

Congressional Speech Networks as a Window into Agenda Setting

Dr. Sahar Abi-Hassan, Dr. Janet M. Box-Steffensmeier, Dr. Dino P. Christenson, Dr. Laura Moses,
Charles Costanzo, Cianna Mancino, Grace Orians, Adam Perhala, & Enan Srivastava

Introduction to Congressional Speech Analysis

- Members of Congress leverage floor speeches to articulate policy priorities, advocate for issues, and influence legislative agendas.
- Analyzing these speeches through network analysis unveils patterns of leadership, ideological alignment, and the dynamics of legislative debate

Objectives

- Our work aims to create and analyze networks of congressional speeches to identify influential figures, understand the impact of ideology, rural/urban, and gender on speech patterns, and provide insights into policy formation through legislative discourse

Data Source & Collection

- We compiled a dataset from the Congressional Record, covering speeches from the 97th to the 114th Congress, to analyze the lexical relationships and thematic engagements among Members of Congress over time.
- Pull from govinfo/lexisnexis

Early Analysis

Results and Discussion

Cosine Similarity Matrices

Applying a heatmap to further highlight differences in cosine similarity scores over time, we see that congressmembers tend to have a consistently high cosine similarity between all terms, especially when examining those directly preceding or following. However, we also see that there are terms where there are significant changes which are then generally adhered to in subsequent congresses. Interestingly, in the case of Lindsey Graham, we see a decrease in score followed by an increase shortly thereafter. This suggests that certain issues or opinions were for a time, then reverted after several terms. The largest changes tend to appear to happen directly before or after presidential elections, with some of the most significant changes appearing during Bush Jr.'s presidency.

	Bernie Sanders																			
	Before										After									
	1993-1993	1993-1995	1995-1997	1997-1999	1999-2001	2001-2003	2003-2005	2005-2007	2007-2009	2009-2011	2011-2013	2013-2015	2015-2017	2017-2019	2019-2021	2021-2023	2023-2025	2025-2027	2027-2029	2029-2031
1993-1993	1.00	0.99	0.98	0.93	0.90	0.80	0.76	0.75	0.72	0.71	0.68	0.70								
1993-1995	0.89	1.00	0.92	0.85	0.83	0.80	0.80	0.76	0.75	0.70	0.74	0.80								
1995-1997	0.89	0.92	1.00	0.90	0.87	0.87	0.88	0.81	0.76	0.78	0.78	0.74	0.90							
1997-1999	0.83	0.85	0.90	1.00	0.98	0.96	0.81	0.69	0.68	0.68	0.68	0.71	0.80	1.00						
1999-2001	0.80	0.83	0.87	0.90	1.00	0.90	0.80	0.82	0.70	0.68	0.68	0.66	0.70	0.70	1.00					
2001-2003	0.80	0.83	0.87	0.88	0.90	1.00	0.90	0.85	0.69	0.68	0.67	0.65	0.70	0.70	0.70	1.00				
2003-2005	0.78	0.80	0.87	0.88	0.88	0.89	1.00	0.90	0.71	0.71	0.70	0.68	0.74	0.70	0.70	0.70	1.00			
2005-2007	0.75	0.80	0.81	0.81	0.81	0.81	0.90	1.00	0.69	0.65	0.65	0.62	0.68	0.65	0.65	0.65	0.65	1.00		
2007-2009	0.73	0.76	0.76	0.69	0.70	0.69	0.73	0.69	1.00	0.87	0.85	0.82	0.87	0.85	0.85	0.85	0.85	0.85	1.00	
2009-2011	0.72	0.75	0.76	0.68	0.68	0.71	0.65	0.67	0.87	1.00	0.98	0.92	0.87	0.92	0.92	0.92	0.92	0.92	0.92	1.00
2011-2013	0.71	0.70	0.70	0.68	0.68	0.67	0.70	0.65	0.85	0.98	1.00	0.94	0.90	0.94	0.94	0.94	0.94	0.94	0.94	0.94
2013-2015	0.68	0.74	0.74	0.66	0.66	0.65	0.68	0.62	0.82	0.92	0.94	1.00	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
2015-2017	0.73	0.80	0.80	0.71	0.70	0.70	0.74	0.68	0.87	0.87	0.90	0.96	1.00	0.96	0.96	0.96	0.96	0.96	0.96	0.96

