Polit Behav (2017) 39:585–608
DOI 10.1007/s11109-016-9371-7

ORIGINAL PAPER

Disagreement, Diversity, and Participation: Examining the Properties of Several Measures of Political Discussion Network Characteristics

Robert Lupton[1] · **Judd Thornton**[2]

Published online: 27 October 2016

Abstract Recent advances demonstrate that individuals think and act differently depending upon the political views of their discussion partners. However, issues of both conceptualization and measurement remain. We argue that some of these issues result from conflating what are two distinct characteristics of political discussion: disagreement and diversity. The purpose of this paper is to provide clarity to this literature by more formally distinguishing these two concepts. In doing so, we recommend a preferred measure of each. Substantively, we demonstrate that although exposure to disagreement is associated negatively with political participation, including the decision to vote, exposure to diversity is unrelated to participation. The evidence supports our argument that more formally separating the concepts of disagreement and diversity will help scholars better identify how and when social networks matter for political attitudes and behavior.

Keywords Social networks · Measurement · Participation

Electronic supplementary material The online version of this article (doi:10.1007/s11109-016-9371-7) contains supplementary material, which is available to authorized users.

✉ Judd Thornton
jrthornton@gsu.edu

Robert Lupton
luptonro@msu.edu

[1] Department of Political Science, Michigan State University, East Lansing, MI, USA

[2] Department of Political Science, Georgia State University, Atlanta, GA, USA

Introduction

A voluminous literature testifies to the importance of interpersonal discussion networks for political attitudes and behavior. Simply put, individuals think and act differently depending upon the political views of their discussion partners. However, frustratingly, issues of both conceptualization and measurement remain. We argue that some of these issues result from conflating what are two distinct characteristics of political discussion: disagreement and diversity. Disagreement exists when an individual is consistently exposed to points of view opposed to his or her own. Diversity, on the other hand, exists when an individual's discussion network contains multiple expressed points of view. In other words, disagreement is characterized by discussion network partners whose preferences differ from those of the ego, whereas diversity is defined by network members who disagree with each other. We examine the properties of several extant measures of disagreement and diversity derived from the commonly used name generating procedure in order to accomplish two goals.

First, we provide clarity by explicitly distinguishing disagreement and diversity. Most previous work only implicitly treats the two characteristics separately, if at all, resulting in unnecessarily muddled conceptual waters (see Eveland and Hively 2009 for a notable exception). In doing so, we recommend a preferred measure of each concept. Second, we provide evidence of the relative political impact of each of the two network characteristics. We conclude that competitive political environments do not harm the political process by reducing rates of participation—diversity has no systematic impact on participation. Instead, individuals who find themselves in the minority in one-sided environments are those who are more likely to abstain from the political process.

We do not intend to show definitively the extent of possible influences of disagreement and diversity on individuals' propensity to participate in politics, but we believe that our evidence illustrates that distinguishing these two concepts more formally will help scholars better identify how and when social networks matter for political attitudes and behavior. Moreover, given the pervasive impact of social networks on political attitudes, as well as the fact that scholars in this area recently have turned to issues of measurement (e.g., Eveland and Hively 2009; Klofstad et al. 2013), we believe that our contribution represents a helpful step toward researchers coalescing around a particular set of measures of important social network characteristics. In particular, we that our substantive understanding of social networks can be improved by scholars placing a greater emphasis on precisely delineating the concepts of disagreement and diversity. Although we focus directly on egocentric data constructed from name generators, we believe that scholars of all types of political discussion networks should be careful to differentiate these two concepts.

Background

The study of social context's impact on attitudes and behavior enjoys a long history in the field of political behavior (e.g., Berelson et al. 1954; Campbell et al. 1960; Converse 1966; Lazarsfeld et al. 1944; Miller 1956). A recent resurgence of scholarly interest in this area has identified the considerable influence of social networks. For example, as heterogeneity in one's social network increases, so too does one's openness to persuasion (Ben-Nun Bloom and Levitan 2011) and argumentation (Levitan and Visser 2008). Conversely, when social networks are close-knit, individuals are less likely to adopt a variety of perspectives unless the network is both diverse and extensive (Erisen and Erisen 2012). Further, one's social environment can influence the stability and accessibility of attitudes (Huckfeldt et al. 2000), moderate attitude strength (Levitan and Visser 2009; Visser and Mirabile 2004), and weaken the relationships among several attitudes and predispositions (Ben-Nun Bloom and Bagno-Moldavsky 2015; Lupton et al. 2015).

However, an examination of the field writ large reveals some inconsistent findings. For example, many studies report that political discussion in one's social network can reduce participation (McClurg 2006; Mutz 2002a; Mutz and Mondak 2006). Other research draws the opposite conclusion: Politicized networks are associated with higher levels of political participation. For example, Leighley (1990) finds that one is more likely to participate after one is exposed to disagreement. Others report similar substantive conclusions (e.g., Kenny 1992; Knoke 1990; McClurg 2003; Song and Eveland 2015).

We argue that one source of these inconsistent findings is the abundance of operationalizations of "political discussion". Measurement is fundamentally classification—it is the assignment of numbers to objects according to rules (Stevens 1951). However, the particular rules used do not exist *a priori*, but rather represent an active decision made by the researcher. In other words, "measurement constitutes a proposition about the ways that numerical scores reflect substantively interesting properties of the data" (Jacoby 1999, p. 272). Consequently, some portion of observed variance results from the measurement procedure in addition to the underlying concept being measured (Cliff 1993; Jacoby 1999).

