

What Drives U.S. Congressional Members' Policy Attention on Twitter?

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Abstract

Social media platforms like Twitter enable policymakers to communicate their policy preferences directly and provide a bird's-eye view of their diverse policy agendas. In this article we leverage politicians' social media data to study political attention using a supervised machine-learning classifier that detects policy areas in individual tweets. We examine how individual diversity and institutional factors affect differential attention to public policy among members of the U.S. Congress. Our novel approach to measuring policy attention builds on work by the Comparative Agendas Project, in order to study members' political attention in near real-time and to uncover both intra- and inter-group differences. Using this classifier, we labeled more than one million tweets and found statistically significant differences in both the level and distribution of attention between parties, chambers, and genders. However, these differences were small enough to suggest that other Congressional members' characteristics are also at play. We explored institutional factors (e.g., committee assignment, caucus), partisan issue preferences (e.g., issue ownership), and the political environment (e.g., partisan issues, confirmations) that may help explain the patterns of political attention that appear in Congress's tweets.

Introduction

Lawmakers' public statements often garner as much attention as their policy proposals in Congress, if not more. Members of Congress (MCs) use press releases, newsletters, and now social media to communicate their policy priorities and preferences (Cormack, 2016a; Grimmer, 2010; Russell, 2018). Scholars have traditionally understood lawmakers' behavior by their institutional actions (e.g., roll-call votes) but recent research is turning to non-legislative action, like political communication, to understand complex questions about representation (Carson et al., 2007; Rocca & Gordon, 2010; Shepsle, 1979; Shepsle & Weingast, 1987). Public statements like newsletters and press releases can signal a lawmaker's policy intentions even before legislative action takes place (Cormack, 2016b; Grimmer, 2013), and increasingly, Twitter is a popular site for these statements to appear (Russell, 2018; Straus et al., 2013).

Lawmakers use communication platforms to explain their legislative activities in Washington, and as a result, an MC's policy agenda on Twitter is linked to congressional decision making. Public statements on Twitter provide timely data to determine how individual characteristics (i.e., gender, party, and chamber) affect policy attention. For example, in 140- or 280-characters¹, a member can support a policy, take credit for its success, and signal its advancement to his or her constituents. Here we introduce a computational method to identify the topics mentioned in more than one million Congressional tweet messages, investigate what drives the attention that policy topics receive, and explain patterns of policy attention among various groups of lawmakers. Politicians have indicated that they use social media, even when they don't expect it to impact voters (U. Bernhard et al., 2015), and our study explains how individual and institutional characteristics, rather than strategic considerations, influence social media content.

¹ Twitter announced the move from 140 to 280 characters in the Fall of 2017 (<https://twitter.com/jack/status/912784057863245824>), and therefore some of the tweets in our sample were limited to 140 characters and others to 280.

Studying Twitter presents researchers with a methodological challenge of sorting through large volumes of tweets and deciphering policy attention amid partisan disagreements, birthday messages, and other types of non-policy-related tweets. We address this challenge by introducing a computational model to identify expressions of individual MCs' policy agendas in their tweets. We trained a supervised machine learning classifier to categorize lawmaker tweets according to the Comparative Agendas Project codebook (Baumgartner, 2019). Our approach allows us to study MCs' policy attention in near real-time and to uncover both intra- and inter-group differences that not only highlight how MCs use social media but also reveal MCs' public agenda-setting behavior. The model enables us to evaluate how individual and institutional characteristics affect how legislators explain their work to public audiences. Our results confirm a pattern of skewed policy attention, similar to what other researchers found in studies of budgets, hearings, and bill introductions (e.g., Rocca & Gordon, 2010; Sheingate, 2006; Woon, 2008). Having established tweets as a reliable measure for policy attention based on their reflection of similar patterns in other Congressional materials, we conducted a multinomial logistic regression to identify factors that influence the attention patterns we detected. Our results suggest that party, gender, and chamber affect the policy areas that MCs tweet about. We also compared the diversity of political attention among lawmakers and our findings build and expand on research that suggests Democrats, Representatives, and women are generally more likely to post policy-related tweets (Cormack, 2016b; Evans et al., 2016; Straus et al., 2014); Democrats and Senators exhibited significantly more diversity than Republicans and Representatives. The specific policies that lawmakers address and the timing of their attention likely depend on legislative debates and MCs' committee and caucus memberships.

Policy Agenda Setting on Twitter

Policy agenda setting describes the process through which ideas and policy issues become salient for decision making by political institutions. Traditional agenda-setting

studies among policy and media scholars typically assess institutions' policy agendas, including how the media or governing systems influence issue salience (Baumgartner & Jones, 1993; Kingdon, 1989; McCombs & Shaw, 1972). However, individual lawmakers also practice agenda setting through their public statements, seeking to frame salient policy debates according to their own preference intensities (Rocca et al., 2011).

Lawmakers perpetuate policy debates by reinforcing or introducing a new policy image, influencing how issues are portrayed or characterized. Policy agenda setting and the way issues are discussed is contingent on many factors — e.g., political climate, political feasibility, personal and constituent priorities (Dearing & Rogers, 1996).

Communication and political science scholars alike have analyzed MCs' use of speeches, newsletters, and direct mail to influence media and public agendas (Cormack, 2016a; Grimmer, 2013; Kingdon, 1989). Newsletters and direct mail are tailored to a narrow audience with the expectation that the recipient is a constituent and an interested or likely voter. But, different media attract and target different audiences. Different media allow for different modes of information production and consumption (Jungherr, 2014). The constraints of the technology underlying broadcast news or e-newsletters are different than that of social media, for example. Politicians seem oriented toward their peers in their social media use (U. Bernhard et al., 2015), indicating that they use social media to raise their individual profiles, especially among other political elites (Scherpereel et al., 2017). In newspapers or television broadcasts, politicians' priorities become integrated with the news organizations' priorities. Further, traditional media messages may be an index of elite opinions or deferential to politicians (Bennett, 1990). Traditional media offer a periodic, indirect measure of priorities, where social media offers a more frequent, direct measure where only the political actors and their staff contextualize content.

Twitter, unlike alternative media options, offers lawmakers outsized discretion over the information a networked, digital constituency receives on a daily basis. In a single day, an MC can use Twitter to make multiple policy pronouncements that aim to garner media buzz. Twitter is a broadcasting device for politicians (Gainous & Wagner, 2014;

Golbeck et al., 2018; Hemphill et al., 2013a) experiencing a nearly 100% adoption rate in Congress (Evans et al., 2019; Golbeck et al., 2018; LaMarre & Suzuki-Lambrech, 2013). This public communication domain offers policymakers a relatively unfiltered credit claiming opportunity (Mayhew, 1974) to highlight accomplishments and advertise a political brand. Particularly for those members with less political power or defined by their “outsider” status, lawmakers on Twitter have a venue to develop policy debates and connect with a digital audience (Borge Bravo & Esteve Del Valle, 2017; Evans et al., 2016)). Combined with the publicity surrounding President Donald Trump’s morning tweets, Twitter has become the social media platform of choice for most legislators (Evans et al., 2016; Golbeck et al., 2018). Twitter’s open network — compared to Facebook’s closed system, for example — facilitates a sharing of public information and openness among users that matches MCs desire to connect with as many constituents as possible. Instagram and Snapchat have also been useful political communication tools, but the widespread adoption of Twitter and its use for policy-relevant information rather than photos or personal messages has made it an ideal platform for policy agenda setting. As such, being able to take advantage of Twitter’s outreach capabilities is especially important to politicians and their staffers (Chi & Yang, 2011; Straus et al., 2013).

Further, Twitter enables direct communication with both elite and mass publics with minimal opportunity costs relative to the potential gains. Lawmakers must devote the time and effort to cultivating a political brand on Twitter that they can strategically use for policy statements. In return for this cost, they receive the benefit of increased control over their own communications strategies. A representative gets to decide the timing and tenor of a message that could be directly seen by a wide network of social media followers and indirectly seen by an even greater audience via journalists’ reporting. This relative cost balanced with the outsized potential is why lawmakers are publicly broadcasting their agenda and creating an accessible record of government action (Bruns & Highfield, 2012). In many ways Twitter’s greatest utility, and what distinguishes

it from alternative public relations platforms, is its ability to aggregate a lawmaker's policy agenda in a convenient and accessible public space.

Prior work has established that politicians do use Twitter to communicate their agendas and discuss policy issues (Barberá et al., 2019; Casas & Morar, 2019; Hemphill & Schöpke-Gonzalez, 2019). For MCs, policy agenda setting on Twitter is a two-stage strategy that relies on a) connections with the media and b) direct connections with constituents. Entman's Cascading Activation Model describes how Representatives seek to influence public opinion by framing issues that are reported by the media (Entman, 2003). Twitter is one of many media opportunities that politicians regularly take advantage of, seeking to supply the dominant policy frame that influences public opinions and constituents' voters attitudes (Entman, 2003). Additionally, the information shared on Twitter can bypass journalists through a representative's digital constituency. For these reasons, MCs' Twitter agendas are an ideal platform to address theoretically important questions about legislators' agenda-setting behavior and representation (Russell, 2018). Because individuals develop unique styles of communication and legislative style (W. Bernhard & Sulkin, 2018; Grimmer, 2013), we expect their Twitter agendas and the issues they choose to prioritize for public messaging to reflect those individual patterns of communication.

We use politicians' *policy attention*, or the amount and type of attention they give to a particular policy issue, to understand their policy agendas and agenda-setting behaviors. Twitter's readily available data lets us study attention without having to wait for legislative sessions to complete or to aggregate other resources such as press releases. We demonstrate Twitter's utility for studying attention — the factors that drive attention elsewhere drive attention on Twitter.

Individual Characteristics Affecting Policy Agendas

Policy attention is often dependent on the political climate, issue emergence, and policy frames, but at the individual level, we look at how lawmaker-specific characteristics and

institutional factors influence attention allocation to policy issues on Twitter. In the following sections, we outline our hypotheses about individual and institutional effects on legislators' policy attention patterns on Twitter.