	Nancy Pelosi																			
	Before										After									
	1987-1989	1989-1991	1991-1993	1993-1995	1995-1997	1997-1999	1999-2001	2001-2003	2003-2005	2005-2007	2007-2009	2009-2011	2011-2013	2013-2015	2015-2017	2017-2019	2019-2021	2021-2023	2023-2025	2025-2027
1987-1989	1.00	0.79	0.76	0.72	0.76	0.71	0.75	0.72	0.85	0.70	0.88	0.84	0.58	0.61	0.62					
1989-1991	0.76	1.00	0.81	0.88	0.86	0.84	0.85	0.82	0.75	0.76	0.72	0.68	0.62	0.66	0.69					
1991-1993	0.76	0.89	1.00	0.86	0.87	0.84	0.85	0.82	0.76	0.76	0.72	0.68	0.68	0.71	0.70					
1993-1995	0.77	0.88	0.90	1.00	0.90	0.87	0.88	0.88	0.76	0.77	0.73	0.67	0.68	0.68	0.70					
1995-1997	0.76	0.88	0.87	0.90	1.00	0.89	0.88	0.88	0.80	0.81	0.76	0.70	0.70	0.70	0.70					
1997-1999	0.71	0.88	0.88	0.87	0.88	1.00	0.89	0.89	0.76	0.76	0.70	0.66	0.68	0.65	0.66					
1999-2001	0.75	0.85	0.85	0.88	0.88	0.91	1.00	0.90	0.81	0.79	0.73	0.69	0.65	0.68	0.69					
2001-2003	0.72	0.82	0.81	0.88	0.88	0.88	0.88	1.00	0.80	0.81	0.75	0.71	0.67	0.71	0.70					
2003-2005	0.65	0.75	0.76	0.76	0.81	0.79	0.81	0.85	1.00	0.80	0.81	0.76	0.79	0.79	0.79					
2005-2007	0.70	0.76	0.76	0.77	0.82	0.78	0.79	0.82	0.88	1.00	0.88	0.82	0.81	0.82	0.84					
2007-2009	0.68	0.72	0.75	0.75	0.79	0.79	0.77	0.79	0.81	0.86	1.00	0.88	0.80	0.81	0.82					
2009-2011	0.68	0.65	0.72	0.74	0.79	0.88	0.69	0.72	0.79	0.82	0.87	1.00	0.80	0.81	0.82					
2011-2013	0.68	0.62	0.69	0.67	0.71	0.88	0.65	0.67	0.79	0.81	0.88	0.88	1.00	0.80	0.81					
2013-2015	0.68	0.62	0.69	0.67	0.71	0.88	0.65	0.67	0.79	0.81	0.88	0.88	0.88	1.00	0.80					
2015-2017	0.68	0.69	0.69	0.68	0.71	0.88	0.68	0.71	0.79	0.88	0.88	0.88	0.88	0.88	0.88					
2017-2019	0.68	0.69	0.71	0.76	0.79	0.88	0.68	0.71	0.79	0.88	0.88	0.88	0.88	0.88	0.88					