Viewed against the backdrop of the substantive nature of measurement, that scholars exert considerable effort developing and scrutinizing measures is quite natural. Such scrutiny most often takes one of two forms: first, scholars engage in the "clarification and refinement of concepts"; second is the process of examining particular operationalizations of concepts (Adcock and Collier 2001, p. 529). As Klofstad, Sokhey, and McClurg in an examination of several measures of political discussion (2013, p. 213) note, "measurement practices have emerged without sufficient attention having been given to defining" various terms. In particular, one concern we identify is that some of these commonly used measures, although seemingly similar, in fact measure two different concepts: disagreement and diversity. Although much previous research often implicitly distinguishes between the two concepts, we wish to draw further attention to the difference between

diversity and disagreement. Below, we outline several commonly used measures of social network characteristics and categorize each into one of these two conceptual dimensions. In doing so, we both refine existing concepts as well as improve their operationalization in hopes of encouraging scholars to adopt more consistent indicators of theoretically important aspects of political discussion networks.

Measuring Discussion in Social Networks

Scholars undoubtedly have learned a great deal in recent years about the impact of social networks on attitudes and behavior. However, somewhat concerning is the tendency, noted by Eveland and Hively (2009, p. 206–207), for the terminology of various concepts to be used inconsistently across studies. The terms "ambivalent", "cross-cutting", "disagreement", and "heterogeneous", among others, all have been used to characterize discussion in social networks. Despite the interchangeable use of these terms and unfortunate confusion that results, we believe that previous scholarship identifies two distinct concepts that characterize social network discussion: disagreement and diversity. Disagreement is the extent to which one is exposed to individuals with whom one disagrees—in other words, it represents cross-cutting network discussion. Diversity, on the other hand, represents the extent to which multiple viewpoints are expressed in the individual's discussion network.[1]

Although these two concepts are related both theoretically and empirically, let us consider an example illustrating that they can diverge. Imagine an individual who discusses politics with three individuals with views different from his own but who all agree with one another—this individual would be exposed to quite a bit of disagreement but very little diversity. We certainly are not the first to recognize this potential distinction. For example, La Due Lake and Huckfeldt note that diversity and disagreement each can influence participation (1998, p. 582). Similarly, Eveland and Hively (2009), Nir (2011), and Song and Eveland (2015) write that scholars of political communication would be wise to consider this potential difference. Nevertheless, inconsistent language use persists in the literature, and we thus argue that a more formal distinction of these two concepts will help elucidate the impact that important social network characteristics exert on political attitudes and behavior. Therefore, we argue that the potential influence of both disagreement and diversity needs to be examined separately, as the effect of each characteristic may differ.

We do not wish to engage in what Adcock and Collier (2001, p. 532) refer to as making "sweeping claims about the background concepts". Rather, our goals are to motivate scholars to place a greater emphasis on precision in language as well as the practical matter of improving the operationalization of key concepts. To do so, we review several extant measures constructed using name generators and categorize

[1] Previous work shows that diversity in discussion networks can incorporate demographic diversity (e.g., Kwak et al. 2005; Leighley and Matsubayashi 2009; McClurg et al. 2013), but we focus solely on political disagreement and diversity in this paper (Bello 2012; Klar 2014; Sokhey and McClurg 2012). Sinclair (2012) incisively demonstrates that social networks formed on the basis of other factors often intertwine with individuals' political preferences.

each into one of these two conceptual dimensions. We then investigate the relationship between the two concepts using simulated data, as well as actual data from the 2000 CPS American National Election Study (ANES). We should note that although many possible measures exist to capture the influence of interpersonal discussion on political outcomes, recent evidence suggests that the name generator approach we adopt here offers an unbiased avenue for investigating these discussion networks (Klofstad et al. 2009; Sokhey and Djupe 2014).[2] The 2000 ANES asks respondents who they think their discussion partners voted for in the election. These answers are used to construct our political discussion measures.

Disagreement

We focus on Klofstad et al.'s (2013, p. 124) concept of "partisan disagreement", which defines disagreement as having occurred "in any exchange in which agreement is absent". While we focus on "partisan disagreement", a similar argument could be made for what Klofstad et al. define as "general disagreement". Before outlining and comparing two measures of disagreement, we first delineate three desirable characteristics of a potential measure of this concept. First, as one's exposure to disagreement increases, the value of the variable should increase. Second, as one's exposure to disagreement decreases, the value of the measure should decrease. The justification for these two criteria is relatively straightforward when evaluating the measure based on the principle of face validity—if one is exposed to more disagreement, but the measure does not change or decreases, then the measure does not capture the extent to which an individual is exposed to opposite viewpoints. Our third criterion is that the measure should account for the amount of each kind of discussant present in the network. Our justification here is that doing so maximizes the potential variation in the measure.

We examine two measures that have been used to capture disagreement in the discussion network literature and evaluate their properties against these three criteria. To begin, let us define terms: In both measures discussed in this section, D represents the number of discussion partners who disagree with the respondent and A represents the number who agree.

[2] Respondents are initially asked, "From time to time, people discuss government, elections and politics with other people. I'd like to ask you about the people with whom you discuss these matters. These people might or might not be relatives. Can you think of anyone?" This is followed by, "Is there anyone else you talk with about these matters?" Respondents are allowed to list up to four discussants. For each discussant listed, respondents are asked a follow-up question: "How do you think <LISTED DISCUSSANT> voted in the election? Do you think he/she voted for Al Gore, George Bush, some other candidate, or do you think <LISTED DISCUSSANT> didn't vote?" One issue with this kind of measure is that it censors some respondents who might list more than the maximum allowed (Eveland et al. 2013). Or, perhaps individuals satisfice when replying to the question (Krosnick et al. 1996). In both cases, the true network size will be underestimated. While any censoring is lamentable, we are reassured by two findings: First, responses to name generators tend to focus on those with whom respondents have close ties (Marsden 2004), and who thus might be most influential. So, although results indicate that overall social networks may be larger, the size of "support cliques" tend to be smaller (Bernard et al. 1990; Hill and Dunbar 2003; Marsden 1987). Name generators might pick up this layer of social networks. Second, an alternative approach—a summary measure where respondents estimate the size of their network—does not appear to exhibit a stronger relationship with participation (Eveland et al. 2013).

