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RECENT ARTICLE

Declining News Media Viewership and the Survival of Political Disagreement

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Abstract

As news viewership has declined in recent years, concerns over the consequences of this phenomenon for democracy have increased. Theories of communication networks and news media effects suggest that accessing self-selected news sources preserves disagreement, whereas interacting with like-minded discussants homogenizes the preferences of members. This study addresses how the level of perceived disagreement within one's networks of political discussion can be maintained when an increasing number of citizens grow disinterested in acquiring political information. Using a series of agent-based simulations with a macro–micro theoretical framework and John Zaller's (1992) axioms as their basis, this study concludes that, if voters continue to "tune out," the number of citizens who perceive network heterogeneity will decrease.

Discussions about politics and the accessing of news media are the two major sources that inform voter preferences. Although discussing politics with like-minded people plays a role in homogenizing preferences (Lazarsfeld, Berelson, & Gaudet, 1948; McClurg, 2006; Nowak & Lewenstein, 1996; Wojcieszak, 2010), the news media has been identified as a critical component of democracy that provides a variety of perspectives to help balance political views (Brundidge, 2010; Mutz & Martin, 2001). If the news media is so critical to preserving the diversity of voters' preferences at the aggregate level, what are the underlying patterns about the effect of partisan news media and the decline in viewership of political news on the survival of political preference diversity? How could we take such patterns as the knowledge base to make a

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partisan society better? This study focuses on the extent to which the decline in news consumption at the individual level influences the number of people who perceive preference diversity at the societal level. Specifically, using an agent-based modeling (ABM) approach, this paper examines (1) how the number of voters who perceive preference diversity within their networks of political discussion changes when the voters become less interested in accessing political news and (2) which type of information environment contributes to the survival of disagreement in such a tuned-out phenomenon.

Declining news viewership has been identified as a trend caused by the audience's loss of confidence in the news media, perceived isolation from the political process, decreased social capital for public dialog, and/or increased excuses for not participating in politics, taking part in political discussions, joining campaigns, or voting (Mindich, 2004). There is little evidence suggesting that the majority of American voters have become more involved in politics and elections or more capable of developing stable and coherent belief systems (Campbell, Converse, Miller, & Stock, 1960; Nie, Verba, & Petrocik, 1976; Page & Xie, 2011; Smith, 1989). Instead, many decades of accumulated evidence shows that losing interest in politics leads to decreased accessing of news media (Stromback & Shehata, 2010).

Consider loss of confidence, a major reason for news viewership decline, as an example. In 2005, six broadcast networks, with the exception of ABC and Fox, suffered a 13% decline in their viewership.[1] In 2010, cable news viewership for CNN, MSNBC, and Fox News also continued to fall precipitously.[2] One cause for the decline in audience viewership is that the news media has failed to meet the expectations and needs of a younger audience (Mersey, 2010). A recent Gallup study notes that 54% of Americans (the margin of sampling error is ±4%) lost confidence in the accuracy of the mass media in 2013, one of the lowest levels since the 1990s. Respondents, and independents and Republicans in particular, thought that the news media was too partisan (Mendes, 2013). This trend continued in 2014: Only 15% of self-identified conservatives said they had a great deal or quite a lot of confidence in newspapers, compared with 25% of moderates and 34% of liberals (Dugan, 2014).

Furthermore, there is no indication that viewers have greater confidence in online news than conventional news media within this trend. Confidence (including responses of "a great deal" or "quite a lot") in television (TV)

[1]http://www.newsmax.com/archives/ic/2005/9/8/104647.shtml

[2]The viewership of the news media is not in constant decline; it has fluctuated over the past decade. However, according to the most recent report by the Pew Institute, long-term viewership of evening (TV) news has been decreasing constantly over the past 20 years: "Since 1980, the three commercial evening newscasts have lost about 27.4 million viewers, or 52.6%, of their audience." See http://stateofthemedia.org/2013/network-news-a-year-of-change-and-challenge-at-nbc/. Regarding the newspaper, the "frequency of newspaper readership increases with the level of education, but all levels of readership are declining." See, http://stateofthemedia.org/2013/newspapers-stabilizing-but-still-threatened/newspapers-by-the-numbers/.

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news, newspapers, and online news dropped to 22%, 19%, and 18%, respectively (Dugan, 2014). This phenomenon of being "tuned out" does not occur only among members of the younger generation. As Mindich (2004) notes, "while most young Americans are tuned out, older Americans are not exactly tuned in" (p. 12). The media environment, which grabs the "leisure-time attention" of the audiences, has caused the politically uninterested to remain tuned out (Converse, 1964).

Having witnessed todays politically polarized and fragmented news media environment, as well as a declining interest in political news consumption, political communication scholars have raised concerns about the impact on democracy. For example, the supply of numerous channels of information can lead to a wider gap between politically aware (politically interested) and less aware (less interested) individuals in terms of levels of political knowledge (Prior, 2007; Stromback, Djerf-Pierre, & Shehata, 2013). Declining interest in political news can result in less well-informed citizens, less political deliberation between individuals, and lower voter turnout (e.g., Bennett, 1998; Mindich, 2004; Robinson & Levy, 1996; Smith, 1989).

Based on these trends, this study takes the next step and asks the following questions: Will the society-level decline in news consumption influence the level of political disagreement? What happens if citizens become less interested in accessing the news media while retaining interest in discussing politics? In addition, what if voters are tuned out from both consuming news and political discussion? To evaluate concerns about the consequences of declining news viewership, I chose to focus on the effect of this decline on heterogeneity in voter preferences, a concept that has been identified over the past decade as one of the most critical mediators between news media use and political behavior, including political discussion and voting (Mutz & Martin, 2001). Moreover, this study integrates two bodies of literature: communication scholars' concerns about the consequences of news viewership declines, and political scientists' interest in the role of network heterogeneity in democracy. It then uses an agent-based simulation approach to synthesize the two most important political news sources (news media and interpersonal networks) and explore the extent to which the focal phenomenon influences the survival of political disagreement.

Theoretical Framework, Concepts, and Definitions

This study addresses a macro-level question, the effects of declining news viewership on the survival of political disagreement, which requires an understanding of both micro-level and micro–macro mechanisms. In contrast to the most empirical research, which concentrates solely on a micro-level unit of analysis, this study's scope incorporates a multilevel analysis and builds a

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bridge between individual behavior and aggregated patterns. Therefore, the theoretical framework of this study must consider theories that address the micro-level phenomena (e.g., belief system, network heterogeneity, selective exposure, selective perception, partisan motivated reasoning, and the two-step flow theory) and incorporate these theoretical perspectives into the micro–macro connection (e.g., the spiral of silence theory).

