy-intensive industries—steel—welcomed the deal as well, but stressed the need for a strategy to provide a competitive level playing field and protect Europe's industries from carbon leakage (Eurofer, 2015; FuelsEurope, 2015). In their response, Europe's largest green NGO coalition on climate and energy issues—Climate Action Network—listed the goods and not-so-goods, including the 1.5 °C target and the lack of binding country contributions, respectively (CAN Europe, 2015).

The EU would "revert to" the 2030 framework after Paris. The positive responses to the dynamic long-term PA were used by "green" groups to argue for tighter EU targets and policies. In March 2016, the Commission responded formally with its Communication "The Road from Paris" (European Commission, 2016). The key message disappointed the green groups—the 2020 and 2030 targets were to remain unchanged. The EU would participate in the first global stocktaking in 2023 and would consider more ambitious action beyond 2030. Priority number one in following up the PA would be to adopt binding policies on climate change (inclusion of Land Use, Land Use Change and Forestry, revision of the EU Emissions Trading System and emission reduction in the non-trading sectors), renewables and energy efficiency—policies planned before the PA to fill the 2030 framework with specific legislation. Further, the policy implications of the 1.5 °C goal must be addressed, and the EU would provide input to a special IPCC report on this issue in 2018.

The member states discussed the Communication at their Environment Council meeting the same month. The Communication was broadly welcomed, although some ministers advocated higher ambitions (Environment Council, 2016). Many ministers highlighted the need to maintain the Paris momentum for adopting new 2030 policies and implementation. The subsequent EU leaders' meeting became overshadowed by the migration crisis, but there was broad support for the Commission's Communication (European Council, 2016). In summary, the main political impact of the PA thus far seems to be to justify EU climate policy and to legitimize the positions of the "frontrunners." This will help to delegitimize opposition and make it more difficult for countries like Poland to question EU climate policy.

As regards the legal aspects, the EU has signed the PA, and intends to ratify the treaty "as soon as possible" (European Commission, 2016, p. 4; European Council, 2016). Combined with the legally binding obligation to pursue domestic measures, ratification of the PA will probably put pressure on "laggards" for swift adoption

of binding policies to deliver on the 2030 target. To ensure legitimacy, EU climate policies will need broad support, beyond qualified majority. The EU leaders have agreed to provide strategic orientation with respect to consensus on the ETS and non-ETS (European Council, 2014). The main bureaucratic/administrative effect of the PA is likely to be its dynamic nature and global stocktaking mechanism. Although this mechanism was strongly favored by the EU, it will keep discussions warm concerning the match between current and planned policies and the EU's 2050 "decarbonization" target.

In conclusion, no EU political actor thus far has used the PA to argue for lower levels of ambition: indeed, the EU institutions, member states, industries, and the green movement have all argued for keeping or raising the level of short- and long-term ambitions. The 1.5 °C goal and the dynamic nature of the PA will trigger a follow-up process that may lead to higher ambitions beyond 2030, particularly since uncertainty prevails on whether EU targets and policies add up to the EU's 2050 goal. The combination of political, legal, and bureaucratic/administrative consequences of the PA will increase the pressure on "laggards" within the EU to deliver on and support the 40% reduction target by 2030 and beyond. Carbon capture and storage (CCS), a key political solution for coal-based member states like Poland and a technological precondition for "decarbonization", has failed across Europe, so the EU will need the PA to legitimate future unpopular decisions on stringent regulation (Skjærseth et al., 2016). The PA may contribute to keep climate at the agenda when the EU is dealing with a number of (other) internal and external crisis. However, it is far too early to pronounce on the actual longer-term impact of the Paris Agreement on the EU.

4. Paris and Carbon Markets: Positive Implications—But Help for a Struggling EU ETS?

The EU ETS is the world's largest carbon market to date, and has been in place for more than a decade. However, it has struggled with a carbon price that has been both volatile and too low to provide forceful incentives to a low-carbon transformation. 2015 saw the adoption of important structural reform of the EU ETS *and* of a global climate agreement. Thus, the scene was set for a positive development of carbon trading in general and within the EU in particular. Nevertheless, the European carbon price has since dropped. Although additional tightening of the EU ETS has been suggested, this now seems to be a long shot. Having fought heavily to get the structural reform adopted last year (Wettestad & Jevnaker, 2016), the interest in reopening that can of worms is low.

Moreover, after years of weak economic growth, the EU has not been willing to strengthen its overall climate targets in light of the PA, including the 1.5 °C ambition (see previous section). Despite the advent of a global climate agreement, the EU still regards carbon leakage a major issue. Shielding EU industries from climate policy in order to preserve their global competitiveness remains important, indicating a "wait and see" attitude towards the bottom-up regime put in place by the PA. How could this be? In this section, we explore the interaction between the EU ETS reform process and the global climate regime along the legal, political and the administrative/bureaucratic pathways.

The Paris Agreement includes elements of relevance for carbon markets, as well as a review process that is intended to strengthen regional and domestic climate policy. The Paris meeting was not expected to give anything to carbon markets, but the implicit and explicit reference to elements associated with carbon markets gave rise to optimistic assessments as to the future of carbon trading. The term "market" was deemed too controversial to be mentioned explicitly in the Agreement itself (except when referring to non-market approaches), although the term "carbon pricing" appears in relation to non-party stakeholders in a COP decision accompanying the agreement, where it is referred to as a tool for incentivizing emission reduction along with domestic policies. Nevertheless, language *relevant* to the development of carbon markets was included in the Paris Agreement. Here, cooperation among countries in achieving their national climate policies (NDCs) was acknowledged: countries could cooperate on implementation by trading "internationally transferred mitigation outcomes" (ITMOs, Art. 6.2). Moreover, a mechanism for sustainable development would be set up (Art. 6.4), building on previous global offsetting mechanisms (Clean Development Mechanism and Joint Implementation), with the specific design to be decided at subsequent meetings. Beyond this, the PA included provisions for periodical review of national climate policies that were to be at least as ambitious as the previous version.

What, then, will the PA entail for the subsequent development of carbon markets? In the following we will concentrate on its impact on the EU ETS, but let us first note a few points as to carbon markets more generally. This includes both the emergence of carbon markets individually and "collectively", i.e. the processes of linking them. The legal pathway is weak as to effects on individual carbon markets, although the PA offers language referring to carbon markets. There is nothing in the PA that requires countries to adopt and implement legislation for a carbon market. Thus, carbon markets will probably continue to emerge in fragmented and piecemeal ways, as in the past. However, the turn to emissions trading in China, today the world's biggest emitter, is important, and could accelerate ETS adoption rates globally. China has already launched plans for a national ETS. Moreover, many countries' INDCs included plans for carbon trading. Together these two factors related to the legal pathway

from the PA—being voluntary and bottom-up rather than top-down and binding—could see enhanced co-operation on this climate policy instrument.

Additional support could come from a follow-up process from the PA on providing common guidance on carbon accounting rules. This is essential for the basic trust of data, and thus for linking processes to work. Although linking could offer cost-efficient emission reduction, there is no 1-to-1 relationship between functionality and linking. In the past, prior cooperation between regions, countries, or sub-national entities has been important for linking emissions trading schemes, and differences in the design of carbon markets can pose challenges unless there is clear political will to make adjustments (Jevnaker & Wettestad, 2016). The legal pathway might also be activated where the PA is used by actors at the domestic or transnational arena in order to push for (more) ambitious caps and well-functioning price management mechanisms. Finally, this might coincide with the administrative/bureaucratic pathway, as the five-year cycle of reviews offers opportunities for actors to utilize this window of opportunity for placing carbon-market issues on the political agenda.

Turning to the EU carbon market, the PA was welcomed by proponents of a stronger EU ETS. Earlier the same year, the EU had finally agreed on a structural reform of its ETS in order to deal with a structural surplus that threatened to undermine the system as well as long-term climate targets. From 2019 onwards, a "market stability reserve" (MSR) would regulate supply by automatically withdrawing or releasing allowances should the total amount of allowances in circulation cross upper or lower thresholds. The road towards reform had been paved with daggers, first with controversy as to whether or not to intervene in the carbon market at all, and then on how to intervene.

It took a heavy load to turn this around: The German election in 2013 resulted in a new coalition government accompanied by structural changes to the energy and environmental ministries. This moved Germany from being reluctant to supportive of carbon market reform. Moreover, bargaining deals in the (European) Council and in the European Parliament were enabled in part because proposals were recalibrated to make them politically feasible, and in part due to concessions given to Central and Eastern member-states, but also due to the display of power, with West European member states overruling Poland and some other CEECs, through majority voting in the final MSR rounds. More generally, the reform process was facilitated by European Council conclusions on the 2030 climate and energy policy, in preparation for the Paris climate summit (Wettestad & Jevnaker, 2016).

As regards the international dimension, EU interest in exercising international climate leadership had pushed EU–internal policy development ahead of the international climate summit in Copenhagen in 2009 (Boasson & Wettestad, 2013). However, this seemed to figure less prominently—and certainly in different manner—prior to Paris. Worried about meager economic development after the financial crisis, with parts of Southern Europe still struggling, the EU was particularly concerned with economic competitiveness and vulnerability, making it more inward-looking. The low hopes of achieving a binding climate agreement in Paris meant that the pull from the external context in the form of global climate negotiations was clearly less than in 2008, although it was not entirely absent (Wettestad & Jevnaker, 2016).

Most observers expected that the adoption of the MSR would mark a turning point for an ETS in headwind since 2010. After meagre outlooks for the ETS price for several years, the carbon price now started climbing, slowly. More importantly, long-term expectations to the carbon price seemed likely to offer incentives to changes in behavior (fuel-switching) with anticipated levels of around €30–40 by 2030 (for an overview of the response to the MSR, see Wettestad & Jevnaker, 2016). As mentioned above, the PA was seen as offering further support. Nevertheless, 2016 saw the return of a gloomy outlook. The carbon price dropped from just above €8 euro to €5–6, settling at around €5. Price estimates for 2030 also dropped significantly. Reacting to the low price, in March 2016 France proposed introducing a price corridor to the ETS, whereby allowances would be placed in the MSR if the price proved to be too low, and released if too high. This was designed to avoid the spread of national measures like the UK carbon-price floor. The Environment Ministry in the key ETS country Germany responded by stating that it was open to discussion of further reform options, but that, rather than a price-based regulation (as proposed by France), it preferred to keep the quantitative-based approach. Other tightening options, such as abolishing allowance banking between phases and a further tightening of the MSR parameters, have been put forward (see Carbon Pulse, 2016).

Thus, in the aftermath of PA, there were calls for increasing ambitiousness of both the overall EU climate target as well at the level of a cornerstone climate policy instrument. The former was related to the PA (and was rejected, see previous section), while the latter came as a response to a price drop. A possible strategy would be to attach such efforts to ongoing ETS reform discussions that were launched in mid-2015 following the adoption of the MSR (European Commission, 2015b). Up until mid-2016 (a decision is expected in early 2017), the debate among policymakers and stakeholders had centered on carbon leakage and support for low-carbon R&D—aspects related to the cap had already been decided in practice by the European Council in October 2014 (Wettestad & Jevnaker, 2016). Thus, the ongoing ETS discussions seemed to proceed unaffected by the PA. Instead, actors jumped on the

price drop to justify further tightening of the system. However, the timing is complicated, as the EU has just concluded a heated and complicated process that ended in the adoption of the MSR. Central Commission officials including Climate and Energy Commissioner Cañete, have signaled disapproval of new tightening measures before the MSR has started to work. Moreover, the interest in shielding and supporting European businesses has remained in place and weigh heavy in current discussions, seemingly unaffected by the advent of a global climate agreement. Thus, neither the legal nor the political pathway have turned out to be important so far, as is the case for the bureaucratic/administrative pathway: follow-up procedures from the PA have not been connected to the ongoing discussion of ETS reform, which is likely to have been concluded by the time that the EU starts preparing for the review.

Could the PA become more important for ETS reform in the future? Without mandatory implementation of a given instrument, the legal pathway seems less relevant for this particular process. As to the bureaucratic/administrative pathway, entering the PA review cycle might affect future ETS discussions, and the MSR review in 2023 could follow up on PA deliverables due the same year. This is related to the political pathway, which for the interaction between the PA and the EU ETS appears most interesting, although requires support from actors within all three EU institutions. Moreover, in light of the diverging views of climate policy in general among member-states (Poland being partly compensated, partly overrun by Germany in the MSR process), strategic use of the PA to garner support for ETS reform across the board might be counter-productive, especially before having concrete evidence of comparable climate efforts emerging outside the EU. As such, successful Chinese carbon trading might trigger an interesting dynamic also inside the EU. As things stand now, however, the case of the EU ETS shows that it will be challenging to use the PA in internal processes and that hopes in this regard should be realistic and moderate.

