

Bursting the filter bubble: The mediating effect of discussion frequency on network
heterogeneity

Structured Abstract

Purpose: The purpose of this study is to identify the structural processes that lead citizens to escape their common social circles when talking about politics and public affairs (e.g., 'filter bubbles'). To do so, this study tests to what extent political attitudes, political behavior, news media consumption and discussion frequency affect discussion network heterogeneity among U.S. citizens.

Methodology/approach: Supported by the polling group Nielsen, this study uses a two-wave panel online survey to study the antecedents and mechanisms of discussion network heterogeneity among U.S. citizens. To test the hypotheses and answer the research questions, OLS regressions (cross-sectional, lagged, autoregressive) and mediation analyses were conducted.

Findings: The findings imply that political discussion frequency functions as the key element in explaining the mechanism that leads politically interested and participatory citizens (online) as well as news consumers of traditional and online media to seek a more heterogeneous discussion network, disrupting the so-called 'filter bubbles.' However, mediation analyses also showed that discussion frequency can lead to more homogenous discussion networks if people score high on political knowledge, possibly reflecting the formation of a close network of political savvy individuals.

Originality/value: The survey data gives important insights into the 2016 pre-election situation, trying to explain why US citizens were more likely to remain in homogenous discussion networks when talking about politics and public affairs. By using two-wave panel data, the analyses allow to draw tentative conclusions about the influential and inhibiting factors and mechanisms that lead individuals to seek/avoid a more heterogenous discussion network.

Keywords: network heterogeneity, discussion frequency, political interest, news use, filter bubble

Bursting the filter bubble: The mediating effect of discussion frequency on network heterogeneity

The US Presidential Election 2016 and the pervasive partisan flow of information about the presidential candidates online have revived the notion of ‘filter bubbles’ (Pariser, 2011) and ‘information cocoons’ (Sunstein, 2006). Journalists, critics and opinion makers were quick in identifying the scapegoats of the surprising turnout of the election, blaming social media for spreading false information (Baer, 2016; El-Bermawy, 2016) and creating an information environment that has reinforced existing beliefs and strengthened political polarization (cf., Stroud, 2010; Knobloch-Westerwick and Meng, 2011). What is more, European politicians and advisors have expressed their concerns about increased personalized media content and its danger for a healthy democracy (Vīķe-Freiberga et al., 2013). It is in this vein that social media and personalized algorithms (e.g., on Twitter, Facebook) have been suspected of enforcing people’s tendency to solely reside in information environments and social circles that affirm their personal opinions, attitudes and points of views (cf. Pariser, 2011).

However, not only has recent research casted doubt on the so-called ‘filter bubble’ (Nelson and Webster, 2017; Zuiderveen Borgesius et al., 2016), part of the theoretical rational is also imperfect: citizens and voters are not active on the Internet or social media 24/7. Surely, recent figures show that 77% of Americans go online every day and 26% of Americans are online almost constantly (Perrin and Jiang, 2018). Yet these findings do not rule out that American citizens also get exposed to views and opinions about politics and current affairs when interacting with their peers in real-life settings. After all, the majority of people goes online for leisure and entertaining purposes rather than for political reasons (Park et al., 2009; Quan-Haase and Young, 2010). And political beliefs, attitudes and voting choices are still vastly influenced by face-to-face conversations with family members, friends and neighbors (Berger et al., 2008; Huckfeldt and Sprague, 1995).

Thus, the discussion about the prevalence of like-minded information cocoons (Sunstein, 2006) needs to better incorporate the offline scenery theoretically and empirically. Furthermore, research needs to better explain why and under what circumstances people are more likely to encounter opinions and viewpoints that differ from their own—both online and offline (cf. Choi and Lee, 2015; Lee et al., 2014; Sunstein, 2018). What we know from past research is that social media and the Internet, just as the offline scenery, offers information and exchange opportunities for both: people who seek information that reaffirms their existing beliefs; and people who seek a more diverse and heterogeneous information environment (Festinger, 1957; Knobloch-Westerwick and Meng, 2009; 2011; Sears and Freedman, 1967).

Facing an age with information ubiquity both offline and online, the question therefore remains: What are the structural processes that lead citizens to escape their common social circles when talking about politics and public affairs? Using a two-wave panel survey among U.S. citizens in 2013/2014, we find that political discussion frequency functions as the key mediator in explaining the mechanism that leads politically interested and participatory citizens (online) as well as news consumers of traditional and online media to seek a more heterogeneous discussion network. However, discussion frequency can also lead to more homogenous discussion networks if people score high on political knowledge, possibly reflecting the formation of a political-savvy elite.

Literature Review

Network Heterogeneity and Democracy

We are currently living in a political environment that is characterized by political polarizations, extremism, and violent rioting (e.g., Charlottesville 2017, Gunter and Hughes, 2018). All around the world, but particularly in the U.S., we have witnessed clashes among society and politics with regards to controversial topics (e.g., climate change, refugee policy, vaccines). Although political debates and disagreement are necessary and useful aspects of a well-functioning democracy (Sorensen, 2018; Chadwick et al., 2017), it has been reported that

not only political debates have become more hostile, disrespectful and polemic over time (Sood and Iyengar, 2016), the strong divide between ideological political stances has also made reconciliations between parties more difficult (Iyengar et al., 2019; Davis and Dunaway, 2016). Given these recent developments, it becomes of paramount interest to study the underlying mechanisms that foster a citizenship that is open-minded and willing to listen to opinions and voices that differ from their own, opening up possibilities for fruitful compromises that create solutions for a harmonious life together. In fact, it has long been argued by sociologists, political scientists and communication scholars that being exposed to a diverse set of viewpoints is the nucleus for deliberative democracies (Habermas, 1989; Price et al., 2002) and democratic citizenship (e.g., Gil de Zúñiga and Valenzuela, 2011; Mutz, 2006; Sunstein, 2002).

