Government Information Quarterly 30 (2013) 464–472

Contents lists available at ScienceDirect

Government Information Quarterly

journal homepage: www.elsevier.com/locate/govinf

Who benefits from Twitter? Social media and political competition in the U.S. House of Representatives

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ARTICLE INFO

Available online 10 September 2013

Keywords:
Social media
The internet
Political finance
Campaign strategy
Political inequality
Political ideology
Political extremist

ABSTRACT

Many researchers have assumed that social media will reduce inequalities between elite politicians and those outside the political mainstream and that it will thus benefit democracy, as it circumvents the traditional media that focus too much on a few elite politicians. I test this assumption by investigating the association between U.S. Representatives using Twitter and their fundraising. Evidence suggests that (1) politicians' adoptions of social media have yielded increased donations from outside their constituencies but little from within their own constituencies; (2) politicians with extreme ideologies tend to benefit more from their social media adoptions; and (3) the political use of social media may yield a more unequal distribution of financial resources among candidates. Finally, I discuss the implications of these findings for political equality, polarization, and democracy.

1. Introduction

1.1. The recent adoptions of social media in politics

The recent advent of new information technology, along with the resulting social media such as Facebook and Twitter, and its enthusiastic use in political competition have rekindled attention to the role of new information technology in politics. Currently, almost every major American politician has a Twitter[1] account, and many employ specific staff or even social media consulting firms to maintain such accounts. One example of a politician who has used social media is Barack Obama, who utilized Twitter to hold America's first virtual presidential town hall meeting in July 2011. During this event, he responded via his official Twitter account to questions posted online by users of social networking services, including the chair of the Republican National Committee, Reince Priebus. Many commentators described the event as a modern "Kennedy–Nixon TV debate moment" that would foreshadow the future use of media in politics. Weeks later, on July 29, the president used Twitter during the debt ceiling debate to mobilize his 9.4 million followers, asking them to "Tweet at your Republican legislators and urge them to support a bipartisan compromise to the debt crisis" (BarackObama, 2011). The growing importance of Twitter in politics is also evidenced by the fact that in October 2010, then Speaker of the House Nancy Pelosi made her initial announcement that she would run for House Minority Leader not on a major news network, but via Twitter.[2,3]

Politicians' recent active adoption of the new information technology raises an important question: Are politicians deriving measurable benefits from their social media adoptions, and if so, to what extent? Presumably, politicians have embraced this new form of communication technology because they find it an effective tool for communicating with their supporters; therefore, it is reasonable to expect that significant benefits are associated with their use of social media. A few studies have attempted to report the potential effects of politicians' use of social media. For instance, a body of literature provides descriptive evidence that online attitudes, as measured through the sentiments of "tweets," correlate well with public sentiment as measured through polls (Tumasjan, Sprenger, Sandner, & Welpe, 2011) and that the size of politicians' online networks (e.g., the "friend" count of politicians' Facebook accounts) is an acceptable predictor

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[1] Twitter is an online social networking and microblogging service that enables its users to send and read text-based posts of up to 140 characters, known as "tweets." The service has rapidly gained worldwide popularity, with over 300 million users as of 2011 (Taylor, 2011), generating over 200 million tweets (Twitter, 2011).

[2] CongressDaily 11/5/2010, p. 1-1.

[3] Twitter use has also spread globally to other democracies. The newly elected president of Chile, Sebastián Piñera, recently asked his cabinet members to start using the social networking tool. Other studies have reported that the number of Japanese politicians using Twitter grew from only three to 485 in less than a year and that 577 German politicians had opened Twitter accounts.

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http://dx.doi.org/10.1016/j.giq.2013.05.009

of public opinion (Wattal, Schuff, Mandviwalla, & Williams, 2010; Williams & Gulati, 2007).[4]

While previous studies have focused on social media use by politicians in general, no study, to the best of my knowledge, has empirically investigated this phenomenon in the context of election campaigns, even though elections are important political activities. Thus, the present research attempts to fill this gap in our understanding of the political use of the social media tool Twitter by presenting an empirical test of the association between the social media adoption of politicians and the success of their campaign financing activities, and how this association differs among politicians with different online network sizes (e.g., Twitter followers) and varying political ideologies.

1.2. Competing hypotheses: Minimal vs. strong effects

Since the advent of radio and television, researchers have hotly debated the effect of new technologies on election campaigns. One school of researchers (Klapper, 1960; Campbell, Converse, Miller, & Stokes, 1960) followed the famous "minimal effects" thesis, which argued, among other things, that political campaigns mediated by information technology only marginally affect public opinion. Katz and Lazarsfeld (1955) provided a theory supporting this finding—namely, the "two-step flow of communication"—positing that media messages are filtered by opinion leaders through social mediation processes. This theory was largely based on social conditions at that time (Bennett & Iyengar, 2008), which were characterized by (1) a pre-mass-communications media system and (2) a group-based society with social capital (Putnam, 2001). Opposing this theory, however, is another school of thought that has emerged since the 1980s, with such underlying social changes as individuals' disconnection from a group-based civil society (Bennett & Iyengar, 2008) and better measurements of priming, framing, and agenda-setting. Numerous studies belonging to this school have suggested that television news could actually determine which issues the public considers important (Iyengar, Peters, & Kinder, 1982) and that public opinion toward policies could be significantly influenced by the content of news stories (Iyengar & Kinder, 1987; Gilliam & Iyengar, 2000; Baum, 2005; Gentzkow & Shapiro, 2006; Gerber, Karlan, & Bergan, 2009).[5]

However, the emergence of new media, such as cable television and the internet, has led to a new era in which media may play a different role in political campaigns (Bennett & Iyengar, 2008). The emergence of new media has created a much wider range of media choices; therefore, politicians are no longer able to reach vast audiences via a limited number of channels. Supporting this statement, Jenkins (2006) has shown that unlike advertisers in the 1960s, who could reach 80% of U.S. women with a prime-time spot on ABC, CBS, and NBC, modern advertisers have to run the same spot on 100 TV channels to reach the same number of viewers. Based on this observation, some scholars argue that we may return to a time of minimal effects (Bennett & Iyengar, 2008).