5. Concluding Comments

Most observers agree that the PA is a step in the right direction in the process towards a new approach for dealing with the challenge of climate change, but the overall significance of this agreement in a problem-solving perspective is unknown. We have therefore focused on the *potential* impact of the PA—on the EU and carbon markets. We concluded that the dynamic structure of the agreement may trigger a follow-up process in the EU that could lead to greater ambitions beyond 2030. The combined impact through the political, legal and bureaucratic/administrative pathways connecting the PA to the EU may also increase pressure on laggards within the EU. The agreement did not create a new global trading regime but it could create some momentum for actors favoring this instrument. Regarding the EU ETS, the world's largest carbon market, the political pathway is of greatest interest for the prospects of further tightening of the system and boosting the carbon price. Still, it will be challenging to use the PA in these internal processes and hopes in this regard should therefore be modest.

However important EU climate polices and carbon markets are for future international climate policies, the main challenges are elsewhere, primarily in developing countries. As these countries have previously had no "hard" commitments we believe the PA is an important step in bringing these countries on board. Equally important, the Paris Agreement contributed to restore the reputation of the UN as a major instrument in bringing this process forward. Still, it is important to realize that this avenue is one among many in the increasingly complex nature of the overall climate regime. However, the PA is important in this broader context as it focuses strongly on the importance of including non-state actors, not the least business and industry, into the process. In order to realize the high ambitions of the Paris Agreement non-state actors as well as states have to demonstrate a political will to deal with the problem that has so far been absent. Whether this can be realized remains to be seen, but with the global framework in place the ball is squarely passed back to them.

Conflict of Interests

The authors declare no conflict of interests.

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Article

From Paris to the End of Oil

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Abstract
This article discusses the possibilities and obstacles for a cost-effective implementation of policies that will lead to a significant reduction in global CO2 emissions from the use of oil. The structural conditions and economic consequences of changing national or regional energy systems vary dramatically. In addition, there are a large number of actors with strong interests along the energy value chain that may potentially halt, delay or alter the implementation of the Paris treaty. We analyze these issues by first locating oil in the overall energy system, then identifying possibilities and obstacles at various stages of the oil value chain, and finally by contextualizing global oil by discussing whether and how it may be affected by geopolitics and regional conflict. In brief, our argument is that developments in consumption volumes and patterns will be most important. Market forces are vital, but they are influenced by politics and public policy outcomes. Transportation is the most important sector for oil consumption, with changes in transport behavior, modes and technology being vital drivers. The behavior of investors will be a decisive factor in shaping the production side of the oil system. If investments go down as a response to lasting low oil prices and/or because investors decide to turn to green economy options, the supply of oil will logically shrink. On the other hand, the growth and development aspirations of a rapidly growing population in developing countries are likely to stimulate demand and thus increase exploration, production and subsequently the price. Finally, we emphasize the importance of (geo)politics influencing all aspects of the value chain of oil.

Keywords
climate change; energy system; oil market; Paris treaty

Issue
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1. Introduction

The Paris treaty is an impressive achievement in international diplomacy. Before the conference, a deal along the lines of the outcome would have been regarded as impossible by most analysts. A total of 195 countries signed the Paris treaty, and most of them will ratify it. As other contributors to this volume demonstrate, the treaty is not just based on voluntarism. However, the willingness of signatories and their capacity to implement the treaty vary. Still, Paris will affect policy-making processes, both directly and indirectly: directly in terms of putting pressure on governments to honor promises of climate warming abatement action and indirectly in the sense that the general public will be more inclined to accept changes in energy usage.

At the same time, the structural conditions and economic consequences of changing national or regional energy systems vary dramatically. There are a large number of actors with strong interests and the capacity to exercise both economic and political power along the energy value chain. They may potentially halt, delay or alter the implementation of the Paris treaty. We analyze these issues by first locating oil in the overall energy sys-

tem, then identifying the possibilities and obstacles at various stages of the oil value chain, and finally contextualizing global oil by discussing whether and how it may be affected by geopolitics and regional conflict.

Our argument in brief is that developments in consumption volumes and patterns will be most important. Market forces are vital, but they are influenced by power, politics and public policy outcomes. Transportation is the most important sector for oil consumption; changes in transport behavior, modes and technology will therefore be vital drivers. The behavior of investors will be a decisive factor in shaping the production side of the oil system. If investments go down as a response to lasting low oil prices, and/or because investors decide to turn to green economy options, then the supply of oil will logically shrink. On the other hand, the growth and development aspirations of a rapidly growing population in developing countries are likely to stimulate demand, and thus increase exploration, production and subsequently the price. Finally, we emphasize the importance of (geo)politics that are influencing all aspects of the value chain of oil.

2. Oil as Part of the Global Energy System

The target set by the Paris Agreement, to keep the increase in the average global temperature well below 2 °C above pre-industrial levels, is demanding. If the target is to be met, radical changes in the global energy system are required. Moreover, key actors also have to change their policy with regard to both adaptation and mitigation measures.

In order to evaluate the impact of the Paris Agreement on energy sectors, it is important to acknowledge some fundamental features of that system. One such feature is that energy sources are not equivalent in all respects, nor are their users. Put simply, the idea is that we have some primary energy sources that we want to turn into various energy services, such as the heating of rooms and water, the cooking of food and the cooling of beer, locomotion, or lighting. In addition, some primary energy sources are used as input factors in industrial production. This goes particularly for oil, which is a key factor in the production of several thousand consumer products. Between the primary energy sources and the energy services, we find what is usually called secondary energy. In the case of oil, these are the various refined petroleum products, such as gasoline, diesel and jet fuel. Electricity is another kind of secondary energy that is particularly flexible, since it can be produced from several of the primary sources and used for most of the energy services. The primary energy sources are usually categorized as fossil fuels (crude oil, natural gas and coal), nuclear fuels (uranium and possibly thorium) or renewable energy (water, sun, wind, tide, biomass and geothermal energy).

The distribution of world consumption of primary energy in 2013 is shown in Table 1. However, the distribution of primary energy does not necessarily reflect the importance of the various primary sources in the end use, or in energy service provision, since the energy efficiency and losses of the different primary sources varies with the different technologies for transferring the primary source into the various energy services.

Table 1 also includes the scenarios of the International Energy Agency (IEA). These are not to be taken as predictions, but rather as descriptions of possible future developments. In the *Current Policies* scenario, only policies for which implementing measures are formally adopted are included. In the *New Policies* scenario, relative intentions announced are also included. This is the central scenario of the IEA. The *450 Scenario* attempts to capture the necessary measures in order to limit the rise in global temperature to two degrees Celsius (IEA, 2015, pp. 34-35).

Technological innovations are essential drivers for increased efficiency and reduced losses in the whole value chain. Technological revolutions do occur, but they are hard to foresee and thus not included in any of the IEA scenarios in Table 1. In the transportation sector, there is ongoing research regarding both the vehicles and engines, and the use of various new fuels, such as hydrogen. More incremental technology-improving processes have been taking place for a long

Table 1. World primary energy consumption in 2013 and IEA scenarios in million tons of oil equivalents (mtoe). Source: IEA (2015, p. 57).

		Current Policies	New Policies	450 Scenario
Year	**2013**	**2040**	**2040**	**2040**
Coal	3,929	5,618	4,414	2,495
Oil	4,219	5,348	4,735	3,351
Gas	2,901	4,610	4,239	3,335
Nuclear	646	1,036	1,201	1,627
Hydro	326	507	531	588
Bioenergy	1,376	1,830	1,878	2,331
Other renewables	161	693	937	1,470
Total	**13,558**	**19,642**	**17,935**	**15,197**
Fossil fuel share	**81%**	**79%**	**75%**	**60%**

time, e.g. with the combustion engine (Jacobs, 2015).

The importance of the different primary energy sources in the various consumption sectors differs from country to country. Although oil constitutes approximately one-third of primary energy consumption, it is not used in all end-user sectors. Table 2 illustrates the variation in primary energy consumption for the US, China, India and the EU. These four constitute 56% of total world energy consumption.

The fossil fuel share is more than 70% in all four countries, although the fossil mix is different, with China having two-thirds of its energy consumption met by coal, compared to the US and the EU, where this share is less than one-fifth. These four actors will be quite decisive if the Paris goal of "well below 2 °C" is to be achieved. Their Indicated Nationally Determined Contributions (INDCs) vary considerably, with the EU's binding target of an at least 40% domestic reduction of greenhouse gas emissions by 2030 compared to 1990 being by far the most ambitious. China aims to achieve the peaking of carbon dioxide emissions by around 2030, and to increase the share of non-fossil fuels in primary energy consumption to approximately 20% (versus 12% in 2013). The US' commitment is a 17% reduction by 2020 (from the 2005 level of emissions) and to explore possible accelerated reductions further on, whereas India has committed itself to a 20–25% reduction over the same period. These policy positions combined are not going to result in implementing the "well below 2 °C" target. The procedure of setting more ambitious targets every five years, and developing a transparent and accountable system to follow up Paris and the five-year revisions, is therefore crucial.

3. Oil Consumption by Sector

Figure 1 shows the distribution of global oil consumption by end-use sectors in 2014 and the IEA's central scenario for 2040. According to the so-called *New Policies* scenario, three-fourths of oil consumption in 2040 will be used for transportation and petrochemicals. Hence, our discussion will focus on some of the possibilities and obstacles for change in these two sectors.

Table 2. Primary energy consumption in 2013 (mtoe and percentage). Source: IEA (2015, annex).

	US		EU		China		India	
	mtoe	**%**	**mtoe**	**%**	**mtoe**	**%**	**mtoe**	**%**
Coal	432	19.8	286	17.6	2,053	67.6	341	44.0
Oil	782	35.8	513	31.6	483	15.9	176	22.7
Gas	610	27.9	387	23.8	142	4.7	45	5.8
Nuclear	214	9.8	229	14.1	29	1.0	9	1.2
Hydro	23	1.1	32	2.0	78	2.6	12	1.5
Bioenergy	97	4.4	140	8.6	216	7.1	188	24.3
Other Renewables	26	1.2	37	2.3	37	1.2	4	0.5
Total	2,184	100.0	1,624	100.0	3,038	100.0	775	100.0
Share of world total		16.1		12.0		22.4		5.7

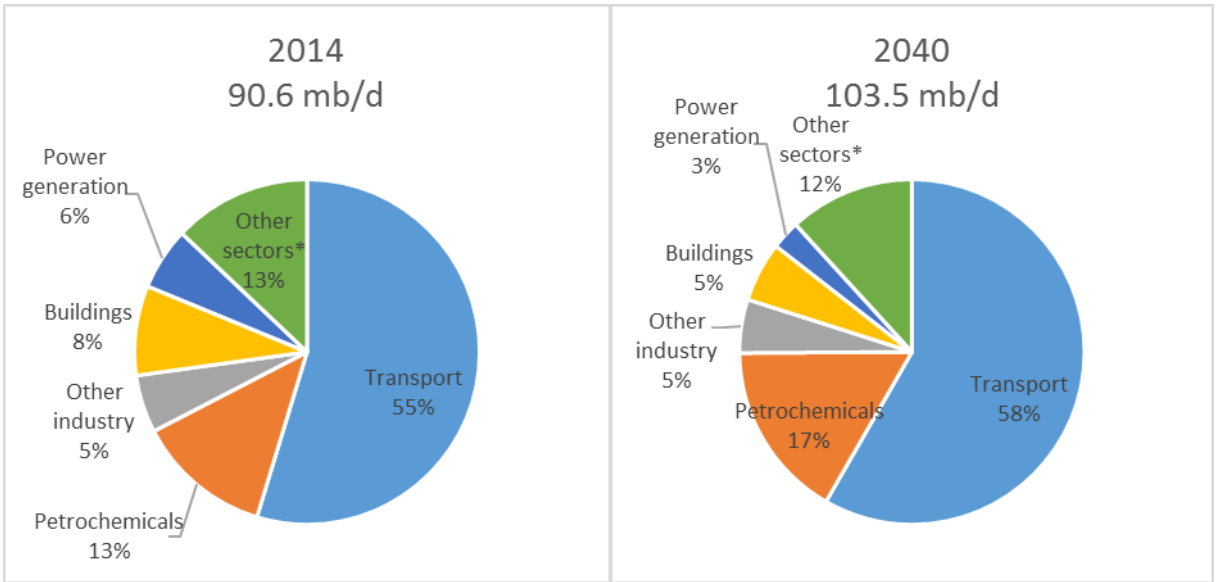

Figure 1. Global oil consumption by sector, 2014 and 2040 (*New Policies* scenario), million barrels per day. Source: IEA (2015, p. 121). Note: * Includes agriculture, transformation and other non-energy use (primarily bitumen and lubricants).

One obvious option is to disconnect emissions from use, in other words to capture the carbon before being released into the atmosphere (Carbon Capture and Storage—CCS). Although this can be important for industrial oil use, applying CCS technology to mobile emission sources seems unrealistic today. The attention of CCS has been more prominent in power generation than in the industry sector, due to the fact that reducing power generation from coal and natural gas could be one of the most important ways of reaching global emission targets, while the oil-based industry is less prominent. Oil has almost been phased out as a source for power generation (cf. Figure 1). Thus, CCS in power generation will in itself hardly affect the global oil market. However, successful CCS in power generation could even influence the industrial sector, and therefore also the oil market. Thus far, the costs of CCS have prohibited large-scale introduction in both power generation and the industrial sector.

