DO ACTIONS SPEAK LOUDER THAN WORDS? HOW PARTIES REWARD LOYAL SPEECH AND VOTING BEHAVIOR

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ABSTRACT. Parties seek to hold their members accountable for their actions, but we know little of how this functions outside of voting behavior. We create a measure of how well each member's floor speeches fit with those of their party—speech fit—and compare it to a similar measure of voting fit in order to study how parties hold members accountable for both floor speeches and votes. We show that parties reward members whose speeches fit the goals of their party by providing them more resources. Interestingly, we find that parties do not reward members based on a similar measure of how well their voting behavior fits with that of the party, computed from DW-NOMINATE. We discuss implications for Congressional research—ours is the first quantitative study that extends party loyalty to spoken behavior—and text research, where our approach has broad applications.
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Many political scientists have argued that party government is a beneficial arrangement for both legislators and the public, providing legislators a source of legislative infrastructure and brand recognition to further their electoral and legislative goals, and providing the public a middle ground between the infeasible organization of direct popular control of government in a complex society and the lack of sovereignty inherent in an autocracy. In order to govern effectively—or "responsibly"—and enact the policy agenda they sold to the public in order to get their candidates elected, parties must be able create cohesion by holding their members accountable for defection from the party's goals (Grynaviski, 2010; Aldrich, 2011; Rohde, 1991; Cox and McCubbins, 2007, 2005; Schattschneider, 1942; Wilson, 1885). This introduces a complex system of trade-offs between the preferences of parties and their members, as individual legislators often have incentive to eschew the party's wishes in favor of their own preferences or those of their constituents (Grynaviski, 2010). To counteract these incentives, parties must provide goods to members of Congress (MCs) such as campaign contributions (Leyden and Borrelli, 1994; Glasgow, 2002) and committee assignments (Cox and McCubbins, 2007; Rohde and Shepsle, 1973; Smith and Ray, 1983; Grier and Munger, 1991) in order to get them to toe the party line.

Do parties treat all MC behaviors equally, or do they care about some more than others? Existing research has almost exclusively relied on roll-call votes when assessing party loyalty and the provisioning of party goods (but see Harris, 2005), so we know little of how parties reward/punish their members based on other behaviors. Consider the two main types of observable actions in Congress: votes and statements. Members of Congress vote on bills, procedures, and amendments, and they make statements to their co-legislators and the public through a variety of means. While the party certainly cannot enact its legislative agenda if it cannot whip its members to vote in favor of its preferred policies, the party's legislative success is also undermined if its members go off-message when speaking about the party's policies. Do parties care more if

their members deviate from the party's preferences in their public statements, or their voting behavior? In this paper, we compare how parties dole out their resources to members based on intraparty variation in speech behavior and voting behavior.

To assess speech behavior, we create a novel measure of MC behavior using a text analysis of floor speeches in Congress. We first determine the topics that are being discussed in members' floor speeches using Latent Dirichlet Allocation (LDA). Then, we project the topic mixtures underlying the generation of each speech from the LDA model into a Euclidean space using locally linear embedding (LLE)—a dimension reduction technique well-suited for use with text data that likely have a nonlinear underlying structure, such as congressional floor speeches (Roweis and Saul, 2000). This approach enables us to describe variation in the content of members' floor speeches within each party. We call this measure "speech fit"—how well a member's speeches fit the party's preferences. We apply this process to the full body of floor speeches in the House of Representatives from the 104th to 108th Congresses, doing so separately for members of each party. To assess voting behavior, we create a measure of "voting fit", which describes intraparty variation in roll call voting records and is computed from DW-NOMINATE scores.

We compare how speech fit and voting fit predict the provision of two party goods: 1) the contributions given to each member by their party committee during a campaign cycle, and 2) the likelihood that a member is assigned to one of the prestige committees in the House. We find that members whose speech patterns deviate more from their party's typical speech patterns receive less money from their party committee and are less likely to be appointed to a prestige committee. We also find that members whose DW-NOMINATE score deviates more from their party receive *more* money from their party committee and are *more* likely to be appointed to a prestige committee. The findings highlight that 1) parties demand loyalty from their members on more than just

votes, and 2) parties seem to care more if their members deviate from the party's message in their speeches than their votes. We close with a discussion of the implications for party operations and legislative decision-making.

Party Preferences and Party Loyalty

In order for parties to exercise their agenda control to keep unwanted legislation from a vote, and to enact into law their own preferred policies, they need their members to behave and vote with the party (Grynaviski, 2010). This reliance on member support of the party's goals only increases with congressional polarization, when minority-party legislators are less likely to vote with the majority party.[1] Members' electoral incentives often entice them to deviate from the party. If MCs step too far out of line with the preferences of their voters, they risk losing their seat in Congress, even with the large electoral advantage afforded to incumbents (Canes-Wrone, Brady and Cogan, 2002; Hollibaugh, Rothenberg and Rulison, 2013; Canes-Wrone, 2015; Nyhan et al., 2012). When the preferences of party and constituency come into conflict, MCs have a difficult choice. Members do not want to act against the will of their constituents without a good reason, so parties must give them one. Parties have resources that can soften the blow to MCs' electoral chances that comes from dissatisfying their constituents.[2]

Researchers have been particularly interested in how parties dole out resources based on (or to entice) party loyalty, such as committee assignments and campaign contributions. Committee assignments are a potent way for parties to reward their

[1] Since 1974, both the proportion of party unity votes and the average party unity score in Congress have steeply risen. Party unity votes are defined as a vote where at least 50% of Democrats vote against at least 50% of Republicans, and a member's party unity score is the percentage of party unity votes on which they vote with the majority of their party.

