Passing the Bucks:
The Congressional contribution network 1985–2006

Brendan Nyhan
Duke University
bjn3@duke.edu

Michael Tofias
UW-Milwaukee
tofias@uwm.edu

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Abstract

Many members of Congress now play an active role in financing the elections of their colleagues, but scholars of Congress have not kept up. To understand the flow of campaign funds between members of Congress, we must consider the structure of the contribution network. Building on recent studies of cosponsorship and committee networks in Congress, we conduct the first network analysis of campaign and leadership PAC contributions between Congressional candidates and members. Using FEC data from 1985 to 2006, we show that the density of these networks has increased over time, identify the most central members within each Congress, and demonstrate that leaders in the House have become more central relative to the rank-and-file over this period. Our analysis provides a foundation for research into how members of Congress use contributions as a mechanism for institutional advancement.

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1 Introduction

Humans are social beings who create, maintain, and abandon relationships with each other. These relationships tie us together, structuring information flow and influencing behavior. Together, they constitute what are called social networks. Recent advances in the methodology of network analysis have led to increased interest in social networks of many kinds (Newman 2001; Watts 2004), including Congressional cosponsorship and committee networks (Porter et al. 2005; Fowler 2006a,b; Porter et al. 2007; Zhang et al. 2008; Cho and Fowler 2006).

This approach holds a great deal of promise for understanding the internal dynamics of Congressional influence and prestige that has not yet been realized. In particular, contributions between the campaign committees and leadership PACs of members of Congress have increased dramatically in recent years. We analyze the network formed by these campaign contributions, which provides a way of looking at congressional parties and partisanship that is not related to roll call voting. It is also distinct from previous research on cosponsorship and committee networks, which largely measure members' legislative connections and stature.

The position of members of Congress within this contribution network may be especially consequential. We hypothesize that members' campaign contributions are motivated by a desire to gain stature and influence within one's party. As such, we analyze each member's position within the network, characterizing the relative importance of members according to several measure of network centrality and suggesting how this approach could help predict institutional advancement within Congress. We also investigate changes in the structure of the contribution network and the relationship between network centrality and relevant covariates over time.

2 Previous research

Campaign finance has received a good deal of attention from political scientists, but this research has largely focused on who receives contributions from political action committees (e.g. Grier and Munger 1993) and the effect of campaign contributions on both electoral outcomes (e.g. Jacobson 2004) and voting in Congress (e.g. Witko 2006). Until quite recently, very few have scholars have studied the contributions that members of Congress make to each other.

Several studies that have been conducted thus far focus on predictors of contribution recipients. For instance, analysts have considered whether members of Congress give to other candidates based on gender (Kanthak 2007), ideological proximity (Currinder 2003), or the competitiveness of the potential recipient's campaign (Potoski, Lowry, and Talbert 2003). Currinder (2003) also examines leadership PAC contribution choices, finding that House members change their contribution strategies when their party holds majority control of the chamber.

Others consider the relationship between intra-candidate giving and institutional stature. Heberlig and Larson (2005) shows that House members in leadership posts contribute relatively more money to House candidates and congressional campaign committees than other members, especially during closely fought battles for majority control, while Heberlig, Hetherington, and Larson (2006) find that ideologically extreme members can win party leadership battles if they contribute more funds to other members than their less extreme rivals. In addition, Heberlig (2003) and Cann (2005) conclude that contributions to other members are positively associated with securing desired committee assignments.

However, these individual- and dyad-level analyses ignore the wealth of information contained in the structure of the contribution network, which has aggregate properties that are not captured by previous studies. In addition, previous studies do not capture members' relative positions within the network, which could be

consequential within Congress as a measure of their power and prestige.

3 Theoretical approach

Parties are both the organizing forces of Congress and electoral teams competing for seats and majority power. Members of Congress are asked to help their co-partisans through votes on key issues, campaign endorsements, and fundraising. One important aspect of a member's relationship with her party is the efforts made on behalf of other members and candidates, including campaign contributions. These contributions not only support the electoral efforts of the party but help to create or strengthen personal relationships that may be useful to the member.

It is clear that ambitious members of Congress approach this task in a strategic fashion. Rather than simply giving randomly to other candidates, many members appear to make contributions to fellow partisans as a mechanism to increase their prestige and influence. The pattern of these contributions is consequential. In particular, members who give generously to candidates who are popular targets of their co-partisans will be more centrally located within their party's contribution network than members whose donations are more irregular or idiosyncratic. (Future work will consider whether centrally located members are more likely to ascend into leadership and other prestigious positions than those who are not.)