A second option, both in transport and industry, is to improve the efficiency of installations, production plants and vehicle engines. As mentioned above, oil is part of the production of goods used in the industry sectors itself, in building materials and in thousands of consumer products. These many products are made by the application of a number of different technologies and production processes. It follows that "a piecewise approach to reducing emissions is required, which is challenging to monitor, incentivize and control" (Brown, Gambhir, Florin, & Fennel, 2012, p. 1). Furthermore, the current industrial technological standard varies immensely across countries and regions. As a result, technology transfer will both increase efficiency and reduce emissions. Nonetheless, improved energy efficiency can have unintended consequences regarding consumption. If buying a more fuel-efficient car leads to increased driving, the positive effect on emissions is reduced (Sorrell, 2007). This is further complicated in the transportation sector, since there is no linear relationship between high income and reduced emission. With a high income, two effects follow: a larger car, with a more gasoline consuming engine, and more cars in the same household. These effects can nullify the effect of technological improvements in the car engines themselves.

A third possible strategy is to switch from fossil fuels to renewables. In the *industrial sector,* this will be a matter of costs and profit margins. In most cases, changing fuel in existing industrial plants seems to be prohibitively costly, at least without government subsidies. Building new plants with non-fossil input will depend on investments in new technology, but without any subsidies such investments will have to pay off in companies' balance sheets within a reasonable time frame. In the *transport sector,* there are major challenges to accomplish a total fuel switch. The most readily available alternative at the end-user stage is to switch from a fossil fuel car to an electric car. The US National Academy of Sciences discusses this issue in a large-scale report entitled, *Hidden Costs of Energy*. They balance the externalities of a reduction in urban emissions, safety issues and the environmental aspects related to battery recycling and disposal. They find that the positive impact of fuel switching in the consumption stage of the value chain depends on the type of primary energy fed into the electricity production. If coal is used to generate the electricity used in electric vehicles, the emission reduction from replacing the internal combustion engine with the electric engine is reduced and possibly lost, also if considering the efficiency gains in the engine: "when the damages attributable to other parts of the life cycle were included, especially the emissions from the feedstock and the fuel (emissions from electricity production), the aggregate damages for the grid-dependent and all-electric vehicles became comparable to, or somewhat higher than, those from gasoline" (NAS, 2013, p. 202). The net benefit of the electric car is a highly controversial issue, and solving it is far beyond the scope of this article.

Finally, the underlying trends in demand will also influence the possibility of reducing overall global oil consumption. For the industry sector, the IEA finds that, "Despite the growth in total demand, the oil intensity of GDP (i.e. the amount of oil used per unit of economic value) continues to decline….The industry sector, the second-largest contributor to global GDP and the second-largest oil consumer (when including petrochemical feed stocks), uses 30% less oil per unit of value added [than one and a half decade ago]." This effect is slower in the industry sector than in the service sectors because "soaring demand for plastic products in developing economies more than offset further improvements and saturation effects in the industrialized countries" (IEA, 2015, p 120). In the *transportation sector,* a number of factors will influence the future demand for the various fuels. Although the average fuel consumption, and thus emissions, of new passenger cars is likely to continue to fall, consumer choices may offset the effect on total emissions as the number of cars increases (cf. Figure 2). Also note that in 2005 the number of new cars sold in China was 33% of the number sold in the US, and that by 2015 the same ratio had increased to 140%. The number of vehicles in use in 2014 was 808 per 1,000 inhabitants in the US, 569 in the EU, 102 in China and only 22 per 1,000 inhabitants in India (OICA, 2015). From 2013 to 2014, the share of electric vehicles grew from 1.3% to 1.5% in the US, and from 0.1% to 0.3% in China. We predict that the car industry will move strongly into non-fossil car production over the coming decades, and that both electricity and hydrogen will represent competitive alternatives to fossil fuel cars.

The hardest obstacle to achieving a reduced global consumption of fossil fuels is the fact that for several decades many hundreds of millions of people will in-

crease their energy consumption. Table 1 suggests an increase in the use of all types of primary energy sources, although renewables represent the strongest growth. It nevertheless leads to a fossil fuel share in the global energy mix in 2040, even in the best climate scenario, of 60%.

Within these global trends, there are important geographical differences that reflect variations in the level of industrialization and economic development. Countries and regions that are relatively industrialized and economically developed will reduce oil demand, whereas those which are still relatively less industrialized, and with populations aspiring to economic development, will likely increase their demand for oil (Figure 3). The Paris treaty takes unequal levels of development into account by not committing developing, in particular the least developed, countries to combatting GHG emissions to the extent that developed countries are committed. Implementation of the agreement will "reflect equity and the principle of common but differentiated responsibilities and respective capabilities" (Agreement art. 2). A major political issue in the years ahead will therefore be how to balance global goals for combatting GHG with national aspirations for economic development. In this issue area, China and not least India, with its combination of demographic growth and high economic growth potential, will be key actors. For both these countries, however, the vital factor in determining their follow-up of Paris is their consumption of coal (see Table 2). There is a considerable amount of potential for energy conservation in the carbon sector in China, but it is very much dependent on an increased investment in innovating and developing new technology (Boqiang & Xuan, 2015).

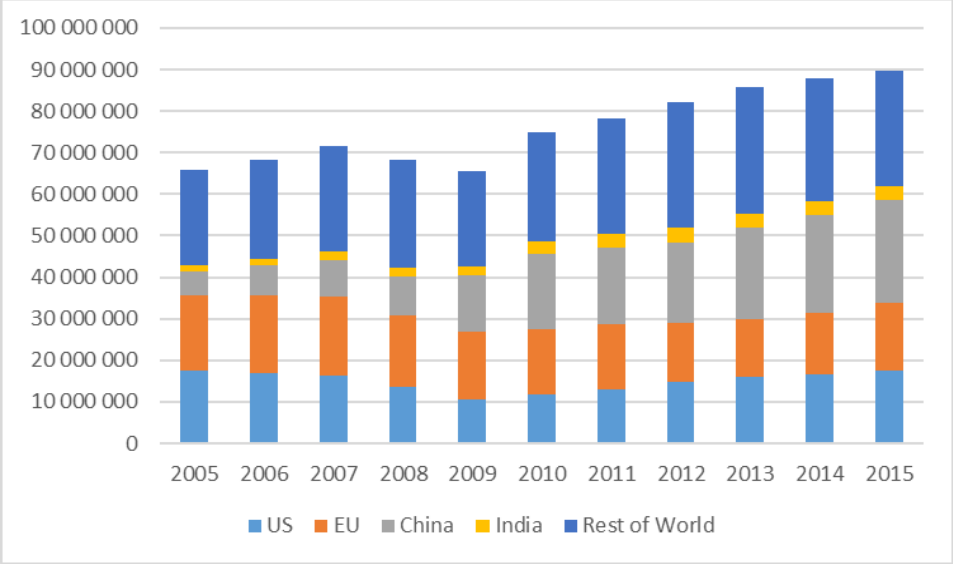

Figure 2. Registration or sales of new vehicles 2005–2015. Source: OICA (2015).

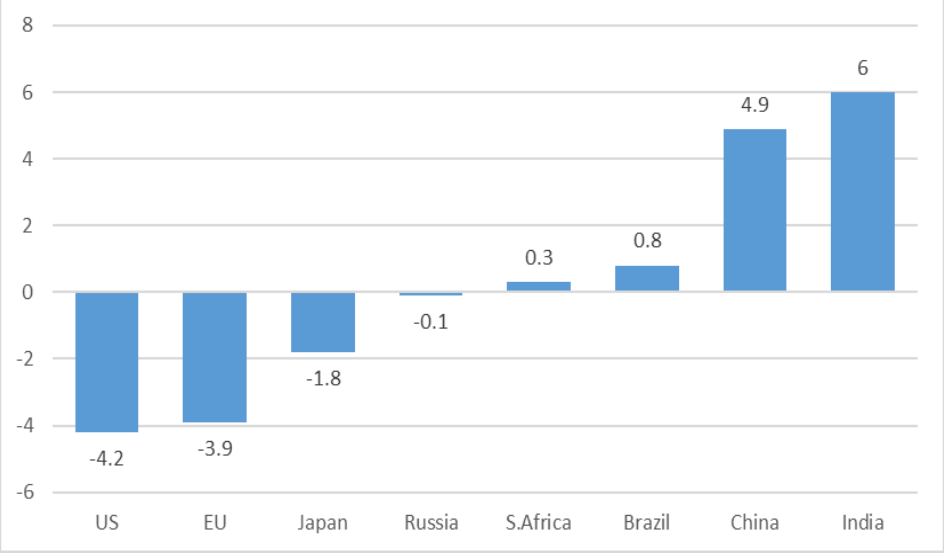

Figure 3. Change in oil demand in selected countries and regions in the *New Policies* scenario, 2014–2040. Source: IEA (2015, p. 467).

There are billions of oil consumers making individual decisions and calculations every day with implications for global oil consumption. The implementation of the Paris Agreement will have to put in place various incentives, restrictions, regulations and legislation all over the world for these individuals to reduce their oil consumption. A large number of the oil-consuming individuals live in countries that provide them with a significant degree of freedom regarding their choices of energy consumption. In these cases, changes are best induced through mild incentives or changes in attitudes toward oil consumption at the societal-, and not least the local level.

4. Counterforces: Producer Reactions

The structure on the producer side of the market is different from that on the consumer side. Compared to the billions of individual oil consumers, the top 10 producing countries cover two-thirds of the market (cf. Table 3), which obviously represents considerable power.

All of the top 10 producers, with the exception of the US, have a strong state involvement and control over their oil industry, and thus all decisions related to oil production, and subsequently the market-related reactions to the implementation of the Paris Agreement. Although there are important differences between Canada, Saudi Arabia and China regarding governmental control, we argue that the economic aspects relevant for analyzing their reaction to Paris will be fairly similar.

Most of the largest oil producers were against any type of international climate agreement, simply because it increases the likelihood of a reduced consumption of oil. Some producer countries were more active in their opposition to the Paris treaty than others, with reports suggesting that Saudi Arabia was particularly active.

We will not discuss these aspects further here, instead focusing on the options available to oil-producing countries in the face of an increased potential for non-trivial negative effects on oil consumption following from the Paris conference. The conclusion of the previous section was that such effects are hard to identify in the short run, but they might be more likely in the longer run. It should also be noted that the Paris Agreement can create significant emission reductions without having a strong impact on the oil sector, for instance if the global coal consumption is reduced considerably.

Even so, it is fair to expect some kind of strategic reaction from oil producers, based on the fact that the Paris Agreement has created a new type of uncertainty for their long-term reliance on income from oil exports. Saudi Arabia's intention to diversify into financial operations is an illustration, though probably a non-typical one given the country's extraordinarily strong position as the world's largest oil exporter. When it comes to options related to the market and the oil industry of producing countries, we see three possible strategies to meet reduced demand induced by the Paris Agreement:

Competitive strategy: In this case, the oil producers meet the competition from other energy sources by reducing the price of oil. On average, the production costs in countries like Saudi Arabia and the other Gulf states are less than 10 US dollars per barrel. More important in the oil industry is the so-called replacement cost (the cost of replacing a consumed barrel with a new barrel), which represents the long-term costs of sustaining current production levels. The figure has been falling every year over the last three decades, but with some exceptions. The technical and industrial potential for a long-term/low-price strategy is present. However, to what extent it is economically and politically viable is less obvious, and if the alternative is to be out of business, several key producers might find this strategy attractive. With moderate investments, several of the producers around the Persian Gulf can increase their production capacity (OPEC, 2015).

Capitulation strategy: Models of resource economics suggest that oil-producing countries do not operate according to principles of market economics, but instead try to gain as much rent from their respective oil wealth as possible (Dasgupta & Heal, 1979; Hotelling, 1931). If the expectation is that the consumers will turn away from oil in the long term, it could make sense to try to gain as much money as possible from the oil reserves, as soon as possible. This would imply immediately dumping as much oil as possible on the market.

Table 3. Top 10 oil producers. Source: BP (2015) and World Bank (2016a).

Country	Share of world production (2014)	Oil share of GDP (2014)
US	13.1	0.8
Saudi Arabia	13.0	38.7
Russia	12.2	12.7
Canada	4.8	3.4
China	4.8	0.9
UAE	4.2	19.0
Iran	4.1	23.6
Iraq	3.7	41.4
Kuwait	3.5	57.7
Mexico	3.1	6.8

This would obviously bring the price down, so it is not entirely distinct from their competitive strategy, but it can be identified by the oil producers, thereby maximizing their production according to their installed production capacity and, if possible, to increase their production capacity even further.

