

Talking Politics on Twitter: Gender, Elections, and Social Networks

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Abstract

As campaign discussions increasingly circulate within social media, it is important to understand the characteristics of these conversations. Specifically, we ask whether well-documented patterns of gendered bias against women candidates persist in socially networked political discussions. Theorizing power dynamics as relational, we use dialectic configurations between actors as independent variables determining network measures as outcomes. Our goal is to assess relational power granted to candidates through Twitter conversations about them and whether they change depending on the gender of their opponent. Based on more than a quarter of a million tweets about 50 candidates for state-wide offices during the 2014 US elections, results suggest that when a woman opposes a man, the conversation revolves around her, but she retains a smaller portion of rhetorical share. We find that gender affects network structure—women candidates are both more central and more replied to when they run against men. Despite the potential for social media to disrupt deeply rooted gender bias, our findings suggest that the structure of networked discussions about male and female candidates still results in a differential distribution of relational power.

Keywords

gender, network analysis, political communication, relational effects, Twitter

The presidential campaigns of 2008 provided a glimpse at the barriers of entry that women have to the highest office in the United States. Republican vice-presidential nominee Sarah Palin's political efficacy was often called into question, in part based on whether she might be too burdened by motherhood to be president. During the Democratic primaries, the press and public questioned Hillary Clinton's character—Was she too abrasive to lead the nation? Both Clinton and Palin became “symbols of the somewhat unsettled nature of public thinking about the role of women in politics” (Dolan, 2014, p. 96).

At the dawn of Clinton's historic Democratic nomination, the 2014 mid-term elections offer a chance to update the assessment of public attitudes about women in politics. This may be especially relevant with the increasing importance of social media, particularly for its ability to introduce new actors to political conversations (Freelon & Karpf, 2015). In 2014, at least 19 women ran for the US Senate or state gubernatorial elections. Four sitting women governors and four senators sought re-election, and a score of formidable women challengers garnered intense media and public attention for their candidacies. Excitement generated by the record number of women on the ballot in 2014, a precursor election to Clinton's run in 2016, was tempered by media speculation about whether Clinton would drop out of the race to focus on

“being a grandmother” (Newton-Small, 2014). In addition, many of the state-wide races in 2014 were marked by gendered stereotypes. Discussion of Texas Democratic candidate for governor, Wendy Davis, distills the uniquely gendered binds that women candidates face. Her outspoken support for abortion rights led detractors to dub her “Abortion Barbie”—a variation on attacks made against Palin in 2008 and a taunt at Davis' carefully coiffed appearance.

Discussion and media coverage of women, prominent in 2014 elections, seemingly stem from gender stereotypes about women's role in electoral politics. But the locus of gender stereotypes has shifted along with the media environment as whole. While the Clinton example above comes from the mainstream media, it was Twitter users who first christened Davis “Abortion Barbie,” via hashtag. The ways media cover gender in politics is a matter of contention (Banwart, Bystrom, & Robertson, 2003; Devitt, 1999; Major & Coleman, 2008). But now, as voters more and more get

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political information in a socially networked environment (Chadwick, 2013; Pew Research Center, 2013, 2016), the characteristics of online discussions about gender and politics are increasingly relevant.

In this article, we employ network analysis, which is particularly well equipped to offer insight about Twitter data (Freelon & Karpf, 2015; Highfield, Harrington, & Bruns, 2013; Pew Research Center, 2014). Discussion network attributes offer the possibility to uncover a candidate's relative power within political discussion. By network attributes, we refer to certain characteristics of the Twitter conversation about candidates—namely, centrality, the proportion of posts stemming from the candidate, and the extent to which individuals reply to candidates. We argue that network structure is deeply important, as the public's increasingly mediated interaction with politics often takes place inside (social) networks. Understanding the power differential between men and women candidates, relative to their position in the discussion network about them, offers a novel measure of public opinion and the strength of underlying stereotypes.

The 2014 mid-term elections seem ripe for inquiry into public attitudes about women candidates, and like Dolan (2014), we aim to contribute to political science and gender studies with knowledge about the dynamic relationship between women candidates and the public, particularly on social media. To probe this relationship, we conduct a network analysis of the conversations about 2014 candidates for senate and governor. Through a series of network measures, we assess relational power granted to male and female candidates via online discussion networks. This article contributes to the literature by analyzing the role of gender, in conjunction with other political and contextual variables, in building the network structures that support and shape online political discussion. Overall, results suggest *relational effects* of gender on network attributes. Like recent work, we find that gender alone is not a strong predictor of political outcomes (Dolan, 2014; McGregor, Lawrence, & Cardona, 2016), but rather that gender affects network structure in more nuanced ways that vary across different types of races.

Women in American Politics

Since the first elections with women candidates, feminist and political science scholars have produced a vibrant body of research seeking to answer one overarching concern: how does gender bias limit women's ability to get elected? Research into this bias has examined three areas: media coverage, voter perceptions, and candidate strategy (Banwart et al., 2003; Banwart, Bystrom, Robertson, & Miller, 2000; Cantrell & Bachmann, 2008; Huddy & Terkildsen, 1993; Kahn, 1992, 1994; Lawless, 2004; Lawrence & Rose, 2010; Norris, 1997).

When it comes to media coverage of women in politics, early findings suggested that female candidates receive less

coverage overall (Kahn & Goldenberg, 1991). On the other hand, Carroll and Schreiber (1997) find that in the 1992 elections, women representatives received unprecedented attention. The authors conclude that because 1992 was dubbed "The Year of the Woman,"¹ women candidates were portrayed as positive agents of change, championing issues like women's health, abortion, and sexual harassment. Recent research focuses more on media content, showing that women candidates receive less issue-oriented campaign coverage and the coverage focuses on personal characteristics related to appearance, personality, and the marital and parental status of the candidate (Aday & Devitt, 2001; Lawrence & Rose, 2010; Miller & Peake, 2013; Scharrer, 2002). When news media do tie women candidates to issues, coverage more often links them to the so-called "feminine issues" like women's rights, health care, education, and social welfare (Heldman, Carroll, & Olson, 2005; Herrnson, Lay, & Stokes, 2003).

