States' Interests at the Climate Change Negotiations: New Measures of Bargaining Positions

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This paper contributes to empirical research on international environmental institutions by introducing a new dataset of national positions at the UN Framework Convention for Climate Change (UNFCCC). The observations cover more than 90 countries on two historical moments of climate change decision making: the pre-Kyoto Protocol enforcement phase (2001-04) and the post-Kyoto Protocol meetings (2008-11). The data is retrieved from official UNFCCC documents and National Communications, and was collected by means of two measurement strategies: a qualitative (dictionary–based) content analysis, and a frequentist analysis based on Wordfish. By describing and comparing the original data, this paper offers a "map" of national preferences at the climate negotiations. Moreover, it proposes a discussion on the dimensionality of the conflict over climate policies and the salience that countries attach to them.

1 Introduction

Students of international organizations are increasingly interested in explaining the dynamics of the climate negotiations with formal bargaining analysis (Hovi and Areklett, 2004; Pittel and Rübbelke, 2008; Ward et al., 2001). Unfortunately, however, the literature on international climate policy does not offer a bridge between the underpinnings of bargaining theory and empirical observations. Works on the UNFCCC then face a problem identified in other areas of political science: featuring "partial post hoc explanations" and lacking the "ingredients needed for an informed prediction" (Haas, 1990, p. 6-7).

Prominent scholars have long raised concerns with the scarcity of data on climate change decision making (Bernauer, 1995; Sprinz, 2004). Today, research is still at the beginning of the "long road of cumulative knowledge on environmental institutions" (Breitmeier et al., 2006, p. 9). Questions over the comprehensiveness of policies and the distributional conflict around climate change agreements call for empirical answers, and yet virtually no systematic information is available to take over this type of analysis. In addressing this problem, I will now present two original datasets collected to fill this gap.

The data described in this paper refers to two bargaining rounds, namely the pre–Kyoto Protocol enforcement negotiations and the post–Kyoto Protocol negotiations. More substantively, the coded variables delineate the issue space of the climate negotiations and identify agreements, disagreements, countries' ideal positions and saliences at the UNFCCC. The goal is to match theories of international climate cooperation to real–world information. Thus, the data gathering endeavour is inspired by works that establish an exchange between theory and empirics in other bargaining spheres – e.g., Mansfield et al. (2000) for international trade, and Thomson et al. (2006) for EU legislation.

The paper is structured as follows: First, I summarize how the literature has empirically investigated international positions at the UNFCCC. I highlight the gaps in the applied research and point to the opportunities that large–N data presents for a comprehensive study of the international climate negotiations. Second, I describe the way I collected the UNFCCC information. This is based on content analysis and builds upon spatial measurements of bargaining positions. I then present the data points for the issue-specific national positions and identify their underlying dimensions, therefore exploring width and depth of the positional data. Finally, I present an alternative dataset drawn on the same texts, but with quantitative content analysis. I conclude by wrapping up the efforts to delineate the bargaining space of the UNFCCC.

2 Measuring climate bargaining positions

Studies of the UNFCCC negotiations have benefited from model building and theory development in economics (Carraro and Siniscalco, 1993; Barrett, 2003) and political science (Grundig, 2006; Ward et al., 2001; Hovi, 2001). However, the implications of these studies are sometimes elusive, because of their restrained empirical capacity. Taking a critical perspective on the works so far, I argue that research on the climate negotiations risks "stagnating" over empirical deficiencies. In what follows I concentrate on two main limitations: the weak link between climate policy research and spatial measurements of bargaining, and the predominance of "small" data.

The first limitation is revealed by the little attention that climate policy students have so far paid to the spatial analysis of political competition (Downs, 1957; Hinich and Munger, 1997). Researchers of international organizations (e.g. the EU) have long focused on spatial measures to generate empirical estimates of international negotiations (see, for instance, Tsebelis, 1999). Accordingly, a negotiation agreement (O) is one point in a spectrum of possible outcomes (i.e. the bargaining set). This is determined by the distance between the status quo of the previous agreement (d) and the ideal position (x_i) of bargaining actors ($i = 1, 2, ..., n$). The latter can be additionally weighted by the importance (i.e. salience) that each attaches to the negotiation. Figure 1 illustrates these elements over one single issue (j).

In its simplest form, the spatial framework describes variation over a continuum. This allows researchers to compute distances across points on a line, therefore quickly calculating how far the agreement is from the status quo, and how successful a given country is in pulling the agreement close to its position. In addition, the usefulness of spatial measurements lies in the possibility of disentangling the negotiated issues (e.g., $j \neq z$), or otherwise overlapping them into one unique dimension.

Figure 1: Spatial illustration of bargaining elements

Spatial analysis has delivered important empirical information regarding several bargaining endeavours, from domestic coalitions (Boekhoon et al., 2006; Morgan and Schwebach,

1995) to international negotiations (Bueno De Mesquita, 2004; Schneider, 2005; Odell and Sell, 2006; Hug and König, 2002). And yet, this understanding has not been fully integrated in the empirical analysis of the UNFCCC. Researchers of climate change bargaining have not often used this setup to draw data, thereby missing the opportunity of framing their information on simple and intuitive scales.

The second limitation is the custom of analyzing restricted numbers of countries or issues. Some authors work around the complexity of the UN climate negotiations by referring to a small set of parties instead of the global sample. This approach may be helpful for theoretical propositions over few ideal countries (Hovi and Areklett, 2004). However, the inferences can hardly be translated into real world judgments (as also acknowledged in Barrett, 1999). By contrast, other researchers choose to shrink the number of issues in order to simplify the analysis of a large N of actors (Grundig, 2006; Ward et al., 2001). This custom levels the facets of the negotiation agenda, and possibly compromises the diversity of the bargained issues.

These simplifications occur in both quantitative and qualitative camps of climate negotiations studies (see review in Sprinz, 2004). Even if econometric techniques have improved the feasibility of statistical inferences from small samples, quantitative researchers have continued preferring the analysis of single topics of UNFCCC bargaining. For instance, Jensen and Spoon (2011) focus on long-term emission reduction targets, while Lange et al. (2007) investigate only the issue of equity and "differentiated responsibility". This form of 'shrinkage' is also reinforced by the fact that the majority of studies on climate change negotiations still resides in qualitative research. Case-studies have protracted the "one-issue, one-country" exploration of the UNFCCC (e.g. Bang et al., 2005; Levy and Egan, 2003), at the cost of discounting the general implications of their conclusions.

One exception of climate research aimed at gathering spatially delineated data in a large–sample fashion is the "*Negotiating Climate Change*" project led by the Swiss Federal Institute of Technology and University of Zurich (Weiler, 2012, but see also Bailer, 2012 and Castro et al., 2011). This is data collected from an expert survey conducted at the UNFCCC conferences, and complemented with the coding of sparse national documents presented at the Kyoto Protocol Ad-Hoc Working Groups. The information includes 56 national positions on eight theoretically-derived 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 dataset also presents salience

values. These are the fraction of countries' statements on the selected issues as reported by the UNFCCC watchdog, the "Earth Negotiation Bulletin" (for a description of the ENB's monitoring role, see Chasek, 2001).

While this data gathering is certainly relevant for a broad delineation of climate change bargaining, some information remains unclear. First, it is left unexplained why the negotiations are proxied as a bargaining between the selected 56 countries. In other words, it is not specified in what terms this sample is representative of the real-world negotiations. It is also not clear to what extent the data generating process described in Weiler (2012) is homogeneous. While the positions are drawn from interviews with members of national delegations, the saliencies 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 problem is that the position data is collected in two years (2009 and 2010) that only partially overlap with the data source for salience (ENB for 2007-2009). While this can be justified if positions and salience do not vary much throughout the years, the evolution of bargaining across time is not really addressed. This leads to a third critique, regarding issue selection and dimensionality: the eight issues in this dataset 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 does support such distinction, or whether the delegates may actually think of the issues as in "bundles". The EU literature suggests that inductive approaches to issue identification may reject theoretical determinations of the bargaining space. Accordingly, factor analysis or related techniques should be considered to investigate the latent dimensions of the data (Hix and Crombez, 2005).