Change-over strategy: This strategy moves us away from the pure market operations, and focuses on alternative courses of action in order to sustain current economic welfare levels. Several of the Middle East oil producers have pursued such a strategy for decades, though with little success. It is very difficult to turn resources and investments away from an extremely lucrative industry, such as oil production in the Middle East, into necessarily less lucrative sectors. A fall in oil prices might help such a strategy. Another aspect emerging is that some of these countries have natural conditions for alternative energy production, first and foremost solar power. It would obviously not be possible to replace the income from oil in the short run. But it is possible to imagine a breaking point, in which the long-term value of solar power, investment costs included, outweigh a losing battle to sustain world oil demand by cutting oil prices.

The three strategies are not that distinct from each other, but they can be empirically identified by investigating market behavior, production level and capacity change, as well as investments in alternative industries. Still, these factors can change even without any reference to the Paris treaty or climate change in general. Since 2014, the market behavior of the leading producer country, Saudi Arabia, has seemingly changed dramatically, from sustaining a high price to instigating a price war against high-cost producers outside of OPEC. On closer inspection, however, the Saudi Arabian policy is not new. It is in line with the behavior of the Kingdom in 1985–86, when the attempt to sustain the high prices created in the 1970s by cutting production failed. It then flooded the market in order to drive high-costs producers out of business. The high price of oil from 2008 to 2014, combined with technological breakthroughs in the production of so-called shale oil, has attracted new producers, in particular in the United States. The market became oversupplied, and the price started dropping in the autumn of 2014. This time Saudi Arabia did not cut its own production, but instead increased it in order to reduce the profitability for all high-cost producers.

The immediate motivation behind this strategy is not directly linked to climate change or the Paris treaty. Even so, the ambition for oil producers with large resource bases to prolong the horizon of the oil age can influence the likelihood and costs of replacing the consumption of fossil fuels with renewables. An oil price above $100 per barrel would make it much easier for renewables to compete than with an oil price below $50 per barrel. The available resources that can be produced profitably at $20 per barrel over the next decades are almost infinite.

For some of the key oil exporters, the income from oil exports is crucial for their economic activity in general, and thus for the welfare level of their societies (cf. Table 4). In addition, some of these countries are so-called rentier states (Luciani, 1990; Noreng, 2004), indicating that the state is economically independent of its inhabitants as it supports itself from oil income. In such cases, a reduction in oil income jeopardizes the political leadership. For instance, the Saudi Arabian regime appears to be dependent on distributing parts of its oil income among a population that is widely unemployed (Cappelen & Choudhury, 2004). At the same time, it has a huge potential for defending its position, illustrated by its announcement to register ARAMCO, the state oil company, and by far the biggest producer in the world, at the Riyadh stock exchange. Selling a mere 5% of the company will raise $250 billion and support state finances currently running a budget deficit. In other words, the Kingdom disposes of a huge reserve of not only oil, but also financial resources that could make it not only invulnerable to financial problems, but also diversify its economy and make it less dependent on oil income in the future.

Table 4. Top 10 crude oil exporters. Source: World Bank (2016b).

Country	Oil exports (mb/d)	Share of total exports (%)
Saudi Arabia	6,250	76
Russia	4,871	68
Canada	2,470	19
Iran	2,297	54
United Arab Emirates	2,181	28
Nigeria	2,115	92
Angola	1,909	90
Iraq	1,903	99
Venezuela	1,594	96
Kuwait	1,495	94

5. Pursue Paris or Protect Profits? Investor and Company Reactions

Investor decisions are a crucial factor in shaping the effects of Paris. Private investment decisions are also crucial to the prospect of sustained oil production in most producer countries, with the possible exception of several key producers in the Middle East. While the rig count of Saudi Arabia increased 15% from 2014 to 2015, it was almost cut in half in the US (OPEC, 2016, p. 91). If investments in the oil industry were to dry up, the industry would also contract. At the moment (Spring, 2016), the price of oil is naturally a focal point for investors. With low prices, the time horizon will have to be extended in order to handle risk and gain lifetime profits from the individual field investments. Nonetheless, we argue that price developments are not the only factor to consider when the future behavior of investors and companies is analyzed.

Contrary to the oil producers themselves, the investor can rapidly change from oil to other assets. The role of investors, whether they sit inside the producing companies, provide capital to finance those companies or the oil services companies, or whether they consider investing in transportation modes, has an effect at all stages of the oil value chain. In many countries, oil production is a capital-intensive business. Therefore, a crucial variable in the premises forming investor decisions is what long-term strategies they adopt, among other things what time horizon they apply for their profit target and what risk they are prepared to take. The coal industry is already subject to substantial disinvestment. Moreover, several individual investors, as well as corporate managements, have signaled that they will invest in the transformation to a green economy. However, the standard assumption is that most investors still respond primarily to market forces, and their own profit aspirations and risk assessments rather than to Paris. Will this change, and thus give Paris a significant impact on investors' behavior?

Current trends could be a signal. At the current price level ($40 per barrel), producer companies lose money on drilling for oil in the United States and most, if not all, offshore global locations. They "are slashing jobs, costs and capital spending in order to maintain promised dividend payouts. But the lower prices go, the more they borrow to honour those pledges" (*The Economist,* 2016b). The 400 largest oil service companies have slashed 250,000 jobs since 2014 (Ånestad & Haug, 2016). Several of the major Western companies piled up debt in 2015, and some have been downgraded by the rating agency, Standard & Poor's. An increasing share of corporate bonds is trading on negative yields, and investors are losing money. The proportion of junk bonds deemed to be distressed more than doubled from early 2015 to 2016, with the oil and gas sector accounting for the biggest share of issuers in distress, at 30% of the total (*The Economist*, 2016a). Although the default rate is still below the historical average, it doubled from the low of 2014, and will likely continue to rise if the price of oil does not.

The downward trend is also reflected in investments. Hence, global investments in oil fell from $920 billion in 2014 to an estimated $620 billion in 2016. At the same time, investments in green energy have been larger for the last four years than in the entire carbon sector. Green investments have increased six-fold from 2004 to 2015 (Mathismoen, 2016). Consequently, there is a possibility that investors will decide to move out of all fossil fuels, and not only coal. These trends are clear signals, but should at this point still be seen as indications of change, and not proof that an irreversible change has started. It is, however, a clear indication of change that the one-third drop in investments started before Paris. On the other hand, the past is a story of very volatile oil prices; and some investors may bet on that pattern repeating itself. A good number of them are expecting price increases in the months or years to come; they may rely on the consultancy firm Rystad Energy, which predicts a price rise to above $100 by 2020 (Melberg, 2016). Some of them may even decide to invest in exploration, but maintain the option to withdraw the investment later if the success of operations looks unpromising.[1]

The Western majors, the International Oil Companies (IOCs) that ruled the oil industry for several decades, are no longer in a position to do so. Since the 1970s, they have lost control over primary oil production and reserves, and they have also lost some of their control over oil technology to service companies. Their response has been to diversify, notably into gas, thereby merging and maximizing shareholder value. Gas, however, is a competitive market, in which the IOCs are neither dominant nor necessarily the most competitive. And as we demonstrated above, shareholders appear to be becoming as concerned about current cash flow problems and increasing debt as they are about making new investments. As Paul Stevens argues, the whole business model of the IOCs is faltering; as they have adapted too late to the changing technology and geopolitical shifts (Stevens, 2016). At the same time, we submit that the IOCs, perhaps because they are struggling to maintain their global position and their business model, may attempt to compensate for their losing power at the international level by exercising pressure and power at the domestic level. This appears to apply in particular to the US, where the president's policy decisions may be blocked by Congress. If the IOCs want to block Paris, this is arguably their best chance of doing so. Having said this, we also observe that some of the IOCs like Shell have set a strategy that

[1] For a modelling of this and alternative decision-making options, see Begg, Bratvold and Campbell (2002).

implies that they plan to take part in the greening of the energy system.

6. Contextualizing the Issue: Geopolitics or Paris?

Periodically, political, in particular geopolitical factors, have had a strong influence on the price of oil (Favennec, 2007; Painter, 2014). Major wars or political revolutions in major producer countries almost automatically lead to greatly increased oil prices, while a peaceful resolution to a major conflict lowers prices. Abrupt changes in political regimes also have a proven effect on prices. Security, including energy security, has traditionally been and will continue to be a serious concern for governments. These factors have either trumped market factors to set them aside, or they have boosted them. In both cases, the result has been upwards or downwards price fluctuations (cf. Figure 4), and there is nothing to indicate that these factors will have less importance in the future.

Predicting geopolitics and its effects is almost as difficult as predicting the price of oil—of which geopolitical events are also major drivers. Together with the reintegration of Iran in the oil market after the nuclear deal, the current conflict between Saudi Arabia and Iran has led to an increased supply. Due to the geopolitical interests of Saudi Arabia overriding the economic interests of re-establishing the producer alliance, the Doha meeting in mid-April 2016 ended without an OPEC agreement to regulate volume (Raval, Sheppard, & Hume, 2016). Changes in the regional security complex of the Middle East, and more specifically the Persian Gulf, will continue to influence the market behavior of the oil suppliers inside the region. It will also continue to be an important factor in the foreign policy of the superpowers. The evolution of the relationship between the United States and China will likely affect the demand for oil; if they stay relatively cooperative they will not drive demand, but if they were to turn towards more conflict, for instance over East Asian security issues, these powers are likely to increase efforts to guarantee their own energy security. National security may trump international compliance to climate policy, and Realism trumps Institutionalism.

This may result in various types of policy, ranging from measures at home to action at the international level. Increased self-sufficiency in primary energy would imply measures such as an increased stocking of supplies and less emphasis on the cost of production at home. It may also mean diversifying energy usage and supply channels, including foreign ones and to try and obtain better control of them (Tunsjø, 2013). The major powers will even attempt to control exogenous supplies to their geopolitical competitor(s) by influencing their suppliers, control transportation lines or by other means. An increased emphasis on energy security may also imply that nuclear power as a primary energy source may become reinstated.

History offers several examples of the rationing of secondary energy usage being introduced during periods of war or major international conflicts, with the purpose of diverting energy usage from civilian to military-related applications. Such motives might still be important, but the most likely net effect of increased geopolitical conflicts is to halt or stop GHG measures following from the Paris treaty. The countries likely to be involved in geopolitical games are also the major oil consumers and/or producers.

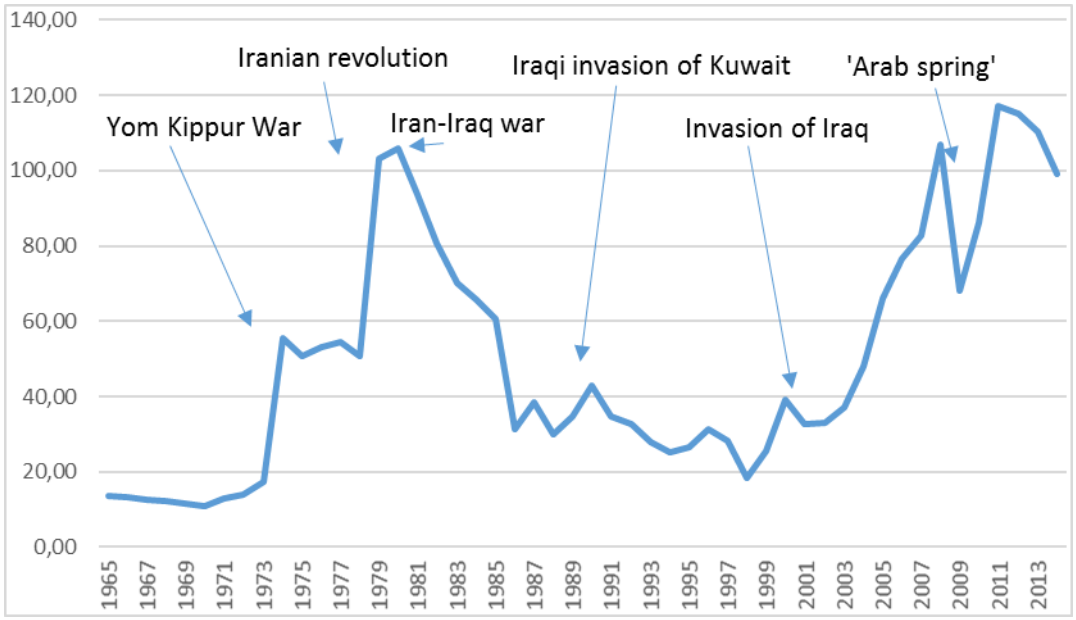

Figure 4. Oil price ($2014 per barrel) and political events. Source: BP (2015).

7. Summary and Conclusion

The Paris treaty is a major political and institutional achievement. However, its effect on the global oil system is uncertain and complex. The casual chain leading from Paris to the end of oil is long, and subject to a number of intervening factors. Even if consumers and investors also push for de-carbonization regarding oil, producer countries and the oil industry might contradict such efforts. How strong and how general the Paris effect will be on oil is therefore extremely difficult if not impossible to predict.

