Analyzing Political Information Network of the U.S. Partisan Public on Twitter

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Abstract. The growing significance of social media among potential voters has been recognized by politicians because social media provides a direct method for political actors to connect with their citizens and organize them into online clusters through their use of hashtags. However, with few exclusions, most of the former studies stressed on the identification of personal tweets or cumulative properties of a mass of tweets and political fondness of discrete users, not on partisan public in the U.S. Thus, there is a lack of complete understanding about online social network of politically conflicting public and the public discourse in the network. Therefore, the purpose of this study is to investigate how people adopt political information on Twitter via hashtag as a networked public and how people facilitate political communication among users with similar or disparate political orientations. This study confirmed the theory of homophily in adopting political hashtags on Twitter network. The referred media and highly mentioned domains for each network also support the concept of homophily. The manually examined users with top betweenness centralities were identified as opinion leaders and their tweeting patterns provide evidences that they play key roles in disseminating information through eWOM by occupying an important relational spot in the network.

Keywords: Twitter · Political information network · Homophily

1 Introduction

The growing significance of social media among potential voters has been also recognized by politicians because social media provides a direct method for political actors to connect with their citizens and organize them into online clusters through especially their use of hashtags (Bode et al. 2015). Many U.S. presidential candidates, including Barack Obama, Hillary Clinton, and Donald Trump, launched their presidential campaigns on social media to reach a younger population and create a more welcoming impression among the general voting public by avoiding media gatekeepers. As politicians increasingly rely on social media to communicate their messages, the political impact of social media has been the focus of many research studies.

Among social media, Twitter emerged as the most popular micro-blogging platform, where information proliferates rapidly, and posted information and actions cause instantaneous responses from users. These characteristics are ideal to promote political viewpoints, particularly during contentious election campaigns (Makazhanov et al.

2014). Political impact on social media has been examined through political discourses, and the political discourses on Twitter have been explored during the past several years by researchers. The emphasis on those studies were analyzing online networks of candidates and active users to forecast the results of the elections (Makazhanov et al. 2014). Moreover, with few exclusions, most of those former studies regarding the political discourses on Twitter stressed the identification of personal tweets or the cumulative properties of a mass of tweets and the political fondness of discrete users (Makazhanov et al. 2014). Little is known about how the partisan public in the U.S. interacts on Twitter, and thus, there is a lack of complete understanding in the body of knowledge about information behaviors of politically conflicting publics in online social networks and the public discourse in the networks. One ignored area of Twitter is the adoption of the political hashtag, user-created keywords prearranged with the # symbol. Twitter users adopt hashtags to gather around certain issues, which fundamentally are used to generate conversational groups around a public interest. Based on this rationale, the study argues that Twitter contributes the generation of manifold public spheres among the politically driven via hashtag adoption, and the users in these configurations are identified by shared interests and concerns, social and political identities, and communication sources and strategies.

This study employs a targeted and unique sample that applied the pro-Trump #MAGA and anti-Trump #Resist in order to investigate Twitter users' adoption of the political hashtag and its distributional force on the networked platforms. The hashtags were selected because they respectively represent those who support and those who oppose Trump and his agenda. Tweets were collected through Twitter application programming interface (API) on 10 am, April 22, 2017. The collected data was curated by a combination of network clustering algorithms and investigated by applying social network analysis and manual examinations of selected data to discover the answers to the research questions concerning the user behaviors and disseminations of political communication in the opposing networks.

2 Literature Review

In *The structural transformation of the public sphere*, Habermas (1962) developed the idea of a public sphere where people convene to discuss issues, establish problems, and tried to arrange a course of political action. Recent studies discovered that the public sphere has increasingly been fragmented and polarized, which is attributed to the growing dominance of digital communication (Dahlgren 2005; Habermas 2006; Papacharissi 2002). But much disagreement exists regarding the degree of this polarization (Neuman et al. 2011). Many researchers claimed that social media boosts polarization (Baum and Groeling 2008) and online users bisect along a conventional Right and Left political split (Adamic and Glance 2005; Farrell and Drezner 2008; Hindman 2008; Tremayne et al. 2006). Based on these viewpoints, social networking services (SNSs) and online news platforms either nurture diverse public arenas or support and intensify factional divides, or they demonstrate a little mixture of the two (Baum and Groeling 2008; Robertson et al. 2010). Regardless of these arguments,

digital technologies reinforced the public's capacity to link to each other while forming a spectrum of collective and connected entities (Shah et al. 2005).