However, recent detrimental societal movements, such as the rise of the political right around the globe (e.g., Berlet and Lyons, 2018) as well as hate speech and discrimination on the net (e.g., Gerstenfeld et al., 2003), show that our democratic societies are far away from enacting deliberative discourses. Moreover, the increasing fragmentation and polarization within societies pose a real threat for the functioning of democracies. Individuals have become less likely to identify common ground and understanding with the ‘other group’ (Sunstein, 2001). It is in this vein that human interactions and discussions between individuals who differ in their ideas, viewpoints as well as ethnical and social backgrounds gain increasing relevance. Scholars in communication science have identified the discussion among people with diverse viewpoints and political attitudes as *discussion network heterogeneity* (Kwak et al., 2005; Mutz, 2002; Scheufele et al., 2006; Scheufele et al., 2004). These unfamiliar encounters are believed to increase the identification of shared experiences, and thereby the likeliness of acceptance and tolerance which work as “social glue” (Sunstein, 2002, p. 9; Mutz and Mondak, 2006; Price et al., 2002) for diverse democratic societies. As Sunstein (2018) contends, “in a democracy...lives—including digital ones—should be

structured so that people frequently come across views and topics that they have not specifically selected” (p. 7)

Network Heterogeneity and Endogeneity Problems

However, the vast majority of research on discussion network heterogeneity has concentrated on the concept as a direct or indirect antecedent for political behavior such as political participation, political knowledge or civic engagement (e.g., Choi et al., 2017; Kim and Chen, 2015; McLeod et al., 1999b; Mutz, 2002; Scheufele et al., 2004; 2006). Thus, rather than providing another study that aims at testing the positive outcomes of political discussions among a diverse network of people for democracy, we strive for empirical evidence that informs us about the underlying mechanisms that explain why individuals are more likely to expose themselves to a heterogeneous discussion network. Reviewing previous research on network heterogeneity, we have identified various behavioral and attitudinal variables that can be hypothesized to contribute to individuals’ likeliness to reside in non-like-minded discussion networks. These include political participation, political efficacy, political interest, political knowledge, ideology and news use. What is more, we position *discussion frequency* about politics and public affairs—which has so far been mostly considered as a control variable—at the center of our analysis, arguing that it works as a conduit between political attitudes, political behavior, news use and discussion network heterogeneity. See Figure 1 for the conceptual model.

[Figure 1 about here]

Political Behavior, Attitudes and Network Heterogeneity

Political Participation. Although the conceptualization of *network heterogeneity* differs quite substantially among scholars (Eveland and Hively, 2009), the main focus of previous research has lied on the role of network heterogeneity for political participation (e.g., Choi et al., 2017; Lu et al., 2018). Two camps have emerged in this field of research. Representative of the first camp posit that individuals embedded in a heterogenous social

network are more likely to retreat from political activity due to so-called “cross-cutting pressures” and the need for harmony with their social relationships (Lazarsfeld et al., 1944; Mutz, 2002; Nir, 2005). It has been argued that individuals belonging to social groups, characterized by conflicting interests and opinions, have difficulties in making up their political mind, resulting in delayed participation or no participation in elections at all. However, research that has tried to replicate the findings could not find evidence for the cross-pressure hypothesis, pointing to methodological errors and theoretical misconceptions (Eveland and Hively, 2009; Horan, 1971; Knoke, 1990).

In fact, more recent work (second camp) suggests that heterogeneous discussion networks lead to positive effects in terms of political engagement, civic citizenship and deliberative democracy overall (Cappella et al., 2002; Choi et al., 2017; Kim and Chen, 2015; Lu et al., 2018; McLeod et al., 1999b; Scheufele et al., 2004; 2006). For example, individuals who are embedded in a heterogeneous network are not only more knowledgeable in politics (e.g., Scheufele et al., 2004), they are also reported to be more likely to increase political tolerance (Mutz and Mondak, 2006; Price et al., 2002) and decrease polarization (e.g., Lee and Choi, 2020). Furthermore, previous research that has shown that network heterogeneity is positively related to political participation (McLeod et al., 1999b; Scheufele et al., 2004; 2006), has been confirmed by a current stream of research on online social networks that has found positive effects of network heterogeneity on political participation (Choi et al., 2017; Kim and Chen, 2015; Lu et al., 2018), particularly when news use is involved (e.g., Kim, 2018). Despite the plethora of research on the relation between network heterogeneity and political participation, none of the research cited above has focused on the reversed direction. Hence, to get more insights into what determines the constitution of heterogeneous networks, we want to inquire: (RQ1): *How does political participation (offline, online, social media) relate to discussion network heterogeneity?*

Political Efficacy. Given that political efficacy is an important predecessor for political participation (Hayes et al., 2006) and voting (Verba and Nie, 1972), it might also play a crucial role for discussion network heterogeneity. However, as Eveland and Hively (2009) have pointed out, there is a lack of research that has investigated the potential influence of *political efficacy* on diverse networks. Even up to now, research on discussion network heterogeneity has forgone to include political efficacy in conceptual and analytical models, or only used it as a control variable (Kim et al., 2013). However, reversely, research has shown that political efficacy is positively influenced by the frequency of political talk and the orientation toward common understandings within political conversations (Rojas, 2008).

