Which candidates do the public discuss online in an election campaign?: The use of social media by 2012 presidential candidates and its impact on candidate salience

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ABSTRACT

The effects of new communication technologies on election campaigns, and the effectiveness of media-centered campaign strategies more broadly, remain ongoing subjects for debate in political science. This study provides some of the first empirical evidence about the potential impact of social media on the 2012 U.S. presidential elections, by testing the association between "candidate salience" and the candidates' level of engagement in online social media sphere. We define "candidate salience" as the extent to which candidates are discussed online by the public in an election campaign, and have selected the number of mentions presidential candidates receive on the social media site, Twitter, as means of quantifying their salience. This strategy allows us to examine whether social media, which is widely recognized as disruptive in the broader economic and social domains, has the potential to change the traditional dynamics of U.S. election campaigns. We find that while social media does substantially expand the possible modes and methods of election campaigning, high levels of social media activity on the part of presidential candidates have, as of yet, resulted in minimal effects on the amount of public attention they receive online.

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1. Background: the impact of new information technologies

The effects of new communication technologies on election campaigns, and the effectiveness of media-centered campaign strategies more broadly, remain ongoing subjects for debate in political science. While some early political observers argued that radio, newsreels, and television communications were transforming election campaigns, other early social scientists tended to downplay these effects. The survey work of Lazarsfeld, Berelson, and Gaudet (1944) in conjunction with the controlled experiments undertaken by Hovland, Lumsdaine, and Sheffield (1949) resulted in skepticism regarding the disruptive potential of new communications technologies. The above laid the groundwork for the famous "minimal effects" thesis (Campbell, Converse, Miller, & Stokes, 1960; Klapper, 1960), which argued that any competitive advantages gained by political actors' early adoption of new technologies would be quickly neutralized as their competitors followed suit, and/or as the public became inured to them, and that, over any significant period of time, the marginal competitive advantage gained by any one candidate's use of new technological innovations in an election campaign would tend to be zero.

This "minimal effects" hypothesis was dominant among social scientists until the 1980s, and much of the literature which followed during this period shifted focus to discovering the social, psychological, and economic mechanisms that could best explain minimal effect outcomes, including selective exposure, acceptance, and recall (Sears & Whitney, 1973), and inattentiveness to and forgetfulness of the political content of television programming (Neuman, 1986; Patterson & McClure, 1976). Since the 1970s, however, numerous studies have suggested that news can actually shape the issues the public considers important through priming, framing, and agenda setting (Entman, 1993; Gamson, 1992; Iyengar, Peters, & Kinder, 1982; Jacobs & Shapiro, 1994; Nelson & Kinder, 1996),[2] and that public opinion toward policies can be influenced by the content of news stories (Baum, 2005; Dellavigna & Kaplan, 2007; Gentzkow & Shapiro, 2004, 2006; Gerber, Karlan, & Bergan, 2009; Gilliam & Iyengar, 2000; Iyengar & Kinder, 1987; McCombs & Shaw, 1972; Strömberg, 2004).[3] Campaign advertisements have also been found to have an especially significant effect on voter support for the candidates who sponsored

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[2] Also see: Iyengar, 1991; Iyengar & Kinder, 1987; Krosnick & Kinder, 1990; McCombs & Shaw, 1972; Gamson & Lasch, 1983; Gamson & Modigliani, 1987; Nelson, Oxley, & Clawson, 1997.

[3] For instance, the agenda setting theory of McCombs and Shaw (1972, 1993) describes the ability of the news media to influence the salience of topics on the public agenda; in elections since the 1968 presidential contest, they find that the frequency and prominence of news coverage surrounding a particular issue directly affects the public's impression of the importance of that issue, which in turn tilts the agenda of election contests in favor of that issue.

those advertisements (Ansolabehere & Iyengar, 1995; Brader, 2005; Kaid, 1997; Valentino, Hutchings, & Williams, 2004).

