*Article*

Social Science Computer Review
1-21

DOI: 10.1177/0894439315595483
ssc.sagepub.com



# Ideological Extremity and Success in Primary Elections: Drawing Inferences From the Twitter Network

**Aaron S. King[1], Frank J. Orlando[2], and David B. Sparks[3]**

**Abstract**

Many cite the growing tendency of political parties to nominate ideologically extreme candidates in U.S. primary elections as a reason for increasing congressional polarization. However, a lack of quantitative data on candidate ideology makes this claim difficult to test. We propose a unique solution to this problem that exploits data from the increasingly popular realm of social media by estimating ideal points for candidates for the U.S. Senate based on the patterns of connections in their Twitter social network. We identify a latent ideological dimension from the matrix of following relations, which corresponds closely to roll call–based estimates for congressional officeholders. Controlling for other relevant factors, we find support for the hypothesis that ideological extremity is advantageous in party primaries.

**Keywords**

social media, Twitter, congressional primary elections, ideology, network analysis

The ideology of actors in the public arena is not only inherently interesting but also has a bearing on political outcomes with consequences for everyone in the polity at large. The concept of ideology is central to many models of institutional and electoral politics, often formulated as a unidimensional left-right/liberal-conservative continuum, which lends itself well to spatial models of politics.

As such, the measurement of ideology has been an evergreen source of exploration for political scientists, particularly methodologists and congressional scholars. Various studies have used interest group ratings (Groseclose, Levitt, & Snyder, 1999; Jackson & Kingdon, 1992), roll call votes (Ansolabehere, Snyder, & Stewart, 2001a; Hetherington, 2001; Poole & Rosenthal, 2007), surveys like Project Vote Smart (Koch, 2002; Ringquist & Dasse, 2004) and the National Political Awareness Test (Ansolabehere, Snyder, & Stewart, 2001b), press releases (Grimmer, 2010), and campaign

[1] University of North Carolina Wilmington, Wilmington, NC, USA
[2] Saint Leo University, Saint Leo, FL, USA
[3] Boston Celtics, Boston, MA, USA

**Corresponding Author:**
Aaron S. King, University of North Carolina Wilmington, 601 S. College Road, Wilmington, NC 28403, USA.
Email: kinga@uncw.edu

contributions (Bonica, 2013; Hall, 2015) in an attempt to measure the ideology of legislators. These scholars use a variety of statistical tools from simple dimensionality-reducing techniques like singular value decomposition and principal component analysis to more formalized model-based maximum likelihood estimates and Bayesian approaches.

Having access to a valid and reliable measure of candidate ideology is fundamental. There are several readily available measures of ideology for members of Congress, typically based on roll call voting records. These measures are helpful for candidates who already have a voting record but leave researchers in the dark about the relative ideology of politicians who lack legislative experience. In accord with other recent scholarship (Barbera, 2015), we believe Twitter is a valuable data source that allows scholars to expand greatly the universe of individuals whose positions we can map, allowing us to greatly democratize our understanding of ideology in the public sphere. Specifically, we focus on the pattern of ties built within that network to gain insight into the political leanings of its users and the political entities they follow.

In this article, we use data from Twitter and network analysis techniques to study the role of candidate extremity in congressional elections—in particular, the 2010 Senate elections—a phenomenon that many believe contributes to partisan polarization. Specifically, we ask the question: Do voters reward ideological extremity in primary elections?

## *Candidate Extremity in Primary Elections*

While Republicans easily gained control of the House after the midterm wave in 2010, they were unable to take control of the Senate. Although there are important differences in electoral institutions between the chambers, most commentators cited candidate ideology as a key reason for the Grand Old Party's (GOP) failure in the Senate and singled out Republican nominees in Nevada, Colorado, and Delaware because of their perceived ideological extremity. In each of these Republican primaries, the eventual nominee beat out a candidate the public perceived as more moderate but failed to defeat their Democratic opponent in the general election. The conventional wisdom maintained that had the more moderate candidate prevailed in the primary, Republicans would have had a better chance to win seats in the Senate. While the idea that primary voters prefer more ideological candidates seems plausible, the lack of a measure for the ideological position of each candidate inhibits empirical testing.

We construct and examine a proxy for candidate ideology grounded in public perception of a politician's extremity but independent of voting behavior. While researchers have begun to use Twitter to analyze a variety of phenomena, both political and otherwise, we use the popular microblogging site in a novel and informative manner to speak to a theory of political science that is challenging to test. By evaluating the account use patterns of both political elites and their Followers, we are able to make objective claims about the perceived ideological placement of interest groups, influential politicians, members of the media, and most importantly for our present purpose, primary candidates.

Many observers note the decline of two party competition as states and congressional districts become more homogenous and distinct from one another (e.g., Abramowitz, Alexander, & Gunning, 2005; Silver, 2012). As a result, primary elections are increasingly important mechanisms for candidate selection. Our research adds to scholarly knowledge of ideological extremity and primary elections, while simultaneously offering a new technique to measure the ideology of other political actors. A better understanding of the role of ideological extremity in primary elections will allow voters, political parties, candidates, and their campaigns to better navigate the difficult balancing act between pleasing both the primary and general election constituency.

We first examine the previous research on this topic and develop the hypothesis that primary voters reward ideological extremity. Then, we detail the construction of our new measure of candidate ideology and provide evidence of its validity. Our results indicate that extremity does result in a

higher rate of success for members of both parties in primary campaigns. We conclude by detailing avenues for future research and the ways in which our new measure of ideology could help resolve a number of questions in political science.

## Previous Work

Both rational choice theorists (Black, 1948; Downs, 1957; Hotelling, 1929) and empiricists (Ansolabehere et al., 2001a) show that candidates located near the median voter enjoy a high level of success. This candidate centrism means that nonideological issues such as incumbency (Mayhew, 1974) or social attachments (Campbell, Converse, Miller, & Stokes, 1960) play a large role in determining the winning candidate.

This steady state of party convergence has largely fallen apart in recent years, as many political scientists have noted the increase in party divergence and polarization (Abramowitz & Saunders, 1998, 2008). Scholars note both candidates and politicians are becoming extreme in their rhetoric on the campaign trail and the way in which they govern once in office (Cox & McCubbins, 2005; Rohde 1991). This evidence calls into question the preexisting theory of Black and Downs, which led to a new generation of scholars attempting to reconcile the implications of those important works with a new empirical reality. Aldrich (1983) discusses the role that party activism plays in forcing cleavages between the two parties and facilitating ideological divergence between the candidates in a general election contest. This work hints at the role of primaries as a reason for this shift, as amateur activists now play a larger role in the selection of candidates as opposed to established old hands and kingmakers in smoke-filled rooms of the past (Aldrich, 1995; Fiorina, Abrams, & Pope, 2010). Recall that candidates must first move toward the median voter of the primary electorate before moving on toward the median voter of the general electorate in their district (Fenno, 1977). As some scholars point out, it is increasingly difficult to slip from one issue position to another and maintain credibility (Hinich & Munger, 1997).

All signs point to the increased significance of primary elections, and yet the volume of work focused specifically on primaries is meager in comparison to the amount of research on general elections for the data-limiting reasons outlined earlier. Most of the research on primary elections deals more with races to occupy the executive branch than those to fill Congress. For example, scholars such as Aldrich (1980) and Bartels (1988) detail the nominating process for the presidency from both analytical and empirical perspectives.

When studying primary elections, it is critical to acknowledge the differences between primary voters and voters in the general election. Different types of constituencies significantly influence the strategy of members of Congress (Fenno, 1978) as well as candidates for office. Candidates must walk a fine line in trying to please the more ideological primary electorate while not straying too far from the more moderate general electorate. Owen and Grofman (2006) develop a formal model of voter choice and candidate positioning in primary campaigns where the voter's utility function includes a candidate's likelihood of success in the general election as well as the degree of ideological proximity between themselves and the candidate. They find that parties will diverge and candidates will locate in between the median primary voter and median general election voter, with a slight bias toward that of the general election.

While there has been less research on congressional primaries, several scholars are now finding a link between polarization and primary activity. Compared to the general electorate, the more partisan and ideological primary electorate is one of the culprits for party polarization in Congress (Jacobson, 2008). Gerber and Morton (1998) analyze the role of the institutional context in primary elections, and they find that states that employ closed primary rules are the most likely to nominate extreme candidates. On the other hand, some scholars fail to find a link between primary elections and polarization in Congress (Hirano, Snyder, Ansolabehere, & Hansen, 2010).