[2] Members also have incentive to behave loyally so that their party membership is more meaningful. Parties have a strong reputation or brand for stances on certain policies, and association with that reputation gives the public an easy cue about the broad preferences of a candidate, particularly in a polarized political climate (Grynaviski, 2010; Sniderman and Stiglitz, 2012). Running afoul of the party's goals could weaken the relationship between a particular MC and the party's reputation, which could harm their re-election chances. Doing so could also damage the party brand, to the detriment of all members.

members (Sinclair, 2014). These are desirable for MCs as they are important to policy-making, and they allow MCs to signal their value to constituents via specialization, institutional prestige, and pork-barrel policy (Fenno, 1973). A good committee assignment can make or break a career in Congress. Even in the pre-reform era, when parties were viewed as relatively weak, parties were more likely to give preferred treatment for transferring between committees to loyalists (Rohde and Shepsle, 1973). Party loyalty also increases the probability of receiving one's preferred committee assignment from the party's Steering Committee (Smith and Ray, 1983) and being appointed to one of the four prestige committees, and decreases the probability of being denied a committee transfer request (Cox and McCubbins, 2007).[3] Parties also use campaign contributions to induce party loyalty (Leyden and Borrelli, 1994); contributions are a form of partisan control, and an efficient one (Glasgow, 2002).

While we know that parties want their members to be loyal to the party's goals, and punish/reward their members for (dis)loyal behavior, we know very little about whether parties seek accountability through some actions more than others. There are plausible arguments for why parties would be more likely to reward/punish members based on their votes than on their statements, and vice versa. For instance, parties may care little about what their members say so long as they vote with the party. Votes are the most common metric for assessing party loyalty not only because they are easy to measure, but because votes determine which policies become law. Then again, much of the party's power to pass legislation relies on party brand and reputation (Snyder and Ting, 2002), which is undermined if members' public statements deviate from the party's goals. Because of these competing plausible claims, we have no *a priori* expectations about whether parties will be more likely to hold their members accountable for their speeches or their voting behavior, or whether each is treated somewhat equally.

[3]The House prestige committees are Appropriations, Rules, Ways and Means, and Budget.

The influence of party loyalty through different behaviors on rewards from the party is ultimately an empirical question.

Text Analysis of Congressional Floor Speeches

Advances in text analysis allow researchers to efficiently glean information from large text corpora like the body of congressional floor speeches. LDA, a generative topic model developed by Blei, Ng and Jordan (2003), is a popular technique for analyzing large text corpora (*e.g.*, see Catalinac, 2016; Moser and Reeves, 2014; Lauderdale and Clark, 2014).[4] For instance, Grimmer (2010) found that a variant LDA model could reliably group the press releases of Senators into coherent and stable topics, and Quinn et al. (2010) were able to categorize over 118,000 speeches from the Congressional Record into thematic speech topics. The fundamental ability of LDA to uncover the "topics" inherent in large and diverse sets of documents makes it a particularly useful method for analyzing the interplay of party goals and member behavior, as this relationship plays out across many issues and situations. Although some work has been done using topic modeling on floor speeches (*e.g.*, Quinn et al. 2010), the direct comparison between these speeches and party loyalty has not been made.

While existing text analysis research using LDA has been both substantively and methodologically fruitful, this literature often does not utilize all of the information provided by the LDA algorithm. In an LDA model, observations are represented by having partial membership in a mixture of topics, as the model generates a posterior probability of each observation belonging to *every* topic. LDA is often used by researchers to categorize observations in large bodies of text by the topic that maximizes the posterior probability, requiring ad hoc descriptions and selective attention to the numerous topics(*e.g.*, Quinn et al., 2010; Grimmer, 2010, 2013). This discards valuable information

[4]This approach generates probability distributions for how well each document in a collection of text (*e.g.*, one bill, Senate press release, or open-ended survey response) can be explained by unobserved or latent topics.

because observations are usually well-described by more than one topic. This issue becomes even more relevant when the texts themselves are highly complex, and therefore more likely to touch on multiple topics. All else equal, text complexity leads to an increase in the number of topics that best characterize a collection of texts, which corresponds to generally low probabilities of any observation being characterized by any single topic. As bodies of text become more complex, the methods most commonly used by political scientists to employ LDA models become increasingly ill-advised.[5]

LDA also suffers from a local optima problem. That is, because of its generative, unsupervised nature, running the same LDA model on the same text corpus multiple times will produce variation in the terms composing each topic and in the posterior probability of topic membership for each document. Because LDA represents documents as random mixtures over topics, the overall characterization of the data remains the same. However, this implies that substantive interpretation of specific topics is troublesome, at best. We propose an alternative approach that utilizes the full posterior probability distribution for each observation from an LDA model, which preserves the underlying topic structure. Rather than categorizing documents by topic or a set of topics, we use the posterior probability of membership in every topic to generate a measure of how much the floor speeches of each member resemble those of their party.

Data on Floor Speeches

To develop this agenda space, we begin with a database of House member floor speeches in the 104^{th} through 108^{th} Congresses assembled by Gentzkow and Shapiro

[5]Some work on topic modeling in political science goes beyond this type of classification analysis, such as that of Chuang et al. (2015) and Monroe and Schrodt (2008). However, this method of classifying documents as belonging to the topic that maximizes the posterior probability of membership is still the dominant research paradigm, and the approach we present is new to the literature.