In this study, I argue that new media, such as the internet, will still have a significant impact with the rise of a "self-selected" audience as opposed to a more "inadvertent" audience during the heyday of network news. Although political information in a prime-time spot on three networks would have reached a greater audience before, most members of that audience were inadvertent and less likely to change their positions in response to the information provided (Negroponte, 1995; Sunstein, 2009; Prior, 2007; Bennett & Iyengar, 2008). With a large number of media outlets, however, people can now self-select the political information that matches and reinforces their ideological positions. This fragmented audience structure allows political elites to influence public opinion through the targeted use of new information technologies, even though the size of their audience may be smaller.

In order to test these competing hypotheses, the first consideration should be the possible effect of "self-selective" technology. Previous evidence (Hong, 2012) suggests that online technology such as social media may *concentrate* and *polarize* information consumption patterns through a cascade mechanism. Previously, without online technology, people had limited chances to *interact* or *network* with nonlocal politicians, while now they can have a personal conversation with nonlocal candidates by "following" or "friending" them. Out of the large number of nonlocal politicians, people are more likely to "follow" or "friend" the ones they perceive as more *salient* (Hong, 2012; Farrell & Drezner, 2008); that is, either *nationally recognized* or *ideologically distinctive*. Hence, the preferences revealed by people's "self-selection" with these technologies might be more concentrated and polarized than what is observable without these technologies. If this online information consumption pattern affects political behaviors, such as people's willingness to contribute to a political candidate, we should expect increasing *concentration* and *polarization*, not only in online information consumption patterns but also in important political outcomes such as campaign finance.

1.3. Social media & political finance

In examining the effects of new information technology on political outcomes, I investigate the political use of *social media* and its effect on *political finance*. The political effects of such social media technology as Twitter deserve special attention, not only because most politicians are using it but also because one of the key features of this new technology is to maximize "self-selection," which is the component that leads us to the two different hypotheses of minimal and strong effects.[6] Here, I look particularly at Twitter among the many existing forms of social media, because its "asymmetric" form of network makes it potentially more conducive to political interaction (Porter, 2009; Hong & Nadler, 2012),[7] which is defined as the mutual flow of feedback between political actors and citizens (Stromer-Galley, 2000).

Political finance, among the many possible political variables, is important for the following reasons. First, recent empirical evidence has increasingly indicated that political finance has a significant and positive impact on candidate electoral success in a number of countries with national, local, and multiparty elections (Benoit & Marsh, 2008), regardless of whether the candidates are challengers or incumbents.[8]

[4] Another body of work reports some evidence of the impact of the internet or new media in general, rather than focusing on the impact only of social media. Some studies have found that the dominance normally enjoyed by political elites is reproduced or even magnified on the internet (Hindman, 2009; Schlozman et al., 2010), which challenges the optimistic view that the internet will promote a democratic public sphere that reduces inequalities of attention between elites and those outside the political mainstream (Agre, 2002; Benkler, 2006; Bennett & Entman, 2001; Jenkins, 2006). Others report that new media may polarize public opinion (Hong, 2012; Prior, 2007; Sunstein, 2009; Baum & Groeling, 2008). There is also a different body of work that examines the role of new information technologies such as social media in promoting communications between government agencies (Chun & Warner, 2010; Chun, Shulman, Sandoval, & Hovy, 2010; Jaeger & Bertot, 2010), in creating a culture of openness and transparency in government organizations (Bertot, Jaeger, & Grimes, 2010; Bertot, Jaeger, Munson, & Glaisyer, 2010), and in improving managerial effectiveness (Gil-Garcia & Pardo, 2005; Gil-Garcia, Chun, & Janssen, 2009; Gil-Garcia, Pardo, & Burke, 2010; Luna-Reyes, Gil-Garcia, & Cruz, 2007).

[5] Also, see Strömberg (2004), Gentzkow and Shapiro (2004), and DellaVigna and Kaplan (2007).

[6] Further, previous evidence (Hong, 2012) implies that social media technology is an ideal platform for political campaigning, as it provides a greater potential for politicians to reach out to their targeted audiences rather than just waiting for search engines to direct traffic to them.

[7] Twitter differs from many other alternative social media such as Facebook, in the sense that it enables asymmetric networks. For example, Twitter users (say, politicians) can find themselves in the "asymmetric" position of following the tweets of a small number of users, while their own tweets are followed by millions of users (Porter, 2009). Twitter can thus function as a form of social media that is potentially more conducive to political interaction (Porter, 2009).

[8] There is an ongoing debate over whether the impact of campaign spending is more significant for challengers than for incumbents. The former view is supported by Abramowitz (1988, 1991), Ansolabehere and Gerber (1994), Green and Krasno (1988), and Jacobson (1978, 1990); the latter view is supported by Gerber (1998) and Moon (2006).

