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# States' interests at international climate negotiations: new measures of bargaining positions

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To advance empirical research on international environmental institutions, new data on national positions at the international climate change negotiations are introduced. The observations cover more than 90 countries at two historical moments of climate change decision making: the pre–Kyoto Protocol enforcement (2001–2004) and the post–Kyoto Protocol (2008–2011) meetings. Data were collected from different types of written text. Coding entailed a qualitative (dictionary-based) content analysis and a quantitative text analysis. By systematically exploring these new data, I offer a 'map' of national preferences at the United Nations Framework Convention on Climate Change (UNFCCC). I also propose a discussion of the dimensions of conflict and policy competition over 10 years of climate negotiations.

**Keywords:** climate cooperation; climate change negotiations; bargaining positions; UNFCCC



## Introduction

Students of international organisations are increasingly interested in questions over international environmental agreements and bargaining concerning green policies (Ward *et al*. 2001, Hovi and Areklett 2004, Sprinz 2004). Arriving at compelling answers to these questions has proved challenging and at times speculative. In fact, the literature still suffers from a lack of proper empirical material needed for informed and accurate investigations (Bernauer 1995). Based on the claim that we are at the beginning of the 'long road of cumulative knowledge on environmental institutions' (Breitmeier *et al*. 2006, p. 9), here I present data that help fill this gap with regards to climate change.

I outline new, unprecedented data sets on two distinct 'periods' of the international climate negotiations: the 2001–2004 Kyoto Protocol meetings and the 2008–2011 post–Kyoto Protocol meetings. The observations delineate the issues of the climate change conferences. The measurements of countries' ideal positions, as well as their agreements and disagreements, follow similar research

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designs as Mansfield *et al*. (2000) for international trade and Thomson *et al*. (2006) for European legislation.[1] I then show that, due to its comprehensiveness and high external validation, my data lend themselves to systematic and detailed analyses of international climate cooperation.

The next section summarises previous research investigating international bargaining at the climate change meetings. It highlights weaknesses in the empirical literature and opportunities for new data collection. The third section explains the information captured by my data, which is based on content analysis. I explain the data coding, and then identify the underlying dimensions of the data points, therefore exploring the width and depth of my data sets. Finally, I present the complementary data based on the same texts, but with quantitative content analysis. I conclude by wrapping up the efforts of delineating the bargaining space of climate change cooperation.



## State of empirical research

Studies of the meetings at the United Nations Framework Convention on Climate Change (UNFCCC) have benefited strongly from model building and theory development in economics and political science (Barrett 1999, Hovi 2001, Ward *et al*. 2001, Grundig 2006). However, the implications of these studies are sometimes elusive because of their limited empirical capacity. Without empirical observations to explore, these theoretical implications are hard to test. In what follows, I concentrate on two main limitations in the literature: the weak link between climate change research and spatial bargaining measurement, and the scarcity of cross-national data on climate change preferences.

The first limitation is a consequence of the lack of attention that climate-change students have paid to the spatial analysis of political competition (Downs 1957). Researchers of international organisations (e.g. the European Union [EU]) have long focused on spatial measures to generate empirical estimates of international negotiations (see, e.g., Tsebelis 1999). Accordingly, a negotiation agreement ($O$) is one point in a spectrum of possible outcomes, which is determined by the distance between the status quo (e.g. the previous agreement, $d$) and the ideal position ($x$) of national actors ($i = 1, 2, \ldots, n$). The latter can be additionally weighted by the importance (salience, $s$) that each actor attaches to the negotiation. Figure 1 provides an illustration of these basic elements over one single issue ($j$).

In its simplest form, this spatial framework describes the preference variation that researchers seek to understand. One can then use the issue space to calculate

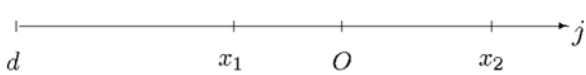



Figure 1. Spatial illustration of bargaining elements.

quickly how far the agreement is from the status quo, or how successful a country is in pulling the agreement close to its position. In addition, spatial measurements can be used to disentangle or to make overlap the negotiated issues, based on the expected dimensionality of the negotiations.

Spatial analysis has facilitated the empirical understanding of several bargaining endeavours (see Schneider and Cederman 1994, Hug and König 2002, Bueno De Mesquita 2004). Nevertheless, this has not yet been integrated into the analysis of the climate negotiations, barring a few scattered exceptions (e.g. Ward *et al*. 2001).

The second limitation is the custom of analysing restricted 'quantities' of these negotiations. Some researchers work around the complexity of the climate negotiations by studying a small set of parties instead of the global community. This approach may be helpful for theoretical reasons (Hovi and Areklett 2004), but can hardly translate into real-world judgements (as also acknowledged in Barrett 1999). By contrast, others choose to focus on a small number of issues (Ward *et al*. 2001, Grundig 2006). This custom eases the study of many countries, but also loses information on the diversity of the bargained issues.

These simplifications are common in all types of climate negotiation studies (see review in Sprinz 2004). At the most prevalent end of research, quantitative analyses have continued to focus on single topics rather than the general negotiation agenda. For instance, Jensen and Spoon (2011) narrow their analysis to long-term emission reduction targets. Similarly, Lange *et al*. (2007) investigate only the issue of differentiated responsibility. In the qualitative camp, the narrowness is reinforced by a plethora of detailed case studies. While these offer detailed explorations of certain aspects of the UNFCCC, they come at the cost of discounting the general implications of their conclusions.

One exception involving spatially delineated observations in a large sample of countries is the Negotiating Climate Change data set of the Swiss Federal Institute of Technology and University of Zurich (Castro *et al*. 2011, Michaelowa and Michaelowa 2012, Weiler 2012). These data are collected from an expert survey conducted at the UNFCCC conferences, and complemented with the coding of national documents presented at the Kyoto Protocol Ad-Hoc Working Groups. The information includes 56 national positions on eight policy issues. The period under analysis is the negotiations between 2009 and 2010, which coincided with the beginning of the second phase of the Kyoto Protocol. Substantiating these national positions, the data set also presents salience values, which are the fraction of countries' statements on the selected issues as reported by the UNFCCC watchdog, the *Earth Negotiation Bulletin* (*ENB*).

