

# Mapping the Ideological Networks of American Climate Politics<sup>\*</sup>

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## Abstract

How do we understand national climate change politics in the United States? Using a methodological innovation in network analysis, this project analyzes discussions about the issue within the US Congress. Through this analysis, the ideological relationships among speakers providing Congressional testimony on the issue of climate change are mapped. Our findings show how consensus is forming around the economic implications of regulating greenhouse gases and the policy instrument that should do the regulating. The paper is separated into three sections. First, we review the ways scholars have looked at climate change policymaking in the United States, paying particular attention to those who have looked at the issue within the US Congress. Next, we present analysis of statements made during Congressional hearings on climate change over a four year period. This paper concludes by discussing how these findings help us understand shifting positions within American climate politics and the implications of these findings.

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## **Introduction**

How do we understand the lack of a national climate policy in the United States? Under both Democratic and Republican Party leadership, the US has been unsuccessful in passing legislation that regulates the emission of greenhouse gases. Since the Kyoto Protocol entered into legal force on 16 February 2005, a number of bills have been proposed in the US Congress that would establish a federal climate change policy, but none have successfully been passed through both houses of the Congress and entered into law.<sup>1</sup>

Social scientists have attempted to understand this lack of a federal climate change policy in many ways, focusing on various aspects of the issue (e.g. Christiansen, 2003; Fisher, 2004; Fletcher, 2009; Harris, 2000; Hovi and Skodvin, 2008; Jacques et al., 2008; Lisowski, 2002; Lutzenhiser, 2001; McCright and Dunlap, 2000; 2003; Rabe, 2004; Rudel, 2001; Selin and VanDeveer, 2007; Victor, 2004; see also Gelbspan, 1997; Leggett, 1999; Ward, et al., 2008 for more popular accounts). On the one hand, there have been numerous studies that focus on climate change politics in the US to understand how national politics contribute to the American position in international negotiations and within the global climate change regime (for recent accounts, see particularly Bang et al., 2007; Paterson, 2009). On the other hand, a growing number of scholars have looked at the policy-making process specifically within the United States. Much of this research has assessed the relationship between sub-national and national policymaking around the issue (see e.g. Jones, 1991; Rabe, 2007, 2009; Vasi, 2006)

Although the studies are numerous, very little research to date has analyzed the role that specific actors play within the US Congress (but see McCright and Dunlap, 2003; Fisher, 2006).

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<sup>1</sup> For a summary of and comparison among the bills, see [www.eenews.net/special\\_reports/climate\\_change\\_domestic/comparison\\_chart/](http://www.eenews.net/special_reports/climate_change_domestic/comparison_chart/) (Accessed 11 March 2011).

This paper builds on this limited work to analyze how the actors involved in discussions about climate politics in the US are ideologically related, and how these interactions help explain the lack of a federal climate policy in the United States.

This paper is separated into three sections. First, we review the ways that scholars have explained American climate politics, paying particular attention to those who study climate change policymaking in the US Congress. Next, we present analysis of Congressional hearings on climate change over a four year period that employs an innovation in network analysis. This paper concludes by discussing how these findings help us understand American climate politics better.

### **Understanding Climate Change Policymaking in the United States**

As has been previously stated, there has been a good deal of research on the politics of climate change in the United States in recent years (e.g. Arimura et al., 2007; Fisher, 2004; Harris, 2000; Jacques et al., 2008; Lisowski, 2002; Lutzenhiser, 2001; McCright and Dunlap, 2000; 2003; Rabe, 2004; Selin and VanDeveer, 2007; Victor, 2004). Much of this research focuses on explaining the US position in international climate change policymaking. In his attempt to explain the US withdrawal from the Kyoto Protocol, for example, Lisowski applies Putnam's logic of the two-level game between international and national politics (Putnam, 1988; see also Evans, Jacobson, and Putnam, 1993). Lisowski finds that U.S. President George W. Bush took advantage of politics inside the United States to "legitimize his hawkish approach" internationally (2002:101). Although Lisowski suggests that President Bush worked within the US political system to further his perspective, more recent work suggests that the legislature continues to play a very big role in US climate politics. In his paper on US climate politics after

the election of President Obama in 2008, for example, Paterson makes a compelling case to show why “effects of a new US President on global climate politics will be rather less than might be expected” (2009: 140).

Other studies are more specifically focused on climate change politics inside the country. Lutzenhiser, for example, aims to explain the U.S. position on climate change. Analyzing the different proposals for potential climate change policy in the United States, the author finds that, as of summer 2001, there was “no U.S. climate policy and little debate about one” (2001:512; but see Arimura et al., 2007). The author specifically focuses on political and economic factors to explain what he calls “non-policy” in the United States (see also Christiansen, 2003 for a more recent account). There have been a limited number of studies that look at federalism and climate change policies in the United States to understand this “non-policy.” These studies build on the general notion that subnational efforts have emerged to “fill a policy void left by federal inaction or refusal to act” (Krane 2007: 462). In their study of federalism and environmentalism in the United States and Germany, for example, Kramer and Schreurs discuss state and municipal climate change initiatives that have sprung up around the U.S. due to a “lack of a strong federal presence in climate change politics” (2007: 40; see also Jones, 1991). Focusing on environmental policy during the Bush Administration, Rabe notes that sub-national climate change policies involved “unilateral state action in the absence of any significant support or encouragement from the federal government” (2007: 425; see also the collection by Selin and VanDeveer, 2009).

At the same time, there has been a number of studies that explain US climate politics by focusing instead on the role that different social actors play in political decisionmaking. In her comparative study of the U.S., Japan and the Netherlands, Fisher explores the role of the state,

market, and civil society sectors in determining national climate change politics more generally. She finds that “the history of the climate change regime in the United States is one of debate and discord” (2004: 105). In this study, Fisher explains how the discord she observes is connected to the lack of a federal climate policy in the United States.

A growing number of studies have also focused particularly on the role of conservative think tanks in climate change policymaking to understand the lack of a national climate change policy in the United States. Jacques, Dunlap and Freeman, for example, find that the conservative movement successfully challenged the science of climate change through publications that are linked to conservative think tanks (2008; see also McCright and Dunlap, 2000; 2003; see also Hoffman, forthcoming). In an earlier investigation, McCright and Dunlap conclude that “the conservative movement and especially the conservative think tanks appear to have successfully affected our nation’s policymaking, this time with international implications” (2003:370; see also 2000).

Although the overall theme of the research on climate change politics in the United States has focused on national policymaking, looking at the challenges within the US, as well as how the politics inside the country contribute to the country’s position in international negotiations about the issue, there is a small number of studies that explore these politics within the legislative branch of the government (e.g. Fisher, 2006; Liu et al., 2009; McCright and Dunlap, 2003; Park et al., 2010). Fisher, for example, looks at the role that different interests play in the voting behavior of Senators (2006). She concludes: “how society uses natural resources such as coal contributes to the influence that such natural resource interests can wield in the policy-making process” (2006: 488). In contrast, McCright and Dunlap incorporate data from Congressional hearings from 1990-1997 in their research on the conservative movement’s

impact on climate change policy (2003). Based on the analyses of speakers in Congressional hearings, the authors conclude that there was a “conspicuous increase in skeptic visibility in Congress” during their period of inquiry (2003: 364). In a more recent study of media and Congressional attention to climate change, Liu and his colleagues find that the change in overall number of Congressional hearings on climate change is associated with international events, climate conditions, and what they call “climate science feedback” (2009). Although this limited research takes an important first step in understanding climate change policymaking within the US Congress, it has yet to analyze the content of the discussions within the Congress. This paper, accordingly, applies an innovation in social network analysis to map the ideological networks of American climate politics within the US Congress.