Conventional wisdom in political science suggests that one's political preferences are derived from his or her belief system, which includes a set of values, such as justice and freedom, as well as attitudes and goals. Zaller's (1992) Receive-Accept-Sample (RAS) model, on which the theoretical framework of this study is based, is one of the pioneering works that apply this conventional wisdom to the study of the psychological mechanism of opinion formation. This model still holds strong today, as it has been cited, examined, and applied in empirical studies over the decades (e.g., Garrett, 2009; Levitan & Verhulst, 2015; Petersen, Skov, Serritzlew, & Ramsøy, 2013; Samuels & Zucco, 2014). In short, the RAS model emphasizes that a voter's responses to a telephone survey is the average of a set of available considerations stored in his or her memory.[3]

The RAS model is composed of four rules or axioms regarding how voters form their preferences about a political issue or a candidate. The reception axiom (Axiom 1) states that the politically aware or political experts are more conscious of political issues and are more likely to actively acquire political information. The level of their political awareness, measured by their level of political expertise, that is, knowledge about political issues and campaigns, determines the probability of obtaining political information. The resistance axiom (Axiom 2) indicates that the awareness of political information determines one's propensity to reject incoming political information. Individuals tend to relate an issue to their political predispositions, and political experts are more likely to, and more capable of, resisting incoming political information than ordinary citizens are. Specifically, political experts tend to resist the information they encounter, whereas the majority of voters, who are poorly informed, tend to accept it. The accessibility axiom (Axiom 3) states that individuals base their statement of preference on information recently stored

[3]An alternative model for future application of the simulation approach is Lodge and Taber's (2013) "John Q. Public" model. Both the RAS and the John Q. Public models focus on how voters process information during a political campaign season when they become politically aware and subject to the influence of partisan cues. The major difference is that the RAS model is a type of memory-based model, assuming that individuals update their preferences based on pieces of information stored as impressions in memory, whereas the John Q. Public model is an online-based model, which assumes that individual preferences about the targeted event or issue are updated by the most recent impression. The online model suggests that affective responses are stored and updated in long-term memory and will surface rapidly outside conscious awareness in response to stimuli during an electoral campaign. I chose the RAS model as the base of the simulations because the rules of behavior and information processing that are made clear in the axioms helps the translation of theoretical reasoning into programming language.

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in their memory. The response axiom (Axiom 4) suggests that individuals sample these stored messages to form their attitudes by "averaging across the considerations that are immediately salient or accessible to them" (p. 49).[4]

This study knits three key concepts, their definitions, and corresponding empirical evidence, which is introduced below, into this RAS framework. These concepts include political disagreement, the heterogeneity of people's networks of political communication, and two types of citizens. First, political disagreement in this study is defined as inconsistency between the voter preferences of the focal respondent and those of the discussants within her interpersonal network of political discussion, which is composed of self-selected political discussants online and/or offline. The concept of network heterogeneity, which refers to the distribution of voter preferences held by those with whom she interacts in her networks of political discussion, is used to operationalize the concept of political disagreement at the aggregate level. An individual resides in a higher level of network heterogeneity if some but not all of those with whom she holds conversations support other political parties or candidates. In contrast, an individual resides in a homogeneous network, or a network of low level of heterogeneity, if the majority of the people with whom discussions occur support the same political party or candidate(s) (e.g., Huckfeldt, Johnson, & Sprague, 2002; Mutz, 2002; Scheufele, Hardy, Brossard, Waismel-Manor, & Nisbet, 2006).

Second, the heterogeneity of people's networks of political communication is largely "a function of structural diversity and discussion setting" (Scheufele et al., 2006, p. 749). Whether one individual is influenced by a second individual's preference within a network of political discussion depends on the distribution of preferences across all other individuals within the setting, who are also connected to the first individual. That is, "individuals are less likely to be persuaded by opinions that win only limited support among the participants within their communication networks" (Huckfeldt, Johnson, & Sprague, 2004, p. 20). Social network scholars argue that political disagreement survives within one's daily life because an individual will stand against neighborhood or homogenizing effects within his or her network as long as he or she finds support from some discussants (Coleman, 2004; McClurg, 2006; Sampson, Morenoff, & Gannon-Rowley, 2002). Conversations within such settings are likely to be what Eveland and Hively (2009) call "dangerous discussions,"

[4]Axioms 1 and 2 are empirically supported. Zaller examines empirical data and finds that the reception of political information is a function of political awareness and that the resistance to political information is a joint function of political awareness and predisposition. However, it remains unclear whether individuals resist information before they receive it and whether they will process information in the order of Axioms 1 and 2. The last axiom, Axiom 4, is based on a psychology model emphasizing that the current impression of an item is an average of stored impressions. Zaller admits that neither the memory-based model nor the online model describes all cases; instead, the current impression depends on the level of the issue and the availability of information in the memory (p. 279).

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which means that respondents will experience cross-cutting pressure when discussing politics with their discussants and ironically feel less engaged while participating in politics. Those who reside in heterogeneous networks still have like-minded discussants and are not limited to those who are exposed solely to dangerous discussions (Garrett, 2009). Therefore, when faced with a salient political issue, the focal respondent in a heterogeneous network perceives that she has some like-minded discussants if she is the minority; or if the majority of her discussants are on her side, she has some discussants holding opposite voter preferences. Additionally, it is expected that a higher level of heterogeneity in voter preference indicates a healthier democracy in which citizens are more politically knowledgeable and tolerant (Eveland & Hively, 2009; Mutz, 2002). Such heterogeneous networks "serve as transmitters and intermediaries that connect individuals to the events and circumstances of democratic politics" (Huckfeldt et al., 2002, p. 19).[5]

Third, a network of political discussion is composed of two types of citizens: the politically aware and/or the ordinary citizens (Converse, 1964; Zaller, 1992). Politically aware individuals, most of whom are partisan voters, are likely to engage in selective exposure. They access self-selected political news sources that are consistent with their own ideology (Dilliplane, Goldman, & Mutz, 2012; Iyengar & Hahn, 2009; Klapper, 1960). Furthermore, politically aware individuals take part in selective perception and take in incoming information, which is consistent with their own ideology (Klapper, 1960; Lazarsfeld, Berelson, & Gaudet, 1968; Slater, 2007). They may also engage in motivated reasoning and generate meanings for incoming information that fits their own ideology (Leeper & Slothuus, 2014; Lodge & Taber, 2013; Nir, 2011; Petersen et al., 2013; Redlawsk, 2002). This process strengthens partisan voters' existing beliefs and stabilizes their political preferences for a certain ideology (Iyengar & Hahn, 2009; Klapper, 1960; Stroud, 2007; Zaller, 1992). As the uses and gratifications theory suggests, partisan voters use political information to strengthen their existing stance (Eveland, 2004; Oliver, 2002; Slater, 2007). Therefore, one could expect that, over the long run, the politically aware will become stable in their preferences.