(2006).[6] They obtain the text for these floor speeches from the United States Government Publishing Office, and parse the text into individual speeches. Each speech is matched to a congressperson using the Database of Congressional Historical Statistics (ICPSR 3371) and the Voteview Roll-Call Data (www.voteview.com) as references.[7]

This database comprises a large source of text data for the 104^{th} through 108^{th} Congresses. In each of these Congresses we have floor speeches from at least 420 representatives. Additional details about our corpora of speeches are shown in Table 1, where we can see that the vast majority of representatives are covered for every congressional session and the practice of making floor speeches is quite common; the average number of speeches given by either Democrats of Republicans across each Congressional session is at least twenty. This provides us with ample information to generate a relational space for members within both parties.

Table 1. Summary statistics for how many speeches were given by MCs by Congress.

		104^{th}	105^{th}	106^{th}	107^{th}	108^{th}
Number of Members in Corpus	Democratic	190	207	213	209	201
	Republican	232	227	220	226	230
Average Number of Speeches by Members	Democratic	30	25	28	24	32
	Republican	25	25	28	20	24
Median Number of Speeches by Members	Democratic	21	19	19	18	20
	Republican	18	19	23	15	17

To prepare the raw floor speeches for our LDA and subsequent analyses, we transform our collection of speeches into speech-term matrices, in which matrix entries are defined as counts of how often a term shows up within the speech. To reduce the number of irrelevant terms and speeches in these speech-term matrices, we employ a

[6] This dataset is hosted at the Inter-University Consortium for Political Science and Social Research (ICSPR) at the following address: http://www.icpsr.umich.edu/icpsrweb/ICPSR/studies/33501.

[7] For a speech to be included in this database, "a perfect match of speaker name, chamber, state, and gender" is required (Gentzkow and Shapiro, 2006, p. 6). Speeches are removed when a perfect match is not found. Using this approach, over three-quarters of speeches in each session are matched to a specific member of Congress.

set of standard text-as-data preprocessing steps.[8] When constructing our speech-term matrices we do so separately for each Congress and party. This is done to account for the fact that agendas in Congress may be qualitatively different between Congresses and that intraparty variation might otherwise be masked by the drastically different goals of the two parties should we combine members of each party in our models. Thus we begin by constructing $M = T \times P$ separate speech-term matrices, where T denotes the number of Congresses in our sample, the 104^{th} through the 108^{th}, and P the number of parties, Democrats and Republicans.

Extracting Speech Fit from Floor Speeches

Regardless of the analytical method, legislative behavior in Congress is exceedingly complex. Characterizing and analyzing individual behavior versus party goals will require some assumptions. If we consider the party's goals to have a certain propensity towards certain issues over others, then we can assume it shares some division of the whole, *i.e.*, that there is a distinct location in a *k*-dimensional space where the speech behavior of each MC lies, where *k* is the number of topics in an LDA model. We use the LDA to identify the broader topics underlying the speeches given by House members in our M Congress-party speech-term matrices, where each topic represents a probability distribution on sets of terms.[9] Based on robustness checks where we vary the parameter k, we set $k = 50$ for our analysis.[10]

[8] These include removing numbers, punctuation, "stopwords", and procedural terms. We also reduce inflected words to their roots using the Porter stemming algorithm (Porter, 2001), and remove purely procedural speeches by taking out all speeches with fewer than 20 words. While this threshold is arbitrary, we find no difference using thresholds of 15 or 25. Lastly, we define terms in our speeches as three-word trigrams.

[9] We estimate the model parameters using variational expectation-maximization (VEM) on each of our Congress-party speech-term matrices described in the previous section. Parameter estimation under this framework is also often accomplished through collapsed Gibbs sampling (Blei and Jordan, 2006). We choose the VEM approach primarily due to its low time-cost, but we find no substantive difference when using a Gibbs sampler. We implement this model using version 0.2-1 of the **topicmodels** package in R (Hornik and Grün, 2011).

[10] With LDA, we still need to specify the number of topics, k, that underlie the generation of the corpora. We have no *a priori* assumptions about the number of topics to set, so we run several LDAs for

Our main focus is to develop a relational space based on intraparty differences in the topics that House members speeches cover. Thus, a substantive interpretation of the topics is not our goal here, and as we discuss above, doing so is also fraught with problems. To develop our relational measure of variation in MCs speech patterns with their party, we turn to the posterior probability matrices (PPMs) from our LDA analyses. These matrices represent the topic mixtures underlying the generation of each speech, in which the rows designate the speeches, the columns topics, and the matrix entries the probability of a given topic in generating that speech.

To generate a relational space for members of Congress from the M PPMs, we begin by aggregating the PPMs to the MC level, producing a new set of M matrices each with dimensions $H \times k$ — where H is the number of House members in each party-Congress pair, which varies across the PPMs. Each row in these new matrices represents the speeches of a single MC, and each entry represents the amount of attention a representative gave to a particular topic across each of their speeches within a given Congress. From here, we use a nonlinear dimensional reduction technique—locally linear embedding—to reduce the $H \times k$ matrices, so that we can develop a low dimensional representation of how similar MCs are from what is typical in their party.[11]

The goal of dimension-reduction approaches, such as LLE, is to find a low-dimensional representation of high-dimensional data. LLE is a non-iterative algorithm that approaches the problem of efficiently maintaining local patterns by utilizing graphs. In the LLE algorithm, local quantities are estimated for each point based on neighboring points. LLE assumes that all points and close neighbors lie on or close to a linear patch of a high-dimensional manifold. The geometric structure of these locally linear patches is estimated by comparing the position of each data point in the data to the sum of the

each Congress-party combination in which we vary k from 30 to 100 at intervals of 10. Our model results are stable across this range. While it is still technically arbitrary to vary k from 30 to 100 in intervals of 10, we believe this to be sufficient variation of the parameter to test the flexibility of the model.