Hence, citizens who encounter more political talk are more likely to believe they have a good understanding of politics and feel qualified to participate in politics (cf. internal efficacy: Niemi et al., 1991). Likewise, citizens might also perceive themselves to be more politically efficacious if they get regularly exposed to a broad range of political ideas, arguments and issues that can be considered representative of the electorate. Reversely, it is also likely that individuals who are exposed to diverse political attitudes become disillusioned about their own ability to participate in politics and more skeptical with regards to their perception about their understanding of the political sphere (cf. Eveland and Hively, 2009). The sheer diversity of viewpoints, argumentations and positions that are difficult to understand—and maybe even to tolerate for some—might discourage individuals to feel politically efficacious. Given the scarce body of research on this matter, we pose the following research question: (RQ2): *How is political efficacy related to individuals' discussion network heterogeneity?*

Political Interest. The fact that motivation and interest in politics play crucial roles in explaining political behavior has long been accepted in the academic community, but particularly since the publication of Prior's work on media choice and inequality in political involvement and elections (2007). Focusing on network heterogeneity, Kwak et al. (2005)

have shown that attention paid to discussions is a crucial factor in explaining the positive relationship between network heterogeneity and political participation. In other words, individuals who are entrenched in a heterogeneous discussion network, and who are attentive to what their discussion partners have to contribute to the conversation, are more likely to become politically engaged. Thus, the extent to which somebody is *interested* in politics might also be strongly linked to the extent to which individuals seek diverse discussion networks.

However, political interest has mostly been ignored (e.g., McLeod et al., 1999b; Scheufele et al., 2004; 2006) or simply been treated as a control variable in past research about discussion network heterogeneity (e.g., Kwak et al., 2005). Investigating disagreement within communication networks, Huckfeldt and Morehouse Mendez (2008) concluded that *political interest*, knowledge and the education of individuals are strong predictors for discussion frequency. A more recent paper by Choi and Lee (2015) has studied the reverse relationships and provided evidence that political interest moderates the relationship between news sharing online and network heterogeneity. Thus, we hypothesize (H1): *Individuals who have a strong interest in politics are more likely to be exposed to a heterogeneous discussion network.*

Political Knowledge. Long ago, political interest has already been found to be strongly linked to political knowledge (Seeman, 1966). Since then, a wide range of research has highlighted that the more people know about politics, the more likely they are to actively participate in politics (e.g., Bennett, 1986; McLeod et al., 1999a; Neuman, 1986). At the same time, it has been argued that this relationship might also be triggered by other intervening factors, such as the frequency of political discussions or with whom people actually discuss politics. Scheufele et al. (2006), for example, found evidence that network heterogeneity is positively related to political participation, but mediated through *political knowledge*. Hence,

how political knowledge contributes to political participation (in various forms) might also depend on the diversity of political opinions and viewpoints individuals encounter.

In fact, previous research has shown that network heterogeneity enhances political knowledge (Huckfeldt et al., 2004; McLeod et al., 1999b; Scheufele et al., 2004). More specifically, it has been argued that individuals exposed to disagreement and opposing views have to use more cognitive activity to reflect upon new arguments they encounter, and in order to find (new) ways to defend their position—possibly also revising their own opinion (Levine and Russo, 1995). More recent studies support this mechanism. Eveland and Hively (2009), distinguishing between issue stance knowledge and knowledge structure density, found that both dangerous and diverse discussion networks are positively related with knowledge structure density.

Hence, when considering the reverse direction, it might also be possible that individuals with strong political knowledge are more likely to seek various political viewpoints to maintain their knowledge and get to know to various perspectives towards an issue. Given the absence of evidence for the reversed relationship between political knowledge and discussion network heterogeneity, we assume: (H2): *The more individuals know about politics, the more they are exposed to a heterogeneous discussion network.*

Political Ideology. A related stream of research investigating information selection in a diverse information environment has focused on the phenomenon of selective exposure and how it reinforces or alters *political ideologies* and attitudes. Grounded in cognitive dissonance theory (Festinger, 1957) and motivated reasoning (Kraft et al., 2015), scholars argue that people are likely to avoid media content that is not in line with their own beliefs and tend to consume information that confirms their already existing opinions and ideologies (Taber and Lodge, 2006), albeit not necessarily avoiding counter-attitudinal information (Garrett et al., 2013). Scholars in political science have found evidence that exposure to diverse political views and ideologies indeed brings about detrimental effects, such as the reinforcement of

pre-existing political attitudes and opinions, thus leading to even more extreme positions (e.g., on gun control: Taber and Lodge, 2006; same-sex marriage and sexual minority rights: Wojcieszak and Price, 2010; or attitude toward political candidates: Meffert et al., 2006).

At the same time, empirical findings have also casted doubt on the black/white news and information consumption behavior (e.g., Nelson and Webster, 2017), pointing to various underlying factors that influence the extent to which people expose themselves to opposing views and ideologies. Lee et al. (2014) have shown, for example, that individuals with a more heterogeneous network on social network services are more polarized in ideology, but only if they discuss politics with others more often. Similarly, a more recent study suggests that the effect of heterogeneous discussion networks on opinion polarization might be moderated by political orientation such that more liberal individuals (i.e. South Koreans) show higher levels of polarization when being exposed to opposing opinions than individuals with lower liberal attitudes (Lee and Choi, 2020). To the best of our knowledge, Lee and colleagues (2014) have provided the only study that has investigated the reversed direction, and they found that political ideology is positively related to network heterogeneity. Given that previous research about network heterogeneity has only controlled for political ideology (Brundidge, 2010) or strength of partisanship respectively (e.g., Kim et al., 2013), we hypothesize based on Lee et al.'s (2014) findings: (H3): *The stronger individuals' political ideology, the more they are exposed to a heterogeneous discussion network.*