4 Data

To construct our data, we identified all contributions between candidate committees and leadership PACs for the 1986–2006 electoral cycles using the Federal Election Commission's "Any Transaction from One Committee to Another" data files (`www.fec.gov/finance/disclosure/ftpdet.shtml`). We then extracted all contributions from each cycle in which the givers and receivers served in the subsequent

session of Congress (i.e. the 1986 electoral cycle was matched to the 100th Congress of 1987–1988), a procedure that allows us to link contribution behavior to subsequent institutional influence.[1] Members of Congress were identified using Poole and Rosenthal's DW-NOMINATE dataset (`www.voteview.com`). A corresponding list of leadership PACs associated with members of Congress were coded from biennial editions of the *Almanac of Federal PACs*.[2]

From these data, we construct eleven election cycles of social networks that were partitioned by party.[3] In these networks, members of Congress and candidates who will serve in the subsequent Congress are nodes that are connected by arcs representing campaign contributions. These arcs are directed, since contributions flow from a giver to a receiver, and valued since the contribution amount may vary. The value of the arc represents the sum of all contributions between two members' committees during an electoral cycle. However, we do not utilize edge value data in the analyses presented below due to difficulties posed by changes in campaign finance law, inflation, and limitations in the available methodological tools for analyzing directed, valued edge data.

Finally, we coded which members served in House and Senate leadership positions from annual editions of the *Congressional Directory* and the *Congressional Biographical Directory* (`http://bioguide.congress.gov`). We also employ Common Space DW-NOMINATE scores as a measure of partisan voting behavior that is comparable across chambers (`www.voteview.com`).

[1] To guard against endogeneity, it is crucial that we link contributions at time t to institutional influence (such as selection of leadership positions and committee chairs) at time $t + 1$.

[2] In our coding, we considered a gift from a leadership PAC to be the same as a gift from a MC's own campaign committee. For leadership PACs associated with several members, we coded the gifts as having come from (and/or having been received by) each member separately, but divided the total value of the contribution between the associated members.

[3] Nearly all contributions are partisan. The bulk of the donations that are coded as cross-party can be explained by party switchers who are moving across the aisle mid-cycle. In the analysis below, all cross-partisan donations were discarded.

5 Results

In this section,we analyze the aggregate properties of the contribution networks; present a simple graphic illustration of our data; identify the most central members by party and Congress using three measures of centrality; and then describe how centrality varies by leadership, seniority status, and roll-call voting behavior.

5.1 Aggregate contribution patterns

The plots in Figure 1 display four measures of the volume of contributions in the Congressional contribution networks from 1985 and 2006 by party. Each one shows a general trend toward increasing contribution activity from the early 1990s to 2004 and then a dramatic decline in GOP giving in 2006 (possibly the result of unfavorable electoral conditions).

[Figure 1 about here.]

Figure 1(a) plots the percentage of members who gave or received contributions from their colleagues by election cycle (it thus represents the proportion who appear as nodes in our network data). Net participation in the contribution network has increased substantially over the last two decades, particularly among Republicans, though GOP participation declined somewhat in 2006. Figure 1(b) summarizes the rapid growth in the number of arcs in the network (representing one or more contributions from one member to another in a given election cycle), which roughly tripled between 1992 and 2004. A more sophisticated network statistic is presented in Figure 1(c), which combines the information in the previous two plots into a single graph illustrating growth in the *density* of the network. This measure is defined as the number of arcs between members in the network divided by the total number of possible arcs.[4] Despite the seemingly large numbers

[4]Formally, the density of a directed graph with L arcs and p nodes is $\frac{L}{p(p-1)}$.

of contributions, the density plot, which ranges between 0 and 0.06, indicates that the Congressional contribution network is relatively sparsely connected relative to the co-sponsorship networks studied by Fowler (2006a,b) and Zhang et al. (2008). Finally, Figure 1(d) presents the total value of all such contributions per election cycle. Again, the total value of giving among members increased significantly, especially among Republicans, before dropping off in the most recent electoral cycle.

5.2 Visualizing contribution networks

While the contribution networks are too dense and complex to adequately summarize in a single graphic, it is often helpful to see a visualization of part of a network. As such, we present an illustrative representation from the 2004 electoral cycle in Figure 3, which depicts the top three Republican contributors (Tom DeLay, Bill Frist, and Dennis Hastert) and the recipients of their largesse.