[11] We also tried other dimension-reduction techniques, such as Isomap, Principal Component Analysis (PCA), and Multidimensional Scaling (MDS). With each method, we found substantively similar results.

squared errors of reconstructions for that data point based on its neighbors. The algorithm then minimizes these errors by computing weights for the contribution of each data point to each construction. These weights are constrained in such a way that they do not change based on any rotations, scalings, or translations of the data point being reconstructed and its neighbors. Because of this property, each locally linear patch can be projected onto a lower-dimensional space while retaining its geometric structure. The same weights that reconstruct each data point in a high-dimensional space will reliably reconstruct coordinates for the same data point in a lower-dimensional space.

In other words, LLE preserves the distance and angles between points in local patches of the data. In this sense, it is similar to Principal Component Analysis (PCA), though PCA preserves these distance relationships between points globally (and therefore assumes a linear structure to the data). LLE can be thought of as many PCAs, each performed on a small section of high-dimensional data. These locally linear embeddings are then compared globally to find the best non-linear embedding.

The LLE algorithm is summarized as follows:

- Start with many data points in a high dimensional space, lying on some manifold.
- For each data point X_i, find its K neighboring points on the manifold within some Euclidean distance.[12]
- Compute weights W_{ij} that optimally reconstruct each point from its neighbors by constrained linear fits.
- Compute vectors Y_i to translate each point X_i from a D-dimensional space to coordinates in a d-dimensional space ($D >> d$).
  - The Y_i vectors are those best constructed by the minimized weights W_{ij}, according to minimizing a quadratic cost function by its lowest non-zero eigenvectors.

[12]The LLE algorithm we use chooses an optimized K.

Linear approaches to dimension reduction look at the relationships between all of the documents, regardless of whether the distance between a pair of documents is small or great (*i.e.*, how similar the pair is). Since relationships between documents which are "far" away are also influential, these approaches are known as global approaches. Unfortunately, the global view resulting from the linear approaches can obscure local interactions, possibly obscuring overall patterns in collections of information. In contrast, nonlinear approaches focus on local relationships, more accurately preserving the patterns which are blurred by linear techniques. The distinction between linear and nonlinear methods can be clearly demonstrated when they are applied to determining the structure of images. Nonlinear methods work well with geometric figures resembling circles and spirals, where the linear approaches perform comparatively poorly. This type of approach has been shown to work well in text based analyses.[13]

Using this approach, we construct a single measure of the difference between an MC's speech behavior and that of his/her party for every Congress in the 104^{th} through 108^{th} for both Democrats and Republicans. To compute intraparty variation, the value for each member is the Euclidean distance between their estimated point in the speech space and the average of their party's leadership. Since the LDAs and LLE procedures were run separately for each Congress and party, we standardize the Euclidean distances before combining them into one dataset, so that each of the observations are on a common scale. We call this resulting measure *speech fit*; lower values indicate that an MC's speeches better fit that of the party, or that they have better speech fit. Higher values indicate worse speech fit.

We also construct a measure of fit with the party from DW-NOMINATE scores (Poole and Rosenthal, 2000, 1985). This measure is the absolute value of the distance of the

[13]For example, see Bengio et al. (2004). Bengio et al. use another non-linear dimension reduction technique, isomap. We applied the isomap approach as well and the results were substantively similar.

difference between each representative's first-dimension DW-NOMINATE score and the average of the DW-NOMINATE scores of their party leaders, a proxy for the ideological center of the party. In other words, this is a measure of how ideologically similar each MC is to their party; we call this measure voting fit. As with our measure of speech fit, we would expect MCs who are more ideologically similar to their party (higher voting fit) to receive more party goods.[14]

Party Loyalty and Party Goods

We make two important assumptions in our empirical analysis. First, we assume that parties discipline their members optimally. Otherwise, we could not make any inference about the relationship between votes, speeches, and party goods. Second, if floor speeches represent an MC's discussion of their preferred topics, then the universe of floor speeches represents an approximation of the speech behavior of the entire chamber.[15]

To assess how parties reward and punish members because of their floor speech and voting patterns, we construct two separate tests. Both of our tests involve ways that parties reward members for loyal behavior. We assess whether 1) contributions from the party committees (the RNC or the DNC), and 2) assignment to prestige committees—collectively "party goods"—can be predicted by speech fit and voting fit. A strength of these two measures is that they are exogenous to each other; we have little reason to believe there is a mechanism that would cause an association between party committee contributions and committee assignments, outside of general support the member

[14]Using CFscores (Bonica, 2013) in place of DW-NOMINATE scores to construct voting fit does not change our results. Additionally, we run a second model for each test using untransformed DW-NOMINATE scores to show that our transformation is not driving the results.

[15]Poole and Rosenthal (2011) make an analogous assumption about votes in the original NOMINATE, which carries over to the current iteration of DW-NOMINATE (Lewis and Poole, 2004; Carroll et al., 2009).

is receiving from their party. While both speak to party loyalty and member accountability, the data generating processes for party committee contributions and prestige committee assignments are largely distinct.