Second, online technology may have great potential for revolutionizing how politicians raise money for their campaigns, as Obama's extraordinary success at internet fundraising in the 2008 presidential election suggests. In 2008, presidential candidates raised more than $1.6 billion, an increase of more than 149% over the amount raised by presidential candidates in 2004. The internet, along with social media technologies, has often been identified as one of the most important contributing factors to the increase in fundraising in 2008 (Weintraub & Levine, 2009). Finally, political representation in the United States is often described as "'surrogate,' in which citizens are represented by legislators with whom they have no electoral relationship" (Mansbridge, 2003, p. 522), and this surrogate representation is primarily expressed through campaign contributions (Mansbridge, 2003; Gimpel, Lee, & Pearson-Merkowitz, 2008).

1.4. In-state vs. out-of-state donations

For the purpose of my research, I classify campaign contributions as *in-state* and *out-of-state*. The terms *in-state* and *out-of-state* are defined with reference to the states in the United States and to the fact that a significant number of people do donate to candidates outside their home states. *Out-of-state* implies a state that the politician does not represent, and similarly, *in-state* implies the home state of a politician. I examine the association between political use of social media and political finance separately for *in-state* and *out-of-state* donations for two reasons.[9]

First, and most important, the widespread political use of social media may have different effects on *in-state* and *out-of-state* donations. It is likely to increase the relative importance of *out-of-state* donations compared to *in-state* donations, because contributions to nonlocal candidates are often hampered by information barriers between individuals and the candidates. Networks formed through social media can reduce these information costs in the following manner: Networks constructed in a non-formal setting through social media technologies may help citizens to learn about the politicians. This knowledge is important because "to become engaged in the fundraising efforts of out-of-district candidates, citizens need to learn about them and come to believe that they will be a sensible investment of campaign dollars" (Gimpel et al., 2008, p. 375). Further, individuals generally contribute to political campaigns mainly because they are *asked* to do so (Brown, Powell, & Wilcox, 1995; Francia, Green, Herrnson, Powell, & Wilcox, 2003; Grant & Rudolph, 2002). Their willingness to contribute is greatly affected by social networks formed in a variety of settings (Brady, Schlozman, & Verba, 1999; Cho & Gimpel, 2007; Gimpel, Lee, & Kaminski, 2006), which may include the online networks on social media.

Second, the differential effects of social media on out-of-state and in-state donations may have important implications for the system of representation, political equality, and political polarization. In the United States, campaign contribution is an important medium through which political representation is expressed (Mansbridge, 2003; Gimpel et al., 2008), and the basis of political representation is geographic. Thus, an increase in the relative importance of out-of-state donations might increase the discrepancy between *whom politicians represent* and *who supports them financially* and thus harm the integrity of the system of representation as well as political equality (Beitz, 1989). An increase in the relative importance of out-of-state donations may also have implications for political polarization. People contribute to nonlocal candidates with whom they sympathize ideologically (Gimpel et al., 2008); thus, ideologically distinctive members are more likely to receive out-of-state contributions.[10] If out-of-state donations become relatively more important with the new information technology, then candidates with extreme ideological positions would have a greater chance of winning elections, which may increase polarization.

2. Data

2.1. Social media activities

This study uses observations of social media activities by members of the 112th U.S. House of Representatives. The sample contains information from about 415 politicians whose campaign finance data were identified by the Center for Responsive Politics, including 298 who have adopted Twitter. Out of the 298 Twitter accounts, I exclude accounts that are either inactive or premature,[11] and consider only the remaining 195 accounts to be valid. I collected data on politicians' Twitter activities between June 8 and 22, 2011. These data include the exact date of their first Twitter posts, the number of followers, users followed, and the number of posts ("tweets") made at the time of data collection. I observed the politicians' number of Twitter followers once in June 2011. Even though I do not have observations on how the number of followers changed over time, I have observations on the dates when politicians adopted Twitter.

2.2. Campaign finance

I obtained data about politicians' campaign finance from the Center for Responsive Politics' database, OpenSecrets.org. The original source of these data was the publicly available Federal Election Commission (FEC) files on individual contributions between January 2005 and December 2010.[12] The FEC maintains information on individual contributors who have donated more than $200[13] to a single politician, and previous evidence suggests that individual contributions in amounts of less than $200 generally account for a very small part of the candidate's total fundraising (Gimpel et al., 2008).[14] Because I am interested in the impact of politicians' social media networks on their fundraising,

[9] An alternative way of conducting the analysis would be to do so at the congressional district level. However, in this study, I use state-level rather than district-level observations for two reasons. Most important is that in-state and out-of-state donations may have different implications for the system of representation in the United States, and the boundaries of *states* are the most important geographical unit of political representation. For instance, the U.S. Constitution grants rights of representation in Congress to *states*, not to congressional districts or individual citizens (Rehfield, 2005; Gimpel et al., 2008). Further, campaign finance data is observed at the zip code level and the provided zip code areas are, in many cases, split by congressional district boundaries. Thus, the in-state and out-of-state comparison is likely to provide a more robust estimate than a similarly defined in-district and out-of-district comparison.

[10] For a formal theory that explains the relevance of political candidates' ideological profiles in campaign donors, see, for example, Aldrich (1983), among many.

[11] I did not consider those politicians whose Twitter activities satisfy one of the following conditions: (1) the number of posts ("tweets") is fewer than 50; (2) it has been less than six months since they opened the account. Specifically, there were 35 Twitter accounts that were inactive (the number of posts being fewer than 50) and 94 Twitter accounts that were premature (less than 6 months old). But, in fact, the exclusion of those inactive and premature accounts from the sample did not have significant impacts on key results, as including those accounts in the analysis did not introduce any meaningful changes in the estimated coefficients in Tables 2–5.