The first measure we examine is the most widespread measure of disagreement, which evidence suggests is associated with levels of participation. For example, McClurg (2006) finds that as the proportion of disagreeing discussants increases, the number of campaign activities in which an individual engages decreases; further, disagreement is associated with a delay in the formation of vote intentions. This measure, which we label "proportion disagreeing", is defined as follows:

$$\text{Proportion disagreeing} = \frac{D}{A + D}. \tag{1}$$

In one sense, this measure meets the first and second criteria—for most values of A, as D increases, so too does the measure; similarly, for most values of D, as A increases, the measure decreases. However, when A is zero, so long as D is greater than zero, the measure will have the same score, one. Similarly, there are multiple ways to receive a score of zero: Any respondent who lists only discussants who agree with him or her will have a score of zero, as will a respondent who lists no discussants.[3] In this way, the measure fails the third criterion: By definition, the proportion measure cannot take into account the absolute amount of agreement or disagreement in the individual's discussion network. As a consequence, the proportion measure may underestimate the amount of variation that exists between respondents as a result of it automatically "correcting" for the size of the network.

The next measure we examine has been shown to moderate the relationships among core values, partisanship, and candidate evaluations (Lupton et al. 2015), and influence one's vote choice (Richey 2008). We label it "exposure", and it is defined as follows:

$$\text{Exposure to disagreement} = D - A. \tag{2}$$

This measure could be considered the net amount of what Eveland and Hively (2009) label dangerous discussion in one's discussion network. The measure therefore meets the first and second criteria: Holding A constant, as D increases, the measure increases; and, holding D constant, as A increases, the measure decreases. Further, it meets the third criteria by accounting for the absolute amount of each kind of discussant.[4] One way to think of the measure in Eq. (2) is that exposure is a linear function of D, while A shifts the y-intercept.

In short, whereas, for example, the proportion measure treats identically respondents situated in discussion networks composed entirely of agreeable discussants, regardless of the number of discussants the respondents lists—and even respondents situated in discussion networks made up of zero respondents—the exposure measure differentiates these type of respondents. To illustrate this point further, we present the relationship between each measure and D, conditioned on A, in Fig. 1. The top portion of the figure displays the proportion measure and the bottom portion the exposure measure. Each figure presents the 15 possible combinations of A and D that result from respondents being able to list up to four discussants.

[3] While the measure is technically undefined for those respondents with no discussion partners, most existing studies code such respondents as having a score of zero (e.g., McClurg 2006).

[4] Worth noting is that Eq. (2) can be altered to correct for the size of the network: $(D - A)/(D + A)$.

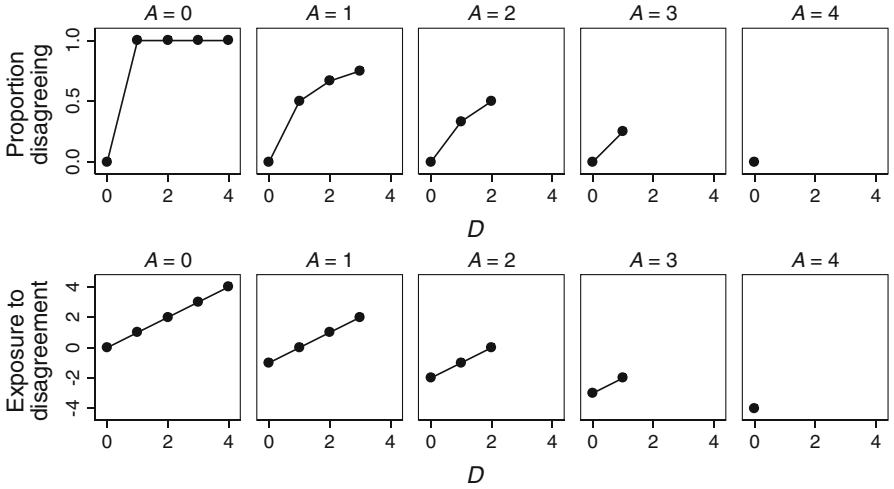

Fig. 1 Disagreement measures as a function of D, conditioned on A

As expected, the largest difference between these two measures is that Eq. (1) automatically corrects for the size of the network and as a result compresses some potential variation. As shown in Fig. 1, there are five possible ways for an individual to receive a score of zero and four to receive a score of one. This measure may thus underestimate the potential variation in exposure to disagreement among respondents.[5] Although we advocate for use of the exposure measure, we should assess the extent to which these two measures related.

To answer this question, we first compare the two measures using simulated data. The results of these comparison are featured in Fig. 2, which presents the relationship between the 15 possible networks that result from individuals being able to list up to four discussants where each score is equally likely to occur—in the figure, the points are slightly "jittered" to avoid over-plotting (Cleveland 1993). Here, we see that the relationship between these two measures is non-linear, which is driven largely from the compression discussed earlier. Still, the two measures share quite a bit of variation—$r = 0.87$ for the simulated data presented in Fig. 2. Of course, the precise correlation between the two will be dependent upon the pattern of responses for a

[5] Some surveys ask not just if the discussant disagrees with the respondent, but also how strongly he or she disagrees. For example, responses might range from "not at all disagreeing" to "strongly disagreeing" on a five-point scale. Fortunately, each of the measures discussed can accommodate such information. For measures of disagreement, in order to incorporate how strongly each discussant agrees or disagrees, D and A could be weighted by the strength of agreement or disagreement. For the measures in (1) and (2), $A = a_1 + a_2 + a_3 + a_4$, where $a_1 = 1$ if at least one discussant who agrees is listed, $a_2 = 1$ if a second respondent who disagrees is listed, and so on. To account for strength, a_i could be weighted, so for example, $A = s_1a_1 + s_2a_2 + s_3a_3 + s_4a_4$, where s_i represents the strength of agreement for a_i. Likewise, D could be measured as $s_1d_1 + s_2d_2 + s_3d_3 + s_4d_4$. Thus, our arguments regarding maximizing variation generalize: For example, when using the measure in Eq. (1), dividing by the total number of listed discussants reduces the amount of potential variance in the measure—an individual with one person who strongly disagrees with her would have the same score as an individual with three discussants who strongly disagree.