It is likely that ordinary citizens are subject to the influence of the politically aware, if they are available. Both the two-step flow theory and the neighborhood theory point in the same direction. The former suggests that information cascades from the news media to public opinions and then to ordinary citizens; the latter states that those with lower political expertise are likely to be influenced by their more politically knowledgeable counterparts in terms of voter preferences (Huckfeldt, 2001; Iyengar & Hahn, 2009; Katz,

[5]Even though, there has been a debate about the extent to which offline heterogeneous communication networks mobilize or demobilize political participation (Anderson & Paskeviciute, 2005; Mutz, 2006a; Nir, 2011).

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1957; Latane, 1996; Liu, 2007; McClurg, 2006; Prior, 2013; Wojcieszak, 2010). When the networks of ordinary citizens become heterogeneous, they are even more likely to be subject to discussant influences (Huckfeldt et al., 2004; Sampson et al., 2002; Zuckerman, 2005).

These micro-level theoretical foundations and their empirical evidence provide essential understanding regarding the causal relations between variables at the individual level. However, these theories supply minimal explanations and expectations regarding whether political disagreement survives when voters tune out. The spiral of silence theory (Noelle-Neumann, 1993) is one exception that attempts to bridge the gap between micro-level phenomenon and macro-level phenomenon. It suggests that "silence," or unwillingness to engage in political discussion, will expand when individuals of one side perceive that they are minority. In contrast to the social network approach, which places greater emphasis on the network (Huckfeldt et al., 2004), the spiral of silence theory focuses on the role of the news media in one's perception regarding the distribution of voter preferences. It guides us to believe that whether political disagreement survives in one's daily life depends on an evaluation of the "climate of opinion," that is, if the distribution of voter preferences favors one's stance, through the news media.

I might well need to update the spiral of silence theory, conceived decades ago, to fit the present news media environment. Such a consideration is beyond the scope of this research. However, a recent finding related to this theory notes that politically aware partisan voters are more likely to become polarized on learning that they are in the majority from the news media (Tsfati, Stroud, & Chotiner, 2014). This finding, consistent with evidence drawn from the social network research reviewed above, suggests that the politically aware are the last people to change their political preferences if they continue to access self-selected news sources. This finding further implies that partisan-minded voters and the news media, although fragmented and biased, are two critical factors for the survival of political disagreement in a society.

Based on the underpinnings provided by previous research, I am able to draw a synergized theoretical landscape in which politically aware voters are likely to believe themselves the majority on a political issue and perceive a lower level of political disagreement within their networks of political discussion. I expect their level of network heterogeneity to either remain low or decrease over time. When ordinary voters start to tune out, the news media has less influence on voter perceptions regarding the "opinion climate." Hence, I expect that voters will be more subject to the influence of their self-selected political discussants, particularly those who remain unchanged in their voter preferences. Because the politically aware are likely to form

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homogeneous networks, the phenomenon of tuning out could result in an increase in the number of individuals who are more subject to the influence of their self-selected network members and a decrease in the number of individuals who perceive political disagreement.

Given the systematic and dynamic framework of political disagreement that incorporates network-based and news-media-oriented perspectives I have constructed, and because it is difficult to empirically validate this cross-unit-of-analysis framework, I turn to computational experiments in which terms such as heterogeneity, homogeneity, surroundings, and disagreement are concepts more closely related to perception than reality. For simulation purposes, I assume that greater actual heterogeneity in the network approximately equals greater perceived heterogeneity, with all other things being equal.

Note that the ABM approach the present study adopts, as used by Axelrod in his classic "The Evolution of Cooperation" published in 1984 and other recent works, such as Laver and Sergenti's (2012) "Party Competition: An Agent-Based Model," emphasizes mechanisms and patterns emerging from laboratory simulations. From the point of view of scientific realism, seeking a clearly predefined theoretical framework, in which all elements used for simulation find their corresponding counterparts in a theory, is not a priority. Although seeking and confirming a theory that explains the causal relationship between selective exposure and polarization in the present study is an important research endeavor, my concern here is that we still know little regarding the mechanisms explaining the association between the two constructs (e.g., Knobloch-Westerwick, 2012, p. 629; Tsfati et al., 2014, p. 18). Therefore, when presenting my theoretical framework, I focus on its concepts, ideas, and mechanisms drawn from the literature together. This study does not "randomly" combine these concepts and ideas; rather, I carefully inspect them to provide a clear and unambiguous simulation model and program codes.

Connecting Micro-Level Mechanisms to the Design of a Macro-Level Simulation Model

To simulate the survival of political disagreement with sufficient internal validity, a researcher must construct a model that is based on theories of opinion formation to the maximum extent possible. The design of the simulation derives from Zaller's (1992) RAS model. The RAS model summarizes empirical findings regarding both types of citizens—politically aware and ordinary (less politically aware)—and provides a clear framework for individual differences to enrich the design of the simulation. The four axioms of the RAS model, however, are far from sufficient to provide direct answers to the

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inquiries of this article. Therefore, it is necessary to translate these axioms into a simulation program and enrich the program with additional behavioral rules.

The four axioms of the model were translated into five sets of behavior rules that are programmable. Simulated voters (hereafter, citizen agents) will follow these rules of behavior to form their voter preferences. Because these rules are simplified when they are translated into a programming language, I link their meanings to empirical findings as much as possible.

The first set of rules concerns the composition of networks of political communication. People tend to discuss politics with like-minded individuals within self-selected communication networks (Carmines & Huckfeldt, 1996; Huckfeldt, 2001). I provide every agent with a party identity coded 1 or 0. An agent's communication network is composed of other agents whose voter preferences (also 1 or 0 corresponding to their party identity) are randomly generated; this pattern will reflect the structural diversity level of their discussion network of political communication (Scheufele et al., 2006). Each agent subjectively ranks contacts as members of its communication network following a selection rule. An agent will first seek discussants that are similar in political predisposition (i.e., party identification). If they are of the same level of political expertise, the agent will then seek an agent of a higher level of political awareness or expertise. An agent of party identification 0 and political expertise level 4, for example, will prioritize a discussant of party identification 0 with the same political expertise level over a discussant of party identification 1 with the same political expertise level within the same communication network. For two discussants with the same party identification 0, the agent will prioritize a discussant of political expertise level 6 over a discussant of expertise level 2. Following this rule, some agents, particularly those with higher levels of political expertise, will be contacted more frequently than the others will be. The agent is least likely to access discussants with both different political party orientations and lower political expertise. Ultimately, when an agent finds an available discussant on his/her contact list, both agents will become unavailable to the other agents (Huckfeldt, Beck, Dalton, & Levine, 1995). This rule of contact ranking represents the concept of political homophily, the love of the same, or as commonly noted, "birds of a feather flock together." This is the tendency of individuals to associate and bond with similar others (Bramoulle, Currarini, Jackson, Pin, & Rogers, 2012; Wojcieszak, 2010).