While media bias often presents by tying women to feminine "issue traits" (Meeks, 2012), voters' gender stereotyping is rooted in character traits. Enduring gender stereotypes can lead individuals to associate women with compassion and other communal traits like caring, trustworthiness, and willingness to compromise. On the other hand, men are more often associated with agentic traits like dominance, decisiveness, and self-confidence (Alexander & Andersen, 1993; Banwart, 2010; Banwart & McKinney, 2005; Meeks, 2013). Simply put, voters expect politicians to possess more masculine traits than feminine ones, especially when it comes to executive office positions (Alexander & Andersen, 1993; Fowler & Lawless, 2009; Huddy & Terkildsen, 1993; Kahn & Gordon, 1997; Rose, 2013). In a process even simpler than aligning traits with gender, voters also bias choice by relying on the sex of the candidate alone to cue party or ideological affiliations (Koch, 2002; McDermott, 1997).

The confluence of stereotypes place women politicians in a paradox. While the coverage of elections is often represented as a male arena, "masculine" characteristics that voters largely expect from political leaders are considered incongruous with female politicians (Cantrell & Bachmann, 2008; Huddy & Terkildsen, 1993; Lawrence & Rose, 2010). As a result, women may choose to emphasize stereotypical characteristics when running for office, highlighting these traits as strengths (Iyengar, Valentino, Ansolabehere, & Simon, 1996; Kahn & Gordon, 1997). Several scholars have found that playing to gender stereotypes advantages female politicians, especially when "women's issues" become central elements to a campaign (Iyengar et al., 1996). Yet, to the extent that the media focuses coverage on the economy and foreign policy, traditional "masculine" arenas could weaken women candidates' ability to drive the conversation around them (Banwart et al., 2003). For female candidates, self-presentation becomes a delicate balancing act (Lawrence & Rose, 2010; Rose, 2013). As such, Fridkin and Kenney (2014) propose Strategic Stereotype Theory: Politicians seek

to capitalize on gender stereotypes that benefit their political aims while counteracting potentially damaging gender stereotypes. The challenge for female politicians, they argue, is to shut down stereotypes that associate men with agentic traits, while cautiously exploiting stereotypes that associate women with caring.

For all the research on gender bias in electoral politics, it is possible that gender no longer exhibits strong effects on media coverage or public opinion and thus candidate strategies. In recent years, electoral context factors have been shown to shape campaign strategies overall more than gender alone (Bystrom, Banwart, Kaid, & Robertson, 2004; Dolan, 2005; Druckman, Kifer, & Parkin, 2009; Fowler & Lawless, 2009; Fridkin & Kenney, 2014; McGregor et al., 2016). Gender may not play a large stand-alone role once contextual factors like party, incumbency, and competitiveness are controlled for. Yet, contests with women candidates are fundamentally different from those where only men compete (Palmer & Simon, 2005). The uniqueness of campaigns with women materializes in media coverage, public opinion, candidate's campaign strategy—and, as we hypothesize, in online discussion network characteristics. Because of this, we study aspects of the *relational effects* of gender—opponent gender and dyad type, that is, the different possibilities for the race: male/male, male/female, and female/female.

Electoral Discussion on Twitter

Social network sites (SNSs) seem uniquely capable of both disrupting and enforcing gender stereotypes. There are several reasons to suspect that Twitter may possess the potential to disrupt normative political behavior and communication. First, political discussions on Twitter are embedded within other more routine activities, which may lead to better quality political discourse (Wojcieszak & Mutz, 2009). One way citizens may enter politics is through social media, which allows the public to invite themselves into politics without necessarily forming strong partisan opinions (Papacharissi, 2013, 2014). Second, Twitter is home to all three purveyors of gender bias outlined above—the news media, the public, and candidates. In the Twittersphere, traditional journalists intermingle with bloggers, the public, and the candidates themselves to offer a vast array of electoral commentary. Twitter users may not be representative (Hindman, 2010) and activity can vary widely, but social media does afford exposure to and inclusion of non-traditional political voices (Freelon & Karpf, 2015).

On the other hand, the affordances of SNS may do little to correct bias in media coverage. Research has shown that online news content still emphasizes men more than women (Armstrong & Gao, 2011; Yun, Postelnicu, Ramoutar, & Lee Kaid, 2007). In a study about news coverage on Twitter, Lasorsa (2012) found that online formats did not change the male-centric characteristic of journalistic coverage. Similarly,

in a study set out to examine how political journalists covered the gender-related policies that were labeled “women’s issues” on Twitter in 2012, Mourao (2016) found that coverage mentioned mostly male politicians, although female journalists were more likely than males to diversify their sources, mentions, and hyperlinks. These articles primarily employed content analyses of tweets and, as such, were limited in assessing interactivity among users, as well as multimedia content. While Mourao (2016) and Armstrong and Gao (2011) did conduct additional content analyses of the hyperlinks contained within those tweets, this body of research has only scratched the surface of the relationship between Twitter conversations and content that is exogenous to the platform.

Whether candidate-focused discussions on SNS work to uphold or tear down gender stereotyping, there is no doubt of the political importance of SNS. According to data from the Pew Research Center (2014) for Excellence in Journalism, about 17% of Americans used Twitter, Facebook, and YouTube to learn about 2014 campaigns, a number that has doubled since January 2012. These numbers continue to rise—in the 2016 presidential race, 44% of Americans used social media to learn about the campaign in the last week, with 35% of 18–29-year-olds naming social media as the most helpful source of political news (Pew Research Center, 2016). Political engagement is also prevalent on social networking sites—66% of social media users, or 33% of all American adults, have taken at least one civic or political action within social media (Pew Research Center, 2012). Beyond public inclusion, Twitter is also home to media outlets and candidates themselves, among other political actors. It is within this increasingly mediated context that voters encounter politically relevant information about electoral contests (Williams & Delli Carpini, 2011).