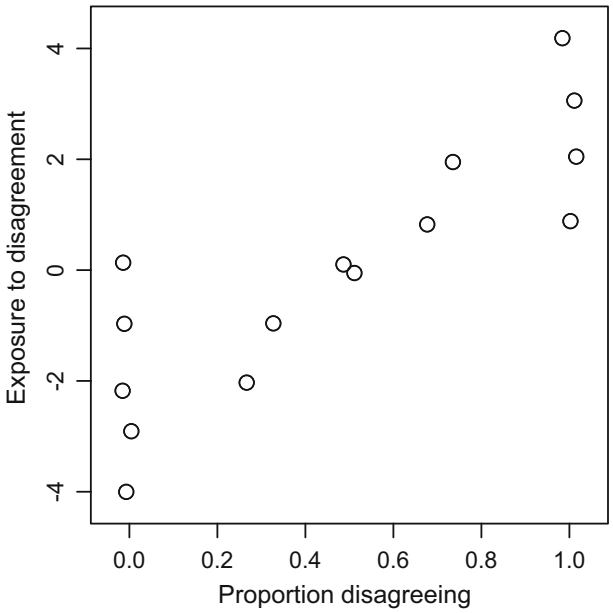

Fig. 2 The relationship between two measures of disagreement

given sample. In the 2000 ANES, the non-linearity in the relationship is more severe given that about 30 % of respondents list only discussants who agree with them. As a result, the correlation is lower, $r = 0.65$. However, we wish to emphasize that even though the measures share quite a bit of variation, they are not linear approximations of one another. In this regard, r is a somewhat misleading indicator and possibly overstates the relationship between the two measures.

Because the exact relationship between the measures depends on the particular pattern of responses, we examine the measures using a variety of simulated data in which we vary the size and makeup of the networks as well as the likelihood that the "respondent" was in the majority or the minority. We briefly discuss the general patterns that were observed in the simulations. More detailed results from these analyses and the code used are available in the supplemental material. We wish to highlight three observations from the simulations. First, we note that the observed non-linearity between the two measures is a consistent pattern across almost all of the simulations. Second, the relationship between the two measures strengthens as the overall number of respondents increases. And third, the relationship between the two variables is at its weakest when the following two conditions are met: when one type of discussant is much more likely to be offered and when the overall number of listed discussants is rather low (e.g., the total number of listed respondents is, on average, less than about 0.75). This suggests that the correlation we observe in the 2000 ANES, where respondents are about 50 % more likely to list a discussant who agrees and on average list about 1.5 discussants, are on the lower end of what we observe in the simulations. Thus, we believe that the simulations strengthen the case for our preferred measure of disagreement.

We wish to emphasize two points from this discussion. First, given the similarity between the two measures observed in both the actual and simulated data, we are optimistic that the results of most previous studies using the proportion measure are valid. That is, we do not think prior findings employing the proportion measure necessarily need to be rejected due to measurement choice. Second, although the measures correlate highly, given the clear advantage of the exposure measure in its ability to capture the full range of potential variation in respondents' exposure to political disagreement in their discussion networks, we argue that it should be researchers' preferred choice moving forward. Most importantly, we wish to emphasize that both measures examined here—the proportion measure and the exposure measure—differ conceptually from other measures designed to capture diverse networks in which the ego is not exposed solely, or primarily, to viewpoints different from her own, but rather is situated in a network consisting of multiple points of view. We turn toward measures of this latter concept in the next section.

Diversity

The extent to which a mix of views are present in one's social network has variously been labeled "diversity" (Eveland and Hively 2009), "heterogeneity" (Huckfeldt et al. 2004), and "network ambivalence" (Nir 2005). Whereas measures of disagreement have their highest score when an individual is surrounded by only those who disagree, measures of diversity have higher values when an equal mix of views is present in the discussion network. Accordingly, here we have a slightly different set of criteria for evaluating these measures, which are adapted from Breckler's (1994) study of measures of attitudinal conflict. First, as the larger of the two values between the number of agreeing and disagreeing discussants increases, the overall measure should decrease. Second, as the smaller of the two values increases, the overall measure should increase. And third, when the two values are equal, diversity should increase as both values increase. Let us again begin by defining terms. When examining the diversity of a network, we are interested in the extent to which opinion is more or less one-sided, regardless of the direction. So, we take A and D above and define whichever is larger as L and whichever is smaller as S.

We first focus on what has been termed "network heterogeneity". Huckfeldt et al. (2004) demonstrate that increased heterogeneity is associated with an increase in the experience of attitudinal ambivalence, but is not associated with political participation. Heterogeneity is measured as:

$$\text{Network heterogeneity} = L \times S. \tag{3}$$

The measure satisfies criteria two and three. However, it can result in counterintuitive scores that violate the first criterion.[6] For example, a respondent with three discussion partners of one viewpoint and one of another viewpoint would receive a score of three, which is larger than the score that would be assigned to a respondent

[6] We are certainly not the first to recognize this property of this measure. For example, Meffert et al. (2004) note in discussing measures of attitudinal ambivalence that the multiplicative measure can produce counterintuitive scores.

who has one discussant of each viewpoint—in other words, the measure sometimes actually increases even as the network becomes less diverse.