[Figure 2 about here.]

As the figure suggests, most members' contribution activity is unevenly distributed toward either giving or receiving (among those who are active). Figure 4 illustrates this point by plotting the indegree and outdegree values for each node in the network (i.e. the number of incoming and outgoing ties).

[Figure 3 about here.]

In fact, only a tiny number of members give and receive more than a few contributions in the same cycle. In addition, the figure also illustrates that a few members are vastly more well-connected than their colleagues as either contributors or recipients. (We discuss these individuals further below.)

5.3 Individual centrality

We formally characterize define individual centrality within each electoral cycle's partisan contribution network using three measures: outdegree centrality, eigenvector centrality, and a modified version of the network closeness measure proposed by Butts (2008).[5] As defined below, each of these measures is calculated without respect to the arc values in question—there is as yet no respected centrality measure for directed, valued networks that can be applied to each node in the network (Liua et al. 2005).

The first measure we use, outdegree centrality, refers to the number of outgoing ties between a given node (candidate) and other nodes, which captures the extent to which an actor is active within the network (Freeman 1979). This measure can be normalized to the number of nodes in the network (Wasserman and Faust 1994, 199). We do not do so, however, for ease of interpretability.[6]

A second measure is eigenvector centrality (Bonacich 1972a,b), which represents the weighted sum of the centrality of all nodes to which a given node is connected. If we define a $p \times p$ adjacency matrix A for a network with p nodes where $A_{ij} = 1$ if the nodes are connected directly and $A_{ij} = 0$ otherwise, the eigenvector centrality e_i of unit i can be defined as $\lambda e_i = \sum_j A_{ij} e_j$. ($\lambda$ is a constant that is needed to avoid a nonzero solution.) Equivalently, in matrix notation, $\lambda e = Ae$ where e is the eigenvector of A and λ is its largest eigenvalue.

Finally, we use a modified network closeness measure. In a directed network, closeness is typically defined as the inverse of the average directed distance between a node and all other nodes in a network (Sabidussi 1966). If we let $d(n_i, n_j)$ represent the shortest distance between nodes i and j in a network with p nodes,

[5] As recommended by Wasserman and Faust (1994, 198-202), we do not calculate betweenness or information centrality, the two other most well-known measures of network position, which are less useful for directed networks, particularly ones as sparse as these.

[6] Also, the network is sufficiently sparse that no one approaches saturating the maximum number of possible connections.

then this measure can be defined as $\frac{p-1}{\sum_{j=1}^{p} d(n_i,n_j)}$. However, as Wasserman and Faust (1994, 200) note, the measure is not defined for weakly connected graphs where directed paths do not exist from nodes i to j for all i and j. In these cases, $d(n_i, n_j)$ is infinite. This situation applies frequently in the sparsely connected, directed networks we analyze. As a result, we use a slight modification of the closeness formula proposed by Butts (2008, 23) that is defined for all nodes in our data: $\frac{\sum_{j=1}^{p} d(n_i,n_j)^{-1}}{p-1}$. In this case, all non-connected dyads $d(n_i, n_j)$ take a value of 0. The measure can range between 0 (for an isolate with no ties to any other actor) to 1 (for an actor who has a direct outgoing tie to every other node in the network).

Table 1 lists the most central members of Congress according to each of these measures.

[Table 1 about here.]

Table 1(a) lists the most central members according to outdegree centrality, Table 1(b) lists the most central according to eigenvector centrality, and Table 1(c) lists the most central according to our modification of the Butts (2008) measure. The lists have strong face validity and include numerous party leaders, prominent members of Congress, and presidential candidates. The three lists also overlap significantly due to the relatively significant correlations between the three measures, which suggests that our results are not driven by the choice of a single measure.[7]

5.4 Leadership, seniority, and roll-call voting

We now present preliminary results characterizing the relationship between modified closeness (our preferred measure of centrality) and three relevant institutional characteristics and behaviors—leadership status, seniority, and roll-call voting behavior.

[7] Specifically, the pairwise correlations are .64 (outdegree/eigenvector), .77 (outdegree/closeness), and .57 (eigenvector/closeness).