In elections in general – and especially in presidential primaries – mainstream media coverage and media interpretations of early contests can have significant effects on the results of later contests, and the nomination process as a whole (Brady & Johnston, 1987; Patterson, 1980, 1994). This notion is an important assumption of the "momentum" literature (c.f. Bartels, 1987) as well as the "information effects" literature (Baum & Groeling, 2009; McKelvey & Ordeshook, 1985; Neuman, 1986; Page & Shapiro, 1992) which finds that relevant "cues" and "information shortcuts" in the social and political environment can influence voters, especially in the direction of candidates whose names or political parties are most immediately cognitively accessible (Zaller, 1992; Zaller & Feldman, 1992).

It is thus reasonable to believe that similar kinds of public discourse in the new social media sphere might also have such effects, and it would be as prudent for political candidates to attempt to affect this emerging discourse through their own social media activities as it would be for them to attempt to affect mainstream media coverage through television and radio interviews. After all, where transaction costs are comparatively low (such as they are in the domain of social media) – and the stakes involve national presidential elections – actual political actors can hardly be expected to heed warnings of "minimal effects" in relation to almost any aspect of their election campaign. In what follows, we explore the extent to which political actors have indeed adopted social media in their election campaigns, and the extent to which higher levels of activity in this sphere increase the salience of candidates in the context of a presidential primary.

2. Political use of social media and candidate salience

This paper presents evidence of the association between the level of discussion surrounding the 2012 U.S. presidential candidates in the newly emerging social media sphere, and the candidates' own social media activities. Specifically, we examine "candidate salience", which we define as the extent to which candidates are discussed online by the public in an election campaign, and which we measure using the number of mentions a candidate garners on the social media site Twitter.[4] Through this strategy, we hope to examine whether technologies such as the social media that are widely recognized as disruptive in broader economic and social domains (given that they substantially expand the possible modes and methods of election campaigning), have the potential to change the traditional dynamics of U.S. election campaigns. Some studies (e.g., Baum & Groeling, 2008; Baum & Kernell, 1999) have extended earlier findings regarding the relationship between media reporting and agenda setting into the realm of modern technology by assessing the impact of new media – such as cable news and online blogs – on public opinion, but little is known about the impact of social media on the public's impression of the candidates.

Social media tools such as Twitter and Facebook have been hailed as politically disruptive communication technologies, properly understood and appreciated only in comparison to the most politically significant technological innovations of the twentieth century, such as radio and television (Grant, Moon, & Busby Grant, 2010). Many have predicted that social networking tools will bring about a radical transformation of how politicians, governments, and citizens will engage with one another. Services such as Twitter are being used by politicians and governments to amplify more traditional forms of communication, such as press releases. The immediate release of concise bursts of information to a large audience (Chun, Shulman, Sandoval, & Hovy, 2010) is

more effective than posting massive amounts of data on public websites (Fung, Graham, & Weil, 2007). They also use the social networking service to promote communications with the public and between agencies (Chun & Warner, 2010; Chun et al., 2010; Jaeger & Bertot, 2010). Bertot, Jaeger, and Grimes (2010) and Bertot, Jaeger, Munson, and Glaisyer (2010) predict that social media will create a culture of openness and transparency and thus reduce corruption. Shogan (2010) claims that "social networking websites possess the greatest potential for changes in constituent communication strategies".