Party Committee Contributions. Our party committee contributions data come from the Database on Ideology, Money in Politics, and Elections collected by Adam Bonica (2014). We use national party committee contributions as a proxy for party support because the roles of the RNC and DNC in financing elections have remained constant between the Congresses we study (1994-2006). During this time, other measures of party leader contributions (including leadership PACs and direct contributions) have changed based on Supreme Court rulings on campaign contributions and changes to FEC rules.[16]

To estimate the effect of speech fit and voting fit on national party committee contributions, we include additional covariates: tenure in Congress (the number of terms each member has served in the House), a dummy variable for party, and district competitiveness.[17] Competitiveness is a race-specific determinant of contribution patterns, and should capture increased party resources being funneled to more competitive races. Including congressional tenure allows us to control for more money going to more entrenched and senior members. The inclusion of a dummy variable for party also serves as a covariate for majority status, as the Republican party held a majority in the House for all the Congresses we analyze. To estimate the model we utilize a standard linear regression framework with fixed effects by Congress, and the results are shown in Table 2. We estimate models with speech fit (column 1) and voting fit (column 2) as separate predictors, and combine them in the same model (column 3).

[16] See Aldrich et al. (2017) for further discussion of changes in party leader contributions.

[17] We measure district competitiveness as the magnitude of the difference between the Democratic share of the two-party presidential vote in the district and the national mean of the Democratic share of the two-party presidential vote across districts.

Table 2. Linear regression results predicting party committee donations by speech fit and voting fit (k=50), with covariates.

	Dependent variable:		
	Logged Campaign Contributions		
	(1)	(2)	(3)
Difference in Speech Fit	-0.086^{*}		-0.083^{*}
	(0.051)		(0.051)
Difference in Voting Fit		0.743^{*}	0.727^{*}
		(0.395)	(0.395)
Competiiveness	-2.766^{***}	-2.433^{***}	-2.463^{***}
	(0.493)	(0.513)	(0.513)
Tenure	-0.041^{***}	-0.047^{***}	-0.043^{***}
	(0.012)	(0.012)	(0.012)
Republican	0.086	0.055	0.045
	(0.089)	(0.091)	(0.091)
104th Congress	7.918^{***}	7.682^{***}	7.769^{***}
	(0.142)	(0.150)	(0.159)
105th Congress	7.534^{***}	7.328^{***}	7.406^{***}
	(0.138)	(0.147)	(0.154)
106th Congress	7.482^{***}	7.250^{***}	7.344^{***}
	(0.144)	(0.152)	(0.162)
107th Congress	7.386^{***}	7.180^{***}	7.256^{***}
	(0.151)	(0.160)	(0.167)
108th Congress	6.895^{***}	6.726^{***}	6.803^{***}
	(0.151)	(0.152)	(0.159)
Observations	1,514	1,512	1,512
Adjusted R^2	0.943	0.943	0.943
Note:			*p<0.1; **p<0.05; ***p<0.01

As expected, speech fit has a significant effect on party committee donations: those MCs whose speeches are a better fit for their party's receive more campaign contributions from the party committee. The covariates for competitiveness and tenure

are significant in the expected direction. Members in more competitive races receive more campaign contributions from their party committee, and representatives who have served more terms in the House receive fewer contributions. While the latter may seem counterintuitive, it is actually in line with our knowledge of party operations. Because parties are strategic in their donations behavior, they funnel fewer of their scarce funds to candidates who are less vulnerable. While members of the House win re-election at high rates—greater than 90% since 1972—long-tenured representatives are even less likely to lose their re-election bids. Voting fit also has an effect on party committee contributions. As the distance between the DW-NOMINATE score of an individual MC and the median of their party's leadership increases, so does the amount donated to that MC by the party committee.

It is difficult to tell from coefficients and standard errors whether these effects are substantively meaningful. We can further investigate the relationship between voting/speech fit and party committee contributions with marginal effects plots. We set up a two scenarios where we hold all model variables to their medians except for 1) speech fit, and 2) voting fit, which we vary from their minimum to maximum values. Next, we take 1,000 random draws from a multivariate normal distribution to obtain distributions for the point estimates of each of the regression coefficients based on the two scenarios. After obtaining these distributions, we calculate the predicted value of contributions based on the conditions set by the scenarios. We plot the results of this analysis in Figure 1.