First, our closeness measure shows strong face validity in distinguishing party leaders from rank-and-file members. In this analysis, we define members as part of their chamber's party leadership if they are Speaker of the House; Majority/Minority Leader (House or Senate); or Majority/Minority Whip (House or Senate). Figure 4 presents lowess curves showing how centrality changed over time by leadership status and party.

[Figure 4 about here.]

The smoothed regression lines in the figure illustrate that members of the party leaderships have typically been more central to their party contribution networks than rank-and-file members for both chambers and parties (though the gap has narrowed in the last few election cycles).

However, we expect that institutionally ambitious members might increase their giving in anticipation of an attempt to ascend higher in party leadership. The plots above do not allow us to distinguish between members who wish to move up and those who do not among either among leaders or the rank-and-file. To illustrate how members might use contributions to facilitate upward mobility, we present the centrality trajectories of four prominent members of House of Representatives in Figure 5 who attempted to ascend into party leadership during the period covered by our data.

[Figure 5 about here.]

As Dennis Hastert, David Dreier, Nancy Pelosi, and Steny Hoyer became more prominent, they increased their contributions to their fellow colleagues and moved toward the center of their party's contribution networks.

A related question is how members' positions in the contribution network change as they gain more seniority. Figure 6 compares lowess regression curves predicting modified closeness centrality using seniority by time period. Two curves are

presented for each party—one for the era largely dominated by Democratic Congressional majorities (1985–1994) and one for the more recent period consisting almost entirely of Republican majorities (1995–2006).

[Figure 6 about here.]

In the more recent period, members appear to increase in centrality more rapidly as their seniority increases in the more recent period. One interpretation of this finding is that ambitious members are using contributions to other members to try to gain stature and bypass the seniority hierarchy.

Finally, given previous research examining the relationship between ideological position and contributions to other members, Figure 7 examines the relationship between members' ideological position on the first dimension of Common Space DW-NOMINATE and our modified closeness measure of network centrality.

[Figure 7 about here.]

The graphic, which uses a locally weighted regression fit, shows that the most central MCs in the contribution networks are located near the median member of their parties by chamber.[8] Moreover, average closeness declines as members become more extreme relative to their party median except for centrist Senate Democrats, whose centrality shows a non-monotonic increase near the Common Space DW-NOMINATE midpoint.

6 Conclusion

In this paper, we describe the Congressional contribution network for each electoral cycle of the 1985–2006 period, show that contribution activity in these networks has generally increased over time, characterize the positions of members

[8] To avoid extrapolating into sparsely populated regions of the data, the lowess fits in the figure are censored above 0 for Democrats and below 0 for Republicans.

within them according to three measures of network centrality, and examine the relationship between member centrality and leadership status, seniority, and roll-call voting behavior.

However, this analysis only begins to scratch the surface. In subsequent work, we plan to develop a new centrality measure that is substantively and methodologically appropriate for the directed, valued nature of the Congressional contribution networks. We then would like to use this measure to predict member success in rising through the party and committee leadership structure. Ultimately, we hope to use exponential random graph models to investigates the predictors of ties between members and changes in those relationships over time.

Social network analysis holds the promise to give us new insight into the often opaque dynamics of political institutions such as the U.S. Congress. We have sketched out a new way to measure the internal dynamics of the modern political party that we think shows significant promise for future research.

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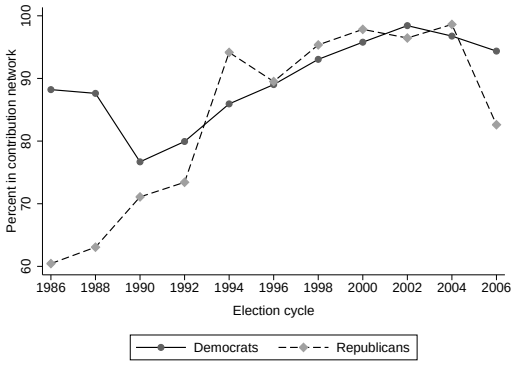
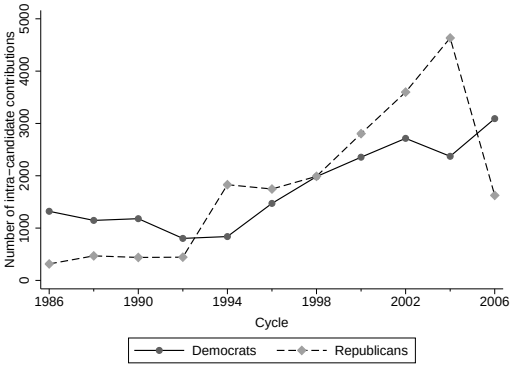
Figure 1: Increased giving in the Congressional contribution network