	John McCain																			
	Before										After									
	1981-1983	1983-1985	1985-1987	1987-1989	1989-1991	1991-1993	1993-1995	1995-1997	1997-1999	1999-2001	2001-2003	2003-2005	2005-2007	2007-2009	2009-2011	2011-2013	2013-2015	2015-2017	2017-2019	2019-2021
1981-1983	1.00	0.97	0.98	0.94	0.94	0.92	0.94	0.90	0.80	0.79	0.80	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
1983-1985	0.94	1.00	0.98	0.94	0.94	0.92	0.94	0.90	0.80	0.79	0.80	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81	0.81
1985-1987	0.94	0.98	1.00	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
1987-1989	0.94	0.94	0.98	1.00	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
1989-1991	0.94	0.94	0.98	0.98	1.00	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
1991-1993	0.94	0.94	0.98	0.98	0.98	1.00	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
1993-1995	0.94	0.94	0.98	0.98	0.98	0.98	1.00	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
1995-1997	0.94	0.94	0.98	0.98	0.98	0.98	0.98	1.00	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
1997-1999	0.94	0.94	0.98	0.98	0.98	0.98	0.98	0.98	1.00	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
1999-2001	0.94	0.94	0.98	0.98	0.98	0.98	0.98	0.98	0.98	1.00	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
2001-2003	0.94	0.94	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	1.00	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
2003-2005	0.94	0.94	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	1.00	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
2005-2007	0.94	0.94	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	1.00	0.98	0.98	0.98	0.98	0.98	0.98	0.98
2007-2009	0.94	0.94	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	1.00	0.98	0.98	0.98	0.98	0.98	0.98
2009-2011	0.94	0.94	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	1.00	0.98	0.98	0.98	0.98	0.98
2011-2013	0.94	0.94	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	1.00	0.98	0.98	0.98	0.98
2013-2015	0.94	0.94	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	1.00	0.98	0.98	0.98
2015-2017	0.94	0.94	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	1.00	0.98	0.98

	Lindsey Graham																			
	Before										After									
	1995-1997	1997-1999	1999-2001	2001-2003	2003-2005	2005-2007	2007-2009	2009-2011	2011-2013	2013-2015	2015-2017	2017-2019	2019-2021	2021-2023	2023-2025	2025-2027	2027-2029	2029-2031	2031-2033	2033-2035
1995-1997	1.00	0.69	0.67	0.61	0.64	0.57	0.55	0.70	0.58	0.56	0.56									
1997-1999	0.69	1.00	0.70	0.67	0.61	0.54	0.52	0.62	0.54	0.55	0.54									
1999-2001	0.67	0.70	1.00	0.73	0.66	0.58	0.51	0.58	0.54	0.52	0.49									
2001-2003	0.61	0.67	0.73	1.00	0.62	0.50	0.47	0.55	0.49	0.50	0.49									

Methodological Framework

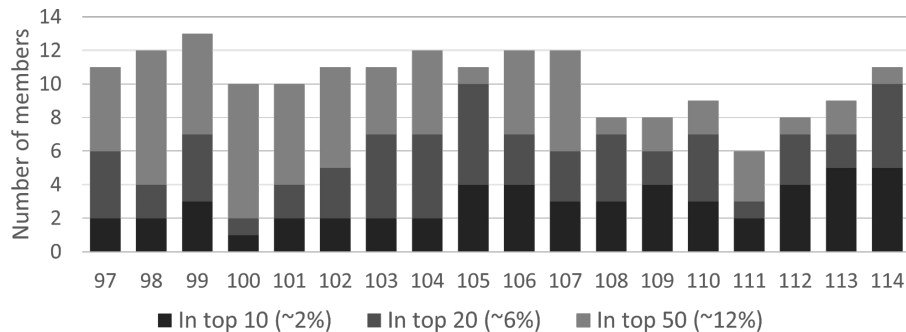
- **Text Analysis:**
 - Applied Term Frequency-Inverse Document Frequency (TF-IDF) to quantify the importance of words within the corpus, highlighting themes and topics.
 - Preprocessed text to normalize data: converted to lowercase, removed stop words and non-alphabetic characters.
- **Network Construction:**
 - Constructed speech networks based on lexical similarities, using cosine similarity as a metric.
 - Treated each congress member's aggregated speeches per session as a single document to create weighted word vectors.
- **Network Analysis:**
 - Analyzed the constructed networks to identify central nodes and clusters, employing measures like degree centrality and betweenness centrality.
 - Utilized community detection algorithms (e.g., Louvain method) to identify thematic clusters within the network.