Eveland and Hively (2009) propose using Simpson's D (Simpson 1949), a common measure from other fields (e.g., Hunter and Gaston 1988), as a measure of diversity. Using data from a battleground state in 2004, Eveland and Hively (2009) find that this measure is associated with decreased political participation, but Song and Eveland (2015) find no relationship with participation. In the context of political discussion networks, diversity is defined as:

$$\text{Simpson's } D = 1 - \left(p_L^2 + p_S^2\right), \tag{4}$$

where p is the proportion of discussants of a given type. This measure is a special case of Simpson's D in which there are only two categories. The more general measure is $1 - \sum_{i=1}^{N} p_i^2$ where i represents one of the N groups. As such, an obvious advantage of the measure is that it generalizes to contexts in which more than two types of respondents are present—that is, the measure is highly useful if one wishes to account explicitly for political independents in the U.S. or multiple parties in a comparative context. However, in the case of two groups, the measure fails to meet the first and third criteria. Regarding the first, whenever a network is made up of only one type of respondent, the score will equal zero, irrespective of the size of the network. Regarding the third, increasing both together does not increase the overall score; a network made up of two discussants would receive the same score, 0.5, as one made up of four if both networks are equally divided.

Last, we focus on what has been termed "network ambivalence". The measure is a modification of Thompson et al.'s (1995) measure of attitudinal ambivalence, which gauges conflicted attitudes toward some stimulus object. Introduced by Nir (2005), this measure captures the "mix of pro- and counter-attitudinal information" in one's social network (429). Contrary to Eveland and Hively (2009) but consistent with Song and Eveland (2015), Nir finds that diversity, or network ambivalence, has no relationship with political participation. The measure is defined as:

$$\text{Network ambivalence} = \frac{L+S}{2} - |L - S|. \tag{5}$$

Nir's measure satisfies all three conditions. Similar to the exposure measure, this measure has a linear relationship to S, while L shifts the intercept. Given that it meets all three criteria, we recommend that the measure be used to gauge diversity in social networks in situations where the researcher identifies two types of discussants.

Figure 3 displays the relationship between S and each of the three measures conditioned on L. As shown in the figure, Simpson's D and the measure of heterogeneity expectedly suffer from a similar problem as the proportion measure described above—each is compressed in that there are multiple ways, in both cases, for a respondent to receive a score of zero. To reiterate, the problem is that each measure assumes that a network made up of four likeminded (or disagreeing) discussants is the same as one composed of three, two, one, or in fact no discussants at all. In other words, each of the measures removes the possibility of accounting for

the "intensity" of the homogeneity in networks made up of only one kind of discussant.

As in the proceeding section examining measures of disagreement, we compare here the three measures of diversity using both simulated and empirical data. We begin by examining the correlations between the three measures, which are displayed in Table 1. Visually inspecting the relationships between the measures in the simulated data—see Fig. 4, where the plotted points are jittered—shows that the associations are not strictly linear, or in some cases even mostly so. In particular, Huckfeldt et al.'s (2004) measure exhibits a non-monotonic relationship with the other measures, a universal result of the simulations. Also clear from the simulations

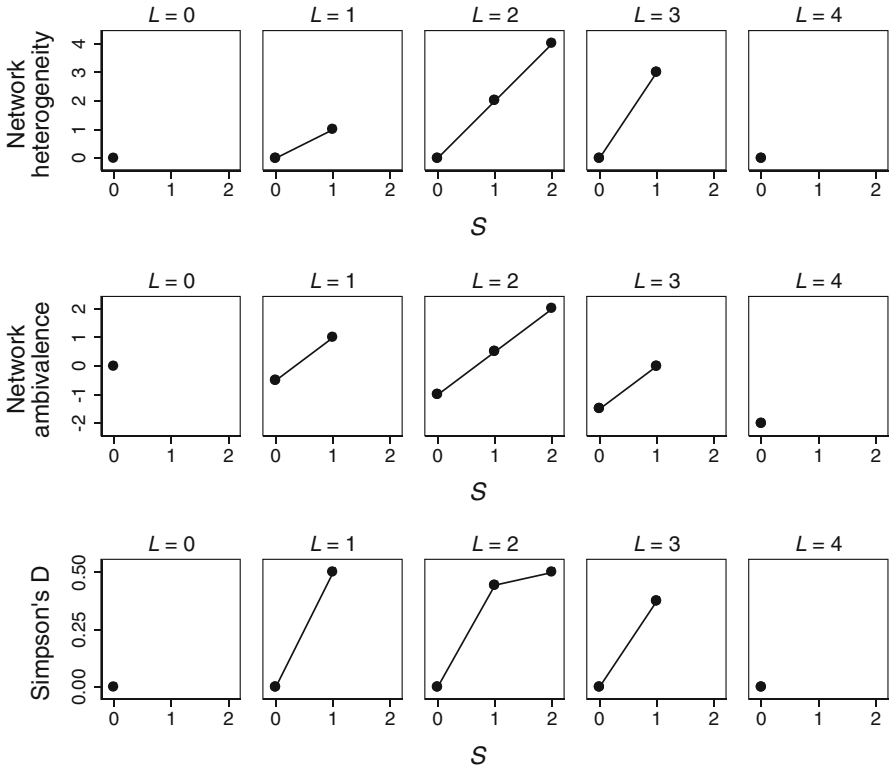

Fig. 3 Diversity measures as a function of *S*, conditioned on *L*

Table 1 Correlation between measures of diversity

Heterogeneity	Simpson's *D*	Ambivalence
1.00		
0.85, 0.87	1.00	
0.75, 0.76	0.86, 0.84	1.00