While the internet notoriously played at least a rhetorical role in Al Gore's presidential bid in 2000, and while many have observed the growing importance the internet has played in successive early 21st century campaigns – from Howard Dean's groundbreaking use of that medium for fundraising and mobilization in 2004, to Barack Obama's tremendously successful use of the web for those same purposes in 2008 – virtually no technology, including websites themselves, has become infused into the political process with the rapidity that social media has between 2010 and 2012. In a very short space of time (about two years), politicians in modern democracies across the world have eagerly adopted social networking tools, such as Facebook and Twitter, seeing in them powerful new mediums for engaging their constituents (Chi & Yang, 2011; Williams & Gulati, 2010). Almost 200 million people have Twitter accounts (Twitter blog, 2011), from which they can opt to follow politicians. At the height of Barack Obama's presidential campaign, he employed over 100 staff to work on his social media outreach alone, including his Twitter account (The Economist, 2010). In 2010, former House Majority Leader Nancy Pelosi shunned major news networks and talk shows to make the initial announcement that she would run for House Minority Leader on Twitter (House, 2010). The following year, President Obama held the first ever virtual news conference via Twitter; members of the public could submit questions to the President in real time, from their own homes, and watch the President answer them on television. As part of their 2012 presidential election campaigns, every significant candidate for the Republican nomination has adopted a social media strategy, including the regular posting of updates and political messages via Twitter.

Presumably, politicians have embraced new social media because they see in tools such as Facebook and Twitter intriguingly effective ways of circumventing the far more mediated and structured interactions available to them through traditional media, such as television and radio (Posetti, 2010; Westling, 2007). Surely, a free broadcast technology such as Twitter might be viewed by less well-funded candidates as a political equalizer—a mode of direct constituent communication that circumvents the steep costs of traditional forms of political advertising, such as television. However, to date, very few have attempted to systematically investigate whether and to what extent politicians have derived measurable benefits from their recent adoption of social media (Wattal, Schuff, Mandviwalla, & Williams, 2010).

This paper attempts to fill the gap in our current understanding of the use of social media by political candidates by undertaking a quantitative analysis of American politicians' Twitter use and its impact on their levels of online salience. Twitter is especially interesting to those studying possible transformations in political communication and engagement because of the "asymmetric model" of human relationships that it enables and encourages—user tweets are public and visible to both subscribers and non-subscribers of the user, which sets it apart from services like Facebook. For one thing, Facebook has instituted special privileges and privacy requests by default for a user wishing to follow posts, links, or status updates of another user (Porter, 2009). Furthermore, on Facebook, two typical users can view one another's full profile only if they both agree to exchange information (i.e., if they agree to a "symmetrical relationship"). On the other hand, on Twitter, one user (say, a politician) could find himself or herself in the "asymmetric" position of following the tweets of only three other users (perhaps their family members), while his or her

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[4] 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 rapidly gained worldwide popularity, with over 300 million users as of 2011 (Taylor, 2011), generating over 200 million tweets (Twitter blog, 2011).

own tweets can be viewed by as many users who choose to follow him or her (there is no limit to this number). Therefore, the possibility of asymmetrical social relationships makes Twitter more conducive to political use and interaction compared to symmetrical and privacy-focused social networks like Facebook.

3. Empirical framework

In what follows we examine whether, and to what extent, the political use of the social media network Twitter by presidential candidates has the potential to impact "candidate salience," or the amount of online public attention a given candidate receives in an election. Specifically, we conducted an empirical analysis with the number of Twitter "mentions" about a politician as a measure of "candidate salience". The number of Twitter mentions is an estimated number of total tweets containing a discussion about one of the politicians in our sample. If a politician tweets, the tweet will be passed on to his or her followers and will generate a discussion in the "Twitter sphere" in a form of a reply, re-tweet or just a mention (all of which are counted in our variable Twitter mentions). The higher the number of tweets by a politician, the higher the possibility that the politician will be mentioned. Our use of Twitter mentions as the dependent variable allows us to estimate the potential impact that the political use of Twitter may have on public opinion. If we find that the amount of Twitter mentions is affected by the intensity of a politician's Twitter activities, this result might suggest that the politicians' use of social media has a potentially great impact on public opinion.

We also include the number of traditional media mentions about the presidential candidates in our sample, which is the number of times each politician is mentioned by a major television network or newspaper. The estimated coefficients of media mentions and politicians' Twitter activities can be compared to assess the relative influence of the two. In addition, we disaggregate the number of media mentions into two groups: those with positive and negative sentiments. Then, we control for these two variables to see whether the tone of the media has an impact on the number of Twitter mentions. The list of traditional media used for the analysis is included in Section 4.