Based on the lessons from the mentioned literature and the gaps identified in the climate change research, I contribute to the empirical exploration of these negotiations by proposing new original data framed as the spatial parameters of bargaining. In what follows I first present the criteria that precede the data gathering, and then I illustrate the actual data.

3 The data sources

The main reason why little work has been undertaken to collect large–scale information on the ongoing climate negotiations is the cost of generating such data (see Achen, 2006, for an

equivalent statement regarding EU bargaining). Weiler (2012) and Weiler and Bailer (2011) successfully face this challenge, but with the arguable shortcomings I have pointed out.

To enrich and possibly strengthen the data collection initiated on this front, I focus on different information on the UNFCCC. The data source should grant absolute uniformity between countries' positions and salience, in that it should provide both values simultaneously. Moreover, not only should the data be generated by the countries that negotiate at the UNFCCC, but it should at the same time be derived from the decision making process. Ultimately, I seek to embed this information in a spatial understanding of bargaining. This means that the data should be framed in a spatial spectrum (say, j) that includes each single country's position (x_{ij}) as well as the collective agreement (O_j) and the reference point (d_j).

The most cost-effective sources of bargaining data are texts generated in the negotiation process. As the evidence of policy (or political) preferences can be found in "content originated within an environment of collective associative memory" (Krippendorff, 2004, p. 14), I can rely on documents produced for and within the UNFCCC as a reliable mirror of bargaining interests. However, differently from Weiler and colleagues, I use content that countries *must* submit within the UNFCCC.[1] This boils down to the selection of two types of documents. On the one hand I collect "decision–level texts", which represent the resolutions that the international community agrees upon at two different points in time (i.e. an earlier document for the status quo, d, and a later document for the outcome, O). On the other hand, I identify "country–level texts", which carry information on countries' positions (x) – and saliences (s) – on the negotiated issues.

3.1 Decision-level texts

Law-making at the United Nations, as in other international bodies such as the World Trade Organization or the European Commission, is grounded on the practice of member states collectively adopting a text (Franchino and Mariotto, 2013; Odell and Sell, 2006). Decision making documents are most often written in recommendatory language, for the subsequent conduct of the countries is what actually determines the enforcement of international law. Yet still, they represent a major condition for the creation of global standards and international treaties (Schachter, 1994; Kaufmann, 1980). Not for nothing writing these texts

[1] This is important because it prevents from not–at–random missingness. Broadly speaking, it does not matter if positions are sincere or strategic. Surely part of the bargaining can take place elsewhere, e.g. in the coalition meetings before the observed negotiation rounds. However, as I am focusing only on the "real" negotiations between the positions expressed, the fact that they are compulsory is relevant.

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 convenance of the assembly. In the case of the UNFCCC, each finalized draft goes to the Conference of the Parties (COP), which is the supreme body of the Convention (Brunnee, 2002). The rule of vote is consensus.[2] 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 (e.g. Adaptation Fund Board sessions, meetings of the Least Developed Countries expert group, among others), two types of gatherings represent the core of the text–drafting process: the meeting of the UNFCCC subsidiary bodies occurring in midyear; and the COP in conjunction with the subsidiary bodies, which occurs at the end of each year. At both conferences all parties can review the implementation of the Convention and, since 1997, assess the Kyoto Protocol practices and adopt further resolutions (Boyd et al., 2008).

The selection of the decision–level texts for the data gathering is then linked to the choice of the years that determine the status quo (d) and the outcome (O) of my dataset. A logical strategy is choosing the negotiation points between two end-of-the-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 rather 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 EU decision making research suggests (Hug and König, 2002).

Figure 2 shows the stepping stones of the history of the UNFCCC negotiations and identifies the blocks of negotiations worth analyzing. The years between 1992 and 1997 constitute the time in which national positions where first articulated (Bodansky, 2001). As interactions in this period were fully heuristic, data for this period may be rather incoherent.

A more useful moment corresponds to the negotiation rounds between the meeting in Marrakech (2001) and the Kyoto Protocol first commitment period (2005). This time pre-

[2] A special provision for failed consensual agreement exists, but the UNFCCC has never relied on it.

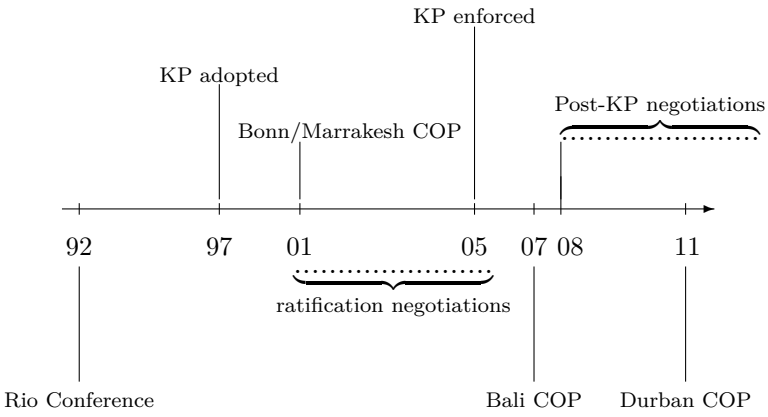


Figure 2: Time line of UNFCCC events

sented a new paradigm for climate change policy, because it shifted the international focus from the definition of 'engagement' to the concretization of commitment (Gupta, 2010, p. 646). These UNFCCC meetings also reflected a new type of diplomacy, 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 period between the establishment of the Bali Roadmap (2008) and the Durban meeting (2011) represent an important negotiation round. During these more recent years new bargaining issues emerged that more closely involved developing countries. At the same time, the financial crisis just erupted, which raised concerns with the design of the Convention and the distribution of responsibilities (Gupta, 2010).

Based on such considerations, my data collection focuses on these two highlighted periods of UNFCCC bargaining. I call these the *pre–Kyoto Protocol enforcement negotiations*, which span between the Bonn conference in the summer of 2001 (COP06)[3] and the Protocol enforcement established in Buenos Aires in 2004 (COP10); and the *post–Kyoto Protocol negotiations*, which go from the Poznan negotiations in 2008 (COP14) to the Durban agreement in 2011 (COP17). The COP06 and COP14 agreement texts represent the status quo points for the two bargaining periods. The COP10 and COP17 agreement documents, by contrast, provide the two respective outcomes.

[3]I am here referring to the mid-year Bonn meeting in July 2001, which for several special circumstances represented a true full convention (Dessai, 2001).

3.2 Country-level texts

In terms of country-specific texts, several types of documents exist within the context of the UN climate negotiations (see UNFCCC, 2012b). For part of their data collection, Weiler and colleagues make use of submissions by countries (or, in some cases, coalitions) willing to express a certain position on any of the issues dealt by the Ad-Hoc Working Groups of the Convention. These documents are written in the same form of national position papers at the EU, and therefore easily convey national stances on specific topics. However, the problems with such texts are two: first, they are not obligatory, and many countries never wrote any; second, they are open to any issue a country wants to state a position on, therefore allowing for issue discrimination. These two aspects pose the problem of missing observations across countries as well as issues. Besides, these documents have only started being a practice since 2007. I therefore dismiss their usefulness for my data gathering.