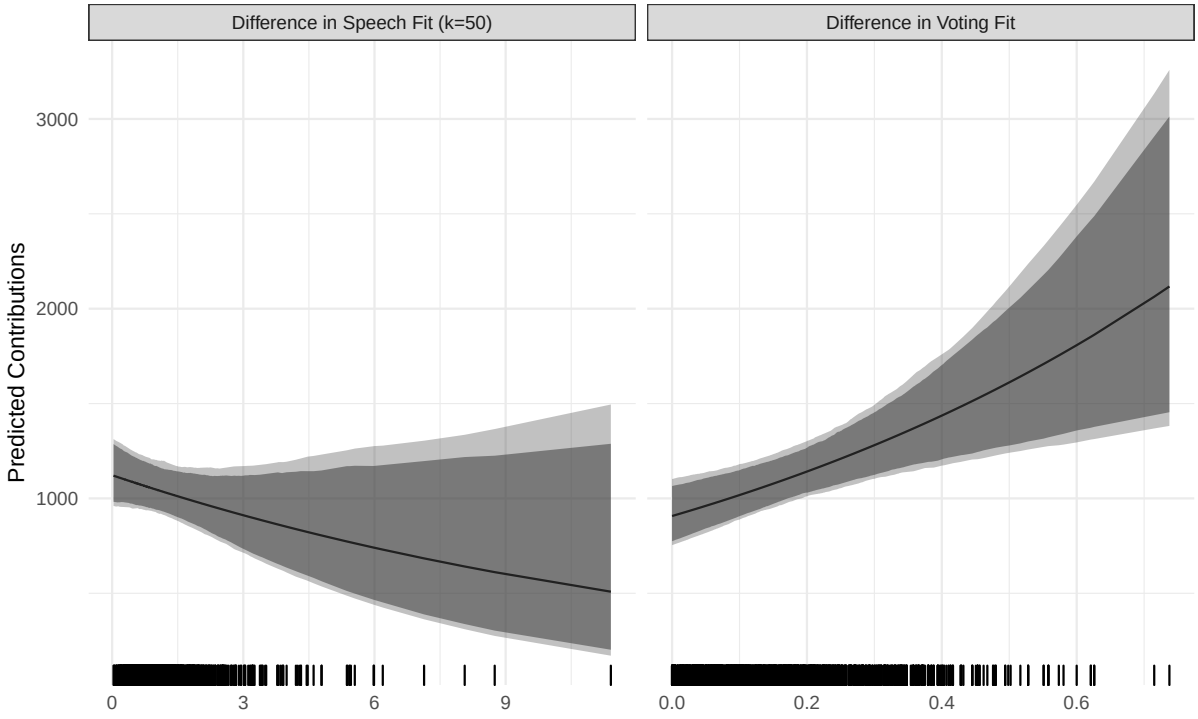

Figure 1. Expected values for party committee contributions based on scenarios where all variables are held to their median but difference in speech fit (panel 1) and voting fit (panel 2), which vary from their minimum to maximum values. The 90% interval of each distribution is shaded in dark grey and the 95% in light grey.

Here we confirm the effect of increased distance from the party in on party committee contributions, measured via speech fit and voting fit. Discarding outliers, the expected party committee contributions change from the 55th quantile of contributions ($\$1,120$) to the 50th quantile ($\$908$) over the range of speech fit, and from the 49th quantile ($\$887$) to the 66th quantile ($\$1,548$) over the range of voting fit. This is a change of at least 5 quantiles in the distribution of the dependent variable for each main independent variable, even when accounting for competitiveness, party, tenure, and Congress.

Committee Assignments. We use committee assignment data from the Congressional committees database maintained by Stewart and Woon (2005) to predict membership

in the four House "prestige" committees (Appropriations, Budget, Rules, and Ways and Means). Appointment to these committees is seen as a reward for loyal, long-tenured members of Congress that have been, and promise to be, reliable members in support of the party's goals (Cox and McCubbins, 2005; Fenno, 1966; Groseclose and Stewart III, 1998; Krehbiel, 1992). Changes to the committee assignment and chairmanship system since the 1970s have given party leaders even more control over the membership of committees broadly, and have generally acted to make prestige committee appointments a reward for party loyalty rather than just for seniority (Rohde, 1994, 1991; Cox and McCubbins, 2007). Because party loyalty has been observed in many committee assignment behaviors (*e.g.*, Sinclair, 2014; Rohde and Shepsle, 1973; Smith and Ray, 1983) and appointment to a prestige committee is a relatively rare occurrence for particularly loyal members(*e.g.*, Cox and McCubbins, 2007), the effect of speech fit and voting fit on prestige committee appointment can be seen as a lower bound of the effect of party loyalty on committee assignment behavior.

To test how parties reward members with prestige committee assignments based on their speech and voting patterns, we use a logistic regression model. We include covariates for congressional tenure, a dummy variable for party, and fixed effects for each Congress.[18] We include these to control for the classic explanation of committee assignment as a function of seniority, to differentiate any effects of party loyalty from partisan or majority status effects, and to account for variation between each Congress. The results of these models are shown in Table 3. As in the section on party committee contributions, we estimate models with speech fit (column 1) and voting fit (column 2) as separate predictors, and combine them in the same model (column 3).

The patterns in Table 3 are similar to those in Table 2. Members whose speech behavior differs more from that of the party are less likely to be appointed to a prestige committee, and members whose voting behavior differs more from that of their party

[18]Again, party also functions as a majority status variable in this analysis.

Table 3. Logistic regression results predicting prestige committee assignment by speech fit and voting fit(k=50), with covariates.

	Dependent variable:		
	Prestige Committee Assignment		
	(1)	(2)	(3)
Difference in Speech Fit	-0.163^{***}		-0.189^{***}
	(0.049)		(0.054)
Difference in Voting Fit		1.269^{***}	1.246^{***}
		(0.435)	(0.436)
Tenure	-0.107^{***}	-0.118^{***}	-0.113^{***}
	(0.012)	(0.013)	(0.013)
Republican	-0.242^{**}	-0.266^{**}	-0.284^{***}
	(0.100)	(0.107)	(0.108)
104th Congress	1.819^{***}	1.512^{***}	1.712^{***}
	(0.153)	(0.159)	(0.170)
105th Congress	1.812^{***}	1.465^{***}	1.639^{***}
	(0.149)	(0.154)	(0.163)
106th Congress	1.867^{***}	1.450^{***}	1.664^{***}
	(0.155)	(0.157)	(0.170)
107th Congress	1.893^{***}	1.518^{***}	1.688^{***}
	(0.154)	(0.165)	(0.173)
108th Congress	1.938^{***}	1.680^{***}	1.858^{***}
	(0.156)	(0.158)	(0.167)
Observations	2,197	1,991	1,991
Log Likelihood	−1,242.030	−1,136.664	−1,130.433
Akaike Inf. Crit.	2,500.059	2,289.328	2,278.865
Note:			$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