Gender

Work by Evans and Clark (2016) suggests gender will directly affect political candidates' social media messages. They found that women running for Congress mention policy issues on Twitter at a higher rate, and those issues are often "women's issues" (e.g., health care, education, poverty). In a later study, Evans further clarified that women mention all policy issues, not just "women's issues", more frequently than men (Evans, 2016). Stereotypes of female lawmakers as compassionate relationship-builders rather than policy experts may incentivize some women to be more active in policy communication on Twitter (Evans & Clark, 2016; Huddy & Terkildsen, 1993). Wagner and Gainous find that during campaign periods, female Congressional candidates are more likely than males to integrate Twitter into their campaign strategies (Wagner et al., 2017). Once in office, they may also adopt styles of communication that highlight policy preferences more often. Women may also combat stereotypes by adopting more diverse agendas that allow them to develop reputations as experts in many policy areas and deter possible challengers (Atkinson & Windett, 2018). Having an alternative agenda space on Twitter may enable female MCs to counter these stereotypes and compensate for perceptions that female lawmakers are less policy capable. Based on this earlier work, we expect that women will mention policy more often than their male counterparts and that they will exhibit greater attention diversity.

H₁: Women will mention policy more often than men.

H₂: Women will exhibit more diverse policy agendas than men.

Party

Political parties are a mechanism to serve and facilitate electoral goals (Mayhew, 1974) and to maintain majority status (Aldrich, 1995). Prior work on Congressional tweets established that Republican and Democratic parties use Twitter for different

communication activities (Golbeck et al., 2018; Hemphill et al., 2013a; Russell, 2018), and we expect to see similar differentiation here. Another study of Twitter use in U.K. Parliament found that Labour Party members generated fragmented communication networks rather than a cohesive party (Adi et al., 2014). The precise impact of party affiliation on a politicians' expressed agenda and communication preferences remains unknown.

Our research expands on work by Gainous and Wagner (2014) and Evans et al. (2014) who find partisan patterns in campaign tweets. Our expectation is that Republicans will more frequently turn to Twitter to outline their policy priorities, given their early adoption of Twitter and distrust of traditional media for agenda setting. Studies by Lassen and Brown (2011) and Peterson (2012) suggest patterns of early Twitter adoption by Republican lawmakers, and we extend that leading behavior to their policy promotion as well. Democrats, as the minority party or "out party" in Congress in 2017 and 2018, may be more focused on party politics and future electoral concerns rather than policy agendas. Lawmakers have increased discretion on Twitter and that discretion is essential for those who believe alternative media platforms, like newspapers or television coverage, are biased. Research suggests an overall decline in public trust of the media (Gronke & Cook, 2007), but that cynicism is most prevalent among conservatives and Republicans (T.-T. Lee, 2005). Conservative politicians signal the public and co-partisans to believe that the media is biased and favors Democrats (Domke et al., 1999; Watts et al., 1999). Republicans may view Twitter as a more viable outlet for their policy messaging strategies if they believe other options are untrustworthy and therefore use it more.

A party's collective effort constrains a lawmaker's strategic action. Parties have increased influence over the institutional agenda (Aldrich, 1995; Cox & McCubbins, 1993; Rohde, 1991), but the extent to which leaders and parties influence the issues that individual lawmakers choose to address in their public agendas on Twitter has implications for both representation and the policy process. Research on issue

ownership — the idea that the public associates particular issues with one party or the other (Arbour, 2014; Egan, 2013) — suggests that Republicans and Democrats will mention different policy issues. Not only do we assume different preferences, but even before those opinions get expressed, the issues up for debate should be different by party. For instance, Republicans are often associated with security and military issues, while Democrats own issues around education and health care (Egan, 2013). Theory argues that voters will consider one party or the other more qualified to handle issues in an area (Petrocik, 1996), and that parties reinforce and leverage these expectations by addressing mainly those issues they own.

Together, research about parties and the media suggest that we will observe two patterns:

H₃: Republicans will mention policy on Twitter more often than Democrats.

H₄: Republicans and Democrats will tweet about different policy issues; specifically, they will attend to issues their party owns.

Chamber

Research that examines chamber differences in Twitter behavior, explicitly, found that senators were, on average, less frequent tweeters than Representatives (Hemphill et al., 2013b). However, to our knowledge, research to date has not yet explored how Senate and House members differ in their policy agendas on Twitter. Senators and Representatives represent different constituencies — states and districts within states — and those constituencies likely require different political strategies. Prior research shows that the differing constituencies produce distinct patterns in federal spending policy and credit-claiming between the two chambers (F. E. Lee, 2004). This prior literature on chamber differences suggests that senators employ more resources and must address more diverse constituencies (Druckman et al., 2009; Gulati & Williams, 2007). The smaller size of the Senate also means that individual senators enjoy more opportunity for influence than do individual House members (Sheingate, 2006).

Therefore, we predict that the Senate will use Twitter more often to mention policy and that they will exhibit more diversity in their attention.

H₅: Senators will mention policy more often than Representatives.

H₆: Senators will exhibit more diverse policy agendas than Representatives.

We address open questions about whether and how lawmakers use Twitter to communicate their policy agendas and how that communication differs among parties, chambers, and genders. We first describe the construction of our classifier, report and discuss the patterns of political attention we found after labeling the 115th U.S. Congress's tweets, and conclude by assessing our hypotheses on the influence of individual characteristics on MCs' attention patterns.

Methods

The fact that social media can both bypass traditional media and facilitate connections between policymakers and journalists requires that we differentiate how we study social and traditional media sources (Barberá et al., 2019; Jungherr, 2014; Shapiro & Hemphill, 2017). The current media landscape requires research that takes advantage of social media's platforms — particularly Twitter — to aggregate attention and participate in dialogue unmediated by mass media.

Existing methods for studying lawmakers' policy agendas often employ manual topic labeling, which depends on human effort and can be restrictive in terms of scope and scale (Quinn et al., 2010). As members of Congress have expanded their use of social media for daily communications about policy problems, so too must the research methods that we use to understand how lawmakers engage various constituencies. To understand what influences those patterns of attention and how they differ among lawmakers, we seek alternative methods of policy agenda analysis.

To address the need for a comprehensive and consistent mechanism for measuring policy agendas through attention on Twitter and at scale, we developed a computational model for estimating political attention. We leveraged a sample of human-labeled

congressional tweets to train a supervised machine learning classifier to label the policy topics in lawmakers' tweets. We tested that classifier to evaluate the performance of our models against experts' labels, and found that the trained classifier serves as a viable alternative to manual coding techniques.

With a high-performing classifier, we can analyze what drives lawmakers' patterns of attention among a consistent set of policy topics on a much larger scale than possible by current content coding techniques. Our machine learning classifier enables analysis across the set of topics from the Comparative Agendas Project that have been used over time to study policy attention. By using all the tweets of lawmakers in Congress, the data allows us to use this coding scheme to test our hypotheses.

Data

115th Congress Data

Using the Twitter Search API, we collected all tweets posted by official accounts linked to voting members of Congress during the 115th Congress, which ran January 3, 2017 to January 3, 2019. We identified MCs' Twitter user names by combining lists of MC social media accounts from the UnitedStates project², George Washington Libraries³, and the Sunlight Foundation⁴. Throughout 2017 and 2018, we periodically used the Twitter API to search for the user names in this composite list and retrieved the accounts' most recent tweets. We conducted our final search on January 3, 2019, shortly after the 115th Congress ended. In all, we collected 1,485,834 original tweets from 524 accounts. We included data from while they were in office for MCs who resigned (e.g., Ryan Zinke) and those who joined after special elections (e.g., Rep. Conor Lamb).

		House	Senate
Man	Republican	441,890	171,083

² <https://github.com/unitedstates/congress-legislators>

³ <https://dataverse.harvard.edu/dataset.xhtml?persistentId=doi:10.7910/DVN/UIVHQR>

⁴ <https://sunlightlabs.github.io/congress/index.html#legislator-spreadsheet>

	Democrat	356,870	143,522
Woman	Republican	65,240	19,867
	Democrat	212,457	74,905

Table 1. Total tweets posted by party, chamber, and gender.

Metadata

We used UnitedStates project and Sunlight Foundation datasets to retrieve MC metadata information, including details about which state they represent, chamber, party, and gender. For each of six MCs (gianforte, lindseygrahamsc, replumenauer, reptyanzinke, amashoffice, and senbillcassidy) that did not have state metadata available via UnitedStates project or Sunlight Foundation, we used data from their official websites to manually collect metadata.

Manually-Labeled Training Data

The original set of labeled tweet data from Russell (2017, 2018) comprised 68,398 tweets. Of these tweets, the model labeled 45,402 tweets as “policy” and 22,996 as “not-policy” tweets. We removed retweets from this set to limit our classification to original tweets, resulting in a final dataset of 59,826 labeled tweets (39,704 *policy* tweets and 20,122 *not policy* tweets). By restricting our analysis to original tweets, we provide conservative estimates of attention.

Model Specification

We used the manually-labeled data to train a logistic regression classifier and achieved an F1 score of 0.79. We experimented with alternative preprocessing steps, different classification algorithms, and feature selection approaches such as word2vec (Mikolov et al., 2013), and found that simple bag-of-words vectorization and logistic regression achieved the best performance⁵.

⁵ Additional details about (a) the development of the model and our experiments and (b) frequencies and associated terms for each category are available in the supplementary materials.

Statistical Analyses

Our goal is to understand and explain how a member's party, chamber, and gender affect their political attention. A tweet's policy area class indicates attention to that topic. Since the Comparative Agendas Project (CAP) codebook includes 20 policy areas, we used multinomial logistic regression to approach this question. We chose policy area number 5, *labor*, as our reference category and used the *nnet* package in R (Venables & Ripley, 2002) to conduct these analyses. We selected *labor* as the base category, given its moderate level of salience and inter-party appeal that spans from issues around workforce development to questions about fair pay and benefits.