This study is related to the body of research analyzing political communication on Twitter. In light of the arguments about the Internet media's contribution to political fragmentation and polarization, along with the fact that a number of U.S. politicians, including candidates for the U.S. Congress and President who adopted Twitter for their election campaigns, few studies have investigated information behaviors of like-minded publics in the polarized political networks. Most studies focused on the strategic application of Twitter, emphasizing the behaviors of the candidates while encouraging them to adopt Twitter with helpful tips for effective applications (Lassen and Brown 2011; Gulati and Williams 2010).

Other research studies explored how Twitter is applied within the electoral context to forecast electoral results (DiGrazia et al. 2013) by discovering candidates' patterns of political practice (Bruns and Highfield 2013; Graham et al. 2013). These investigations stressed the behaviors of the candidates, paying less attention to the behavior and flocking of the political public. Though SNSs provide a channel for political candidates to link to the public, these public spheres also give channels for the online public to connect with each other, self-establish, and get involved with antagonistic politics. Adamic and Glance (2005) discovered that interactive patterns online demonstrated conspicuous conservative and liberal groupings in blogs, such as book recommendations on Amazon.com. This discovery supports the concept of homophily, which is the inclination of people to search for and befriend others who have similar characteristics including physical attributes, beliefs, religion, and political tendencies (McPherson et al. 2001). The principle of homophily has been identified as a primary mechanism in social institutions in both physical and online environments (Thelwall 2009).

Drawing from the Diffusion of Innovation theory (Rogers 1962), many studies have investigated people's power to influence other people. Rogers (1962) defined an individual's asymmetrical influence on others' mindsets or actions as opinion leadership. This theory forecasts that, by focusing on these influencers, a large-scale series of reactions driven by word-of-mouth (WOM) can occur (Katz and Lazarsfeld 1955). Currently, substantial knowledge is lacking in the study of how influencers relate to electronic-word-of-mouth (eWOM), yet a greater knowledge of eWOM structures in SNSs can improve our understanding of promoters of eWOM and give us meaningful insights into online political communication.

3 Research Questions

Tweets are considered relevant when they include a term from a list of devised keywords, comprised manually or semi-automatically (Conover et al. 2011). Hashtags are also a primary feature of Twitter because the users can annotate tweets with metadata establishing the subject or gathering like-minded individuals across the network. In other words, they are applied "to bundle together tweets on a unified, common topic," which makes it easy to identify and characterize the discursive clusters with certain hashtags (Bruns and Burgess 2011, p. 5). For instance, #MAGA stands for "Make America Great Again!" and #tcot stands for "Top Conservatives on Twitter."

Individual hashtag determines the stream of content when participants tag selections, indicating engagement in diverse information channels (Conover et al. 2011). Via hashtags, users can engage with a certain issue or topic, and their tweets belong to an extensive communication among disconnected individuals, which results in a significant structure of online political conversation and behavior (Bode et al. 2015).

   Approaching the hashtag networks of #MAGA and #Resist as homophily clusters, this study examines the following research questions:

- RQ 1: How do #MAGA and #Resist networks demonstrate their political attributes on the Twitter?
- RQ 2: How are the shared information sources characterized within the Twitter network of #MAGA and #Resist?

Also, by drawing from the diffusion of Innovation theory (Roger 1962) in conjunction with social network analysis (SNA) approach (Otte and Rousseau 2002), this study investigates the Twitter network of #MAGA and #Resist to discover influencers in transmitting information. Thus, the following research question will be examined:

- RQ 3: Who are the influencers on the Twitter network of #MAGA and #Resist?

To discover the answers to the research questions, this study applies social network analysis (SNA) method. This study improves upon past efforts to examine Twitter network disseminating political information in an online community via hashtags. In addition, this study compares the Twitter network of the partisan public in the U.S., and through this approach, we can better explore the theory of homophily and diffusion of innovation applied in hashtag network on the Twitter.