[12] The campaign finance data ends in December 2010, as the 2011 data were not available at the time of conducting this research. Using data that ends in 2010 creates the following potential problems. First, one may argue that Twitter was not as widely used in 2010 as it is used today, and therefore, that data that ends in 2010 may provide weak evidence for the estimated result. However, I believe that the data that ends in 2010 provides enough evidence for measuring the impact of social media, because politicians had been using Twitter for an average of 19.3 months prior to December 2010, which, in my opinion provides sufficiently long observations for the test. Second, another problem is that there is a six-month difference between the end of campaign finance data (December 2010) and the time when the size of the online network (the number of followers in Twitter) was collected online (June 2011). However, I believe this six-month lag did not affect key results, as the size of online networks tend to increase linearly (Chi & Yang, 2011) and thus the *relative* size of online networks among politicians in June 2011 would probably be largely similar to that in December 2010.

[13] All money amounts are assumed to be in U.S. dollars. Candidates must disclose the names, addresses, and employers of any contributor who gives more than $200.

[14] According to the Center for Responsive Politics, large individual contributions (individual contributions greater than $200) consisted of 47% and 48% of total contributions collected by House Democrats and Republicans, respectively.

I focus on individual contributions and exclude contributions from political action committees (PACs) and self-financing.[15] The data from the FEC contained information about the donations the representatives collected before they were elected. In order to control for the effect of incumbent status on donations, I excluded donations that the politicians had collected before they assumed their posts as representatives.[16]

2.3. Ideological extremism

I measure politicians' ideological extremism by the folded DW-Nominate score as in previous studies (e.g., Hong, 2012; Gimpel et al., 2008). Specifically, I first subtracted the median value from the DW-Nominate score and took its absolute value so that a value of 0 indicates a moderate ideological position with a median DW-Nominate score, and a positive number implies greater political extremism (either conservative or liberal). The DW-Nominate score and thus the extreme index was available for 334 politicians. Specifically, politician *i*'s extreme index is as follows:

$$extreme_i = |DW\ \ Nominate_i - median\ \ (DW\ \ Nominate_i)|. \quad (1)$$

2.4. Additional data

I collected the following additional sets of data.[17] In order to control for the geographical heterogeneity of online networks, I also collected information about followers' posted geographical information at the U.S. state level. When I excluded the number of Twitter users residing in foreign countries, approximately 85% of those who were following the politicians indicated their home state in the sample. I omitted those users whose geographic information was not available. In addition, in order to control for politicians' use of other social media tools such as Facebook, MySpace, YouTube, and RSS, I used an indicator variable to control for each social media tool. I also included an indicator variable for whether a politician chairs a committee. Table 1 describes these politicians' characteristics as variables included in the study.

3. The impact of social media adoption on fundraising

In this section, I investigate the impact of politicians' use of social media on their campaign finances. I am especially interested in whether (1) politicians saw an increase in donations following their social media adoptions, (2) the political use of social media has made political finance more egalitarian, and (3) politicians with ideologically extreme positions have benefited most.

3.1. Does social media matter in politics?

By observing the dates when politicians adopted Twitter, I tested whether donations to politicians increased *after* their social media adoptions, controlling for the characteristics of the politicians and contributors as well as for common time trends in the donations to all representatives combined.

Given that I have weak priors on the functional form of how donations will change after politicians adopt Twitter, I start by estimating a generalized additive model (GAM) rather than by estimating an ordinary least squares (OLS) regression, which must specify a functional form in advance. GAM is a semi-parametric technique, which allows the relationship between the explanatory and outcome variables to take a flexible, smooth, functional form (Beck & Jackman, 1998). The empirical framework I used in this section is as follows:

$$Donations_{ijt} = \alpha_0 + \mathfrak{G}(adopt_{it}) + outofstate_{ij} + f(t) + timetoelection_{it} + \alpha_j + \alpha_i + \varepsilon_{ijt} \quad (2)$$

The dependent variable $Donations_{ijt}$ is either the number of individual contributors or the amount of individual donations from state *j* to politician *i* at monthly time indicator *t*. I transformed this variable logarithmically to interpret coefficients as percentage changes. The variable $adopt_{it}$ measures the number of months that had passed after or were remaining before politician *i* adopted Twitter. Thus, $adopt_{it}$ is 0 when politician *i* has adopted Twitter, and $outofstate_{ij}$ is a dummy variable indicating whether region *j* is out-of-state for politician *i*. I also included α_i and α_j, which are the politician and state fixed effects, in order to control for unobservable characteristics of politicians and contributors, respectively.

I control for $f(t)$, which is the general time trend of donations,[18] as well as $timetoelection_{it}$, which is a set of dummy variables indicating the number of months remaining before politician *i*'s next election. By controlling for $timetoelection_{it}$, I could compare, for instance, the donations that each politician collected one month before the election in 2010 with what he or she had collected one month before the election in 2006 or 2008.

The sample for GAM estimation includes only the 72-month window around politician *i*'s Twitter adoption. The 72-month treatment window begins three years (36 months) before the adoption of Twitter. The pre-adoption periods are included to verify whether the increase in donations after the adoption can be attributable to politicians' Twitter adoption.[19]

I estimated the regression in Eq. (2) with a full sample and then separately for donations from out-of-state and in-state[20] to determine whether the impact of Twitter adoption on donations differs between these two regions. Figs. 1 and 2 show the estimated effects from Eq. (2), along with 95% confidence bands,[21] for the full sample, including donations from both in-state and out-of-state. Fig. 1 uses the number of donations as the dependent variable, whereas Fig. 2 uses the amount from donations.