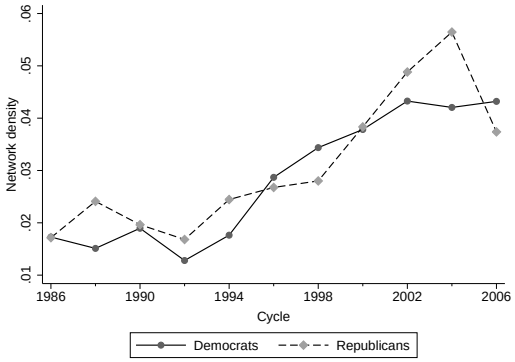
(a) Percent in network



(b) Number of arcs



(c) Network density



(d) Total giving

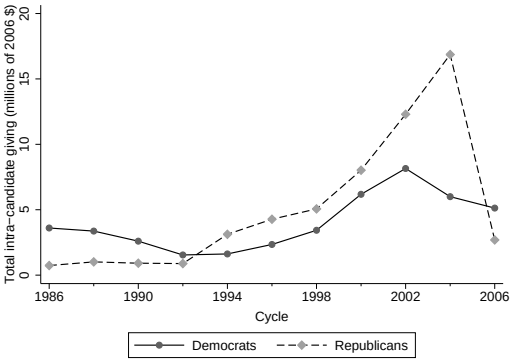


Figure 2: Top GOP givers subnetwork 2003–2004

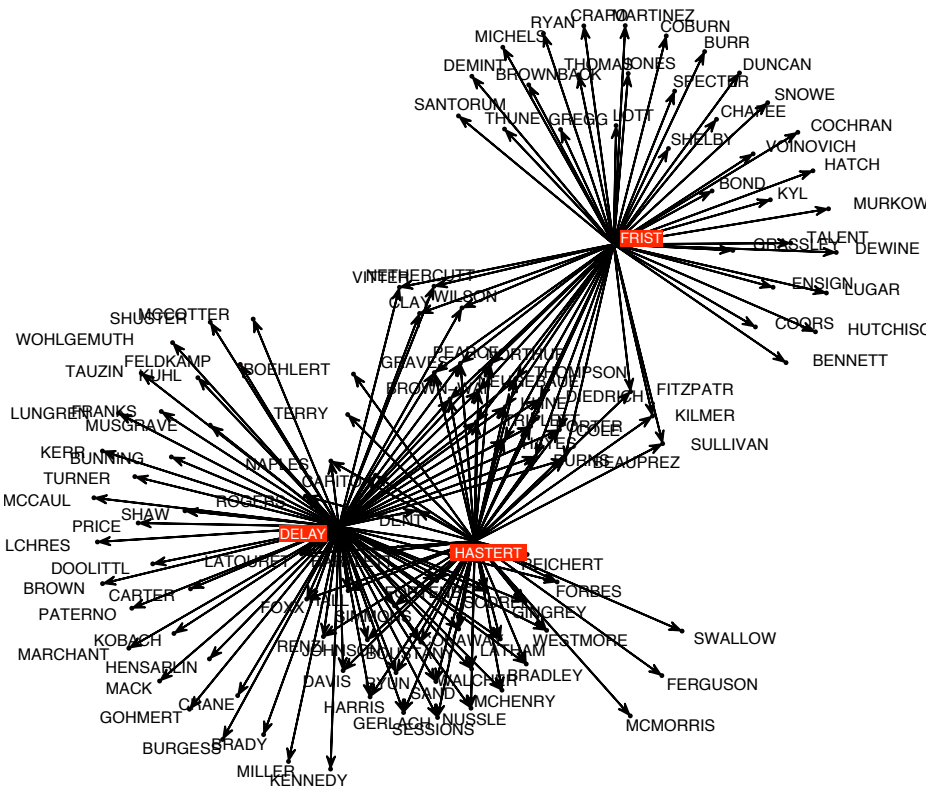