Results

General Policy Attention Patterns

We performed snapshot and time series frequency analyses of policy attention in order to understand general patterns. We see that most policy topic areas receive little attention (see Figure 1), and those low levels of attention vary little over time (see Figure 2).

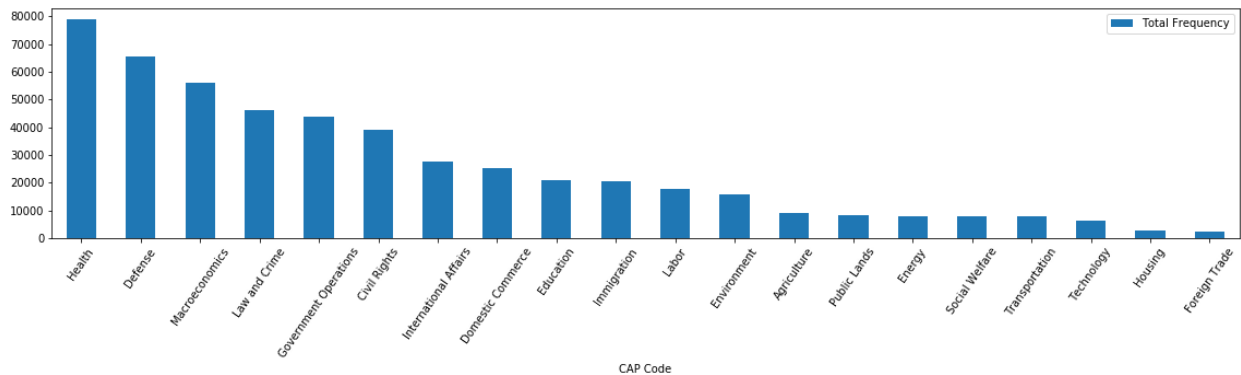


Figure 1. Overall distribution of attention (frequency of tweets) across policy areas for the 115th Congress. Topic 3 (*health*) receives the most attention overall.

Figure 2 shows that *health*, *macroeconomics*, *law and crime*, *defense*, and *immigration* receive more attention sporadically. *Health* (topic 3) received a peak in attention during

the first half of 2017 and then leveled off over the remainder of the 115th Congress. *Macroeconomics* (topic 1) peaked in the Fall of 2017. *Law and crime* (topic 12) received increased attention during the first half of 2018, which then decreased for the rest of the year while remaining higher overall than 2017 rates of attention. *Defense* (topic 16) featured a generally higher baseline than most topics, demonstrating some periodicity towards the end of 2017 and early 2018. For *immigration*, we observed three noticeable peaks — the 4th quarter of 2017 and the first and second quarters of 2018.

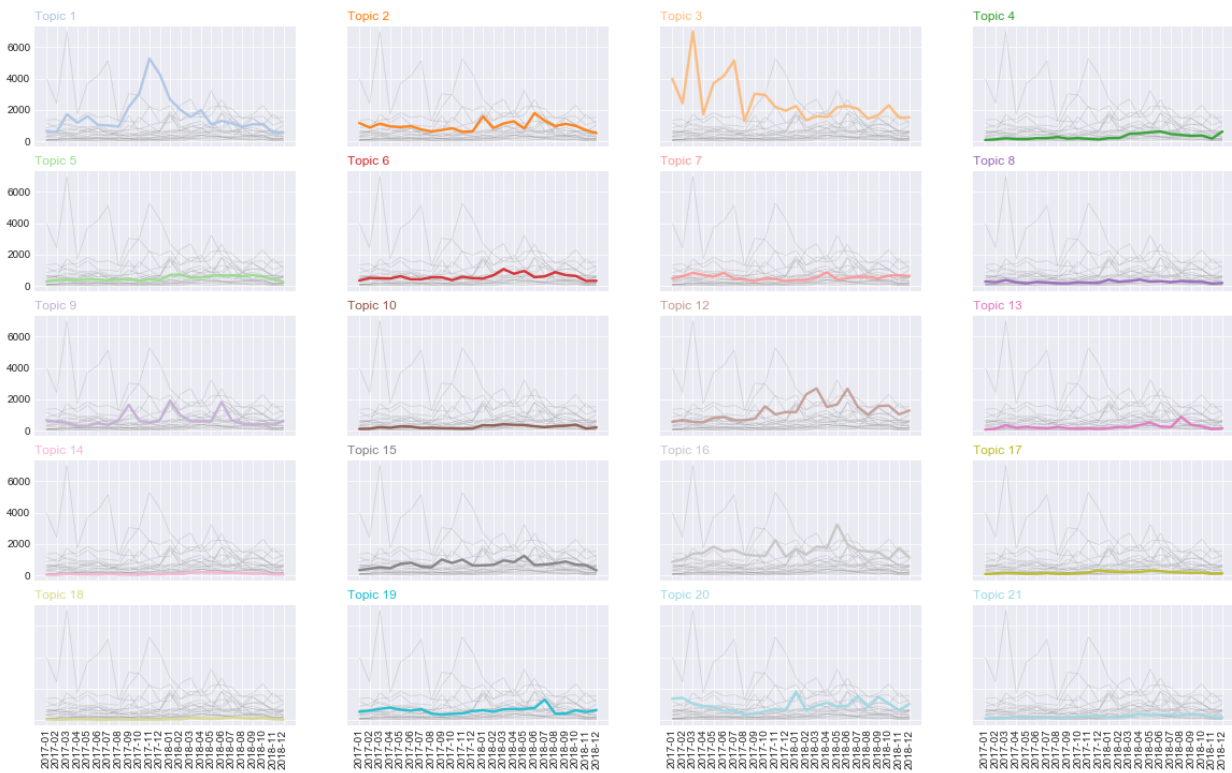


Figure 2. Frequency over time for each topic in CAP codebook. Results are presented with monthly frequencies.

Figure 3 shows the percent of tweets represented by each policy area over time during the 115th Congress. Figures 3 and 4 display the same data, but the stacking in Figure 3 reveals different trends and anomalies. We see that during the first three quarters of 2018, *housing* (topic 14) and *foreign trade* (topic 18) increased slightly in their

proportion of tweet attention relative to other topics. During the third quarter of 2018, we see *social welfare* (topic 13) exhibit a jump in tweet attention. Finally, during the final quarter of 2018, we see *agriculture* (topic 4) also exhibit a jump in tweet attention.

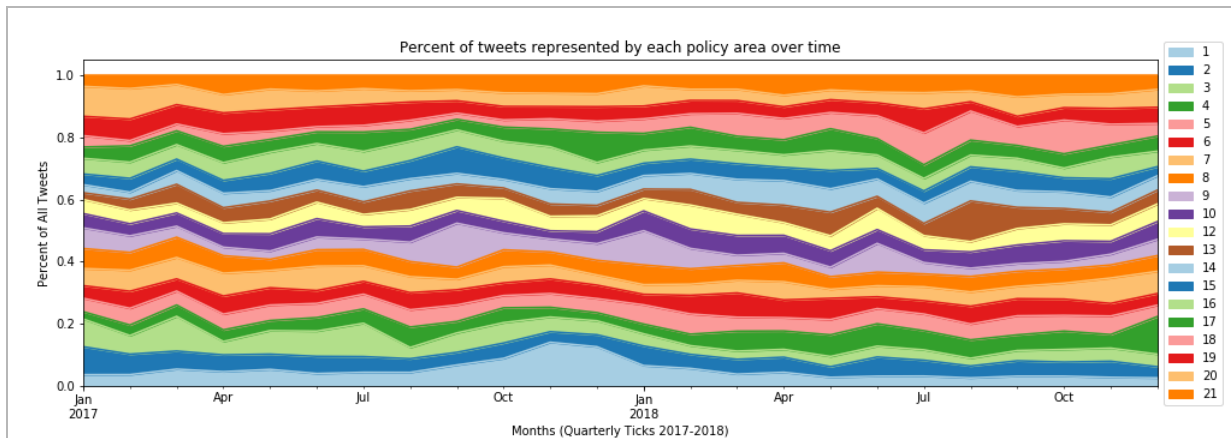


Figure 3. Percent of tweets in each policy area over time.

Individual Characteristics' and Policy Attention Patterns

To identify explanatory patterns in the specific policies mentioned, we fit six different multinomial logistic regression (MLR) models to determine the relationships between party, chamber, gender, and policy area. We fit each of the independent variables alone, then all three together, interacting party and chamber, and interacting all three terms. Using Akaike information criterion (AIC) comparisons and analysis of variance (ANOVA), we found that the model of best fit included all three independent variables and no interaction terms. Table 3 shows the results of the best MLR⁶; it contains odds ratios and standard errors for each topic. The results of the MLR show that there are significant differences between genders, parties, and chambers for nearly all topics in the CAP codebook. This significance indicates that the MCs with different characteristics exhibit different patterns of political attention. However, the odds ratios

⁶ Complete results for all models are available in supplementary documents.

noted in Table 2 are all less than 2, indicating weak to moderate associations between gender, party, chamber, and policy attention.

Table 2. Results of Multinomial Logistic Regressions. Odds ratios (columns 4, 6, 8, and 10) and standard errors (columns 5, 7, 9, and 11) are provided. “Labor” (CAP #5) is the reference category. The CAP codebook has no #11.