I identify the National Reports to the UNFCCC (or National Communications, from here on NCs) as codable texts that countries involved at the negotiations produced in the years under analysis. The NC is a document that each member country must submit to the COP in order to meet commitments under the Convention. The core elements are *"information on emissions and removals of greenhouse gases (GHGs) and details of the activities a Party undertakes to implement the Convention"* (UNFCCC, 2012a). These texts must then be anchored to the preferences that underline national bargaining behavior at the UNFCCC meetings. Moreover, the reports *"contain information on national circumstances, vulnerability assessment, financial resources, and transfer of technology"* (UNFCCC, 2012a). By consequence, NCs are bound to inform and discuss explicitly debated topics of the COP meetings.

I collect the reports that were issued by both developed and developing countries in the years that correspond to the two bargaining periods. These are divided by countries listed under the Annex I of the convention and the otherwise called Non–Annex I countries. The available texts happen to be issued in years in which a new round of NCs was announced. The use of the National Reports as sources of positions data, however, comes with certain caveats.

First, these documents do not constitute simple position papers. NCs in fact agglomerate different types of information, from climate science to economic predictions. This entails a certain likelihood that the texts may be too technical, or that the political content may be neutralized by "noise". This is not necessarily a problem for the sake of comparing more

or less similar content, generally. In any case, I work around this concern by relying on the origin of the NC. Each NC is in fact submitted and published by the Ministry of the Environment (or its national equivalent). Thus, if the climate change negotiations are indeed political as the political science 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 level. This is also in line with the theory that positions are never fully observed on their true dimensions (Lake and Powell, 1999), and that researchers have only access to noisy indicators (Benoit and Laver, 2012).

The second caveat derives from the fact 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 groups of countries. However, a look at the official Reporting Guidelines shows that the risk of evaluating completely different texts is low: the Annex I reports "inform on ongoing policies", and Non-Annex I reports 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.[4]

The final challenge is that 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 2001-04 and 2008-11.

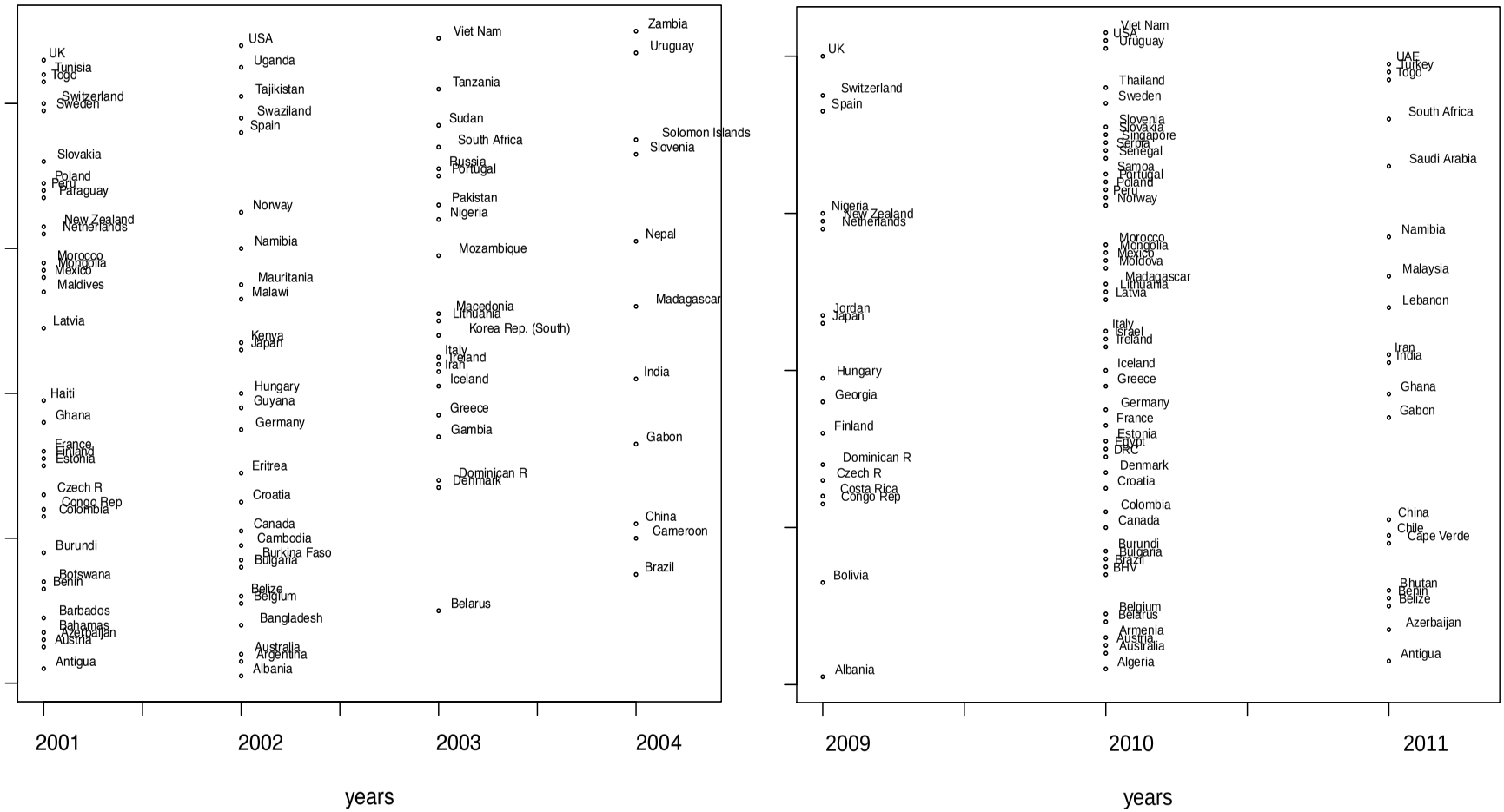
The inspection of the submissions available on the UNFCCC website[5] shows that this is not problematic: of the 192 member countries, 89 submitted their respective NCs in the years preceding the Kyoto Protocol enforcement (corresponding to the NC3 for Annex I and NC1 for Non–Annex I), while 84 submitted their next NC in the post–Kyoto Protocol negotiations period (corresponding to NC5 for Annex I and NC2 for Non–Annex I). In Figure 3 I list the texts from which I draw the ideal positions (and saliences).[6]

[4] http://unfccc.int/national_reports/annex_i_natcom/_guidelines_for_ai_nat_comm/items/2707.php.

[5] http://unfccc.int/national_reports/items/1408.php

[6] The mentioned NCs are in English, French or Spanish. Ukraine and Russia submitted NCs in 2010, but only in Russian. Since I do not have access to Russian speaking assistants, I do not include them.

Figure 3: Country–level texts by year of submission



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

4 Manual content analysis

The two types of texts from which I collect the observations on the UNFCCC were presented in the previous section. In this section I first describe the bargaining issues included in the dataset, and then proceed to the description of the issue scaling and data collection. Lastly I summarize features and characteristics of the data.

4.1 Identification of the issues

Issues constitute a most crucial component of bargaining studies. Not only do they represent the *'what'* around which the negotiations evolve, but they also establish the spectrum over which countries vary with respect to their preferences (Hovi et al., 2009, p. 29-31). In the decision making space, the scale of a negotiated issue delimits the range of possible national and collective positions. The scaling measurement is also of major importance, as it shows the way countries perceive the bargaining, and therefore on what kind of intervals the possible reachable outcomes exist. Last but not least, issues inform, confirm, and disentangle the dimensions of a negotiation.

A data gathering procedure that aims at generating reliable information on the UNFCCC must extract the true issues at the backbone of these negotiations. These are often deeply embedded in the bargaining discourse, and yet they should be known and acknowledged by all players. 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, what criteria to follow in order to systematically identify the bargaining issues.