While previous studies analyzed the way journalists use Twitter to cover women in politics, few, if any, take into consideration the way online publics interact with media and political actors to construct discourse about candidates. More recently, there has been a growing movement to use network analysis to explore online political conversations. For example, Himelboim, McCreery, and Smith (2013) examined the Twitter conversations about politically controversial topics. A combination of network and content analysis found that users were unlikely to be exposed to crosscutting information, as most networks were politically homogeneous. Smith and Himelboim partnered with Pew Research Center (2014) to develop typologies for Twitter conversations, pinpointing six distinct conversational archetypes on Twitter: polarized crowds, tight crowd, brand clusters, community clusters, broadcast network, and support network. Freelon and Karpf (2015) explored the networked construction of humor on Twitter during political debates, finding power in non-elite voices. However, none of these examined a political candidate or race, and there was no analysis of how gender affected the typology.

Aiming to both fill this gap and extend prior work on gender bias in political campaigns, our study is guided by the following research question: *Are there differences in the network attributes of men and women candidates?*

Gender Bias and Network Attributes

Network analysis is en vogue in both political science and political communication scholarship, but most research looks at very limited points in time—a few days of political conversation (Himmelboim et al., 2013) or tweets reacting to presidential debates (Freelon & Karpf, 2015). We advance the literature by integrating network analysis across a host of candidates to better understand the structure of discussion networks about political candidates. Rather than relying on self-reports or the content of tweets, we seek to examine the underlying network structures, which may afford women candidates more (or less) power.

Network analysis, particularly of social media networks, has risen in popularity as communication studies have taken a more spatial turn (Reese, 2016). This geographic move in scholarship has been criticized for being overly descriptive (Benson, 2014). But at the same time, more assemblage-oriented approaches push us to think of power as liminal, conceiving of power dynamics as relational (Chadwick, 2013). Rather than evolving from a state of being, relational power evolves across a series of exchanges and interactions, across varying degrees of dependence and interdependence.

In this study, we conceive of *relationality* in three modes of thinking. First, we examine dependent variables determined by the relationships between users in a candidate's Twitter network. These relational measures of power are granted to candidates vis-à-vis the other individuals in networked political conversations. Second, we conceive of relational effects in a more traditional social science perspective, that is, how gender relates to other contextual campaign variables. Third, we examine the dynamic relationships between candidates within the context of the gender of their opponents. We freeze one of four possible electoral relationships in order to assess the impact of these configurations on relational power: man running against man, man running against woman, woman running against man, and woman running against woman.

More specifically, this study is concerned with three features of social media networks associated with women running for office in 2014: how central they are to the conversation (*centrality*), what is their ability to control the conversation (*rhetorical share*), and how comfortable people are talking to them (*interactivity*). We are also interested in the how these attributes differ between male–male, male–female, and female–female races.

Centrality

A significant body of literature has documented explicit and implicit media bias toward female candidates (Aday & Devitt, 2001; Heldman et al., 2005; Herrnson et al., 2003;

Lawrence & Rose, 2010; Miller & Peake, 2013; Scharrer, 2002), which at times impacts public perceptions and electoral outcomes (Cantrell & Bachmann, 2008; Huddy & Terkildsen, 1993; Lawrence & Rose, 2010). But the sphere in which one encounters political information is no longer dominated by traditional media, where previous inquiry has focused. Instead, political information is in part simultaneously produced, consumed, and discussed on social media sites like Twitter. By assessing the extent to which gender differentially manifests in the structure of these social media communications, we aim to extend inquiry into this hybrid media system (Chadwick, 2013). Women candidates may receive less coverage than their male counterparts (Kahn & Goldenberg, 1991), and this type structural bias may also be revealed in social media. Studies have found that network centrality impacts social status and power (Borgatti, 2005; Burt, 2000; Granovetter, 1973; Mizruchi & Potts, 1998), and it is a particularly apt measure by which to examine political power, especially as we look for differences by gender—woman candidates have historically faced an uphill battle in assessments of agentic traits, which may impact centrality within political discussions. This article poses the following research questions:

RQ1. Are female candidates more or less central to the Twitter conversation about their 2014 election run than their male counterparts?

RQ2. Are female candidates more or less central to the Twitter conversation about their opponents' 2014 election run than their male counterparts?

Rhetorical Share

While centrality measures the power or importance of an element within a networked space (Friedkin, 1993), we also aim to distinguish how much of the actual content in the conversation came from the candidates themselves. In other words, what are the candidates' abilities to drive the conversation within networks of people talking about them?

While the classic assumption of agenda-setting examines the transfer of issue from the media to the public (McCombs & Shaw, 1972), research on agenda building has shown that media coverage around politicians follow the agendas put forward by the campaigns themselves (Boyle, 2001; Kioussis et al., 2015; Lachlan, Crooks, & Laland, 1998; Roberts & McCombs, 1994). When it comes to gender differences, a study by Banwart et al. (2003) found that the media agenda is a reflection of the agenda put forward by the candidates in their political ads. Yet, this relationship is stronger for male candidates, suggesting that they may have more control of the media agenda than their female counterparts (Banwart et al., 2003), confirming the findings by Miller (1996).

As a first step to extend this work into social media, we examine the proportion of messages from candidates in the broader conversation about them. Without performing a

content analysis, we assess the base level of content stemming directly from the candidate:

H1. As such, we hypothesize that tweets from female candidates will take up a smaller share of the conversation about them than will those from their male counterparts.

Interactivity

Social media provides a platform for politicians to “go around” the media and broadcast their messages directly to citizens, with the potential to increase interactivity (Coleman, 2005; McGregor et al., 2016; Meeks, 2013) although studies have found that this communication is more unidimensional, from candidate to public, without reciprocal interactivity (Graham, Broersma, Hazelhoff, & van’t Haar, 2013; Graham, Jackson, & Broersma, 2014; Stromer-Galley, 2014). Female candidates in 2014 gubernatorial elections received more replies than male candidates, which led Lawrence, McGregor, Cardona, and Mourão (2016) to posit that constituents may feel encouraged to engage more with women candidates based on gender stereotypes associating women with relational skills:

H2. We hypothesize that, due to stereotyped thinking about men and women in political races, female candidates will receive more replies in their Twitter network than their male counterparts.