News Use and Network Heterogeneity

Scholars disagree whether being embedded in a heterogeneous discussion network leads individuals to consume more (hard) news media in order to learn about diverse viewpoints, political arguments and topics (McLeod et al., 1998; Nisbet et al., 2003), or whether the consumption of news and the encountering of various positions and issues in the news lead people to seek a more diverse social network (Brundidge, 2010). It has been argued based on the uses and gratifications theory that individuals will pay more attention to diverse

topics in the news if they also anticipate to interacting with a heterogeneous pool of individuals with a variety of interests, backgrounds and viewpoints (Eveland, 2004; Scheufele et al., 2004). McLeod et al. (1999b), for example, concluded that discussions about politics in heterogeneous networks may enhance reflective thinking about issues. And Scheufele et al. (2004), indeed, found that individuals who have reported to have a more diverse discussion network were more likely to use hard news content in newspapers and television—news formats that demand more cognitive effort when processing information compared to soft news.

Brundidge (2010) has confirmed the reversed hypothesis, showing that online news use is positively related with a heterogenous political discussion network, albeit the relationship was rather small. Looking at news sharing activities but not consumption directly, Choi and Lee (2015) have shown that news sharing mediates the relationship between social networking services and network heterogeneity. Similarly, Choi et al. (2017) provided evidence that news sharing positively moderates the relationship between network heterogeneity and political participation. However, given that previous research has not differentiated between traditional, online or social media news use or did not measure active news consumption per se (cf. Choi and Lee, 2015), the relationship between news use and network heterogeneity is still unclear. We thus pose the third research question: (RQ3): *How is news use (RQ3a: traditional, RQ3b: online, RQ3c: social media) related to discussion network heterogeneity?*

The Mediating Role of Discussion Frequency

The more citizens talk about politics and public affairs, the more they become politically informed and the more likely they take responsibility as participatory democratic citizens (e.g., Scheufele et al., 2004; Wyatt et al., 2000). A wide range of research has shown that *political discussion* is a determining factor for political participation in various forms (e.g., Gastil et al., 2002; McLeod et al., 1999a; Scheufele et al., 2004; Wyatt et al., 2000).

Furthermore, more political discussion has been found to enhance understanding for political topics (e.g., Scheufele et al., 2002) and the integration into a community (Stamm et al., 1997). In addition, scholars have identified political discussion as a crucial moderator in strengthening political efficacy when being exposed to political campaigns, either in the newspapers or on the Internet (Nisbet and Scheufele, 2004).

However, the findings reported above solely focus on the uni-directional effect of discussion frequency on political behavior, but not on mediation processes that are indicative for a deliberative democracy, such as the extent to which people discuss politics with a diverse network of opinions and attitudes. What is more, the seminal studies (Choi et al., 2017; Kim and Chen, 2015; Kwak et al., 2005; Mutz, 2002; Scheufele et al., 2004) in the field of discussion network heterogeneity have not consistently considered discussion frequency as a key variable that affects network heterogeneity. While Choi et al. (2017), Mutz (2002) and Scheufele et al. (2004; 2006) simply controlled for the variable when predicting political participation, Kim and Chen (2015) and Kwak et al. (2005) did not even include discussion frequency in their analyses. Thus, there is a conceptual and empirical lack of research that investigates the pivotal role that discussion frequency might play with regard to network heterogeneity. As follows, this study seeks to investigate the mediating effect of discussion frequency by posing the final research question: (RQ4): *To what extent is the relationship between political behavior, political attitudes, news use and network heterogeneity mediated by discussion frequency?*

Method

Sample and Data

The data for this study are based on a two-wave panel online survey which was administered in the United States. The distribution of the survey was supported by the media polling group Nielsen. Nielsen uses a stratified quota-sampling method to recruit respondents from a pool of over 200,000 pre-registered US citizens to reach a sample that is most likely to

resemble the demographic distribution as reported by the US Census. Wave 1 of the survey was carried out in December 2013. From an initial sample of 5000 participants, 2060 individuals responded, resulting in a relatively high response rate of 34.6%. Data for Wave 2 were collected in March 2014. 1024 respondents filled out the survey, which indicates an acceptable retention rate of 57% (Watson and Wooden, 2006).

The resulting sample of the panel survey is diverse and comparable with the US national population as well as similar surveys that use random sampling strategies (e.g., Pew Research Center for the People and the Press, 2013). Respondents varied demographically regarding age (mean [M]=52.71, standard deviation [SD] = 14.77), education (range of scale: 1–8, M = 3.61, SD = 1.44, median [Mdn] = some college), income (ranger of scale 1–8, M = 4.46, SD = 1.44, Mdn = US\$50,000 – US\$59,000), sex (49.9% female), and race (78,1% white). However, slight differences compared to the US Census were prevalent. The sample of this study is slightly younger, more educated and includes fewer Hispanics. See the appendix for the formulation of the following measures.

Measures

Discussion network heterogeneity. Discussion network heterogeneity has been conceptualized and measured in various ways in past research (Eveland and Hively, 2009). We followed Moy and Gastil's (2006) approach in considering network heterogeneity as a multifaceted concept (i.e., ethnic, social, political), using four distinct items for the measurement (see also Diehl et al., 2016). Respondents were asked how often (1 = *never*, 10 = *all the time*) they talk about politics and public affairs online and offline with people a) who disagree with [them], b) whose political views are different from [theirs], c) from a different race or ethnicity, and d) from a different social class (Wave 1: Cronbach's alpha = .94, M = 3.58, SD = 2.45; Wave 2: Cronbach's alpha = .93, M = 3.41, SD = 2.36).