CAP #	CAP Major Code	Issue Owner	GOP	SE	Sen.	SE	Man	SE	Const.	SE
1	Macro-economics	Dem	1.46***	0.012	0.87***	0.013	1.28***	0.014	2.03***	0.012
2	Civil Rights	Dem	0.63***	0.013	0.82***	0.014	0.86***	0.014	2.73***	0.012
3	Health	Dem	1.02	0.012	1.03**	0.012	0.99	0.013	3.75***	0.011
4	Agriculture	Dem	1.83***	0.019	1.34***	0.019	0.86***	0.021	0.34***	0.019
6	Education	Dem	0.88***	0.015	0.94***	0.015	0.89***	0.016	1.23***	0.014
7	Environment	Dem	0.49***	0.017	1.28***	0.016	1.51***	0.018	0.66***	0.016
8	Energy	Dem	1.97***	0.018	1.45***	0.018	1.26***	0.021	0.29***	0.019
9	Immigration	GOP	0.70***	0.016	0.71***	0.017	1.23***	0.017	0.93***	0.015
10	Transportation		0.98	0.019	1.12***	0.019	1.15***	0.021	0.38***	0.019
12	Law and Crime	GOP	0.75***	0.013	0.996	0.013	0.95***	0.014	2.48***	0.012
13	Social Welfare	Dem	0.54***	0.021	0.59***	0.023	0.83***	0.02	0.62***	0.017
14	Housing	Dem	0.64***	0.032	1.16***	0.031	1.03	0.032	0.15***	0.028
15	Domestic Commerce	GOP	1.27***	0.014	0.96***	0.015	1.11***	0.016	1.08***	0.014
16	Defense	GOP	1.70***	0.012	0.96***	0.012	1.18***	0.013	2.51***	0.012

17	Technology		1.15***	0.022	1.36***	0.022	1.05*	0.025	0.24***	0.022
18	Foreign Trade	GOP	1.34***	0.035	1.51***	0.034	1.15***	0.041	0.07***	0.037
19	International Affairs	GOP	1.39***	0.014	1.10***	0.014	1.36***	0.016	0.94***	0.014
20	Government Operations		1.22***	0.012	1.17***	0.013	1.25***	0.014	1.67***	0.012
21	Public Lands	Dem	1.15***	0.019	1.44***	0.019	1.00	0.021	0.36***	0.019

Concerning the effects of gender, we found that *environment* exhibited the highest odds ratio for men compared to women and that *social welfare* receives the lowest odds ratio. These odds ratios suggest that men are more likely to focus attention on *environment* than women, and women are more likely to focus attention on *social welfare* than men.

When examining party effects, we found that the highest odds ratio exists for Republicans compared to Democrats with *energy*. The lowest odds ratio exists for Republicans compared to Democrats for *environment*. These odds ratios suggest that the Republican MCs are more likely to focus attention on *energy* than are Democrats, and Democrat MCs are more likely to focus attention on *environment* issues than are Republicans.⁷

Finally, concerning the effects of chamber, we found the highest odds ratio exists for Senators compared to House Representatives with *foreign trade* and the lowest odds ratio for *social welfare*. These odds ratios suggest that Senators are more likely to focus attention on *foreign trade* than are House Representatives, and House Representatives are more likely to focus attention on *social welfare* than are Senators.

⁷ The CAP codebook's *energy* topic discusses issues generally related to energy policy and appropriations, including: nuclear, electric, natural gas and oil, coal, alternative, and renewable energy sources; energy conservation; and energy research and development. Its *environment* topic discusses issues generally related to environmental policy and appropriations, including: drinking water; waste disposal; hazardous waste; air pollution; recycling; indoor hazards; spices and forest protection; conservation; and environmental research and development not including alternative energy.

To understand whether there are differences among genders, parties, and chambers related to tweeting about policy generally, we first used logistic regression (LR) to predict the frequency of policy tweets on any topic. We have two dependent variables: `policy_tweet`, a binary variable that indicates whether a tweet is about policy; and `policy_area`: a categorical variable that corresponds to the tweet’s major code from the Comparative Agendas Project codebook. We use binary predictor variables `Republican`, `Senate`, and `Man` to indicate party, chamber, and gender. We fit models of the predictors independently, in combination, and with interaction terms. Using AIC comparisons and ANOVA, we found that the exhaustive model that included all three independent variables and interactions among them was the model of best fit when predicting the frequency of policy-related tweets (see Table 3). We plotted residuals using the binned plot function of the *arm* package (Gelman & Su, 2018) and found no significant outliers.

Table 3. Results of Logistic Regression predicting policy tweets.

Term	Odds Ratio	SE
Republican	0.656***	0.006
Senate	1.610***	0.017
Man	0.910***	0.006
Senate:Republican	0.691***	0.014
Republican:man	1.137***	0.012
Senate:man	0.927***	0.012
Republican:Senate:man	1.158***	0.026
(Intercept)	2.857***	0.014

Policy Attention Volume Hypotheses

Overall we observed more policy discussion on Twitter in 2018 than in 2017, peaking in April and May of 2018, increasing after the 2018 primaries, and decreasing after Congressional elections in November 2018. Generally, we found that Democrats, Senators, and women tended to post policy tweets more frequently than Republicans, Representatives, and men. Senators were the most frequent policy tweeters, indicating

support for H_5 (Senators more frequently mentioned policy than did Representatives). Among both Senators and House members, Democrats tweet more frequently than Republicans, leading us to *reject* H_3 (Republicans discuss policy less often than Democrats). While Republicans were initially more likely to adopt Twitter (Lassen & Brown, 2011), we find that Democrats are the more vocal policy messengers on Twitter. Finally, among Democrats women mention policy more often than men, and among Republicans, men mention policy more often than women (see Figure 4). This echoes research by Cormack (2016) that women will communicate more vote revelations than men in their constituent communications. Additionally, this finding supports work by Russell (2018) that finds female senators, primarily Democrats, are likely to send position-taking messages compared to their male counterparts and research by Evans and Clark (2016) that finds a higher rate of policy messages among women in the House. These results indicate *mixed results* for H_1 (the effect of gender on policy tweet frequency depends on party and chamber).

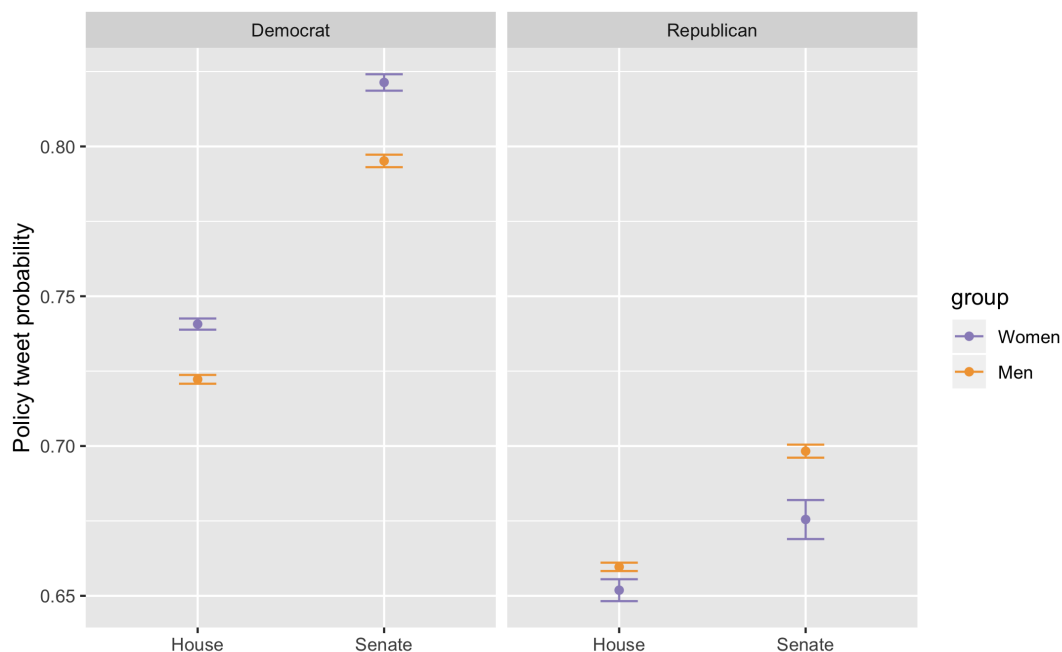


Figure 4. Marginal effects plot comparing policy tweet frequencies by party, chamber, and gender

Issue Ownership Hypothesis

H₄ suggests that Democrats and Republicans will attend to different issues, specifically those that they own. The results of our multinomial logistic regression (see Table 2) indicate *mixed support* for this hypothesis. For some issues, such as Civil Rights, the issue owning party (Democrats) showed more attention. However, for others, such as Immigration, the issue owning party (Republicans) showed less attention.

Policy Attention Diversity Hypotheses

We calculated attention diversity for each MC using Shannon’s H as recommended by Boydston, Bevan, and Thomas (2014) and calculated linear regression to predict H using party, chamber, and gender⁸. Table 4 shows the results of that regression and indicates that Democrats and Senators exhibited significantly more diversity than Republicans and Representatives. These findings *support* H₆ (Senators exhibit more diverse policy agendas than Representatives). We find that the difference between genders was not significant, *rejecting* our H₂ (Women exhibit neither more nor less diverse policy agendas than men).

Table 4. Predicting Agenda Diversity (Shannon’s H) by Party, Chamber, and Gender	
	Shannon’s H
Republican	-0.184***
	(0.017)
Senate	0.104***
	(0.021)
Man	0.003

⁸ We also calculated models including interaction terms, and the full list of models and their results are available in supplementary materials. We again report only the model of best fit here.

	(0.021)
Constant	2.419***
	(0.019)
<i>Note:</i> *p<0.1; **p<0.05; ***p<0.01	

We summarize our hypotheses and whether our statistical analyses either support or reject them in Table 5.

Table 5. Summary of hypotheses and their support.	
Hypothesis	Result
H ₁ : Women will mention policy more often than men.	Among Democrats: Supported Among Republicans: Not supported
H ₂ : Women will exhibit more diverse policy agendas than men.	Not supported
H ₃ : Republicans will mention policy more often than Democrats do.	Not supported
H ₄ : Republicans and Democrats will attend to different policy issues.	Mixed
H ₅ : Senators will mention policy more often than Representatives do.	Supported
H ₆ : Senators will exhibit more diverse policy agendas than Representatives.	Supported

Discussion

We presented a supervised machine learning model that detects political topics in tweets and assigns them to categories in a widely-used codebook for measuring political attention. This model enabled us to a) observe patterns in Congress’s political attention through the 115th Congress, and b) identify differences in policy agendas through political attention patterns among lawmakers’ parties, chambers, and genders. We found that the proportion of lawmakers’ tweets that address policy issues stayed

relatively stable throughout the congress, ranging from 41%–57% of tweets, but that the parties, genders, and chambers produced different patterns of attention to issues within those policy tweets. These differences were quite small in effect, the importance of which we discuss in greater detail in the sections that follow.