Relational Effects

Based on previous research (Bystrom et al., 2004; Dolan, 2005; Druckman et al., 2009; Fowler & Lawless, 2009; Fridkin & Kenney, 2014; McGregor et al., 2016), gender is not a stand-alone predictor of strong effects on discourse about candidates. We call the effects of such interactions *relational effects*, as they emerge from the relationship between gender and other variables. In the literature, three types of “relational effects” are identified: candidate characteristics, public opinion characteristics, and opposition characteristics. Candidate characteristics refer to the interplay between gender and incumbency status, party, and competitiveness of the race (Dolan, 2014; McGregor et al., 2016). Public opinion characteristics refer to the interplay between gender and the general importance/relevance of “women’s issues” during that race (Iyengar et al., 1997). Finally, opposition characteristics refer to the gender of the opponent candidate. In this article, we aim to unravel the effects of “opposition characteristics,” as they intermingle with gender, to predict differences in network characteristics:

RQ3a. Are there differences in a candidate’s network *centrality* based on the gender of their opponent?

RQ3b. Are there differences in a candidate’s network *opposition centrality* based on the gender of their opponent?

RQ3c. Are there differences in a candidate’s *rhetorical share* based on the gender of their opponent?

RQ3d. Are there differences in a candidate’s *reply ratio* based on the gender of their opponent?

Methods

The data here represent more than three-quarters of a million tweets about 50 gubernatorial and senate candidates in the 2014 US mid-term elections. Network analysis measures, like centrality, as well as exogenous variables, such as party and gender, were assessed in the models.

Candidate Selection

This study uses data from online conversations about 50 major-party candidates in 2014. The candidates represent 9 gubernatorial races² and 15 senate races.³ All governor and senate races with at least one female candidate were selected, as well as several male/male dyads for control. For the governor races, seven races are male/female and two races are male/male. Totally, 10 of the 2014-senate races were male/female contests, while two were female/female. For control, we selected an additional three male/male gubernatorial races to analyze as well. The Twitter accounts associated with each candidate were identified through links from their web sites.

Data

The data were collected by accessing the Twitter API and analyzed via NodeXL, a Microsoft Excel application add-in for network overview that supports social network analysis and mapping visualizations (Himmelboim, McCreery, & Smith, 2013). Data collection began on 6 September and ended on 5 November 2014, the day after the 2014 mid-term elections. In addition to capturing the tweets themselves, the data also capture all the people a tweet author follows as well as the people that follow them in a dataset. It’s these connections that, when examined via network analysis, form clusters within the data and reveal key network attributes. To capture the conversation about each candidate, a Boolean query included that candidate’s name, Twitter handle, and associated political hashtags. For example, the Wendy Davis query included the following: @WendyDavisTexas OR (#txgov Davis) OR “Wendy Davis.” The same pattern was used for each candidate in the sample.

Once the data were collected, the researchers queried a 10,000-edge slice of the conversation about each candidate, starting from Election Day and moving backward. This resulted in an unequal distribution of dates for each candidate, but a more equal number of edges (relationships) and tweets. In all, 50,000 interactions and 773,038 tweets are represented in the data.

Network Analysis

The major clusters in each network were identified algorithmically. The vertices of each cluster were grouped using the Clauset-Newman-Moore cluster algorithm. Each vertex represents a Twitter user, and an edge represents replies-to or mention in a tweet. Self-loops, a tweet in which the candidate was mentioned but the user did not direct their tweet at another user, are also included in the data.

Network Variables. In this study, we attempt to use the network attributes of online political discussion about candidates as measures of their influence. We measure these network attributes across four variables: centrality, opposition centrality, retweets, and replies.

In order to answer RQ1, we examine the *centrality* of candidates to the discussion network about them. While there are several metrics for examining network centrality, we chose here to measure eigenvector centrality. Since our overarching question is about whether there are differences between male and female candidates in terms of their influence in a network, we deemed eigenvector centrality, which has been linked to power (Bonacich, 2007) as most appropriate. Eigenvector centrality assumes the centrality of any person is an increasing function of the centralities of all the people they follow (Bonacich, 1972) and quantifies the most central actors in terms of the overall structure of the network. Eigenvector centrality is calculated by assessing how connected a node is to other nodes in the network with the greatest connectivity (range=0.000211–0.039930, mean $[M]=0.01835$, standard deviation $[SD]=0.00704$).

RQ2 also examines centrality, but here we are concerned with the centrality of a candidate in the networked discussion about their opponent—*opposition centrality*. To measure this, we again examined the eigenvector centrality explained above. However, in this case we note a candidate's centrality in their opponent's network (range=0.00–0.007993, $M=0.00242$, $SD=0.00225$).

H1 examines a measure of rhetorical power, *candidate rhetorical share*, which quantifies what proportion of the discussion network about a candidate stems from actual tweets from that candidate. We added the number of tweets from the candidate (C_t , range=0–3,183, $M=844.12$, $SD=743.63$) to the number of times the candidate was retweeted (C_{rt} , range=0–312, $M=30.52$, $SD=59.55$), divided by the total number of tweets in the network (*total* range=1,214–22,072, $M=15,460.76$, $SD=4,585.96$)

$$\text{Candidate rhetorical share} = \frac{C_t + C_{rt}}{\text{Total } n}$$

Candidate rhetorical share ranged from 0 to 0.20759 ($M=0.05685$, $SD=0.05003$).