Discussion Frequency. *Discussion frequency* was measured by using nine items that asked respondents how often (1 = *never*, 10 = *all the time*) they talk about politics or public

affairs online and offline with their spouse or partner, family relatives, friends, acquaintances, strangers, neighbors they know well and don't know well, and co-workers they know well and don't know well (Cronbach's $\alpha = .87$, $M = 3.27$, $SD = 1.74$).

Political participation. Political participation was differentiated between offline, online and social media. For *offline political participation*, respondents were asked to indicate on a 10-point Likert scale (1 = *never*, 10 = *all the time*), how often [they] have a) contacted an elected public official, b) attended a political rally, c) participated in any demonstrations, protests, or marches, d) donated money to a campaign or political cause, e) participated in groups that took any location action for social or political reform, and f) been involved in public interest groups, political action groups, political clubs, political campaigns, or political party committees (Cronbach's $\alpha = .89$, $M = 2.15$, $SD = 1.78$). Regarding *online political participation*, respondents were questioned how often [they] a) signed or shared an online petition, b) participated in online polls, c) participated in an online question and answer session with a politician or public official, d) created an online petition, and e) signed up online to volunteer to help with a political cause (Cronbach's $\alpha = .78$, $M = 2.29$, $SD = 1.70$). Finally, *social media participation* was gauged by inquiring how often [they] a) joined a political or cause-related group on a social media site, and b) started a political or cause-related group on a social media site (Pearson = .66, $M = 1.56$, $SD = 1.46$).

Political efficacy (internal). Internal political efficacy was measured by using three items derived from previous research (Niemi et al., 1991). Ranging on a 10-point Likert scale (1 = *strongly disagree*, 10 = *strongly agree*), respondents had to indicate to what extent they think a) "People like me can influence government", b) "I consider myself well qualified to participate in politics", and c) "I have a good understanding of the important political issues facing our country" (Cronbach's $\alpha = .78$, $M = 5.17$, $SD = 2.24$).

Political interest. Political interest was measured by asking respondents two questions, following prior research (Niemi et al., 1991). Respondents had to indicate on a 10-

point scale (1 = *not at all*, 10 = *a great deal*) a) how interested [they] are in information about what's going on in politics and public affairs and b) how closely [they] pay attention to information about what's going on in politics and public affairs (Pearson = .93, $M = 6.67$, $SD = 2.70$).

Political knowledge. To measure political knowledge, the respondents were asked eight questions regarding politics in the US. After recoding right and wrong answers (1=*right*, 0=*wrong*), the eight items were averaged (Cronbach's alpha: .75, $M = 0.57$, $SD = 0.27$).

Political ideology. To measure political ideology, respondents were asked to place themselves on 11-point scales (0 = *strong conservative*, 11 = *strong liberal*) for a) social issues and b) economic issues. The two items were recoded to form a 4-point scale (1 = *neutral*, 4 = *strong ideology*) (Pearson = .75; $M = 2.36$, $SD = 1.00$).

News use. News use was distinguished between traditional news media, online news media and social media news. *Traditional news use* (e.g., Gil de Zúñiga et al., 2010) was captured by asking respondents nine items that asked how often they get news (1 = *never*, 10 = *all the time*) from network TV news (e.g., ABC, CBS, NBC), local television news (local affiliate stations), national newspapers (e.g. *New York Times*, *Washington Post*, *US Today*), local newspapers (e.g., *Oregonian*, *Houston Chronicle*, *Miami Herald*), cable news (e.g., CNN, Fox News, MSNBC), radio news (e.g., NPR, talk shows), print media, television media, and radio (Cronbach's alpha = .77, $M = 5.26$, $SD = 1.86$).

Online news use was measured using eight items, asking respondents how often they get news (1 = *never*, 10 = *all the time*) from online news sites (e.g., Gawker, Politico, BuzzFeed), citizen journalism sites (e.g., CNN's iReport, Examiner.com), hyperlocal news sites (e.g., Patch.com or other sites dedicated to news in [their] local community), computer web browser (laptop or desktop), tablet app or browser (iPad, 7 inches or larger), smartphone app or browser (handheld mobile device smaller than 7 inches), news aggregators (e.g.,

Google News, etc.) and sites and apps that collect news (e.g., Flipboard or Pulse) (Cronbach's $\alpha = .78$, $M = 2.97$, $SD = 1.55$).

The variable for *social media news use* was constructed based on four items (e.g., Gil de Zúñiga et al., 2010), asking respondents how often they use Facebook for getting news, Twitter for getting news, use social media to stay informed about current events and public affairs, and use social media to get news from mainstream media. Answer categories ranged on a 10-point scale (1 = *never*, 10 = *all the time*; Cronbach's $\alpha = .82$, $M = 2.67$, $SD = 2.06$).

Controls. Following previous research on network heterogeneity (e.g., Lee et al., 2014), we also controlled for daily social media use by asking respondents how often (1 = *never*, 10 = *all the time*) they use social media on a typical day ($M = 4.13$, $SD = 2.99$). Furthermore, following Mutz (2002) and others (e.g., Eveland and Hively, 2009), we measured *network size* to control for the amount of people with whom respondents usually have political discussions. We asked respondents about how many people they would say they have talked to a) face-to-face or over the phone about politics or public affairs, and b) via the Internet, including e-mail, chat rooms, social network sites and micro-blogging sites. Given the highly skewed variable when averaged, a constant (1) was added before applying a log transformation to the variable ($M = 0.89$, $SD = 0.99$, $\min = 0.00$, $\max = 5.62$). As for *demographics*, we included age, gender (1 = male), race (1 = white), annual household income, and education in our analyses.

