Uneven Ambitions: Explaining National Differences in Proposed Emissions Reductions

Julia A. Flagg
Department of Sociology and Environmental Studies Program, Connecticut College, United States of America

Thomas K. Rudel
Department of Human Ecology, Rutgers University, New Jersey, United States of America

Abstract

Large-scale commitments to reduce greenhouse gas emissions have been difficult to achieve, in part because we do not understand the social conditions that encourage mitigation. An analysis of variations across countries’ emissions reduction plans, submitted for the United Nations’ 2015 Paris conference, provides a way to identify the conditions that make societies more likely to commit to emissions reductions. A metric created from a country’s pledged emissions reductions and its baseline year for calculating emissions makes it possible to compare ambition across countries. Possible explanations for cross-national differences in ambition come from different approaches in environmental social science. Societies with ecologically modernized technologies, without fossil fuel–dependent treadmills of production, with mobilized citizens, and with effective governance adopted more ambitious mitigation plans. Given their importance in shaping the 2015 emissions reduction plans, these same social forces could play important roles in the future acceleration of emissions reduction commitments.

Keywords: climate change, governance, inequality, mitigation, nationally determined contributions (NDCs)

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1 Corresponding author: julia.flagg@conncoll.edu.
Introduction

Persistently high and rising levels of greenhouse gases (GHGs) in the atmosphere underline the importance of rapid reductions in GHG emissions if we are to avert catastrophic global warming. Repeated warnings about the climatic effects of high levels of GHG emissions (Intergovernmental Panel on Climate Change [IPCC], 2018) have not provided the political impetus to mitigate in many countries. Against this backdrop of inertia, activists and analysts have asked when and where might we expect leaders to make commitments to emissions declines. Analyses of national plans for emissions reductions, produced for the United Nations’ 2015 Paris Conference of the Parties (COP21), presented here and elsewhere (den Elzen et al., 2016; Pauw et al., 2018; van Soest et al., 2017), provide an initial answer to this question. We quantify the Paris commitments to emissions reductions and use the variations in these numbers across countries to investigate the circumstances that elicit pledges of large-scale emissions reductions from leaders.

The commitments to reduce emissions come from national plans for reductions in GHG emissions submitted by countries who participated in the 2015 United Nations’ COP21 meeting in Paris. The plans, referred to as “nationally determined contributions” (NDCs), were part of a “pledge and review” process, first agreed upon at the 2009 Copenhagen COP15, in which countries pledged to reduce GHG emissions by a certain amount by a given date. At later COP meetings, the national delegations would review their progress in reducing emissions and adjust their plans accordingly (Rose et al., 2017). With each successive revision, the NDCs would become more ambitious about emissions reductions. Since these initial mitigation commitments are the foundation upon which future emissions reduction pledges rest, understanding the conditions that shaped these initial pledges is important for understanding future pledges and future emissions reductions.

The Paris NDCs represented a shift in climate politics because, unlike earlier agreements, they were voluntary and all countries agreed to produce them. For this reason, the structure of the Paris NDCs has been called a “radically new approach” to climate governance (Joyce, 2015, para. 3). The voluntary nature of the NDCs made them a “bottom-up” approach to climate mitigation in which variable conditions within countries shaped the size of national commitments to emissions reductions (Vandyck et al., 2016). The United Nations Framework Convention on Climate Change (UNFCCC) secretariat acknowledged the circumstantial character of these pledged mitigation efforts. In their words, “each climate plan reflects the country’s ambition [emphasis added] for reducing emissions, taking into account its domestic circumstances and capabilities” (UNFCCC, 2018, para. 5). Thus, it is reasonable to characterize countries as having approaches to GHG emissions reductions and to expect that these approaches will reflect the different political, economic, and ecological circumstances of the participating countries. Variations in
pledges to reduce emissions would therefore provide an opportunity to investigate how contextual factors have influenced different countries’ commitments to large-scale emissions reductions.

It is very possible that countries’ pledged emissions reduction commitments will not align with their actual emissions reductions. Although measuring whether countries actually reduce emissions in line with their Paris NDCs falls outside the boundaries of the present analysis, we note that other recent case study research has found that the act of pledging to reduce emissions can generate the political impetus necessary to take initial steps to reduce emissions (Flagg, 2019). We expand the scope of research on emissions reductions commitments through a large cross-national comparative study.

Climate change researchers over the last decade have called for this type of “large-N” comparative study of national climate policies (Bernauer, 2013, p. 434; Le Quere et al., 2019). Comparisons of differences between the climate policies of Annex 1 (developed) countries and non-Annex 1 (developing) countries in the Kyoto Protocol have established some basic tendencies that run across earlier climate policies. The extent of economic development in countries shaped plans for mitigation and for ratification of the 1997 Kyoto Protocol (Givens, 2014; Zahran et al., 2007). Initial evidence suggests that, despite being heralded as a “radically new approach” to climate governance, a similar pattern may have emerged in the NDCs. For example, developing countries often make their NDC commitments at Paris conditional on the receipt of financial assistance from developed countries to meet some of the costs of mitigation (Pauw et al., 2019).

However, the absence of a valid and reliable measure of mitigation efforts has handicapped some early analytic efforts to assess whether these old distinctions in policy hold up, or whether new patterns have emerged. For example, some prior research draws gross distinctions between developed and developing countries without identifying the proximate causes for some countries but not others ratifying the Kyoto Protocol (Zahran et al., 2007). To move beyond these generalities, we construct a quantitative measure of mitigation efforts—the proposed emissions reduction (PER) score—and use it to describe differences in national mitigation plans. We then analyze covariations between nations’ scores and other socioeconomic indicators. These analyses identify three sets of social forces that appear to account for differences in the levels of ambition in the NDCs.

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2 A “large-N” comparative study refers to research that compares data from a large number (N) of sources.