Our second hypothesis examines the extent to which male and female candidates receive replies. The number of replies

(range=25–5,793, $M=3,124.96$, $SD=1,600.14$) was divided by the total number of tweets in the network of tweets about that candidate to calculate a *reply ratio* (range=0.0012699–0.3871711, $M=0.20523$, $SD=0.08402$)

$$\text{Reply ratio} = \frac{N_{\text{replies}}}{\text{Total } n}$$

Exogenous Variables

As a main variable of interest, we coded for the *gender* of the candidate (female=21, male=29). Other variables associated with the candidate like *political party* (Republican=25, Democrat=25) and *race level* (legislative=30, executive=20) were coded and used as controls in regression models. Other contextual variables previously associated with both electoral outcomes (Dolan, 2014) and candidate gender (McGregor et al., 2016) are included in the analysis—*incumbent status* (incumbent, challenger, or open seat) and *competitiveness* of the race (solid R/D, likely R/D, leaning R/D, or toss up). To create this competitiveness index, we combined Larry J. Sabato's *Crystal Ball* and the *Cook Political Report's* competitiveness indexes to create a scale (McGregor et al., 2016) from least to most competitive (range=0–3, $M=1.48$, $SD=1.25$).

As acknowledged earlier, recent scholarship suggests that gender alone may not be a predictor for divergent candidate communication (Iyengar et al., 1997; McGregor et al., 2016), press coverage (Banwart et al., 2003) or, as we hypothesize (H3), candidate discussion network attributes. To explore this further, we created a *dyad-type* variable (male/male, male/female, and female/female) that was entered as an independent variable into regression analyses. In order to further probe the effect of gender dissonance on network attributes, a variable to measure *candidate gender opposition* was created, where 1=man in a race with another man, 2=man in a race with a woman, 3=woman in a race with a man, and 4=woman in a race with another woman.

		Candidate	
		Male	Female
Opponent	Male	1	3
	Female	2	4

Statistical Analysis

In order to answer RQ1, we ran a hierarchical linear regression with *centrality* as the dependent variable, and political context variables, like gender, as independent variables.

Table 1. Research Questions and Hypotheses.

RQ1	Are female candidates more or less central to the Twitter conversation about their 2014 election run than their male counterparts?
RQ2	Are female candidates more or less central to the Twitter conversation about their opponents' 2014 election run than their male counterparts?
H1	Tweets from female candidates will take up a smaller share of the conversation about them than will those from their male counterparts
H2	Female candidates will receive more replies in their Twitter network than their male counterparts
RQ3a	Are there differences in a candidate's network <i>centrality</i> based on the gender of their opponent?
RQ3b	Are there differences in a candidate's network <i>opposition centrality</i> based on the gender of their opponent?
RQ3c	Are there differences in a candidate's <i>rhetorical share</i> based on the gender of their opponent?
RQ3d	Are there differences in a candidates <i>reply ratio</i> based on the gender of their opponent?

We followed the same procedure to answer RQ2, changing the dependent variable to *opposition centrality*. To test H1 and H2, which relate candidate gender to *candidate rhetorical share* and *reply ratio*, respectively, we ran hierarchical linear regressions with *candidate rhetorical share* and *reply ratio* as outcome variables. The variables were entered in individual blocks, and each intermediate model was assessed for model fit and change in variance explained.

Next, we examine the relationship between *candidate gender opposition* and network variables. To test RQ3a–d, a series of analysis of variance (ANOVA) tests were run to examine whether *centrality*, *opposition centrality*, *candidate rhetorical share*, and *reply ratio* varied in relation to the gender of the candidate's opponent. Finally, hierarchical regression models were run with the four types of relationships (man running against woman, man running against man, woman running against man, and woman running against woman) as independent variable blocks, assessing how these relational configurations are associated with network characteristics while controlling for contextual variables.

The dataset compiled here is comprehensive and nonrandom—some recent studies treat datasets like these as censuses, not samples. Along this line of thinking, it's not useful or appropriate to use inferential statistics, as the data are not randomly selected from a larger population (e.g., Conway, Kenski, & Wang, 2013).⁴ From this perspective, our data constitute an “apparent population” (Berk, Western, & Weiss, 1995), not a sample, of the Twitter conversation about these 50 candidates' across the network and time period studied. On the other hand, inferential statistics may be appropriate for those inclined to view datasets like ours as “realizations” of a larger “superpopulation” (Berk et al., 1995). The aim of this study is not to settle that debate, so we report inferential statistics for those readers who view our data as a sample, with the caveat that the underlying data have not been sampled randomly and rather represent a census of relevant tweets about a candidate.

Results

Our first research question asks whether female candidates are more or less central to the Twitter conversation about

them than their male counterparts. A linear regression model was estimated with centrality as the dependent variable, controlling for other predictors related to the characteristics of the candidate and the race. Each variable was entered as a step on hierarchical regressions to assess the impact of each step in the model, and model fit and R^2 changes are reported below (Table 2).

Our findings show that gender ($\beta = .311, p < .05$), competitiveness ($\beta = -.474, p < .01$), and dyad type (female/female, $\beta = -.509, p < .05$) affect a candidate's centrality. These results indicate that women candidates are more central than male candidates to online and networked discussions about them. Candidates in less competitive races are also more likely to be central. The hierarchical model shows that gender alone explains only 2% of the variance ($F = 1.087, ns$). The model becomes significant with the addition of competitiveness of the race ($\Delta R^2 = .144, F = 1.895, p < .05$). Adding the dyad types increases the variance explained by 22% ($F = 3.481, p < .01$). The final model has the best fit, accounting for 36.7% of the variance ($p < .01$). See the first column in Table 2 for the full model and results.

RQ2 also examines centrality, but asks whether there are differences between how central female and male candidates are in the discussion network about their opponent. Results of a hierarchical linear regression indicate that the model as a whole is not significant; that is, it is not a good fit with the data. None of the steps of the model yielded a good fit (all F tests $> .05$).

H1 predicted that female candidates would have a lower rhetorical share of their network than would male candidates. Hierarchical linear regression does not reveal a strong association between gender and candidate rhetorical share (female, $\beta = .039, ns$), but does indicate that party (Democrats, $\beta = .279, p < .05$) positively predicts a candidate's rhetorical share (see Table 2, column 3). Conversely, incumbency status ($\beta = -.279, p < .05$) is negatively associated with rhetorical share. Like other studies, we find challengers to be more prolific not only in absolute terms (Evans, Cordova, & Sipole, 2014) but also when taking into consideration the proportion of the content they produce vis-à-vis what is produced by others in networks about them. These contextual

Table 2. Linear Regression Model Testing Effects of Gender, Political Context on Network Attributes.