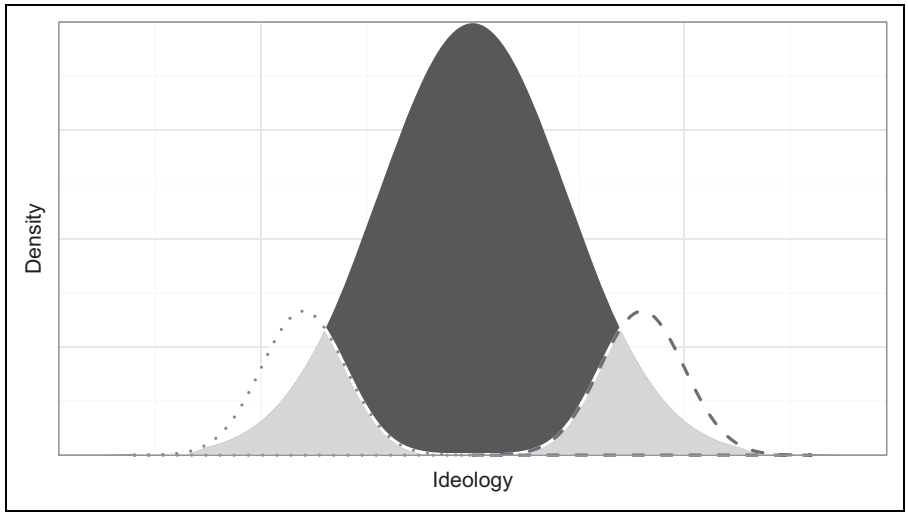


**Figure 1.** Theoretical distribution of voter ideological preferences from more liberal (left) to more conservative (right), with primary electorates to the left (Democrats) and right (Republicans), and general election voters spanning the entire space. Such a distribution of preferences suggests that ideological extremity is an advantage in primary elections, especially relative to general electoral competition.

We pay particular attention to Brady, Han, and Pope (2007), who find that extreme candidates are more successful in primary elections when compared to their more moderate colleagues. While their study covers many campaigns over a long period, they also face a major methodological hurdle. They can only focus on primary campaigns that feature members that will have a voting record, as they use NOMINATE (Nominal Three-Step Estimation) scores (Poole & Rosenthal, 2007) as a proxy for candidate ideology. While this has many advantages, there are several drawbacks. First, this method measures candidate activity in Congress, which may not reflect the perception of that candidate's ideology among the voting public. When conducting a study of voter evaluations of candidates, perceived ideology is more relevant than ideology as inferred from roll call votes. The largest problem with their measure is the number of lost cases it produces. Since many primary candidates will never have a voting record, scholars must throw out a sizable chunk of observations. This issue has been a scourge of primary researchers, and while there are some alternative measures, we believe that we have found a preferable solution.

## *Competition for Votes in Primary Elections*

Following an examination of the literature, we divide the research on this issue into two broad theoretical perspectives. We first consider the *extremity perspective*, where the more ideological primary electorate rewards candidates in close proximity to themselves. Then, we discuss the *moderation perspective*. Here, primary voters support candidates who will be more viable in the general election. While we believe the current political climate rewards extremity, we also acknowledge several important points from the scholarship on moderation.

*The extremity perspective.* This approach theorizes that there is an electoral advantage for candidates who take more extreme positions (within reason). An important aspect of this theory stems from the median voter theorem applied to primary elections. Figure 1 depicts the density of voter ideologies along a single liberal/conservative dimension. The more central and massive distribution represents

the general electorate, while the less-populous densities on either side represent primary electorates. We expect that primary candidates who locate themselves at their own party's primary electorate median, potentially even at the expense of their general appeal, are more likely than more moderate candidates to win their party's nomination, ceteris paribus.

Turnout in primary elections by members of a party is generally much lower than what we observe in general elections. When thinking about the costs of participating in elections, from the time standing in line or the effort necessary to determine whom to vote for, there are several justifications for our belief that those who do turn out are more extreme in their beliefs than those who do not. The cost of participating in primary elections is especially high because voters lack the most important political heuristic, party identification. Looking back at Figure 1, the most engaged and informed voters from both parties occupy the tails of the distribution (Burden, 2001). While uninformed voters may spend a great deal of effort attempting to divine the candidate closest to them on a variety of issue positions, the informational advantage of the more ideological voters lowers the cost of voting in a primary. Relative to the general election, parties and candidates spend less money in reaching out to the electorate. Primaries often receive less media coverage and feature fewer candidate appeals to the public, putting the onus on voters to discover information about the candidates on their own.

Another important reason for the skew toward the extremes in primary electorates is the increased benefit that these voters receive from their preferred candidate winning. If voters receive more utility for casting their ballots for specific candidates, the aforementioned costs of voting are less likely to dissuade them from participating in the election (Riker & Ordeshook, 1968). Voters at the far ends of the distribution have the most to gain from their favorite candidate succeeding, for a variety of reasons. First, their preferred policy position may be far enough away from the median that they have a great deal to lose if their candidate fails. More moderate voters will be relatively indifferent between someone from their own party and the candidate from the other party. More important, however, is the fact that some voters near the extreme of a party's distribution may belong to the activist class. The political and policy goals of activists are closely aligned with the success of their preferred candidates. These individuals are also the most likely to donate money to campaigns, further shifting the ideal point of candidates in a primary campaign toward the tail.

*The moderation perspective.* This perspective contends that voters in primary elections will tend to support candidates who are located somewhere between the general and primary election median voters. As noted above, Owen and Grofman (2006) provide a theoretical justification for this behavior. The utility functions of voters in primaries include not only an ideological component but also a viability component that measures likelihood of success in a general election. Especially in moderate states or districts, extreme candidates have a lower chance of winning the general election, which encourages primary voters to consider candidates who are more moderate.

There is some empirical evidence that this does happen. Abramson, Aldrich, Paolino, and Rohde (2000) examine viability-conscious strategic voting. In their study of presidential elections, a number of voters did not waste their votes on those they felt had little chance of winning, instead looking ahead toward more likely and viable candidates in the general election. According to their findings, because the general electorate median is located between the medians of the two major parties, strategic primary voters in congressional elections should also be loath to nominate candidates who are exceedingly distant from the overall median voter, although the threshold for extremity likely varies based on the electoral climate. Following the logic of the Buckley Rule, voters prefer the most extreme candidate who can win. Of course, this viability threshold changes each election cycle and will likely produce diverse candidates from year to year. In an environment in which almost any nominee of a party will win, voters face no penalty in rewarding extremity. Conversely, in a lean year for the party, we expect primary voters to make more strategic nomination decisions. While

we believe that contemporary primary voters are more ideological than their predecessors are, some voters desire a viable candidate for the general election. Because of this, we cannot dismiss the implications of the moderation perspective, where voters reward viability in the general election.

In addition to viability, other factors may mitigate the movement of candidates toward the extreme. First, our distribution of voters assumes that the nominating process is closed. In a closed primary or caucus, only those voters who have registered as a member of the party determine that party's nominee. In an open or semi-open primary, independents (and sometimes members of the opposite party) can vote in either primary. As the degree of openness increases, the median voter in the primary electorate approaches the general election median. If all voters are acting sincerely, then winning candidates from these elections should be more moderate than candidates nominated through a closed process. Here still, there are a few caveats. First, we cannot assume that voters will not act strategically in open primaries. At the presidential level, one example is the report of Republican voters voting for Hillary Clinton late in the 2008 Democratic presidential nominating process in order to undermine the more likely nominee, Barack Obama (Hillygus & Treul, 2011; Rohter, 2008). Whether at the congressional or presidential level, it is conceivable that members of a party care more about their own nominee than that of their opposition. If true, this constrains the ability of voters to cause mischief, but it also limits the degree to which the median of the electorate moves to the center. Finally, even in states that hold open primaries, the most knowledgeable and impassioned voters, and the campaign resources they provide, reside at the tails of the distribution. All things considered that an open primary should dampen the pull toward the extreme that we might expect in a nominating campaign.

To summarize our main theoretical thrust, it is not extremism in itself that offers an advantage but rather the relative extremism of the primary electorate median. Voters' chief concern is ideological proximity and we expect to see more extreme candidates have more success in primaries because of their ability to resonate with the bulk of the voters in the primary electorate. Still, we borrow from both perspectives by acknowledging that it is at least theoretically possible for a candidate to take a position that is too extreme for their party constituency. We expect to find that the positive effect of extremity is somewhat muted in open nomination processes and that more moderate candidates are more successful when a party is facing an especially unfavorable climate in order to increase the party's likelihood of success in the general election.

## *Twitter as a Data Source*

Online communities like Twitter allow users to opt-in to receiving status updates from a wide variety of other users, which can tell us a lot about not only the users making these decisions but also about the decisions offered to them. This is because in such communities, these decisions are not constrained by monetary cost, public accountability, or even time but rather a function of time, typically thought of as "attention."