While this data gathering is certainly relevant for a broad delineation of climate change bargaining, some information still remains unclear. It is left unexplained why the negotiations should be proxied by an interaction between the selected 56 countries, and why these are representative. It is also not clear to what extent the data-generating process is homogeneous. While the positions are drawn from interviews with members of national delegations, the saliences are

generated from reports written by a third party (the *ENB*). This may be problematic because the positions are provided by a different source compared to the salience estimates, and it raises the concern that the two types of information may not exactly validate each other (Odell 2002).

Another concern regards issue selection and dimensionality: the eight issues in this data set were identified based on previous knowledge of climate experts, which is of course a reliable approach for issue identification. However, Weiler (2012) does not address whether the data support such distinction, or whether the delegates may actually think of the issues as in groups or categories. The international relations literature warns about the inductive approaches to issue identification (Hix and Crombez 2005). Accordingly, factor analysis or related techniques should be considered to investigate the latent dimensions behind the issue preferences.

Based on the lessons and gaps identified in the climate negotiations research, this article proposes a new type of systematic data for studying the UNFCCC. The following section first presents the criteria that precede the data gathering and then illustrates the actual data.



## The data sources

The main reason for the scarcity of work that collects large-scale information on the ongoing climate negotiations is the cost of generating such data (see Achen in Thomson *et al*. 2006, for an equivalent statement regarding EU bargaining). Weiler (2012) successfully faces this challenge, but with the arguable shortcomings discussed above.

To strengthen the data collection, I focus on new information on the UNFCCC, which I aim to frame in a spatial spectrum that includes each single country's position ($x$) and salience ($s$), the collective agreement ($O$), and the reference point ($d$). Since the most cost-effective sources of bargaining data are texts generated in the negotiation process, I rely on the assumption that political preferences can be found in 'content originated within an environment of collective associative memory' (Krippendorff 2004, p. 14). Hence, I focus on documents produced for and within the UNFCCC as a reliable mirror of bargaining interests. Differently from Weiler (2012) and colleagues, I use texts that countries *must* submit within the UNFCCC.[2] This boils down to the selection of two types of documents. First, I collect 'decision-level texts', which represent the resolutions that the international community agrees upon at different points in time (i.e. an earlier document for the status quo, and a later document for the agreement). Second, I identify 'country-level texts', which carry information on countries' positions (and saliences) on the negotiated issues.

### *Decision-level texts*

Law making at the United Nations, as in other international bodies such as the World Trade Organization or the EU, is grounded in the practice of member

states collectively adopting a text. Decision-making documents are most often written in recommendatory language because the subsequent conduct of the countries is what actually determines the enforcement of international law. Nonetheless, they represent a major condition for the creation of global standards and international regimes. The writing of these texts is preceded by long-lasting diplomatic discussions meant to allocate and address national interests at the drafting table (Lax and Sebenius 1986, p. 177–8).

The UN negotiating documents are usually shaped in the course of meetings preceding the convening of the assembly. In the case of the UNFCCC, each finalised draft goes to the Conference of the Parties (COP), which is the supreme body of the Convention (Brunnée 2002). The voting rule is consensus.[3] The text of the Convention presents clauses for amendment, which allow any Party to raise the case against specific decisions. While amendments can be brought to vote, the UNFCCC tradition is to discuss national concerns while drafting a new agreement (Hey 2001).

Decision-making texts have been produced at any official meeting of the UNFCCC since 1992. While today many official events fill the negotiations' calendar, two types of gatherings represent the core of the text-drafting process: the meeting of the UNFCCC subsidiary bodies at mid-year; and the COP in conjunction with the subsidiary bodies at the end of each year. At both conferences, all parties can review the implementation of the Convention. Since 1997, they can also assess the Kyoto Protocol practices and adopt further resolutions (Boyd *et al*. 2008).

The selection of decision-level texts for my data collection is then linked to the choice of the years that determine the threshold agreements (in other words, the status quo and the agreement) of each period in the data sets. One could choose the texts between two of the end-of-year meetings, making the earlier text the status quo and the younger text the outcome. However, at the UNFCCC, not every single session concludes with a significantly different agreement from the previous year because the negotiations have progressed in phases (Gupta 2010). It is then worth focusing on a range of years, in order to study a negotiation 'window' that shows variance of agreements, as the decision-making research suggests (Hug and König 2002).

Figure 2 shows the stepping stones in the history of the UNFCCC negotiations up until the end of the first Kyoto Protocol commitment period (2012). The years between 1992 and 1997 were the time in which national preferences were first articulated (Bodansky 2001). As issues and national positions at this point were still in the making, data for this period may be rather incoherent. A more useful moment is the negotiations between the meeting in Marrakech (2001) and the Kyoto Protocol first commitment period (2005). This time period presented a new paradigm for climate change policy because it shifted the international focus from the definition of 'engagement' to the concretisation of commitment (Gupta 2010, p. 646). These UNFCCC meetings also reflected a new type of diplomacy,

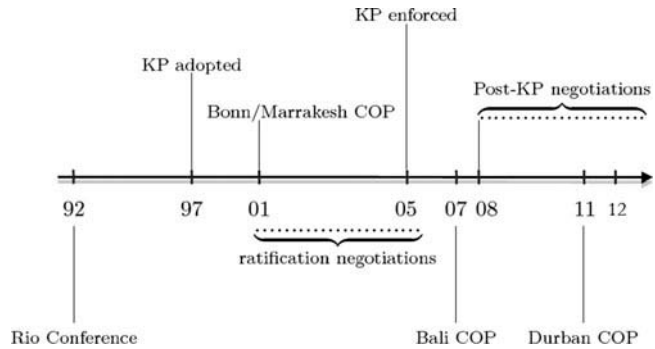



Figure 2. Time line of climate change negotiations.



featuring many draft proposals from countries interested in shaping the outcome of what was perceived as an important international contract (Boyd *et al*. 2008).