Empirical studies on EU decision making usually rely on self-evident issues. These can be raised on an agenda-rolling basis in the course of a European Parliament meeting (Kreppel and Tsebelis, 1995), or are advanced in the form of separate proposals at the Commission (Thomson et al., 2006). This type of issue identification is highly practical for legislative data, as all issues are explicit and known ('issues' are also called as such, and are associated with a specific number and code). However, this is not directly comparable to the UNFCCC: while here too the specific decisions in the agreement texts are assigned an identifiable number, they are not reported accordingly, therefore they are not quite as self-evident as in the EU. Nor are the issues directly linked to the sections (or chapters) of the NCs, which follow a different structure.

This leads to a bifurcation of strategies for the identification of issues at the UNFCCC. On the one side I can rely on induction. I call this a *topic* approach, by which I mean

the extraction of issues based on the cross–validation of topics. On the other I can use a *word–based* approach, which detects issues based on the texts' key–words. In the interest of identifying agenda points with the highest level of validity, I engage in both approaches.

Table 1: Issues and scales

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

4.2 Issue scaling and data collection

As the identification and validation of issues is completed, I now proceed to describing the data. After collecting the texts and cleaning them from figures and tables, the coding is performed in three main steps. The first task is determining the *unit of text* to code. The content analysis literature points to two possibilities, namely the options of "quasi sentences" (Budge et al., 2001) and "natural sentences" (Ray, 2001; Daubler et al., 2011). The choice depends on the nature of the language at hand. The NCs, in fact, follow a 'short paragraph' writing style, featuring consistent spacings in between long sentences (see Table 1). The same is true for the language in the agreement texts, which are sectioned in numbered paragraphs

delimitated by punctuation marks (Daubler et al., 2011). In short, the natural sentence seems a reliable unit of coding for the types of texts under analysis.

The second step is the *assignment of text to the pre-determined issue categories*. This task is equivalent to the categorization of 'quasi sentences' in the Comparative Manifesto Project (CMP) (Budge et al., 2001).[7] However, the difference between the CMP texts and the UNFCCC documents, and in particular the NCs, is remarkable. The size of the electoral manifestos is fairly manageable and lend itself to coding the full texts with all sub-sections (to mention one statistic, the 1992 UK Labour party manifesto is about 7,000 words). By contrast, one NC can go up to 100,000 words (i.e. 340 pages). It is therefore unrealistic to engage in parsimonious human coding that covers all the text of all country-level documents in the sample.

I address this challenge by identifying the relevant subtext with word frequencies (Laver et al., 2003; Benoit et al., 2009) and studying it with classical content analysis (Krippendorff, 2004). The strategy is the following: the text is parsed into units (i.e. periods or short paragraphs), and I screen these to search for words that carry position–relevant (or, in the case of decision–level texts, agreement–relevant) content. The screening is facilitated by the issue-based dictionary previously described. Every time I find one of the terms in the dictionaries, I isolate the text unit, and then I judge it as the reference to an issue or not. In the case in which the text unit is indeed connected to an issue, I assign it to such issue. If instead the text unit does not refer to the issue, reflecting some other topic that is not relevant for this work, it is left uncoded.[8] As in the CMP, issues are assumed to be mutually exclusive, so that the same unit of text cannot be assigned to more than one issue category.

The third and final step is the *assignment of positional value* to each categorized unit of text. This passage relies on the "scaling" of the issue spectrum. Defining such scale is important because bargaining relies on transitive preferences, and coding positions would not be useful if they were not put in a ranking order (Arrow, 1951). Moreover, the issue metric allows for the numerical evaluation of the bargaining elements (Lowe et al., 2011). Scales are necessarily deductive, because I cannot rely on a generalized distribution of all positions. The UNFCCC issues in fact vary in the scaling of positional values: while some

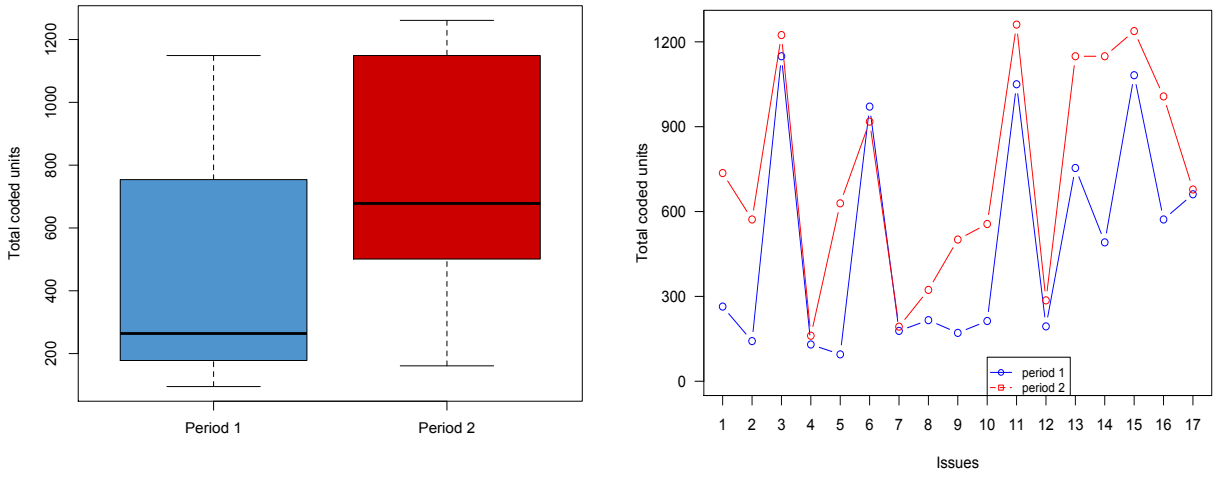
[7] Although the CMP studies parties, the coding approach has migrated to the analysis of political discourse in other decision making organisms (e.g. parliament speeches) with significant success (Laver and Benoit, 2002).

[8] Note that this type of coding does not rely on the sentence–by–sentence sequence. This is beneficial, for it 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).

issues can be defined as continuous (e.g. the percentages of emissions that each country plans to mitigate with reforestation), 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 same sources used to identify the issues: the academic publications and the ENB summaries. To understand how the positional values are pinpointed in their continuum, I go back to the excerpts and scale the issue space based on these descriptions. For example, for the "assignment of abatement units" (period 1) I measure three different positional values: a low value for the more skeptic Australia, Japan and Canada; a higher value for the more peremptory EU, G77/China and Samoa; and an intermediate value for Switzerland. The measurement effort leads to scaling binary, ordinal, and continuous issues, and concludes the manual coding of the UNFCCC documents. A better description is found in the Appendix.