### *Studying Congressional Hearings*

Specifically to understand the discourse around climate issues in American politics, this paper analyzes data from Congressional hearings in the US Congress. Although secondary sources like the news media can help to uncover some of the central topics around climate policy, data on Congressional testimonies provide direct accounts of the discourse and debate around climate legislation, as well as the issue more broadly. We build on the earlier work by McCright and Dunlap, which studies Congressional hearings from 1990-1997 (2003). In contrast to this work, which analyzes these data to assess the “social construction of non-problematicity” in terms of understanding the emergence of climate skepticism in the United States (2003), we analyze data from Congressional hearings to understand how the perspectives presented therein are ideologically related.

Congressional hearings are an important part of the policymaking process in the United States. In the words of the Governmental Printing Office, Congressional hearings are the principal way that Congress members “obtain information and opinions on proposed legislation, conduct an investigation, or evaluate/oversee the activities of a government department or the implementation of a Federal law.”<sup>2</sup> The importance of such hearings as a source of information has been noted within the academic literature as well (see particularly Arnold 1990; Burstein and Hirsh, 2007; Clifton, 2004; Gormley, 1998).

Testimonies at hearings are given by a range of policy actors, including governmental agency officials, interest groups, businesses, think tanks, academic researchers, as well as members of the US Congress (for a discussion, see Burstein and Hirsh, 2007; DeGregorio, 1998). Congressional hearings provide a forum for different policy actors to get their perspectives recognized and garner the attention and support of different political contingencies. These testimonies inform decisionmakers about topics ranging from science, technology, economics and policy. In the words of Burstein and Hirsh, “Members of Congress believe that hearings provide an efficient way to gather information and exert influence...Interest organizations, too, see hearings as important venues for conveying information” (2007: 179; see also Laumann and Knoke 1987). As a result, the perspectives presented during Congressional hearings are an ideal data source for understanding the political alliances around the main issues being debated. In the pages that follow, we discuss how our data were collected and analyzed, and then present our findings.

## **Data and Methods**

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<sup>2</sup> [http://www.gpo.gov/help/about\\_congressional\\_hearings.htm](http://www.gpo.gov/help/about_congressional_hearings.htm) (Accessed 11 March 2011).

In this dataset, the testimonies from climate change hearings during the 109<sup>th</sup> and 110<sup>th</sup> sessions of the US Congress were analyzed. The 109<sup>th</sup> (January 3, 2005-January 3, 2007) and 110<sup>th</sup> Congresses (January 3, 2007-January 3, 2009) were during the second term of George W. Bush's Presidency. During this time period, 341 pieces of legislation, such as bills, resolutions and amendments, pertaining to issues about climate change or global warming were introduced (106 in the 109<sup>th</sup> Congress<sup>3</sup> and 235 in the 110<sup>th</sup> Congress<sup>4</sup>). There was a Republican majority in both bodies of the US Congress during the 109<sup>th</sup> Congress: Republicans held 55% of the voting share in Senate and they held 53% of the voting share in the House of Representatives.<sup>5</sup> In the 110<sup>th</sup> Congress, however, Democrats controlled the majority of the House of Representatives with 54.3% of the voting share. During this Congressional session, Democrats held 49 seats in the Senate. However, the two Independent members of the Senate both caucused with the Democrats, which resulted in their holding 51% of the voting share during this session.<sup>6</sup>

A search for all hearings that discussed climate change was conducted through the Government Printing Office (GPO), which archives transcripts from Congressional hearings and makes them available for the public record.<sup>7</sup> Using the search terms “global warming” and “climate change,” we identified all of the hearings that discussed these issues during the 109<sup>th</sup> and 110<sup>th</sup> Sessions of the US Congress (2005-2008). Although our primary resource for obtaining transcripts of testimonies is the GPO, the results of these searches were cross-referenced with

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<sup>3</sup> <http://www.pewclimate.org/federal/congress/109> (Accessed 17 March 2011).

<sup>4</sup> [http://www.pewclimate.org/what\\_s\\_being\\_done/in\\_the\\_congress/110thcongress.cfm](http://www.pewclimate.org/what_s_being_done/in_the_congress/110thcongress.cfm) (Accessed 17 March 2011).

<sup>5</sup> During the 109<sup>th</sup> Session of the US Congress, there was one independent member of the Senate and one independent member of the House of Representatives.

<sup>6</sup> For more detail, see [www.senate.gov/reference/resources/pdf/RS22555.pdf](http://www.senate.gov/reference/resources/pdf/RS22555.pdf) (Accessed 14 March 2011).

<sup>7</sup> For details, see <http://www.gpoaccess.gov/crecord/> (Accessed 14 March 2011).

two other sources to ensure accuracy: THOMAS,<sup>8</sup> the website and search engine for the Library of Congress; and the Pew Center on Global Climate Change, a non-profit that monitors climate change discussions and legislation in the US Congress.<sup>9</sup> The results of the searches from these three sources were compared to ensure that all of the hearings about climate change were accounted for and included in the dataset.

In addition to comparing these findings, the contents of each hearing were reviewed to confirm that the focus of each hearing was actually the topic of climate change. After this review, 8 hearings in the 109<sup>th</sup> and 3 hearings in the 110<sup>th</sup> Session of Congress were excluded from the analyses. For example, Senate Hearing 109-448, the “U.S. foreign policy, petroleum, and the Middle East : hearing before the Subcommittee on Near Eastern and South Asian Affairs of the Committee on Foreign Relations, United States Senate,” came up in our search. Upon review of the content of the hearing, it was determined that climate change was not the main focus of the hearing. As a result, this hearing was removed from our analysis. In the end, our searches yielded 71 relevant hearings between 2005 and 2008. The transcripts of 29 hearings in the 109<sup>th</sup> Congress were analyzed, which included a total of 498 testimonies and statements. From the 110<sup>th</sup> Congress, there were 42 relevant hearings and 598 total testimonies and statements by members of the Congress. Only formal statements were included in the analysis. Comments made during the question-and-answer portion of the hearings were not analyzed.

The testimonies from these Congressional hearings comprised the dataset and the transcribed texts of each testimony were then transferred into the Discourse Network Analyzer program. Discourse Network Analyzer (DNA) is a new computer program that allows for the

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<sup>8</sup> For details, see <http://thomas.loc.gov/> (Accessed 14 March 2011).

<sup>9</sup> For details, see <http://www.pewclimate.org/federal/archives> (Accessed 14 March 2011).

qualitative coding of articles and statements and prepares the data for network analysis and visualizations so that the relationship between the actors in each “discourse” can be mapped and the strength of these ties can be quantified. The testimonies were organized by hearing number and speaker. In the cases where testimonies were submitted on behalf of an organization, but without a speaker actually testifying in person, the organization name was used. These speakers and organizations were then classified into seven types: (1) Businesses and Business Associations/Trade Groups, (2) Democratic members of the US Congress, (3) Environmental Groups, (4) Republican members of the US Congress, (5) Scientists, (6) US Executive Branch (which includes representatives from Government Agencies), and (7) Other, which includes the small number of Independent members of the US Congress.

The statements were coded for eight categories that are particularly relevant to discussions about climate change policy in the United States. Coding involved noting whether the speaker agreed or disagreed with the specific statement. Two of the categories were about the science of climate change, which has been a central theme in the climate change debate in the United States: “climate change is real and anthropogenic” and “climate change is caused by greenhouse gases.” The six other categories were about different climate policy issues: “there should be legislation to regulate the emission of pollutants,” “legislation should regulate carbon dioxide emissions,” “legislation that regulates carbon dioxide emissions will not hurt the economy,” “the United States should regulate carbon dioxide regardless of what developing countries do,” “legislation should establish a market for carbon emissions (cap and trade),” and “there should be a carbon tax.” Whenever a statement falling under one of the eight categories was made, the statement was coded. Sometimes specific testimonies included multiple

statements that were coded in the same category. In some cases, statements included mention of both side of the issue.