Similarly but later in the negotiations' history, the events between the establishment of the Bali Roadmap (2008) and the Durban meeting (2011) represent an important negotiation period. During these years, new bargaining issues emerged that more closely involved developing countries. At the same time, the financial crisis had just erupted, which raised concerns with the design of the Convention and the distribution of financial responsibilities (Gupta 2010).

Based on these considerations, my data collection focuses on these two highlighted periods of UNFCCC negotiations. I call the first the *pre–Kyoto Protocol enforcement negotiations*. These span between the Bonn conference in the summer of 2001 (COP06)[4] and the Protocol enforcement established in Buenos Aires in 2004 (COP10). The second are the *post–Kyoto Protocol negotiations*, which go from the Poznan negotiations in 2008 (COP14) to the Durban agreement in 2011 (COP17).[5]

### *Country-level texts*

Several types of documents exist within the context of the climate negotiations in terms of country-specific texts (UNFCCC 2012b). For part of their data collection, Weiler and colleagues use written submissions to the Ad Hoc Working Groups of the Convention. These documents are written in the form of national position papers, and therefore easily convey national stances on specific topics. However, they are not obligatory, and many countries never submitted them. Moreover, they are open to any issue a country wants to state a position on, therefore allowing for issue discrimination. Finally, these documents have only started being a practice since 2007.

I identify the National Reports to the UNFCCC (or National Communications, from here on NCs) as codable national texts. The NC is a

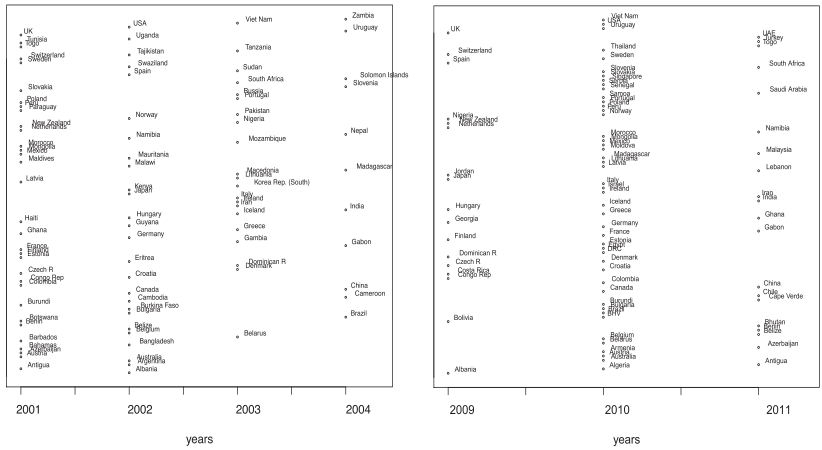
document that each member country must submit to the COP in order to meet commitments under the Convention. These report 'information on emissions and removals of greenhouse gases and details of the activities a Party undertakes to implement the Convention' (UNFCCC 2012a). Moreover, they 'contain information on national circumstances, vulnerability assessment, financial resources, and transfer of technology' (UNFCCC 2012a). Consequently, NCs are anchored to the preferences that underline national positions at the UNFCCC meetings and are bound to topics debated at the COP.

I collected the reports that were issued by both developed (Annex I) and developing (Non-Annex I) countries in the years that correspond to the pre– and post–Kyoto Protocol negotiation periods. The documents were issued in years in which a new round of NCs was announced. The use of the National Reports as sources of position data, however, comes with certain caveats.

First, these documents are not simple position papers. NCs in fact agglomerate different types of information, from scientific forecasts to economic scenarios. This raises the question of whether the technical language may neutralise the political content of these texts.[6] I work around this by going back to the source of the NC. Each NC is submitted and published by the national ministry of the environment (or its national equivalent). Thus, if the climate change negotiations are indeed political, as the literature has argued so far (Gupta and Grubb 2000, Ott *et al*. 2008), the latent 'seabed' of the stream of language in the NCs should also be political to some significant degree. This is in line with the theory that positions are never fully observed on their true dimensions, and that researchers have only access to noisy indicators (Benoit and Laver 2012).

The second caveat is that 'the required contents of National Communications and the timetable for their submission are different for Annex I and Non-Annex I Parties' (UNFCCC 2012b). This may compromise the comparability of the information conveyed by the different countries. However, a look at the official Reporting Guidelines shows that the risk of evaluating completely different texts is low: the Annex I NCs 'inform on ongoing policies', and Non-Annex I NCs similarly 'cover legislative and executive efforts' (Ellis *et al*. 2010). In addition, the NC platforms for Non-Annex I countries present a section for 'other information deemed relevant to report to the international community', allowing them to address bargaining positions on all discussed issues.

Finally, the frequency of the NC submissions is not exactly congruent between the two groups. Annex I countries are required to submit their reports every three to five years. Non-Annex I countries instead submit an initial NC within three years of becoming a Party to the UNFCCC, and then within two to three years from when the following NC is announced (Ellis *et al*. 2010). This may be a problem if the submission period of Annex I countries does not coincide with the submission period of Non-Annex I countries for the years 2001–2004 and 2008–2011.[7] The inspection of the submission dates, however, dismisses this concern: of the 192 UNFCCC member countries, 89 submitted their respective NCs in the years preceding the Kyoto Protocol enforcement




Period 1 Period 2

This dot plot lists the country-level texts for both periods. Countries are listed by year of NC submission, in inverted alphabetical order. The y-axis is used only for illustration purposes.

Figure 3. Country-level texts by submission year.

(corresponding to the NC3 for Annex I and NC1 for Non-Annex I), while 84 submitted their next NC in the post–Kyoto Protocol negotiations period (corresponding to NC5 for Annex I and NC2 for Non-Annex I). These two groups of countries constitute the data samples plotted in Figure 3.[8]

## Qualitative content analysis

The previous section presented the texts from which I collect the observations on the UNFCCC. The following introduces the bargaining issues in the data set, and then proceeds to the description of the data.

### *Identification of the negotiation issues*

Issues constitute a crucial component of bargaining studies. Not only do they represent the 'what' around which the negotiations evolve, but they also determine the space over which countries vary with respect to their preferences (Hovi *et al*. 2009, pp. 29–31). The scale of a negotiated issue delimits the range of positions and shows how countries perceive the possible reachable outcomes. Last, but not least, issues inform, confirm, and disentangle the dimensions of a negotiation.