Party, Gender, and Chamber Effects

Our results show that Democrats, Representatives, and women are generally more likely to post policy-related tweets. However, the significance of the interaction terms in our regression indicate that these general patterns do not always hold. Rather, the effects of party, chamber, and gender depend on one another.

Specifically, party moderates the effect of gender. We found that Democratic women attend to policy *more* often than Democratic men, and Republican women attend to policy *less* than Republican men. Evans and colleagues (2016) also found that women were more likely to attend to policy issues during campaigns. However, they found that, once elected, women in the 112th Congress did not exhibit behavior that differed significantly from men. They do not indicate whether women in both parties exhibit the same pattern, but we found that Republican women were less likely than their male counterparts to post policy tweets. The interaction here between party and gender potentially explains why our results differ — women and men exhibited similar patterns, but party mediated those effects. In a related vein, Pearson et al. (2011) found that “Republican congresswomen have particularly strong incentives to highlight their partisan credentials to both party leaders and attentive constituents,” which may explain why Republican women were less policy attentive in their tweets than Democratic women. Republican women spend more of their time tweeting about constituent relations (i.e., district affairs, emergency response, district awards, holidays, etc.) or partisan debate.

In regard to the diversity of issues, we find no difference between men and women in terms of the range of issues that are discussed on Twitter. Women are not sticking to a narrow set of “women’s issues” nor are they trying to address more issues than their male colleagues. This finding runs counter to work by Atkinson and Windett (2018) that

shows women offer a more diverse number of policy proposals than their male colleagues in their legislative activity. On Twitter, these differences by gender do not appear and suggest further inquiry into the different audiences and different motivations of agenda setting on Twitter versus in Congress.

Democrats in both chambers attend to policy more often than Republicans, and Senators of both parties do so more than Representatives. Parties did not stick to the issues they “own” but did distribute their attention differently. One explanation for this finding may be that on Twitter, MCs have latitude to choose topics that diverge from their legislative policy agendas, allowing them to explore a more diverse range of topics. Also, our model does not investigate policy preferences or whether an MC is speaking in favor of or against a particular policy area. Future work should more thoroughly investigate policy preference as an additional dimension of issue-ownership expression in MCs’ tweets; it may help explain the mixed results we find here for H₄. The higher frequency of policy tweets among Senators contradicted earlier findings where Republicans and Representatives tweeted more often (Hemphill et al., 2013a).

We then examined policy tweets alone and found main effects for party, chamber, and gender on the relative attention topics receive. However, in evaluating each of these demographic groups’ different tweet frequencies, we found that the low odds ratios (indicating weak associations) meant these differences among demographic groups were not meaningful in practice. For instance, Figure 5 shows the proportion of tweets in each category by gender. Though the regression showed a significant statistical difference between the genders for nearly all topics, the figure shows how small those differences are. As in Hayes and Lawless (2016), the “file drawer” problem may mean that published research about gender differences may overrepresent those differences. The small effects of the differences we identified are likely more interesting than the effects themselves.

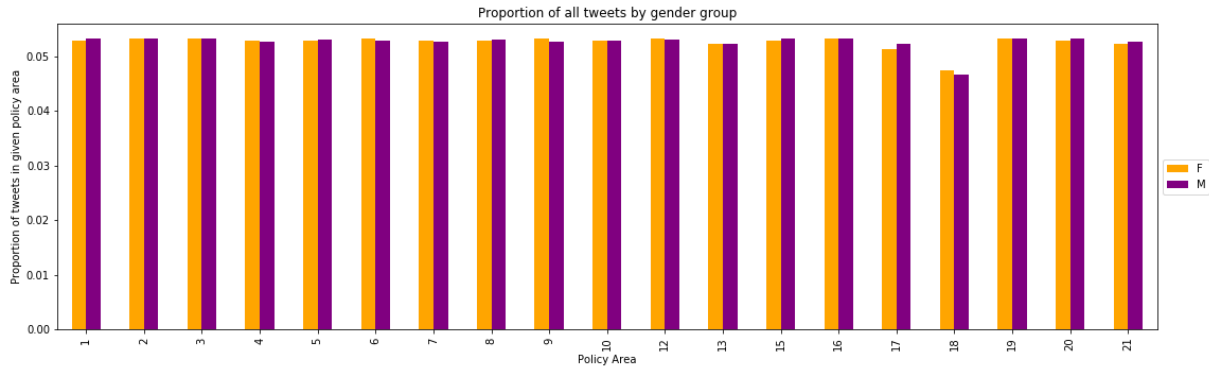


Figure 5. Male and female policy area attention distributions. Orange bars indicate the proportion of attention females paid to a given policy area relative to others, and purple bars indicate male attention.

Future work

Our main contributions are a model for labeling tweets according to their political topics and explanation of the motivations for specific patterns of MC policy attention online. We suggest future work should make advances in four areas: a) modeling, b) institutional effects that impact attention, c) relationships between agendas expressed online and elsewhere, and d) strategic motivations for communication activities.

Model Improvements

To improve the modeling, research may consider including topic vectors or hashtag co-occurrence features. We experimented with different approaches to improve the performance of the model but recommend that future work explore additional designs. For instance, more experiments with different word embedding models may identify a better approach such as topic2vec (Niu et al., 2015) that can learn both words and topics. It may also be useful to include individual characteristics in the models themselves. Party, chamber, and gender have small influence on the topics discussed and so may be more analytically useful as model features — they may help the model assign topics when two categories have similar probabilities such as immigration and agriculture or energy and environment in the U.S. context. Researchers should also experiment with unsupervised approaches to detecting political topics. Our approach

leverages manually labeled data to effectively classify documents, but an unsupervised approach, where the model identifies latent relationships, may generate results that are useful for different approaches to understanding political topics. Denny and Spirling (2018) and Hemphill and Schöpke-Gonzalez (2019) provide interesting comparisons of the two approaches and how they may be useful for different political research agendas.

Institutional Effects

Our predictions and analysis focused on properties of individual MCs that may influence how they divide their political attention. Future work should examine whether institutional effects such as legislative debates or committee and caucus membership influence their behavior. To illustrate directions for this avenue of future work, we examined *health*, the most frequent policy topic, in more detail to explore what else may be driving attention on Twitter. *Health* topics fall under multiple jurisdictions (Sheingate, 2006) and so provide an opportunity to examine the potential influences of institutional factors on Twitter policy attention. To explore what motivates *health* policy area tweet patterns, we examined which MCs contributed to these posts and what they are posting about. We sampled users from two groups: prolific and attentive users. *Prolific* users are those who posted most often (raw count) about *health* and included Sen. Patty Murray (D-WA, F), Sen. Rob Portman (R-OH, M), Sen. Richard J. Durbin (D-IL, M), and Rep. Frank Pallone, Jr. (D-NJ, M). Among *attentive* users, health was the topic they talked about most (proportionally) and included Rep. Brett Guthrie (R-KY, M), Rep. Michael C. Burgess (R-TX, M), Rep. Grace F. Napolitano (D-TX, F), and Rep. Diane Black (R-TN, F). Interestingly, these two lists of MCs do not overlap — those who tweet the most about *health* are not the people who spend most of their attention on *health*. We used tweets from these users to explore the potential influences of institutional factors on Twitter policy attention, including committee membership, caucus membership, and legislative debates. Results from these samples of prolific and attentive tweeters indicate that MC's Twitter content may be driven by four factors that future work should examine:

1. partisan position taking in legislative debates (i.e., ACA debate),

2. advocacy for sponsored legislation (i.e., Sen. Portman's push for his sponsored STOP Act and reauthorization and expansion of the CARA Act),
3. position taking in nomination confirmation debates (i.e., Tom Price to U.S. Secretary of Health and Human Services), and
4. committee and caucus membership (i.e., Napolitano's mental health narrative, or Murray and Black's focus on the ACA debates).

Twitter and the Media Landscape

In addition to model improvements, we suggest that future work should test correlations between political attention on Twitter and elsewhere. For instance, Cormack (2016a) found that in email, MCs communicate an ideology that matches their voters' preferences better than it matches their actual voting history. One interesting question for future work is whether this holds true in Twitter as well as email. This type of work can contribute important revelations about how legislators' communication motivations and goals differ across media platforms.

The relationships between topics on Twitter and in the press also deserve continued attention. Recent work has explained that Twitter is a popular source for political journalists, and confirmed the connection between Congress's Twitter posts and issues covered in *The New York Times* (Shapiro & Hemphill, 2017). In a study of Congress's responsiveness (Shoemaker & Reese, 1991), Barberá and colleagues (2019) found that media outlets influenced political attention among politicians, and that suggests future work should include media attention as a factor in modeling Congress's attention.

Social Media and Legislation

Future work should evaluate explicit relationships between Twitter communication and legislative action in the U.S. Congress. Purpura and Hillard's (2006) legislation classification models, which also use CAP codebook codes, make it possible to compare topic distributions across tweets and legislation. By combining behavioral data from MC votes and topic data from both MC votes and tweets, future work could explain the relationships between legislative actions and communicative activities. Russell and

Wen's (2019) work examining the relationship between bill introductions and tweets falls in this vein, finding an association between policy rhetoric and policy activity in Congress. Each of these avenues can leverage time series analyses to understand how attention patterns and their influences change over time and across media platforms.

Researchers could also explain why politicians adopt *prolific* or *attentive* strategies in their communications and whether those strategies impact electoral or career outcomes. Existing research suggested that an individual's leadership aspirations had greater influence over their behavior than their legislative institution (Scherpereel et al., 2017) or their party (U. Bernhard et al., 2015). Adopting a prolific strategy online may help an individual garner a reputation for general leadership, for instance, while attentive strategies may signal expertise in particular issues. Our findings around gender and party differences, and earlier work on gender and campaigning (Evans & Clark, 2016; Hayes et al., 2014; Hayes & Lawless, 2016) indicate that men and women will have different success with these strategies.