Since we are interested in understanding climate change policymaking in the US Congress, this paper presents the results for three of the codes from this analysis that have been central themes in the American climate change debate during the period of our study: “legislation should regulate carbon dioxide emissions,” “legislation that regulates carbon dioxide emissions will not hurt the economy,” and “legislation should establish a market for carbon emissions (cap and trade).” Although more recent discussions have explored the viability of a carbon tax in the United States, during the period of our study cap-and-trade legislation was the only policy instrument under consideration. Figure 1 shows the overall statement frequencies in Congressional hearings over the period of inquiry.

FIGURE 1 ABOUT HERE.

### *Network Analysis Technique*

Each relevant statement of a political actor was coded for four variables: the name of the actor, the classification of the policy actor into one of the seven types, the issue addressed by the actor, and a dummy variable indicating either a positive or a negative stance on the issue. The statements were transformed into an actor-by-issue affiliation matrix where each issue occupies two distinct columns, reflecting both possible stances, and agreement and disagreement with the issue. To avoid confounding the quantity of an actor’s statements and the actor’s qualitative preferences, we dichotomize the affiliation matrix.<sup>10</sup>

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<sup>10</sup> Data collection and manipulation were completed using the software Discourse Network Analyzer (Leifeld, 2010; cf. Leifeld and Haunss, forthcoming).

The rectangular actor-by-issue affiliation matrix was then converted into a square actor-by-actor co-occurrence matrix where the cell entries reflect the numbers of shared issue stances between the row actor and the column actor, with diagonal entries (“loops” in the language of social network analysis) left blank. Such a co-occurrence matrix can be interpreted as an undirected and weighted network. The network can be visualized as a graph with actors as vertices and the number of shared issue stances as edge weights between these vertices. Clusters in this network represent political coalitions, based on the assumption that coalitions can be measured in terms of their policy beliefs and preferences. We call this co-occurrence network of actors via shared positions a congruence network because it displays how congruent an actor coalition is.

Visualizing a congruence network based on a single issue yields what we call a univariate network. It typically has two completely connected subgraphs ("components") – one representing agreement to the issue and the other one disagreement. In many cases, a couple of actors who send mixed signals on the issue and thus interconnect the two components are also included. We interpret these apparent self-contradictions as moderate positions on the issue because these actors try to align strategically with both camps instead of committing themselves to one position. This interpretation alleviates the potential oversimplification of employing binary agreement patterns, which was imposed in the first place because the reliability and validity of making judgments on a Likert scale would be too low. Conveniently, these moderate actors occupy the center of the network. Univariate networks can give an intuitive overview on the distribution of opinions among speakers while at the same time visualizing attributes of actors, such as their organizational type (reflected by node color) or their overall level of activity as operationalized by their total number of statements (visualized as node size).

Bipolarity is much less induced by the way of coding the data if more than one issue is involved. Beside looking at univariates, we therefore concentrate on a network generated via three core issues that were selected based on their key role in the political process. The resulting discourse network is a good overall indicator of the empirical existence of coalitions, their between-group polarization and their within-group congruence in US climate politics. Ideologies are composed of rather general as well as specific preferences and values. We focus on what Sabatier & Weible (2007) call 'policy core beliefs' because they are the 'glue that binds coalitions together.' Policy core beliefs are preferences regarding the key dimensions of a specific policy." The full array of network-analytic methods can be used to analyze the congruence network. In our analysis, we employ betweenness centrality, density and a hierarchical cluster analysis to describe the network structure and embed these into a qualitative account of the political process.

A path is a vector of adjacent edges connecting two different vertices in a network. The length of a path is the count of these edges. If geodesic distance is defined as the length of the shortest path between two vertices in a given network, then betweenness centrality of a vertex is the number of geodesics leading through this vertex (for details see Freeman, 1978). We employ betweenness centrality as an indicator of brokering positions in the political arena. Actors connecting the (presumably two) coalitions have a high betweenness score while members of the coalitions have low betweenness centrality values. In a theoretical perspective, central actors can tip the scale and promote political feedback processes (cf. Baumgartner and Jones, 1991). Moreover, the number of central actors is indicative of the belief or preference polarization in the political arena of climate politics. In the following paragraphs, we introduce the methods that we use and their underlying concepts.

The degree of polarization deserves closer attention with more sophisticated methods. Comparable to several other methods like blockmodeling, clique analysis or projection techniques (for an overview, see Scott 2000), an agglomerative hierarchical cluster analysis (Jain and Dubes, 1988) with Ward's optimization method (Ward 1963) can serve to assess the subgroup structure and hence polarization versus consensus in a network. There are two options: calculating structural similarity of actors in the congruence network based on their tie profiles, or calculating the similarity of actors based on similar row profiles in the affiliation matrix. We choose the latter option because the construction of the congruence network is already a non-isomorphic transformation of the original data. An adequate measure of similarity for binary vectors like the rows of the affiliation matrix is the Jaccard coefficient (see Jain and Dubes, 1988: 17 for details), which we use to compute the distance matrices for the cluster analyses. We compare issue coalitions in the 109<sup>th</sup> and 110<sup>th</sup> Sessions of the US Congress and derive subgroups for each of these time periods.

The choice of clustering techniques is often arbitrary, and different methods yield different results. We therefore opt for methodological triangulation by partitioning all actors into one out of two groups based on their tie profiles and comparing within-block and between-block binary network densities (Scott 2000) between the 109<sup>th</sup> and 110<sup>th</sup> Congress. If density is high within a group, its internal coherence is high. The lower the density between the two blocks, the more extreme is their polarization. Low within- and high between-block densities would indicate the absence of a coalition structure.

## **Findings**

In the pages that follow, we present the results of our analyses of climate change hearings in the 109<sup>th</sup> and 110<sup>th</sup> Sessions of the US Congress. We start by looking at the organizational affiliations of participants in these hearings. Next we present ideological maps of the contents of the hearings. First we look at each category separately. Then, we combine these categories together.

### *Participation in Congressional Hearings on Climate Change*

Building off of the work by Burstein and Hirsh (2007), Gormley (1998) and McCright and Dunlap (2003), we begin by analyzing the types of actors who made statements during the climate change hearings in our sample. In contrast to what one might expect regarding hearings on the issue of climate change, most of the statements were not prepared by scientists (about 8% in the 109<sup>th</sup> and 11% in the 110<sup>th</sup> Congress). These findings are significantly lower than in McCright and Dunlap's analysis of Congressional hearings from 1990-1997, which found that 27.9% of testimonies were given by scientists (2003: 362). These differences are likely to be the result of the ways that the issue of climate change has changed in the United States since the early 1990s.

In other ways, however, our findings are consistent with the study by McCright and Dunlap (2003: 362), as well as Burstein and Hirsh's study of policy innovation in the US Congress (2007: 186; see also Degregorio, 1998). Specifically, the majority of the speakers in both sessions of the Congress came from different branches of the US government (Burstein and Hirsh, 2007). Although the hearings in both sessions of the Congress were dominated by government actors, there are a number of differences between these two sessions that are worth

noting. First, there are striking differences between the government actors participating in the climate change hearings in these different sessions of the Congress. Even though the rules of the US Congress stipulate that the minority party is given the opportunity to call witnesses at Congressional hearings,<sup>11</sup> participation in these hearings was very different in the two sessions of Congress. In the 109<sup>th</sup> Session of Congress, which had a Republican majority, almost a quarter of the statements (24.%) were provided by Republican members of the Congress. During the 110<sup>th</sup> Session of the Congress, which had a Democratic majority, in contrast, only five percent of people making statements were Republican members of the Congress. Although the level of Republican participation changed significantly during these two Congressional Sessions, Democratic participation remained relatively stable (24% and 20% respectively). At the same time, participation by the Bush Administration increased significantly between the 109<sup>th</sup> and 110<sup>th</sup> Sessions (10% and 22% respectively). These findings are consistent with the work of DeGregorio who finds Administration participation in Congress to be very high “when presidential autonomy is at stake” (1998: 146). In the case of the Democratic-led 110<sup>th</sup> Congress, one would expect representatives of President George W. Bush’s Administration to be actively involved in Hearings taking place so that their position is represented. Table 1 presents these results.