4   Methods

4.1   Data Collection

Tweets were collected by applying #MAGA and #Resist through Twitter application programming interface (API) on April 22, 2017. Theoretically, NodeXL Pro version allows researchers to gather the last 18,000 tweets on a certain hashtag through the Twitter Search network function. However, generally, not quite that many tweets are collected because of Twitter's age screening policy. Twitter.com clarifies, "Age screening is a way for brands and others to determine online whether a follower meets a minimum age requirement, in a way that is consistent with relevant industry or legal guidelines. This makes it easier for advertisers and others with content not suitable for minors (e.g. alcohol advertisers) to advertise on Twitter." In this study, a total of 5,287 vertices (tweets, retweets, mentions, and replied to) generated a total of 10,781 edges (relations between tweets) in #MAGA network, and a total of 6,682 vertices (tweets, retweets, mentions, and replied to) generated a total of 10,567 edges (relations between tweets) in #Resist network.

4.2 Data Analysis

To investigate the proposed research questions, Social Network Analysis (SNA) was conducted using NodeXL (Hansen et al. 2011). Four different types of Twitter edges, including retweets, replies- to, mentions, and tweets, as well as following and follower relationships among users, were extracted. To visualize interpretable data, the data has been calculated and processed with calculating metrics, including indegree, outdegree, betweenness centrality, and page rank among the sampled tweets. During this process, isolates, which are not connected with any other vertices within the network, were removed because they do not present clear relationships with other users. A total of 307 groups were discovered in #MAGA network, and a total of 448 groups were discovered in #Resist Twitter network. Clauset-Newman-Moore algorithm was applied to create these clusters. This algorithm defines the main clusters in a network by placing vertices into the best fitting cluster depending on the patterns of interconnectedness, and this clustering method generally forms a few dominant groups and several very small ones. (Wakita and Tsurumi 2007).

Visual network diagrams of collections of actors (vertices) were created, the network impact (e.g., betweenness centrality or page rank) of a single actor on others was estimated, and significant information, such as top-word pairs and the most frequent domains in tweets in the entire network on the #MAGA and #Resist networks, was retrieved. For each hashtag, ten major clusters were identified and several iterations were conducted to condense sub-groups. To closely examine the influencers of the two networks, the Twitter accounts of the high betweenness centralities were manually examined. Betweenness centrality is a measure of how often a given vertex lies on the shortest path between two other vertices and how a vertex connects groups by bridging the gap in the global network (Hansen et al. 2011). High betweenness centrality implies that it connects the major groups otherwise they are fragmented or incoherent, and it also indicates the elevated level of influence and connectivity (Freeman 1978). Some vertices have high betweenness centralities, which implies that they are closely connected with the major groups in the network.

5 Findings

Figures 1 and 2 present the top ten groups from the entire network of #MAGA and #Resist, respectively. In Fig. 1, the groups were shown with the top keywords next to the number of the group name. The top key words are the most frequently used terms in the cluster. These key words, which include maga (6629), Trump (1968), POTUS (1041), america first (933), president (412), made_usa (362), tcot (362), and conservative (241), clearly demonstrate that #MAGA network supports Trump, his agenda, and the Republican party. For the first research question, the network connectedness and word frequency were examined. The two network graphs are highly reciprocal and actively tied together in their conversations through Twitter activities such as tweets, retweets, mention, and reply to. The top keywords in the entire #Resist network are Resist (8119), trump (2076), trumprussia (1815), the Resistance (1411), funder (1020), russiagate (812), trumpleaks (550), and impeachtrump (221). The keywords used in the
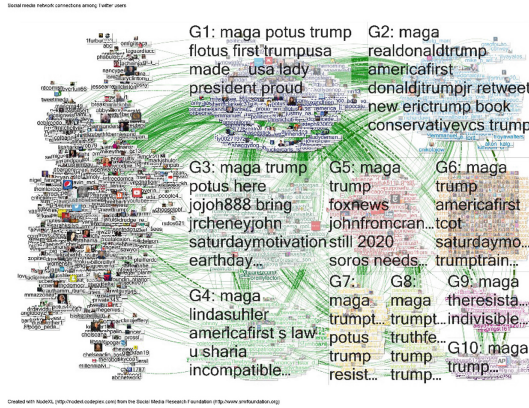
Fig. 1. The top 10 group of the #MAGA network on Twitter with top key words
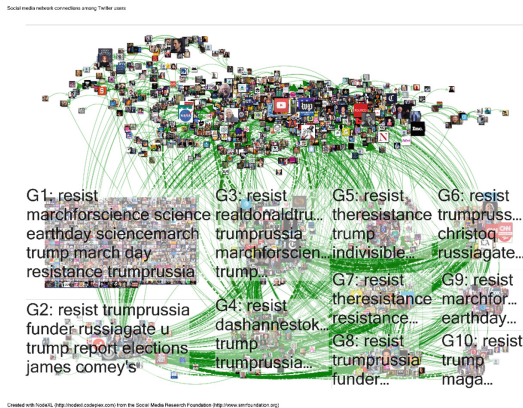