As can be seen in Figs. 1 and 2, the estimated effects tend to become positive approximately 12 months after the adoption with an upward trend. As the dependent variable is the logarithm of donations, the

Table 1
Politicians' use of social media other than Twitter.

Variable	Politicians' social media adoptions (%)	Standard deviation
Facebook	65%	0.48
Flick	19%	0.40
YouTube	75%	0.43
RSS	57%	0.50
MySpace	3%	0.18

[15] In fact, individual contributions are a far more important source for political campaigns than contributions from political action committees (PACs) or corporations (Ansolabehere, de Figueiredo, & Snyder, 2003; Theilmann & Wilhite, 1989).

[16] Alternatively, I included an indicator variable called $incumbent_{it}$, which takes a value of 1 if the politician collected donations when he or she was the representative and 0 otherwise. The estimated results were highly robust and do not depend on the specification.

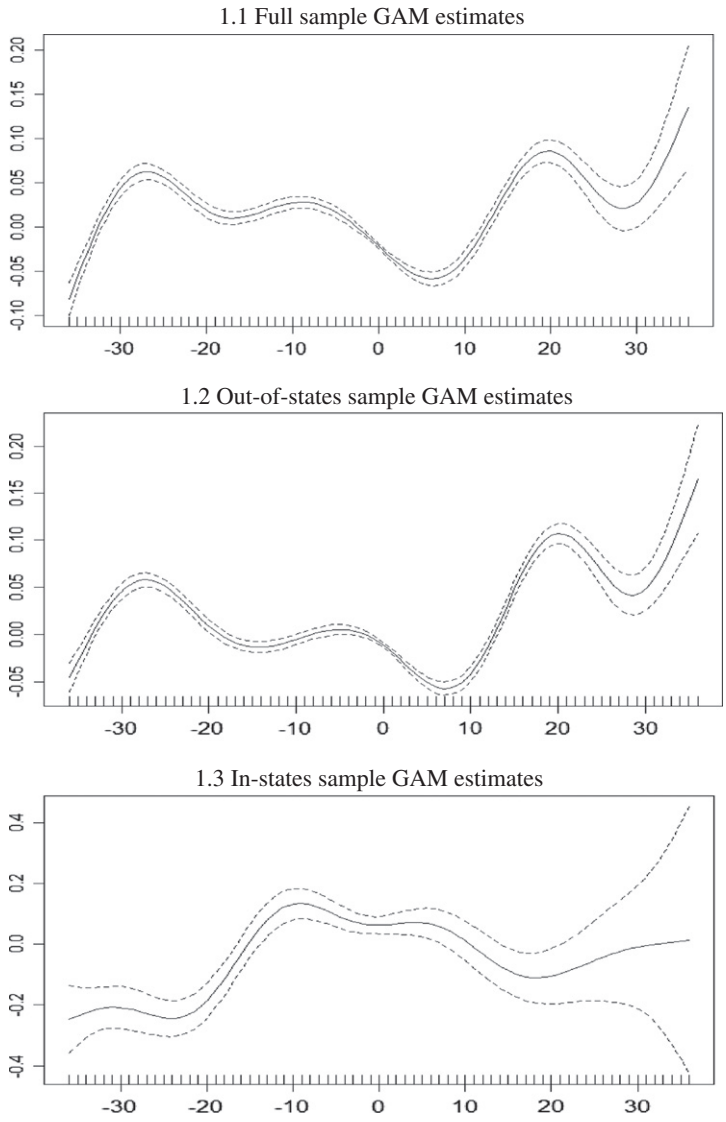
[17] I use these additional sets of data in the robustness check with cross-sectional observations. In panel data regressions, I use the politicians' fixed effect instead of controlling for the variables of politicians' characteristics.

[18] Because of the limited capacity of the statistical package *R* in estimating GAM, I control for a quadratic time trend in Eq. (2), rather than for a nonparametric time trend. I do, however, control for a nonparametric time trend in OLS estimations.

[19] The function $\mathfrak{G}(\cdot)$ is a smooth, penalized spline function, and the model also assumes that within each 72-month window the error in any single month is assumed to be normally distributed and correlated with previous shocks only through the last periods. The model estimates are calculated with the *mgcv* package in the statistical package *R*.

[20] For the regression described above to yield consistent estimates, the critical assumption is that the treatment (Twitter adoption) in a period is independent of the idiosyncratic shocks to donations in that period. In other words, after controlling for time-invariant characteristics, such as politician and state characteristics that affect donations in each period, the treatment (i.e., a politician's Twitter adoption) must be random across politicians. This is a strong but plausible assumption. The main factor determining the timing of a politician's Twitter adoption was assumed to be exogenous to time-varying factors.

[21] The confidence bands are based on standard errors that were corrected for heteroskedasticity across politicians and serial correlation among politicians.



Note: The horizontal axis is the variable $adopt_{it}$, which measures the number of months passed after or remaining before a politician i adopted Twitter. Thus, $adopt_{it}$ is 0 when the politician i adopted Twitter. The vertical axis is the variable $Donations_{ijt}$, which measures the number of individual contributors from state j to politician i at monthly time indicator t.