Figure 3: Indegree and outdegree centrality 1985–2006

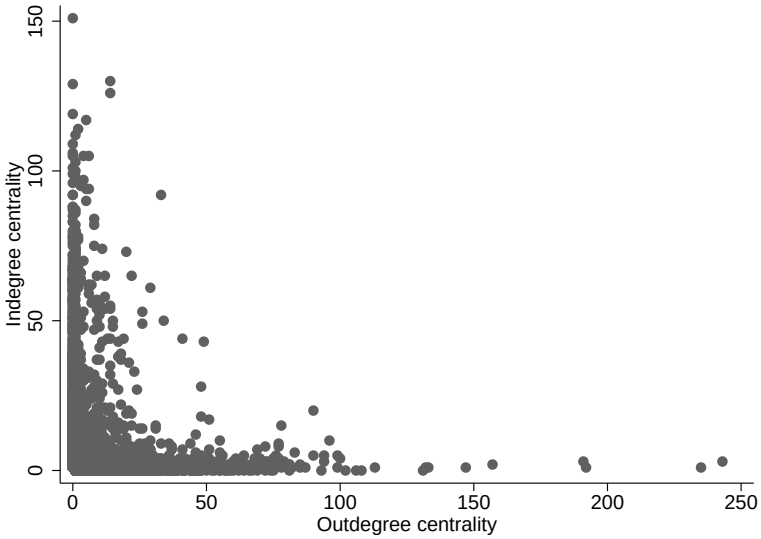
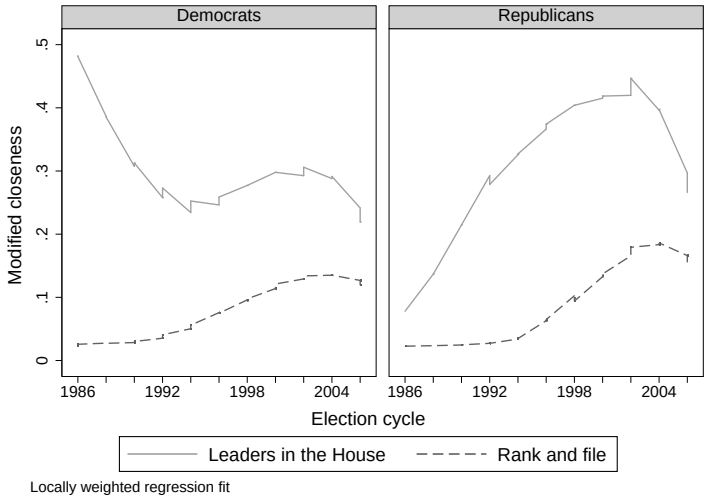


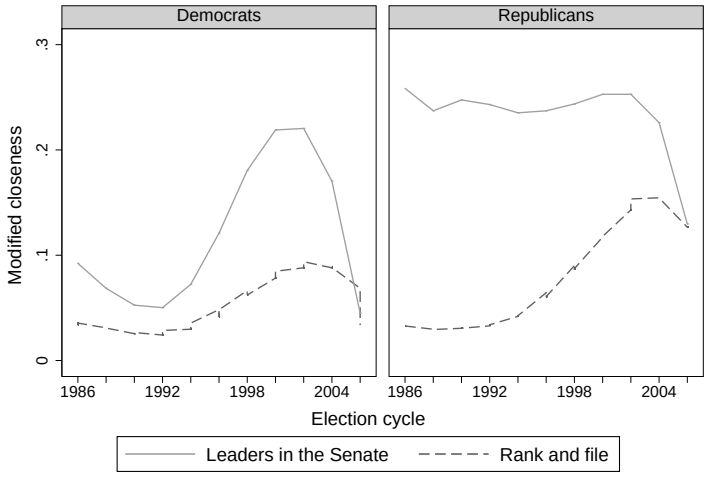
Figure 4: Leader vs. rank-and-file centrality by chamber 1985–2006