An important line of future inquiry should also consider the relationship between the president and a congressional party and whether that shapes the social media strategies of lawmakers. Members from the minority party, relative to the White House, may be incentivized to routinely promote a policy agenda that criticizes the president or his agenda (Green, 2015; Morris, 2001). That criticism is common in press statements (Groeling, 2010), and that behavior may influence the volume and nature of policy fights MCs take up on Twitter. MCs who need to voice their opposition to the president may do so by turning to Twitter to offer an alternative policy agenda that is critical of the White House. The normalization of social media as a universal tool for policy debates lends itself to the needs of those minority voices, vis-a-vis the relationship with the White House.

Conclusion

Understanding how Members of Congress (MCs) distribute their political attention is key to many areas of political science research including agenda setting, framing, and issue

evolution. We demonstrated that it is possible to exploit MCs' Twitter behavior to study their political attention and found statistically significant differences in attention between parties, chambers, and genders. However, these differences were small enough to suggest that other MC characteristics are also at play. Our computational modeling approach is an important first step to future analyses that examine institutional factors (e.g., committee assignment, caucus), partisan issue preferences (e.g., issue-ownership), and political environment (e.g., partisan issues, confirmations, etc.). Our findings indicate these factors likely explain the patterns of political attention we observed. Our study examines a critical aspect of the dataset and method we developed—what differences in attention appear—and facilitates future efforts to understand political attention, social media, and legislative action.

Appendix

Beginning with content analysis of peaks and troughs in *health* attention, we observed patterns in content that reflected prescient legislative debates. However, not all content in these periods reflected these debates. Responding to existing scholarship on committee and caucus membership, we examined each of these phenomena's potential influences on *health* attention in order to understand possible tweet motivations beyond legislative debate. We examined committee membership's effects based on Mann and Ornstein's (1981) findings that lawmakers develop legislative expertise in committees, which they can then talk about publicly to gain national exposure and draw attention from voters. We also examined caucus membership's effects based on Hammond's (2001) findings that caucus membership can support both greater coordination across some policy agendas and greater fragmentation across others. Building on these findings, we sought to evaluate whether caucus membership would demonstrate any notable topical relationship with policy attention patterns, reflective of either those coordinative or fragmenting effects which Hammond observed in policy agenda setting.

Legislative Debates

Through generating time series visualizations, we identified peaks and troughs in health attention, and studied prevalent content patterns during these periods. Health received the most attention during the first half of 2017 and then leveled off. This peak in attention was likely related to debates in Congress about repealing and replacing the Affordable Care Act (ACA) that peaked during the same period. 155,638 tweets were labeled as health. Of these, 32,997 or approximately 21% address the ACA and its debates explicitly (i.e., including hashtags or phrases such as #ACA, #repealANDreplace, Obamacare, aca). Figure 6 shows the total number of tweets about health and the subset that contain ACA-related phrases. We can see that the ACA-related tweets reflect spikes in activity that mirror noticeable spikes in health-related conversation. Though these moments in the tweet stream and legislative debates may not explain the entirety of the health spike during the first half of 2017,

they suggest a correlation between legislative debates in Congress and the type of content that MCs tweet about that is worthy of further investigation.

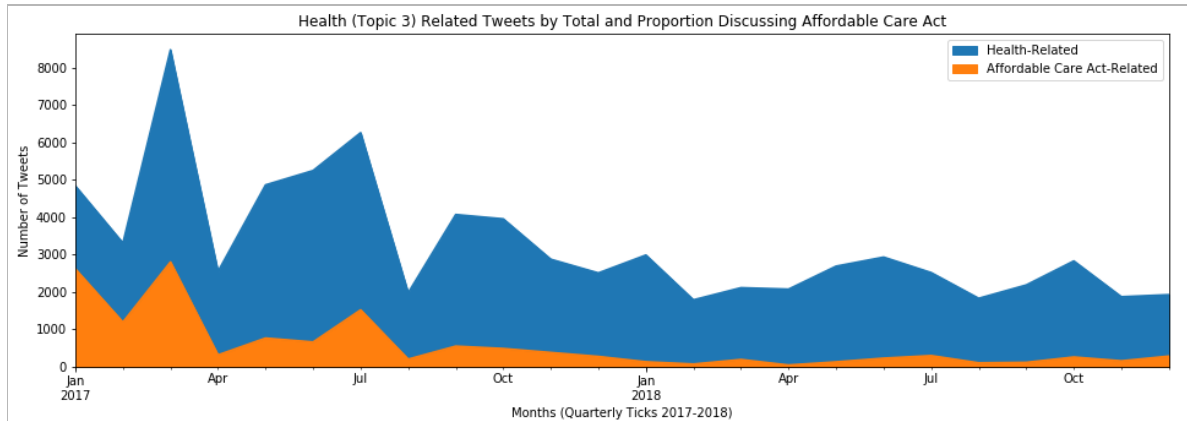


Figure 6. Frequency of tweets labeled *health* during the 115th Congress. The orange area marks tweets that explicitly mentioned the Affordable Care Act and/or related repeal efforts.

Not all MCs reflect legislative debates on their Twitter timelines in the same way, however. We plot each of these MCs' health-focused tweet attention patterns over time in Figure 7 and discuss the topics in each groups' tweets. Overall, among the prolific and attentive groups, we see deviations from the overall pattern of health tweets. Individuals in these groups exhibit different peaks, valleys, and overall distributions from one another and Congress overall. Cook (2016) found that social media activity, at least in the Senate, did not reflect legislative activity. Rather, mass media and social media influenced the networks Senators generated through Twitter. Our close reading suggests a relationship between legislative activity and the content of tweets, and determining the nature of the relationship between content and network relationships is an avenue for future research.

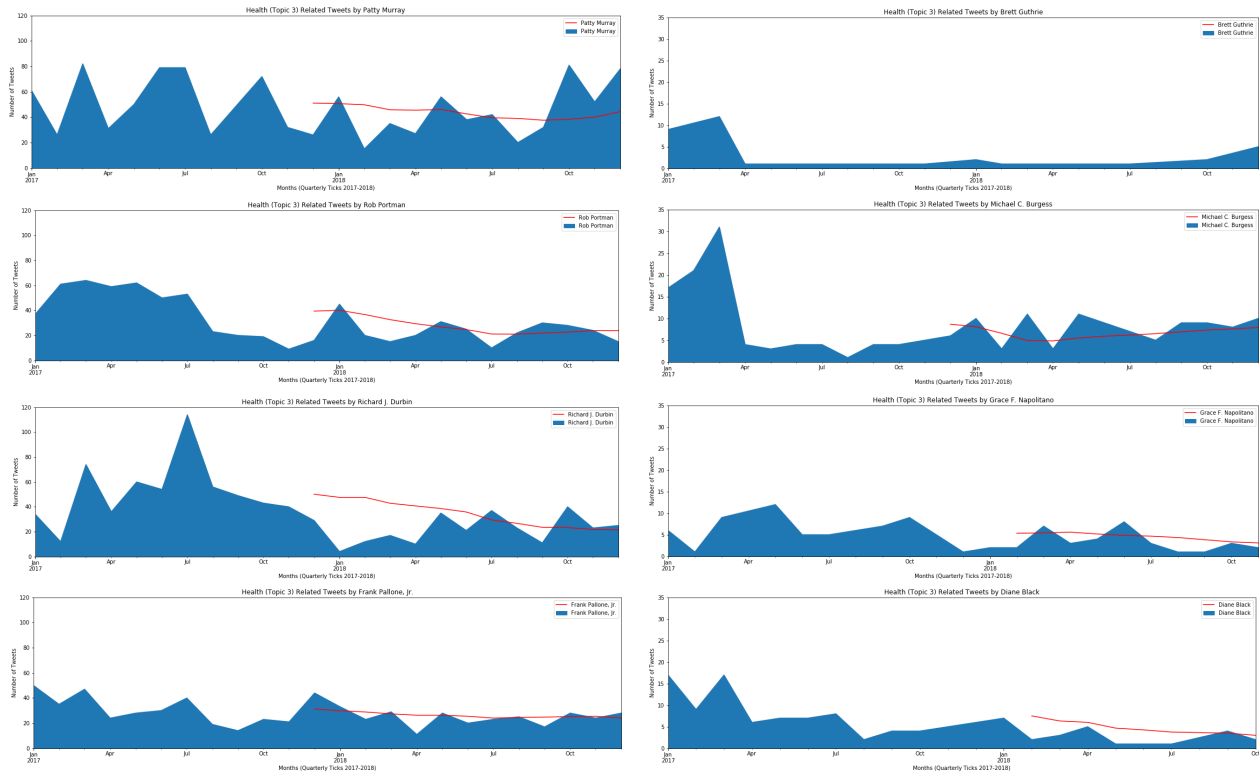


Figure 7. Each of the most prolific tweeters' attention to health over time according to the number of tweets (on left), and the MCs that paid most attention to health relative to other topics they tweeted about over time according to the number of tweets (on right).

Prolific tweeters focused mainly on specific legislative actions, whether the ACA repeal and replacement attempts, opioid-related bills, or CHIP. *Attentive* tweeters mentioned a wider variety of general health issues, some concerning specific bills and others concerning raising awareness of health-related events and issues. We observe that in some months, individual attention patterns among *prolific* tweeters appear reflected in overall attention patterns. Given this observation, we argue that, when they tweet prolifically, individual MCs do affect overall tweet attention patterns. That *attentive* tweets appear less closely aligned with overall tweet attention patterns suggests that in addition to legislative events, MCs may be motivated to tweet to raise public awareness around particular issues or attend to their own interests.