The second set, political discussion rules, concerns the exchange of preferences between agents. An individual tends to discuss politics with political experts, those who he or she perceives as possessing a higher level of political knowledge than himself or herself, even if they hold opposing preferences (Beck, 1991; Huckfeldt et al., 2002; Mutz & Martin, 2001; Scherer & Cho, 2003; Stromback & Shehata, 2010; Wyatt, Kim, & Katz, 2000). Individuals are

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more likely to discuss issues when they judge the discussants as trustworthy and more politically knowledgeable than themselves (Carmines & Huckfeldt, 1996; Huckfeldt, 2001; Miller, Monin, & Prentice, 2000). Therefore, I define political discussion as the exchange of preferences when two agents meet; the agent of a relatively lower level of political expertise will take the preference of its discussant as an impression. Citizen agents who copy their discussants' preferences store these as rounded integers 1 or 0 in a running tally in their memory rather than as accurate opinions denoted by decimal numbers between 0.00 and 1.00. Given this design, the concept of discussion should be understood as a self-selected alternative news sources or informal news sources from political discussion with a perceived opinion leader, for example. The first and second sets of rules will result in a pattern that corresponds to the empirical world: partisan citizens form close networks of political discussion (e.g., Brundidge, 2010; Lyons & Sokhey, 2014).

The third set of behavioral rules concerns media access, that is, how citizen agents interact with the news media. First, individuals access either news media or political discussants for political information. Hence, in this simulation, citizen agents will be given a random number as their "mood" of either accessing the news media (if the number is closer to 1) or discussing politics (if the number is closer to 0). Because I am simulating the survival of political disagreement during a campaign season, the term news media is restricted to campaign messages, including campaign advertising, news about political parties, and what Zaller calls elite discourse, such as candidate speeches and debates, campaign talks, and invited expert analyses. The advantage of adopting this definition of news media is that there will be no need to differentiate among news media types—TV, newspaper, radio, or online news (Mitchelstein & Boczkowski, 2010). The news media objects in this simulation, therefore, can be considered the core information source in a campaign advertising environment and will motivate selective interpretation or reasoning (Kim, Wang, Gotlieb, Gabay, & Edgerly, 2013).

The fourth set of behavioral rules concerns the mechanism of news consumption. Recent studies confirm that the selective exposure and selective perception will be activated when voters encounter sensitive political choices (Klapper, 1960; Knobloch-Westerwick, 2012; Levendusky, 2013; Petersen et al., 2013; Shih, Scheufele, & Brossard, 2013). Individuals are likely to self-select news sources that are consistent with their political orientation; when exposed to contradictory information in their social environment, individuals will follow up on these interactions "by seeking out more information in the mass media or other sources to bolster their initial positions or even rethink their original issue stances" (Scheufele et al., 2006, p. 731). The politically aware (those with strong value predispositions) are more likely than ordinary citizens (those whose value predisposition are weaker) to engage in a selective

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process, that is, to fall back to their original positions in the face of disagreement (Shih et al., 2013). Partisans, in particular, are likely to actively seek and reinterpret information to fit their partisan orientation (Johnston, 2006; Kim et al., 2013; Kleinnijenhuis, van Hoof, & Oegema, 2006; Leeper & Slothuus, 2014).

As the RAS framework does not provide much more detail about how voters engage in selective perception, I fill this gap by providing the fourth set of rules as follows: (1) politically aware agents are more likely to engage in selective perception than ordinary citizens are; (2) agents who engage in selective perception while accessing the news media during a time step will add an impression that is consistent with their partisan orientation to their memory's running tally. Agents who do not engage in selective perception will ignore the message received, that is, not transform the message into an impression, even if the message is consistent with their partisan orientation. I expect that this selective perception mechanism will weaken and slow the process of opinion consolidation and preserve possibilities for agents to inadvertently receive opposing messages from their political discussants. During the simulation, it is expected that politically aware agents will become extreme in their opinions and their preferences will be consolidated and stabilized.[6]

The fifth set of behavioral rules concerns opinion updating. As Axiom 4 of the RAS model suggests, a citizen's current opinion can be formulated as D/(C+D), where D denotes a dominant message and C denotes a countervalent message. From the perspective of simulation, I see that C and D are the number of messages stored in memory and set that citizen agents' current vote preferences as rounded (0 or 1) from their opinions or as a continuous variable varying from 0.00 to 1.00 as the simulation proceeds. An ordinary citizen has a short-term memory and can memorize 10 pieces of political considerations, whereas a political expert can memorize 20 (the Appendix provides details about the difference between the two types of agents). If an ordinary agent's current memory is composed of six dominant messages (six "1s") and four countervalent messages (four "0s"), his/her current opinion is 0.6. Although 0.5 refers to a neutral stance, an opinion value 0.6 indicates that the agent's voter preference will be rounded to 1. Similarly, if another agent collects three "1s" and seven "0s" over the previous 10 activities—preferences obtained from accessing self-selected news media, talking to self-selected agents, or doing nothing but maintaining its current opinion—his/her opinion will be

[6]It remains unknown whether an individual would "take" or "skip" a cognitively incongruent political message. In this article, I assume the skip mechanism. A recent study confirms that nonpartisans process campaign information as systematic information processing, cue taking, or simply withdrawal from decision-making (Kim, Wang, Gotlieb, Gabay, & Edgerly, 2013). If the assumption is changed to "take," one should expect a higher level of opinion dynamics for agents from encountering more inadvertency (Brundidge, 2010), a higher level of network heterogeneity, and a longer peiod over which a model can become stabilized.

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0.4 and his/her current vote preference will be rounded to 0, the integer that any other agents who talk to this agent will commit to memory. Because an agent's current opinion value is averaged over the 10 most recent considerations and then rounded to his/her voter preferences, these preferences may change from 1 to 0 or 0 to 1 whenever their opinion value crosses the 0.5 threshold in either direction. This midpoint threshold is set to be consistent with empirical findings about conformity (Coleman, 2004) and to correspond with the theoretical explanation for the polarization of opinions that "people want to be perceived well by their fellow group members and hence adjust their opinions toward the perceived group mean" (Stroud, 2010, p. 558).