3 The United Nations’ Climate Change Convention, established at the 1992 Rio de Janeiro meeting, created a regulatory approach that distinguished between two types of nations: Annex I developed countries and non-Annex 1 developing countries.
The determinants of pledged reductions in emissions: Three theoretical approaches

Three fundamental patterns in the relationships between societies and their natural environments offer potential explanations for cross-national differences in the emissions reductions pledged at the Paris conference. One line of argument stems from ecological modernization (Mol et al., 2009) in industrialized societies. The distal cause for differences in commitments to emissions reduction is economic development. This is why early ecological modernization theory was developed in and initially applied to societies in Western Europe (Mol & Sonnenfeld, 2000). Economic development has both accelerated GHG emissions and created affluent societies with the political and technological means to reduce GHG emissions through the introduction of more fossil fuel–efficient technologies. Following this line of reasoning, emissions from the fossil fuels that power industrial technologies have, in large part, driven climate change, so the substitution of newer, more fuel-efficient technologies for older, dirtier, less fuel-efficient technologies should spur reductions in overall emissions. Fisher and Freudenburg (2001) called this process “superindustrialization.” Applying this line of argument to plans for future emissions reductions, ecological modernization theorists would argue that the most ambitious plans for emissions reductions should come from those societies that have already achieved substantial reductions in emissions through the development of cleaner, more fuel-efficient technologies. Past success in emissions reductions would encourage state planners to accept the challenge of making further reductions in emissions.

An alternative societal dynamic that might shape the substance of NDCs has its origins in the treadmill of production theory (Gould et al., 2008). According to this political–economic dynamic, industrialized societies dominated by large firms extract natural resources from the environment and return harmful additions back into the environment (Rudel et al., 2011). Companies, agencies, and individuals purchase a continuous stream of these products (Givens, 2014). Since the owners of these enterprises seek an unending stream of profits, both they and the firms’ workers appear to be caught on a treadmill of production.

Not all firms emit large amounts of greenhouse gases during the course of their economic activities. For example, service industries probably generate relatively small volumes of greenhouse gases compared with manufacturing and mining companies. This line of argument about emissions intensity across different industrial political economies can be extended to regional political economies. In places where GHG-intensive production processes characterize regional treadmills of production, political and economic elites would be reluctant to curtail emissions because it would come at great economic cost to owners and workers. For example, regions in the
United States that produce large volumes of GHG-rich fuels like coal would refuse to create NDC plans for large-scale emissions declines (Fisher, 2004). The same pattern should prevail transnationally, with oil-producing regions like the Middle East submitting plans for NDCs that do not reduce GHG emissions.

A third societal dynamic that may help explain countries’ pledges is world society theory. This approach emphasizes that countries become similar to one another as norms propagate across state lines (Frank et al., 2000; Hironaka, 2014). In this approach, civil society plays an important role for spreading norms about curbing climate change (Hironaka, 2014). This line of influence has been visible at the recent UNFCCC COP meetings where representatives from international nongovernmental organizations (INGOs) have gathered to press for collective action to limit further warming. Taken together, the leaders and members of these organizations constitute the sinews of civil society. In countries where many citizens belong to INGOs, global culture is more highly institutionalized (Hironaka, 2014). It is in these contexts, with a high degree of institutionalization of the world society, that we would expect activists for the INGOs to shape political processes in ways that would expand the scale of planned emissions reductions in the NDCs.

While the above discussion highlights a global process of isomorphism, similar normative dynamics may explain some of the regional convergence in NDCs. Sikkink (2011), for example, found that the norm of holding heads of state accountable for human rights violations spread first among countries in the same geographic region before becoming a global phenomenon. In a similar fashion, countries may mimic the emissions reduction pledges of their neighbors. Membership in organizations of states might also, through the spread of norms (DiMaggio & Powell, 1983; Rose et al., 2017), induce the adoption of similar plans for emissions reductions among the members. Discussions sponsored by regional organizations like the European Union (EU) or the Organization of Petroleum Exporting Countries (OPEC) could facilitate the spread of similar policies across state lines, thus leading to a kind of neighboring effect in which countries mimic the actions of other nearby or similarly situated countries. Previous research provides some evidence of this neighboring effect. For example, using data from 24 developed countries between 2006 and 2012, Tobin (2017) found that the combination of being a member of the EU, having high GDP per capita, and having few political constraints was conducive to having more ambitious climate policies. The ecological modernization, treadmill of production, and world society theories all generate distinct hypotheses about the social forces that have shaped the substance of NDCs.

- H1: Countries with previous declines in GHG emissions adopted more ambitious mitigation pledges in their NDCs.
- H2: Countries with fossil fuel–based political economies adopted less ambitious mitigation pledges in their NDCs.
• **H3**: Countries in which citizens hold greater membership in environmental INGOs adopted more ambitious mitigation pledges.

While we distinguish between each hypothesis for the sake of clarity and because each hypothesis suggests a distinct societal dynamic, the three theoretical approaches are not mutually exclusive. For example, the treadmill of production could explain why, in an oil-dependent regional economy like the Middle East, the NDCs tend to preserve GHG emissions at their current levels. At the same time, this lenient norm about GHG emissions could have spread across countries in the Middle East, per world society theory, to create a uniform pattern among the NDCs from the region. Similarly, large firms with treadmill-like production processes would have the capital to reduce GHG emissions from their products through ecological modernization at the same time that the sheer volume of products coming off their treadmill-like assembly lines sustains a high level of emissions.