The so-called attention economy has been well-covered elsewhere (see, e.g., Davenport & Beck, 2001), but the idea is simply that in an economy with essentially infinite supply and infinite demand (due to zero monetary cost), the limiting factor in consumption is attention. Individuals have only so much attention they can spend and thus will only allocate it to the objects that most reward this attention. One implication of this model of consumption is that consumers will prioritize those things that most interest them, and thus their behavior will reflect their primary interests. In addition, voters cast ballots with only limited information on the candidates (see research on bounded rationality, e.g., Jones, 1994, 2001).

Thus, we expect someone who enjoys listening to National Public Radio (NPR) but does not listen to Rush Limbaugh, if she uses Twitter at all, to be more likely to "follow" the status updates of NPR than those of Limbaugh. We seek to push this logic even further. If we find a bundle of Twitter

accounts together consistently—either all followed by multiple users or all not followed by multiple users—we may infer that each entity in this bundle has something in common.

This wealth of information contained in the social network of Twitter users provides numerous opportunities to social scientists. Scholars have used Twitter sentiment to predict elections in Europe (Sang & Bos, 2012; Tumasjan, Sprenger, Sandner, & Welpe, 2010) and to monitor the effects of political events on public sentiment (Bollen, Mao, & Pepe, 2011; Thelwall, Buckley, & Paltoglou, 2011). Political scientists have also analyzed the adoption (Straus, Glassman, Shogan, & Smelcer, 2013) and use of Twitter by elites in political campaigns (Evans, Cordova, & Sipole, 2014). Finally, researchers have used the microblogging service to analyze questions of political participation by the public (Gibson & Cantijoch, 2013).

## Data Collection

We test our hypothesis that primary voters reward ideological extremity with new data and a novel methodological approach. In order to generate estimates of candidate ideology in the absence of roll call votes or similar records of policy preference, we use data gathered from the online social networking/microblogging service Twitter (http://www.twitter.com).

Leading up to the 2010 primary elections, we identified the 114 Senate primary challengers, 59 incumbent senators, and 211 members of the House of Representatives with active Twitter accounts. While we are interested in the ideological bent of primary candidates, in order to compare our estimate with well-known political actors, we also selected 197 other political figures, members of the media, interest groups, and celebrities with a Twitter presence, the majority of whom have either formal or widely known informal connections to major political parties or causes. Although we chose these additional actors in an ad hoc manner, our intent was to reflect the zeitgeist during the primary campaigns. Varying the specific composition of this group does not change our results. They are included to evaluate our contention that the ideology of even nonexplicit partisans can be unearthed with this method. We limited the number of additional actors in order to maintain the computational tractability of the scaling procedure. Of the entire set of accounts, 183 are Democrats and 219 are Republicans, which reflects the slightly larger GOP presence on the site in 2010.

Twitter users typically use the service to convey information about their locations, activities, opinions, or conversations, in the form of 140-character (or fewer) status updates. Individuals can select other users' accounts to follow to keep them updated on others' status messages. The set of individuals "following" an account are collectively known as "Followers," while those followed by a given user are typically called "Friends." Thus, we can describe the entire set of relations on the site as a directed network of following relations. Figure 2 illustrates this network for the set of 581 "elites" for whom we collected data. Triangles represent Republicans and circles represent Democrats. There is a clear modularity in the network, clustering Democrats/liberals and Republicans/conservatives.

Using the Twitter application program interface, we collected the list of Followers and Friends for each of the users in our set,[1] giving us two massive person-to-group network adjacency matrices, with 3,782,182 unique Followers and 1,276,579 unique Friends. An alternative way to view these data is as two sets of several million observations on several hundred variables—each a binary measure of whether or not a given user follows (or is followed by) one of the individuals in our set of elites.

## Estimating a Latent Ideological Space

Such data are amenable to the use of data reduction techniques, of which principal component analysis and Poole and Rosenthal's (2007) NOMINATE procedure are well-known examples. We take a

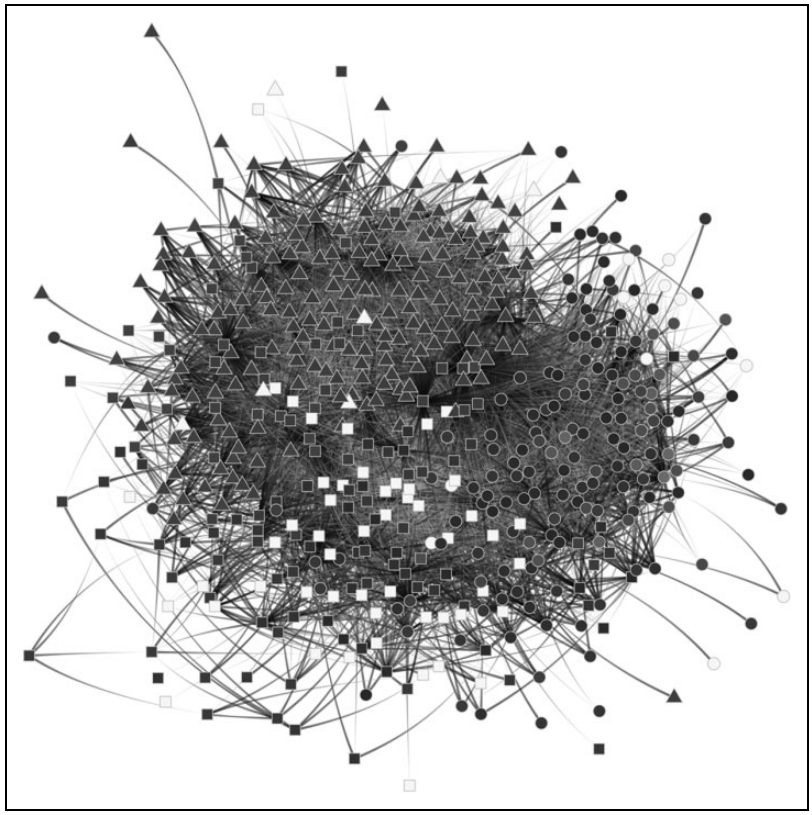

**Figure 2.** The elite-to-elite following relations network. Triangles represent Republicans and circles represent Democrats, while political elites without an explicit partisan affiliation are squares. Vertices without shading represent elites for whom we were unable to obtain a complete set of network ties.

similar approach to identify the latent space that best characterizes Twitter users' follow/not-follow decisions.

We adopt the process used by Weisberg and Rusk (1970) and Jacoby and Armstrong (2014) to estimate the latent ideological space underlying evaluations of political figures. We calculate a correlation matrix for our set of Twitter elites, based exclusively on the set of mass users' binary follow/not-follow decisions. This correlation matrix represents each Twitter elite in a multidimensional space, so we then calculate the Euclidean distance between each account based on these correlations, so that users who evince a similar pattern of correlations are more proximate/similar.

We are interested in identifying whether there appears to be any latent structure driving the (dis)similarities between accounts, so multidimensional scaling is a natural choice. As Jacoby and Armstrong note, "Within the [MDS] scaled point configuration, clusters of points may correspond to groups of stimuli that are distinct from each other .... And directions within the space may correspond to properties of the objects that vary in a more continuous manner" (2014, p. 265). Accordingly, we run Kruskal's (1964a, 1964b; Venables & Ripley, 2002) nonmetric multidimensional scaling algorithm on the distance matrix, to identify the arrangement in two-dimensional space that best fits the observed pattern of correlations.[2]

We apply this process to both the Followers and Friends data, giving us two sets of multidimensional scalings for our users of interest. As with any such dimensionality-reducing technique, interpretation of the resulting dimensions is subjective, although in the present case, clear. The first dimensions of both

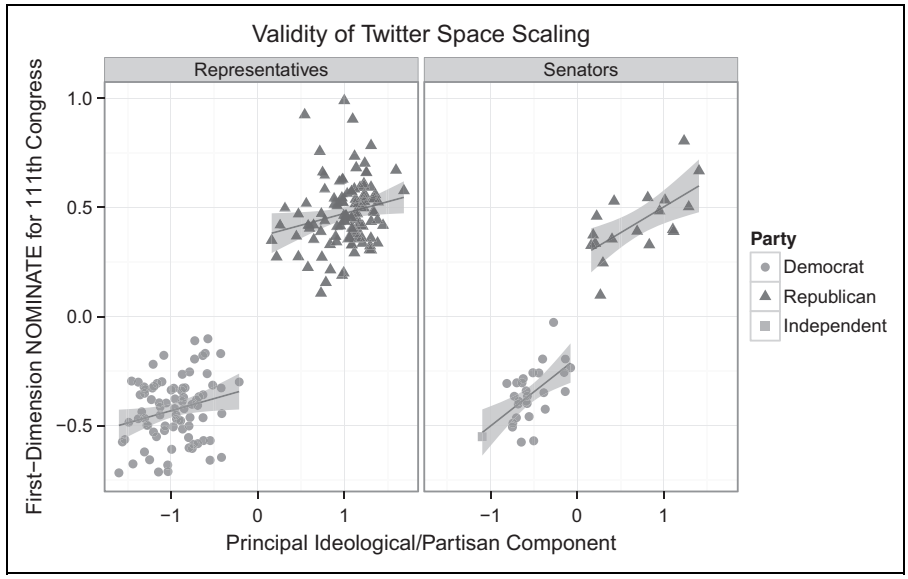


**Figure 3.** Twitter-based estimates of elected officials' ideology correspond closely to Poole and Rosenthal's roll call–based W-NOMINATE estimates. The correlation is strongest among Senators and within the Republican party.