The third and fourth sets of rules are expected to result in three patterns that correspond to empirical findings: (1) politically aware agents will be more resistant to the influence of their campaign information environment and remain consistent in their preferences (Lauderdale, 2013; Lodge & Taber, 2013); (2) their prior judgments or preferences will decay more slowly than their less politically aware counterparts' preferences will (Huckfeldt, Pietryka, & Reilly, 2014); and (3) agents that reside in homogeneous networks will have stronger attitudes than those in heterogeneous networks. When agents engage in partisan selective exposure to either news media or homogeneous interpersonal networks, their attitudes will be polarized, that is, opinions become stronger in one direction (Feldman, Myers, Hmielowski, & Leiserowitz, 2014; Stroud, 2010).

Experimental Design

The ABM approach empowers researchers to answer a series of what-if counter factual questions with a systematical view that incorporates all independent variables into a system and then observe the results emerging from the interaction among the agents and the system (Axelrod, 1997; Elster, 1998; Lane, 1996). Because it allows experiments for exploring and visualizing patterns, the ABM approach has been applied in physics, biology, and social sciences (e.g., Epstein, 2007; Janssen & Ostrom, 2006; Laver, 2005; Johnson, 2002).

The model for this study is constructed using the Swarm toolkit, where agents refer to voters.[7] The simulation program allows users to access a few parameters through which one can change focal parameter values to create scenarios, such as a society in which agents have lower propensities to access news media and discuss politics. Such propensities describe how opinion formation and perception of network heterogeneity at the agent level (given the RAS axioms) relate to the decline in news exposure at the aggregate level in this study.

[7]http://www.swarm.org/. The original source codes (written in Objective-C) are available at http://cl.ly/0Y2F0N2K1V3g.

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In the ABM model of this study, each citizen agent takes an action based on his/her propensity to either discuss politics or access the news media at each time step, and all citizen agents in this program act simultaneously. Without interfering in the simulation process, I observe a time-series, dynamic change in citizen agent's voter preferences and perceptions of political disagreement. I outline the basic settings of the simulated scenarios below and present the result patterns in the next section.

First, I consider a simulated society of 1,600 agents composed of two types of citizens. Ordinary citizens (C1 agents) are generally less politically attentive than the politically aware—political experts or opinion leaders (C2 agents), who account for approximately 2% of the population. The settings mandate that C2 agents account for a small proportion of the population, and it is expected that C2 agents will have only a mild influence on C1 agents.[8]

Second, agents access self-selected news media and selectively perceive the information they obtain. The two news media objects in the simulation model refer to two news sources that broadcast opposing preferences (e.g., news channels favoring Barack Obama vs. those favoring Mitt Romney in the 2012 American presidential election) and are accessible by any agent at any time. For individual agents, these news objects are better understood as their favorite news programs. One aspect in which agents differ is the probability of performing selective perception when accessing news media. By design, C1 agents are less likely to engage in selective perception than C2 agents are; this means that C1 agents are more likely to randomly receive preferences whenever they access the news media and that C2 agents are more likely to perceive preferences consistent with their current preferences.

Third, the simulated society is polarized when all agents are equally divided into two preference groups. Half of C1 agents hold "YES" (coded as 1) and the other half holds "NO" (coded as 0); the proportions are the same for the C2 agents. There can be numerous initial settings—some voters will be independent or undecided, for example—but the polarized society setting best characterizes a competitive presidential campaign season. This setting also helps to simplify the initial environment for cross-model comparison. The initial settings are illustrated in Figure 1, which shows the desktop environment that includes (from left to right and top to bottom) the parameter panel, grid of opinion distribution, plots of changes, and control panels.

[8]According to the Pew Research Center's recent reports about political knowledge and political engagement (http://www.pewinternet.org/2013/04/25/civic-engagement-in-the-digital-age/, http://www.people-press.org/2014/06/12/political-polarization-in-the-american-public/, and http://www.people-press.org/2014/06/26/section-10-political-participation-interest-and-knowledge/), about 20% of the electorate is either consistently liberal or consistently conservative in their political values. Lacking direct access to the most recent raw data to identify the exact proportion of respondents who are strongly partisan, politically knowledgeable, and likely to discuss politics every day, I estimate and assume that 10% of the 20% political activists are this type of citizen.

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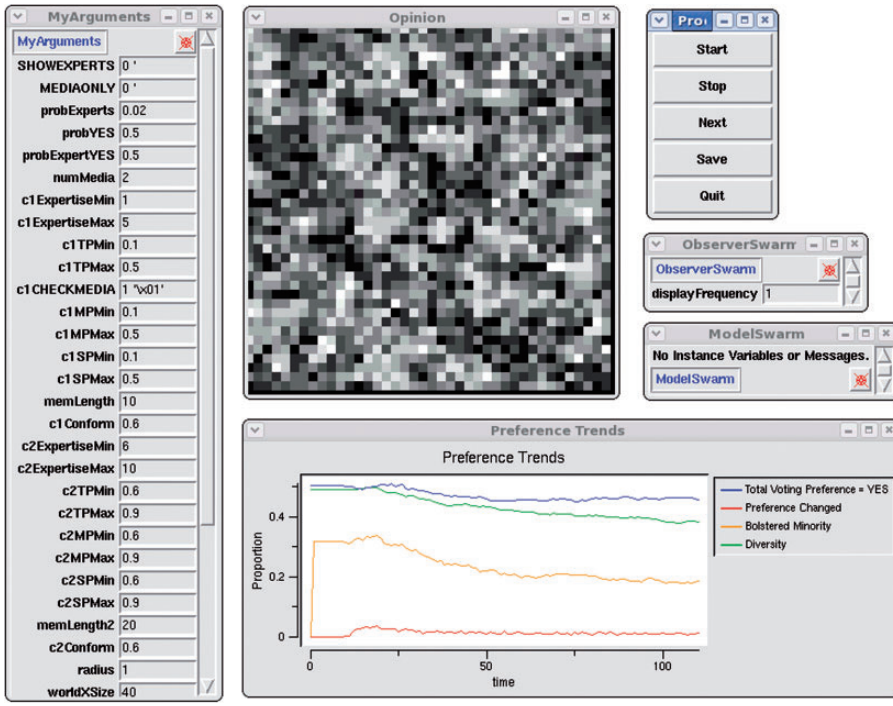
Figure 1
The graphical interface of the simulation program



The series of experiments is conducted by running a simulation program with specified settings and parameters (or variables in coding language). The two important parameter values—the maximum probability of accessing news media and the maximum probability of political discussion—refer to an individual's propensity to access news media and discuss politics, respectively. A value of 0.3 for the propensity to access news media, for example, means that the agent's willingness to access news media is 30%. The variance in the values for these two parameters will result in six settings. The model is estimated 100 times with 100 different random seeds for each of the six settings (labeled A–E) before summary statistics for the proportion of agents favoring YES and the proportion of agents perceiving network heterogeneity are calculated.