We present an empirical test to shed light on the potential impact of the political use of Twitter using the following empirical model:

$$mentions_{it} = \alpha_0 + \beta_1 tweet_{it} + \beta_2 media_{it} + f(t) + \alpha_i + \varepsilon_{it} \tag{1}$$

The dependent variable $mentions_{it}$ is the number of Twitter mentions for politician i on day t. The first independent variable, $tweet_{it}$, is the number of times politician i tweeted in day t. The second independent variable, $media_{it}$, is the number of times the mass media mentioned politician i on day t, which we call simply "media mentions". All three variables are logarithmically transformed for percentage interpretation. In order to control for additional omitted variable bias, we also include time trend controls $f(t)$, which include time fixed effects, as well as dummy variables indicating three different periods: before the Iowa caucus (from December 26th, 2011 to January 3rd, 2012); after the Iowa caucus and until the New Hampshire primary (from January 4th, 2012 to January 10th, 2012); and after the New Hampshire primary until January 16, 2012. We also control for politicians' unobserved individual characteristics with a politicians' fixed effect term, α_i.[5]

We then test whether the association between media mentions and Twitter mentions depends on the sentiment of the news messages. Specifically, we disaggregate media mentions, $media_{it}$, into two different groups: number of media counts with positive sentiment, $positive_{it}$, and those with negative sentiment, $negative_{it}$. Both $positive_{it}$ and

negative$_{it}$ are also logarithmically transformed. Then, we replace $media_{it}$ by turns with $positive_{it}$ and $negative_{it}$ to test the following equation. The estimated results of Eqs. (1) and (2) are presented in Table 2.

$$mentions_{it} = \alpha_0 + \beta_1 tweet_{it} + \beta_2 positive_{it} + \beta_3 negative_{it}$$
$$+ f(t) + \alpha_i + \varepsilon_{it} \tag{2}$$

Additionally, we present two further tests as robustness checks. First, we test Eqs. (1) and (2) with a one-day lagged dependent variable to check the possibility for a lag between the day a politician tweeted or the media mentioned him, and the day people discussed him on Twitter. Specifically, we test Eqs. (1) and (2) with a new dependent variable, $mentions_{i,t+1}$, in place of $mentions_{it}$.

We must clarify that our assumption that there is a one-day lag between our dependent and independent variables does not appear to be very compelling, given the fact that many people using Twitter generally have access to mobile technologies (Pew Research Center's Internet & American Life Project, 2010), and therefore, information spreads very quickly with no or little lag. Still, we believe it would be meaningful to look at the estimated coefficients as a robustness check of the estimated results of Eqs. (1) and (2). If our hypothesis that Twitter mentions are more or less affected by the intensity of politicians' Twitter activities or media mentions is true, we expect that the estimated associations β_1 and β_2 in Eq. (1) will become less significant, but will continue to remain positive when we impose the one-day lag specification. In other words, we expect that both politicians' Twitter activities and media mentions have some impact on the dependent variable, but that the associations will be weaker. The results with a one-day lag assumption are presented in Table 3.

We undertake another test with the assumption that the impact of a politician's Twitter activity increases the size of his or her network on Twitter, as reported by previous studies (e.g., Hong, 2012a). Network size is measured by the number of Twitter followers. Specifically, we devise Eqs. (3) and (4) using Eqs. (1) and (2).

$$mentions_{it} = \alpha_0 + \beta_1 tweet_{it} + \beta_2 tweet_{it} followers_i + \beta_3 media_{it}$$
$$+ f(t) + \alpha_i + \varepsilon_{it} \tag{3}$$

$$mentions_{it} = \alpha_0 + \beta_1 tweet_{it} + \beta_2 tweet_{it} followers_i$$
$$+ \beta_3 media_{it} + \beta_4 negative_{it} + f(t) + \alpha_i + \varepsilon_{it} \tag{4}$$