Agenda points are often embedded in the bargaining discourse, and yet all players should know them. In the climate change case, both decision-level and country-level texts are assumed to carry information on the underlying issues at

the COPs. The question is, then, of what criteria to follow in order to identify the most important issues systematically.

Empirical studies on EU decision making usually rely on self-evident issues. These can be raised systematically in the course of a European Parliament meeting or are advanced in the form of separate proposals by the Commission (Thomson *et al*. 2006). This type of issue identification is highly practical for legislative data ('issues' are also called as such, and are associated with a number and code). However, this is not directly comparable to the UNFCCC: while here too specific decisions are assigned a number in the agreement text, they are not quite as self-evident as in other contexts. Nor are the issues directly linked to the sections of the NCs, which follow a different structure.

This leads to a bifurcation of strategies for the identification of UNFCCC issues. First, I rely on an inductive 'topic' approach. This is the extraction of issues based on the cross-validation of topics from different sources. This approach leverages in particular the web archives of the *ENB*, the citation indices of Google Scholar, and general expert knowledge on the agenda points at the UNFCCC since 2001. The second is a word-based approach, which detects issues based on key words extracted from secondary sources such as newspapers and academic publications. To distinguish valid topics, the article uses both approaches (see online Appendix for a description of the steps undertaken). The identification exercise produces 22 issues for the first period, and 23 for the more recent years. As Table 1 indicates, some topics (e.g. differentiated responsibility) are discussed throughout the whole series of years in the data sets. Others (e.g. carbon capture and storage) emerged at only one of the two observed periods.

### *Issue scaling and data distributions*

This section describes the national positions data. After cleaning the documents and dividing them into 'natural sentences' (sentences that follow standard grammatical rules and not the 'quasi-sentences' often used in content analysis; see Benoit and Laver 2012), the coding entailed assigning units of text to the predetermined issues from Table 1. This task is equivalent to the categorisation of 'quasi sentences' in the Comparative Manifesto Project (CMP; Budge *et al*. 2001).[9] However, note that while the size of electoral manifestos lends itself to complete hand coding (e.g. the 1992 UK Labour Party manifesto is about 7000 words), the NCs can go up to 100,000 words. I addressed this hand-coding challenge by using keywords to scan the relevant subtexts (Laver *et al*. 2003, Benoit *et al*. 2009). I then coded the useful subtexts with classical content analysis (Krippendorff 2004).[10] As in the CMP case, issues are assumed to be mutually exclusive, so that the same unit of text cannot be assigned to more than one issue category.

The final and most crucial step of the coding is assigning positional value to each categorised unit of text. This passage required 'scaling' the issue spectrum. Defining the issue scales is important because bargaining relies on transitive

Table 1. Issues.

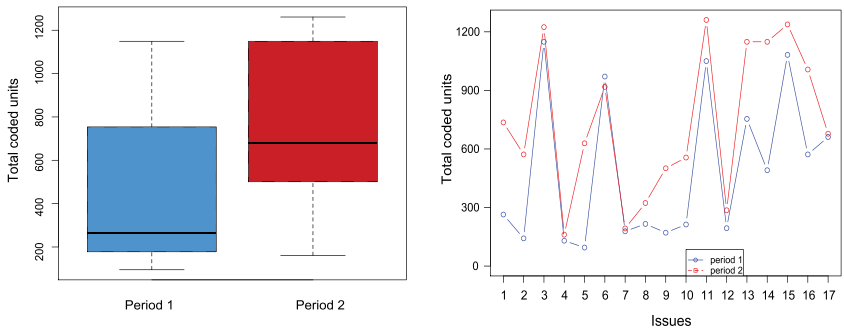
| Period 1 | Period 2 |
|---|---|
| 1. CDM engagement | 1. CDM engagement |
| 2. Emission trading | 2. Emission trading |
| 3. Binding commitment | 3. Binding commitment |
| 4. LUCF accounting | 4. LUCF historical records |
| 5. Funding approach | 5. Funding approach |
| 6. Abatement credits | 6. Abatement credits |
| 7. LUCF eligible threshold | 7. REDD eligible threshold |
| 8. Nuclear energy use | 8. Nuclear energy use |
| 9. Technological transfers | 9. CCS adoption |
| 10. Adaptation support | 10. Adaptation support |
| 11. LUCF-based abatement | 11. Technological transfers |
| 12. GHG abatement target | 12. GHG abatement target |
| 13. International accountability | 13. International accountability |
| 14. Legislative action level | 14. Legislative action level |
| 15. Offset projects credit | 15. Offset projects credit |
| 16. Regulatory approach | 16. Regulatory approach |
| 17. Systematic observation | 17. Systematic observation |
| 18. Historical responsibility | 18. Historical responsibility |
| 19. ODA diversion | 19. ODA diversion |
| 20. Supplementarity | 20. Supplementarity |
| 21. Proportional industry impact | 21. Temperature rise limit |
| 22. Uncertainty | 22. Post-2012 regime |
| | 23. International bunkers |



preferences, and coding positions would not be useful if they were not put in a ranking order. Moreover, the issue metric allows for the numerical evaluation of the bargaining elements (Lowe *et al*. 2011). Scales are deductive because I cannot rely on a generalised distribution of all positions. In fact, some of the issues in Table 1 can be defined as continuous (e.g. the percentages of emissions that each country plans to mitigate with reforestation), while others are best measured as a binary outcome (i.e. yes/no for differentiated responsibility).

The criteria for defining the extreme and intermediate positional values are drawn from the sources used to identify the issues, i.e. the academic publications and the *ENB* summaries. For example, for the 'assignment of abatement units', I measure three different positional values: a low value for the more sceptic Australia, Japan, and Canada; a higher value for the more peremptory EU, G77/China, and Samoa; and an intermediate value for Switzerland (see online Appendix).