Committee and Caucus Membership

We also examined the relationships between committee and caucus memberships and *health* attention among these eight MCs. Analysis of each of these eight MCs suggests that committee or caucus memberships do motivate tweet narratives around particular topics or issues. For instance, Sen. Murray's committee memberships and the issues she discussed are closely aligned. Sen. Murray belongs to the Senate Committees on Appropriations; Budget; and Health, Education, Labor, and Pensions (HELP). HELP was responsible for reviewing the GOP's counter-proposal to the ACA (the American Health Care Act of 2017) and Tom Price's nomination to U.S. Secretary of Health and Human Services. Appropriations also deals with government funding issues like government shutdowns. The salience of repeal and replace, Price's nomination, and the government shutdown on Sen. Murray's tweetstream suggest that these committee memberships' may affect tweet behavior. Similarly, Black belonged to the House Budget Committee and Ways and Means Committee. The House Budget Committee's Subcommittee on Health was responsible for review of the GOP's counter-proposal to the ACA, which holds thematic resemblance to Black's sustained tweet narrative surrounding this proposal.

In the ACA debates, it is difficult to separate institutional effects because the ACA was a popular topic throughout Congress, not just in relevant committees. This means we cannot yet identify committee membership's specific impacts on Sen. Murray's and Rep. Black's attention. In Sen. Portman's case, none of his narrative appears to be explicitly related to his committee or caucus memberships, but we observe that much of his tweet attention relates to bills he sponsors.

References

- Adi, A., Erickson, K., & Lilleker, D. G. (2014). Elite Tweets: Analyzing the Twitter Communication Patterns of Labour Party Peers in the House of Lords. *Policy & Internet*, 6(1), 1–27.
<https://doi.org/10.1002/1944-2866.POI350>
- Aldrich, J. H. (1995). *Why Parties?: The Origin and Transformation of Political Parties in America*. University of Chicago Press.
- Arbour, B. (2014). Issue Frame Ownership: The Partisan Roots of Campaign Rhetoric. *Political Communication*, 31(4), 604–627. <https://doi.org/10.1080/10584609.2013.852639>
- Atkinson, M. L., & Windett, J. H. (2018). Gender Stereotypes and the Policy Priorities of Women in Congress. *Political Behavior*. <https://doi.org/10.1007/s11109-018-9471-7>
- Barberá, P., Casas, A., Nagler, J., Egan, P. J., Bonneau, R., Jost, J. T., & Tucker, J. A. (2019). Who Leads? Who Follows? Measuring Issue Attention and Agenda Setting by Legislators and the Mass Public Using Social Media Data. *The American Political Science Review*, 1–19. <https://doi.org/10.1017/S0003055419000352>
- Baumgartner, F. R. (2019). *Comparative Policy Agendas: Theory, Tools, Data*. Oxford University Press.
- Baumgartner, F. R., & Jones, B. D. (1993). *Agendas and Instability in American Politics*. University of Chicago Press.
https://books.google.com/books?hl=en&lr=&id=NZ0tRwwYbN8C&oi=fnd&pg=PA1&ots=o4s7rN5UTt&sig=AuJCxml43tK93_8aiwc5pQwXAEs
- Bennett, W. L. (1990). Toward a Theory of Press-State Relations in the United States. In *Journal of Communication* (Vol. 40, Issue 2, pp. 103–127).
<https://doi.org/10.1111/j.1460-2466.1990.tb02265.x>
- Bernhard, U., Dohle, M., & Vowe, G. (2015). Do Presumed Online Media Effects Have an

Influence on the Online Activities of Politicians? *Policy & Internet*.

<https://doi.org/10.1002/poi3.108>

Bernhard, W., & Sulkin, T. (2018). *Legislative Style*. University of Chicago Press.

Borge Bravo, R., & Esteve Del Valle, M. (2017). Opinion leadership in parliamentary Twitter networks: A matter of layers of interaction? *Journal of Information Technology & Politics*, 14(3), 263–276. <https://doi.org/10.1080/19331681.2017.1337602>

Boydston, A. E., Bevan, S., & Thomas, H. F., III. (2014). The importance of attention diversity and how to measure it. *Policy Studies Journal*, 42(2), 173–196.

<https://onlinelibrary.wiley.com/doi/abs/10.1111/psj.12055>

Bruns, A., & Highfield, T. (2012). Blogs, Twitter, and breaking news: The produsage of citizen journalism. In R. A. Lind (Ed.), *Producing Theory in a Digital World : The Intersection of Audiences and Production in Contemporary Theory* (Vol. 80, pp. 15–32). Peter Lang Publishing, Inc.

<http://snurb.info/files/2012/Blogs,%20Twitter,%20and%20Breaking%20News.pdf>

Carson, J. L., Engstrom, E. J., & Roberts, J. M. (2007). Candidate Quality, the Personal Vote, and the Incumbency Advantage in Congress. *The American Political Science Review*, 101(2), 289–301. <https://doi.org/10.1017/S0003055407070311>

Casas, A., & Morar, D. (2019). *Different Channel, Same Strategy? Filling Empirical Gaps in Congress Literature*. <https://doi.org/10.2139/ssrn.3395307>

Chi, F., & Yang, N. (2011). Twitter adoption in Congress. *Review of Network Economics*, 10(1).

<https://doi.org/10.2202/1446-9022.1255>

Cook, J. M. (2016). Are American Politicians as Partisan Online as They are Offline? Twitter Networks in the U.S. Senate and Maine State Legislature. *Policy & Internet*, 8(1), 55–71.

<https://doi.org/10.1002/poi3.109>

- Cormack, L. (2016a). Extremity in Congress: Communications versus Votes. *Legislative Studies Quarterly*, 41(3), 575–603. <https://doi.org/10.1111/lsq.12126>
- Cormack, L. (2016b). Gender and vote revelation strategy in the United States Congress. *Indian Journal of Gender Studies*, 25(6), 626–640.
<https://doi.org/10.1080/09589236.2015.1078228>
- Cox, G. W., & McCubbins, M. D. (1993). *Legislative Leviathan: Party Government in the House (California series on social choice and political economy; 23)*. University of California Press.
- Dearing, J. W., & Rogers, E. M. (1996). *Agenda-setting*. Sage Publications, Inc.
<https://doi.org/10.4135/9781452243283>
- Denny, M. J., & Spirling, A. (2018). Text preprocessing for unsupervised learning: Why it matters, when it misleads, and what to do about it. *Political Analysis*, 26(2), 168–189.
<https://www.cambridge.org/core/journals/political-analysis/article/text-preprocessing-for-unsupervised-learning-why-it-matters-when-it-misleads-and-what-to-do-about-it/AA7D4DE0AA6AB208502515AE3EC6989E>
- Domke, D., Watts, M. D., Shah, D. V., & Fan, D. P. (1999). The Politics of Conservative Elites and the “Liberal Media” Argument. *The Journal of Communication*, 49(4), 35–58.
<https://doi.org/10.1111/j.1460-2466.1999.tb02816.x>
- Druckman, J. N., Hennessy, C. L., Kifer, M. J., & Parkin, M. (2009). Issue Engagement on Congressional Candidate Web Sites, 2002—2006: *Social Science Computer Review*, 28(1), 3–23. <https://doi.org/10.1177/0894439309335485>
- Egan, P. J. (2013). *Partisan Priorities: How Issue Ownership Drives and Distorts American Politics*. Cambridge University Press.
- Entman, R. M. (2003). Cascading Activation: Contesting the White House’s Frame After 9/11. *Political Communication*, 20(4), 415–432. <https://doi.org/10.1080/10584600390244176>

- Evans, H. K. (2016). Do women only talk about “female issues”? Gender and issue discussion on Twitter. *Online Information Review*, 40(5), 660–672.
<https://doi.org/10.1108/OIR-10-2015-0338>
- Evans, H. K., & Clark, J. H. (2016). “You Tweet Like a Girl!”: How Female Candidates Campaign on Twitter. *American Politics Research*, 44(2), 326–352.
<https://doi.org/10.1177/1532673X15597747>
- Evans, H. K., Cordova, V., & Sipole, S. (2014). Twitter Style: An Analysis of How House Candidates Used Twitter in Their 2012 Campaigns. *PS, Political Science & Politics*, 47(2), 454–462. <https://doi.org/10.1017/S1049096514000389>
- Evans, H. K., Habib, J., Litzen, D., Jose, B. S., & Ziegenbein, A. (2019). Awkward Independents: What Are Third-Party Candidates Doing on Twitter? *PS, Political Science & Politics*, 52(1), 1–6. <https://doi.org/10.1017/S1049096518001087>
- Evans, H. K., Ovalle, J., & Green, S. (2016). Rockin’ robins: Do congresswomen rule the roost in the Twittersphere? *Journal of the Association for Information Science and Technology*, 67(2), 268–275. <https://doi.org/10.1002/asi.23383>
- Gainous, J., & Wagner, K. M. (2014). *Tweeting to Power: The Social Media Revolution in American Politics*. Oxford University Press.
- Gelman, A., & Su, Y.-S. (2018). *arm: Data Analysis Using Regression and Multilevel/Hierarchical Models*. <https://CRAN.R-project.org/package=arm>
- Golbeck, J., Auxier, B., Bickford, A., Cabrera, L., Conte McHugh, M., Moore, S., Hart, J., Resti, J., Rogers, A., & Zimmerman, J. (2018). Congressional twitter use revisited on the platform’s 10-year anniversary. *Journal of the Association for Information Science and Technology*, 69(8), 1067–1070. <https://doi.org/10.1002/asi.24022>
- Green, M. N. (2015). *Underdog Politics: The Minority Party in the U.S. House of*

Representatives. Yale University Press.

<https://play.google.com/store/books/details?id=r0PwBQAAQBAJ>

Grimmer, J. (2010). A Bayesian Hierarchical Topic Model for Political Texts: Measuring Expressed Agendas in Senate Press Releases. *Political Analysis: An Annual Publication of the Methodology Section of the American Political Science Association*, 18(1), 1–35.
<https://doi.org/10.1093/pan/mpp034>

Grimmer, J. (2013). *Representational Style in Congress: What Legislators Say and Why It Matters*. Cambridge University Press.