This article has discussed several factors that may impact on the outcome, some in support of the Paris agreement and others working against it, and yet others with an uncertain or neutral effect. The agreement's key principle of burden-sharing, that countries have a Common But Differentiated Responsibility (CBDR), offers flexibility in implementation and therefore also uncertainty regarding the end result. With this complexity and variety in mind, we presented scenarios for how Paris might affect different parts of the global oil system:

- Without a substantial effect on the global consumption of fossil fuels (oil, gas and coal), the Paris treaty will be a failure. Oil is probably the hardest to eliminate since the technological alternatives in the transportation sector have not been fully developed thus far. De-carbonizing oil consumption implies not only a switch of power source from oil to hydrogen or electricity, but also new motors, cars, ships, airplanes and new infrastructure in most parts of the transportation sector. Such changes might be both induced and reduced by the interests and attitudes of the world's billions of energy consumers. It may obviously also be influenced by powerful commercial actors. In democratic countries, the attitude of the electorate will strongly influence the pattern and speed of change. On the international political scene, individual countries are reluctant to move ahead of other countries in introducing costly taxation or climate programs, for fear of losing competitiveness. In certain cases, domestic public opinion can override such fear. Rich countries are in a better position to take on risky climate policies than poor countries, and democratic consuming countries are more likely to experience such a domestic pressure than autocratic regimes, although it should be mentioned that recent changes in the Chinese energy policy are assumed to be the result of strong public opposition to local environmental degradation from, inter alia, coal-fired power plants.
- We emphasize the role of investors. Their behavior is an early warning of the future, an economically viable course, and that the energy transition may follow. Investments are essentially an attempt to spend money today in order to earn money tomorrow. If the de-carbonization of the energy system is becoming profitable, we should expect to see a move in investments from fossil fuels to renewables, including in technologies, production, infrastructure, end-user facilities and so on. Decisions by risk-aversive investors outside of the oil industry increasingly follow the latter, and have a large overall effect on the industry. In the most likely variant of this scenario, investors continue to move out of oil in the expectation of continued uncertainty about future profitability. In the case of oil, such an observation is distorted today as investors are moving away from oil, but most likely due to the relative low oil price that emerged in 2015.
- The most compelling counteracting factor in this picture is the response to changes in consumption by the key oil producers. We developed three possible producer strategies with the following implications: producers with low costs of production follow a competitive or capitulation strategy, while facing the prospect of continued prices below profitability, many of those producing at higher costs will pursue the change-over strategy.
- We also see politics as an intervening factor among the producers. Geopolitically motivated competition and rivalry, as well as radical political regime changes, create periodic price changes. Historically, they have mostly resulted in price increases that induce rival producers and investors to remain in oil. In the case of the current geopolitical competition in the Middle East between Iran and Saudi Arabia, the result is an increase in volume that has led to a price drop. Unfortunately, this has resulted in a price drop that, at least from a climate emissions point of view, makes oil more competitive for energy consumers.

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Conflict of Interests

The authors declare no conflict of interests.

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Article

The Paris Agreement: Short-Term and Long-Term Effectiveness

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Abstract
The 2015 Paris Agreement was widely greeted with enthusiasm. We assess the short-term and long-term potential effectiveness of Paris. Concerning short-term effectiveness, we contend that while Paris scores high on participation, and reasonably high on the depth of the parties' commitments (ambition), its Achilles' heel will likely be compliance. Concerning long-term effectiveness, we argue that Paris does little to restructure states' incentives so as to avoid free riding. At worst, it might end up as a failure, much like Kyoto did. On the other hand, domestic and international norms could continue to develop in a direction that makes it more and more difficult for individuals, firms, and states alike to ignore the plea to limit and reduce their carbon footprints. Technological progress that gradually reduces abatement costs, combined with leadership by major emitters such as the United States, might further strengthen climate cooperation and enhance other countries' willingness to follow through. However, deep political polarization continues to represent a significant barrier to U.S. leadership on climate change.

Keywords
climate change mitigation; climate cooperation; effectiveness, international leadership; Paris Agreement; U.S.

Issue
This article is part of the issue "Climate Governance and the Paris Agreement", edited by Jon Hovi and Tora Skodvin (University of Oslo, Norway).

1. Introduction

While the expectations for the 2015 Paris climate change meeting were modest, the outcome—the Paris Agreement—was widely greeted with enthusiasm (e.g., Brun, 2016; Dimitrov, 2016). A bottom-up agreement, Paris requires countries to submit nationally determined contributions (NDCs) to reducing global emissions. It also includes a set of mechanisms for ratcheting up these NDCs over time. Partly because the NDCs are not legally binding, Paris does not include any enforcement measures. Importantly, therefore, the intention is that once key countries make first steps towards cutting their emissions, others will follow suit.

In this paper, we assess the short-term and long-term effectiveness of the Paris Agreement. By short-term effectiveness we mean the extent to which Paris may be expected to contribute to reducing global emissions in its first five-year period. By long-term effectiveness we mean the extent to which it is likely to reduce global emissions in a time perspective longer than five years.

Section 2 clarifies the criteria we use to assess the Paris Agreement's effectiveness. Sections 3 and 4 consider the Agreement's short-term and long-term effectiveness, respectively. We argue that its short-term effectiveness will likely be limited. Moreover, its long-term effectiveness remains uncertain. At worst, the Agreement might prove to be a failure. At best, it might cause a race to the top that eventually makes it very effective in the long term. The outcome will likely depend on, among other things, whether major emitters

prove able and willing to take the lead. In section 5 we discuss the prospects for such leadership by one major emitter that has a particularly important role as a first mover—the United States. Finally, section 6 concludes.

2. Criteria for Evaluation

To be effective, a climate agreement must satisfy three requirements (Barrett, 2003). First, it must attract broad participation to ensure that most (or preferably all) of the world's anthropogenic greenhouse gas (GHG) emissions are covered by the agreement. Second, to make a real difference for curbing climate change the agreement must reflect high ambitions, in the sense that it must commit the participating countries to deep emissions reductions. Finally, the agreement must achieve high compliance rates, that is, the participating countries must actually meet their emissions reduction targets.

We emphasize that these three conditions for effectiveness apply to all climate agreements, regardless of their type. In particular, they apply regardless of whether the participating countries' commitments to curbing emissions are determined top down or bottom up. They also apply regardless of the extent to which the participating countries are held responsible for their actions internationally or only at the national level.

Importantly, satisfying one or two requirements is not enough. In the words of Simmons (1998, p. 78), "while compliance may be necessary for effectiveness, there is no reason to consider it sufficient". The same can be said about broad participation and deep commitments: Whereas each condition is necessary, all three must be fulfilled to ensure effectiveness.

Conversely, any climate agreement that fails to satisfy at least one of the requirements will experience free riding in one or more forms. Consider the Kyoto Protocol. Kyoto 1 seems to have achieved perfect compliance levels; indeed, all Annex B countries met or even exceeded their emissions reduction or limitation targets in the first commitment period.[1] Nevertheless, when Kyoto 1 expired in 2012 global emissions were approximately 50% higher than they were in 1990 (Kyoto's baseline year). The reason is that Kyoto 1's effectiveness was hampered by at least four forms of free riding (Hovi, Skodvin, & Aakre, 2013). First, a few countries—most notably the United States—failed to ratify. Second, one country—Canada—essentially ignored its emissions reductions commitment until it withdrew from the agreement in 2011. Third, some economies in transition participated with extremely shallow targets that they could easily meet or exceed even without implementing any measures specifically intended to curb emissions (the hot air problem). Finally, the developing countries ratified without any binding target for emissions reductions or limitations.

[1] http://phys.org/news/2016-06-kyoto-analysis-compliance.html

We do not dispute that even an agreement that falls *somewhat* short of fulfilling all three requirements can make a difference, by causing global emissions to become lower than they would have been without the agreement. However, no agreement that falls *significantly* short of fulfilling one or more requirements can even come close to solving the climate change problem.

An agreement can be effective in the short and/or in the long term. Short-term effectiveness concerns the extent to which the agreement is effective in its own lifetime (here defined as the first 5-year period). Long-term effectiveness concerns the extent to which the agreement triggers future actions that enhance effectiveness in a longer time perspective (beyond the first 5-year period).

The Paris Agreement includes both individual and collective goals. Each party reports a nationally determined contribution (NDC), which constitutes that party's individual goal. Two key collective goals in the Paris Agreement are, first, to keep the rise in global mean temperatures well below 2 °C and "pursue efforts" to limit warming to 1.5 °C and, second, to achieve worldwide carbon neutrality sometime between 2050 and 2100.

An assessment of the agreement's effectiveness thus needs to take into account (1) whether the parties comply with their individual goals, and (2) whether the aggregate effect of a successful implementation of the individual goals enables the parties to reach the agreement's collective goals. In terms of Barrett's three requirements, the latter point concerns whether the parties' (self-determined[2]) emissions reduction targets qualify as deep commitments. If the aggregate effect of reaching the individual goals is inadequate to reach the collective goals of the agreement, we further need to consider whether the agreement includes mechanisms that may trigger deeper (more ambitious) commitments over time. The *long-term* effectiveness of the Paris Agreement thus depends on its ability to preserve ambitious commitments over time—and further deepen them if necessary—while preserving broad participation and high compliance levels.

3. Short-Term Effectiveness

In this section, we consider the short-term effectiveness of the Paris Agreement. We do so by assessing how this Agreement fares regarding participation, the depth of participating countries' commitments, and the prospects for achieving high compliance levels. Because we expect compliance to be the Achilles' heel of the Paris Agreement, we place more emphasis on the last requirement than on the first two.

[2] In contrast to the Kyoto Protocol, where the parties' individual goals were negotiated (a "top-down approach"), the parties' individual goals in the Paris Agreement are self-determined (a "bottom-up" approach).

The Kyoto Protocol was ratified by nearly all countries. However, after the United States denounced the agreement, Kyoto imposed an emissions reduction or limitation target on only 37 ratifying countries (36 after Canada's withdrawal in 2011). Moreover, these 37 countries were responsible for less than 20% of global emissions. In this sense, participation in Kyoto was rather limited.

In contrast, a major strength of the Paris Agreement is its broad participation. In Paris, 195 countries consented to the Agreement's adoption and by 1 March 2016, 165 countries—including major emitters such as China and the United States—had submitted their NDCs under the Agreement.[3] It is thus fair to say that participation is far broader in the Paris Agreement than it was in the Kyoto Protocol.

In Kyoto, Annex I countries committed to reducing emissions about 5% below 1990 levels in the first commitment period. Many of these countries have made considerably deeper commitments under the Paris Agreement. For example, the European Union has committed to reducing emissions 40% below 1990 levels by 2030. Moreover, the non-Annex I countries have now joined the Annex I countries in making commitments.

Some countries' NDCs are formulated in a way that makes it challenging to determine whether and, if so, to what extent their fulfilment requires emissions reductions beyond business as usual. Consequently, it is not easy to determine the average depth of the commitments made under the Paris Agreement. However, observers seem to think that the current NDCs, if fully implemented, will curb global warming to somewhere between 2.7 °C and 3.0 °C above preindustrial levels, down from the 3.6 °C expected to result with the policies already in place before (and not including) Paris (Kinver, 2015). Thus, a substantial gap remains between the Agreement's collective aims and the sum of the parties' individual NDCs.

An important question is whether the current NDCs will be fully implemented. Under Paris, NDCs are not legally binding. Hence, one may well question whether it is meaningful to speak of noncompliance if a country fails to fulfil its NDC. However, for lack of better terms, we will nevertheless use the terms "compliance" and "noncompliance".

Compliance with an international agreement depends on many factors, of which we will here briefly consider three. The first is whether the agreement concerned aims to solve a coordination problem or a collaboration problem (Stein, 1990). While countries participating in an agreement of the former type do not face any incentive for noncompliance, countries participating in an agreement of the latter type do (see, for example, Keohane & Oppenheimer, 2016). The climate change problem is a collaboration problem; indeed, it may well be the most challenging collaboration problem ever (Barrett, 2003).

The second factor concerns the depth of the parties' commitments.[4] A shallow commitment does not require any costly behavioural change. In contrast, implementing a deep commitment might entail very substantial costs (Downs, Rocke, & Barsoom, 1996). Nearly all economic activity entails GHG emissions (Barrett, 2003). Thus, deep commitments in a climate agreement will be very costly to implement. The deeper the commitments, the greater the costs involved, and the greater the risk of noncompliance (other things being equal).

The third factor has to do with the presence or absence of enforcement measures. In general, the implementation of a climate agreement may be influenced through at least four main types of compliance mechanisms: (1) pressure from domestic stakeholders (including through domestic courts), (2) informal enforcement by other countries, (3) facilitation by international institutions, and (4) enforcement by international institutions.[5] While Kyoto relied on all four types, it seems that Paris will only rely on the first three.

The Paris Agreement requires each country to report to other countries— and to the public—its progress in implementing its NDC. It also includes an ambition to "track progress towards the long-term goal through a robust transparency and accountability system".[6] However, Paris provides no material consequences to be implemented against a country that fails to fulfil its NDC. Work is currently underway to develop a compliance system; however, Paris specifically states that any compliance measures should be "expert-based and facilitative in nature and function in a manner that is transparent, non-adversarial and non-punitive".