Figure 4: Coded text by periods and issues



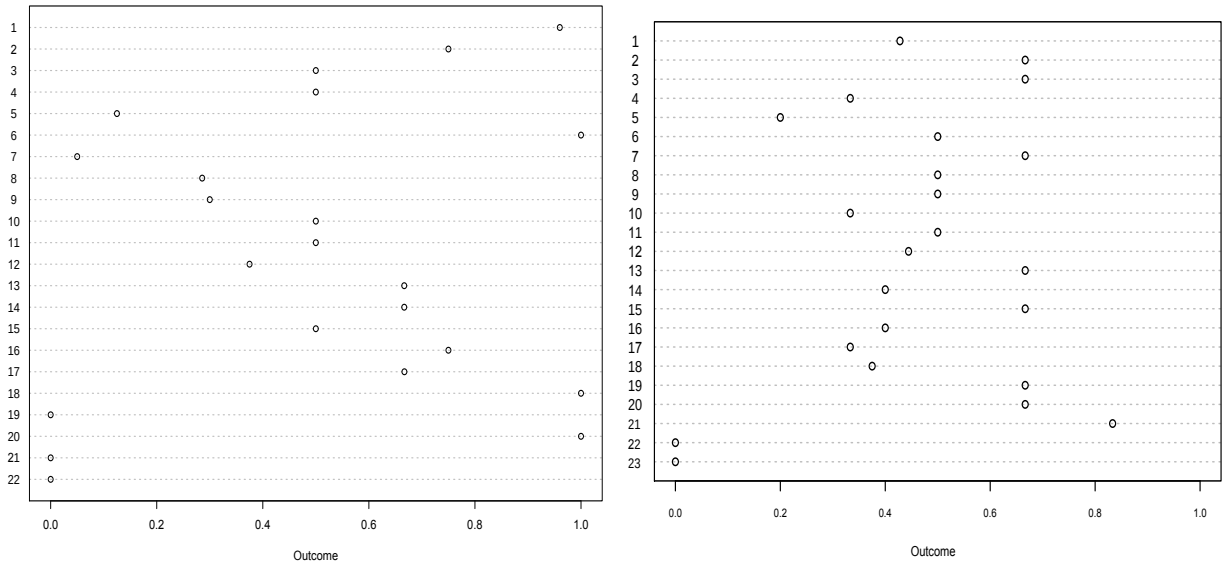
Text units by bargaining period Text units across issues

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.

The content analysis generates information on the characteristics of the NCs as well as the data on positions (x), outcomes (O) and disagreements (d) at the UNFCCC. Tables in the Appendix summarize the country-level data. The changing nature of the issues across negotiations is shown in Figure 4. The box plots in subfigure (a) indicate that the amount of text for all coded issues increases from period 1 to period 2. In fact, while for period 1 the dataset reports an average of about 300 units coded per issue, for period 2 the coding

produces an average of 600 units per issue. Analogously, subfigure (b) shows that some topics receive a 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 2001–04 NCs. While this is known from observational evidence, mine is the first large dataset that records this variation over time.[9]

Figure 5: Coded outcomes



Period 1 Period 2

The plotted 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.

Finally, the manual coding generates specific information regarding the agreement points. As Figure 5 illustrates, the locations of the bargaining outcomes also vary across issues and time. 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 [issue 14] at the post–Kyoto Protocol negotiations (Weiler and Bailer, 2011). However, the UNFCCC dataset introduced here additionally includes the value of the agreements before 2005. My data then goes beyond any extant dataset in granting "long and wide" information on climate agreements.

The descriptive statistics of the bargaining positions and international outcomes provide a snapshot of the UNFCCC dataset. The changing nature of the identified issues is a crucial feature here. This variance offers important empirical substance, for example, for

[9] Weiler and Bailer (2011), for example, do have information on the repetition of issues on UNFCCC legal texts, but only cover issues discussed at the 2009-10 negotiations.

the study of changing bargaining strategies in the course of the negotiations. At the same time, it justifies separating the analyses in different bargaining windows, as not all issues are strictly comparable. In short, the data represents an important basis for the comparative study of climate policy making and bargaining.

4.3 Dimensionality

The previous section described the manual coding of the two bargaining periods under analysis. Now I move to the exploration of the gathered information, in order to first assess how this information reveals the dimensions underlying the negotiations.

The study of international negotiations traditionally relies on theoretical constructions on what underlines bargaining conflict. EU scholars often assume that topics are rooted in an integration dimension (Schneider and Cederman, 1994; Thomson et al., 2006; Kreppel and Tsebelis, 1995). Similarly, WTO research conceptualizes trade preferences on this continuum (Milner and Rosendorff, 1997), although some call it the economic liberalization dimension (Boockmann and Dreher, 2003). This theoretical understanding applies to climate change negotiations too. Gupta (2012), for example, notes that despite the large number of agenda issues at the UNFCCC, parties always refer back to general "multilateralism". This assumption, however, must be grounded on empirical confirmations. I therefore recur to the exploration of dimensions in the UNFCCC dataset with latent variable modelling.

In the universe of data reduction models, factor analysis, which assumes the number of latent variables to be smaller than the observations, is the most popular model. Factorization has been used to induce the underlying dimensions of bargaining preferences (see, e.g., Hix and Crombez, 2005). And yet, the choice of the factoring specification needs a careful assessment.

As the issue variables in the UNFCCC dataset are differently scaled, the latent construct has both ordinal and continuous indicators. Accordingly, a "normal theory" factor analysis may run into measurement problems, as discretizing continuous variables would lose information, while slicing up discrete variables would complicate the estimation. A solution is to accommodate these ordinal and continuous variables with a Markov Chain Monte Carlo (MCMC) algorithm that adjusts for differences between components, and captures variation between types of responses. I then use Quinn (2004)'s Bayesian mixed factor analysis algo-

rithm, which models the variable:

$$x_{ij}^{*} = \Lambda\phi_i + \varepsilon_i \tag{1}$$

where Λ is a matrix of factor loadings, ϕ_i is the vector of factor scores, ε_i is the vector of (normally distributed) disturbances, and x_{ij}^{*} is the vector of latent responses associated with the elements of $\mathbf{X}$:

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

where j are the indexed responses, i are the observations, c is the categorical variable with values $(1, 2, ...C_j)$ that identifies whether a variable is ordinal, and γ is a collection of cut-points that tend to infinity.

I first run a test that determines the likelihood that a fixed amount of factors is enough to explain the data variance. The hypothesis that three factors are underlining the data fails to be rejected for both periods ($p > 0.07$). Therefore, I perform the Bayesian mixed factor analysis on three factors.[10]

Table 2 shows that the factors explain more than one third of the variance of the positions in both periods. In fact, including an extra factor only increases the explanatory power of the factor analysis of 4 percent. The results are similar (and marginally stronger) if I ignore the scaling differences and run a a principal component factor analysis with orthogonal rotation. The alternative principal-components factoring is reported in the Appendix.

Table 2: Variance proportion of mixed factor analysis

Period 1	**Variance**	**Proportion**	**Cumulative**
Factor 1	3.671	0.17	0.170
Factor 2	1.787	0.08	0.248
Factor 3	1.670	0.07	0.328

Period 2	**Variance**	**Proportion**	**Cumulative**
Factor 1	3.914	0.17	0.170
Factor 2	1.720	0.07	0.244
Factor 3	1.364	0.05	0.305

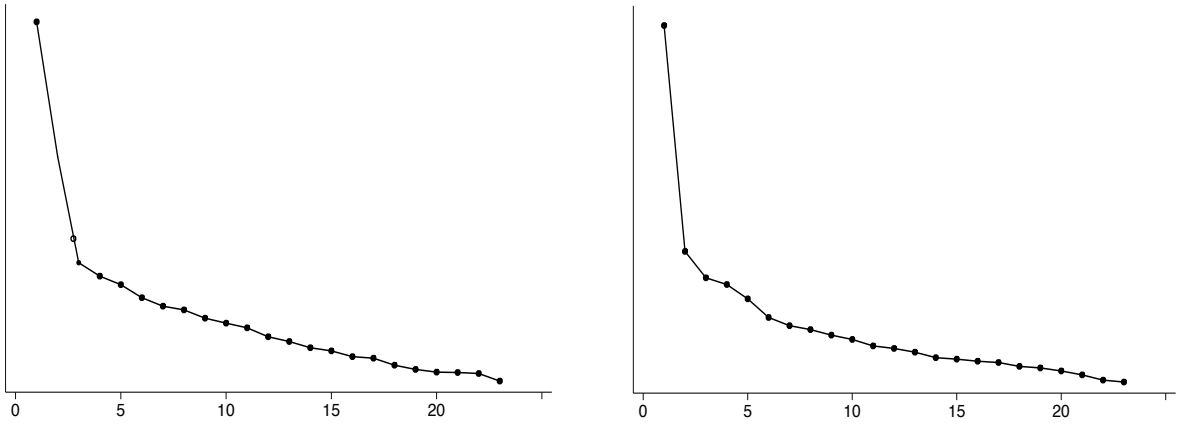
H0 (1 factor): $p = 0.00$; H0 (2 factors): $p = 0.02$; H0 (3 factors): $p = 0.07$.