Fig. 2. The top 10 group of the #Resist network on Twitter with top keywords

#Resist network also represent that the network is a strong adversarial to Trump and his agenda. The most frequently used word pairs in the entire network are present in Table 1. This also solidifies the argument that content of communication within the networks dominantly support their political side, respectively.

The shared word pairs within the networks reveal extremely polarized conversation of #MAGA and #Resist because while the #MAGA network resonates the important agenda of the Trump administration, the #Resist network promotes to Resist his agenda, to raise concerns about his relationship with Russia during the presidential campaign, and even to impeach Trump.

Information sources of the social media network are very important because more than half of the U.S. population obtain news through social media, and around 50% of these social media users get information about the 2016 presidential election via social media websites (Gottfried and Shearer 2016). The sources of information can also

Table 1. Top word pairs in #MAGA and #Resist networks

Top word pairs in the #MAGA network				Top word pairs in the #Resist network			
Word1	Word 2	Count	Salience	Word1	Word 2	Count	Salience
maga	trumptrain	442	0.007	resisit	theResistance	844	0.010
maga	americafirst	430	0.007	trumprussia	Resist	616	0.008
americafirst	maga	407	0.007	russiagate	Resist	604	0.008
maga	trump	303	0.005	trumprussia	russiagate	600	0.008
u	s	290	0.005	theResistance	indivisible	571	0.008
sharia	law	287	0.005	marchforscience	Resist	418	0.006
trump	maga	270	0.005	indivisible	scrotus	397	0.006
s	constitution	259	0.005	scrotus	peeotus	337	0.005

indicate the political inclinations of the shared news and conversations in the network. Table 2 describes the most frequently appearing domains in the entire #MAGA and #Resist networks. These domains illustrate the most used and referred websites in the networks. The shared domains among the hashtag users clearly show their political alikeness. Truthfeed.com, breitbart.com, and americanthinker.com are the examples of conservative media, which is arguably called the right extreme media. On the other hand, top domains in tweets shared in the #Resist network reveal that they obtain information from the progressive or liberal media, such as huffingtonpost.com and washingtonpost.com. In addition, the top urls in tweets also came from these top shared domains. Therefore, this also bolsters the findings of the RQ1while supporting the principle of homophily.

Table 2. Top domains in tweets of #MAGA and #Resist networks

Top domains in the #MAGA network	Top domains in the #Resist network
twitter.com	twitter.com
truthfeed.com	instagram.com
comicallyincorrect.com	cnn.com
reddit.com	huffingtonpost.com
israelvideonetwork.com	co.uk
youtube.com	moveon.org
facebook.com	pfaw.org
breitbart.com	youtube.com
americanthinker.com	dailykos.com
thehill.com	washingtonpost.com

To answer the third research question, degree centralities and betweenness centralities were examined between the two networks. Table 3 presents the users with the highest betweenness centrality, and tweets by POTUS (President of the United States) and Trump were the most popular and important position in the #MAGA network.

POTUS had dominant impact on the entire network, and its tweets were most frequently retweeted and mentioned in the network.