It is well known that compliance with international environmental agreements is generally good, despite that few such agreements include potent enforcement measures (Chayes & Chayes, 1995). However, it is far from clear that these findings are relevant for deep climate agreements, where the costs of compliance are

[3] NDCs submissions are available at: http://www4.unfccc.int/submissions/indc/Submission%20Pages/submissions.aspx

[4] This means that commitment depth influences the Agreement's effectiveness both directly (a positive effect) and indirectly (via reduced compliance, a negative effect). The net effect therefore depends on the size of these direct and indirect effects.

[5] For example, the 1989 Montreal Protocol on Substances that Deplete the Ozone Layer, which is widely regarded as a very successful treaty, includes a possibility of enforcement in the form of trade restrictions against nonparticipating and noncompliant countries (e.g., see Aakre, Helland, & Hovi, 2014). While these enforcement measures have never been used, anecdotal evidence suggests that their existence have been important for boosting participation as well as compliance (Brack, 2003, p. 220).

[6] See http://ec.europa.eu/clima/policies/international/negotiations/paris/index_en.htm

likely to be much larger than in other international environmental agreements.

Because NDCs are not legally binding, enforcement through domestic legal action is also unlikely. Moreover, judged by Canada's experience after its withdrawal from Kyoto, we should not expect much informal enforcement by other members if a country fails to deliver on its NDC or even withdraws from the Paris agreement.

Thus, what remains is the possibility of naming and shaming by domestic and international politicians and pressure groups. The risk of such naming and shaming did not deter the United States from denouncing the Kyoto Protocol in 2001. Nor did it deter Canada from withdrawing 10 years later. It therefore seems pertinent to question whether the anticipation of informal enforcement will suffice to induce all (or even most) of the 195 parties to the Paris Agreement to implement their NDCs. Technically, failure to do so may not result in noncompliance; it may equally well end in the countries concerned pulling out of the agreement (similar to Canada's withdrawal from Kyoto).

Proponents of the management school provide a forceful argument that the design of international enforcement measures is 'a waste of time', because states are (according to this school) largely motivated by international norms rather than by self-interest (Chayes & Chayes, 1995).[7] They also argue that simply doing the best one can to reach compliance is efficient, because constantly looking for opportunities to act as a free rider would consume considerable resources.

Concerning climate change, however, the record for commitments without international enforcement is not impressive. While participants in the 1988 Toronto conference collectively aimed to reduce global CO2 emissions 20% below 1988 levels by 2005, global emissions actually increased more than 30% between 1988 and 2005. As noted by Barrett (2008, p. 240), the problem with such global targets is that "everyone is responsible for meeting them—meaning, of course, that no one is responsible for meeting them". Barrett's words also apply to the Paris Agreement's collective goal of stabilizing the global mean temperature at no more than 2 °C above preindustrial levels, while pursuing efforts to limit warming to 1.5 °C. Indeed, the Paris Agreement's collective goal also suffers from the problem that the global mean temperature partly depends on natural variations; hence, it is even less under the control of the parties than global emissions are.

A better strategy might be to aim for individual targets, and the Paris Agreement specifies individual targets in the form of NDCs. However, the record concerning compliance with individual non-binding emissions reduction targets is not good either. After the Toronto conference, Austria, Denmark, Italy, and Luxembourg stated that they would meet the Toronto target individually by reducing their own emissions 20% below 1988 levels by 2005. None of them did. Other individual targets have also been missed (Barrett, 2008).[8] Although much has changed since the 1980s, it is far from clear that we can take it for granted that all countries will fulfil their NDCs under the Paris Agreement.

Assuming that enforcement matters, the countries most likely to comply with Paris are the EU members. The reason is that the EU controls a number of enforcement measures of its own that might be used to spur its members to fulfil their targets.

A way to circumvent the need for enforcement could be to design a climate agreement in such a way as to transform the climate change collaboration problem into a coordination problem. Some agreements that introduce a technology standard in the presence of network externalities might serve as an example (see Barrett, 2003). However, the Paris agreement makes little (if any) attempt at pursuing this strategy.

In summary, the Paris Agreement scores high on participation and scores reasonably high on depth (although assessing such depth is challenging). Thus, concerning short-term effectiveness, the main issue is to what extent the countries participating in Paris will actually fulfil their NDCs. Whereas some countries (such as the EU countries) may be expected to be compliant, it remains an open question whether a number of other countries will be. However, even with some noncompliance, Paris could end up as a reasonably successful agreement. Lack of enforcement measures may induce some countries to submit deeper NDCs than they would have done otherwise (Victor, 2011). The irony is that the deeper the commitments, the larger the need for enforcement and the less likely that such enforcement will be politically feasible (Aakre & Hovi, 2010). However, at least in principle, an agreement with deep commitments and only moderate compliance levels might fare better than one with only shallow commitments but full compliance.

4. Long-Term Effectiveness

The long-term effectiveness of the Paris agreement depends on (1) whether a successful implementation of the parties' individual goals (the NDCs) enables the parties to reach their long-term goals of the agreement, and (2) whether the agreement includes mechanisms to further deepen commitments over time, while also ensuring high compliance rates and (continued) broad participation.

[7] Following Elster (1989, pp. 98-99), we define a norm as an imperative that is not outcome-oriented. A norm is social if it is shared by several actors and partly sustained by other actors' approval or disapproval.

[8] For a complete list of declared targets or commitments undertaken by OECD countries at this time, see Paterson and Grubb (1992, p. 301).

In its adoption of the Paris Agreement, COP21 emphasized its "serious concern" for the "urgent need to address the significant gap between the aggregate effect of Parties' mitigation pledges…and aggregate emission pathways consistent with holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels" (Decision 1/CP.21, preamble). In the short term, the Paris Agreement does little to close this gap. A key question, therefore, is whether the Paris Agreement includes mechanisms that contribute to closing the gap over time.

The main mechanism to ensure the Agreement's long-term effectiveness is detailed in Article 4, which states that each party "shall prepare, communicate and maintain successive nationally determined contributions [NDCs] that it intends to achieve" (Article 4.2). These successive NDCs "will represent a *progression* beyond the Party's then current [NDCs] and reflect its highest possible ambition" (Article 4.3, emphasis added). Each party is invited to communicate its NDC, at the latest, when it submits its instrument of ratification, acceptance, approval or accession. Parties are then requested to communicate a new NDC by 2020 and every five years thereafter (Article 4.9; Decision 1/CP.21, paragraphs 21-24).

This mechanism is supported by the Agreement's reporting, transparency, and monitoring provisions. First, a party is obliged to "regularly provide a national GHG inventory and the information necessary to track progress in implementing and achieving its NDC" (Bodansky & O'Connor, 2016, p. 10), (Article 13.7a, b). Second, parties are required to submit their NDCs to the secretariat at least 9–12 months in advance of the relevant COP/MOP meeting "with a view to facilitate the clarity, transparency and understanding of these contributions". The NDCs are then summarized in a synthesis report prepared by the secretariat (Decision 1/CP.21, paragraph 25; Article 4.9). Third, a monitoring function of sorts is established in the inclusion of provisions for a "global stocktake", which implies that the COP "shall periodically take stock of the implementation of this Agreement to assess the collective progress towards achieving the purpose of this Agreement and its long-term goals" (Article 14.1). Such global stocktaking shall take place every five years beginning in 2023 (i.e., two years before the parties' NDCs are up for their first revision).

So the Agreement does indeed include mechanisms intended to enhance its long-term effectiveness. However, it remains uncertain whether these mechanisms suffice to ensure the positive snowball effect (or race to the top) many participants and observers hope for. This uncertainty is due to two key features of the Agreement.

First, while the Agreement establishes procedural obligations such as the ones mentioned above, it is largely silent regarding the *substantive content* of the parties' NDCs. For instance, the Agreement includes a general aim "to reach global peaking of [GHGs] as soon as possible" with "rapid reductions thereafter" (Article 4.1), instructs parties that their NDCs will reflect their "highest possible ambition" (Article 4.3), and states that developed country parties "should continue taking the lead by undertaking economy-wide absolute emission reduction targets" (Article 4.4). However, the parties' commitments will continue to be self-determined and may thus, in aggregate, fall well short of reaching the collective 2 °C long-term goal. If so, the Paris Agreement may, even with full compliance and even in the long term, prove unable to close the gap COP21 expressed its concern about.

Second, and perhaps more importantly, the Agreement's lack of an enforcement mechanism might generate uncertainty concerning some parties' willingness to honour their commitments. A "compliance mechanism" is established to "facilitate implementation and promote compliance with the provisions of this Agreement" (Article 15.1). But this mechanism will almost certainly include no incentives to actively discourage and sanction noncompliance. On the contrary, the Paris Agreement expressly states that the compliance mechanism "shall be…non-adversarial and non-punitive" (Article 15.2). Thus, parties might be tempted to communicate over-ambitious NDCs—for instance, targets they do not know if they are able to implement, are unlikely to implement, or even do not intend to implement—with impunity. An NDC thus represents little more than a party's good intentions. If there are reasons to doubt a party's sincerity, other parties' willingness to implement ambitious emissions reductions might be weakened accordingly. The lack of an enforcement mechanism, therefore, could limit the Agreement's long-term effectiveness, because it means that even if all parties intend to implement ambitious emissions reductions, they might nevertheless be reluctant to do so simply because they lack confidence in other parties' willingness to honour their commitments. Thus, even if we might see an initial upward cycle of progressively rigorous NDCs, the long-term effectiveness of the Agreement could be modest.

The lack of an enforcement mechanism is arguably the Agreement's main weakness. Yet, this feature might also be the cause of the Agreement's most hailed achievement: participation by a broad scope of countries (including developed countries as well as developing countries and countries with emerging economies) that have set specified emissions reduction or control targets. Indeed, parties may have agreed to join the Agreement with emissions control targets precisely because there is no risk associated with such behaviour. While noncompliance might entail reputational damage, it will not entail immediate material costs.

The interlinkage between participation, the depth of commitments, and enforcement implies that even if parties were to supplement the Paris Agreement with an enforcement mechanism in the future (there are no indications at present that they will), that might adversely affect the incentive to remain a party and/or the incentive to submit an ambitious NDC. First, with an enforcement mechanism in place, parties that fail to implement their NDCs might withdraw from the Agreement rather than remain a party and suffer the costs of punitive sanctions for noncompliance. Article 28 states that "at any time after three years from the date on which this Agreement has entered into force for a Party, that Party may withdraw from the Agreement" (28.1), and that "any such withdrawal shall take effect upon expiry of one year from the date of receipt by the Depositary of the notification of withdrawal" (28.2).

Second, with an enforcement mechanism in place, parties might feel inclined to submit less ambitious NDCs, both to be certain of their ability to meet the targets (and hence avoid punitive sanctions) and to enable them subsequently to submit progressively more rigorous NDCs at low cost. In these scenarios, therefore, rather than seeing the positive snowball effect everyone hopes for, we might see that the Agreement will have decreasing participation and an increasing gap between the aggregate effect of parties' mitigation pledges and the required aggregate emission pathway to reach the 2 °C goal.

While the Paris Agreement includes provisions intended to increase its effectiveness over time, no incentives are included to support these provisions and to ensure their intended effect. The long-term effectiveness of the Paris Agreement thus entirely depends on other factors.

One such factor might be the reputational damage that could be associated with nonparticipation and noncompliance. Bodansky and O'Connor suggest that "states risk greater costs to their reputation and to their relations with other states if they violate a treaty commitment than a political commitment, making noncompliance less attractive" (2016, p. 16). But he also suggests that 'the inclusion of transparency and accountability mechanisms in the Paris agreement could accomplish the same result. By making it more likely that poor performance will be detected and criticized, these mechanisms will raise the reputational costs of failing to achieve one's NDC' (2016, pp. 16-17). Yet, as we have already seen, the risk of reputational costs does not seem to have significantly influenced the United States' decision not to ratify Kyoto 1, Canada's decision to withdraw from it, or the decision of countries such as Belarus, Japan, New Zealand, Russia, and Ukraine not to sign on to Kyoto 2.

Another factor concerns the market responses to the Agreement. If the Paris Agreement generates new investment patterns in key global markets, for instance by accelerating investments in "green energy" and decelerating investments in fossil energy, it could have significant implications for future emissions reductions. While experts see it as "likely" that the Paris Agreement "will accelerate investments in technologies like renewable energy and electric vehicles", the International Energy Agency forecasts that "fossil fuels will still account for about 75 percent of energy demand in 2030, with coal hitting a plateau, oil growing slightly and gas surging" (Campbell, 2015).

Finally, as noted, the long-term effectiveness of the Paris Agreement mostly depends on the extent to which parties trust each other to implement their commitments. In particular, the Paris Agreement's long-term effectiveness will likely be significantly influenced by the response of large global emitters. In the next section, we consider the likelihood that the United States will act as a leader under the Paris Agreement.