[10]The analysis was performed with the *MCMCpack* in R. For the loadings, see the Appendix.

The rest of the topics that load on factor 1 (though less strongly) are issues such as emission trading, differentiated responsibility, and international accountability. These capture the rather ideological nature of the climate change debate, clustering issues dealing with compliance at the UNFCCC. Following this interpretation, the climate negotiation positions in my dataset are aligned on two axes: on the one hand these are positively associated with issues related to integration and compliance; on the other, countries cluster on issues related to the technicalities of climate mitigation (e.g. land use capacity and CCS).

The strong loadings on factor 1 are further supported by the scree test plots obtained from the principal component factor analysis. Figure 6 shows 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 at the UNFCCC.

Figure 6: Scree test plots from principal component factor analysis



Period 1 Period 2

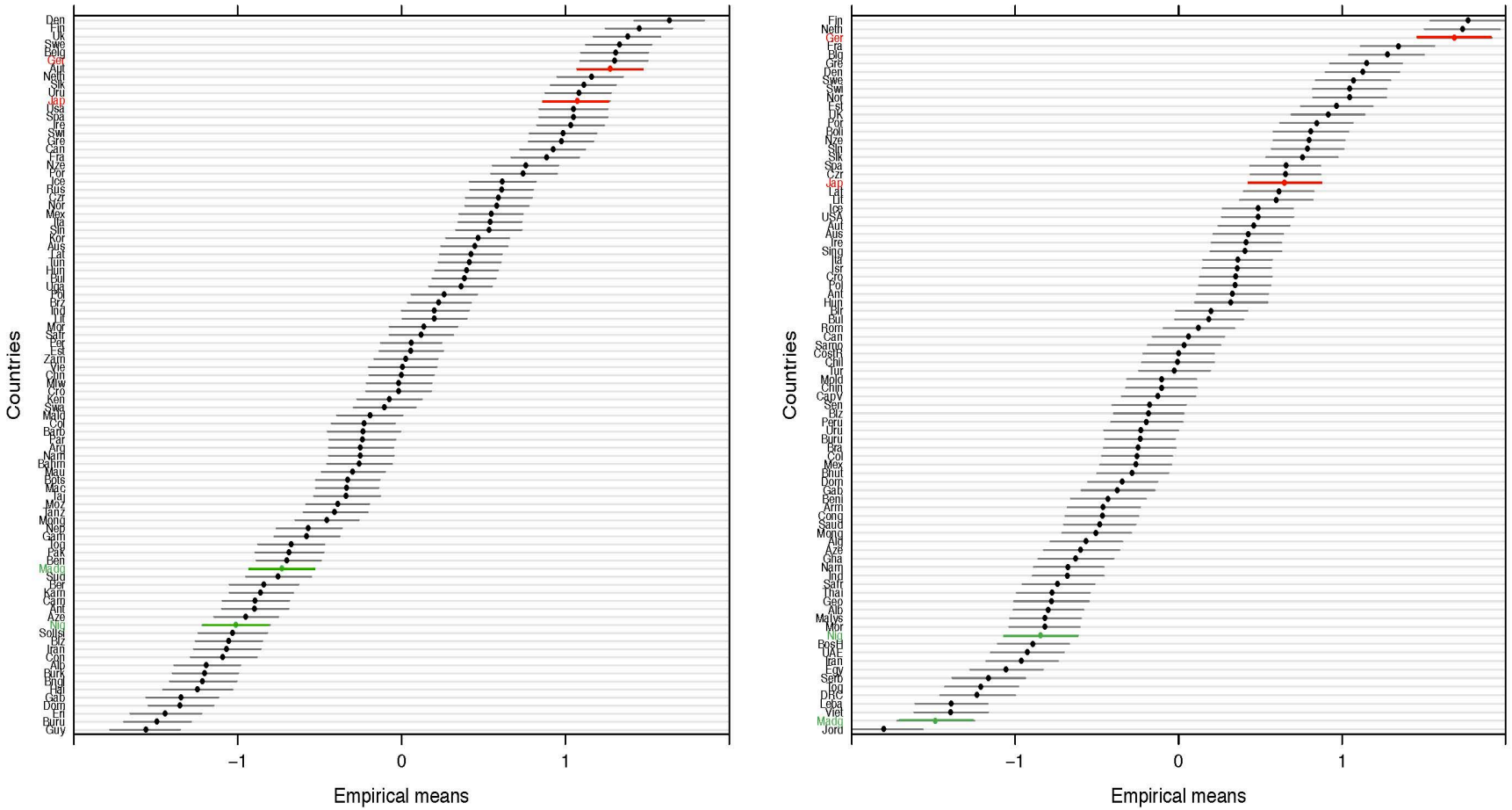
In order to understand what this factorization implies for the distribution of the countries across the UNFCCC issues, Figure 7 plots country estimates of the latent scores (ϕ) of factor 1. Empirical means and uncertainty bounds show an interesting pattern. For both periods, most developed countries (e.g. Germany and Japan, in red in the figure) cluster on the very upper end of the scale. By contrast, the least developed countries are located at the low end of the plots, e.g. Madagascar and Nigeria (in green).

This posterior distribution can be interpreted in two ways. On the one hand, these estimates simply discriminate Annex I and Non Annex I countries, as these groups are strong determinants of bargaining at the UNFCCC (see Castro et al., 2011). On the other hand,

they may distinguish countries that have truly different views of what the UNFCCC is about. "Strong" countries, for example, use the negotiations to discuss international compliance and leadership. "Weak" countries, by contrast, rarely miss the occasion to focus their speeches on responsibility and aid. So, generally, factor 1 reveals conflict over commitment, integration, but also redistribution at the UNFCCC.

Interestingly, note that in Figure 7 the empirical means close to zero (i.e. with little association to either sides of the dimension) refer to countries like Brazil, China and India. Accordingly, emerging powers seem to prefer moderate integration. This supports the qualitative observation that BASIC countries have had a role of "dynamic brokers" rather than "nay sayers" at the climate change negotiations (Michaelowa and Michaelowa, 2012).

Figure 7: Country scores across Factor 1



Period 1 Period 2

Plot of estimates of positions on UNFCCC latent dimension. Dots are posterior means and the line segments depict the 90% credible intervals for each country. In red are the positions of Germany and Japan. In green are the positions of Madagascar and Nigeria.

5 Quantitative content analysis

The data generation described in the previous section has the benefit of having been supervised throughout the entire generation process. However, it comes with important trade offs: beside a costly amount of time spent on coding, it assumes that issues are separate and ideal positions are self–evident. If these assumptions did not hold, more inductive approaches to preference estimation would be of better use.

Applied research in the past two decades has developed a range of semi- and fully automated techniques that help determining political actors' ideal points based on frequentist assumptions on words in texts. Some of these approaches are based on supervised learning, such as Wordscores (Laver et al., 2003). Others represent unsupervised scaling methods, from correspondence analysis (Greenacre, 2007) to expectation-maximization and multinomial choice models (Proksch and Slapin, 2008; Slapin and Proksch, 2008).

While all these methods are capable of extracting climate policy positions, the technique I use for the quantitative analysis of the UNFCCC documents is *Wordfish*.[11] This automated scaling program generates estimates of policy positions comparing the body of different documents. The method has been applied to different text sources (manifestos, speeches, statements, and pledges), measuring policy positions of individuals, parties, and interests groups in different political settings (Klüver, 2009; Proksch and Slapin, 2010).