There are also noteworthy differences among non-governmental actors. Participation by representatives of businesses and business or trade associations decreased between the 109<sup>th</sup> and 110<sup>th</sup> sessions of Congress (20% to 14%). However environmental group participation went up between these two sessions of the US Congress (about 9% to almost 15% respectively). It is

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<sup>11</sup> For a full discussion of these rules see <http://lieberman.senate.gov/assets/pdf/crs/senatehearings.pdf> for the Senate and [http://www.house.gov/house/Tying\\_it\\_all.shtml](http://www.house.gov/house/Tying_it_all.shtml) for the House of Representatives. (Accessed 17 March 2011).

interesting to note that the level of participation by business and environmental actors is relatively consistent with the findings from earlier research on climate change hearings, where 20.9% of all testimonies were given by business actors and 8.4% of all testimonies were given by environmental actors (McCright and Dunlap 2003: 362-363). These findings are also consistent with those of Park and his colleagues in their study of connections among Congressional committees, Congressional hearings, and the witnesses at these hearings, which finds that there were significant differences in witness selection based on which party held the majority (2010). When looking at Congressional attention to climate change, however, Liu et al. find that “Republican composition in Congress appeared to have an effect in restricting the climate change issue, but the partisan impact was not statistically significant” (2009: 11).

#### TABLE 1 ABOUT HERE

##### *Mapping Ideological Networks*

Although these results show that there are interesting patterns of participation during these two sessions of the US Congress, they do not tell us anything about the *content* of the Hearings. Accordingly, we now look at how the different policy actors’ testimonies were related. In particular, this analysis presents the ideological maps for each of the three categories separately. As has been previously stated, to understand how the contents of the testimonies were ideologically related statements made during Congressional hearings on climate change in these two Congressional sessions were analyzed using Discourse Network Analyzer. The maps represent organizational positions for and against each category. In each map, the right hand side of the figure represents those actors who are against each category. Those who agree with the categories are placed on the left hand side of the diagram. Organizational affiliation is

depicted with different colors: blue indicates Democrats in Congress, green indicates environmental groups, pink indicates representatives from the executive branch of the government, purple indicates businesses and business and trade organizations, red indicates Republicans in Congress, yellow indicates scientists, and grey indicates policy actors that fall into the “other” category. In the sections below, each map will be discussed in turn.

*Legislation should regulate carbon dioxide emissions.* There is a high level of polarization around the question of whether legislation should regulate carbon dioxide in both sessions of the Congress. In the 109<sup>th</sup> Congress, twenty-six policy actors spoke in support of the category and twelve spoke against it. There was only one policy actor who presented a moderate position, speaking on both sides of this issue—both for and against emissions legislation that includes the regulation of carbon dioxide. In this session of Congress, the policy actors against this category were all Republicans, representatives of the Bush Administration, and representatives of businesses or trade associations. Those in support of this category, in contrast, were mostly Democrats in the Congress and environmental groups.

In the 110<sup>th</sup> Congress, there were far fewer actors speaking against the category and many more actors supporting it: only eight spoke against this category and forty policy actors spoke in support of it. Actors against this issue continued to come from the same social groups. There was one environmental group—the Natural Resources Stewardship Project, which is a Canadian non-profit organization that is known to include a number of leading climate change skeptics.<sup>12</sup>

At the same time, there were also businesses and Republicans in Congress who supported this position. Although this issue continued to be polarized in the 110<sup>th</sup> Congress, there was less opposition and more support for legislation to regulate carbon dioxide by a broader range of

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<sup>12</sup> For more information, see [www.sourcewatch.org/index.php?title=Natural\\_Resources\\_Stewardship\\_Project](http://www.sourcewatch.org/index.php?title=Natural_Resources_Stewardship_Project) (Accessed 21 March 2011).

actors. Figure 2 presents these results.

#### FIGURE 2 ABOUT HERE

*Legislation that regulates carbon dioxide emissions will not hurt the economy.*

Statements during Congressional hearings on climate change frequently discussed the economic implications of regulating carbon dioxide. In the 109<sup>th</sup> Congress, there was a very high level of polarization around this issue. In fact, the debate was relatively balanced and there were almost an equal number of speakers for and against this category (22 versus 23 accordingly). Here again, those actors against the issue were predominantly Republicans in the Congress and businesses. Also like the first category, most of those actors who supported this statement were Democrats in the Congress and environmental groups. However, business and trade associations also supported this category.

In the 110<sup>th</sup> Congress, there was much less polarization: three different policy actors presented a moderate position, speaking on both sides of this category. Like the first category, support for the issue grew in this Congress and thirty-eight actors spoke in support of the issue while thirteen spoke against it in the later session. The increase in support also resulted in a broader diversity of actors supporting this category, including scientists. Figure 3 presents this network diagram.

#### FIGURE 3 ABOUT HERE

*Legislation should establish a market for carbon emissions through cap-and-trade.* This subject was not a main topic of discussion during Congressional hearings in the 109<sup>th</sup> Congress. In this session, only twenty-one people spoke about it in their statements: thirteen policy actors spoke in support of this category and eight spoke against it. Supporters were mainly from environmental groups. Like the previous two categories, those actors against the issue were

mostly Republicans in the Congress and businesses.

In the 110<sup>th</sup> Congress, there was a lot more discussion about this issue. Thirty-seven actors spoke in support of it and eleven spoke against it. Supporters in this Congress included Democrats and Republicans in the Congress, along with environmental groups and business groups. Opposition was made up almost entirely of Republicans in the Congress. It is worth noting that there was one environmental group that spoke in opposition to the establishment of a cap-and-trade system in the United States: The American Council for an Energy- Efficient Economy. Figure 4 presents the results of this analysis.

FIGURE 4 ABOUT HERE

### *Stacking Up the Networks*

By looking at the univariate network diagrams of these categories, we get a general sense of the various perspectives presented in the Congressional hearings on climate change during the 109<sup>th</sup> and 110<sup>th</sup> Sessions of the US Congress. It is clear that there was much more support for all of these categories in the later session of the Congress and that the position was supported by a more diverse set of policy actors in the more recent Congress. However, it does not tell us how consistent these positions were across the different categories. Therefore, our next step in the analysis is to stack the results of these different categories to see the overall ideological maps for the climate change hearings in the two sessions of Congress.

In this analysis, policy actors are separated into cliques based on their similarity across the three categories, which are graphically depicted as a dendrogram. The height of the dendrogram represents the (dis)similarity of the clusters. The higher the height at which two branches are merged, the less similar they are overall. Conversely, the lower the agglomeration

height where two actors or branches are merged, the higher their similarity. Within these analyses, the same colors are used to represent the different types of social actors. Placement of actors within each group is random.

Figure 5 presents the results of this analysis of the three categories together for the 109<sup>th</sup> Congress. Speakers within the 109<sup>th</sup> Congress separate out into two distinct “camps” in this analysis: one dominated by Republicans and business groups on the left of the diagram, which oppose the categories; and the other dominated by Democrats and environmental groups on the right, which support them. The binary densities for each group are relatively consistent: 0.75 for those taking the oppositional stance and 0.65 for those who take the supportive stance.