This content analysis leads to measuring positions and agreements on binary, ordinal, and continuous issues. The time variance over the issues is shown in Figure 4. The box plots on the left indicate that the amount of coded issues (in terms of units of texts) increases from period 1 to period 2.[11] In fact, while for period 1 the data set reports an average of about 300 text units per issue, for period 2 the coding produces an average of 600 units per issue. Analogously, the subfigure on the right shows that some topics receive a

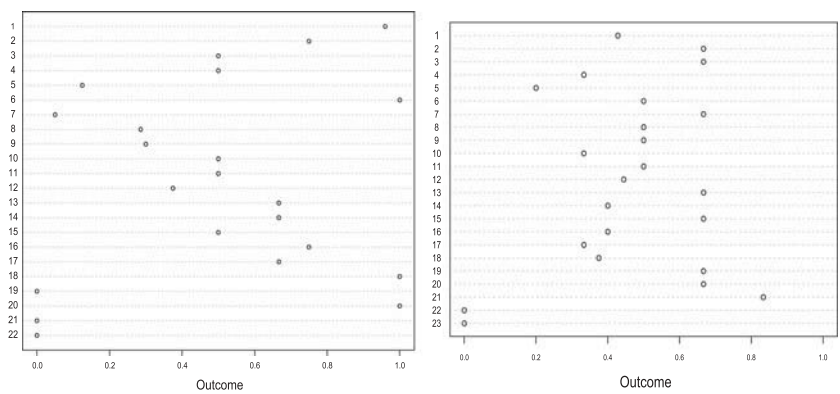



The box plot displays the number of coded units of text for all issues by bargaining period. The dot plot compares the number of coded units of text per each of the 17 issues that overlap in the two periods.

Figure 4. Coded text plots.

different degree of attention in the 2008–2011 NCs compared to the earlier ones. For example, in 2008–2011, countries mentioned emission trading (issue 5) and international climate funding (issue 14) twice as much as in the 2001–2004 NCs. This is the first climate negotiation data set that records such variation over time.[12]

Also, the manual coding generates specific information regarding the agreement points, as Figure 5 illustrates. Note that the spatial depiction lends itself to a comparison with the outcomes in Weiler (2012). For example, his data also assigns a median value to the decision over international funding




Period 1 Period 2

The dots represent the values of the outcomes standardized to a scale between 0 and 1. The y–axis refers to the issues in the dataset. The x–axis is the continuum of possible positions

Figure 5. Outcomes.

(issue 14) at the post–Kyoto Protocol negotiations. However, the data introduced here additionally include the value of the agreements before 2005, thus granting 'long and wide' information on climate agreements.

The changing nature of the identified issues is a crucial feature of the data. This variance offers important empirical substance, for example, for the study of changing bargaining strategies. At the same time, it justifies separating the two bargaining windows, as not all issues are strictly comparable. In sum, the qualitative content analysis generates data that lend themselves to the comparative study of climate policy bargaining, which is explored below.

### *Dimensionality*

The previous section described the raw data for the two periods under analysis. Now I move to explore the data – in particular, the conflicts that may underline the positions that the data identify.

The study of international negotiations traditionally relies on theoretical constructions on the dimensions underlining bargaining. International relations scholars often assume that topics are rooted in an integration dimension that goes from domestically concerned positions to the internationally open positions (Schneider and Cederman 1994, Milner and Rosendorff 1997, Thomson *et al*. 2006). This theoretical understanding applies to climate change negotiations too. Gupta (2012), for example, notes that despite the large number of agenda issues, UNFCCC parties always refer back to the concern for 'bilateral versus multilateralism'. To confirm this understanding of the climate negotiations, I use latent variable modelling. More specifically, I rely on a factor analysis to induce the main underlying dimensions of bargaining preferences in my data sets (as, e.g., Hix and Crombez 2005).

The choice of the factoring specification needs a careful assessment. As the issue variables in the UNFCCC data sets are differently scaled, the latent construct has both ordinal and continuous indicators. Accordingly, a 'normal theory' factor analysis may run into measurement problems: making variables discrete loses information, while slicing up discrete variables into continuous variables complicates the estimation. A solution is to accommodate ordinal and continuous variables with a Markov Chain Monte Carlo algorithm that adjusts for differences between components, and captures variation between types of responses. I then use Quinn's (2004) Bayesian mixed factor analysis estimator, which models a variable that is split between its continuous component and its categorical one (the ordinal indicators).[13]

I first run a test to determine the likelihood that a fixed amount of factors is enough to explain the variance in the position data. The hypothesis that three factors are underlining the data fails to be rejected for both periods ($p > 0.07$). Table 2 shows that the three factors explain more than one third of the variance of the positions in both periods. Including an extra factor only increases the explanatory power of the factor analysis by 4%. The results are rather similar (in

Table 2. Variance proportion of mixed factor analysis.

| | Variance | Proportion | Cumulative |
|---|---|---|---|
| *Period 1* | | | |
| Factor 1 | 3.67 | 0.17 | 0.17 |
| Factor 2 | 1.78 | 0.08 | 0.24 |
| Factor 3 | 1.67 | 0.07 | 0.32 |
| *Period 2* | | | |
| Factor 1 | 3.92 | 0.17 | 0.17 |
| Factor 2 | 1.72 | 0.07 | 0.24 |
| Factor 3 | 1.36 | 0.05 | 0.30 |



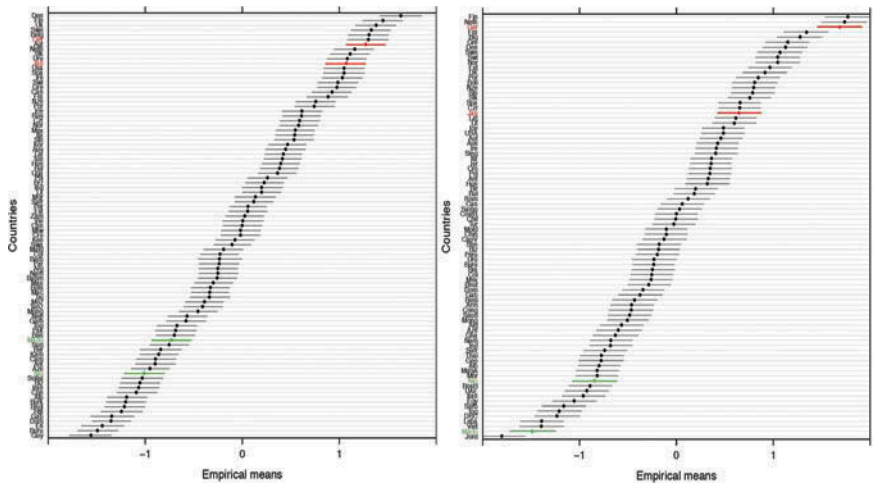
fact stronger) if I ignore the scaling differences and run a principal component factor analysis with orthogonal rotation (see online Appendix).