Governance practice provides an additional, proximate explanation for variations in NDC commitments. It represents a control variable in this study in that it would work in tandem with the other theoretical approaches, outlined above, in explaining variations in NDCs. Previous research provides ample evidence that good governance is associated with higher levels of commitment to climate policies. States with more civil liberties implemented more components of the UNFCCC regime (Dolšak, 2009). States with greater political openness and higher scores on indices of democracy were more likely to ratify the Kyoto Protocol (Zahran et al., 2007). In contrast, among industrialized democracies, countries with higher perceptions of political corruption have had weaker climate policies (Rafaty, 2018). Flagg (2015) found that countries that score highly on global indices of good governance were more likely than other countries to pledge to become carbon neutral (i.e., to achieve net zero emissions) in the future. Countries with good governance promise and provide public goods with greater independence from the influence of special interest groups like the fossil fuel industries (Fisher, 2004). Strong states have a greater capacity to mobilize people for collective efforts (Migdal, 1988). Given these governance capacities, delegations in countries with good governance would have more confidence in their ability to achieve substantial reductions in emissions and would be more likely to pledge these reductions as goals in NDC plans. For these reasons, countries with high scores on governance would pledge ambitious reductions in GHG emissions at the Paris meetings.
Materials and methods

Dependent variable—the proposed emissions reduction (PER) score

The substantive and methodological contributions of the paper begin with a quantified measure of an NDC’s pledged decline in emissions, that is, of its ambition; the PER score. The PER score incorporates (1) a country’s pledged percentage decline in emissions, and (2) its baseline year for calculating emissions declines. This metric is the dependent variable in the multivariate analysis presented below. The data for the construction of a country’s level of ambition in its NDC comes from the INDC⁴ Dashboard of the CAIT Climate Data Explorer website (World Resources Institute [WRI], n.d., table). This information on percentage declines in emissions and baseline years comes from the summary information for each NDC that is listed in the “(I)NDC summary” column of the table available at this website. Where the NDC commits a country to a percentage decline in emissions and establishes a baseline year for realizing this goal, we can compute the proposed numerical decline in emissions for that country and include it in the study.

Some NDCs do not meet these criteria and are therefore not comparable with other NDCs because they do not set quantifiable emissions reduction goals. Where the emissions commitment is conditional on the uncertain receipt of financial assistance from other countries, we cannot calculate an emissions decline commitment for that country. For example, if assistance from wealthy donor states is not forthcoming or is not large enough from the point of view of the recipient countries, then they may take little action to reduce emissions (Pauw et al., 2019). These contingencies do not make for predictable emissions declines. As a result, if the (I)NDC summary information in the CAIT database (WRI, n.d.) gives the emissions pledge as contingent on the receipt of foreign aid, we had to exclude the country from the study.

Similarly, several large countries such as China and India have made their commitment in terms of percentage declines in emissions per unit of GDP. Because these NDCs do not specify an upper limit for their GDPs, their aggregated emissions and emissions declines cannot be projected for a target year. For this reason, these “energy intensity” NDCs cannot be meaningfully compared with the NDCs that project percentage emissions declines from a baseline year for a particular target year.

In sum, we excluded the conditional NDCs and the energy intensity NDCs from the analysis because they could not be compared with the quantifiable NDCs.

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⁴ INDC = intended nationally determined contribution.
After reviewing each country’s information on the INDC Dashboard of the CAIT Climate Data Explorer (WRI, n.d.), we calculated the PER scores. Table 1 contains the list of countries included in the analysis and their PER scores. Table 2 lists the countries excluded from the analysis because they did not submit quantifiable NDCs. Almost all of the countries without quantifiable NDCs come from the Global South. Missing data on some of the independent variables for a further 11 countries (Andorra, Cook Islands, Eritrea, Liechtenstein, Marshall Islands, Monaco, North Korea, Oman, Palestine, San Marino, and the Federated States of Micronesia) reduced the number of cases to 126 countries whose NDCs could be compared and analyzed. The 11 countries excluded from the analysis on the basis of missing data share a tendency to be small (in land area and population size) in comparison to countries included in the sample. Small size may account for the difficulty in obtaining relevant data from these countries. The emissions from the 126 countries in the study collectively represented about 58% of global GHG emissions from 2014 (WRI, n.d.).

Table 1. List of countries in sample and proposed emissions reduction (PER) scores

| Nation               | PER score | Nation                  | PER score | Nation                  | PER score | Nation                      | PER score |
|----------------------|-----------|-------------------------|-----------|-------------------------|-----------|-----------------------------|-----------|
| Afghanistan          | 26.40     | Czech Republic          | 10.00     | Japan                   | −3.00     | Republic of the Congo       | −13.00    |
| Albania              | 28.50     | Democratic Republic of Congo | 23.00 | Jordan                 | 26.00     | Romania                     | 13.00     |
| Algeria              | 33.00     | Denmark                 | −24.00    | Kazakhstan              | −15.00    | Russia                      | −27.50    |
| Angola               | 5.00      | Djibouti                | 0.00      | Kenya                  | 10.00     | Sao Tome and Principe       | 16.00     |
| Argentina            | 21.60     | Dominica                | −20.70    | Kiribati                | 27.20     | Senegal                     | 35.00     |
| Australia            | −12.00    | Dominican Republic      | −5.00     | Kyrgyzstan              | 27.38     | Serbia                      | −9.80     |
| Austria              | −21.00    | Ecuador                 | 12.40     | Latvia                  | 9.00      | Seychelles                  | 11.00     |
| Azerbaijan           | −35.00    | Equatorial Guinea       | 0.00      | Lebanon                 | 25.00     | Slovakia                    | 0.00      |
| Bahamas              | 10.00     | Estonia                 | 2.00      | Lesotho                 | 30.00     | Slovenia                    | −5.00     |
| Bangladesh           | 35.00     | Ethiopia                | −24.00    | Liberia                 | 25.00     | Solomon Island              | −5.00     |
| Barbados             | −5.00     | Finland                 | −24.00    | Lithuania               | 6.00      | South Korea                 | 3.00      |
| Belarus              | −28.00    | France                  | −22.00    | Luxembourg              | −25.00    | Spain                       | −11.00    |
| Belgium              | −20.00    | Gabon                   | −15.00    | Macedonia               | 7.00      | Sri Lanka                   | 36.50     |
| Benin                | 27.37     | Gambia                  | −9.40     | Madagascar              | 26.00     | St. Kitts                   | 5.00      |
| Bosnia               | 38.00     | Georgia                 | 25.00     | Maldives                | 30.00     | St. Lucia                   | 17.00     |
| Botswana             | 5.00      | Germany                 | −23.00    | Malta                   | −4.00     | St. Vincent                 | 13.00     |
| Brazil               | −22.00    | Ghana                   | 25.00     | Mauritania              | 17.70     | Sweden                      | −25.00    |
| Bulgaria             | 15.00     | Greece                  | −1.00     | Mexico                  | 15.00     | Switzerland                 | −50.00    |
| Burkina Faso         | 33.40     | Grenada                 | −10.00    | Moldova                 | −65.50    | Tanzania                    | 25.00     |
| Burundi              | 37.00     | Guatemala               | 3.80      | Mongolia                | 26.00     | Thailand                    | 20.00     |
| Cambodia             | 13.00     | Guinea                  | −9.00     | Montenegro              | −30.00    | Togo                        | 28.86     |
### Uneven Ambitions