#### FIGURE 5 ABOUT HERE

Turning to the 110<sup>th</sup> Congress, the bifurcation has disappeared: the cluster analysis does not fall into two specific camps. Instead, smaller cliques emerge. For example, there is a small group of predominantly Republican Members of Congress who oppose all three categories in the center of the diagram. At the same time, Republican members of Congress also end up in other parts of the diagram. This distribution suggests that climate change is not a partisan issue within the 110<sup>th</sup> Congress. Similarly, environmental NGOs are uniformly distributed across the different clusters. Coalitions are much less clear-cut than before, and the transitions between the camps are fluent. Clusters are rather nested within each other, which is an indicator of the lack of separation between ideologies. Figure 6 presents a dendrogram of the three categories together for the 110<sup>th</sup> Congress. In the 110<sup>th</sup> Congress, the binary density of the groups of actors supporting the issue is almost the same as in the 109<sup>th</sup> Congress: 0.64. This finding suggests that this cluster is rather stable. The binary density for the group opposing the issue, however, has

dropped 0.10 to 0.55, which indicates that it is weaker than the comparable group in the 109<sup>th</sup> Congress and in relation to those who supported this issue in the 110<sup>th</sup> Congress.

#### FIGURE 6 ABOUT HERE

To ensure that the results are not an artifact of the clustering method used here, we next analyze the structure of preferences using the aggregated congruence network of all three categories, as shown in Figure 7. Gray edges indicate that two actors share one single issue stance, and black edges indicate that they share two or more issue stances. In line with the previous analyses, there are several interesting findings. First, the composition of the group of supporters of a pro-active climate policy becomes more heterogeneous over time. While this group is mainly composed of Democrats in Congress, environmental non-governmental organizations, and business associations/firms in the 109<sup>th</sup> Congress, many Republicans and scientists join this group in the 110<sup>th</sup> Congress. Second, the number of supporters grows substantially over time while the group size of the actors opposing climate politics sharply decreases from the 109<sup>th</sup> to the 110<sup>th</sup> Congress. Third, as already suggested by the density measure presented above, the coherence of the group that opposes these categories, which is depicted on the right side of the diagrams, is declining between the two time periods. For those who support the issue and who are depicted by the coalition on the left, the density measure is constant. Forth, in both time periods, environmental groups shape the center of one camp, and business organizations and Republicans in the Congress are at the center of the other camp. Fifth and finally, black edges, which represent higher rates of agreement between actors, are prevalent *within* each of the two camps in the 109<sup>th</sup> Congress. In the 110<sup>th</sup> Congress, however, these strong ties are predominant *between* the two groups. We interpret this difference as an erosion of the

bipolarity observed in the former time period. This finding is consistent with the main finding of the cluster analysis presented above.

FIGURE 7 ABOUT HERE

### **Discussion and Conclusion**

Overall, by using the new technology of the Discourse Network Analyzer to analyze the content of Congressional hearings on climate change, we are able to map ideological networks around the issue. These findings provide context to claims within the literature regarding the federal climate change “policy void” in the United States (Krane 2007; see also Christiansen, 2003). Applying this innovation in social network analysis we go beyond the views of current scholars who analyze US climate change politics by looking at the policy outcome in terms of the passage (or non-passage) of Congressional legislation (e.g. Fisher, 2006; Lisowski 2002, Lutzenhiser, 2001). Instead, this method allows us to assess shifting positions within the US Congress. Furthermore, we are able to identify emergent cliques of climate policy supporters and opponents over time. By analyzing the *content* of discourse within the testimonies in Congressional hearings, rather than just the number of hearings and the affiliations of witnesses participating in them (e.g. Burstein and Hirsh, 2007; Gormley 1998; Liu et al., 2009; McCright and Dunlap, 2003; Park et al. 2010), we are able to show how interest groups and politicians change their preferences over the course of two sessions of the US Congress.

The results of our analysis show how the ideological networks around climate change in the US Congress changed over time: there was a noteworthy increase in supporters of climate change legislation and there was a simultaneous decrease in opposition to such legislation. Moreover, the diversity of actors supporting climate change legislation in terms of their

organizational affiliations increased substantially. Even with these changes, however, by the end of the 110<sup>th</sup> Congress, there continued to be opposition to federal climate change legislation.

These findings show that there was emerging consensus around the issue of climate change in the US Congress by the end of the 110<sup>th</sup> Session in 2008. Our findings are supported by the fact that the US House of Representatives passed a climate change bill for the first time ever during the 111<sup>th</sup> Congress.<sup>13</sup> With the Republican party taking over the majority of both houses of the US Congress in the 112<sup>th</sup> Session of Congress in January 2011, there is a clear need to extend this research to understand how climate politics and the discourse around these politics has changed more recently.

Thus, future research must analyze the content of hearings around climate politics in the more recent sessions of Congress to map out how ideological networks have continued to change. By extending the time period of analysis, we will be able to observe these trends over longer periods of time and assess whether changes we have observed between the 109<sup>th</sup> and 110<sup>th</sup> sessions of the US Congress may be a trend or part of larger random fluctuations. Until research is done on a wider time period, however, these findings must be interpreted with caution as there are other potential explanations that must be explored in future research. In particular, future research that includes data from more sessions of the US Congress will help to parse out the specific role that the party holding the majority plays in shifting ideological networks.

Our findings also have implications to climate politics more broadly. Through our analysis of the ideological networks of American climate politics during two sessions of Congress, we are able to identify clear cliques that cross beyond partisan or other commonly understood coalitions. Looking at the groups of actors who emerge as part of different clusters in the stacked networks, we can identify opportunities for collaborations that may not have

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<sup>13</sup> For more information, see [www.govtrack.us/congress/bill.xpd?bill=h111-2454](http://www.govtrack.us/congress/bill.xpd?bill=h111-2454) (Accessed 22 March 2011).

previously been recognized. These findings can also be expanded with analysis of the content of Congressional hearings on climate change in more recent sessions of Congress. Such extended research will significantly enhance our understanding of climate politics, as well as providing a more robust account of ideological networks within American climate politics.

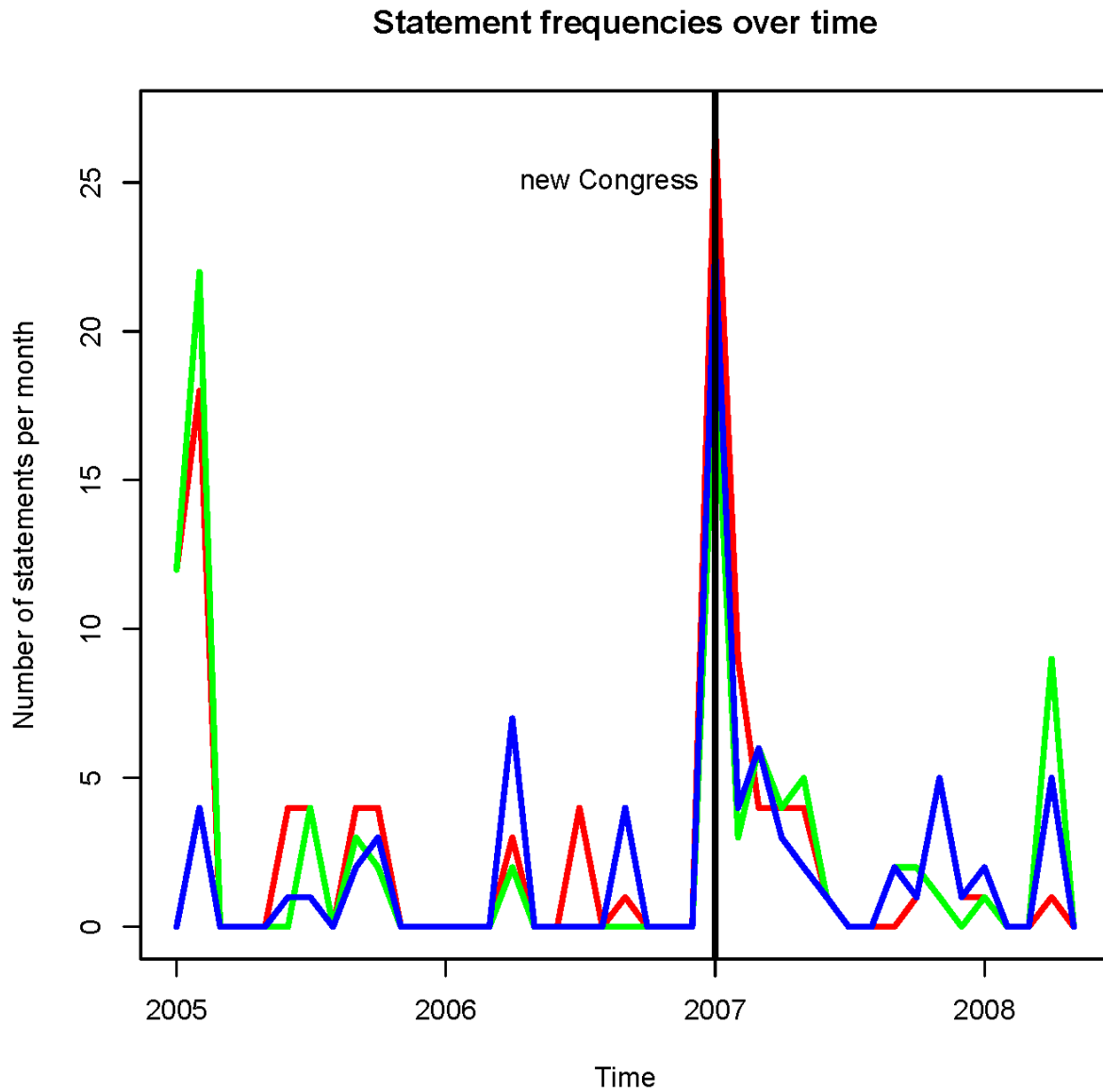
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**Figure 1: Statement Frequencies Over Time**