are more likely to be appointed to a prestige committee. The coefficient and standard error are once again larger for the voting fit coefficient than for the speech fit coefficient. As above, we conduct simulations to reach a more fine-grained understanding

of the substantive effects of speech fit and voting fit on prestige committee appointments. We set up two scenarios where we hold all variables to their medians except for 1) speech fit and 2) voting fit, which we vary from their minimum to maximum values.[19] We then follow the same procedure we used to make Figure 1 to calculate the predicted probability of prestige committee appointment over the range of speech fit (panel 1) and voting fit (panel 2). We plot the results of this analysis in Figure 2.

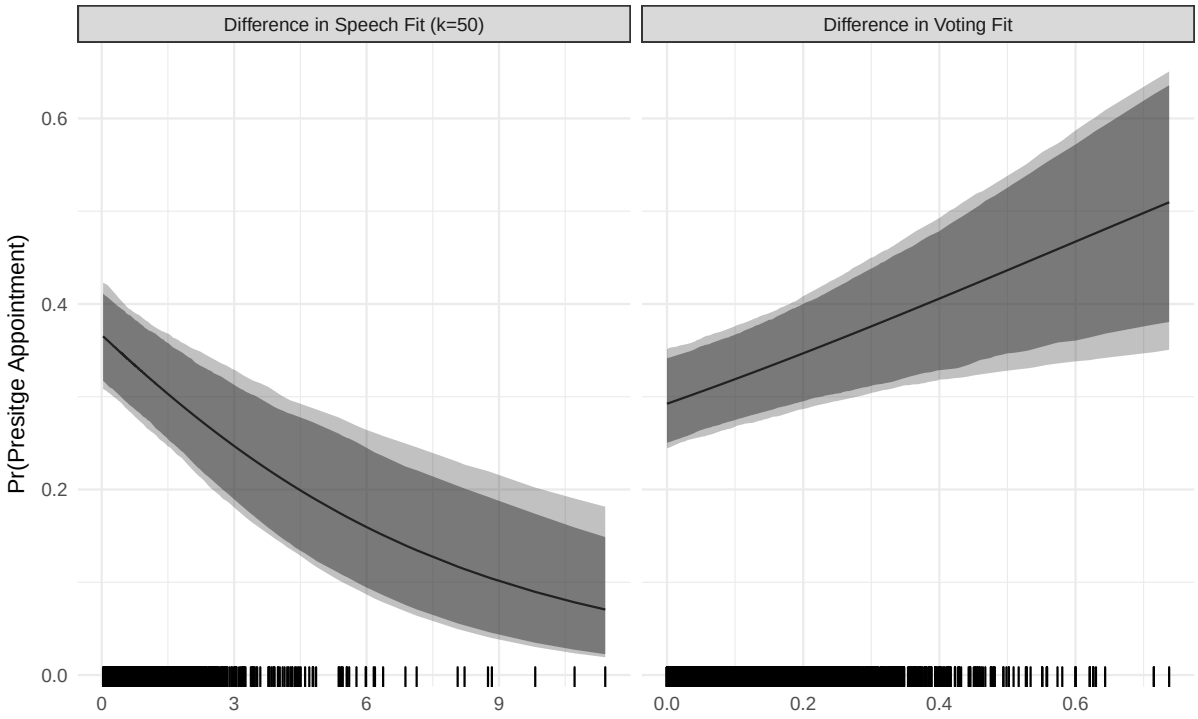

Figure 2. Predicted probability of receiving a prestige committee appointment based on scenarios where all variables are held to their median but speech fit (panel 1) and voting fit (panel 2), which vary from their minimum to maximum values. The 90% interval of each distribution is shaded in dark grey and the 95% in light grey.

These effects are substantial. Discarding outliers, we see a difference in probability of about 10% between the highest (37%) and lowest (27%) levels of speech fit, and a

[19]The only difference from the analysis in the previous section is that we have to take into account the logistic link function when calculating the predicted probabilities: $\frac{1}{1+exp(-\hat{y})}$, where $\hat{y}$ are the raw predictions from the model.

difference of about 15% between the highest (30%) and lowest (45%) levels of voting fit. These predicted value ranges are also relatively consistent with the observed probability of prestige committee appointment (27%), although slightly inflated. Considering that we include common covariates from the committees literature, this is a substantial effect. The direction of the effects are the same as our first test on party committee contributions, as are the differences between the effects of voting and speech fit. Our second test provides more evidence that parties are more likely to reward loyal members for their speech behavior than for their voting behavior.

Discussion and Conclusion

We conduct a test of when parties expect party loyalty by extending the literature beyond measures of voting fit to encompass how well MCs' speech behavior fits with their party. We find that parties reward members whose floor speeches fit with those of the party via campaign contributions and prestige committee assignment, but not those whose voting behavior is a better fit with the party. These results are quite stable; we find the same patterns for both Democrats and Republicans from 1994 to 2006. Furthermore, our results are not an artifact of the subjective parameters inherent to the LDA used in our text analysis of speeches.