More importantly, Table 2 suggests that most positions in the data sets load on the first estimated factor. These are positions on issues such as emission trading, differentiated responsibility, and international accountability – in other words, all issues that have political significance at the UNFCCC (Hovi 2001).

Note that some topics, such as offset projects, LUCF eligibility, and Carbon Capture and Storage (CCS), have sparse loadings. There are a few reasons why these do not load univocally on Factor 1. One possible reason is that some issues may reflect less conflictive discussions on climate policymaking than the literature led us to believe. For example, the discussion on LUCF eligibility criteria is much more technical than the issue that involves choosing the level of national accountability on climate change. Another reason is the long-debated divide between mitigation and adaptation. Arguably, based on the discussions between 2001 and 2011, most of the issues in my data sets represent mitigation concerns. Therefore, Factor 1 may indicate positions towards mitigation, while adaptation issues cluster differently in the bargaining space (also shown by the fact that adaptation tends to load on Factor 2).

Nonetheless, the majority of the issue positions in the data set are still aligned on the first 'axis' of the factorised dimension.[14] Hence, while some countries in the data sets may position themselves on special issues more than others, most states arrange their preferences over issues of regime integration, political responsibility, and compliance with climate policies.

To understand the implications of this factorisation for the international interactions at the UNFCCC, in Figure 6, I plot country estimates of the latent scores of Factor 1 (Quinn 2004). The graph shows an interesting pattern. For both periods, most developed countries (e.g. Germany and Japan - in red in online print of Figure 6) cluster on the very upper end of the scale. By contrast, the least developed countries (e.g. Madagascar and Nigeria - in green in online print of Figure 6) are located at the low end of the plots.




Period 1 Period 2
Plot of positions on UNFCCC latent dimension. Dots are posterior means and the line segments depict the 90% credible intervals for each country

Figure 6. Country scores across main factor.

This country distribution can be interpreted in two (non-exclusive) ways. First, these estimates discriminate Annex I and Non-Annex I countries, as these groupings are powerful determinants of climate policy interactions (Castro *et al*. 2011). Second and more interestingly, they distinguish countries that have truly different views on what the UNFCCC is about. 'Strong' countries use the negotiations to discuss international targets and leadership. 'Weak' countries, by contrast, rarely miss the occasion to focus their documents on responsibility, sovereignty, and compensation. So, generally, Factor 1 reveals conflict over policy commitment and redistribution at the UNFCCC.

Also interestingly, in Figure 6, the country estimations with little association to either sides of the dimension (close to zero) are nations such as Brazil, China, and India. Evidently, emerging powers have moderate preferences over the climate change issues. This supports the qualitative observation that *basic* countries play the role of 'dynamic brokers' rather than 'nay sayers' at the climate change negotiations (Michaelowa and Michaelowa 2012).

## Quantitative content analysis

The data described thus far are rich and fine-grained. The trade-off is that, besides requiring a costly amount of time spent on coding, the qualitative data are based on the assumption that issues are separate, and ideal positions are self-evident. If these assumptions do not hold, more inductive approaches to preference estimation would provide better understanding of the bargaining

positions and outcomes at the climate negotiations. This is what motivates the quantitative content analysis that this last section explains.

Researchers have developed a range of techniques to determine ideal positions based on distributional assumptions about words in texts (Laver *et al*. 2003, Slapin and Proksch 2008). The technique that I use for the quantitative analysis of the NCs is the automated scaling program called *Wordfish*.[15] This algorithm generates estimates of policy positions comparing the body of different documents under the assumption that word frequencies provide information about the position of each document with respect to others (Slapin and Proksch 2008, Kluver 2009). Ultimately, the goal is to scale texts on a common (and singular) latent dimension, which should reflect the main factor observed in the qualitative data.

Wordfish assumes that words follow a Poisson distribution defined by the parameter $\lambda$, which represents both the mean and the variance of the distribution. Applying this logic to the distribution of words in the NC texts, ideal position estimates are determined as

$$y_{ijt} \sim Poisson(\lambda_{ijt})$$

where $y$ measures how often the word $j$ appears in the NC document $i$ at the bargaining period $t$. The parameter $\lambda$ is determined by maximising the following equation:

$$\lambda_{ijt} = exp(\alpha_{it} + \psi_j + \beta_j + \omega_{it})$$

where $\omega$ and $\alpha$ represent the period-specific document positions and fixed effects respectively, and $\beta$ and $\psi$ constitute the words' parameter and their fixed effects. The coefficients of interest here are the word discrimination parameter, $\beta$, which corresponds to the word placement along a latent dimension, and the positions of the documents, $\omega$, across the dimension that is up to the researcher to interpret.

I first explore the word coefficients, $\beta$, to understand what dimension the algorithm captures from these texts.[16] Figure 7 displays the words' parameters for the two negotiation periods. The $y$-axis reports the word fixed effect ($\psi$), which is the logged mean count of each word across all the documents as measured by Wordfish. By contrast, the $x$-axis distinguishes the distance across every single scaled word. Common vocabulary in the corpus of the NCs is supposed to load around the zero weight value. It is then no surprise that non-discriminative words such as *fund* and *rainfall* (period 1), and *coastal* and *commitment* (periods 2) are at the top of the word pyramid. Similarly, note that *Kyoto* and *carbon* are quite high.