The variable $followers_i$ is the log-transformed number of Twitter followers of politician i, as of January 6, 2012. As $followers_i$ is cross-sectional, its main effect is dropped when we add the politicians' fixed effect. Eqs. (3) and (4) can also be regarded as robustness checks for Eqs. (1) and (2); if politicians' Twitter activities have a significant impact on Twitter mentions about them, it is reasonable to expect that the impact increases the number of their Twitter followers, and thus we have a positive coefficient β_2 in Eqs. (3) and (4). The estimated results of Eqs. (3) and (4) are included in Table 4.

Recently, however, there has been criticism over the large number of Twitter followers some politicians have gathered. For example, there have been allegations of politicians hiring firms to increase their Twitter follower count by creating fake accounts (Goddard, 2011). In order to address this concern, we perform another robustness check by introducing two measures of politicians' influence on Twitter. The two variables are the Klout Score and PeerIndex, provided by private data providers Klout (klout.com) and PeerIndex (peerindex.net), respectively. Both variables measure how influential each politician is in the online world. Specifically, the Klout Score is "a measure of the impact of opinions, links and recommendations on the web" (Klout, 2008). The PeerIndex is "a relative measure of one's on-line authority… (and) … reflects the impact of one's online activities, and the extent to which one has built up social and reputational capital on the web" (PeerIndex, 2009). Although we could not precisely

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[5] Either time or politicians' fixed effects is a set of indicator variables for each time t or each politician i, respectively.

verify how these variables are measured, we decided to use these results as part of our analysis as many other academic studies are increasingly using these metrics (e.g., Lassen & Brown, 2010). The results can be found in Table 4.

4. Data

Our study analyzes the Twitter activities of seven politicians who are running for the post of U.S. President in 2012: Mitt Romney, Newt Gingrich, Jon Huntsman, Ron Paul, Rick Perry, and Rick Santorum. The data set comprises daily observations from December 26, 2011 to January 16, 2012, for the duration of 22 days, with a total sample size of 132.[6] Table 1 provides summary statistics for all the variables used in this study.

Data for our dependent variable ($mentions_{it}$) is sourced from the Washington Post's @MentionMachine, a web application that monitors Twitter for political candidate mentions. Our independent variable ($tweet_{it}$) is sourced from each politician's Twitter account. Data for our control variable ($media_{it}$) comes from Perception Metrics, a private company providing "data-driven media insights" (Perception Metrics, 2007). It observes the number of mentions in the media for each politician by tracking the top five newspapers according to circulation, and the most prominent news-reporting websites in the United States. The media included in our analysis are: ABC News, the BBC, CNN, Fox News, MSNBC, the Kansas City Star, the Los Angeles Times, the New York Times, My San Antonio (the online portal of the San Antonio Express news), the Pittsburgh Post-Gazette, Reuters, USA Today, and the Washington Post. Perception Metrics has also conducted a sentiment analysis of news messages provided by the media listed above, and categorized each news message as either positive, negative, or neutral. Our variables $positive_{it}$ and $negative_{it}$ are log-transformed values of the number of positive and negative news messages, respectively.

The number of Twitter followers ($followers_i$) is also collected from each politician's Twitter account. As Twitter provides only the current number of Twitter followers, ($followers_i$) is a cross-sectional variable collected on January 6, 2012. The variables $klout_i$ and $peerindex_i$ are collected from the websites of Klout and PeerIndex, respectively. These variables are also cross-sectional data as observed on January 6, 2012.

5. Results

Our results are presented in Tables 2 through 4. Table 2 reports the estimated results of Eqs. (1) and (2). Columns (1) through (5) present estimates with different specifications. One of the most significant findings is that the association between the number of tweets and Twitter mentions is not robust; the association is statistically significant in a binary regression in column (1), but it becomes insignificant when we include both politicians' fixed effect and time trend controls. However, we find that the association between media mentions and Twitter mentions is positive and robust for various specifications. On average, a 10% increase in the number of mentions of a politician in our selected media is associated with a 4 to 6% increase in the number of mentions for that politician on Twitter.