Table 3. Top 10 vertices ranked by betweenness centrality

#MAGA	Betweenness centrality	#Resist	Betweenness centrality
potus	6453489.678	funder	8050720.433
realdonaldtrump	6274745.945	realdonaldtrump	5588982.278
lindasuhler	3427726.595	dashannestokes	4181448.956
mcspocky	1663081.129	mcspocky	3877107.458
drumpfshit360	1390032.349	immigrant4trump	1250191.559
jimrobinsonsea	1036666.227	potus	1233574.705
jali_benz	976978.64	fmoniteau	1140418.018
uncletony52	823659.5114	altstatedpt	989964.7122
lorihendry	768630.0174	badhombrenps	883408.129
johnfromcranber	757015.8872	indivisibleteam	841818.4517

POTUS also demonstrates high betweenness centrality in the #Resist network with 1233574.705. However, when compared with 6453489.678 of the #MAGA network, it represents that POTUS is not the primary network gap bridger in the #Resist network. Most vertices with high betweenness centralities in #MAGA's network were identified as right-wing or far-right conservatives. For example, lindasuhler describes her profile as "I support PRESIDENT Donald Trump AMERICA FIRST Christian supports Family ~ Constitution ~ Capitalism ~ 1A ~ 2A ~ 10A ~ NRA ~ Military ~ Police ~ Israel".

In the case of the #Resist network, funder, the top influencer, is identified as Scott Dworkin, and he describes himself as "Dem Campaigner since '04; Co-Founder-@TheDemCoalition aka Dems Against Trump; Obama Alum; '09 Inaug/'12 DNCC" and promotes hashtags such as #TrumpLeaks, #TrumpRussia, and #RussiaGate, which are prevalent in the entire #Resist network, as previously examined. Other users with high betweenness centrality in #Resist network also coherently expose their anti-Trump stance through their posted tweets, retweeted information, and linked media sources. For example, dashannestokes describes himself as "sociologist, author, speaker, pundit. Fighter for equality & justice" and tweets along with #trumprussia, #TheResistance, #trumpleaks, #russiagate, and #impeachtrump in many cases.

6   Discussion and Conclusions

This study discovered that the #MAGA network is conservative, and the users of #MAGA were identified as nationalists or ultraconservatives. The users of the #MAGA employ anti-liberal hashtags and express antagonistic views and emotions by sharing certain hashtags, including #obamadisaster, #arresthillary, and #hillaryforjail. Interestingly, anti-Democratic hashtags were primarily focused on attacking Democratic politicians while the anti-Trumpers focused on the political issues and events, such as

#russiagate, #Marchforscience, and #trumprussia. The major influencers on Twitter were @realDonaldTrump and @POTUS with the highest betweenness centrality, and this confirms that Trump is the nucleus of the #MAGA network.

On the other hand, liberals, activist groups, and anti-Trump organizations adopted #Resist along with other anti-trump hashtags, such as #trumprussia, #russiagate, and #impeachtrump. #Marchforscience and #earthday were also shared by these same users because the analyzed data set were collected on the Earth Day and there were global rallies with the slogan of March for Science. This illustrates that #Resist is related to the exogenous hashtag, which captures activities or incidents resulting from outside of the Twitter system (Papacharissi 2015). The most frequently appearing domains were democratic movement organizations such as moveon.org (democracy in action) and pfaw.org (People for the American Way). Unlike the #MAGA network, top consulted media includes major mainstream media outlets such as cnn.com, huffingtonpost.com, and washingtonpost.com.

Among top influencers of both hashtag users, #MAGA users chiefly concentrated on retweeting pro-Trump tweets and information, while #Resist users focused on creating tweets to post information, thoughts, and action guides, which implicates a dissimilar pattern between the grassroots who employed the hashtags. This pattern explains that the users of #Resist more creatively and pro-actively adopted Twitter to distribute political information and facilitate the Twitter platform for grass-root activism.

Therefore, this study confirmed the theory of homophily in adopting political hashtags on the Twitter network. The referred media and highly mentioned domains for each network also support the concept of homophily. The manually examined users with top betweenness centralities were identified as opinion leaders and their tweeting patterns provide evidences that they play key roles in disseminating information through eWOM by occupying an important relational spot in the network. This study also established the methodological implication by implementing the concept of betweenness centrality as criteria of influencers in social network analysis.

This study also identified significant political polarization along with these hashtags among the U.S. online public, which confirms the previously examined literature regarding political polarization of political communication among Americans. Some users combined several hashtags with #MAGA or #Resist while others rarely integrated other related hashtags with those two. This study reveals that layperson users or bot Twitter account can also be a powerful influencer depending on their position and connectivity on the Twitter network. The study also revealed that Twitter contributes the creation of various public spheres among the politically oriented through hashtag use, and the users in these configurations are recognized as homophily in terms of political viewpoints.

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