Follow and Friend space correlate with the number of connections in each set of ties, thus we characterize it to represent popularity, accessibility, or duration of presence on the network.

The second dimension of both mappings is clearly ideological/partisan. As a validity check, we compare locations in this second dimension to a widely used roll call–based estimate of congressional ideology, Poole and Rosenthal's (2007) W-NOMINATE (Weighted Nominal Three-Step Estimation) scores. We find that the second dimension of the Friend-based space correlates with the first dimension of W-NOMINATE at 0.600 for senators and 0.786 for representatives. Interestingly, the Follower-based estimates correspond even more closely to the roll call record, correlating at 0.934 for senators and 0.923 for representatives. To be sure, we should expect some differences in ideology as perceived by members of the public as measured through following behavior and ideology as expressed through voting behavior in Congress, hence the imperfect, though very high, correlations.

For comparison, Bonica (2013) uses political action committee (PAC) contributions to arrive at estimates for the ideology of candidates. On average, he reports his measure correlates closely with DW-NOMINATE (Dynamic, Weighted Nominal Three-Step Estimation) scores ($r = 0.9$). For the purposes of understanding voting behavior, we believe our public opinion–based measure developed here is more appropriate for studying primary elections. Just as political parties have an incentive to wait until candidates have won the nomination before supporting them, PACs have a similar incentive to wait. As Bonica discusses, previous research shows that PACs have a complicated decision calculus when allocating funds and must consider factors like incumbency, competitiveness, and majority status.

To arrive at our ultimate Twitter-based ideology estimate, we use the sum of each individual's Follower- and Friend-based estimates[3] in an attempt to improve scale reliability and reduce the effects of measurement error, and rescale these sums by a constant, so that they are on the same approximate scale as NOMINATE estimates. We call this final scaled estimate the primary ideological/partisan component (PIPC).

Figure 3 depicts the relationship between the Twitter-based PIPC and W-NOMINATE scores for members of the 111th House and Senate. As the figure shows, the PIPC perfectly separates the two

parties and discriminates ideological positions relatively well within parties.[4] As Figure 4 illustrates, a cut point exists along the PIPC dimension that correctly classifies all senators and nearly all Senate primary candidates by party. It is also worth noting that Republican candidates affiliated with the Tea Party occupy the rightmost tail of the distribution. There is a similar pattern among the various other politicians, media entities, interest groups, and celebrities for whom we estimated PIPC values (see Figure A1 in Appendix A).

While we believe Twitter data offer a new strategy for unraveling some of this complexity, we must make several assumptions prior to analyzing these data. First, we assume candidates have some level of control over their Twitter account. Some candidates may control all aspects of their Twitter activity (e.g., composing tweets, following other users, etc.), while others may delegate this task to a campaign staffer. In either case, we believe candidates have a significant incentive to monitor their account in order to ensure their electoral name brand remains strong. There is evidence that members of Congress use Twitter to connect with members of the media (e.g., Amira, 2013), and our procedure reveals a first dimension that correlates closely with popularity and exposure. Still, we uncover a second dimension that reveals a clear ideological pattern.

Second, we assume our findings generalize outside of this sample of Senate candidates. As we collected information from Twitter accounts leading up to the primary elections in 2010, some candidates were not active social media users. Out of the 206 candidates in primary elections, 61.2% had active accounts. As this form of communication has continued to increase in popularity since then, we suspect Twitter data are even more informative today. Finally, it is important to note that we do not make any *a priori* assumptions about the ideology of Senate candidates or their followers. Our scaling procedure is agnostic in this respect and simply finds a spatial representation that best explains the similarities between candidates' Twitter account behavior. As discussed above, the first dimension primarily reflects popularity or exposure on Twitter and the second dimension represents ideology.

## Comparison to Other Approaches

There are two main advantages to our approach, relative to that taken elsewhere in the literature on ideological scaling. The first is one of scope. The use of congressional roll call votes as a basis for ideological estimates is familiar and has been done well, notably by Poole and Rosenthal (2007) and Clinton, Jackman, and Rivers (2004). Others have sought to expand the scope of these studies to all American legislatures (Shor & McCarty, 2011) and all campaign contributors and recipients (Bonica, 2013). Our use of Twitter data expands the potential pool to the hundreds of millions of monthly active users of the site, and further, allows instantaneously updated dynamic estimates, as users follow and unfollow a set of political elites whose ideal points shift over time. Unlike survey responses or campaign contributions, Twitter trace data are essentially costless to our population of interest and are expressed on a voluntary basis. For the application explored here, we need not constrain ourselves to primary candidates who have served in a U.S. lawmaking institution or given or received campaign contributions. Rather, the threshold for inclusion in our study is a Twitter presence, which is increasingly becoming ubiquitous among anyone who would consider contending for public office.

The second benefit to our approach is methodological and is required by our use of social media trace data. Roll calls or surveys offer lawmakers/respondents several options, and their preferences are encoded as yea/nay/abstain. The follow/unfollow decision, though encoded as a binary, is not the same. While a "one" indicates that the decision to follow has been made and executed by a Twitter user, a "zero" does not necessarily imply that the user has considered the possibility of following an entity but chosen not to. Unlike a roll call vote, it is possible, even likely, that a Twitter user has not considered or even encountered many of the political elites we include in our study. These "excess