Column (6) of Table 2 reports an interesting result regarding the impact of the sentiment of news messages on the number of Twitter mentions. The estimated association between media mentions and Twitter mentions is larger when the news has a positive sentiment towards the politician compared to when the sentiment is negative. Both estimated associations remain statistically significant, although their magnitudes become smaller when compared to the coefficient $media_{it}$ in column (5).

[6] The total sample size 132 is obtained by multiplying the number of candidates (6) by the number of days (22) observed.

Table 1
Summary statistics.

Variable	Data type	Data source	Obs	Mean	Std. dev.	Min	Max
$mentions_{it}$	Daily panel	@MentionMachine	132	9.175	1.110	6.146	11.586
$tweet_{it}$	Daily panel	Politicians' Twitter accounts	132	1.033	0.668	0	2.485
$media_{it}$	Daily panel	Perception metrics	132	6.448	1.081	2.996	8.764
$positive_{it}$	Daily panel	Perception metrics	132	5.710	1.117	2.332	8.236
$negative_{it}$	Daily panel	Perception metrics	132	5.803	1.076	2.272	7.968
$followers_{it}$	Cross sectional	Politicians' Twitter accounts	132	12.085	1.020	11.156	14.144
$klout_i$	Cross sectional	Klout	132	4.351	0.043	4.304	4.431
$peerindex_i$	Cross sectional	PeerIndex	132	4.136	0.249	3.738	4.522

Note: 1. All variables are logarithmically transformed.
2. Data ranges from December 26, 2011 to January 16, 2012. But, for Table 3, all variables except for the dependent variable range from December 25, 2011 to January 15, 2012.
3. Three cross-sectional variables, $followers_i$, $klout_i$, and $peerindex_i$, are collected on January 6, 2012.

We repeat the analysis presented in Table 2 with a time-lagged dependent variable and report the result in Table 3. As expected, the estimated associations of $tweet_{it}$ and $media_{it}$ become smaller in terms of their statistical significance as well as their magnitudes. This result is not surprising given the fact that information spreads very quickly on Twitter. The association between the number of tweets and Twitter mentions becomes insignificant again when we add the politicians' fixed effect and time controls in columns (4) and (5), although the association between the number of media mentions and Twitter mentions remains statistically significant, merely becoming smaller in magnitude. A 10% increase in the number of media mentions is associated with a 2 to 4% increase in the number of Twitter mentions. Column (6) of Table 3 also reports that a news message with a positive sentiment is still statistically significant, while one with a negative sentiment is no longer significant.

We also test whether the impact of politicians' Twitter activities increases with the size of their networks in Table 4. The first two columns of Table 4 use $followers_i$, while the last two use $klout_i$ and $peerindex_i$ as robustness checks for $followers_i$. The estimated result shows that the interaction terms (i.e., the interactions between politicians' Twitter activities and each of our three variables) are not statistically significant, although they are positive in all three specifications. Overall, this result

Table 2
Political use of Twitter and candidate salience.

	Dependent variable: $mentions_{it}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$tweet_{it}$	0.587** (0.150)		0.348** (0.135)	0.258* (0.135)	0.0512 (0.133)	0.0470 (0.111)
$media_{it}$		0.543** (0.0844)	0.476** (0.0878)	0.432** (0.0976)	0.648** (0.0903)	
$positive_{it}$						0.365** (0.148)
$negative_{it}$						0.265* (0.144)
Politician fixed effect	No	No	No	Yes	Yes	Yes
Time controls	No	No	No	No	Yes	Yes
Num. of obs.	132	132	132	132	132	132
Adjusted R^2	0.118	0.274	0.308	0.569	0.817	0.813

Note: 1. Standard errors in parentheses: *p<0.10, **p<0.05;
2. Variables are logarithmically transformed.