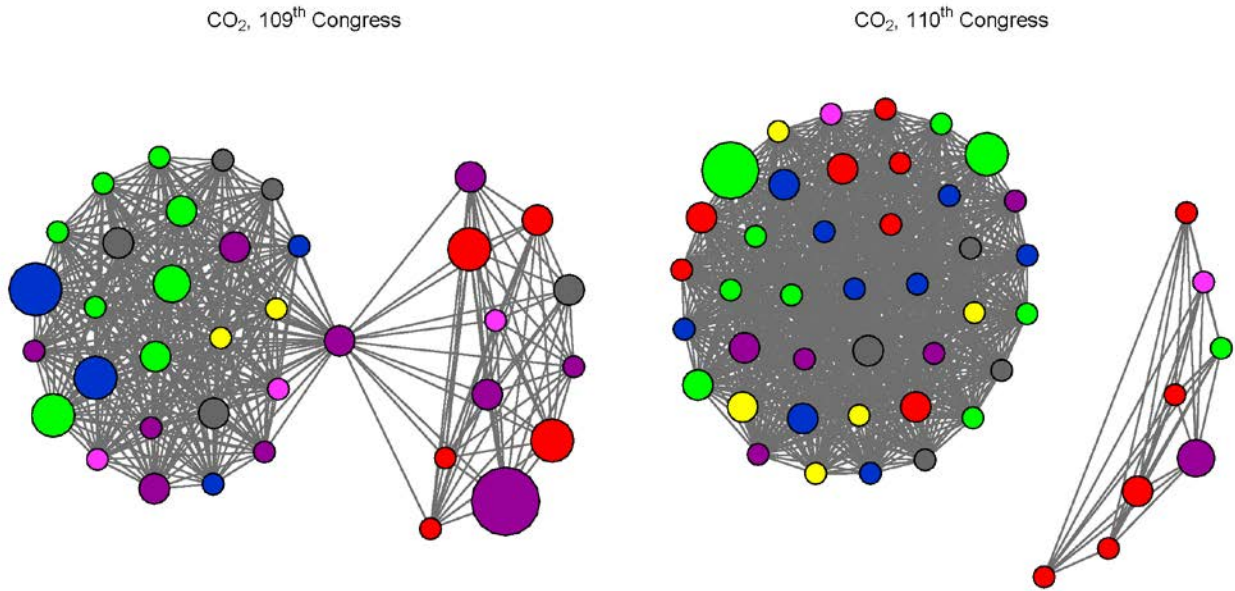


**Key:** green = “legislation should regulate carbon dioxide emissions;” red = “legislation that regulates carbon dioxide emissions will not hurt the economy;” and blue = and “legislation should establish a market for carbon emissions (cap and trade).”

**Table 1. Organizational Affiliations of Witnesses at Congressional Hearings on Climate Change (2005-2008)**

	109th Congress	110th Congress
Business or Business Association/Trade Group	85 (20.6%)	54 (13.9%)
Democrat in Congress	100 (24.3%)	79 (20.2%)
Environmental Group	36 (8.7%)	58 (14.8%)
Republican in Congress	99 (24%)	19 (4.9%)
Scientist	34 (8.3%)	42 (10.7%)
US Executive Branch	41 (10%)	87 (22.3%)
Other	17 (4.1%)	51 (13%)
<b>Total</b>	<b>412</b>	<b>391</b>

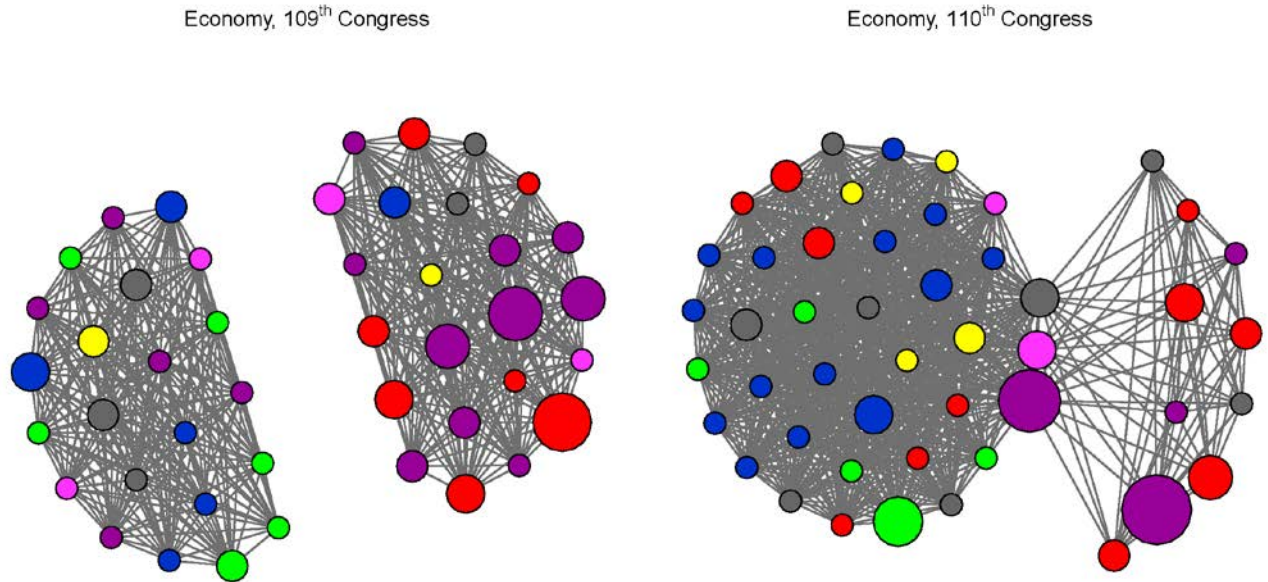
**Figure 2: Network Diagram of Positions on “*Legislation should regulate carbon dioxide emissions*”**



**Notes:** The right side of the diagram represents opposition; node size is a function of statement frequency; and spatial proximity cannot be meaningfully interpreted in network diagrams.