	Centrality	Opposition centrality	Rhetorical share	Reply ratio
Gender (female = 1)	0.311*	0.461*	0.033	0.082
Party (democrat = 1)	-0.032	-0.173	0.279*	0.13
Race type (senate = 1)	0.051	-0.115	-0.211	-0.23
Competitiveness of race	-0.474**	0.104	-0.149	-0.279*
Incumbency (incumbent = 1)	0.036	0.14	-0.279*	-0.112
<i>Dyad type</i>				
Male/male (ref)				
Male/female	0.041	-0.19	-0.223	0.084
Female/female	-0.509**	-0.306	-0.367*	-0.471**
Total R ²	36.7%**	22.0% ns	34.4%**	38.2%**

OLS: ordinary least squares.

Sample size = 50. Cell entries are final-entry OLS standardized beta (β) coefficients.

* $p < .05$; ** $p < .01$; *** $p < .001$.

variables explain 27.8% of the variance ($F=3.392$, $p < .05$). When it comes to dyad types, candidates in female/female races have lower rhetorical share. In all, the results do not indicate a direct relationship between gender and rhetorical share (H1 is not supported). However, there is a link between gender and candidate rhetorical share when taking into consideration the gender of both candidates, which we explore in more details on Table 7. The final model explains 35.4% of the variance observed ($F=3.287$, $p < .01$).

We also hypothesized that female candidates are more likely to receive replies in the network conversations about them than their male counterparts (H2). Regression analysis does not suggest that gender is a strong predictor for a candidates reply ratio (female, $\beta = .088$, ns), while the analysis suggests that competitiveness has a negative relationship with reply ratio ($\beta = -.279$, $p < .05$). Contextual variables explain 17% of the variance ($F=1.806$, ns), and the model becomes a better fit with the addition of the dyad-type block ($\Delta R^2 = .212$, $p < .01$). When it comes to dyads, a candidate in a female/female race is less likely to be replied to when compared to those in a male/male election. The full model is in the fourth column of Table 2. Overall, results here suggest there are no differences between males and females when it comes to receiving replies in the networked conversation about them. The contrasts observed manifest between different relational configurations (detailed below). As such, H2 is not supported.

Last, we turn to a series of research questions that examine how network attributes may differ for relationship configurations: men running against men, men running against women, women running against men, and women running against women. RQ3a asks, "Are there differences in a candidate's network centrality based on the gender of their opponent?" The eigenvector centrality of the four groups was averaged 0.0179 ($SD=0.0038$), 0.0172 ($SD=0.0078$), 0.0215 ($SD=0.0069$), and 0.0184 ($SD=0.0070$), respectively (see Table 3).

Table 3. ANOVA—Variance in Centrality by Candidate Gender Opposition.

	Centrality	
	M/SD	F (df)
(1) Male versus male	0.0179/0.0038	$F(3,46) = 2.943^*$
(2) Male versus female	0.0172/0.0078	
(3) Female versus male	0.0215/0.0069 ^a	
(4) Female versus female	0.0184/0.0070	

HSD: honest significant difference; ANOVA: analysis of variance; M: mean; SD: standard deviation; df: degrees of freedom.

^aA post hoc test using Tukey HSD showed that Group 4 had a significantly lower mean score than Group 3.

* $p < .05$; ** $p < .01$; *** $p < .001$.

A significant mean difference was found among the groups $F(3,46) = 2.943$, $p < .05$. A post hoc test using Tukey honest significant difference (HSD) showed that Group 4 (female candidates running against a female candidate) had a lower mean score than Group 3 (female candidates running against a male candidate). These results suggest that women running against men are more central to the Twitter conversation about them than are women running against other women. Results from a regression analysis support these findings. Women running against women are less likely to be central to the conversation ($\beta = -.338$, $p < .05$) than all the other possible relationships. In addition, competitiveness of the race remains negatively associated with centrality ($\beta = -.474$, $p < .05$); that is, the more competitive the race, the less central the candidates are to their own networks. The relationship's block explains 24% of the variance ($p < .01$). The total model explains 36.7% of the observed variance in centrality.

RQ3b explores the differences in a candidate's centrality in their opponent's network between candidate gender opposition groups. Women candidates running against men (Group 3) had the highest mean centrality $M=0.0035$ ($SD=0.0025$), $F(3,46) = 2.586$, ns, Group 1: $M=0.0023$ ($SD=0.0020$),

Table 4. ANOVA—Variance in Opposition Centrality by Candidate Gender Opposition.

	Opposition centrality	
	M/SD	F (df)
(1) Male versus male	0.0023/0.0020	F(3,46) = 2.586
(2) Male versus female	0.0016/0.0019	
(3) Female versus male	0.0035/0.0025	
(4) Female versus female	0.0015/0.0013	

ANOVA: analysis of variance; M: mean; SD: standard deviation; df: degrees of freedom.

Group 2: $M=0.0016$ ($SD=0.0019$), and Group 4: $M=0.0015$ ($SD=.0013$) all had lower mean scores. The ANOVA tests here suggest that female candidates running against men are more central to the networked discussion about their male opponent than are other dyad types (see Table 4). That is, when women run against men, the woman candidate is more central to the conversation about themselves *and* their male opponent, but this effect disappears when women oppose women. The regression model for opposition centrality was not significant, indicating a poor model fit for this variable.