Table 3
Political use of Twitter and candidate salience (with a lagged dependent variable).

	Dependent variable: $mentions_{it+1}$ (1-day lag)					
	(1)	(2)	(3)	(4)	(5)	(6)
$tweet_{it}$	0.459**		0.270*	0.035	0.062	0.067
	(0.147)		(0.143)	(0.160)	(0.119)	(0.123)
$media_{it}$		0.347**	0.295**	0.151*	0.416**	
		(0.093)	(0.099)	(0.091)	(0.093)	
$positive_{it}$						0.136
						(0.168)
$negative_{it}$						0.271*
						(0.161)
Politician fixed effect	No	No	No	Yes	Yes	Yes
Time controls	No	No	No	No	Yes	Yes
Num. of obs.	132	132	132	132	132	132
Adjusted R^2	0.064	0.129	0.144	0.459	0.758	0.756

Note: 1. Standard errors in parentheses: *p<0.10, **p<0.05;
2. Variables are logarithmically transformed.

supports our finding in Table 2 that the association between politicians' Twitter activities and Twitter mentions is not clear enough to be observed with statistical significance in our sample.

6. Conclusion, limitations and direction of future research

This study seeks to contribute to the discussion of whether, and to what extent, the political use of Twitter has the potential to impact public agenda and opinion. To address this question, we examined if U.S. presidential candidates' Twitter activities are associated with the number of Twitter mentions they receive, and if so, to what extent. Taken altogether, we found little evidence to suggest that candidates' Twitter activities have a significant impact on the number of mentions about them on Twitter. However, we found strong evidence positively linking the number of times a politician is mentioned by popular traditional media with the number of mentions he gets on Twitter. On average, a 10% increase in the number of media mentions for a politician is associated with a 4 to 6% increase in the number of Twitter mentions.

Nevertheless, we still find a consistently positive association, although not a statistically significant one, between politicians' Twitter activities and Twitter mentions. The fact that this association became non-significant when we added either the politicians' fixed effect or time trend controls suggests that a significant part of the observed positive association might not be causal. For example, it is possible that politicians who have the capacity to attract more attention on

Table 4
Interaction with the online network size.

	Dependent variable: $mentions_{it}$			
	(1)	(2)	(3)	(4)
$tweet_{it}$	0.339**	0.064	0.052	0.083
	(0.128)	(0.134)	(0.133)	(0.142)
$tweet_{it} \times followers_i$	−0.056	0.114		
	(0.140)	(0.127)		
$tweet_{it} \times klout_i$			0.128	
			(1.674)	
$tweet_{it} \times peerindex_i$				0.541
				(0.433)
$followers_i$	−0.073			
	(0.073)			
$media_{it}$	0.492**	0.657**	0.648**	0.657**
	(0.095)	(0.094)	(0.092)	(0.092)
Politician fixed effect	No	Yes	Yes	Yes
Time controls	No	Yes	Yes	Yes
Num. of obs.	132	132	132	132
Adjusted R^2	0.304	0.818	0.816	0.819

Note: 1. Standard errors in parentheses: *p<0.10, **p<0.05.
2. Variables are logarithmically transformed.

Twitter tend to use Twitter more intensively in general, or that they tend to use Twitter more intensively on a day when they expect people to discuss them (e.g., on the day of the Iowa caucus). The reported large variation in the adjusted R square values[7] across different specifications in Tables 2 and 3 supports this argument; the salience of a politician on Twitter is largely explained by the politician's individual characteristics (e.g. how popular the politician is) and the general time trend (e.g. how many days left before the Iowa caucus), and only a relatively small part is explained by either the politician's Twitter activities or his or her coverage in the selected media.