5. The United States—A Pivotal Actor in the Paris Agreement

The United States is a crucial player in the Paris Agreement, not only because it is the world's second largest emitter of GHGs but also because it has a special role to play in terms of triggering action from other countries. As described above, the Agreement relies inherently on vagueness in its specification of commitments, compliance requirements and the ratcheting-up mechanism (see also Keohane & Oppenheimer, 2016). While such vagueness was necessary diplomacy for forging the Agreement itself and attract broad participation, it locks success to reliance on key countries to go first and set the stage for a snowball effect (or race to the top). As argued by Underdal (1994, pp. 179-180), "the more complex the negotiation setting (that is, the larger the number of actors and the number and 'intricacy' of issues), the more likely that some actors will emerge as leaders and others as followers…, and the more critical leadership becomes as a determinant of success".

Arguably, the United States must play an important role in such leadership for at least two reasons. First, as the largest economy in the world and the second largest carbon emitter the United States is often pointed to as a key actor because of its major historical responsibilities for the climate change problem (e.g. World Resources Institute, 2016). What happens with U.S. climate policy has an effect for the entire world. Second, in the history of international climate negotiations the United States has often played the role as crucial laggard, blaming lack of participation by all major emitters and flawed treaty design for its own non-participation—for instance in the Kyoto Protocol. Experience thus indicates that for any comprehensive international climate agreement to work, it is vital that the world's most powerful country shows interest in participation and compliance with its pledges. If a pivotal actor like

the United States should fail to implement its commitments, it will likely negatively affect other parties' incentives to adopt and implement ambitious NDCs.

In the following pages, we analyse the role that the United States took at COP 21 and in the months preceding the conference to secure the adoption of a bottom-up agreement. We argue that the United States took several crucial steps to influence the outcome. We also analyse the domestic politics underlying the U.S. position at COP 21, to enable an evaluation of the prospects for the country to deliver on its Paris pledges. The dynamic between domestic politics and international negotiation positions is important in order to understand the scope for acceptance of international commitments in all countries. In the U.S. case this dynamic is influenced by the separation of powers in the political system that gives the president great freedoms in international negotiations, but allows the Senate decisive powers in issues of treaty ratification and funding of new policy programs. Hence, the interaction between the executive and legislative branches of government defines the scope for U.S. pledges at Paris, as well as the prospects to fulfil them. It helps explain why the United States can come to play an important role for the success of the Paris Agreement if it engages in a role as first mover (in a race to the top), but can also explain why in a difficult collaboration problem like climate change the United States may have difficulties in taking on such leadership.

In Paris, U.S. diplomacy and personal engagement by President Barack Obama and Secretary of State John Kerry helped craft compromises that were necessary for the adoption of the Agreement. Importantly, Obama engaged with China's President Xi through crucial bilateral contact in the months before the Paris meeting, paving the way for support of the Agreement by both countries (Goldenberg, 2014; Henderson, 2015). At the Paris meeting, President Obama said: "I've come here personally, as the leader of the world's largest economy and the second-largest emitter, to say that the United States of America not only recognizes our role in creating this problem, we embrace our responsibility to do something about it" (White House, 2015). The Obama administration acknowledged that the United States can play a key role in inspiring and convincing other countries to address their GHG emissions, and committed to reducing U.S. GHG emissions 26 to 28% below 2005 levels by 2025, premised on numerous domestic policy measures that have been or are to be implemented (Bang & Schreurs, 2016). Ambitious domestic investments in clean energy, energy efficiency programs, and new federal regulations limiting carbon emissions from power plants are among the climate policies initiated by the Obama administration.

The Obama administration has fought hard for changes in domestic climate policy. At the outset of his first term, President Obama pushed for the U.S. Congress to pass climate legislation. Several bills were debated, and in June 2009 Congressmen Waxman and Markey's American Clean Energy and Security Act narrowly passed a vote in the House yet later died in the Senate (Bang & Skodvin, 2014). Voting on this controversial bill largely followed party lines, reflecting deep and bitter polarization between Republicans and Democrats (Skocpol, 2013). No climate bill has been debated in the U.S. Congress since, and with Republican majorities in both the House and the Senate after the 2012 elections, climate legislation was no longer on the congressional agenda. In his second term, therefore, President Obama decided to use executive powers to circumvent the congressional gridlock on climate policy. Acting on the U.S. Supreme Court's ruling from 2009, which identified carbon emissions as a pollutant causing risks to the health and welfare of citizens, Obama ordered the Environmental Protection Agency (EPA) to develop regulations under the Clean Air Act to cut CO_2 emissions in the power sector by 32% by 2030 (Bang, 2015). The EPA worked with stakeholders and state-level regulators over two years (2013–2015) to set up regulations—the Clean Power Plan—that engage states to design individual plans for cutting carbon emissions from power plants. States are assigned individual emissions reduction targets, and are encouraged to find policy solutions adapted to local circumstances to minimize negative effects on industry and consumers (EPA, 2015).

The Clean Power Plan (CPP) is extremely controversial among policymakers at both the federal and the state levels. The controversy centres on whether the Clean Air Act gives the president and the EPA the authority to introduce wide-ranging regulations for CO_2 emissions without involving the U.S. Congress. Opponents at the federal and state levels have sought to put up barriers. Republican leaders in Congress have vowed to cancel the CPP at the first opportunity. Senate Majority Leader Mitch McConnell (Republican from Kentucky) encouraged states not to start developing plans, arguing that they would be wasting resources since the CPP will likely be removed either through congressional action by the Republican majority or through the courts (Cama, 2016). Several votes in Congress in 2013–2015 tried to remove the EPA's authority on the issue; however, those bills that passed were vetoed by the president. In October 2015, a coalition of 26 states—many of which depend heavily on coal for power generation—brought litigation against the EPA, arguing that the CPP represented a "power grab" by the federal government over state-level electricity systems that would be excessively burdensome for the states' economies (Bang & Schreurs, 2016). A significant blow to the Obama administration's climate policy came in February 2016 when a 5-4 decision in the Supreme Court stayed implementation of the CPP until judicial review of its legality. The Court's decision illus-

trates the fragility of the Obama administration's climate policy and the significant role of judicial review when executive power is used to impose policy in a controversial field. If the Supreme Court decides to hear the case, its ruling might influence the future of the CPP as well as the U.S. ability to fulfil its commitment in the Paris Agreement.

Many U.S. states have put on hold any effort to develop state implementation plans for adhering to the CPP, while other states are pursuing climate action regardless of the uncertainty surrounding the plan's future (C2ES, 2016). Clearly, deep polarization in U.S. climate policy affects the United States' ability to live up to the promises it made in Paris. Without a firm domestic policy strategy, like the CPP or some other federal climate policy, investors and business owners will have weak incentives to make long-term business decisions that include a pathway to a low carbon economy. Moreover, the U.S. NDC under the Paris Agreement will be less credible. U.S. political parties greatly disagree on the importance of climate policy action. Most Democrats accept that climate change is a serious problem that requires political action to reduce emissions. Most Republicans, on the other hand, are not committed to addressing the climate change problem, because they do not believe in the science or because they think it is premature to risk the potential economic hardship that climate action might bring (Leiserowitz et al., 2016).

These different views regarding the need for climate policy action convey the level of willingness to recognize the Paris Agreement as a priority for the United States. While President Obama and a clear majority in the Democratic Party are fully committed, Republican leaders reacted very differently to the Agreement's adoption. The immediate reaction of leading Republicans after COP 21 indicated a looming fight over the commitment to the Paris Agreement. Senate Majority Leader Mitch McConnell said, "Obama is making promises he can't keep" and should remember that the Agreement "is subject to being shredded" after the 2016 election. With reference to the presidential election, McConnell said the Agreement could be reversed if the Republicans win the White House (Freking, 2015). Republicans argued that the deal is simply politically binding, not judicially binding, and hence barely worth any serious attention. Congressman Ed Whitfield (Republican from Kentucky) described the Paris Agreement as merely a "signal" of the Obama administration's preferences rather than a treaty. He said, "While some may claim the resulting deal is a grand triumph, the bottom line is that this was a nonbinding political document that does not impose any new obligation on the United States". He added that Obama "misled the international community in Paris" (Chemnik, 2016).

The Republican Party Convention in 2016 adopted a political platform that explicitly rejects any form of federal carbon price, and pledged to disengage the United States from any further involvement with the "non-binding" Paris Agreement. The Democratic Party Convention in 2016 supported both a carbon tax, continuation of Obama's climate policy programs, and fulfilment of pledges made in Paris. Presidential candidates Donald Trump and Hillary Clinton mirror their party's opposing views, hence representing starkly different ways forward for U.S. climate policy.

In sum, deep political polarization over climate change prevents the United States from sending a clear signal to other countries that it is ready to address carbon emissions seriously and to lead the international process envisioned by the Paris Agreement. Potentially, the 2016 presidential election could upset Obama's climate leadership and put the United States back in a position where no credible federal climate policy initiatives exist. For the time being, therefore, the potential and willingness for the United States to lead is unclear.

6. Conclusion

To build an effective climate agreement and to strengthen it over time, states might rely on two main types of factors—norms and incentives. An ideal agreement would ensure that both norms and incentives push the parties to make serious efforts to reduce emissions and to gradually reinforce those efforts.

The Paris Agreement currently relies disproportionately on norms, while doing little to restructure states' incentives so as to deter free riding. Norms and incentives thus pull in opposite directions, meaning that the outcome will depend on the force of each factor. Because virtually all economic activity entails emissions of GHGs, the incentive to free ride is much stronger in the context of climate change than in the context of other international environmental cooperation. Unsurprisingly, therefore, the historical record of climate change cooperation suggests that the force of incentives has thus far outweighed that of norms. Judged by this record, the Paris Agreement may well suffer a fate similar to Kyoto's. Kyoto, too, aimed for a series of 5-year periods with new and more ambitious commitments in every period. Yet already by the end of the first period, this architecture was clearly not viable.

On a more optimistic note, norms can change. For example, the Paris Agreement shows that today's interpretation of the common-but-differentiated-responsibilities norm differs from that of the 1990s and 2000s. Consequently, the cards are now stacked somewhat less in favour of incentives than they were then. Domestic and international norms may well continue to develop such that it becomes increasingly difficult for individuals, firms, and states to ignore pleas to limit and reduce their carbon footprints. In addition, technological progress may gradually lessen abatement costs. Such developments would further favour norms over incentives. Finally, if major emitters such as the

United States prove able and willing to take the lead, it might further strengthen cooperative norms and limit other countries' costs of compliance. Such developments might ultimately pave the way for a transformation from a logic of consequences to a logic of appropriateness in the field of climate change (Mitchell, 2015).

So far, however, deep political polarization has represented a significant barrier to U.S. leadership on climate change. Thus, while the Paris Agreement could become the start of a race to the top that sets the world on a path towards solving the climate change problem, it might also end as a flop, much like the Kyoto Protocol did. The latter outcome is particularly plausible if the United States and other major emitters prove unable or unwilling to lead.

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Conflict of Interests

The authors declare no conflict of interests.

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Commentary

The Paris Climate Agreement and the Three Largest Emitters: China, the United States, and the European Union

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Abstract
The Paris Agreement would not have come into being had China, the United States (US), and the European Union (EU), which together contribute more than half of all global greenhouse gas emissions, not signaled their intent to take major steps to reduce their domestic emissions. The EU has been at the forefront of global climate change measures for years having issued binding domestic emission reduction targets for 2020 and 2030. For many years, China refused to announce a target date for when it might begin reducing its greenhouse gas emissions, and the US Congress blocked action on climate change. In the lead up to the Paris climate negotiations, however, there were major shifts in China's and the US's climate positions. This commentary examines the climate policies of the three largest emitters and the factors motivating the positions they took in the Paris negotiations. Given that the commitments made in Paris are most likely insufficient to keep global temperature from rising 2 °C above pre-industrial levels, the commentary also considers what the likelihood is that these three major economies will strengthen their emission reduction targets in the near future.

Keywords
China; climate change; European Union; leadership; Paris; United States

Issue
This commentary is part of the issue "Climate Governance and the Paris Agreement", edited by Jon Hovi and Tora Skodvin (University of Oslo, Norway).

1. Introduction

The Paris Agreement marks the beginning of a new phase in international efforts to promote climate mitigation and adaptation. The agreement sets a goal of maintaining the global temperature rise to below 2 °C above pre-industrial levels, and to strive for no more than 1.5 °C. As of August 1, 2016, 162 Intended Nationally Determined Contributions (INDCs) had been submitted to the United Nations Framework Convention on Climate Change (UNFCCC) Secretariat (UNFCCC Secretariat, 2016). As the countries of the European Union (EU) submit a joint INDC, this means that almost 200 countries have submitted pledges. Existing pledges do not, however, appear to go far enough to remain within the 2 °C target. An assessment made by an international team of experts and published in the journal *Nature* estimates that the existing INDCs would most likely only keep temperature rises at between 2.6 °C and 3.1 °C by 2100 (Rogelj et al., 2016).

Although the global nature of the agreement is its hallmark, it would not have come into being had the three largest greenhouse gas (GHG) emitters not signaled that they were prepared to take action. Combined, China (30 percent), the US (15 percent), and the EU (EU-28) (10 percent)—contribute more than half of all global greenhouse gas emissions (PBL Netherlands Environmental Assessment Agency, 2015).