(a) House



Locally weighted regression fit

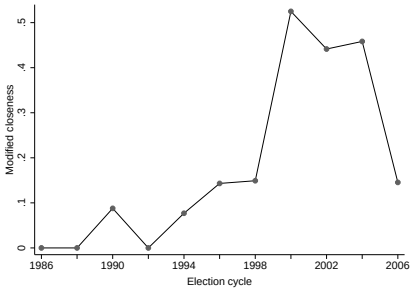
(b) Senate



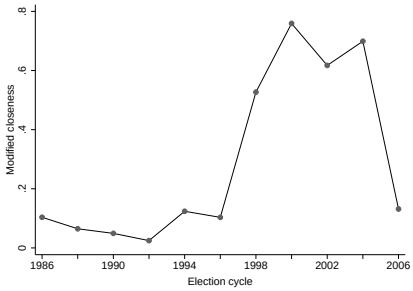
Locally weighted regression fit

Figure 5: Prominent career trajectories within the partisan networks

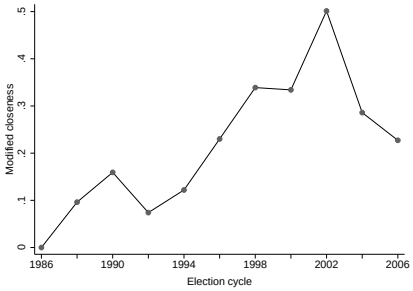
(a) Hastert



(b) Dreier



(c) Pelosi



(d) Hoyer

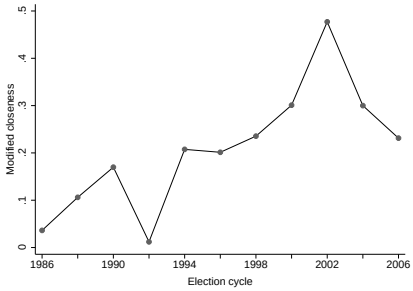
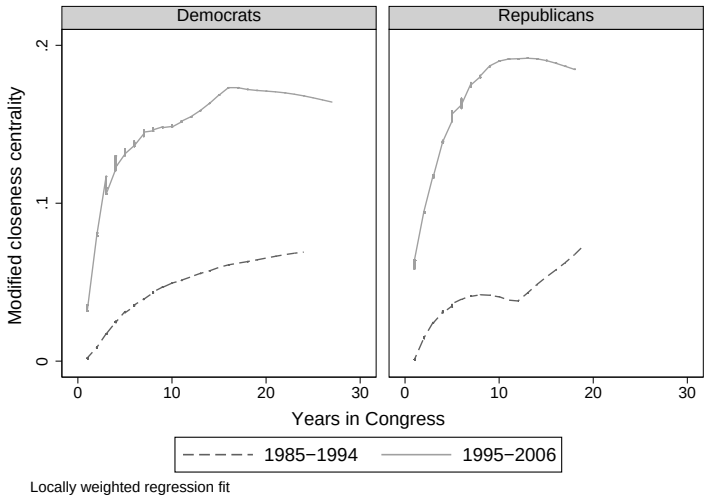


Figure 6: Seniority and centrality 1985–1994 and 1995–2006

(a) House



(b) Senate

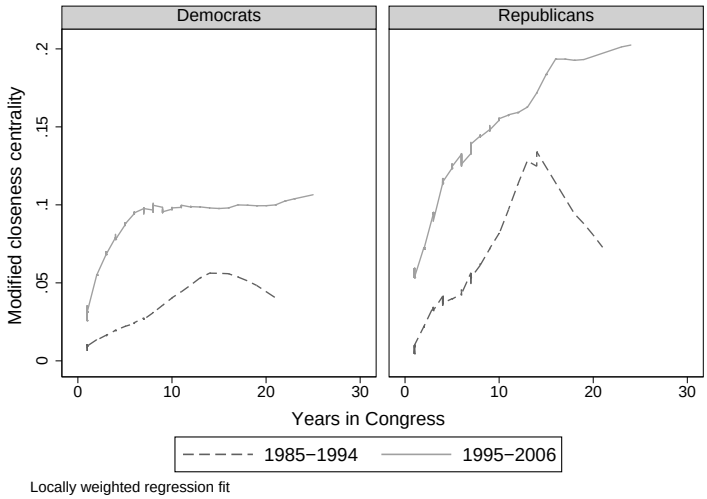
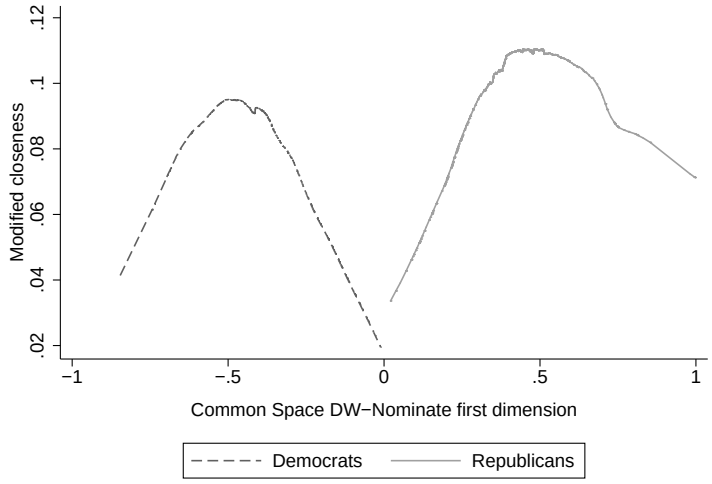