However, it is necessary to highlight the possibility that a politician's Twitter activities may themselves affect the number of times the politician is mentioned by the selected mass media.[8] This positive association implies that some journalists may take "cues" from the politicians' tweets when they decide to mention a politician in their news articles. That is, a politician's Twitter activities may influence how journalists frame their news articles (Farrell & Drezner, 2008). If this is true, then at least a part of the significant impact of media mentions on candidate salience should be attributable to politicians' Twitter activities. Future research can test this hypothesis by conducting a content analysis of the selected traditional media.

It is also important to emphasize that the estimated coefficients in this study represent descriptive associations rather than causal impacts of the political use of Twitter. Although we believe that we controlled for a reasonable amount of bias by including fixed effects, and found robust coefficients in various specifications, we are cautious in drawing a causal interpretation from our estimated coefficients. Specifically, in order to make a causal interpretation of our estimated coefficients in column (5) of Table 2, we are required to make a critical assumption, that both politicians' Twitter activities and their mentions in the media should be random after controlling for politicians individual characteristics and time trends of their mentions on Twitter. This might be a strong assumption if we cannot guarantee the existence of factors that vary over time, and at the same time, across all politicians. In fact, we could not identify an exogenous event to use as an instrumental variable for politicians' Twitter activities.[9] However, this study can be a good starting point for a more in-depth examination that estimates the causal impact of politicians' Twitter activities.

We also acknowledge that the estimated impacts within this paper may not reveal the full impact of the political use of social media. The internet and social media are still rapidly changing in various aspects, and we might arrive at different estimates when we replicate the same analysis in the future. As others have noted (e.g., Schlozman, Verba, & Brady, 2010), there is the possibility that the impact of new social media information technologies will grow at such a rate that politicians' Twitter activities might one day have impacts comparable with those of traditional media.

In sum, we find that while social media is in many respects an obvious disruptive technology which substantially expands the possible modes and methods of election campaigning – and though it has been eagerly adopted and actively used by presidential candidates in the 2012 election – high levels of social media activity on the part of presidential candidates have, as of yet, resulted in minimal effects on the amount of public attention they receive online. This finding supports the argument that the emergence of new media has created such a wide range of media choices that politicians can no longer access or influence the public via the limited number of channels available to them (Bennett & Iyengar, 2008). For instance, Jenkins (2006) commented on the decreasing reach of media channels: "In the 1960s, an

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[7] Adjusted R squares are produced by STATA 11.
[8] The correlation between $tweet_{it}$ and $media_{it}$ is 0.3110.
[9] An exogenous event, to be a valid instrument, should have affected politicians' salience on Twitter only through affecting their Twitter activities. It is often difficult to find such a "natural experiment", especially when the data covers a relatively short time frame.

advertiser could reach 80% of U.S. women with a prime-time spot on the three networks. Today, it has been estimated that the same spot would have to run on one hundred TV channels to reach the same number of viewers" (2006, 66).

However, we should be cautious in drawing general implications from this finding about the effect of social media on public opinion. Although "the amount of public attention" is a proxy for the potential impact media can have on public opinion, the two measures might not necessarily correspond. For instance, previous studies (Bennett & Iyengar, 2008; Hong, 2012b; Negroponte, 1995; Prior, 2007; Sunstein, 2007) observe the rise of a more "self-selected" audience in the case of new information technologies such as social media, as opposed to the more "inadvertent" audience of traditional media. Additionally, Hong (2012b, 2012c) presents evidence that this fragmented audience structure allows politicians to influence political outcomes through targeted use of social media, even though the sizes of their audiences are smaller. Therefore, future research may try to reconcile these apparently conflicting pieces of evidence under a single theory.

Despite its limitations, this study provides some of the first empirical evidence regarding the impact of the political use of social media. Although we found little evidence that politicians' Twitter activities can affect the amount of public attention they garner to the extent that traditional news media can, we still believe that social media may significantly change the nature of political competitions or government practices in other ways. Our understanding of the effects of new information technology on politics, government, and our society will evolve hand-in-hand with the growing ascendancy of Twitter and other social media channels.

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