The first group of settings, A, B, and C, demonstrates the effect of a decline in interest in discussing politics on the proportion of agents perceiving preference heterogeneity in their communication networks. The maximum probability of political discussion is held constant across settings A, B, and C, whereas the maximum probabilities for C1 agents accessing the news media

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are set to 0.5, 0.25, and 0.1, respectively. In other words, ordinary citizen agents in setting A are more likely to access their favorite news than are their counterparts in settings B and C.[9] This group of settings targets the most important research questions of this article: Will the phenomenon of news consumption decline at the society level influence the perception of political disagreement at the individual level? How serious will the consequence be?

The second group of settings resembles the first but adjusts the value of the propensity to discuss politics. Models D and E hold the probabilities of accessing the news media constant and vary the likelihood of discussing politics. The maximum probability of C1 agents to discuss politics is 0.25 and 0.1 in Models D and E, respectively. The comparison between Models A, D, and E will show how the decline in interpersonal political discussion (from 0.5, 0.25 to 0.1) affects the proportion of agents perceiving political disagreement within their communication networks. This group of setting corresponds to the third research question: What if citizens become less interested in accessing the news media but remain interested in discussing politics? This scenario refers to a democracy in which the news media exerts minimum influence and communication networks maximize neighborhood effects. In this scenario, opinion clusters will emerge, preferences within clusters will be homogeneous, and boundaries between clusters will become sharp (Bramoulle et al., 2012; Latane, 1996; McClurg, 2006; Zuckerman, 2005). Information is expected to flow from well-informed network members to ordinary citizens. Democracies, as such, are expected to witness intensive ideological conflict between supporters of opposite sides.

In Model F, C1 agents are least likely to access news media or discuss politics. The maximum probabilities of C1 agents accessing self-selected news sources and discussing politics are both set at 0.1. Contrasting the results of Model F with those of the first five models will help us to deconstruct the effect of the decline of interest in acquiring political information. This setting corresponds to the final research question: What if voters become less interested in both accessing news media and discussing politics? This scenario refers to a completely individualist "bowling alone" society in which every voter resists the influences of their information environment (Kaid, 2003; Patterson, 2002; Putnam, 2000). If such a society is a democracy divided by

[9]Alternatively, one can choose to use parameter sweep techniques to inspect the impact of the full range of parameter values on the emergence of a phenomenon (Johnson, 2002). The use of the arbitrary setting of only three parameter values at 0.5, 0.25, and 0.1 is based on the goal of presenting a trend of decline in one parameter with a minimum number of experiments. As it is unlikely the case that all (1.0) of or none (0.0) of the voters watch campaign news, I think that these three parameters are sufficient to approximate the empirical phenomenon.

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Table 1
Average of Parameter Values Across 100 Simulations

Settings	A	B	C	D	E	F
Agent's propensity to						
Access news media	**[0, .50]**	**[0, .25]**	**[0, .10]**	[0, .50]	[0, .50]	**[0, .10]**
Discuss politics	**[0, .50]**	[0, .50]	[0, .50]	**[0, .25]**	**[0, .10]**	**[0, .10]**
Outcome average						
% supporting "YES"	0.503	0.501	0.499	0.502	0.502	0.502
	(0.025)	(0.039)	(0.039)	(0.021)	(0.016)	(0.034)
% heterogeneous networks	0.396	0.306	0.234	0.438	0.468	0.346
	(0.011)	(0.013)	(0.016)	(0.010)	(0.008)	(0.011)

Note. Each simulation runs for 2,000 time steps. Standard deviations are given in the parentheses. Bold values are used for comparison across settings.

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salient issues, preference divisions will last for a long time, whereas information exchange flows at a slow pace.

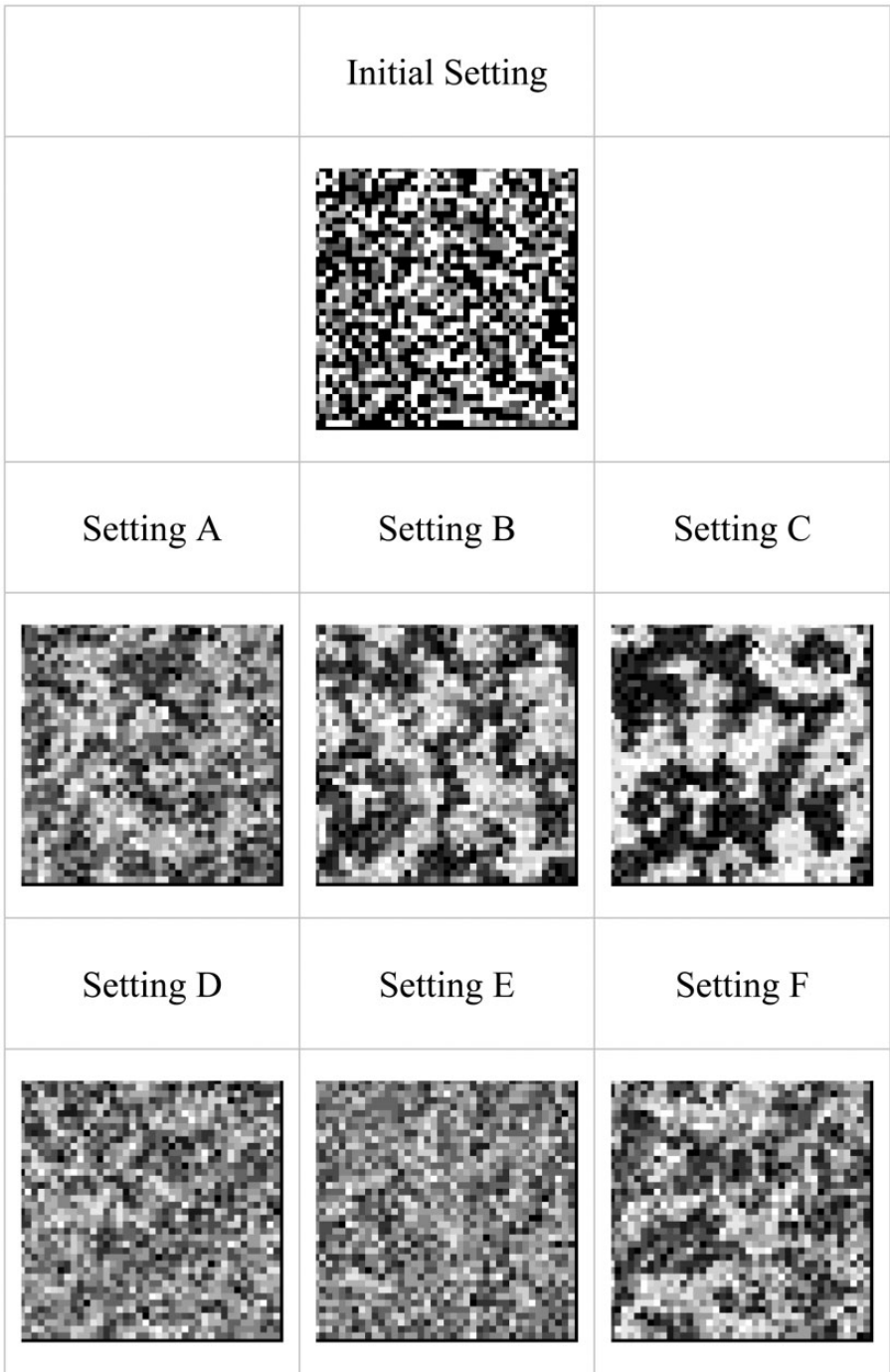
Simulation Results

The simulation results are presented in two ways. First, the summary statistics, as shown in Table 1, present general differences across experiment settings. Second, the opinion grids, as shown in Figure 2, present the distribution of opinion clusters and level of opinion heterogeneity within communication networks.