More importantly, Figure 7 reports the discriminative words that distinguish positions on the unidimensional space. While typically the fixed effects distribution is interpreted as the left–right dimension (Slapin and Proksch 2008), it is

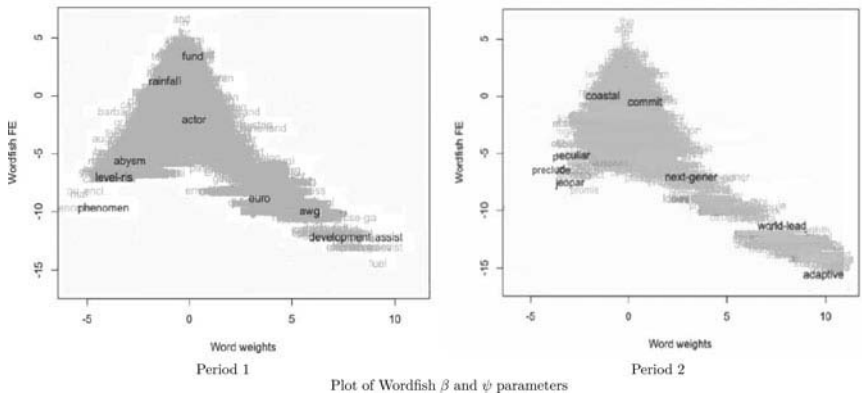



Figure 7. Wordfish coefficient parameters.



hard to imagine that this scale underlines the climate change negotiations. Rather, words seem to fall on a scale between pro-growth and pro-environment, or pro-integration and anti-integration (Lowe *et al*. 2011). The words on the left side of the axis in period 1 are *abysmal*, *level-rise*, and *phenomenal*, among others. These words are attributed to parties that are concerned with sovereignty loss and the uncertainty of climate change action. For example, in 2004, India writes that given 'the abysmal consequences of climate change in the past decade, India still needs resources to implement adaptation measures … despite significant and increasing efforts at fortifying infrastructure and enhancing the preparedness to phenomenal challenges in the recent decades' (India, NC 1, p. 229).

Words on the right are *development*, *assistance*, and *Europe*, which are used by countries that link climate change to sustainable development, and that associate Europe with climate leadership. For example, Germany in 2002 reports 'the Government's development assistance policies are in keeping with the principle of sustainable development. Cooperation in designing international agreements, and support for developing countries in implementation of such agreements, represents an important contribution to global structures and climate-protection aims' (Germany, NC 3, p. 136). Hence, the prominent terms seem to point to a scale between 'sovereignty–seekers' and 'integration – profiteers', as already identified with the qualitative sets of data.

The $\beta$ plot of period 2 also shows two different sets of words. The words on the left side refer again to concerns over sovereignty and compromises to deal with climate change. *Peculiar* and *jeopardise* are used in the NCs of parties preoccupied with the specific characteristics of their own countries and 'the absence of specific action that precludes from making reliable climate projections' (Belize, NC 2, p. 70). By contrast, the words on the right side are adopted by the countries interested in regime making and in positioning themselves 'as a *world-leading* exponent of smart, innovative and business-savvy responses to

environmental issues, leveraging off clean, green images and reputation for business integrity' (New Zealand, NC 5, p. 152).

The words highlighted in Figure 7 support the conjecture that the NCs reflect preferences over integration and leadership. But what do the words actually say about the unidimensional positions of these documents? Assuming that the entire climate negotiation agenda can be described as a unique spectrum of bargaining positions, the Wordfish document estimates ($\omega$) should confirm that countries cluster into different groups: alarmed countries on one end (e.g. Madagascar), and optimistic countries on the other (e.g. Germany).

Figure 9 shows the plotted distribution of the document parameter. The NCs tend to be arrayed as the word plots led us to suggest. In both periods, developed democracies (e.g. Germany and Japan) are on the upper bound of the document scale. By contrast, smaller states and OPEC countries (e.g. Madagascar and Nigeria) are located on the lower bound of the distribution. The story from Figure 8, then, fits the interpretation from the previous analysis: countries are divided across 'strong' and 'weak' countries, with emerging economies taking more moderate positions than generally assumed.[17]

Finally, to check the meaning of the quantitative analysis, I cross-validate the Wordfish estimates with the human-coded data described in the previous section. This way, I examine whether the general picture of the climate negotiations is captured by both the qualitative and quantitative text analyses, despite their different assumptions (Kluver 2009). For each bargaining period under consideration, Figure 9 plots the unidimensional positions obtained with Wordfish and the scores of the factorised data (Factor 1 loadings) with a fitted regression line. The result is a high positive correlation, where the Pearson coefficients are 0.79 for both periods.[18] Although they stem

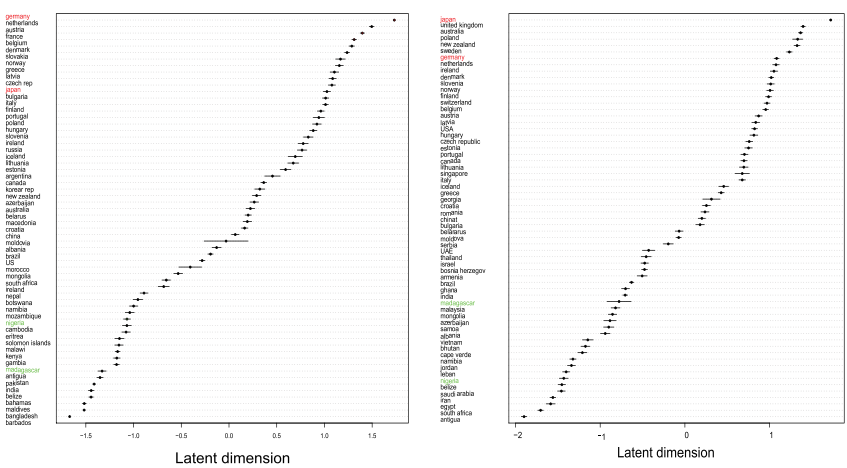



Figure 8. Dot plot of Wordfish estimates.