RQ3c asks, “Are there differences in a candidate’s rhetorical share based on the gender of their opponent?” The rhetorical share ratio was averaged for the four candidate opponent groups: Group 1: $M=0.0819$ ($SD=0.0508$), Group 2: $M=0.0494$ ($SD=0.0479$), Group 3: $M=0.0573$ ($SD=0.0504$), and Group 4: $M=0.0116$ ($SD=0.0107$). Results suggest that men running against men have the highest rhetorical share $F(3,46)=2.586$, ns, suggesting that in male/male races, the public has less to say about the candidates, allowing the candidate himself to control more of the rhetoric inside the network (Tables 5). Regression results in Table 7 show that of all possible relationship combinations, women running against other women have the lowest rhetorical share ($\beta=-.348$, $p<.05$). While the final model explains the most variance (35.4%, $F=3.287$, $p<.01$), the final block does not add a significant F change to the model, suggesting that the power of different relationships to rhetorical share is much more limited than in centrality, for example.

RQ3d examines variance in a candidate’s reply ratio in the network discussion about them between candidate gender opposition groups. Women candidates running against men had a higher reply ratio in their network ($M=0.2274$, $SD=0.0506$) than women running against women ($M=0.0735$, $SD=0.0650$), as well as men running against men ($M=0.2112$, $SD=0.0720$), and men running against women ($M=0.2098$, $SD=0.0990$), $F(3,46)=4.501$, $p<.01$. A post hoc test using Tukey HSD revealed that Group 4 (female candidate running against another woman) had significantly lower reply ratio mean than any of the other four groups. Regression analysis support this finding ($\beta=-.426$, $p<.05$).

Table 5. ANOVA—Variance in Candidate Rhetorical Share by Candidate Gender Opposition.

	Candidate rhetorical hare	
	M/SD	F (df)
(1) Male versus male	0.0819/0.0508	F(3,46) = 2.407
(2) Male versus female	0.0494/0.0479	
(3) Female versus male	0.0573/0.0504	
(4) Female versus female	0.0116/0.0107	

ANOVA: analysis of variance; M: mean; SD: standard deviation; df: degrees of freedom.

Table 6. ANOVA—Variance in Reply Ratio by Candidate Gender Opposition.

	Reply ratio	
	M/SD	F (df)
(1) Male versus male	0.2112/0.0720 ^a	F(3,46) = 4.501 ^{**}
(2) Male versus female	0.2098/0.0990 ^b	
(3) Female versus male	0.2274/0.0506 ^c	
(4) Female versus female	0.0735/0.0650 ^d	

HSD: honest significant difference; ANOVA: analysis of variance; M: mean; SD: standard deviation; df: degrees of freedom.

^aA post hoc test using Tukey HSD showed that Group 1 had a significantly higher mean score than Group 4.

^bA post hoc test using Tukey HSD showed that Group 2 had a significantly higher mean score than Group 4.

^cA post hoc test using Tukey HSD shows that Group 3 had a significantly higher mean score than Group 4.

^dA post hoc test using Tukey HSD shows that Group 4 had a significantly lower mean score than Groups 1, 2, and 3.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Contextual variables (party and race characteristics) explain only 16.7% of the variance ($F=2.260$, $p=.07$). By adding the different relationships, the model explains 27.9% of the variance ($F=3.715$, $p<.01$). Once again, this means that when a woman runs against a man, the conversation will revolve around her: she is both more central and more replied to. Yet, women candidates have less control of the conversation, as measured by the share of the conversation that actually comes from them.

Discussion

In this article, we employ network analysis to reveal the dynamic relationship between candidates and voters on Twitter. Through a series of network measures, we assess the level of power granted to men and women candidates via centrality, rhetorical share, and interactivity. Our results show that women are more central to the conversation about them and about their opponents than are male candidates, indicating that the power of their connections within the networks is stronger.

Table 7. Linear Regression Model Testing Relational Effects of Gender Dyads and Political Context on Network Attributes.

	Centrality	Opposition centrality	Rhetorical share	Reply ratio
Party (democrat = 1)	-0.032	-0.173	0.279*	0.13
Race type (senate = 1)	0.051	-0.115	-0.211	-0.23
Competitiveness of race	-0.474**	0.104	-0.149	-0.279*
Incumbency (incumbent = 1)	0.036	0.14	-0.279*	-0.112
<i>Relational dyad</i>				
Male/male (ref)				
Male/female	0.042	-0.193	-0.227	0.085
Female/male	0.34*	0.249	-0.195	0.164
Female/female	-0.338*	-0.052	-0.348*	-0.426**
Total R ²	36.7%**	22% ns	35.4%**	38.2%**

OLS: ordinary least squares.

Sample size = 50. Cell entries are final-entry OLS standardized beta (β) coefficients.

* $p < .05$; ** $p < .01$; *** $p < .001$.

In addition to differences by gender, we argue for *relational effects*, part of which we examine here in regard to candidate gender opposition, that is, the difference between a candidate running against a person of the same or opposite sex. We found that when women ran against men, the female candidate was more central to the conversation, but this effect disappeared when women opposed women. When men ran against other men, they had the highest rhetorical share suggesting that, in male/male races, the public had less to say about the election, allowing the candidate himself to control a greater share of the rhetoric inside the network.

There are two ways to understand these findings. First, women's power via centrality could present an optimistic picture regarding the bias of online political discussion. Here, we found that women were more connected to powerful people and were talked about the most. On the other hand, our findings on rhetorical share could be viewed more negatively with regard to bias, as they suggest that men hold a different measure of power: they control the rhetoric of the discussion about them.

These findings raise an interesting question about power within networked spaces: is it better to have other subgroups of people talking about you *or* to have dominated the conversation via your own messages? We may assume normatively that rhetorical share is more powerful, as the candidates can better control campaign messages. Yet, if more people talk about a candidate, even if the content is partly negative, it reduces the costs of campaigning and amplifies recognition. This is especially true considering that eigenvector centrality not only measures a candidate's network power but also considers the cascading power of their connections.

It is worth noting that our measure of rhetorical share is conservative, assessing only posts coming directly from the candidate. As such, the extent to which individuals adopt the language and the narratives put forward by candidates without directly mentioning them is not captured. Since this article focuses on differences between men and women candidates, this absolute metric provided a basis of comparison

that could be replicable to a vast number of political races in different contexts. Yet, future work should employ content analysis to assess more nuanced measures of rhetorical share that can help explain *how* some of the bias we detect here arises.