Analyses

To answer the research questions and test the hypotheses, including the mediating effect of discussion frequency, we conducted a series of ordinary least squares regression analyses, and causal mediation analyses (Baron and Kenny, 1986) with the computing software *R*. To control for non-normal data, the mediation analyses were conducted with 1,000 bootstrap samples. What is more, the two-wave survey design allowed us to test for

tentative causal directions of the assumed relationships. To do so, we estimated three OLS regression models (cross-sectional, lagged, autoregressive). It is particularly the autoregressive model that allows for more confident causal assumptions as it regresses the independent variable (IV) from wave one on the dependent variable (DV) from wave two while, at the same time, controlling for the DV from wave one (Finkel, 1995).

Results

The first research question dealt with the relationship between political participation and network heterogeneity. The OLS results (see Table 1) indicate that none of the forms of political participation (offline, online, social media) is significantly related to network heterogeneity. In the second research question we inquired how political efficacy is associated with network heterogeneity. We equally find no significant relationship in the OLS models. The first hypothesis posed in this study assumed that individuals who have a strong interest in politics are more likely to be exposed to a heterogeneous discussion network. The results show that there is a direct significant positive relationships between political interest and discussion network heterogeneity in the cross-sectional model (OLS: $\beta = .082, p < .05$). Hence, the more people are interested in politics and public affairs, the more likely they seek a heterogeneous discussion network. In the second hypotheses we asserted that individuals who know more about politics, are more likely to be exposed to a heterogeneous discussion network. However, we did not find support for this assumption in the OLS models.

[Table 1]

The third hypothesis dealt with the positive relationship between political ideology and network heterogeneity. Here, no significant correlations were detected in the OLS models either. In addition, we inquired how news media consumption relates to network heterogeneity (RQ3). The results reveal that traditional news use is positively related with network heterogeneity, both in the lagged and autoregressive OLS model (lagged: $\beta = .077, p < .05$; autoregressive: $\beta = .089, p < .05$). Thus, the more people consume traditional news

(e.g., newspapers, TV, radio), the more likely they reside in heterogeneous networks.

However, no other form of news media use has been found to be related with discussion network heterogeneity.

The final research question dealt with the mediating effect of discussion frequency for the relationship between political attitudes, behavior, news use and discussion network heterogeneity. The causal mediation analyses have revealed that the positive effect of political participation online on discussion network heterogeneity is largely dependent on discussion frequency. Accordingly, when frequently discussing politics, the relationship between online political participation and network heterogeneity becomes apparent for individuals. Second, political interest can also lead to a more diverse discussion network over time, but only if politics is discussed more frequently. Third, while there was no direct effect of political knowledge on network heterogeneity in the OLS models, discussion frequency works as a negative mediator; hence decreasing discussion network heterogeneity. Eventually, the positive effects of traditional news consumption on network heterogeneity were found to be largely contingent on whether individuals frequently talk to other people about politics and public affairs. Positive mediation effects were also detected for online news consumption. For social media news use, the mediation effect was absent, however.

[Table 2 about here]

Discussion

Having recently faced widely debated issues around ‘information cocoons’, ‘echo chambers’, and ‘filter bubbles’, this study aimed at shedding light on what political attitudes, political behavior as well as news consumption behaviors are indicative for US citizens to talk to people from diverse backgrounds (e.g., social, ethnical, political). What scholars in political science and communication science have called “discussion network heterogeneity” (Mutz, 2002; Scheufele et al., 2004; 2006), and which has been ascribed a pivotal role for deliberative democracies (Habermas, 1989), has so-far been mainly considered as an

exogenous variable in theoretical and empirical models (except: Brundidge, 2010; Lee et al., 2014; Choi and Lee, 2015). However, in this study we sought out to identify the major antecedents for network heterogeneity, while at the same time, also accounting for the mediating role of discussion frequency.

Findings revealed that the most important factors that lead people to seek a heterogeneous discussion network are political interest, political participation online as well as news use (traditional, online). Political knowledge, on the other hand, has been found to rather attenuate network heterogeneity. However, while the direct relationship between these factors were found to be limited (e.g., only present for political interest and traditional news use), it became clear that citizens need to foster frequent talks about politics and public affairs in order to get exposed to counter-attitudinal political opinions. Hence, the more politically interested individuals talk to others about politics and public affairs, the more likely they are to encounter alternative viewpoints and explanations. Research on selective exposure has indeed shown that politically interested individuals are not dismissive about opinions and attitudes that differ from theirs, but that they seek opposing arguments in order to construct counter-arguments and become prepared for political discussions with the opposition (e.g., Garrett, 2009, Valentino et al., 2009).

While this mechanism seems to be at work for politically interested citizens, political intelligence combined with discussion frequency might function as a damper. The results have shown that politically savvy people are less likely to encounter heterogeneous discussion networks if they talk about politics and public affairs frequently. Rather, it seems that politically knowledgeable people—especially if they talk with others about politics and public affairs more often—might be less inclined to listening to counter-attitudinal viewpoints. These findings point to a dangerous formation of a politically sophisticated elite that becomes increasingly delineated from the broader, average political forum (cf. Putnam, 1976).