| Nation                  | PER score | Nation     | PER score | Nation     | PER score | Nation         | PER score |
|-------------------------|-----------|------------|-----------|------------|-----------|----------------|-----------|
| Cameroon                | 13.00     | Haiti      | 35.00     | Morocco    | 23.00     | Trinidad and Tobago | 25.00     |
| Canada                  | −15.00    | Honduras   | 25.00     | Namibia    | −49.00    | Tuvalu         | −40.00    |
| Central African Republic| 35.00     | Hungary    | 8.00      | Netherlands| −21.00    | Uganda         | 18.00     |
| Chad                    | 21.80     | Iceland    | −40.00    | New Zealand| −15.00    | Ukraine        | −40.00    |
| Chile                   | −13.00    | Indonesia  | 11.00     | Niger      | 36.50     | United Kingdom  | −22.00    |
| Colombia                | 20.00     | Iran       | 36.00     | Norway     | −40.00    | USA            | −12.00    |
| Comoros                 | −44.00    | Iraq       | 30.00     | Paraguay   | 30.00     | Venezuela      | 20.00     |
| Costa Rica              | −3.00     | Ireland    | −15.00    | Peru       | 10.00     | Vietnam        | 32.00     |
| Côte d’Ivoire<sup>a</sup>| 12.00     | Israel     | −11.00    | Philippines| −30.00    | Yemen          | 26.00     |
| Croatia                 | 8.00      | Italy      | −18.00    | Poland     | 8.00      |                |           |
| Cyprus                  | −9.00     | Jamaica    | 32.20     | Portugal   | −13.00    |                |           |

*Note. N = 126. Negative numbers represent proposed emissions declines. <sup>a</sup> Côte d’Ivoire is listed as “Ivory Coast” at the source.*

Source: Authors’ data generated from data at CAIT Climate Data Explorer—Paris Contributions Map—INDC Dashboard (WRI, n.d.).

### Table 2. Countries that made nationally determined contributions (NDCs) that are not comparable with other NDCs in sample

| Antigua and Barbuda | Malaysia | Somalia          |
|---------------------|----------|------------------|
| Armenia             | Mali     | South Africa     |
| Bahrain             | Mauritius| South Sudan      |
| Belize              | Mozambique| Sudan          |
| Bhutan              | Myanmar  | Suriname         |
| Bolivia             | Nauru    | Swaziland        |
| Brunei              | Nepal    | Tajikistan       |
| Cabo Verde<sup>a</sup> | Nigeria | Timor-Leste    |
| China               | Niue     | Tonga            |
| Cuba                | Qatar    | Tunisia          |
| Egypt               | Pakistan | Turkey           |
| El Salvador         | Palau    | Turkmenistan     |
| Fiji                | Panama   | United Arab Emirates |
| Guinea Bissau       | Papua New Guinea | Uruguay |
| Guyana              | Rwanda   | Uzbekistan       |
| India               | Samoa    | Vanuatu          |
| Kuwait              | Saudi Arabia | Zambia     |
| Laos                | Sierra Leone | Zimbabwe  |
| Malawi              | Singapore|                  |

*Note. N = 56. <sup>a</sup> Cabo Verde is listed as “Cape Verde” at the source.*

Source: CAIT Climate Data Explorer—Paris Contributions Map—INDC Dashboard (WRI, n.d.).
The sample, while missing some large countries like India and China, ranges across some primary socioeconomic and geographic divides that distinguish countries from one another on the climate change issue. There are large subsamples of countries from the less developed Global South as well as the more developed Global North. The sample also contains more vulnerable small island states as well as less vulnerable large continental states. It includes more variation in global economic development than the samples used in recent work on cross-national climate policy stringency (Rafaty, 2018), climate policy ambition (Tobin, 2017), and emissions reduction (Le Quere et al., 2019) that were limited to analyses of industrialized countries.

The sample contains 28 EU countries who submitted a collective NDC, and then, through a burden-sharing protocol, outlined individual NDCs for each country (European Commission, Directorate-General for Climate Action, 2016). We use these burden-sharing goals to calculate the emissions reduction ambitions for individual EU countries. Table 1 lists the PER scores for individual countries in the EU.

The quantifiable NDC plans have three dimensions. First, there is a target date. The plans indicate the year by which a country will have achieved the stipulated percentage decline in emissions. Many state officials preferred 2030 as a target date, perhaps because the United Nations Environmental Programme (UNEP) chose 2030 as the date for assessing global progress in emissions reductions. UNEP (2017) officials argued that the world needs to achieve a 30% decline in emissions by 2030 to have a reasonable chance of limiting global warming to a 2°C increase. So many countries chose 2030 as a target date that there is little variation in target dates across countries. For this reason, target dates do not figure centrally in the analyses in this paper.