Within a few weeks of each other between October and November 2014, the EU, the United States (US), and China each pledged to reduce their GHG emissions. Given the failure of previous attempts to forge a global

agreement acceptable to all three of these major emitters, what led to their Paris commitments? Why were they able to find the politically feasible solutions (Underdal, 1998) which had escaped them during the negotiations in Copenhagen?

The Paris Agreement is both legally binding and voluntary. The agreement obliges all parties "to undertake and communicate ambitious efforts" and to have these efforts represent "a progression over time". It also expects each signatory to "prepare, communicate and maintain successive nationally determined contributions that it intends to achieve." Every five years a nationally determined contribution is to be communicated; a contribution may be adjusted "with a view to enhancing its level of ambition" (UNFCCC, 2015). Can such upward adjustments be expected from China, the EU, and the US? This question is quite critical as without a strengthening of the reduction commitments made by the three largest emitters, it is doubtful that other countries could be persuaded to go farther than they agreed to in Paris. Further action will be needed if there is to be a realistic chance of maintaining global average temperature increases to within the 2 °C target.

2. The European Union

Over the past two decades the EU has been the most consistent in not only calling for the establishment of binding international climate agreements but in backing these calls up with its own binding GHG emission reduction targets. It has exhibited a kind of unilateral leadership, "setting the pace for others to follow" (Underdal, 1994, p. 183). For the 1997 Kyoto Protocol, the EU committed to an 8 percent reduction in its GHG emissions compared with 1990 levels. A decade later, it committed to three goals to be met by 2020: a 20 percent reduction in GHG levels (compared to 1990 levels), obtaining 20 percent renewables in the energy consumption mix, and reducing energy consumption with a 20 percent improvement in energy efficiency (compared to projected levels) (European Commission, 2010).

In October 2014, the EU announced its 2030 targets: a binding 40 percent GHG emissions reduction target (relative to 1990 levels), a renewable energy target of 27 percent and a minimum energy efficiency improvement of 27 percent. Unlike in 2008 when the EU announced its 2020 target, no agreement has been reached on how responsibility for achieving these targets on a country-by-country basis is to be determined.

A variety of factors can explain why the EU has been at the forefront of global efforts to tackle climate change. One is the strong level of public concern with climate change. In a 2015 Eurobarometer poll, 91 percent of respondents found climate change to be a serious or very serious problem (European Commission, 2015). A second is strong concern about long-term energy security. European supplies of fossil fuels are limited. The EU is the world's single largest energy importer; it imported over 53 percent of the energy it consumed in 2013 (Eurostat, 2015). This is a factor behind the establishment in 2015 of the Energy Union, an initiative to enhance coordination on energy policy among the EU Member States focusing on five policy areas: supply security, an integrated internal energy market, energy efficiency, climate change, and research and innovation for low carbon technologies.

Europe's relative share of global GHG emissions at the time of the Paris negotiations (10 percent) was considerably less than it was at the time of the Kyoto negotiations (15 percent). Exerting soft power by example (showing that a transition to a low carbon economy is possible), may be one of the best ways for Europe to continue to exert global leadership in this policy area as its relative international weight declines along with its declining emissions levels (Skodvin & Andresen, 2006)? The transition is viewed by many as a way of developing a more sustainable economy, stimulating new industries and creating new jobs.

Still, there are many barriers to overcome for a successful energy transition. Path dependencies remain strong. The oil, coal, and gas industries exert considerable pressure on politicians. Environmental interests are also not equally strong across the EU. As renewables have grown in some parts of Europe, so too have efforts to block their progress especially in regions which feel threatened by their success.

There are different views about the best road ahead for Europe. When the EU 2030 emission targets were being negotiated, Germany was pushing for relatively ambitious climate targets. Poland resisted these efforts arguing that Europe was taking on too much of the global climate burden and that its coal-dominated economy would be threatened by the changes. Great Britain opposed the German push for a higher renewables target because of their ambitions to invest further in nuclear energy (Dehmer, 2014) although they did support Germany in calling for a more ambitious energy efficiency target. In the end, the EU settled on 40-27-27 targets rather than higher targets wanted by the European Parliament and some more progressive member states.

There is also the added challenge of the resurgence of nationalist and far right parties. Populism in Europe has been driven by public frustration with economic inequalities, fears stemming from globalization, and reactions to immigrants entering the EU from Eastern Europe and conflict ridden and economically challenged regions in the Middle East and Africa. Marie Le Pen's National Front in France is now a political force to be reckoned with. The party is opposed to participation in the international climate agreement. David Cameron's political gamble to hold a referendum on membership in the EU ended badly. Brexit will mean

the EU will lose one of its stronger supporters of climate action although British–EU cooperation on climate change is likely to continue in some form.

To date, no effort sharing agreements have been reached among the member states to determine what a fair allocation of burden should be towards meeting the EU's GHG and renewable energy targets. In this political environment, further strengthening of climate targets will be very difficult. EU leadership on climate in the future is likely to be more strongly dependent on developments in the US, China, and other emerging economies.

3. The United States

Although the William J. Clinton Administration signed the Kyoto Protocol in 1997, George W. Bush abandoned the agreement in 2001. Upon entering office in 2009, Barack Obama signaled his intentions to once again assume a US leadership role in the climate negotiations. Two interconnected strategies have been pursued. One has been gaining cooperation on action from China and India and the other has been targeting emissions from automobiles and power plants domestically.

Years of efforts to improve bilateral climate cooperation with China led to the joint press statement by China's President Xi Jinping and President Obama in November 2014 in which they announced their 2030 climate targets. Obama pledged that the US would cut its emissions by 26–28 percent below 2005 levels by 2025, with a best effort to reduce by 28 percent. President Xi Jinping announced that China would peak its GHG emissions by around 2030 and if possible earlier, increase the non-fossil fuel share of energy to 20 percent, lower the carbon intensity of the GDP by 60 to 65 percent below 2005 levels by 2030 and expand forest coverage. This remarkable achievement, which helped to break a long standing deadlock in the international negotiations (Underdal, Hovi, Kallbekken, & Skodvin, 2012), would not have been possible had both countries not shown that they were prepared to take serious steps to address their domestic GHG emissions.

In order to show climate progress, the Obama administration has had to find a way to work around Congressional opposition to climate action. It has done this through various executive actions. The Environmental Protection Agency (EPA) has mandated Federal Government facilities to cut their GHG emissions by 40 percent compared to 2008 levels by 2025 and to expand the use of electricity from renewable sources. The EPA has issued a series of new fuel efficiency standards for automobiles and light- and heavy- vehicles based on the US Clean Air Act. In 2013, the President's Climate Action Plan (2013) was announced (Executive Office of the President, 2013). The plan outlined measures to cut carbon pollution to make it possible to meet the "voluntary" pledge to cut emissions Obama made in Copenhagen (to reduce US GHG emissions by 17 percent of 2005 levels by 2025) and paved the path for the establishment of the Clean Power Plan. The Clean Power Plan is the single most important element of the Obama administration's climate strategy. It aims to cut CO_2 emissions from power plants by 32 percent by 2030 (EPA, 2015a).

The Obama administration moreover worked to shape the Paris Agreement in such a way that it would not require ratification by the Senate. The Obama administration's position is that the legally binding aspects of the agreement are already covered by earlier agreements (like the UNFCCC) which the Senate has already ratified and thus, do not require renewed approval. The INDCs are non-binding, aspirational targets, and thus, as interpreted by the Obama administration, do not need Congressional approval.

While Obama's climate initiatives have been welcomed by environmentalists, they have been attacked by conservatives. Republican Senator James Inhofe, Chairman of the Senate Environment and Public Works Committee, well-known for his climate skepticism, has challenged the Obama administration's position stating in a press release: "Despite this administration's desperate effort to demonstrate an international agreement on climate change, the announcement of a final climate deal from Paris is no more significant to the US than the Kyoto Protocol announcement 18 years ago….This agreement is no more binding than any other 'agreement' from any Conference of the Parties over the last 21 years" (Inhofe, 2015). Republican Presidential candidate Donald Trump has vowed to pull the US out of the climate agreement if he is elected. In contrast, Democratic Presidential candidate Hillary Clinton has signaled her intentions to continue with and even strengthen US climate actions.

Beyond Obama's climate initiatives, it should be noted that some emissions reductions are due to changes in the fuel mix. The 2005 Energy Policy Act, a signature achievement of Vice President Dick Cheney, eased restrictions on fossil fuel extraction on federal lands. One consequence of the policy was that it eased permitting for unconventional oil and gas drilling, also known as fracking. Cheap oil and gas have led to a displacement of coal and a concomitant reduction in GHG emissions due to the lower carbon content of gas relative to coal. Thus, whereas US GHG emissions were rising through 2007, they have since declined quite dramatically. Emissions in 2013 were 5.9 percent higher than 1990 levels, far less than at their peak in 2007 when they were 17 percent higher (EPA, 2015b). These emission reductions should not, however, be considered sustainable as eventually, these natural gas reserves will be depleted.

The success of the Obama administration's climate initiatives and the potential to eventually strengthen the US GHG reduction target will depend heavily on the

outcome of the 2016 presidential and Congressional elections and court rulings on Obama's use of executive orders.

4. China

In China's view, the main historical responsibility for rising GHG emissions lies with the US, Europe, Japan, and other rich countries. China has for many years resisted pleas by the international community for it to cap its rapidly rising emissions and has instead argued that developed countries have to do more to reduce their emissions and to assist developing countries financially and technologically with climate mitigation and adaptation.

In 2009 in Copenhagen, China announced that it was not prepared to take on an emissions reduction commitment, but it would reduce its energy intensity by 40 to 45 percent of 2005 levels by 2020, expand its use of non-fossil fuels to about 15 percent, and increase forest cover by 40 million hectares. China's announcement in the lead-up to the Paris negotiations that it was now prepared to peak its emissions around 2030 is thus a significant break with the past. What is behind China's change in position?

To an extent international pressure is a factor. China became the world's largest GHG emitter, surpassing US emission levels in 2006. This makes it increasingly difficult to shift exclusive blame for climate change to the West. It has also become more difficult to use per capita emission differentials to argue for exceptions for China. In 2012, per capita GHG emissions in China (7.1 tons) were still well below those in the US (16.4 tons) but they were basically the same as the EU average (7.4 tons) (PBL Netherlands Environmental Agency, 2013).

There is also a growing desire in China to be recognized as an international power. That China together with the US and the EU set the tone for the Paris negotiations has strong symbolic power.

Still more than international pressure, domestic factors have shaped China's changing stance on climate action. China is experiencing severe pollution problems and growing civil dissatisfaction with pollution levels. Air pollution has reached crisis levels largely because of the dramatic growth in automobiles, continued heavy reliance on coal (down from about 76 percent in 1990 but still at about 63 percent in 2013) and the growing demand for oil.

As is the case in the EU, China is concerned about long-term energy security having become a net energy importer. With a population that is not expected to peak until around 2025 at about 1.41 billion (Fu, 2015) and an economic growth rate that although slowing is still at between 6 and 7 percent per annum, China's appetite for energy will remain robust.

China thus has strong incentives to promote alternative sources of energy and energy efficiency. Government leaders also see considerable innovation potential linked to the greening of the economy and the development and export of green technologies and can use support of a green economy as an argument in favor of modernization and the shutting down of inefficient industries, which otherwise would be politically more challenging.

These various factors have contributed to China's leadership's decision to introduce a series of increasingly ambitious environmental laws and programs. In March 2014, Premier Li Keqang declared war against pollution. A program to reduce emissions from the top 10,000 largest carbon dioxide emitters was included in the 12th Five Year Plan. China introduced seven pilot regional carbon emissions trading schemes and will launch its national carbon emissions trading scheme in 2017 (Chen & Reklev, 2014). As of 2014, China was investing more in renewable energy than any other country in the world and also had the largest amount of installed capacity (Ren21, 2015). The 13th Five Year Plan issued in early 2016 includes measures intended to help China implement its 2030 climate, energy efficiency, and fuel switching targets.

5. Conclusion

Assessments suggest that the INDCs which countries have proposed for the Paris Agreement do not add up to what it will take to maintain global temperature increases below 2 °C. The political situation in the EU and the US will make it challenging but not impossible to strengthen their climate action commitments in the coming period. China may be best positioned to further strengthen its climate targets assuming that its political situation does not destabilize. That China announced it would cap its emissions by 2030 or earlier, suggests that the leadership may believe that an earlier peak is possible. If the population peaks in 2025, this too would increase the likelihood that emissions could begin to decline around this time, assuming energy efficiency improvements continue.

If China were to step up to take a stronger leadership role on climate and make an early announcement of plans to move up the date by when it plans to peak and then begin to reduce its GHG emissions, it would weaken the arguments of populists in the West that major transition countries are not doing their fair share.

At the same time, the EU and the US will have to work to convince skeptics of the benefits of early action. Frontrunners on both sides of the Atlantic have already done much to show the benefits that can be achieved from pursuing low carbon energy transitions.

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Conflict of Interests

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