What is more, having researched news media effects for a variety of news platforms (traditional, online, social media), it became apparent that traditional news use can be considered the strongest predictor for discussion network heterogeneity—and even over time. Furthermore, the mediation analyses showed that frequent discussions with others about politics and public affairs do not only mediate the positive effect of traditional news use on network heterogeneity, it also enhances citizens who consume online news to talk more often with people from diverse backgrounds. In other words, the more individuals consume news via traditional and online media outlets and discuss politics with others, the more likely they are to seek out conversation partners that differ from themselves socially, politically, and/or ethnically.

These findings are not only in line with Brundidge (2010), who has shown that online news consumption leads to network heterogeneity through discussion frequency; the results also provide evidence that the previously identified uni-directional relationship between traditional news use and network heterogeneity (Scheufele et al., 2004; 2006) also holds in the reverse order. Eventually, the reason that we do not find a mediation effect of discussion frequency for the relationship between social media news use and network heterogeneity can be well-reasoned. Given that consuming news via social media already implies that people have a large network and frequent discussions in the online sphere (in most cases), it is plausible that the mediating effect of discussion frequency seems to become obsolete in our analyses.

Lastly, we found that discussion frequency works as a positive mediator for political participation online affecting network heterogeneity positively. Hence, while political participation on social media and offline might not necessarily increase the likeliness to be exposed to different viewpoints, online political participation (e.g., signing online petitions or participating in a Q&A with politicians online) might represent actions that could help to burst the so-called ‘filter bubble.’ Explanations for this finding can be found when

considering the nature of the different forms of political participation. Offline political participation (e.g., participation in rallies, demonstrations or political interest groups) oftentimes take place within a common social community (e.g., political party, friends, social circles who stand up for a shared cause). The same can be said about political participation on social media. Here, the activity remains in the social media sphere, such as starting or joining a cause-related group but does not extend beyond the familiar social online circles. Yet, online political participation, which includes creating, sharing, signing a petition or signing up to volunteer for a political cause, implies that one does not necessarily need to be exposed to the same group of people. Petitions can take various forms and can focus on a diversity of topics. What is more, online tools nowadays enable people to become exposed to a variety of political opinions and backgrounds that one would not have necessarily encountered offline or on social media (e.g., emails, newsletters, forums, What's App groups).

Limitations

Although this study has given new insights into the antecedents and mechanisms of discussion network heterogeneity, there are certain limitations that need to be taken into account. First, the data could be considered outdated as the surveys were conducted back in 2013 and 2014 respectively. However, as we are still facing many questions regarding the outcome of the US elections in 2016, the findings of this study can be deemed indicative for why US citizens have turned away from seeking alternative political views and rather resided in social circles that (re-)confirmed their existing political beliefs. Second, we had to rely on survey data which are widely known in the field to be prone to social desirability, untrustworthy answers, and missing values (cf. decreases the sample for final analyses). However, rather than relying on a small dataset that might be less generalizable, we opted for a large-scale, representative survey in order to make more compelling conclusions about the U.S. population. Future research should, however, focus on tracking-data and survey-techniques that use smartphone and other intrusive online techniques.

Thirdly, and lastly, we were only able to identify a direct relationship between traditional news use, political interest and discussion network heterogeneity respectively. All other variables that measured political attitude and behavior as well as news use did not yield positive results, albeit the mediation effects revealed more interesting insights. It is in this vein that we reason that network heterogeneity is part of a recursive process in which political attitudes, behavior and news consumption mutually influence and reinforce each other. As a result, this study has given useful insights into the antecedents and mechanisms of network heterogeneity when considered as an endogenous construct.

What is more, follow-up studies should investigate discussion network heterogeneity as a social constructive process. More specifically, future research could take a look at the individual, cognitive processes that take place when citizens encounter counter-attitudinal political viewpoints, and how these conversations affect their political attitudes and behaviors (over time). Another possibility could be an intervention study, focusing on the micro-level processes of promoting network heterogeneity. A prime example in this regard is the initiative by the Germany newspaper ZEIT “Deutschland spricht”¹ since 2017. A similar project could be conducted in the US, engaging citizens to meet and talk about politics with fellow citizens who differ in their political ideas. The results of the personal exchange, the regular meetings and conversations could be scientifically accompanied by means of follow-up interviews and surveys, providing insights into the effects of heterogeneous discussion networks on beliefs and attitudes toward democratic principles.

Conclusion

All in all, the findings of this study lend support that political discussion can be considered the “social glue” (Sunstein, 2002, p. 9) that keeps democratic societies together and that might lead to the “bursting” of the alleged ‘filter bubbles’ and ‘information cocoons’ these days. Thus, there is a need to create platforms in societies to talk about politics and public affairs more frequently—either privately, at home, in the public sector, in schools, at

universities, or at work. Furthermore, educational institutions and lecturers are in demand to arouse interest among pupils and students to become engaged with politics and public affairs. Reading the news regularly (e.g., in the newspapers or online) is part of the process to stay informed and equip oneself with the necessary tools to participate in political discussions. In short, the results of this study have shown that strengthening political interest, political participation online and news media consumption, coupled with more political talks, is key to ensure a thriving democracy that is based on citizens who seek to encounter diverse opinions, show interest in various standpoints, and are open to listen to alternative viewpoints.