Second, NDCs specify a percentage decline in total carbon emissions, for example, a 25% decline or a 40% decline in emissions from a business-as-usual scenario in the baseline year. Third, the NDCs stipulate a baseline year, like 1990, 2005, or 2030. GHG emissions in that baseline year establish a benchmark from which the percentage declines in emissions will be calculated. As Rowan (2019) points out, the choice of a baseline year has a large impact on the degree of difficulty in achieving an emissions reduction goal. During the twentieth and twenty-first centuries, GDPs and GHG emissions increased over time, but the increases in GHG emissions were slower, due no doubt to the gradual decoupling of economic growth from energy consumption (Jorgenson & Clark, 2012). This pattern has implications for the selection of a baseline year in the NDC plans. Some countries would choose an early year, like 1990, when economies were relatively small and total emissions were relatively low. Then they would choose a percentage decline of some magnitude, like 40%, from the level of emissions in the baseline year. Given the relatively small size of the 1990 economy and emissions relative to later years, a 40% decline in emissions from that year would produce a low volume of permissible GHG emissions. Other
countries might choose a decline of a similar magnitude (45%), but elect a much later baseline year, like 2030. In this instance, that country’s economy would have an additional 40 years to grow from 1990, so the economy and associated GHG emissions would be much larger than it was in 1990. Poorer countries would choose later baseline years to give their economies more time to grow before phasing in emissions reductions that could restrict economic growth. Although the spread of clean energy sources would reduce the carbon (energy) intensity of each $1 of output by the later baseline date, the overall level of allowable emissions would still be higher because the economy and the volume of associated emissions would have grown larger since 1990. A 40% decline in emissions in the larger 2030 economy therefore allows for a higher level of emissions than a 40% decline in a much smaller 1990 economy. However, if the countries choosing a 1990 or 2005 baseline year for their emissions reductions have larger economies than countries choosing a 2030 baseline year, then the amounts of actual emissions in 2030 might become more equal across countries compared with the distribution of emissions across countries in 1990 (Zimm & Nakicenovic, 2020). This convergence in emissions occurs because the poorer countries with lower emissions get a chance to grow their economies before they begin serious efforts to reduce emissions.

The countervailing effects of a high percentage reduction in emissions and a late baseline year can be captured if we use the following formula to quantify the level of emissions reduction ambition in an NDC plan.

\[
\text{PER Score} = -1 \times (\text{ER goal} \% - \text{[Baseline year – 1990]})
\]

This formula produces an ordinal level, the PER score, for the countries in our dataset. The multivariate analysis in this paper analyzes variations across countries in these PER scores. Equation 1 multiplies through by $-1$ so that negative scores on the dependent variable represent pledged emissions declines. Conversely, countries with positive scores on the dependent variable signify that they plan to allow some growth in the volume of emissions in the interval between 2015 and the target year (usually 2030). For example, Afghanistan pledged a 13.6% reduction in emissions from a business-as-usual scenario in the baseline year of 2030, making its PER score 26.4, which indicates a relatively high level of permissible future emissions. Conversely, Switzerland committed to a 50% reduction in emissions from a business-as-usual scenario in the baseline year of 1990, making its score $-50$. This negative score indicates pledged emissions reductions. As seen in Table 1, there is wide variation in values on the pledged emissions reduction variable, with scores ranging from $-65.50$ to $38$.

This measure of planned reductions in emissions is not without fault. It assumes that emissions and emissions intensity will change over time in uniform ways across countries, which plainly has not occurred. Still, Equation 1 offers a useful first approximation of the ambition represented by NDC pledges in the Paris
Agreement. Descriptive statistics appear in Table 3 and bivariate correlations appear in Table 4. To ensure that our predictor variables predate our pledged emissions reduction variable, we collected data for the control and independent variables from 2010 or earlier, unless otherwise noted.

Table 3. Descriptive statistics

|                          | Mean    | Standard deviation | Minimum | Maximum |
|--------------------------|---------|--------------------|---------|---------|
| **Dependent variable**   |         |                    |         |         |
| PER score                | 3.307   | 23.371             | −65.50  | 38.000  |
| **Independent variables**|         |                    |         |         |
| Emissions declines 1990–2010 | 0.469  | 1.795              | −9.97   | 8.770   |
| Middle East (dummy variable) | 0.060  | 0.245              | 0.00    | 1.000   |
| INGO memberships         | 1169.170| 1126.530           | 0.00    | 4226.000|
| **Control**              |         |                    |         |         |
| Governance               | 0.053   | 1.029              | −1.743  | 2.229   |

*Note. N = 126. NDC = nationally determined contribution; PER = proposed emissions reduction; INGO = international nongovernmental organization. Source: Authors’ findings.*

Table 4. Bivariate correlations

|                          | PER score | Emissions declines 1990–2010 | Middle East | INGO memberships | Governance |
|--------------------------|-----------|------------------------------|--------------|------------------|------------|
| PER score                | 1.000     |                              |              |                  |            |
| Emissions declines 1990–2010 | .206*    | 1.000                        |              |                  |            |
| Middle East              | .278**    |                              | .144         | 1.000            |            |
| INGO memberships         | −.425***  | −.161                        | −.134        |                  | 1.000      |
| Governance               | −.446***  | −.060                        | −.169        | .723***          | 1.000      |

*Note. N = 126. NDC = nationally determined contribution; PER = proposed emissions reduction; INGO = international nongovernmental organization. *p <.05. **p <.01. ***p <.001. Source: Authors’ findings.*

Independent variables—prior emissions declines; the Middle East region; the salience of INGOs; governance

Changes in GHG emissions between 1990 and 2010

This variable measures changes in gigatons of GHG emissions between 1990 and 2010 (Climate Watch, 2020). This variable measures the extent to which earlier processes of ecological modernization shaped the variations in NDCs across countries in 2015. Larger declines in past GHG emissions signal a process of
ecological modernization in which cleaner technologies replaced dirtier, fossil fuel-powered technologies. Economies with larger GDPs will have more capital to expend on the development of these new technologies, so ecological modernization would concentrate in countries with higher GDPs. The greater the emissions declines between 1990 and 2010, the more ecological modernization has occurred, and this record of achievement would encourage the creators of an NDC to pledge a large decline in emissions for 2030.

Regional dummy variable—the Middle East
This variable provides an admittedly inexact measure for variations in regional political economies that would measure the degree to which a fossil fuel–based treadmill of production characterizes a geographical cluster of countries. The Middle East contains the most fossil fuel–dominant treadmill of production of all of the world’s regions. The managers of a fossil fuel–based treadmill of production would not approve a NDC plan that would reduce the use of fossil fuels and thereby reduce GHG emissions.