Relational effects also show that, in terms of interactivity, women candidates opposing men had higher ratios of replies than all other candidates. This suggests that gender bias influences levels of interactivity with women candidates. Future research should investigate if this happens because people feel more comfortable talking to women candidates due to stereotypes of communal traits or because the male-skewed population of Twitter (Pew Research Center, 2015) encourages men to "talk back at" female candidates online. As a starting point, we suggest an examination of the content of social media posts about candidates that focuses specifically on gender, which could avail a deeper understanding of how these biases arise and manifest.

As increasing numbers of Americans use social media for campaign information (Pew Research Center, 2016) and candidates use social media to communicate with the public and the press (Kreiss, 2014; Stromer-Galley, 2014), a better understanding political communication in these spaces is important along several lines of inquiry including the gender bias we examine here. While political discussions on social media can be more inclusive (Freelon & Karpf, 2015), our findings suggest gender bias endures, albeit in new forms. Despite the femininity and disruptive potential of social media, political discussions on Twitter about candidates do not show that relational power (as opposed to more institutional power) manifest with largely different outcomes with regard to gender bias. Campaign strategy has long been informed by gender (e.g., Fridkin & Kenney, 2014), so the extent to which gender bias is present in social media will undoubtedly affect this process. Women candidates adopt differing campaign strategies with regard to social media (Lawrence et al., 2016) but they all must contend with the uneven and gendered terrain of these networked spaces. Our

findings suggest that women candidates may experience increased attention on Twitter, but may have less direct influence on the rhetoric of the conversations about them.

In this study, we examine Twitter discussions about candidates in mid-term US elections, and so our ability to generalize across other elections or social media platforms is limited. Instead, we hope this study lays the groundwork for other scholars to examine gender bias on social media, adopting network analysis or other approaches. We also acknowledge that Twitter users are not representative of the voting public in the United States. Rather our sample is likely to be highly politically interested and partisan, but we contend this represents a population that will presumably vote in large numbers (Delli Carpini & Keeter, 1996).

Especially in communication and political science, “public opinion” has been associated with a specific meaning—a representative sample of the populace from whose opinions and attitudes we can draw conclusions about the population as a whole. And yet, individuals who discuss politics online *are* members of the public even if they are not a generalizable sample of the US population. As Herbst (1998) argues, the meaning of public opinion is contingent. **Elite actors—journalists and politicians—fashion social media posts and metrics into public opinion. Journalists report these metrics, much in the same way they report public opinion polls, as part of the dominant style of horse-race coverage. Like journalists, campaigns and candidates use social media as a measure of public opinion (Chadwick, 2013; Kreiss, 2012). Rather than survey researchers calling public opinion into existence, the public can now use social media to partake in the real-time creation of public opinion. This alternative representation of public opinion is more dynamic than polls—it’s interactive, reactive, and continuous. And yet—it’s specific—in this case to networked discussions about candidates. Our study attempts to document the underlying structure of this particular representation of public opinion about 2014 candidates, singling out markers of gender bias.**

In this article, we explore network configurations as the outcome of different assemblies regarding the gender of the candidates involved in the race. Here, we use dialectic configurations between actors as independent variables determining network measures as outcomes. Our goal is to go beyond the exploratory nature of the “new descriptivism” that has plagued much of recent political communication research using spatial-based models, that is, those involving “ecosystems,” “boundaries,” and “networks” (Benson, 2014; Reese, 2016). By holding relational configurations constant and testing their impact on centrality, reply ratio, and rhetorical influence, we connect our findings to the theoretical understanding of how gender relates to political communication. Our results suggest that gender alone is not meaningful, but rather the relationship between a candidate’s gender and that of their opponent impacts network structure. These findings are just the starting point for detangling how gender bias operates on power across networks of political

communication. Future studies should explore how men and women candidates differ in various settings of relationships, such as male incumbents running against women challengers or Democrat women running against Republican men, just to cite a few. Because assemblage-oriented approaches forefront thinking of dynamic and hybrid systems, they allow us to take up a more inclusive and fluid study of power within systems, theorizing power as liminal, networked, and relational.

Previous studies have identified three possible types of relational effects with gender: candidate characteristics (Dolan, 2014; McGregor et al., 2016), public opinion (Iyengar et al., 1997), and opponent characteristics (Palmer & Simon, 2005). In this article, we address the *relational effects* of both candidate and opponent characteristics. Results show that when a woman runs against a man, the conversation will revolve around the woman: she is both more central and more replied to. This effect weakens when women run against other women.

Past research has examined how women candidates run against male and/or female candidates and also how the press covers candidates differently. This is, to our knowledge, the first study to examine the differences in network structure and attributes of female candidates, with a special emphasis on how the gender of their opponent may drive different discussion patterns (one aspect of relationality). While these networks do not fully represent public opinion in the traditional sense, our results suggest that male and female candidates face different challenges in socially mediated engagement and discussion partly because of the gender of their opponent. Echoing Palmer and Simon (2005), we argue that there is still something unique about a campaign with a woman that also manifests in network structures.

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Notes

1. However, according to Daughton (1994), the very use of labels like “The Year of the Woman” and “war on women” are indications of major structural limitations, as they designate a specific time frame in which it is appropriate to talk about gender.

2. South Carolina, New Mexico, Oklahoma, Massachusetts, Texas, South Dakota, Wisconsin, Arkansas, Florida, California.
3. Louisiana, Maine, North Carolina, New Hampshire, Georgia, Iowa, Montana, Michigan, Oklahoma, West Virginia, Kentucky, Oregon, Colorado, Nebraska, South Dakota.
4. As Conway et al. (2013) express this view,

Researchers sometimes mistakenly use p values to connote substantive associations or differences, which of course p values cannot do. Any differences shown between the candidates are real differences in this study. The extent to which the differences are meaningful substantively is a matter of interpretation.

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