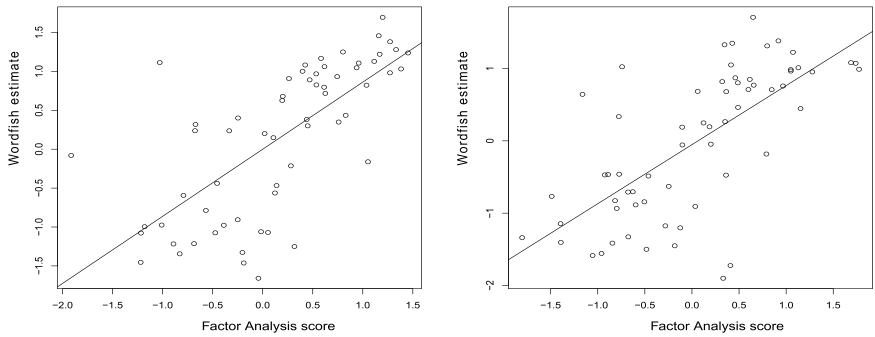



Figure 9. Wordfish estimates and factor analysis scores.

from different gathering processes, the measures overall validate each other. In sum, the two types of data carry largely similar information regarding UNFCCC positions.

## Conclusion

Studies of the international climate change negotiations have increased exponentially in recent years. These works have enriched the knowledge on cooperation at the UNFCCC. Yet the literature is still missing inferences based on broad and systematic data sets. Little attention has been paid to formal measurements, and the lack of large-*N* studies has hampered ambitious empirical analyses. I therefor propose new original data on ideal positions and outcomes at two points in the history of the climate negotiations.

I have presented my new UNFCCC data sets here, introducing the data sources and the bargaining space at the origin of the data gathering before performing data reduction modelling and a quantitative text analysis, in order to understand the essence of the international interactions at these negotiations. The data 'map' national climate change preferences and show the conflict between developed and developing countries, where sovereignty and leadership concerns constitute the main political struggles.

The information presented here is essential to foster explanations of international climate policymaking. The estimates lend themselves to further investigations of success and agreements at these negotiations. Moreover, they represent useful prior knowledge for case studies of negotiation behaviour across time.

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## Notes

1. I refer to issues as 'areas' where nations have specific preferences (Hix and Crombez 2005). Issues can overlap with topics. I use these two concepts interchangeably, as both are related to the UNFCCC negotiation agenda points. Note that these are not intended as 'dimensions'. I discuss how issues (and thus topics) relate to the dimensions further below.
2. The fact that the NCs are compulsory submissions lowers the risk that the data are missing in a systematic (non-random) way. It is realistic to believe that some NCs can be copied across countries. This is also because part of the international bargaining may take place before the general assembly, i.e. in the coalition meetings before the observed negotiation rounds. However, I follow the general bargaining literature and assume that positions in national documents are sincere (Laver *et al*. 2003).
3. A UNFCCC provision for failed consensus exists, but countries never actually use it.
4. The 2001 conference refers to the mid-year Bonn meeting in July 2001, which for several special circumstances represented a true full convention (Dessai 2001).
5. The COP06 and COP14 agreement texts represent the status quos for the two bargaining periods. The COP10 and COP17 agreement documents, by contrast, provide the two respective final outcomes.
6. Although ideally one should study position papers, the fact that the NCs are more technical reports is not a problem for the sake of comparing similar content.
7. Arguably countries may anticipate or delay the NC submission for strategic reasons. However, I do not have prior information or theoretical reasons to assume that countries may be deliberately submitting the NCs late.
8. The mentioned NCs are in English, French, or Spanish. Ukraine and Russia submitted NCs in 2010 only in Russian. Since I do not have access to Russian-speaking assistants, I have not included them.
9. Although the CMP studies parties, the coding approach has migrated to the analysis of political discourse in other decision-making organisms (e.g. parliament speeches) with significant success (Benoit and Laver 2012).
10. The manual coding strategy is the following: the text is parsed into units (i.e. periods or short paragraphs). I screen the text units to search for words that carry relevant content. The issue-based dictionary facilitates the 'screening'. In cases where the text unit is indeed connected to an issue, I assign it to such an issue. If instead the text unit does not refer to an issue, reflecting some other topic that is not relevant for this work, it is left uncoded. This type of coding does not rely on the sentence-by-sentence sequence. This implies that coders' priors do not affect the quality of the coding, and the generated values are independent and identically distributed (*i.i.d.*) (Benoit *et al*. 2012).
11. Note that, due to randomly missing observations, I have performed linear imputations.
12. Weiler (2012) and colleagues, for example, have information on the repetition of issues on UNFCCC legal texts, but only cover issues discussed at the 2009–2010 negotiations.
13. Quinn's estimator (2004) models the variable:

$$x_{ij}^{*} = \Lambda\varphi_i + \varepsilon_i$$

where $\Lambda$ is a matrix of factor loadings, $\varphi_i$ is the vector of factor scores, $\varepsilon_i$ is the error term, and $x^*_{ij}$ is the vector of latent responses associated with the elements of $\mathbf{X}$:

$$x_{ij} = \begin{cases} x_{ij}^* \text{ if } j \text{ is continuous} \\ c \text{ if } x_{ij} \in \left(\gamma_{i(c\text{-}1),}\, \gamma_{jc}\right) \text{ and } j \text{ is ordinal} \end{cases}$$

where $j$ are the indexed responses, $i$ are the observations, $c$ is the categorical indicator that identifies whether a variable is ordinal, and $\gamma$ is a collection of cut-points that tend to infinity. The analysis was performed with the M*CMCpack* in R. For details, see online Appendix.

14. Scree test plots obtained from the principal component factor analysis with varimax rotation further support the strong loadings on Factor 1. Figures in the online Appendix show that the eigenvalue of the first component is noticeably higher than the rest. It is therefore safe to presume that this measure captures the major latent variation of national preferences.
15. Note that I use quantitative text analysis only on the NCs, as the agreement texts are too few for an accurate estimation.
16. As with other quantitative text analysis software, Wordfish works only with texts in the same language. Hence, I kept the English documents and dropped the French and Spanish ones. The samples include 65 and 63 NCs for the 2001–2004 and 2008–2011 respectively.
17. This inference holds robustly to Wordfish estimations with other reference documents and on different text subsamples (details in the online Appendix).
18. The results of the ordinary least squares regressions are (for both periods) $R^2 = 0.5$, $\beta = 0.58$, $p = 0.000$, S.E. = 0.07. The significance also holds when dropping outliers.

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