The left entry in each cell is from the simulated data presented in Fig. 4; the right entry is from the 2000 ANES

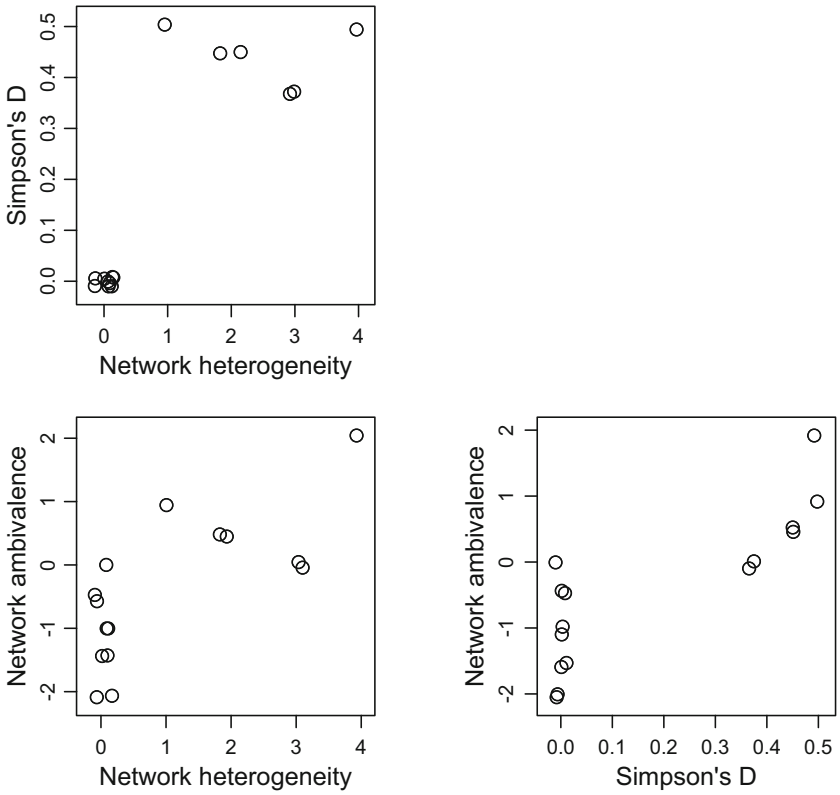

Fig. 4 The relationship between three measures of diversity

presented in Fig. 4 is that many different combinations of L and S will result in a score of zero for the measures in (3) and (4).

A notable observation from our more extensive simulations is that—consistent with our measures of disagreement—the relationship between the Simpson's D and network ambivalence measures of diversity weakens when the overall number of listed partners is low and when one type of partner is much more likely to be discussed. Further, as the total number of listed discussants approaches the maximum allowed, the relationship between the two measures strengthens.

Similar to our analysis of measures of disagreement, we are optimistic that previous findings are quite likely valid given the observed correlations among the three measures. We do, however, encourage scholars to make use of Nir's (2005) measure in the future given its demonstrated strengths when only two categories of discussants are listed.[7] Of course, if one wished to account explicitly for

[7] Worth noting that the measure is, of course, not without its own limitations. An examination of the "Griffin index" in the context of measuring ambivalence indicates that it can mishandle those with no reaction (Rudolph 2005; Thornton 2011). In the case of the name generator, that would be those individuals who list no discussants. Measures of social network characteristics generally might have difficulty in handling such individuals.

independents and minor party supporters in the U.S., or examine political discussion networks in a multi-party setting, then Simpson's D may be preferable. Lastly, given the undesirable properties of the measure in Eq. (3) and its decidedly non-monotonic relationship with the other two measures, we advise against its use. We next evaluate the relationship between disagreement and diversity to test our primary argument that these concepts are distinct.

Disagreement and Diversity

In order to demonstrate that disagreement and diversity are distinct components of social networks, we again use both simulated and empirical data to compare our recommended measures of each concept. Figure 5 shows that the relationship between the two measures—exposure to disagreement and network ambivalence—is expectedly non-linear for the simulated data. Those scores associated with both very little and a great deal of exposure to disagreement have low values on the diversity measure. In fact, the correlation is zero for the simulated data. In the 2000 ANES data, because partisans are more likely to list those who agree than disagree, the relationship is positive: $r = 0.370$. Still, the relationship between the two measures displays the same expected non-linear relationship as in the simulated data. The correlation between our preferred measure of disagreement and the other two measures of diversity is also zero for the simulated data. The correlation between the measure in Eq. (1) and the measures in (3), (4), and (5) is 0.061, 0.067, and -0.030, respectively, for the simulated data. For the 2000 ANES, the correlations between both measures of disagreement and each of the measures of diversity, while non-zero, are quite modest and never greater than 0.375.

We again wish to highlight the results from our more extensive simulations to reiterate our argument that disagreement and diversity are theoretically distinct.