The salience of INGOs
This variable measures the influence of international civil society on the politics of crafting NDCs in individual countries. It is the “natural log of total number of INGOs in which citizens of a country hold membership” (Hironaka, 2014, p. 165). Data were calculated from the Union of International Associations, 1948–1999 (Longhofer & Schofer, 2010). This measure captures the influence of all INGOs, and is considered the “conventional way to operationalize the influence of world society and global culture” (Hironaka, 2014, p. 165). The more international organizations in which the citizens of a country hold memberships, the more influence global culture and movements would have in a country, and this influence would encourage planners to increase emissions reductions in the NDC.

A control variable—governance
We include a control variable—a nation’s quality of governance—in the multivariate analysis. This variable measures government effectiveness in 2010. The measure comes from the World Bank’s Worldwide Governance Indicators database (World Bank, n.d., series “Government Effectiveness: estimate”). The measure “captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government’s commitment to such policies” (World Bank, n.d., metadata for series “Government Effectiveness: estimate”). Scores range from −2.5 to 2.5, with positive numbers indicating a well-received system of governance.
Table 5 presents mean NDCs for well known regions and groups of countries. To demonstrate the similarity of within-region PER scores, Table 6 provides detailed descriptions of the NDCs across two regions, the European Union periphery and the Middle East. Table 7 presents a multivariate analysis of the variations in the PER scores across countries. To assess the predictive power of the different theoretical approaches discussed above, we computed a General Linear Model rather than an Ordinary Least Squares Model for the variations in the NDCs. Table 7 reports the coefficients and the robust standard errors for this model. Equation 1 does suffer from heteroscedascity, so we have computed robust standard errors. To reduce problems of multi-collinearity in the equation, we did not include GDP as a control variable in the equation.

Results

Table 5 shows differences in the mean characteristics of the NDCs (pledged declines in emissions, baseline years for calculating the declines, and overall PER scores). It sorts the PER scores by countries in different regional (Middle East, Sub-Saharan Africa, Latin America and Caribbean) and organizational (Alliance of Small Island States [AOSIS], OPEC) groupings.

Table 5. Nationally determined contributions (NDCs) by organizations and regions: Percentage pledged declines, baseline year, and overall proposed emissions reduction (PER) scores

| Groups of countries          | Pledged decline in emissions (%)a | Baseline year for calculating emissionsa | PER scoreb  |
|-----------------------------|------------------------------------|-----------------------------------------|-------------|
| AOSIS?                      |                                    |                                         |             |
| No                          | 23.39                              | 2016                                    | 3.00        |
| Yes                         | 28.35                              | 2023                                    | 5.09        |
| OPEC?                       |                                    |                                         |             |
| No                          | 24.23                              | 2016                                    | 2.48        |
| Yes                         | 21.94                              | 2029                                    | 17.34*      |
| Sub-Saharan Africa?         |                                    |                                         |             |
| No                          | 23.89                              | 2014                                    | 0.52        |
| Yes                         | 24.79                              | 2027                                    | 12.20**     |
| Latin America & Caribbean? |                                    |                                         |             |
| No                          | 24.39                              | 2016                                    | 1.94        |
| Yes                         | 22.81                              | 2022                                    | 9.40        |
| Middle East?                |                                    |                                         |             |
| No                          | 24.89                              | 2016                                    | 1.62        |
| Yes                         | 12.45*                             | 2030                                    | 28.17**     |
Countries in the Middle East committed to smaller percentage declines in emissions (−14%) than other countries (−29%). The most dramatic differences between NDCs have to do with the baseline years chosen by countries. Countries chose to either frontload or backload their cuts in emissions. The frontloaded strategy chooses an early year like 2005 and calculates the percentage decline in emissions from emissions in that year. The backloaded strategy calculates the decline in emissions for a later year, typically 2030, when the economy will be larger and the volume of emissions will be higher, so it permits more emissions. Virtually all of the poorer countries chose to backload their emissions cuts. The wealthier countries usually frontloaded their emissions cuts.

In Table 6, the PER scores from countries of two regions, the European Union periphery and the Middle East, illustrate how uniform the NDCs can be within geographical regions. Despite great differences in wealth, countries on the periphery of the EU pledged ambitious reductions, in line with the pledges adopted by their neighbors in the EU. Countries as economically diverse as Azerbaijan, Russia, and Switzerland adopted pledges similar to each other and to their EU neighbors. The NDCs in the Middle East also show a similar degree of uniformity, but in their region the pledged reductions were small. All pledges made by countries in the Middle East correspond with a greater permissible level of future emissions. The patterns in both regions, consistent with world society theory, suggest that norms about emissions reduction commitments spread from nation to nation within regions.

| Country                        | NDC pledged % decline in emissions | Baseline year for calculating emissions | PER score<sup>a</sup> |
|--------------------------------|-----------------------------------|----------------------------------------|-----------------------|
| **The European Union Periphery** |                                   |                                        |                       |
| Albania                        | 11.5                              | 2030                                   | 28.5                  |
| Azerbaijan                     | 35                                | 1990                                   | −35                   |
| Belarus                        | 28                                | 1990                                   | −28                   |
| Iceland                        | 40                                | 1990                                   | −40                   |

<sup>a</sup> Higher number indicates more emissions relative to 2015. AOSIS = Alliance of Small Island States; OPEC = Organization of Petroleum Exporting Countries.

*<sup>p</sup> <.05. **<sup>p</sup> <.01.