Modelling

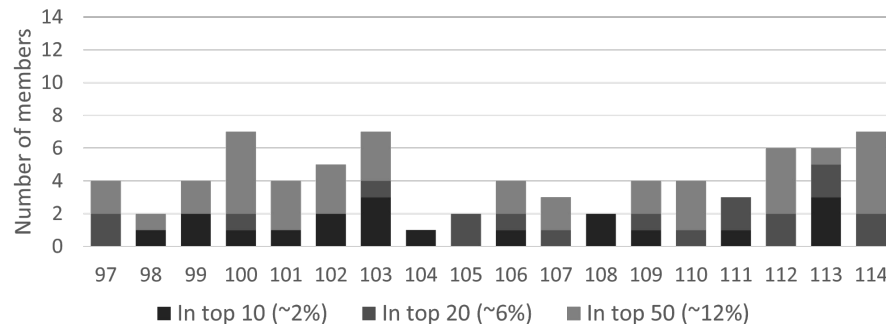
- Applied Exponential Random Graph Models (ERGMs) and Temporal Exponential Random Graph Models (TERGMs) to understand network evolution over time and the influence of exogenous variables.
- Modeled the probability of network ties considering factors such as partisanship, ideology, and demographic characteristics of congress members.
- **Key Variables Considered:**
 - a. Ideology (liberal-conservative spectrum based on NOMINATE scores).
 - b. Demographics (race, gender).
 - c. Political variables (party affiliation, committee memberships).

Committee Memberships

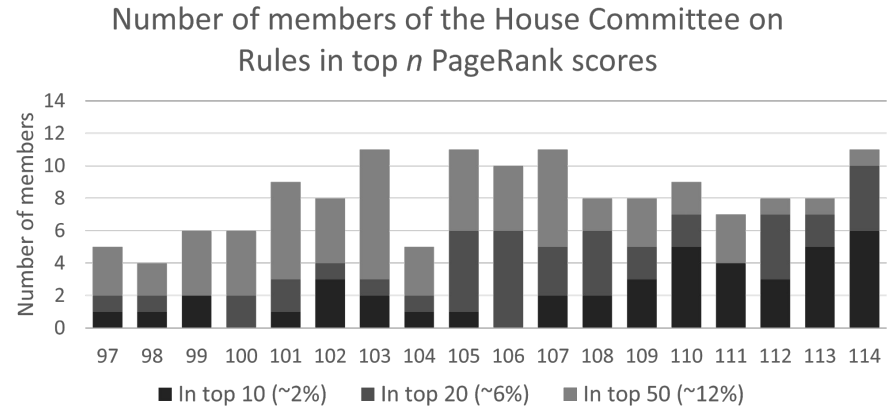
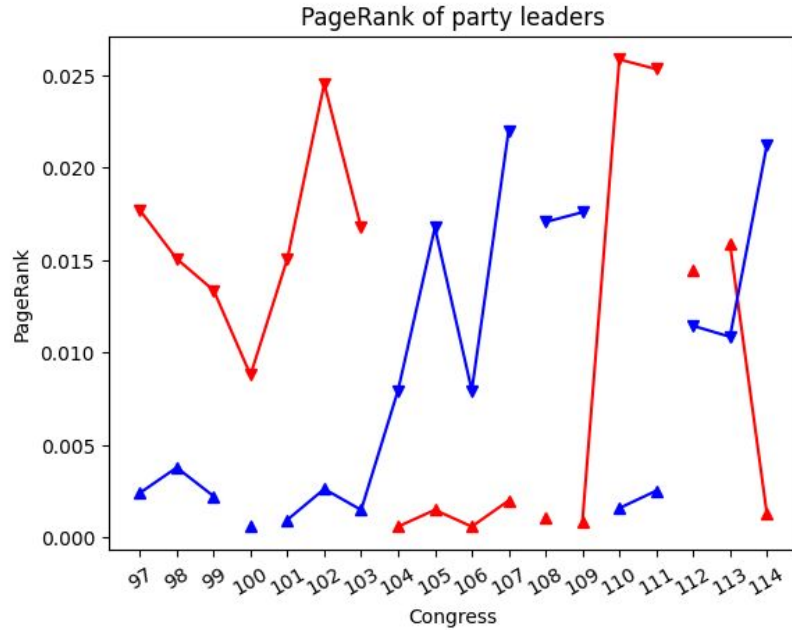
Number of members of the House Committee on Rules in top n Eigenvector Centrality scores