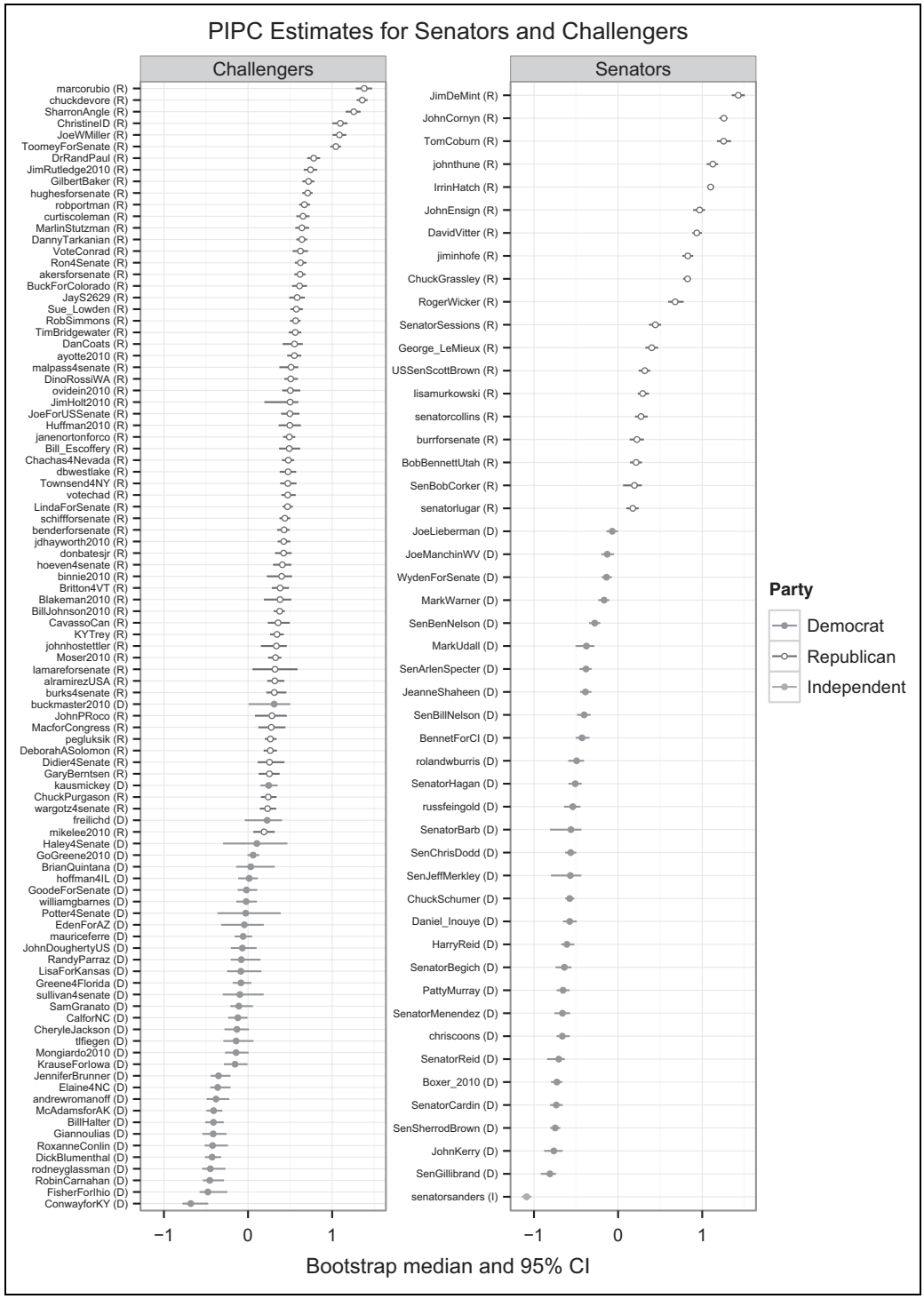


**Figure 4.** Primary ideological/partisan component estimates for Senators and Senate Primary Challengers, with 95% bootstrap confidence intervals. Note the party-separating cut point between the most conservative Democratic Senator (@JoeLieberman) and the most liberal Republican Senator (@senatorlugar).

**Table 1.** Variables and Expectations.

| | | | | Expected Relationship | |
|---|---|---|---|---|---|
| | Min | Max | Mean | Vote Share Model | Win Primary Model |
| PIPC score | −0.791 | 1.397 | 0.234 | | |
| *Democrats* | −0.791 | 0.236 | −0.233 | Negative | Negative |
| *Republicans* | 0.179 | 1.397 | 0.574 | Positive | Positive |
| Open primary | 0 | 1 | 0.315 | | |
| PIPC Score × Open | −0.737 | 1.397 | 0.079 | | |
| *Democrats* | −0.737 | 0.236 | −0.037 | Positive | Positive |
| *Republicans* | 0 | 1.397 | 0.157 | Negative | Negative |
| Disbursement ratio | 0 | 1 | 0.345 | Positive | Positive |
| Obama state | −0.193 | 0.193 | −0.022 | | |
| Candidates in race | 1 | 5 | 3.553 | Negative | Negative |

*Note.* Variable descriptions: PIPC score =The primary ideological/partisan component score is a measure for the perceived ideology of important political actors, such as candidates, officeholders, news personalities, interest groups, and so on. Similar to NOMINATE scores, more conservative actors have higher PIPC scores, while actors who are more liberal have lower scores; Open primary = An indicator variable denoting whether or not the Republican or Democratic primary has open participation rules, meaning voters can participate in a primary regardless of their (or lack of) partisan registration status; PIPC Score × Open = An interaction variable to account for asymmetric effect of open primaries for different PIPC scores; Disbursement ratio = The total campaign disbursements of each candidate divided by the total amount of disbursements for all candidates in each individual primary race; Obama state = A variable that controls for ideological differences between states. We subtract President Obama's national two-party vote share in 2008 (53.68%) from his two-party vote share in each state. States that are more conservative have negative values, while states that are more liberal have positive values; Candidates in race = A count variable to measure the number of candidates in each individual primary race.

zeroes'' mean that the methods used for scaling roll call votes are not well-suited to our data. In light of this issue, we follow the more general multidimensional scaling approach described above, first reducing our data to a similarity matrix and then finding the best low-dimensional spatial representation of those similarities.

## *Analysis*

If this Twitter-based measure is indeed a valid representation of ideology or partisan extremity, as the foregoing discussion suggests, we can use it to test our hypothesis about ideological extremity and primary electoral success. In order to find the true relationship between our variable of interest and election outcomes, we must control for a variety of causal factors, in addition to ideology. In Table 1, we present the variables for our analysis and include descriptive statistics, expected relationships, and descriptions of each variable.

Our key independent variable is the ideology of each primary candidate (PIPC score). We hypothesize that more extreme candidates will be more successful in primary elections than candidates who are more moderate. We include a dichotomous variable to indicate an open primary, which ought to affect the type of candidate who is successful. Furthermore, we control for the interaction of a candidate's ideology and the presence of an open primary in the hopes of coming closer to the true effect of extremity in an open seat race. Specifically, we expect an open primary will temper the benefits of more ideological positions, as the electorate includes more moderates that are not registered partisans.

The amount of exposure that a candidate receives will have a profound impact on both the candidate's vote share and likelihood of victory. Most studies of congressional general elections find this relationship (e.g., Jacobson, 2008), and there is no reason to believe that the amount of attention a candidate receives is any less correlated with primary success; however, it is relatively difficult to

find an objective variable that measures the degree to which a candidate remains in the consciousness of voters. In the models presented in the next section, we use a measure of financial resources to serve this end; however, some races are more expensive than others are. Specifically, we use data from the Federal Election Commission (FEC) to calculate the total amount of money spent during each primary campaign (according to the preprimary report that candidates are required to file). Then, we take the money spent by each candidate in comparison to the other candidates in the race to obtain a *disbursement ratio*. In other words, we compare the spending habits of candidates relative to their opponents in each primary race.

We also control for state-level ideological characteristics. One could imagine that a conservative Republican in Delaware would fare much worse than a similar-minded candidate in Utah would fare. We construct a continuous variable called *Obama State* that takes the difference between Obama's two party vote in 2008 in each state minus in his two party vote nationwide. We assume states that are more liberal had higher vote shares for President Obama than the national average, while states that are more conservative had vote shares below the national average.[5]

While general elections often pit two candidates against one another, primary elections frequently have multiple candidates. All else equal, more candidates in a race will temper the level of success an individual has in the primary, so we include a count variable in our models as a control.

Knowing how valuable electoral experience is for congressional candidates (Carson, Engstrom, & Roberts, 2007), we collected previous office-holding experience for all candidates in our data set. While the most common measure of experience is a simple binary variable for whether or not an individual has held electoral office, our data also include a more fine-grained measure. While incumbency is a significant factor in primary elections (Ansolabehere, Hansen, Hirano, & Snyder, 2007), the strength of an incumbent in a contested primary varies. Rather than making assumptions about which levels of electoral experience are the most valuable in primary elections, in the results we present here, we use a random effects model to control for different levels of electoral experience.[6]

We are interested in the effect of ideological extremity on both candidates' probability of winning and their degree of electoral support, so we have included models with similar specifications and two different responses. First, we examine a candidate's received vote share. Second, we test our model using a dependent variable that actually marks if the candidate was victorious or not. Specifically, we run these models for each party using the lme4 package in R[7] to estimate linear mixed effects models with random effects for electoral experience.

## Results

Let us first examine the specification with candidate vote share as the dependent variable, as seen in Table 2. Our hypothesis is that voters should reward extremity. Because the PIPC measure associates low numbers with liberalness and high numbers with conservatism, we expect to see opposite-signed effects for each of the two parties. For Democrats, a negative value is associated with increased extremity, and the inverse is true for Republicans. For both parties, extremity increases the vote share of primary candidates. We illustrate the effect of shifts in ideology on vote share in Figure B1 in Appendix B. As a robustness check, we also ran the models with a quadratic term, though it was never significant.[8]

Our expectation that an interaction featuring ideology and primary openness would lead to a lower vote share for more extreme candidates is also borne out for Republicans. In other words, open primaries punish more extreme Republican candidates. For both Republican and Democratic primaries, spending more money than your opponents is a significant predictor of vote share. In addition, as the number of candidates in the race increases, the predicted vote share of candidates naturally decreases.

**Table 2.** Random Effects Mixed Model Predicting Vote Share.

| Vote Share | Democrats ($n = 49$) | Republicans ($n = 71$) |
|---|---|---|
| PIPC score | −0.285** (0.124) | 0.317*** (0.072) |
| Open primary | 0.092 (057) | 0.165** (0.078) |
| PIPC Score × Open | 0.180 (0.176) | −0.266** (0.116) |
| Disbursement ratio | 0.521*** (0.067) | 0.456*** (0.055) |
| Obama state | −0.146 (0.251) | −0.004 (0.177) |
| Candidates in race | −0.046*** (0.017) | −0.071*** (0.014) |
| Constant | 0.283*** (0.079) | 0.285*** (0.075) |
| AIC | −17.1 | −37.8 |
| Log likelihood | 17.6 | 27.9 |
| Deviance | −61.7 | −85.5 |

*Note.* PIPC = primary ideological/partisan component; AIC = Akaike information criterion.
*$p < 0.1$. **$p < 0.05$. ***$p < 0.01$.