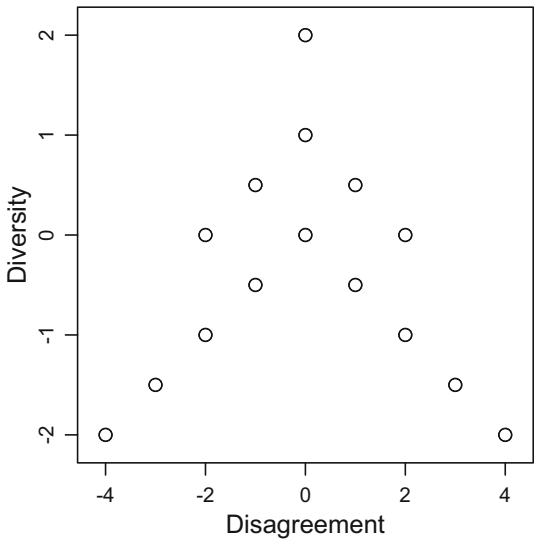

Fig. 5 The relationship between disagreement and diversity

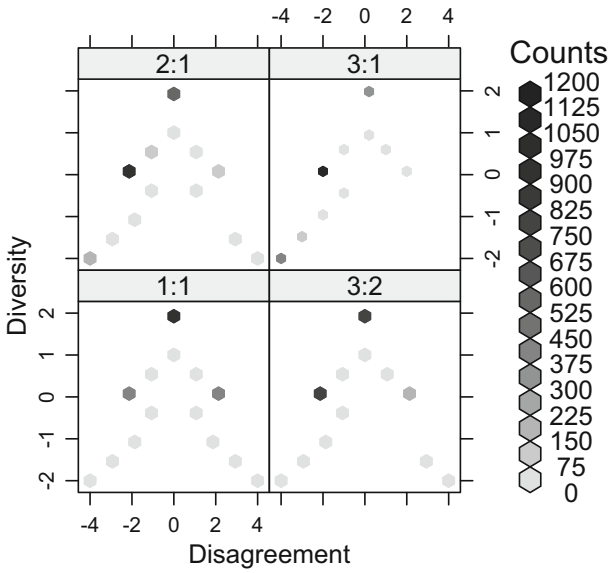

Fig. 6 The relationship between disagreement and diversity using simulated data

However, we noted that a positive relationship between the two exists in the 2000 ANES because respondents are more likely to list a likeminded discussant. This result is sensible in light of our simulations: We observe that, regardless of the total number of respondents listed, as the likelihood that one type of discussant increases relative to the other, the absolute value of the correlation coefficient between the two measures increases. This is, of course, expected—we argue the measure is designed to capture diversity, but if networks are made up of mostly one kind of discussant, then there is little variation in diversity for the measure to capture.

Given the importance to our argument of demonstrating that diversity and disagreement are distinct concepts, we further examine the relationship between these two measures graphically in Fig. 6. To do so, we examine four of the simulations. In each simulation we hold the average number of listed responses at about four and vary the likelihood that one kind of respondent is more likely to be listed than the other. The figure displays a "hexplot", which is a kind of two-dimensional histogram where the shade of plotted points indicates the number of observations, with darker shades representing more observations. Such a graph is designed to deal with over-plotting (Carr et al. 1987), which in this case is quite severe for some of the values. The four panels represent various ratios between the type of discussants listed; e.g., "3:1" indicates that respondents are three times as likely to list discussants with whom they agree compared to disagreeing discussants. The figure indicates that the increase in the observed correlation as the ratio increases is the result of certain combinations of scores being less likely to be observed. For example, in the lower left-hand panel, the correlation between diversity and disagreement is 0.005; as networks become more one-sided on average, the correlation between the two increases—in the upper right-hand panel,

$r = 0.907$.[8] Such an observation is the result of there being very few—or in the extreme case, no—disagreement scores greater than two. The figure demonstrates that although the observed frequency of any particular response depends on the ratio of agreeing to disagreeing discussants, so long as networks are not exclusively or overwhelmingly one-sided, then it is worthwhile to distinguish disagreement from diversity.

Thus, the simulated and empirical results support our overriding argument that diversity and disagreement are distinct concepts and thus should not be treated interchangeably (see also Eveland and Hively 2009; Nir 2005; Song and Eveland 2015). Figures 5 and 6 indicate that some of the contradictory findings in previous studies regarding the impact of political discussion on participation may result from conflating two distinct concepts that should not be treated equivalently. Substantively, the simulations also indicate that researchers need to exhibit caution when the number of listed discussants is especially low. Reassuringly, however, we know of no existing data where such a pattern exists. Additionally, the results suggest that the utility in distinguishing disagreement and diversity is diminished when respondents are overwhelmingly more likely to list one type of respondent. However, we are again reassured that we do not observe such patterns in any known data sets. For example, in the 2000 ANES, only about 14 % of the variance is shared between the two measures, further highlighting the importance of distinguishing the two concepts. A variety of simulated and empirical results therefore reveal differences between our preferred measures of disagreement and diversity and other measures of each concept, and, most importantly for our argument, illustrate the conceptual distinction between disagreeing and diverse social networks. We next evaluate the behavioral consequences of each political discussion network characteristic.

Disagreement, Diversity, and Political Participation

Scholars have posited an impact of political communication on participation since the earliest empirical studies of voting behavior. Recent findings offer mixed answers to this enduring question. Here, we compare the impact of disagreement and diversity on participation to assess systematically the two variables' potentially independent effects on voting and other forms of political behavior. Previous studies have firmly established the psychological underpinnings of discussion and deliberation (e.g., Barabas 2004; Huckfeldt et al. 2004; Mutz 2002a; Price et al. 2002; Ulbig and Funk 1999). Further, considerable existing evidence leads us to hypothesize that exposure to disagreement decreases participation. For example, Mutz (2002a, p. 840) writes, "cross-cutting exposure could make people uncertain of their own positions with respect to issues or candidates, and make them less

[8] In each of four examples presented here, discussants who agree with the respondent are as likely or more likely to be listed. If the reverse were true, then both the sign of the correlation coefficient as well as the panels would be flipped—e.g., if respondents were three times as likely to list discussants who disagreed with them, then there would be a negative correlation and the bottom left-hand portion of the figure would be empty rather than the right as observed here.

likely to take political action as a result". The preponderance of studies of which we are aware employing measures of discussion network disagreement—regardless of terminology—support these conclusions (Bello 2012; Eveland and Hively 2009; Jang 2009; Nir 2011; McClurg 2006).[9] Thus, our first hypothesis is that increased exposure to disagreement is negatively associated with participation.