Compared to supervised methods such as Wordscores, the convenience of *Wordfish* relies on the no–prior knowledge on the nature of the single texts (Benoit and Nulty, 2013). Moreover, and especially when dealing with international texts, Wordfish is more generous than nonparametric scaling approaches (Lowe et al., 2011). By sampling natural language over words, nonparametric scaling requires the corpus of compared words to be absolutely homogenous. However, this assumption is hardly applicable to the NCs.

Wordfish assumes that words' frequencies provide information about the policy position of each document with respect to others. The probability of each word appearing in a given document is independent of the presence of others. Looking at the word frequencies contained in each text, Wordfish determines the differences between alternative documents by scaling them on a common (and singular) latent dimension. It is on this dimension that the algorithm measures the documents' relative policy positions.

Since words' frequencies are expected to be generated from a counting stochastic pro-

[11] Note that I use quantitative text analysis only on NCs, as the agreement texts are too few for an accurate estimation.

cess, the algorithm assumes that words follow a Poisson distribution defined by the parameter λ, which represents both the mean and the variance of the distribution. Applying this logic to the distribution of words in the climate change texts, ideal position estimates are determined as

$$y_{ijt} \sim Poisson(\lambda_{ijt}) \tag{2}$$

where y measures how often the word j appears in the NC document i at each of the bargaining period t. The parameter λ is determined by maximizing the following equation:

$$\lambda_{ijt} = exp(\alpha_{it} + \psi_j + \beta_j + \omega_{it}) \tag{3}$$

where ω and α represent the period–specific document positions and fixed effects, respectively, and β and ψ constitute the words' parameter and their fixed effects. The coefficients of interest here are the positions of the documents, ω, across a dimension that is up to the researcher to interpret, and the word discrimination parameter, β, which corresponds to the word placement along the latent dimension.

I run Wordfish on the NCs in order to determine national positions across the latent unidimensional space. First, however, I explore the word coefficients, β, to understand what type of dimension the algorithm captures from these texts.[12] Figure 8 displays the words parameters (β) for the first and second period. The y-axis reports the word fixed effect (ψ), 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 texts 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.

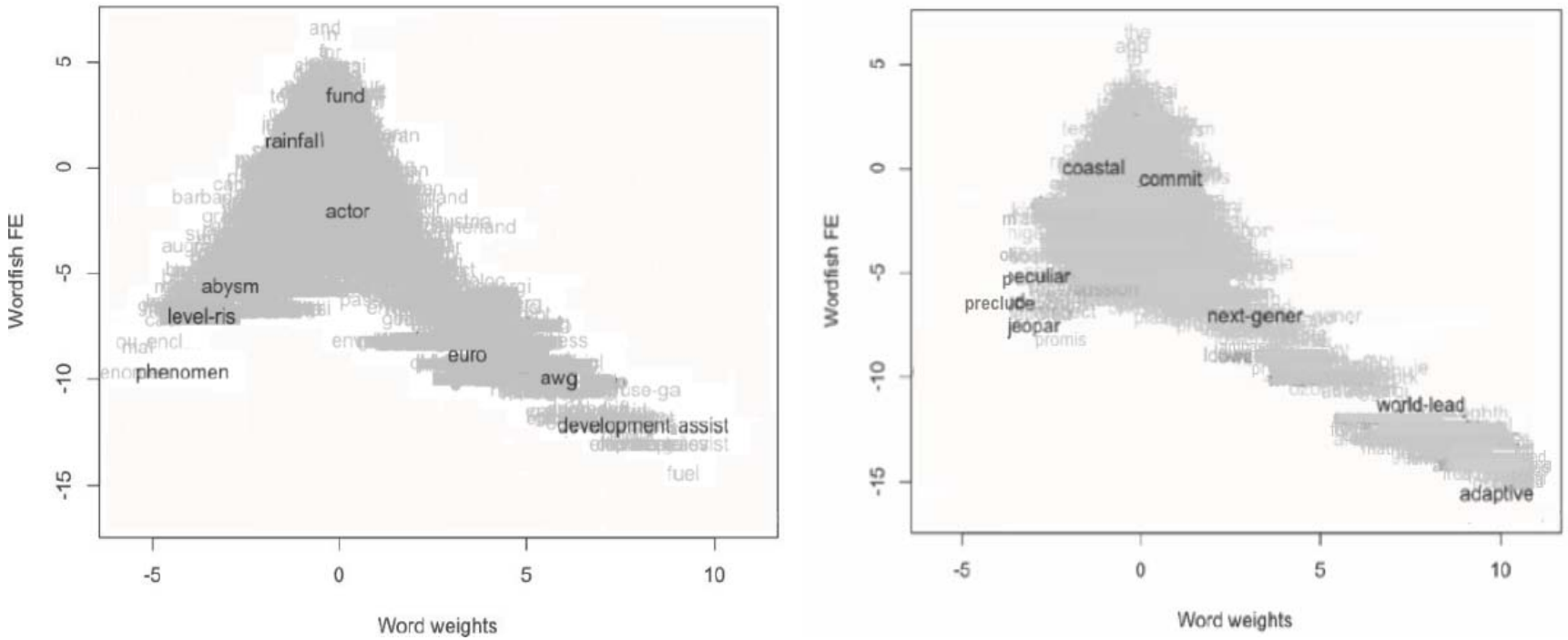
Moving to the discriminative words, in typical scaling exercises the fixed effects distribution is interpreted as the left–right dimension. However, it is hard to imagine that this scale underlines the climate change negotiations. Rather, following the CMP subcategory system, these should fall on a scale between pro–growth and pro–environment, or pro–integration and anti–integration.

Figure 8 sheds light on the nature of the scaling. The words on the left side of the axis

[12] As other quantitative text analysis softwares, Wordfish works only with texts in the same language. Hence, I keep the English documents and drop the French and Spanish ones. The Wordfish samples include 65 and 63 NCs for the 2001-04 and 2008-11 periods, respectively.

in subfigure (a) are *abysmal*, *level–rise*, and *phenomenal*, among others. These words have little to do with left–wing values, and are rather attributed to parties that are concerned with loss of sovereignty 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).