**Table 3.** Logit Random Effects Mixed Model Predicting Primary Victory.

| Win Primary | Democrats ($n = 49$) | Republicans ($n = 71$) |
|---|---|---|
| PIPC score | −8.037** (3.724) | 5.932*** (2.091) |
| Open primary | 3.325** (1.600) | 3.208 (2.128) |
| PIPC Score × Open | 9.088* (5.005) | −5.611* (3.209) |
| Disbursement ratio | 4.785** (1.792) | 4.500*** (1.288) |
| Obama state | −7.883 (6.700) | 1.213 (3.692) |
| Candidates in race | 0.326 (0.403) | −0.273 (0.301) |
| Constant | −5.876*** (2.272) | −4.439** (1.851) |
| AIC | 46.9 | 69.4 |
| Log likelihood | −15.4 | −26.7 |
| Deviance | 30.9 | 53.4 |

*Note.* PIPC = primary ideological/partisan component; AIC = Akaike information criterion.
*$p < 0.1$. **$p < 0.05$. ***$p < 0.01$.

When we turn our focus to the logit specification that predicts candidate victory, we find similar core results, with some important distinctions (see Table 3). There is no reason to believe that any of our variables will respond any differently than we expected in our model that predicted vote share. When we examine the estimates for our treatment variable, we find just as before, extremity leads to success in primary elections. As Republicans become more conservative and Democrats more liberal, the odds of winning the primary increase. Once again, adding a quadratic term did not improve the fit of the model nor was the term statistically significant. We find an unexpected result with open primaries increasing Democratic candidates' chance of victory but having no effect on Republican candidates. Examining the interaction with the PIPC scores, open primaries temper the benefit of extremity for both parties. As with the previous model specification, candidates with a higher disbursement ratio are more likely to win the primary, and the control for the ideological leaning of the state was not statistically significant. Knowing the number of candidates in the race does improve our ability to predict a given candidate's odds of winning the election.

Interestingly, while Canes-Wrone, Brady, and Cogan (2002) find that extremity is a good predictor of electoral victory but not of vote share, we find that for both measures, voters reward extremity. Figure B1 in Appendix B shows the predicted probabilities of winning a primary and the predicted vote shares based on the ideology of candidates. Our model predicts that an average Republican

(PIPC = 0.574) would win the primary 42% of the time, while a Republican one standard deviation (SD) further to the right would receive a vote share of about 77%. For the typical Democrat (PIPC = −0.233), we predict the odds of winning the primary at about 23%, while a more liberal Democrat by one SD would increase his or her odds of winning to about 63%.[9]

## Discussion

Our results suggest that ideological extremity is indeed advantageous to those competing for their party's nomination for senatorial candidacy. Just as other scholars of primary elections have encountered, we reached a measurement roadblock when dealing with candidate ideology. We then developed a novel method for perceived ideology that drew data from the popular microblogging site, Twitter. Our estimates of ideology corresponded well with a roll call–based measure of ideology already well accepted in the discipline. Finally, our models employing the new ideology variable show voters rewarded extremity in 2010. We not only find a great deal of support for the extremity perspective but also find that institutional context can serve to moderate our results.

The ability to bring a new methodology to bear on an extant question in the study of ideology and elections is our chief contribution to the current literature. As the use of social media continues to expand, so too will the usefulness of this research. Scholars can apply our technique to the study of ideology in elections across the country and in comparative research. Thanks to the ubiquity of social media data, researchers can measure the impact that differing electoral systems have on candidate selection at all stages of the process. Using this method, political scientists—and researchers from other disciplines—can analyze a bevy of theories with the wealth of data available through Twitter.

Critics of our scaling procedure may argue that we cannot place a true ideological value on a candidate without evaluating the candidate's policy content or without making assumptions about the associations that he or she makes; we would respond that this is a great strength of the method. It is true that we are unable to divine the privately held ideology of the politicians and elites that we measure in our model, but such an endeavor would require extensive case studies for each candidate of interest. Our model does not measure candidates' actual ideology but rather the public perception of their ideological leanings. This means that our technique is limited in its ability to interpret effects of party pressure, ambition, and reelection pursuits on voting behavior in a legislature. For the purposes of predicting electoral outcomes, this is more than sufficient, and it is desirable. Our lack of assumptions about candidate and Follower ideology makes it possible to map members of the media, think tanks, celebrities, members of Congress, and candidates for higher office all on the same scale, something that has escaped other scaling techniques.

As discussed above, the importance of ideology as a concept has led scholars to develop a number of different measurement techniques. Our measure does not invalidate these, but rather it adds a new perspective to our collective understanding of the various ways ideology influences the political process. While we hope to refine and expand on this measure of ideology in the future, we believe that our PIPC scores are an excellent place to start. Moving forward, we plan to formalize aspects of our theory in order to generate more testable predictions. Empirically speaking, we hope to collect and analyze similar data for future campaigns in order to replicate our results. Because of the nature of our data source, it is impossible to work backward, but we feel that the requisite data in the future will be plentiful.

We also look forward to further exploiting the content of Twitter by analyzing the creation and dissemination of tweets, retweets, and hashtags. The prospects for political research, and social science research more generally, that use new data available from social media are great. Given that

social scientists must wrestle with questions that are not always straightforward to answer, we encourage them to continue to think "outside the box" and look for new avenues to address existing questions.

As for the proximate goal of this article, we believe that this research is another step forward in improving our knowledge of primary elections. Our results have significant implications for the literature on polarization and for other aspects of political science. While some research finds value in moderation and appealing to the median voter, primary elections have important consequences in a polarized climate, especially if the ideological gap between the primary and general electorate widens. So long as primary voters remain ideologically polarized, we expect candidates will benefit from staking out increasingly liberal or conservative positions.

## Appendix A

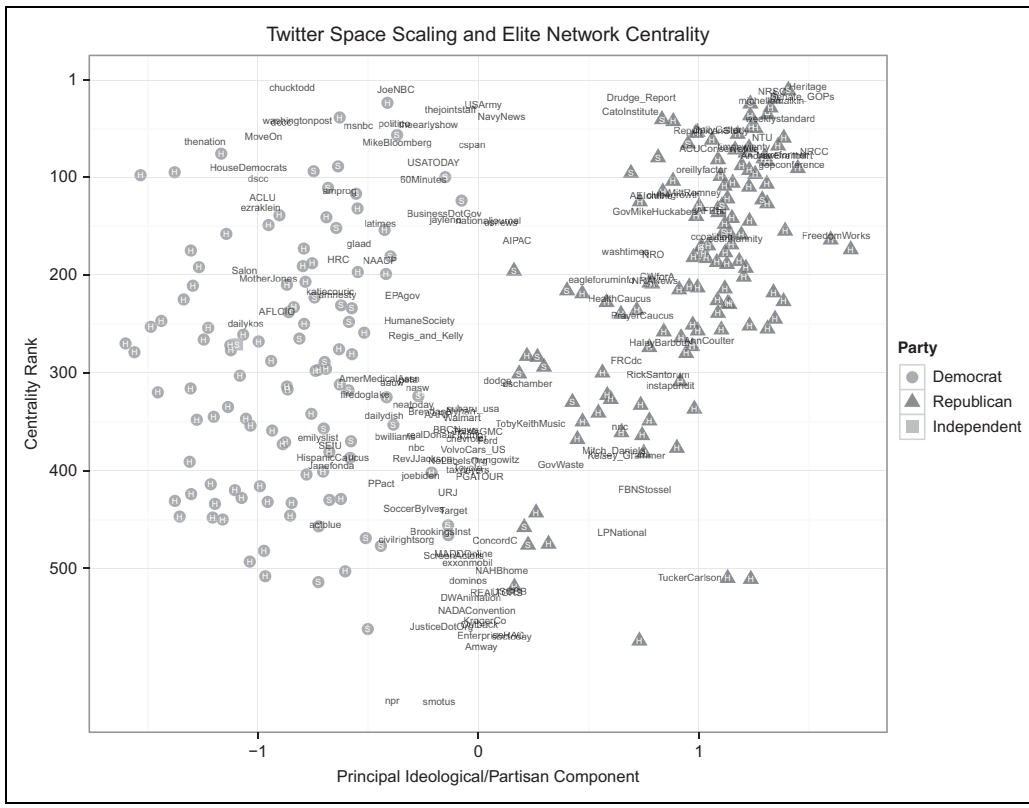


**Figure A1.** Primary ideological/partisan component (PIPC) scores for miscellaneous entities plotted against centrality within the network of political elites on Twitter, superimposed over incumbent members of Congress. Without a roll call–based measure of ideology against which to compare, a subjective evaluation supports our contention that our scaling procedure does in fact unearth a latent ideological dimension, even among nonlegislators.