Source: <sup>a</sup> CAIT Climate Data Explorer—Paris Contributions Map—INDC Dashboard (WRI, n.d.); <sup>b</sup> Authors’ data.
| Country          | NDC pledged % decline in emissions | Baseline year for calculating emissions declines | PER score |  |
|------------------|-----------------------------------|-----------------------------------------------|-----------|-
| Kazakhstan       | 15                                | 1990                                          | −15       | |
| Moldova          | 65.5                              | 1990                                          | −65.5     | |
| Montenegro       | 30                                | 1990                                          | −30       | |
| Norway           | 40                                | 1990                                          | −40       | |
| Russia           | 27.5                              | 1990                                          | −27.5     | |
| Serbia           | 9.8                               | 1990                                          | −9.8      | |
| Switzerland      | 50                                | 1990                                          | −50       | |
| Ukraine          | 40                                | 1990                                          | −40       | |

**The Middle East**

| Country          | NDC pledged % decline in emissions | Baseline year for calculating emissions declines | PER score |  |
|------------------|-----------------------------------|-----------------------------------------------|-----------|-
| Afghanistan      | 13.6                              | 2030                                          | 26.4      | |
| Algeria          | 7                                 | 2030                                          | 33        | |
| Iran             | 4                                 | 2030                                          | 36        | |
| Iraq             | 15                                | 2030                                          | 30        | |
| Jordan           | 14                                | 2030                                          | 26        | |
| Lebanon          | 15                                | 2030                                          | 25        | |
| Morocco          | 17                                | 2030                                          | 23        | |
| Yemen            | 14                                | 2030                                          | 26        | |

*Note.*  

= Higher number indicates more emissions relative to 2015.  
Source: *a* CAIT Climate Data Explorer—Paris Contributions Map—INDC Dashboard (WRI, n.d.); *b* Authors’ data.

**Table 7. General linear model of nationally determined contributions (NDCs) from the Paris Agreement: Parameter estimates and robust standard errors**

| Parameter                                    | Parameter estimate | Robust standard error |
|----------------------------------------------|--------------------|-----------------------|
| Emissions declines 1990–2010                 | 1.739*             | (.950)                |
| Middle East                                  | 17.942***          | (3.686)               |
| INGO memberships in Nation                   | −.004*             | (.002)                |
| Governance (a control)                       | −6.328**           | (2.456)               |

*Note.* N = 126. The first number is the parameter associated with that variable in Equation 1. The figure in parentheses is the robust standard error for that variable. INGO = international nongovernmental organization.  
*p < .10. **p < .05. ***p < .001. R2 = .255.  
Source: Authors’ findings.
Table 7 presents the multivariate analysis of the PER scores. In accord with ecological modernization theory, the larger the emissions declines between 1990 and 2010, the more likely it was that a country would pledge large-scale and early emissions declines in their NDCs. As expected in treadmill of production theory, the Middle East, a region dependent on oil production for its economic sustenance, showed an aversion to cutting emissions by reducing the use of fossil fuels. In line with the expectations from world society theory, the larger the number of INGO memberships within a country, the more likely it is that a nation will pledge large-scale and early emissions declines. Finally, the control variable, governance, is associated with larger pledged emissions declines.

Discussion

The 2015 Paris Agreement ushered in a new “pledging by all” era in global climate politics in which participating countries promised to reduce emissions (Rose et al., 2017). In this circumstance, the overall magnitude of the promised emissions reductions would appear to depend on the political dynamics in individual countries. This paper investigates these dynamics by looking for substantive patterns in emissions reductions that run through the 126 comparable plans submitted for the COP21 in Paris. The quantitative patterns that run through these NDCs can be summarized as paths to emissions abatement (van Soest et al., 2017).

The results of this analysis reveal that there appear to be two paths to pledged emissions reductions in the Paris NDCs: the frontloaded approach and the backloaded approach. These paths had their origins in the UNFCCC meeting in Rio de Janeiro in 1992 when UNFCCC officials decided to treat two groups of countries differently. At that time, Annex 1 (developed) countries were called upon to reduce their GHG emissions while non-Annex 1 (developing) countries were not expected to reduce their emissions in the near term. The 1997 Kyoto Protocol formalized this emissions reduction strategy. The “pledging by all” approach of the 2015 Paris Agreement explicitly did away with this division. However, our analysis reveals that in the Paris NDCs, the Annex 1 countries continued to differ from the non-Annex 1 countries. The Annex 1 countries used early baseline years in calculating their pledged emissions reductions. This strategy promises near term reductions in emissions of up to 40% from the smaller baseline economies of 2005. This path is a frontloaded emissions reduction strategy; it acknowledges that emissions in industrialized societies have been too high for a long period. Countries pursuing this path adopted either the 1990 or the 2005 volume of emissions as baselines for measuring emissions declines. The EU has adopted this strategy, but so have other societies with historical European influence including Canada, Chile, and New Zealand.

5 For more information about the Kyoto Protocol, see: unfccc.int/kyoto_protocol.
A second path to an emissions reduction commitment, common in the non-Annex 1 developing countries, has a backloaded emphasis. Typically, countries using this approach adopt a later baseline year, like 2030, for calculating emissions declines. This accounting strategy allows an economy to grow and emissions to get larger until, as the target year of 2030 approaches, the adoption of low emissions technologies makes it possible to achieve the pledged percentage decline in emissions. The baseline year for calculating the decline in emissions is the same as the target year for achieving emissions declines, so it is usually 2030. Many presently impoverished countries in the Global South have adopted this path in their emissions reduction commitments. It acknowledges that emissions may grow with economic development before 2030, but eventually, in the years just before 2030, the adoption of clean technologies will lead to emissions declines from a business-as-usual scenario.

These two paths to pledged emissions reductions reflect the tremendous economic inequalities between countries. Wealthier, already industrialized countries chose the first path, and poorer, less industrialized countries chose the second path. While the NDC approach has been called a “radically new approach” (Joyce, 2015) and a new model of global climate governance (Held & Roger, 2018), the difference we document in Paris NDC strategies recalls the Kyoto Protocol in which the initial cuts in emissions were all to come from the already industrialized, affluent countries. At COP21 in Paris, the wealthier countries with historical responsibility for the accumulation of greenhouse gases adopted the more aggressive, frontloaded NDC approach to the problem while the economically and historically disadvantaged countries opted for a backloaded NDC approach that allows for delays in emissions cuts until their economies have grown larger. While the Paris NDC emissions abatement process with its voluntary, bottom-up emphasis differs from the mandatory Kyoto Protocol, the substantive differences between the NDC plans submitted at Paris resemble the Kyoto distinction in strategies between Annex 1 and non-Annex 1 countries. Kyoto concentrated the bulk of emissions reductions in the affluent Annex 1 countries that bear the primary historical responsibility for the global buildup of GHG emissions. While leaders in several developing countries have supported more immediate mitigation in their home countries in recent years (Michaelowa & Michaelowa, 2015), the pattern in the NDCs concentrates emissions abatement plans in the wealthier countries.