Our results for committee assignment are much stronger than those for party committee contributions, perhaps because the link between party loyalty and committee assignment is more clear than the link between party loyalty and campaign contributions. For instance, the direction of the relationship between campaign contributions and party loyalty is less clear. While we provide evidence that speech fit increases campaign finance contributions, there is also evidence that campaign finance contributions can be used to "buy" party loyalty (Leyden and Borrelli, 1990), and that campaign contributions lead to higher party unity scores (Leyden and Borrelli, 1994). With this in mind, it is perhaps surprising that we found any results for campaign contributions.

Further, there is no evidence that committee assignments are used to induce, rather than reward, party loyalty.

The patterns we find are consistent with party power and agenda control theories in the Congress and parties literatures, but extend the empirical evidence beyond voting behavior to speech patterns. Strong parties are motivated to maintain ideology- and agenda-based homogeneity — when it furthers the interests of their members — through the provision of party goods to members who fit better with the party (Aldrich, 2011; Cox and McCubbins, 2005, 2007; Rohde, 1991). We show that parties seek to influence the way their members speak with these goods, but not the way they vote.

The latter finding, that parties do not reward members with higher voting fit with campaign contributions and committee assignments—and in fact give more party goods to those whose voting is a worse fit with the party—deserves further thought. One possibility is that deviations from the party in terms of voting behavior are more likely to be punished in other ways, while loyalty in terms of speech behavior is rewarded. This is quite plausible, given the relative level of party constraint inherent in speeches versus votes. MCs more readily see the incentive to vote with the party than speak with the party. Because the stakes are higher with votes than speeches, parties have created an environment where loyal voting behavior is expected. If the behavior is expected, then loyal voting behavior is less likely to be rewarded, and disloyal voting behavior more likely to be punished. Because loyal speech is relatively less expected, parties have to create incentives for their members to do so.[20] In this way, the goods we study are relatively weaker incentives, more likely to be provided to entice loyal speaking behavior that is less the norm than loyal voting behavior. If an MC votes against the party, the party can retaliate in more harmful ways such as shutting that member out of the lawmaking process by blocking their bills or encouraging other members not to work

[20] And indeed, parties often induce their members to make statements as a strategic precommitment device in the lawmaking process (Ballard, 2017).

with them, making sure they face a strong primary challenger, etc. Voting decisions are concrete outcomes that cannot be spun, walked back, or retracted in the same way that speeches can. If a member makes a speech that the party dislikes, the party has other less severe options at its disposal, because a speech that is detrimental to the party's goals is less harmful than deviant voting behavior. This would explain our finding that parties reward members based on their speeches, but not on their voting. Further research should examine other ways in which parties might punish members based on disloyal voting behavior, but that is beyond the scope of our current study.

Other factors suggest that our substantive results may be stronger, and our analytical approach more efficacious, than we are able to demonstrate here. We study a period of Congressional history during which the centralization of party control increased, particularly for the Republican Party starting with the 104^{th} Congress, and this trend has continued since 2006. We also do not look at the content of speeches, but only whether they mention a subject. This means we assume that if a MC mentions an issue in a floor speech, that they do so in a way that fits their party's stance on that issue. If a MC mentions an issue in a floor speech and goes *against* the party, we would expect that this is met with retribution by the party. While we think such instances are rare, further study should delve deeper into the content of political texts. That we find stable results without a sentiment analysis of floor speeches is itself evidence in favor of our method, and as such our results may in fact understate the strength of the relationship between relative member agendas and party goods today.

The substantive tests also indicate that our approach is particularly adept at uncovering differences between political actors based on texts. MCs devote a significant amount of time to Congressional floor speeches, and as such they are thought to matter to parties and their members. However, researchers have had difficulty uncovering just how floor speeches relate to concepts like party loyalty. While our study can only be viewed an indirect test of the relationship between speech fit and party power via

the provision of party goods, we are encouraged by the fact that our methods are analytically sound, and that our results are both inductively and deductively consistent.

Our approach to text analysis is an additional contribution to the literature. Speech fit is created from approach to more fully utilize the information provided by LDA models for text analysis in political science. Information from the full topic profile of each observation is distilled via LLE—which is new to the political science literature, but has wide applications to text and network analysis—so that it is more practical to apply regression techniques. We allow for comparisons of complex text corpora that may invoke numerous topics simultaneously, without reducing analysis to simple similarity measures or discarding much of the useful data. The result is a highly adaptable measure, which gives scholars an additional tool to study legislative behavior. Researchers will find this measure useful in exploring questions of agenda setting, campaign finance operations, co-sponsorship networks, and more.

We show that floor speeches are a reasonable and stable source of information on member speech behavior, but they are far from the only source. Campaign speeches, press releases, committee hearing transcripts, and social media posts are examples of possible sources of information about how members use speech to interact with their constituents, their party, and other groups, and should be examined by future research. This area of research is particularly interesting because it requires the use of data other than votes, which have to date been the sole focus of many lines of congressional research.

Furthermore, our approach to text analysis can readily improve analytic strategies in a variety of political science settings. For instance, a long line of research has examined how the constitutions of different nations affects the functioning of their political institutions (Elkins, Ginsburg and Melton, 2009). This approach could be applied to analyze the text of various constitutions and determine whether differences picked up by an LDA model affect political outcomes. This same process could also be applied to other

research topics, such as how media coverage of political events affects polling in campaigns, what we can say about legislators' ideologies based on bill content, how social media posts such as those on Twitter or Facebook can help shape individuals' political beliefs and voting behavior, and much more.

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