# Appendix B

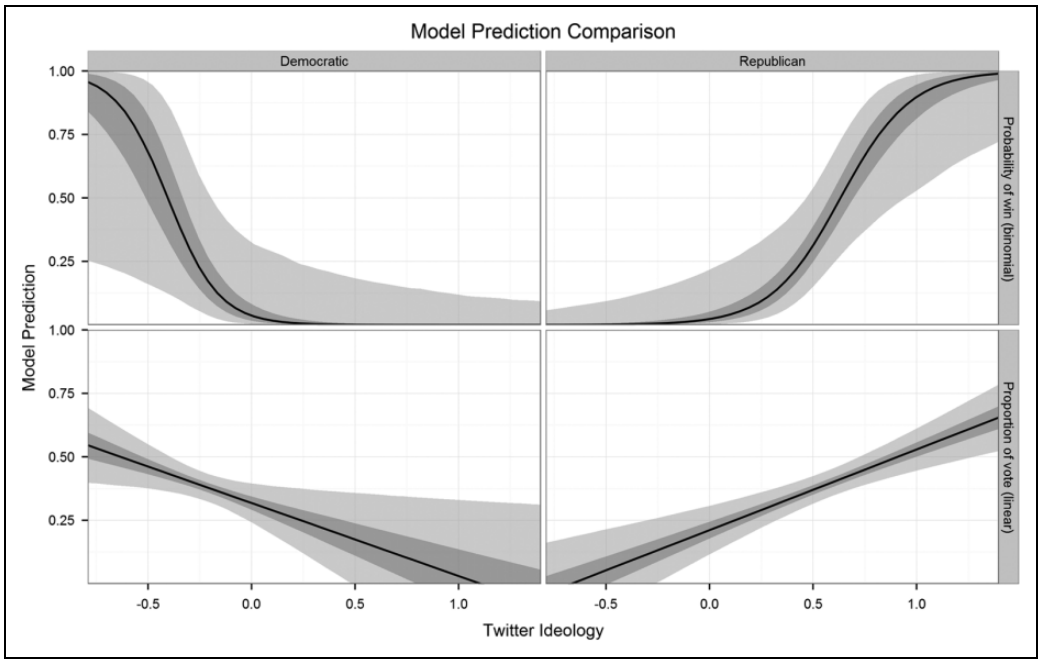


**Figure B1.** Predictions for probability of winning primary election and vote shares, by PIPC score for Republicans and Democrats. To evaluate the effect of shifts in ideology on the probability of winning a primary election, and on vote share, we simulate nonopen seat primaries with three candidates (average disbursement ratio is 1:3). The black line indicates the median simulated prediction, while the dark and light gray bands show the interquartile range and the 95% confidence interval, respectively. Recall that our theory predicted that ideological extremity, within reason, would be beneficial to candidates, holding all else constant. For the Democrats in our sample, the average candidate had PIPC score of $-0.23$ (min $= -0.79$, max $= 0.24$) and a standard deviation (SD) of 0.26. For Republican candidates, the average PIPC score is 0.57 (min $= 0.18$, max $= 1.40$) and an SD of 0.30.

## Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

## Notes

1. Some accounts, such as those of the *New York Times* and Sarah Palin, had several hundred thousand Followers. Due to the vagaries of the methods through which Twitter allows such data to be collected, it was not possible to obtain data for these extremely popular users. Others choose to keep their data private. In either case, we omit these users from the analysis.
2. We also iteratively resample Twitter users and reconstruct adjacency matrices on which to base our scaling. Done 1,000 times, this gives us bootstrapped distributions for our estimates, permitting comparative inferences.

3. Working with two dimensions from the Follower-derived space and the Friend-derived space, we sought to build a scale that maximized Cronbach's $\alpha$. Our scale sums the second dimension of the Follower-derived space, along with the first and second dimensions of the Friend-based space (Cronbach's $\alpha = 0.64$). Unsurprisingly, the first dimension of the Follower space, omitted from our scale, is the most driven by general popularity rather than ideology.
4. Among House Republicans, the primary ideological/partisan component (PIPC) correlates with W-NOMINATE at 0.24. Among Democrats, the correlation is 0.23. In the Senate, these respective figures are much higher: 0.67 and 0.48. For comparison, in our sample, Bonica's campaign-finance-based measure of ideology correlates at .28 among House Republicans, 0.20 among House Democrats, 0.59 among Senate Republicans, and 0.75 among Senate Democrats. The members of Congress for whom PIPC and W-NOMINATE most diverged are known for the fiscal conservatism, including Ron Paul, Jeff Flake, and John Shadegg. This suggests that Twitter users are discriminating ideology on more than one policy dimension, though the NOMINATE estimation tends to collapse this multidimensionality, and there may be some important differences in how ideology is perceived by the electorate as distinct from congressional voting alone.
5. An alternative strategy is to use a simple indicator variable for whether or not Obama won the electoral votes from each state; however, we feel our more detailed measure better captures the difference in the ideological extremity of voters across states.
6. Our classification scheme for electoral experience ranges from incumbent senators to candidates with no electoral experience. We differentiate between experience at the federal, state, and local level. In addition, we code for whether a candidate currently holds an office or had done so previously. Since incumbency is also very important in primary elections (Ansolabehere et al., 2007), we also ran alternative specifications with a simple indicator variable for incumbency. It was never significant nor did its inclusion alter the substantive results. The granularity of our classification of electoral experience means that it does not lend itself well to a fixed effects model nor can we treat the levels of the scale as continuous or ordinal. We are not explicitly interested in the electoral value of each level of experience, but we do believe that they drive variation in our dependent variables, meaning that a random effects approach is appropriate.
7. For more information on this package, see Bates (2010) or visit http://cran.r-project.org/web/packages/lme4/index.html
8. To be sure, there is likely a limit to extremity the primary electorate would tolerate. We ran several alternative specifications with a quadratic term for the PIPC score. While the value of extremity did decrease, this coefficient was never statistically significant. While there may be a threshold where voters believe a candidate is too extreme, our look at the 2010 elections does not support this.
9. We obtained predicted probability by simulating ($n = 10{,}000$) nonopen seat primary races with three candidates (the median for all races) and an average disbursement ratio of 1:3 (the average in a three-candidate race).

## References

Abramowitz, A. I., Alexander, B., & Gunning, M. (2005). Incumbency, redistricting, and the decline of competition in U.S. house elections. *The Journal of Politics*, *68*, 75–88.

Abramowitz, A. I., & Saunders, K. L. (1998). Ideological realignment in the U.S. electorate. *The Journal of Politics*, *60*, 634–652.

Abramowitz, A. I., & Saunders, K. L. (2008). Is polarization a myth? *The Journal of Politics*, *70*, 542–555.

Abramson, P. R., Aldrich, J. H., Paolino, P., & Rohde, D. W. (2000). Challenges to the American two-party system: Evidence from the 1968, 1980, 1992, and 1996 presidential elections. *Political Research Quarterly*, *53*, 495–522.

Aldrich, J. H. (1980). *Before the convention: Strategies and choices in presidential nomination campaigns*. Chicago, IL: University of Chicago Press.

Aldrich, J. H. (1983). A Downsian spatial model with party activism. *The American Political Science Review*, *77*, 974–990.

Aldrich, J. H. (1995). *Why parties? The origin and transformation of political parties in America*. Chicago, IL: The University of Chicago Press.

Amira, D. (2013, September 3). Who do members of congress follow on Twitter? *New York Magazine*. Retrieved from http://nymag.com/daily/intelligencer/2013/08/who-do-members-of-congress-follow-on-twitter.html

Ansolabehere, S., Snyder, J. M., Jr., & Stewart III, C. (2001a). Candidate positioning in U.S. house elections. *American Journal of Political Science*, *45*, 136–159.

Ansolabehere, S., Snyder, J. M., Jr., & Stewart III, C. (2001b). The effects of party and preferences on congressional roll-call voting. *Legislative Studies Quarterly*, *26*, 533–572.

Ansolabehere, S., Hansen, J. M., Hirano, S., & Snyder, J. M., Jr. (2007). The incumbency advantage in U.S. primary elections. *Electoral Studies*, *26*, 660–668.

Barbera, P. (2015). Birds of the same feather tweet together: Bayesian ideal point estimation using Twitter data. *Political Analysis*, *23*, 76–91.