**Node color code:** Blue indicates Democrats in Congress, Green indicates environmental groups, Pink indicates representatives from the executive branch of the government, Purple indicates businesses and business and trade organizations, Red indicates Republicans in Congress, Yellow indicates scientists, and Grey indicates policy actors that fall into the “other” category.

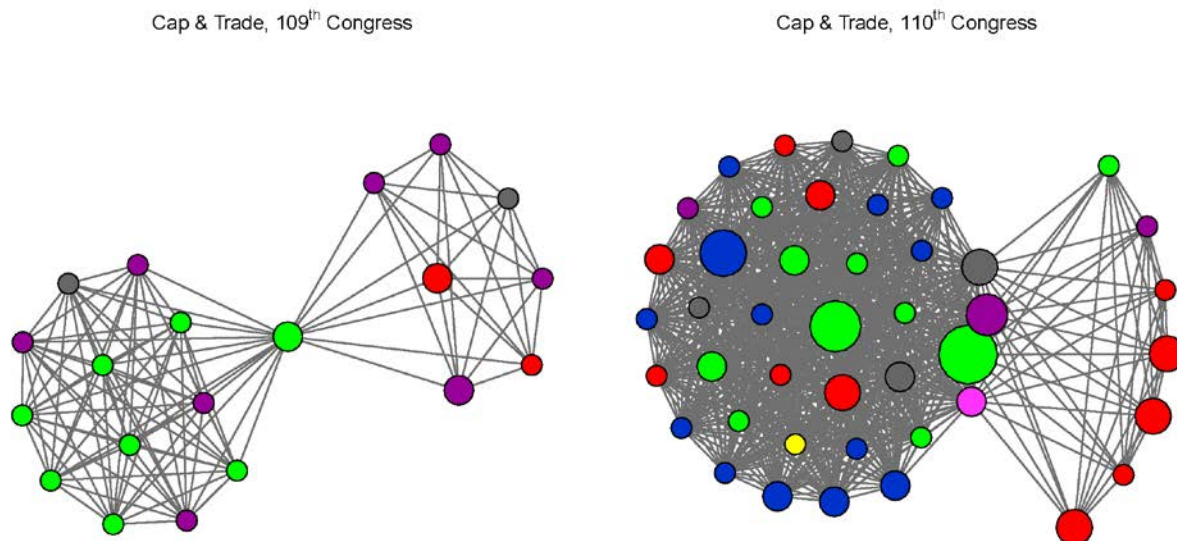
**Figure 3: Network Diagram of Positions on “Legislation that regulates carbon dioxide emissions will not hurt the economy”**



**Notes:** The right side of the diagram represents opposition; node size is a function of statement frequency; and spatial proximity cannot be meaningfully interpreted in network diagrams.

**Node color code:** Blue indicates Democrats in Congress, Green indicates environmental groups, Pink indicates representatives from the executive branch of the government, Purple indicates businesses and business and trade organizations, Red indicates Republicans in Congress, Yellow indicates scientists, and Grey indicates policy actors that fall into the “other” category.

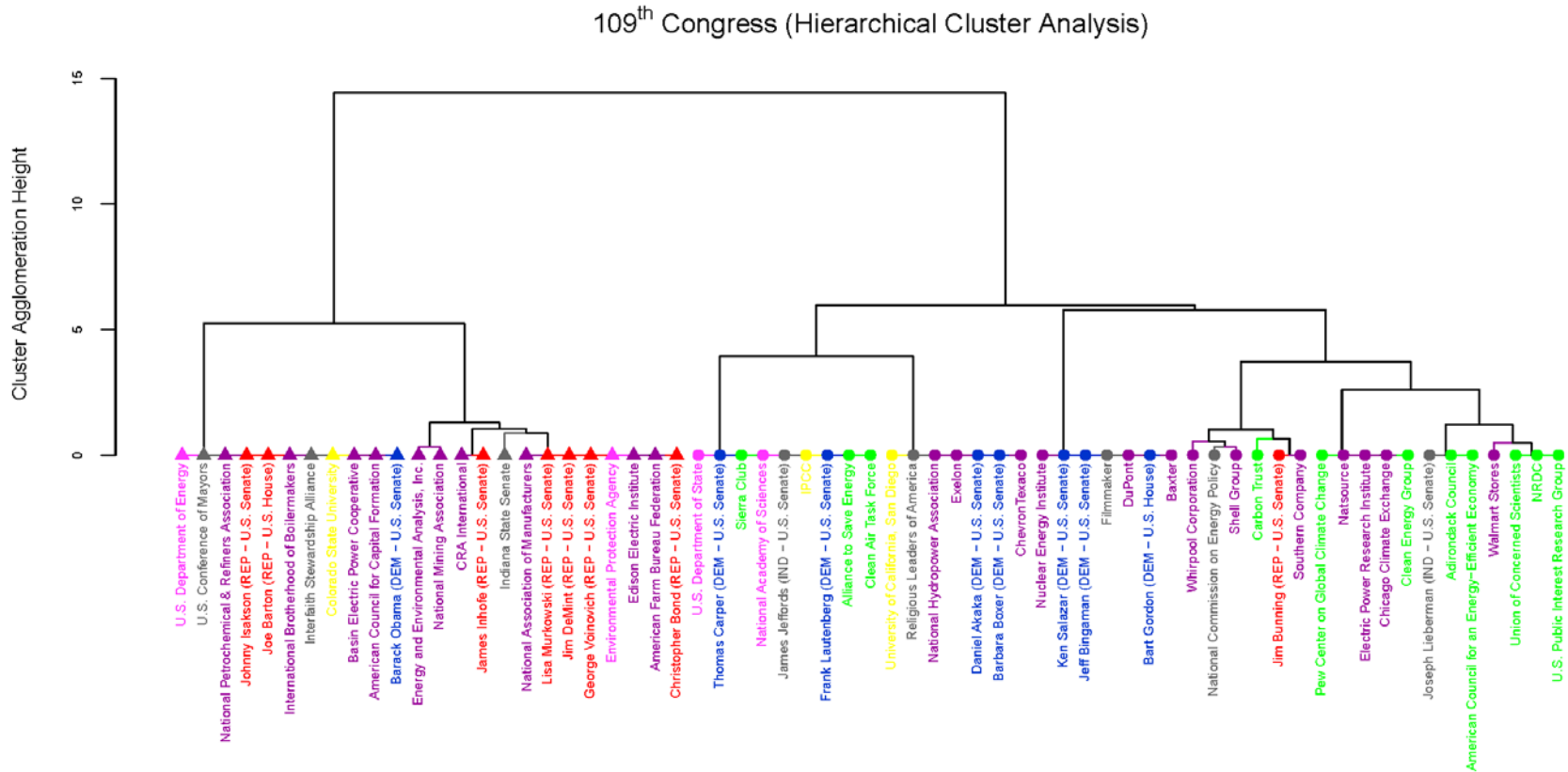
**Figure 4: Network Diagram of Positions on “Legislation should establish a market for carbon emissions through cap-and-trade”**



**Notes:** The right side of the diagram represents opposition; node size is a function of statement frequency; and spatial proximity cannot be meaningfully interpreted in network diagrams.

**Node color code:** Blue indicates Democrats in Congress, Green indicates environmental groups, Pink indicates representatives from the executive branch of the government, Purple indicates businesses and business and trade organizations, Red indicates Republicans in Congress, Yellow indicates scientists, and Grey indicates policy actors that fall into the “other” category.