Figure 8: Wordfish coefficient parameters



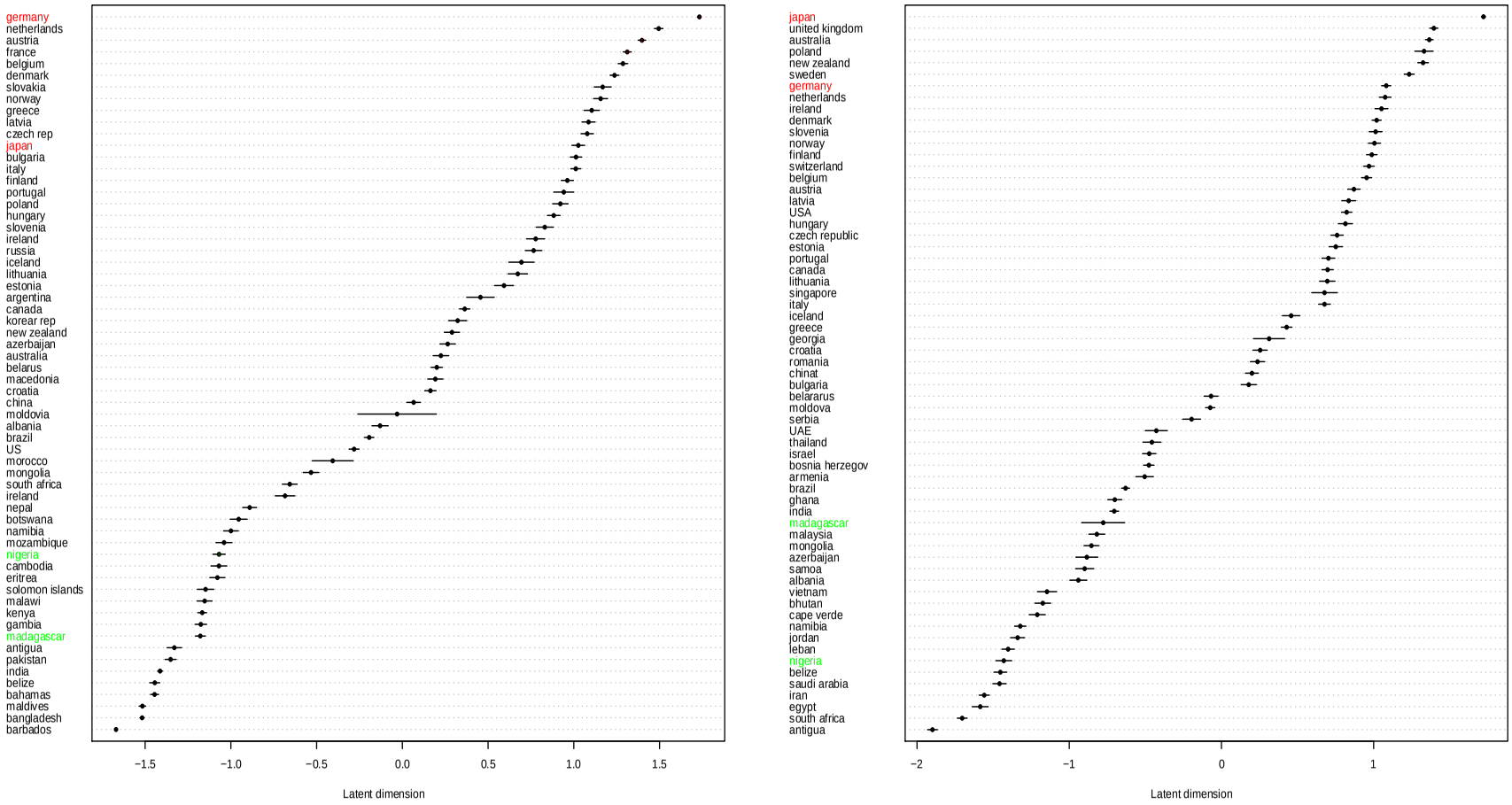
Period 1 Period 2

Plot of Wordfish β and ψ parameters.

The words that appear on the right end are instead *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 indicates that "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".

The β plot of period 2 (subfigure b) also successfully discriminates these two sets of words, although the distribution is slightly more skewed than for period 1. The words on the left side refer again to concerns over sovereignty and compromises to deal with climate change. *Peculiar* and *jeopardize* 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).

Figure 9: Dot plot of Wordfish document estimates



Period 1 Period 2

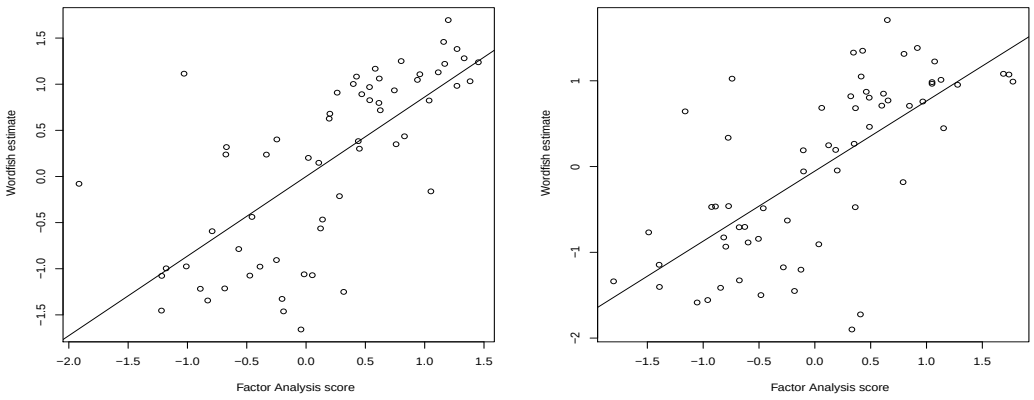
Plot of estimates of Wordfish positions. Dots are document estimates and the line segments depict the 95% confidence intervals for each country. In red are the positions of Germany and Japan. In green are the positions of Madagascar and Nigeria.

The words highlighted in Figure 8 support the conjecture that the NCs reflect preferences over integration. 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 (ω) should confirm that countries cluster into different groups: alarmed countries on one end (e.g. Madagascar), and regime optimists on the other (e.g. Germany).

Figure 9 shows the plotted distribution of the document parameter ω. Interestingly, the National Communications turn to be arrayed as the word plots led to suggest: In both periods countries like Germany and Japan are on the upper bound of the Wordfish document scale. By contrast, smaller states and OPEC countries (see Madagascar and Nigeria) are located on the lower bound of the distribution. This fits the interpretation drawn from the fixed effects plots, holding robust to estimations on text subsamples.[13]

To ultimately substantiate the meaning of the quantitative analysis of the NC documents, the literature suggests to cross–validate the quantitative scores with human–coded positions (Klüver, 2009). I then compare the Wordfish estimates with the manually coded data. For each bargaining period under consideration, Figure 10 plots the unidimensional

Figure 10: Comparison of Wordfish estimates and factor analysis scores



Period 1 Period 2

estimates obtained with Wordfish (y–axis) and the scores of the factorized data from the

[13] As a robustness check, I take a look at a subsection of the NC, to address the possibility that different parts of these long texts may carry different positions and therefore unfold multidimensionality (Slapin and Proksch, 2008). I select the section called "Policies and measures", which is supposed to be the chapter where parties more directly address past and future policies on climate change. The separate analysis on this subsample does not change the positioning of the national estimates from the analysis on the whole documents, as shown in the Appendix.

manual coding (x–axis) with a fitted regression line. The result is a high positive correlation, where the Pearson coefficients are 0.70 for period 1 and 0.68 for period 2.[14] Although they stem from different gathering processes, the measures overall validate each other. In sum, the two types of data carry largely similar information regarding climate bargaining positions.

6 Conclusion

Studies on the UN–sponsored climate change negotiations have exponentially increased in the past years. Still, while these works have enriched the knowledge on cooperation at the UNFCCC, the literature is still missing inferences based on broad datasets. I here claim that the little attention paid to spatial measurements and the lack of large–N studies have hampered ambitious empirical analyses in this field of research. Based on the lessons from studies of international negotiations in other realms, I present new original data on ideal positions, outcomes and disagreements at two points in the history of the climate negotiations.[15]

This paper has presented the systematic process of data collection that generated the UNFCCC dataset. I first introduced the data sources: the COP agreement texts and the National Communications. Second, I identified the bargained issues and described the manual data gathering. I then engaged in reliability tests, data reduction modelling and salience estimation, in order to investigate the data as well as checking the trustworthiness of the coding. Finally, I moved away from multidimensionality assumptions and made use of quantitative text analysis to extract unidimensional ideal points. I thereby applied the Wordfish algorithm to the National Communications. The results are not only intuitive, but also valid according to cross–checks with the manual dataset.

The dataset is ultimately meant to foster the explanations of international climate policy making. The estimates lend themselves to further investigations of success and agreements at these negotiations. Moreover, these represent useful prior knowledge for case studies of climate negotiation behaviour across time. These and other investigations will find answers in this new data.

[14] The results of the ordinary least squares regressions are (for both periods) $R^2 = 0.5$, $\beta = 0.58$, $p = .000$, S.E. $= 0.07$. Note that the significance holds also when dropping outliers (i.e. the most extreme country on each side of the distributions).

[15] The data will be made available on the author's website upon publication.

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