Fig. 1. Impact of Twitter adoption on the number of donations over time.

estimated marginal impacts can be interpreted as approximate percentage changes in either the number of or amount from donations resulting from Twitter adoption. Thus, 36 months after Twitter adoption, politicians who adopted Twitter received more donations in terms of the number and amount than those who did not (approximately 15% and 90%, respectively). Another important point in Figs. 1 and 2 is that in-state donations do not show the estimated effects on donations. The estimated coefficients tend to increase in the out-of-state sample (Figs. 1.2 and 2.2), but not in the in-state sample (Figs. 1.3 and 2.3).

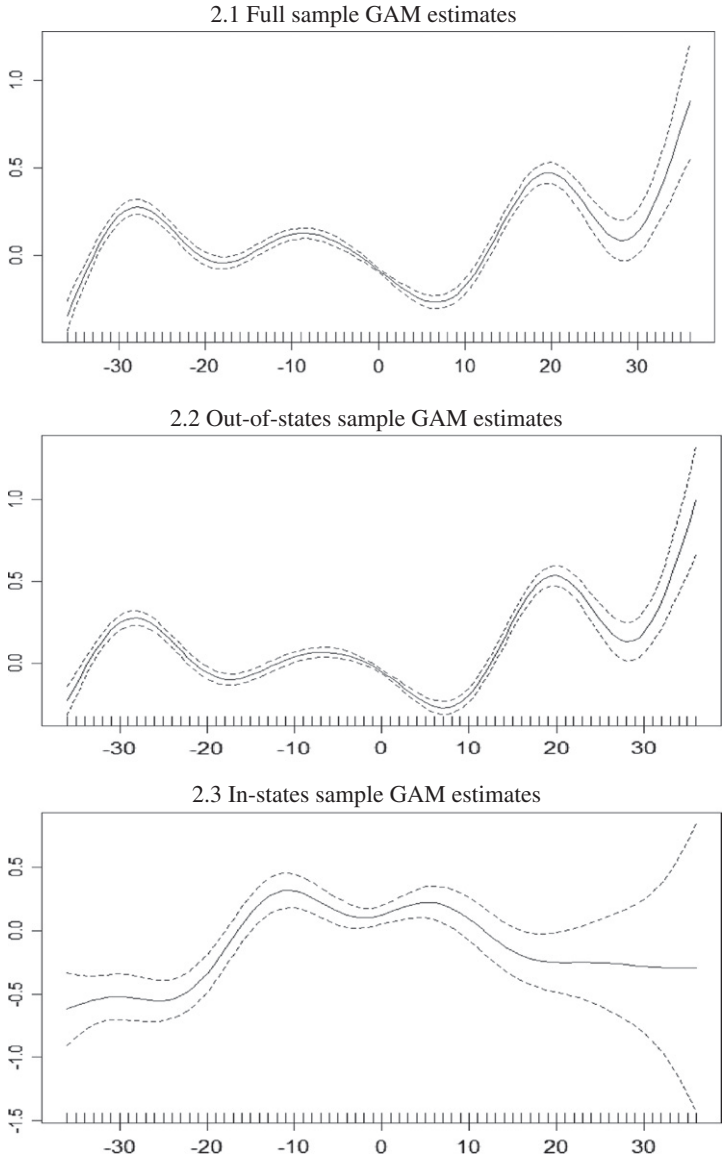
3.2. Does social media create a more egalitarian power structure?

A drawback of Eq. (2) is that the model does not consider the variation in the number of Twitter followers. Thus, the estimates in Figs. 1 and 2 reflect the average impact for each time period after Twitter adoption. The problem, however, is that some politicians may have differentially benefited from using Twitter, depending on the size of their online networks. In order to address the question of *who* benefits from adopting the new technology, I first grouped politicians into 10 subgroups with respect to the size of their online networks (i.e., the number of Twitter followers) and ran the following regression:

$$Donations_{ijt} = \alpha_0 + \beta_1 adopt_{it} + \beta_2 adopt_{it} followers_i + outofstate_{ij} + f(t) + timetoelection_{it} + \alpha_j + \alpha_i + \epsilon_{ijt}. \quad (3)$$

Now, $adopt_{it}$ measures the number of months that passed after politician i adopted Twitter. Thus, $adopt_{it}$ is an integer greater than or equal to zero. Unlike in Eq. (1), I assume that the impact of social media increases linearly after the adoption and estimate OLS instead of GAM, because estimating an interaction impact with GAM is too demanding computationally.[22] Politician i's number of Twitter followers is $followers_i$, measured in ten thousands. I include the interaction between $adopt_{it}$ and $followers_i$ to see whether the effect estimated with Eq. (2) depends on the size of the

[22] In fact, this linear assumption turns out to be a reasonable assumption from the semi-parametric GAM estimations in Figs. 1 and 2.



Note: The horizontal axis is the variable $adopt_{it}$, which measures the number of months passed after or remaining before a politician i adopted Twitter. Thus, $adopt_{it}$ is 0 when the politician i adopted Twitter. The vertical axis is the variable $Donations_{ijt}$, which measures the amount of individual donations from state j to politician i at monthly time indicator t.

Fig. 2. Impact of Twitter adoption on the amount of donations over time. Note: The horizontal axis is the variable $adopt_{it}$, which measures the number of months passed after or remaining before a politician i adopted Twitter. Thus, $adopt_{it}$ is 0 when the politician i adopted Twitter. The vertical axis is the variable $Donations_{ijt}$, which measures the amount of individual donations from state j to politician i at monthly time indicator t.

networks on Twitter. The coefficient of this interaction term is expected to be positive, which can be a useful test to see whether the estimated effect with Eq. (2) is, in fact, associated with politicians' Twitter activities.