This historical pattern may be upended by the need for steeper cuts in emissions in the years to come. Natural scientists have modeled the global warming implications of countries fulfilling the pledges included in their Paris NDCs. They find that if countries fulfill their Paris NDCs, this achievement will keep global warming to a lower level than previous policies did, but it will not keep the anticipated warming below 2°C (Rogelj et al., 2016). The NDCs must become more ambitious to keep warming below the 2°C threshold. Countries are supposed to increase the ambition of their climate policies in each future NDC (Rogelj et al., 2016).
The multivariate analyses in Table 7 and the theoretical approaches assessed there suggest directions that could lead to the adoption of progressively more ambitious NDCs in future years. For example, some measure of emissions abatement can be achieved through such technological innovations as typically occur through processes of ecological modernization (Mol et al., 2009). In addition, the utility of treadmill of production theory (Gould et al., 2008) in outlining the political economies that sustain GHG emissions in regions like the Middle East suggest that the treadmill will have to be disrupted, perhaps through large-scale social movements, if dramatic declines in emissions are to occur. In the absence of such disruptions, regional political economies, such as the one we identified in the Middle East, will continue to run as if on a treadmill, leading to a greater concentration of GHGs in the atmosphere. Similarly, as world society theorists would insist, large-scale social movements, based in INGOs, are vitally important in getting governments and industries to commit to large-scale and immediate cuts in GHG emissions (Hironaka, 2014).

There are important interactions between these different strategies. The recent French yellow vest movement provides a case in point. Demonstrators called for a rollback in carbon taxes because they impose a burden on rural, automobile-dependent people in France. In this context, the political coalitions necessary to push through emissions reductions will emerge only if reform advocates require that emissions reductions are paired with economic redistribution and opportunity for the rural working classes. While the French example concerns dynamics within a particular national political arena, the same dynamic operates internationally. The poorer countries, largely without historical responsibility for global warming, will most likely join a climate stabilization coalition only when it promises to provide climate adaptation assistance that reduces cross-national inequalities (Hermwille et al., 2017). Redistributive dynamics following from continued technological innovation with renewable energy, a disrupted treadmill of production, and a reinvigorated environmental movement provide a foundation that would support a thoroughgoing effort to limit climate change. In this respect, all three of the theoretical approaches outlined above—ecological modernization, redistribution from the treadmill of production, and civil society dynamics—would contribute to the mobilization to slow climate change.

Another key finding from this research is that the political currents of opposition and support for climate change mitigation run along regional lines. Countries in the Middle East show a uniform lack of ambition in their pledges. These countries’ historical positions in the Global South, combined with their large deposits of fossil fuels and their fossil fuel–dependent economies, likely influenced their reluctance to mitigate (Fisher, 2004). These regional effects are also visible at lesser geographic scales (Fisher, 2004). In contrast, countries along the periphery of the EU appear to have mimicked the ambition of their EU neighbors by pledging steep declines in emissions. Benson (2010) documented several cases of regional mitigation efforts involving alliances between some US states and Canadian provinces. As world
society theorists would point out, regionalism often involves more than mimicking each other’s policies. Repeated interactions among delegations from neighboring countries facilitate political coalition building, so it is not surprising, for example, that Kuwait joined with Saudi Arabia in opposing an expression of support for the October 2018 IPCC report at the COP24 meeting in Katowice, Poland (Sullivan, 2018). It may have been the case that interactions among state leaders from countries along the EU periphery with leaders from the EU facilitated the steep pledged emissions declines in countries along the periphery.

There are two notable limitations to this study. The first limitation is a case of data deficiency. In order to compare quantifiable NDCs, we excluded the energy intensity NDCs like China and India, and we excluded the NDCs that are conditional on receipt of financial assistance from developed countries. The exclusion of China and India from the study, while defensible methodologically, places important limits on the application of our findings. The second limitation stems from the assumption in our metric for pledged emissions reductions that emissions intensity will change over time in uniform ways across countries. The assumption that emissions and economic growth will decouple seems empirically defensible, but it probably will not happen in a uniform way across countries.

Despite these deficiencies, this study makes a novel methodological contribution to comparative research on climate policies by presenting a metric to compare cross-national variation in pledged emissions reductions. Our metric provides a reasonable way to compare pledged emissions reductions between countries with similar NDCs. By taking into consideration what national delegations wrote in their NDCs, specifically the baseline year and the percentage decline in emissions, we create a way to analyze the commitments made by both wealthier, developed countries and poorer, still-developing countries. We then use this metric to explore the variations in emissions reduction pledges across a wide range of countries in both the Global North and South.

The annual United Nations emissions gap reports underscore that NDCs will have to increase their levels of emissions abatement substantially over the next 10 years if we are to prevent an increase of more than 2°C in global temperatures (UNEP, 2017, 2018; Rogelj et al., 2016). Under these circumstances, societal reforms to facilitate emissions reductions become more urgent. Metrics that make it possible to compare the extent of reforms in GHG emissions, as proposed here, would appear to be a modest, but still necessary, building block in these reform efforts. Future research could investigate which political contexts generate actual emissions reductions, something that falls outside the boundaries of our analysis of differences in emissions reductions pledges. This kind of study could help us assess whether the countries that promise steeper declines in emissions follow through with policies that reduce emissions. Future research could also further investigate how regional dynamics shape climate mitigation efforts. China’s 2020 pledge to become carbon
neutral by 2060 (Myers, 2020), followed by Japan’s commitment just weeks later to reach the same goal by 2050 (Dooley et al., 2020), suggests the continued importance of understanding the regional dynamics of emissions reduction commitments.

In some instances, these regional dynamics would underline the disparities in power between large and small countries, with the large countries wielding inordinate amounts of power. China may well shape the NDCs of neighboring countries. Similarly, the United States, by the level of ambition it displays in its NDC, probably has a tangible effect on the scale of emissions declines sought by other countries. To the extent that these plans become actual emissions reduction efforts, the postures of these powerful countries shape the substance of the smaller countries’ NDCs.

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