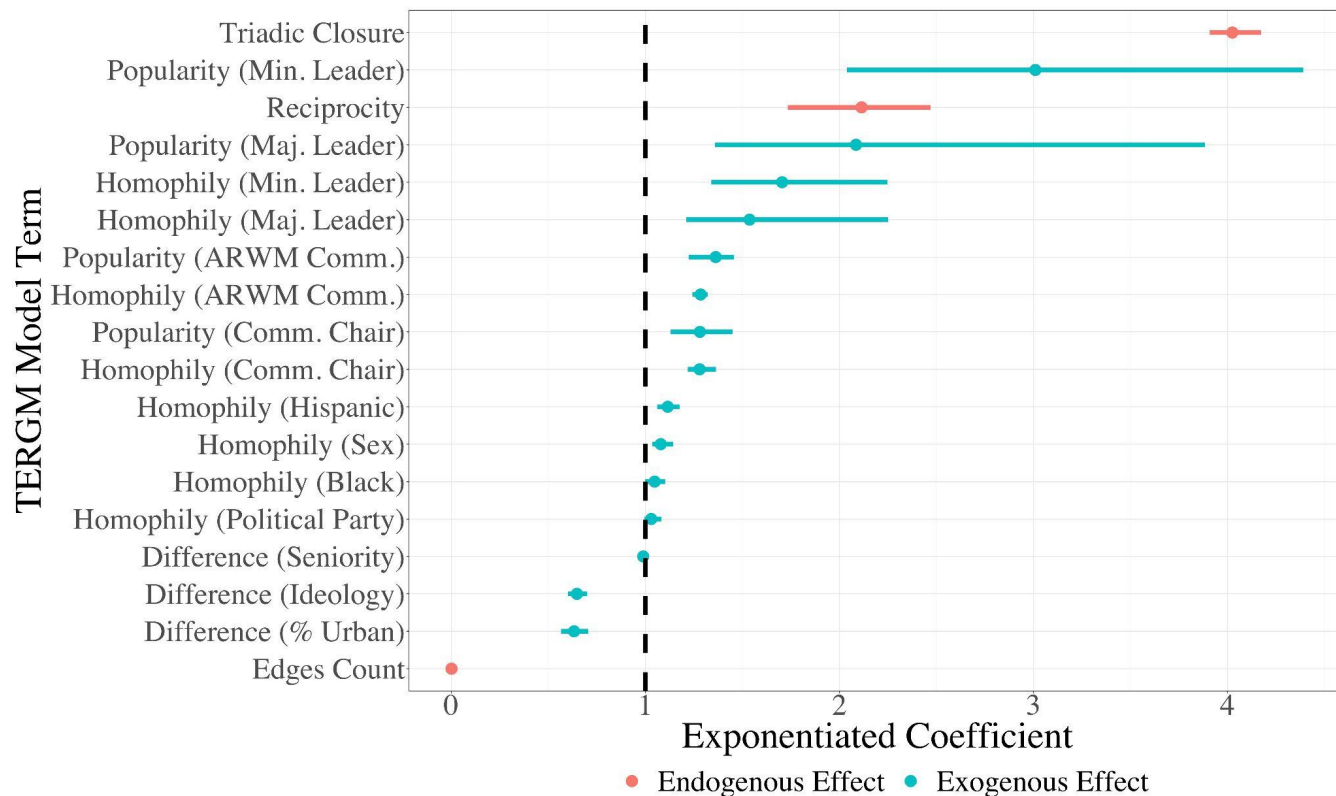
Number of members of the House Committee on Rules in top n Betweenness Centrality scores



Party Leader Pagerank



Modeling Congressional Speech Networks



Key Findings & Insights

- Identification of speech leadership patterns within Congress.
- Significant influence of ideological alignment and demographic factors on network centrality.
- Stability of speech similarity over time, with noted variations across political divides.

Discussion

- Speech networks offer early indicators of policy priorities and legislative agendas.
 - Validating party leader importance
- Understanding of speech leadership can inform strategies for policy advocacy.
- Expansion to include sentiment analysis and external factors for deeper understanding of speech impact