Tables 2 and 3 present the estimated results of Eq. (3). Again, I estimated the regression in Eq. (3) with a full sample and then separately for donations from out-of-state and in-state. For the full sample and out-of-state donations, the coefficient β_2 is estimated to be significantly positive. This evidence further supports that the estimated effects with Eq. (2) in Figs. 1 and 2 are associated with politicians' Twitter activities. For in-state donations, however, the coefficient was significantly positive with the number of donations, but not with the amount. Overall,

Table 2
Impact of Twitter adoption on the number of donations (interaction with the number of Twitter followers).

	(1) Full sample	(2) Impacts on donations from out-of-states	(3) Impacts on donations from in-states
Adopt	0.001*	0.002**	−0.008*
	(0.000)	(0.000)	(0.004)
Adopt × followers	0.001**	0.001**	0.003**
	(0.000)	(0.000)	(0.001)
N	316,525	292,698	23,827
Adj. R^2	0.405	0.160	0.402

1. Standard errors in parentheses: * $p < 0.05$, ** $p < 0.01$.
2. The number of followers is in ten thousands.

Table 3
Impact of Twitter adoption on the amount of donations (interaction with the number of Twitter followers).

	(1) Full sample	(2) Impacts on donations from out-of-states	(3) Impacts on donations from in-states
Adopt	0.007**	0.009**	−0.015
	(0.002)	(0.002)	(0.010)
Adopt × followers	0.005**	0.005**	0.003
	(0.000)	(0.000)	(0.002)
N	316,525	292,698	23,827
Adj. R^2	0.271	0.147	0.370

1. Standard errors in parentheses: * p < 0.05, ** p < 0.01.
2. The number of followers is in ten thousands.

Table 4
Impact of Twitter adoption on the number of donations (interaction with ideological extremism).

	(1) Full sample	(2) Impacts on donations from out-of-states	(3) Impacts on donations from in-states
Adopt	0.002**	0.002**	0.005
	(0.001)	(0.001)	(0.004)
Adopt × extreme	0.002**	0.004**	−0.008
	(0.001)	(0.001)	(0.005)
N	282,900	261,562	21,338
Adj. R^2	0.399	0.144	0.539

1. Standard errors in parentheses: * p < 0.05, ** p < 0.01.
2. The number of observations is smaller than in Tables 2–3 as DW Nominate scores were not available for all the politicians in the sample.

the associations between politicians' Twitter activities and donations are more obvious for out-of-state donations than for in-state donations.

The evidence that politicians with larger online networks have benefitted more than others suggests that political competition might become less egalitarian with the advent of information technology and its active use in politics. Fig. 3 plots politicians' numbers of Twitter followers as of June 2011 against their ranks in terms of that number. This figure shows that politicians' Twitter networks are highly concentrated. The ten high-profile politicians having the largest number of Twitter followers possess almost half (47%) of all the representatives' followers combined. In sum, the estimates imply that the active use of social media in politics may yield a more unequal distribution of financial resources among candidates in political competitions.

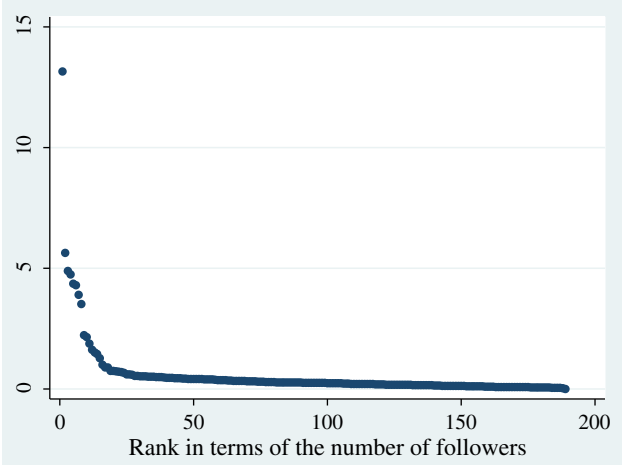
3.3. Do extremists benefit more from social media?

Technology like the social media tends to identify the more *salient* ideas more easily (e.g., new ideas or ideas no one has ever talked about for some reason) and is thus more likely to benefit political extremists. Further, the evidence that donations have increased from out-of-state—albeit relatively little, if any, from in-state—leads us to consider the importance of ideology in the self-selection process. Out-of-state donors are more likely to be people who sympathize ideologically with politicians, so an increase in out-of-state donors may imply an increasing importance in ideology with reference to social media adoption.

$$Donations_{ijt} = \alpha_0 + \beta_1 adopt_{it} + \beta_2 adopt_{it} extreme_i + outofstate_{ij} + f(t) + \alpha_j + \alpha_i + \epsilon_{ijt} \quad (4)$$

Eq. (4) aims to test this hypothesis. I followed previous studies (e.g., Gimpel et al., 2008) in measuring ideological extremism. The variable $extreme_i$ is the folded DW-Nominate score, which measures the ideological position of politician *i*, with a greater number referring to a more politically extreme position, either liberally or conservatively.

Tables 4 and 5 report the estimated impact in terms of the number of and amount of donations, respectively. Overall, the results suggest that a large part of the financial benefits associated with social media adoption is observed among high-profile politicians with ideologically extreme positions.[23] This evidence supports the argument that an increase in out-of-state donations may imply that political ideology is becoming increasingly important, with the recent emergence of social media as a political communication tool, in shaping the relationships between politicians and their donors.



High-profile politicians' dominance on Twitter

Definition of high-profile politicians	Share of high-profile politicians' numbers of Twitter followers out of Representatives' total number of followers
Top 6	35.7%
Top 8	42.8%
Top 10	47.0%
Top 15	54.4%
Top 20	58.6%

Fig. 3. Highly concentrated number of Twitter followers.