Bartels, L. M. (1988). *Presidential primaries and the dynamics of public choice*. Princeton, NJ: Princeton University Press.

Bates, D. (2010). *lmr4: Mixed-effects modeling in R*. New York, NY: Springer.

Black, D. (1948). On the rationale of group decision-making. *The Journal of Political Economy*, *56*, 23–34.

Bollen, J., Mao, H., & Pepe, A. (2011). *Modeling public mood and emotion: Twitter sentiment and socio-economic phenomena*. Presented at the 2011 Annual Meeting of The International Conference on Weblogs and Social Media, Barcelona, Spain.

Bonica, A. (2013). Ideology and interests in the political marketplace. *American Journal of Political Science*, *57*, 294–311.

Brady, D. W., Han, H., & Pope, J. C. (2007). Primary elections and candidate ideology: Out of step with primary electorate? *Legislative Studies Quarterly*, *32*, 79–105.

Burden, B. C. (2001). The polarizing effects of congressional primaries. In P. F. Galderisi, M. Ezra, & M. Lyons (Eds.), *Congressional primaries and the politics of representation* (pp. 95–115). Lanham, MD: Rowman & Littlefield.

Campbell, A., Converse, P. E., Miller, W. E., & Stokes, D. E. (1960). *The American voter*. New York, NY: Wiley.

Canes-Wrone, B., Brady, D. W., & Cogan, J. F. (2002). Out of step, out of office: Electoral accountability and house members voting. *The American Political Science Review*, *96*, 127–140.

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*, 289–301.

Clinton, J., Jackman, S., & Rivers, D. (2004). The statistical analysis of roll call data. *American Political Science Review*, *98*, 355–370.

Cox, G. W., & McCubbins, M. D. (2005). *Setting the agenda: Responsible party government in the U.S. House of Representatives*. New York, NY: Cambridge University Press.

Davenport, T., & Beck, J. (2001). *The attention economy: Understanding the new currency of business*. Cambridge, MA: Harvard Business School Press.

Downs, A. (1957). *An economic theory of democracy*. New York, NY: Harper.

Evans, H. K., Cordova, V., & Sipole, S. (2014). Twitter style: An analysis of now house candidates used Twitter in their 2012 campaigns. *PS: Political Science & Politics*, *47*, 454–462.

Fenno, R. F., Jr. (1977). U.S. house members in their constituencies: An exploration. *The American Political Science Review*, *71*, 883–917.

Fenno, R. F., Jr. (1978). *Home style: House members in their districts*. Boston, MA: Little, Brown.

Fiorina, M. P., Abrams, S. J., & Pope, J. C. (2010). *Culture war? The myth of a polarized America*. (3rd ed.) New York, NY: Longman.

Gerber, E. R., & Morton, R. B. (1998). Primary election systems and representation. *Journal of Law, Economics, and Organization*, *14*, 304–324.

Gibson, R., & Cantijoch, M. (2013). Conceptualizing and measuring participation in the age of the Internet: Is online political engagement really different to offline? *The Journal of Politics*, *75*, 701–716.

Grimmer, J. (2010). A Bayesian hierarchical topic model for political texts: Measuring expressed agendas in senate press releases. *Political Analysis*, *18*, 1–35.

Groseclose, T., Levitt, S. D., & Snyder, J. M., Jr. (1999). Comparing interest group scores across time and chambers: Adjusted ADA scores for the U.S. congress. *The American Political Science Review*, *93*, 33–50.

Hall, A. B. (2015). What happens when extremists win primaries? *The American Political Science Review*, *109*, 18–42.

Hetherington, M. J. (2001). Resurgent mass partisanship: The role of elite polarization. *The American Political Science Review*, *95*, 619–631.

Hillygus, D. S., & Treul, S. (2011). *The effects of institutions on primary voting behavior*. Presented at the Duke University Institutions Workshop, Durham, NC.

Hinich, M. J., & Munger, M. C. (1997). *Analytical politics*. Cambridge, England: Cambridge University Press.

Hirano, S., Snyder, J. M., Jr., Ansolabehere, S. D., & Hansen, J. M. (2010). Primary elections and polarization in the U.S. congress. *Quarterly Journal of Political Science*, *5*, 169–191.

Hotelling, H. (1929). Stability in competition. *The Economic Journal*, *39*, 41–57.

Jackson, J. E., & Kingdon, J. W. (1992). Ideology, interest group scores, and legislative votes. *American Journal of Political Science*, *36*, 805–823.

Jacobson, G. C. (2008). *The politics of congressional elections*. (7th ed.) New York, NY: Longman.

Jacoby, W. G., & Armstrong, D. A. (2014). Bootstrap confidence regions for multidimensional scaling solutions. *American Journal of Political Science*, *58*, 264–278.

Jones, B. D. (1994). *Reconceiving decision-making in democratic politics: Attention, choice, and public policy*. Chicago, IL: University of Chicago Press.

Jones, B. D. (2001). *Politics and the architecture of choice: Bounded rationality and governance*. Chicago, IL: University of Chicago Press.

Koch, J. W. (2002). Gender stereotypes and citizens' impressions of house candidates' ideological orientations. *American Journal of Political Science*, *46*, 453–462.

Kruskal, J. B. (1964a). Multidimensional scaling by optimizing goodness of fit to a nonmetric hypothesis. *Psychometrika*, *29*, 1–27.

Kruskal, J. B. (1964b). Nonmetric multidimensional scaling: A numerical method. *Psychometrika*, *29*, 115–129.

Mayhew, D. (1974). *The electoral connection*. New Haven, CT: Yale University Press.

Owen, G., & Grofman, B. (2006). Two-stage electoral competition in two-party contests: Persistent divergence of party positions. *Social Choice and Welfare*, *26*, 547–569.

Poole, K. T., & Rosenthal, H. (2007). *Ideology and congress*. New Brunswick, NJ: Transaction.

Riker, W. H., & Ordeshook, P. C. (1968). A theory of the calculus of voting. *The American Political Science Review*, *62*, 25–42.

Ringquist, E. J., & Dasse, C. (2004). Lies, damned lies, and campaign promises? Environmental legislation in the 105th Congress. *Social Science Quarterly*, *85*, 400–419.

Rohde, D. W. (1991). *Parties and leaders in the postreform house*. Chicago, IL: University of Chicago Press.

Rohter, L. (2008, May 3). Republicans crossing over to vote in democratic contests. *The New York Times*. Retrieved from http://www.nytimes.com/2008/05/03/us/politics/03crossover.html?pagewanted=all&_r=0

Sang, E. T. K., & Bos, J. (2012). Predicting the 2011 Dutch senate election results with Twitter. Presented at the Annual Conference of the European Chapter of the Association for Computational Linguistics, Avignon, France.

Shor, B., & McCarty, N. (2011). The ideological mapping of American legislatures. *American Political Science Review*, *105*, 530–551.

Silver, N. (2012). As swing districts dwindle, can a divided house stand? FiveThirtyEight (blog). *The New York Times*. Retrieved from http://fivethirtyeight.blogs.nytimes.com/2012/12/27/as-swing-districts-dwindle-can-a-divided-house-stand/?_r=0

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*, 60–66.

Thelwall, M., Buckley, K., & Paltoglou, G. (2011). Sentiment in Twitter events. *Journal of the American Society for Information Science and Technology*, *62*, 406–418.

Tumasjan, A., Sprenger, T. O., Sandner, P. G., & Welpe, I. M. (2010). *Predicting elections with Twitter: What 140 characters reveal about political sentiment*. Presented at the 2010 Annual Meeting of The International Conference on Weblogs and Social Media, Washington, DC, USA.

Venables, W. N., & Ripley, B. D. (2002). *Modern applied statistics with S*. (4th ed.) New York, NY: Springer.

Weisberg, H. F., & Rusk, J. G. (1970). Dimensions of candidate evaluation. *The American Political Science Review*, *64*, 1167–1185.

## Author Biographies

**Aaron S. King** is an assistant professor in the Department of Public & International Affairs at the University of North Carolina–Wilmington. His research focuses on congressional procedure and elections, ambition and representation, political parties, and public opinion. He may be contacted at kinga@uncw.edu.

**Frank J. Orlando** is an instructor of political science in the Department of Social Sciences at Saint Leo University. His research interests include national institutions, and he serves as the politics expert for the Saint Leo Polling Institute. He may be contacted at francis.orlando@saintleo.edu.

**David B. Sparks** is Director of Basketball Analytics for the Boston Celtics. His dissertation research focused on the estimation of ideology and polarization among elites and within the electorate. He may be contacted at dsparks@celtics.com.