Table 1 shows the summary statistics for 100 runs of each model. The mean of the first parameter, the proportion of agents holding a "YES" opinion, is approximately 0.50 across the board, which suggests that by the time the simulation ends (at the 2001st time step), there will be no dominant preference in any model. This is the result of the polarized agent setting. The second parameter, network heterogeneity, indicates the average percentage of citizen agents who perceive a certain level of political disagreement in their communication networks over 100 simulations. Of the eight discussants in the 3×3 grid, the focal agent perceives that more than two discussants are either like-minded or hold opposite voter preferences. A low percentage of this parameter will mean that homogeneous clusters of opinion emerge, that is, a societal agreement about a candidate forms. Conversely, a high value will indicate that most citizen agents perceive greater preference heterogeneity during a campaign season.

The two major patterns shown in Table 1 are that (1) the means of the level of perceived disagreement decrease in Models A, B, and C and that (2) the means of the level of perceived disagreement increase in Models A, D, and E. These two sets of models suggest that the level of perceived disagreement

Figure 2
Opinion and preference distributions of simulation results



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increases when C1 agents become less likely to access their favorite media source and decreases when the agents become less likely to discuss politics.

The top image in Figure 2 represents the distribution of agent opinions at the beginning of the simulation. In this grid, a gray cell indicates an agent's opinion is close to 0.5 (away from 0.0 or 1.0), the darker gray to black cells represent agents that say "NO," and light gray to white cells represent the agents that say "YES." The image of the initial setting shows the random distributions of both C1 and C2 agents. These images are the most representative depictions of the series of simulations run for each setting. Figure 2 combines the representative snapshots that are taken when the simulations attained equilibrium, defined as the condition under which the proportion of agents switch their preferences from 1 to 0 or from 0 to 1 is <0.002; if equilibrium is not achieved, screenshots are taken at the 2001st time step.[10]

Let us first compare the images of settings A, B, and C, the first experimental set. Distinct opinion clusters form and become more homogeneous when agents spend less time accessing their favorite news sources, more time interacting with network fellows, or even stop interacting with their political context. This pattern suggests that little political discussion occurs in settings B and C. As the light gray clusters become lighter and the dark gray clusters become darker, it is expected that political discussion will only occur at the borders of these clusters, where agents perceive a greater level of preference heterogeneity.

Next, I compare the images of settings A, D, and E in Figure 2. The line between white and black becomes blurred and opinion clusters diminish. An expected consequence derived from the model design is that when agents become less involved in political discussion, the homogenizing effect of communication networks decreases. What is unexpected is a greater number of agents reporting perception of political disagreements and therefore implying greater chances of becoming involved in a "dangerous discussion." Interestingly, this trend results in the expansion of the gray areas but not of the light or dark areas. The emergence of a pattern similar to that observed in the image of setting E suggests that when the influence of communication networks declines, there are more agents whose preferences become neutral and who perceive heterogeneity within their communication networks.

Finally, contrast the image of setting F with the above two sets of images (Models A, B, and C and Models A, D, and E). The comparison between

[10]Technically speaking, these pictures are snapshots of simulations where the means of the two parameters (opinion "YES" and perceived heterogeneity) fall within 2 standard deviations of the mean of 100 simulation results. Specifically, the image representing setting A is taken from the 14th of the 100 runs using this setting; image setting B is taken from the 33rd simulation; image setting C is taken from the 45th run; image setting D is taken from the 4th run; image setting E is taken from the 63rd run; and image setting F is taken from the 87th run.

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settings C and F confirms my initial expectation that when ordinary agents (C1) become less interested in discussing politics, the homogenizing influence of social networks decreases. What advances our knowledge is the pattern of blurring borders between the black and white clusters and more gray areas emerge. Although opinion clusters remain in setting F, the borders between clusters are less sharp than are those in setting C; there are fewer bright white and fewer dark areas in setting F. This pattern implies that in an era during which few citizens access news media, political disagreement is more likely to survive within networks in which citizens discuss politics with self-selected discussants less often.

Comparing settings E and F leads to a similar observation. When C1 agents become less interested in accessing their favorite news programs, meaning that they can choose to interact with their network fellows or simply stop interacting in all political contexts, gray areas diminish and opinion clusters form. These two patterns together suggest that in a politically polarized electoral campaign season during which only a few voters remain interested in accessing self-selected news media, such news sources play a critical role in preserving heterogeneous networks at the aggregate level, even if the news is biased, polarized, or audiences selectively perceive news contents.

Conclusion and Discussion

Since Schelling's (1978) innovative work on the linkage between motives at the individual level and behavior at the collective level, subsuming multiple levels of actors into one model has become an ideal toward which social scientists strive. As research methods and techniques advance, this multilevel approach has been identified as important to understanding media effects and public opinion formation (Kim et al., 2013; Schmitt-Beck & Lup, 2013). This study echoes the call for a systematic and theoretical analysis of the news viewership crisis (Siles & Boczkowski, 2012) and presents a systematic framework that synthesizes the perspectives of both social network and news media studies, followed by the utilization of the ABM approach to visualize internally valid simulation results that help assess the impact of the turning out phenomenon on the health of democracy.

The simulation results suggest that, as expected, when news viewership declines over time, (1) politically aware individuals will perceive minimal change in their network homogeneity because this group of news consumers will continue tracking the news for their own needs, and (2) less politically aware individuals will experience more network member influence. If the surroundings of the less politically aware are politically heterogeneous, these citizens' preferences cannot remain stable over time and are likely to be influenced by close discussants whose preferences remain consistent, as

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noted by Huckfeldt et al. (2004): "In a model of autoregressive influence within dyads, whether or not this first individual is influenced by the opinion of a second individual within the network depends on the distribution of opinions across all the other individuals within the network who are also connected to the first individual" (p. 20).