Groeling, T. (2010). *When Politicians Attack: Party Cohesion in the Media*. Cambridge University Press.

Gronke, P., & Cook, T. E. (2007). Disdaining the Media: The American Public's Changing Attitudes Toward the News. *Political Communication*, 24(3), 259–281.
<https://doi.org/10.1080/10584600701471591>

Gulati, G. J., & Williams, C. B. (2007). Closing the gap, raising the bar: Candidate web site communication in the 2006 campaigns for congress. *Social Science Computer Review*, 25(4), 443–465. <https://doi.org/10.1177/0894439307305624>

Hammond, S. W. (2001). *Congressional Caucuses in National Policymaking*. John Hopkins University Press.

Hayes, D., & Lawless, J. L. (2016). *Women on the Run: Gender, Media, and Political Campaigns in a Polarized Era*. Cambridge University Press.

Hayes, D., Lawless, J. L., & Baitinger, G. (2014). Who Cares What They Wear? Media, Gender, and the Influence of Candidate Appearance. *Social Science Quarterly*, 95(5), 1194–1212.
<https://doi.org/10.1111/ssqu.12113>

Hemphill, L., Otterbacher, J., & Shapiro, M. (2013a). What's Congress Doing on Twitter?

- Proceedings of the 2013 Conference on Computer Supported Cooperative Work*, 877–886.
<https://doi.org/10.1145/2441776.2441876>
- Hemphill, L., Otterbacher, J., & Shapiro, M. (2013b). What's congress doing on twitter?
Proceedings of the 2013 Conference on Computer Supported Cooperative Work, 877–886.
<https://doi.org/10.1145/2441776.2441876>
- Hemphill, L., & Schöpke-Gonzalez, A. M. (2019, September 17). Two Computational Models for Analyzing Political Attention in Social Media. *Proceedings of the Fourteenth International AAI Conference on Web and Social Media - ICWSM 2020*. <http://arxiv.org/abs/1909.08189>
- Huddy, L., & Terkildsen, N. (1993). Gender Stereotypes and the Perception of Male and Female Candidates. *American Journal of Political Science*, 37(1), 119–147.
<https://doi.org/10.2307/2111526>
- Jungherr, A. (2014). The Logic of Political Coverage on Twitter: Temporal Dynamics and Content. *The Journal of Communication*, 64(2), 239–259.
<https://doi.org/10.1111/jcom.12087>
- Kingdon, J. W. (1989). *Congressmen's Voting Decisions*. University of Michigan Press.
- LaMarre, H. L., & Suzuki-Lambrech, Y. (2013). Tweeting democracy? Examining Twitter as an online public relations strategy for congressional campaigns'. *Public Relations Review*, 39, 360–368. <https://doi.org/10.1016/j.pubrev.2013.07.009>
- Lassen, D. S., & Brown, A. R. (2011). Twitter: The Electoral Connection? *Social Science Computer Review*, 29(4), 419–436. <https://doi.org/10.1177/0894439310382749>
- Lee, F. E. (2004). Bicameralism and Geographic Politics: Allocating Funds in the House and Senate. *Legislative Studies Quarterly*, 29(2), 185–213.
<https://doi.org/10.3162/036298004X201140>
- Lee, T.-T. (2005). The Liberal Media Myth Revisited: An Examination of Factors Influencing

- Perceptions of Media Bias. *Journal of Broadcasting & Electronic Media*, 49(1), 43–64.
https://doi.org/10.1207/s15506878jobem4901_4
- Mann, T. E., & Ornstein, N. J. (1981). *The New Congress*. American Enterprise Institute Press.
- Mayhew, D. R. (1974). *Congress: The Electoral Connection*. Yale University Press.
- McCombs, M. E., & Shaw, D. L. (1972). The Agenda-Setting Function of Mass Media. *Public Opinion Quarterly*, 36(2), 176–187. <https://doi.org/10.1086/267990>
- Mikolov, T., Chen, K., Corrado, G., & Dean, J. (2013). Efficient Estimation of Word Representations in Vector Space. In *arXiv [cs.CL]*. arXiv. <http://arxiv.org/abs/1301.3781>
- Morris, J. S. (2001). Reexamining the Politics of Talk: Partisan Rhetoric in the 104th House. *Legislative Studies Quarterly*, 26(1), 101–121. <https://doi.org/10.2307/440405>
- Niu, L., Dai, X., Zhang, J., & Chen, J. (2015). Topic2Vec: Learning distributed representations of topics. *2015 International Conference on Asian Language Processing (IALP)*, 193–196.
<https://doi.org/10.1109/IALP.2015.7451564>
- Pearson, K., & Dancey, L. (2011). Elevating Women's Voices in Congress: Speech Participation in the House of Representatives. *Political Research Quarterly*, 64(4), 910–923.
<https://doi.org/10.1177/1065912910388190>
- Peterson, R. D. (2012). To tweet or not to tweet: Exploring the determinants of early adoption of Twitter by House members in the 111th Congress. *The Social Science Journal*, 49(4), 430–438. <https://doi.org/10.1016/j.soscij.2012.07.002>
- Petrocik, J. R. (1996). Issue ownership in presidential elections, with a 1980 case study. *American Journal of Political Science*, 40, 825–850.
http://darp.lse.ac.uk/Frankweb/courses/Ec501/petrocik_issue_ownership.pdf
- Purpura, S., & Hillard, D. (2006). Automated classification of congressional legislation. *Dg.o '06 Proceedings of the 2006 International Conference on Digital Government Research*. 2006

International Conference on Digital Government Research, San Diego, CA, USA.

<https://doi.org/10.1145/1146598.1146660>

Quinn, K. M., Monroe, B. L., Colaresi, M., Crespín, M. H., & Radev, D. R. (2010). How to Analyze Political Attention with Minimal Assumptions and Costs. *American Journal of Political Science*, 54(1), 209–228. <https://doi.org/10.1111/j.1540-5907.2009.00427.x>

Rocca, M. S., & Gordon, S. B. (2010). The Position-taking Value of Bill Sponsorship in Congress. *Political Research Quarterly*, 63(2), 387–397.

<https://doi.org/10.1177/1065912908330347>

Rocca, M. S., Sanchez, G. R., & Morin, J. L. (2011). The Institutional Mobility of Minority Members of Congress. *Political Research Quarterly*, 64(4), 897–909.

<https://doi.org/10.1177/1065912910379225>

Rohde, D. W. (1991). *Parties and Leaders in the Postreform House*. University of Chicago Press.

Russell, A. (2017). U.S. Senators on Twitter: Asymmetric Party Rhetoric in 140 Characters. *American Politics Research*, 1532673X17715619.

<https://doi.org/10.1177/1532673X17715619>

Russell, A. (2018). The Politics of Prioritization: Senators' Attention in 140 Characters. *Forum*, 16(2), 331–356. <https://doi.org/10.1515/for-2018-0020>

Russell, A., & Wen, J. (2019). From Rhetoric to Record: Measuring Expressed and Legislative Agendas in Congress. *APSA 2019*. American Political Science Association Meeting, Washington, D.C.

Scherpereel, J. A., Wohlgemuth, J., & Lievens, A. (2017). Does Institutional Setting Affect Legislators' Use of Twitter? *Policy & Internet*.

<http://onlinelibrary.wiley.com/doi/10.1002/poi3.156/full>

- Shapiro, M. A., & Hemphill, L. (2017). Politicians and the Policy Agenda: Does Use of Twitter by the U.S. Congress Direct New York Times Content? *Policy & Internet*, 9(1), 109–132.
<https://doi.org/10.1002/poi3.120>
- Sheingate, A. D. (2006). Structure and Opportunity: Committee Jurisdiction and Issue Attention in Congress. *American Journal of Political Science*, 50(4), 844–859.
<https://doi.org/10.1111/j.1540-5907.2006.00219.x>
- Shepsle, K. A. (1979). Institutional Arrangements and Equilibrium in Multidimensional Voting Models. *American Journal of Political Science*, 23(1), 27–59.
<https://doi.org/10.2307/2110770>
- Shepsle, K. A., & Weingast, B. R. (1987). The Institutional Foundations of Committee Power. *The American Political Science Review*, 81(1), 85–104. <https://doi.org/10.2307/1960780>
- Shoemaker, P. J., & Reese, S. D. (1991). *Mediating the message: theories of influences on mass media content*. Longman.
<https://play.google.com/store/books/details?id=AtdhAAAAMAAJ>
- Straus, J. R., Glassman, M. E., Shogan, C. J., & Smelcer, S. N. (2013). Communicating in 140 Characters or Less: Congressional Adoption of Twitter in the 111th Congress. *PS: Political Science & Politics*, 46(1), 60–66. <https://doi.org/10.1017/S1049096512001242>
- Straus, J. R., Williams, R., Shogan, C., & Glassman, M. E. (2014). *Social Media as a Communication Tool in Congress: Evaluating Senate Usage of Twitter in the 113th Congress* (ID 2452781). Social Science Research Network.
<http://papers.ssrn.com/abstract=2452781>
- Venables, W. N., & Ripley, B. D. (2002). *Modern Applied Statistics with S*. Springer Science+Business Media.
- Wagner, K. M., Gainous, J., & Holman, M. R. (2017). I Am Woman, Hear Me Tweet! Gender

Differences in Twitter Use among Congressional Candidates. *Journal of Women, Politics & Policy*, 38(4), 430–455. <https://doi.org/10.1080/1554477X.2016.1268871>

Watts, M. D., Domke, D., Shah, D. V., & Fan, D. P. (1999). Elite Cues and Media Bias in Presidential Campaigns: Explaining Public Perceptions of a Liberal Press. *Communication Research*, 26(2), 144–175. <https://doi.org/10.1177/009365099026002003>

Woon, J. (2008). Bill Sponsorship in Congress: The Moderating Effect of Agenda Positions on Legislative Proposals. *The Journal of Politics*, 70(1), 201–216.
<https://doi.org/10.1017/s0022381607080140>