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Footnotes

¹ More information on the project (in German): <https://www.zeit.de/serie/deutschland-spricht>

Table 1

OLS Regression Models Predicting Discussion Frequency and Network Heterogeneity (Cross-Sectional, Lagged, Autoregressive)

	Discussion Frequency Cross-Sectional ^{W1} β	Network Heterogeneity Cross-Sectional ^{W1} β	Network Heterogeneity Lagged ^{W2} β	Network Heterogeneity Autoregressive ^{W2} β
<i>Block 1: Autoregressive Term</i>				
Network Heterogeneity ^{W1}	—	—	—	.434*** (.533)
Constant	.000 (.372)	.000 (.489)	.000 (.570)	.000 (.533)
<i>Block 2: Demographics & Controls</i>				
Age	-.059 (.004)	.015 (.005)	-.024 (.006)	-.030 (.005)
Gender (1=male)	-.011 (.097)	-.029 (.123)	.007 (.149)	.020 (.139)
Race (1=white)	.014 (.122)	.024 (.160)	.022 (.187)	.011 (.175)
Income	.080** (.034)	-.057* (.046)	-.063 (.053)	-.038 (.050)
Education	.030 (.034)	.026 (.044)	.067 (.052)	.056 (.048)
Social Media Use	-.019 (.021)	.053 (.027)	.089* (.032)	.066 (.030)
Network Size (log)	.385*** (.056)	.126*** (.081)	.213*** (.094)	.158*** (.089)
<i>Block 3: Political Antecedents</i>				
Political Participation Offline	.045 (.049)	.039 (.064)	.093 (.075)	.076 (.070)
Political Participation Online	.144** (.051)	.062 (.068)	.107 (.079)	.080 (.074)
Political Participation Social Media	.058 (.049)	-.033 (.064)	-.074 (.075)	-.060 (.070)
Political Efficacy Internal	.050 (.029)	.015 (.038)	.074 (.045)	.068 (.042)
Political Interest	.182*** (.028)	.082* (.037)	.084 (.043)	.049 (.040)
Political Knowledge	-.098** (.232)	.067 (.306)	-.019 (.357)	-.048 (.334)
Political Ideology	.030 (.050)	-.012 (.065)	-.019 (.076)	-.014 (.071)
<i>Block 4: News Media Use</i>				
Traditional News	.135*** (.030)	-.029 (.040)	.077* (.047)	.089* (.044)
Online News	.095** (.039)	.004 (.052)	-.014 (.060)	-.016 (.056)
Social Media News	.037 (.034)	-.053 (.045)	.020 (.052)	.043 (.049)
<i>Block 5: Mediator</i>				
Discussion Frequency	—	.596*** (.053)	.286*** (.061)	.028 (.069)
Total R²	.549	.629	.457	.526
Observations	641	641	641	641

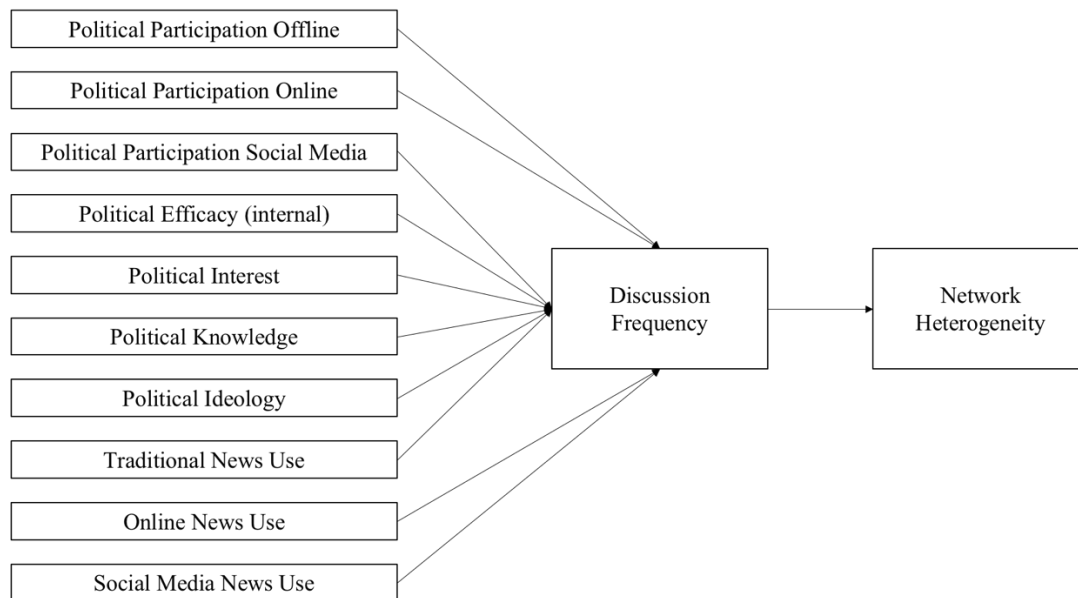
Note. Cell entries are final-entry ordinary least squares (OLS), standardized Beta (β) coefficients; standard errors in parentheses; * $p < .05$, ** $p < .01$, *** $p < .001$

Table 2

Causal Mediation Analyses

	Discussion Frequency → Network Heterogeneity		
	Cross-sectional ^{W1}	Lagged ^{W2}	Autoregressive ^{W2}
	β	β	β
<u>Political Attitudes</u>			
Political Participation Offline	.039	.018	.002
Political Participation Online	.128**	.059**	.006
Political Participation Social Media	.064	.030	.003
Political Efficacy Internal	.033	.015	.001
Political Interest	.096***	.046***	.004
Political Knowledge	-.522*	-.241*	-.023
Political Ideology	.044	.020	.002
<u>News Media Use</u>			
Traditional News	.104***	.048***	.005
Online News	.093*	.043*	.004
Social Media News	.026	.012	.001

Note. Cell entries are unstandardized coefficients of the Average Causal Mediation Effect (ACME, indirect effect); nonparametric bootstrap confidence intervals with 1,000 iterations; * $p < .05$, ** $p < .01$, *** $p < .001$

Figure 1. *Conceptual mediation model of network heterogeneity.*