For the politically aware, political beliefs will remain related to media exposure, which is a pattern that persists across newspaper, political talk radio, cable news, and Internet exposure (Stroud, 2007). This implies that how a partisan voter perceives disagreement will be subject to their news media environment. In a democratic setting in which political news channels are fragmented, or polarized, when news viewership decreases, this result echoes the empirical findings that the politically aware continue to perceive minimal change in their world of partisan reasoning (Johnston, 2006; Leeper & Slothuus, 2014; Levendusky, 2013). In addition, consistent with recent findings (Brundidge, 2010; Jun, 2012), the simulation results suggest that ordinary citizens remain supported by their like-minded discussants but can perceive that they and their discussants are less stable in their voter preferences because (1) all political discussants are now less connected to a news source that consistently provides information that maintains or strengthens their existing preferences and (2) shifting access to the news media to interacting with someone online can increase one's perception of network heterogeneity.

The most important pattern, which is drawn from the simulation results and goes beyond the empirical findings, is that when voters become less interested in accessing political news, the number of citizens who perceive heterogeneity in their networks can decrease. This pattern implies that, given the influence of network of political discussion, accessing self-selected news sources plays a critical role in preserving political disagreement. The polarized media environment, established as the environment of simulation, consistently empowers partisan voters to practice selective exposure, motivated reasoning, and selective perception of campaign news that stabilize their preferences at the individual level and then stabilizes patterns of preference distribution at the aggregate level. This finding extends beyond the argument that political disagreement can be preserved within dyads (Huckfeldt et al., 2004), agrees with a recent study showing that a media environment featuring two polarized perspectives may blunt one's hostility toward oppositional media (Arceneaux, Johnson, & Murphy, 2012) and provides a more systematic and dynamic view regarding how citizens' access to a polarized media environment facilitates the preservation of political disagreement. This pattern leads to two situations in which political disagreement survives and individuals perceive more preference heterogeneity: (1) when access to self-selected news sources occurs more frequently and (2) when voters are less engaged in political discussions with self-selected network members.

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There are reasons to worry that today's media environment, including the decline in news viewership, may harm the quality of democracy. For example, the existence of multiple news sources may have widened the gap between the politically aware and less aware in terms of political participation and may have produced a more polarized society (Prior, 2007, 2013). TV news programs may not help individuals to perceive wider political views in their daily life but may drive them to interact more with self-selected discussants (Tsfati, Tukachinsky, & Peri, 2009). This study confirms that accessing news counters the homogenizing effect of like-minded communication networks (Mutz & Martin, 2001); I further suggest that even if individuals are partisan and engaging in selective processes during an electoral campaign, today's affective and polarized news environment still plays a role in preserving political disagreement within one's political surroundings that are composed of largely self-selected discussants. In this simulation, when voters' preferences are consistent with those of the majority of their network fellows, accessing self-selected news programs will strengthen their preferences over time. For citizen agents who hold minority preferences within their networks, however, accessing self-selected news sources helps preserve their preferences and increases others' awareness of the heterogeneity within the network. A decline in news consumption alone will not lead to a fragmented society, a finding that contradicts Sunstein's (2001) predictions. However, I find that such fragmentation will occur if this trend is accompanied by an increase in political discussion with self-selected like-minded discussants, regardless of whether they occur online or offline.

That the number of agents reporting that their networks are heterogeneous increases when more people withdraw from discussion with like-minded individuals can be seen as a positive message to scholars concerning the health of democracy. Normatively speaking, this study suggests we should worry less about individuals becoming less involved in discussing politics and should worry more about the consumption of political information. By design, the simulation program will generate a pattern in which large opinion clusters will emerge when individuals are devoted to talking to like-minded discussants. Hence, it is not my purpose to reject the value of discussing politics with like-minded individuals given the formation of opinion clusters. Because this is part of the simulation design, we must not focus on the value of discussion with like-minded others but rather on the result, which indicates that both decreases in discussion with like-minded others and increases in self-selected information sources will lead to a greater level of perceived disagreement.

Consequently, a large decrease in political discussion will not necessarily hurt a democracy but may produce benefits, because such a decline neither changes the initial pattern of preference distribution (in this study, a polarized electorate) nor results in conflict between two sides with large preference

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differences, which are indicated by opinion cluster area expansions (compare across the graphs A, D, and E in Figure 2). Instead, a decrease in political discussion results in an increase in the proportion of agents who perceive heterogeneity within their communication networks. The problematic scenario in which people withdraw from overall political discussion occurs when the majority of people withdraw from both discussing politics and accessing news media, which will result in larger ideological differences between two sides holding distinct preferences (compare across the graphs A, D, E, and F in Figure 2). Given the decline in news viewership, I suggest that scholars pay closer attention to possible declines in the discussion of politics.

As used for thought experiments in social sciences, the ABM approach facilitates the exploration of causal inferences; it does not depart from a theory but bridges phenomena. However, owing to the use of simplified and universal behavioral rules in programming, external validation can be seen as one of the major limits of the approach. I am aware that a simulation program rooted in the RAS model is insufficient to justify all implications. Even if one achieves full internal validity of programming, one will still inevitably encounter a gap between patterns derived from simplified behavioral rules and the phenomenon in the targeted population. Therefore, I think that the value of applying this approach to the study of social phenomena resides in an internally validated program from which a researcher draws heuristic implications as theoretical predictions. For example, future studies can consider advancing the simulation program with the perspectives of autoregressive influence theory, which suggests further integration of the social network approach (micro) and the spiral-of-silence perspective (micro–macro) in future simulations: people tend to change their voter preferences when they perceive they are in the minority in a social context (Huckfeldt et al., 2004; Neuman, Just, & Crigler, 1992).

In this study, all citizen agents are assumed to be partisan during an electoral campaign season because (1) it is easier to model (partisans are more likely to practice mobilized party reasoning, including selective exposure and selective perception) and because (2) it is still unclear how independent voters and so-called leaners reason within a campaign information environment, particularly when they do not acquire political information regarding public policies (Boudreau & MacKenzie, 2014; Leeper & Slothuus, 2014). Because I was unsure how ordinary citizens are different from their partisan counterparts in terms of processing political information, I applied the same axioms to both types of citizen agents.

Therefore, I suggest that future research using the ABM approach consider using advanced settings, such as including other methods of reasoning (Nir, 2011), relaxing behavioral assumptions, for example, allowing agents to form bigger discussion networks (Lyons & Sokhey, 2014), accessing balanced

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or counter-attitudinal sources (Messing & Westwood, 2012), and exploring the mechanism of polarization at both the individual and the aggregate levels. Such modifications using simulation approaches may not provide direct solutions to empirical problems, but such thought experiment approaches will cooperate with other approaches to advance our prospective understanding of the long-term dynamics of public opinion at both the individual and the aggregate levels.

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