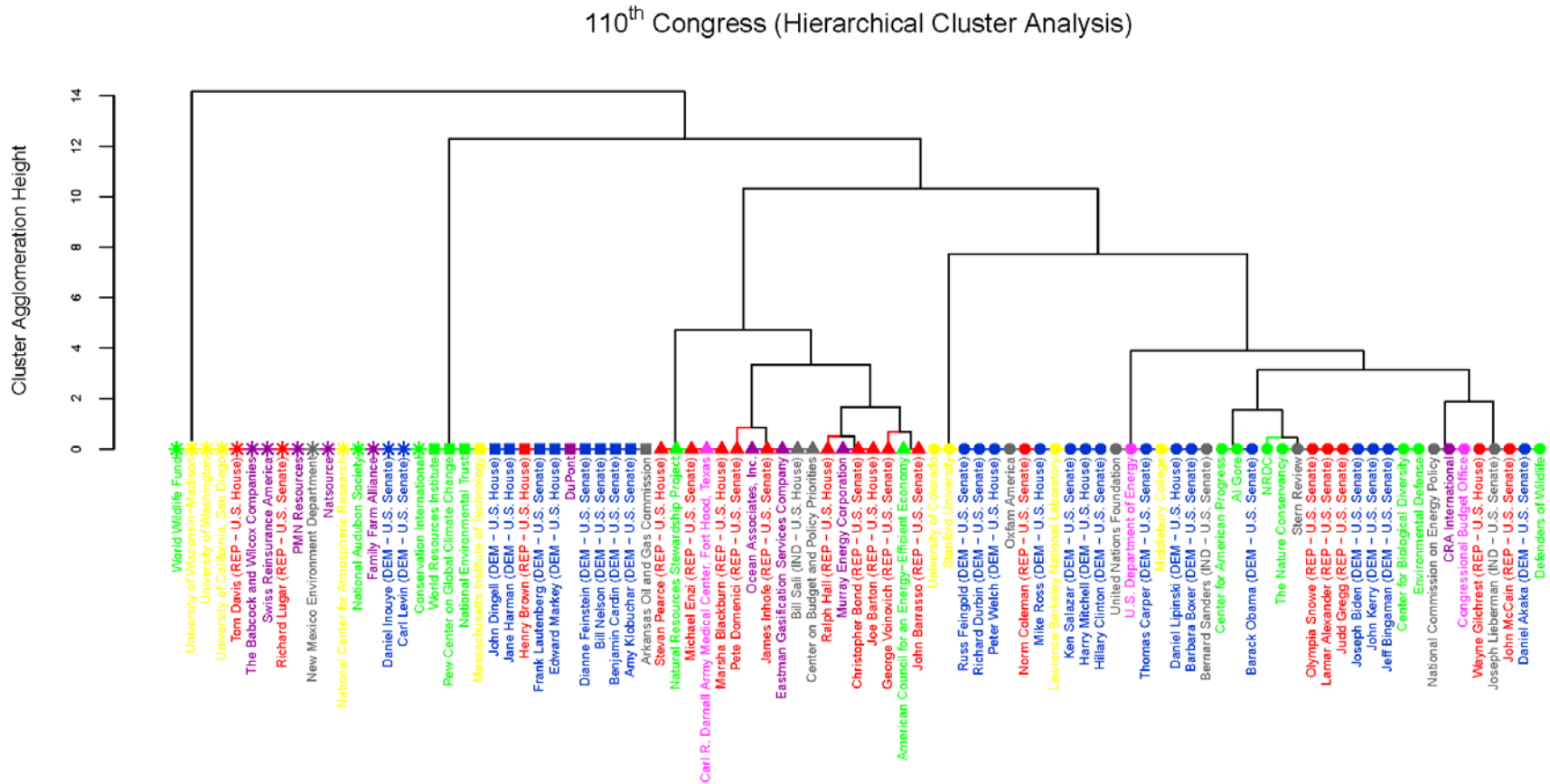
Figure 5: Dendrogram of 109<sup>th</sup> Congress



**Notes:** The left side of the diagram represents opposition and position within the clusters cannot be meaningfully interpreted in the dendrogram.

**Color code:** Blue indicates Democrats in Congress, Green indicates environmental groups, Pink indicates representatives from the executive branch of the government, Purple indicates businesses and business and trade organizations, Red indicates Republicans in Congress, Yellow indicates scientists, and Grey indicates policy actors that fall into the “other” category.

**Figure 6: Dendrogram of 110<sup>th</sup> Congress**

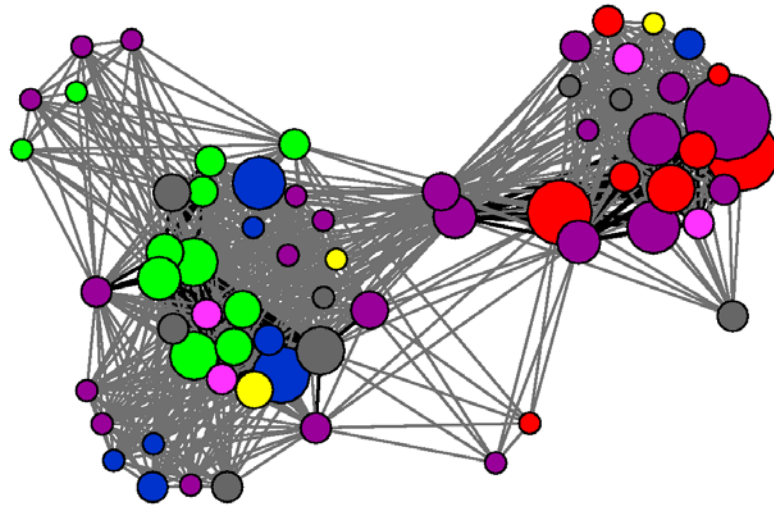


**Notes:** The left side of the diagram represents opposition and position within the clusters cannot be meaningfully interpreted in the dendrogram.

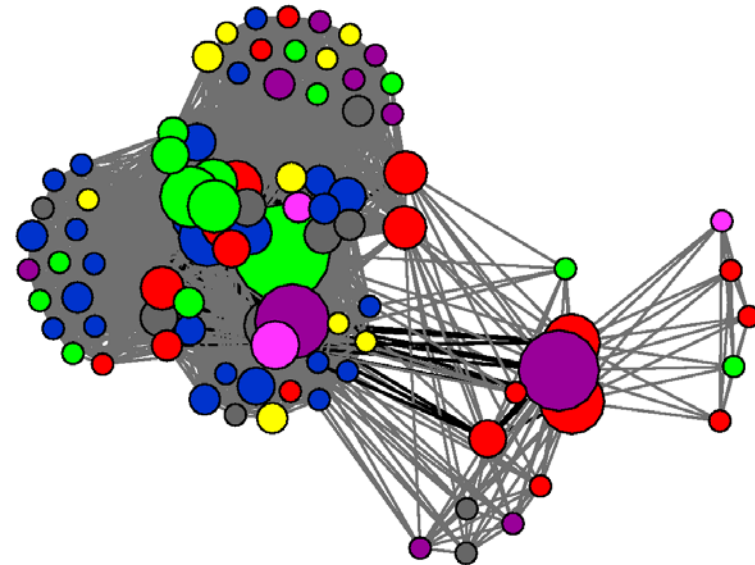
**Color code:** Blue indicates Democrats in Congress, Green indicates environmental groups, Pink indicates representatives from the executive branch of the government, Purple indicates businesses and business and trade organizations, Red indicates Republicans in Congress, Yellow indicates scientists, and Grey indicates policy actors that fall into the “other” category.

**Figure 7: Network Diagram of Positions on all three categories together**

CO<sub>2</sub>, Economy, C&T, 109<sup>th</sup> Congress



CO<sub>2</sub>, Economy, C&T, 110<sup>th</sup> Congress



**Notes:** The right side of the diagram represents opposition; node size is a function of statement frequency; and spatial proximity cannot be meaningfully interpreted in network diagrams.

**Node color code:** Blue indicates Democrats in Congress, Green indicates environmental groups, Pink indicates representatives from the executive branch of the government, Purple indicates businesses and business and trade organizations, Red indicates Republicans in Congress, Yellow indicates scientists, and Grey indicates policy actors that fall into the “other” category.