4. Findings & political implications

This study presents evidence that (1) politicians' social media adoptions have yielded increased donations from outside their constituencies but little from within their own constituencies; (2) politicians with extreme ideologies tend to benefit more from their social media adoptions; and (3) the political use of social media may yield a more unequal distribution of financial resources among candidates.

The first and second findings have important implications for the integrity of the system of political representation as well as for political polarization. They suggest that politicians' use of new information technologies neutralizes the importance of geographical distance and highlights ideological positions, therefore increasing the discrepancies between *whom they represent* and *who supports them*. This phenomenon may be detrimental to the integrity of the system of representation, as it calls into question politicians' incentives in representing their constituents. "[W]hen financial incentives encourage legislators to subordinate the interests of their constituents to those of others elsewhere, an additional form of distortion in the system of representation is introduced" (Beitz, 1989, p. 204).

Further, the two findings may imply an increasing political polarization due to the use of social media. The internet may bring *new people* into political giving but may not bring in *new kinds of people* (Schlozman, Verba, & Brady, 2010). However, even if the internet does not significantly change the profile of donors in the U.S. as a whole,

[23] In fact, the estimated effect was not symmetric for left- and right-leaning politicians. Republican extremists have enjoyed a much larger extremism premium than Democrat extremists have.

Table 5
Impact of Twitter adoption on the amount of donations (interaction with ideological extremism).

	(1)	(2)	(3)
	Full sample	Impacts on donations from out-of-states	Impacts on donations from in-states
Adopt	0.013**	0.013**	0.002
	(0.003)	(0.003)	(0.010)
Adopt × extreme	0.004	0.008*	−0.021
	(0.003)	(0.004)	(0.012)
N	282,900	264,008	21,338
Adj. R^2	0.262	0.128	0.357

1. Standard errors in parentheses: * $p < 0.05$, ** $p < 0.01$.
2. The number of observations is smaller than in Tables 2–3 as DW Nominate scores were not available for all the politicians in the sample.

the political implications may change with an analysis from the standpoint of each politician. That is, new technologies like social media allow politicians to communicate with a "self-selected" group of people online who may have different profiles from those whom the politicians used to ask for support offline. One possibility is that the "self-selection" technology reduces the information barriers between individuals and nonlocal politicians and allows politicians more easily to communicate with people who are from remote geographical locations but who sympathize with them ideologically. That is, all else being equal, out-of-state donors are more likely to be those who sympathize with the politician ideologically (Gimpel et al., 2008), and the evidence of the increased out-of-state donations as well as greater financial benefits for political extremists may contribute to the greater ability of ideologically intense or extreme candidates to win elections, thereby increasing political polarization.[24]

The third finding also has an important implication for political equality, which is a fundamental premise of democracy (Verba, Schlozman, & Brady, 1995; Dahl, 2006). To begin with, the "surrogate representation" in the United States is often criticized as "embodying far more political inequality than does even the traditional legislator–constituent relation" (Mansbridge, 2003, p. 523) because the representation is often exercised through monetary contributions. Thus, it is often argued that in order to secure political equality, the system of political finance in the United States should ensure that politicians who participate in political competition have equal opportunities for effective political influence (Dahl, 1989; Beitz, 1989; Cohen, 2001; see also Rawls, 1971 for similar arguments). Although there is no consensus as to whether equality of resources is necessary for political equality (Beitz, 1989; Wright, 1982; Cohen, 2001), equality of resources still may serve "as a convenient proxy for a more complex criterion that would be excessively difficult to interpret and administer" (Beitz, 1989, p. 209). Thus, evidence that the widespread political use of social media results in a more unequal distribution of financial resources among candidates implies that the use of new information technology may aggravate rather than alleviate political inequality.

5. Limitation & conclusion

This study examined whether politicians' social media adoptions have influenced their fundraising. My findings suggest that donations increased significantly after politicians adopted social media. Notably, such adoptions have a more dramatic impact on out-of-state donations, as there was little evidence that donations from politicians' own constituencies increased following social media adoption.

My findings have important implications for the integrity of the system of political representation, political polarization, and political equality. They also shed light on the recent debate about the impact of new information technology on democracy. The estimated impact of the new information technology on fundraising was much greater than I had anticipated. However, because this study has analyzed a phenomenon that continues to evolve rapidly, this estimated impact can hardly be regarded as representing the full and final impact of the new social media (Schlozman et al., 2010; Bimber, 1998; Xenos & Moy, 2007). Similarly, although I observed financial benefits only among politicians with large online networks, as other politicians' online networks grow and mature, the unequal benefits across politicians may become less concerning.

Further, although the overall pattern of my findings reflects the effect of politicians' social media adoptions, more work will be needed to obtain a more precise estimate of causality. For instance, the effect I tested with politicians' Twitter adoptions might need to be understood as the effect of politicians' social media adoptions. If these politicians adopted other social media technologies at the same time they adopted Twitter (a highly likely possibility), the effects may be overestimated, and we should attribute the estimated effect to political use of the new social media in general, rather than to Twitter in particular. Nevertheless, this study is among the first to demonstrate empirically the impact of social media adoptions on political finance and to discuss its implications for political equality, polarization, and democracy.

[24] Previous studies report that political extremists are more successful in terms of fundraising (see, for example, Ensley, 2009; Gimpel et al., 2008) and that this advantage may increase even further with the widespread use of the "self-selection" technology.

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