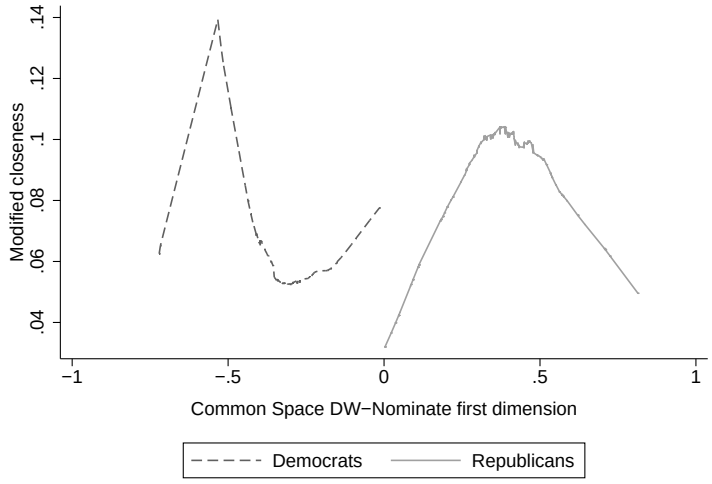
Figure 7: Common space scores and centrality 1985–2006

(a) House



Locally weighted regression fit; party distributions truncated at 0

(b) Senate



Locally weighted regression fit; party distributions truncated at 0

Table 1: The most central members of Congress in contribution networks

(a) Outdegree centrality

Year	Candidate	State	CD
Democrats			
1986	Coelho	CA	15
1988	Coelho	CA	15
1990	Rostenkowski	IL	8
1992	Gephardt	MO	3
1994	Rose	NC	7
1996	Matsui	CA	5
1998	Frost/Pelosi	TX/CA	–
2000	Pelosi	CA	8
2002	Pelosi	CA	8
2004	Hoyer	MD	5
2006	Becerra	CA	31
Republicans			
1986	Kemp	NY	31
1988	Dole	KS	S
1990	Dole	KS	0
1992	Lewis/Michel	CA/IL	–
1994	Delay	TX	22
1996	Armey	TX	26
1998	Dreier	CA	28
2000	Watts	OK	4
2002	Dreier	CA	26
2004	Dreier	CA	26
2006	Doolittle	CA	4

(b) Eigenvector centrality

Year	Candidate	State	CD
Democrats			
1986	Rangel	NY	16
1988	Coelho	CA	15
1990	Rostenkowski	IL	8
1992	Rostenkowski	IL	5
1994	Richardson	NM	3
1996	tie (four MCs)		
1998	Reid	NV	S
2000	Peterson	MN	7
2002	Lieberman	CT	S
2004	Dodd	CT	S
2006	Murtha	PA	12
Republicans			
1986	Cochran/Wilson	MS/CA	S
1988	Kyl/Dole/Stump	AZ/KS/AZ	–
1990	tie (ten MCs)		
1992	tie (four MCs)		
1994	Dole	KS	S
1996	Weller	IL	11
1998	Dreier	CA	28
2000	Watts	OK	4
2002	Dreier	CA	26
2004	Dreier	CA	26
2006	Doolittle	CA	4

(c) Closeness centrality

Year	Candidate	State	CD
Democrats			
1986	Coelho	CA	15
1988	Coelho	CA	15
1990	Rostenkowski	IL	8
1992	Gephardt	MO	3
1994	Rose	NC	7
1996	Rangel	NY	15
1998	Gephardt	MO	3
2000	Pelosi	CA	8
2002	Pelosi	CA	8
2004	Hoyer	MD	5
2006	Murtha	PA	12
Republicans			
1986	Kemp	NY	31
1988	Dole	KS	S
1990	Dole	KS	S
1992	Dole	KS	S
1994	Delay	TX	22
1996	Delay	TX	22
1998	Dreier	CA	28
2000	Watts	OK	4
2002	Dreier	CA	26
2004	Dreier	CA	26
2006	Cole	OK	4