On the other hand, we expect that diversity will have no deleterious effect on participation, consistent with Nir (2005). We have thus far presented simulated and empirical evidence demonstrating that diversity is conceptually distinct from disagreement, an exercise motivated by our close reading of discussion network characteristics identified in this literature. Of course, these conceptual differences arise from normative and theoretical considerations regarding the influence of interpersonal discussion on individuals' attitudes and behavior. Normatively, a healthy democracy relies upon the ability and willingness of citizens to exchange opposing ideas in order to learn about important public policies and thus make informed choices. As Mutz notes, no one can possibly imagine the full range of political preferences that exist—or the rationales for those viewpoints—absent communication, rendering exposure to diverse viewpoints essential for policy learning (2002b, p. 112). Despite the notoriously low levels of information possessed by the majority of Americans (e.g., Delli-Carpini and Keeter 1996), evidence suggests that discussion network diversity does in fact increase respondents' political knowledge (Song and Eveland 2015) and quality of political thinking (Erisen and Erisen 2012).[10]

Moreover, disagreement and diversity are theoretically distinct because the influence of being surrounded by disagreeing discussion partners likely differs from being on one side of a divided network. As Nir cogently notes in outlining the distinction between disagreeing and diverse networks, "There is a critical difference between encountering an environment that opposes the individual's position, and encountering an environment that is split between supporters and opponents of the individual's position" (2005, p. 426). Thus, we should not expect the existence of multiple viewpoints in the respondent's network to stymie participation, but we would anticipate that exposure to increasing levels of disagreeing opinions to demobilize the respondent. Thus, we follow Nir (2005) in stating our expectation that a diverse network will not be associated with a decline political in participation.

We examine participation in two ways. First, we examine if a person's decision to vote or abstain is related to disagreement and diversity. We measure this variable

[9] Bello (2012) and Nir (2011) extend this work to show that discussion is negatively related to political participation in networks in which none of the members agree with the respondent. Eveland and Lively (2009, 2012) importantly note that some previous work reporting a positive relationship between disagreement and participation suffers from failing to control for the respondent's network size or frequency of discussion. Pattie and Johnston (2009) find no effect of disagreement on participation, but their study was conducted in Britain and examines discussion at the level of groups, not individuals.

[10] Worth noting is that Sokhey and Djupe (2014) find that political discussion improves "correct voting", but not through policy learning. Rather, they report that because Americans largely discuss politics with like-minded others, citizens receive candidate signals that are consistent with their underlying preferences.

using ANES self-reports.[11] We next examine if the respondent engaged in at least one other form of political participation. We code those respondents who engaged in at least one of the following activities as having participated: whether or not the respondent worked for a campaign, attended a campaign event, donated to a candidate, donated to a political party, or displayed a campaign sticker or pin.[12] We control for other correlates of participation by drawing from the extensive literature on the subject.

We include as demographic controls measures of age, education, and income, all of which are shown to relate positively to political participation (Leighley and Nagler 2013; Rosenstone and Hansen 1993; Sondheimer and Green 2010; Verba and Nie 1972). To control for motivational goals, we include a three-point scale of interest in the campaign and a four-point scale of partisan strength ranging from pure independent to strong partisan. Because political sophistication is positively related to participation, included is a six-point scale of political knowledge drawing from a series of factual questions about politics and current events.[13] We also account for if the respondent was contacted by someone encouraging him or her to participate. Finally, we include the average level of political knowledge in the respondent's discussion network.[14]

We first investigate the turnout decision. The results of a logistic regression in which having voted is coded as one are presented in Table 2, where entries represent coefficients, standard errors, and two-sided p values, respectively. The impact of the control variables are consistent with previous expectations. For example, as education, interest, and the network size increase, the probability of voting increases.

Based on previous theory and our empirical model, we can derive and test our two formal hypotheses. Our first expectation—exposure to disagreement is associated with a decline in the likelihood of voting—leads to the hypothesis that $\beta_{Disagreement} < 0$. With an observed coefficient of -0.138 and a standard error of 0.065, we reject the null hypothesis ($p < 0.05$). Our second prediction—diversity is unrelated to turnout—cannot be tested by merely failing to reject the null hypothesis of no effect. Rather, Rainey (2014) demonstrates that a formal test of a null or "negligible" effect is $\beta_{Diversity} \in (-m, m)$, where m is defined as the minimal substantively meaningful effect. Given our estimation strategy, this is tested more

[11] We acknowledge problems with self-reports. In particular, better educated and more politically interested respondents are more likely to misreport that they voted when they in fact abstained (Ansolabehere and Hersh 2012). Given that these same variables are associated with deliberation and discussion (e.g., Neblo et al. 2010), the results presented below are probably biased—that is, we overestimate the impact of discussion on participation. However, given that our purpose is to compare the effects of diversity with those of disagreement, we are not overly concerned because the effect of both will be biased in the same direction.

[12] For our participation scale, Cronbach's $\alpha = 0.624$.

[13] Included in the scale are the following questions: What job or political office does Tony Blair hold? What job or political office does William Rehnquist hold? What job or political office does Trent Lott hold? What job or political office does Janet Reno hold? And, what are the names of the candidates running for office in the respondent's district? For the knowledge scale, $\alpha = 0.680$.

[14] We also estimated a model in which knowledge was measured as the absolute level of knowledge in the discussion network. Substantive results are identical to those presented here.

Table 2 Logistic regression predicting turn out

Variable	Coefficient	Std. err.	p value
Disagreement	−0.138	(0.065)	0.035
Diversity	0.145	(0.125)	0.247
Age	0.017	(0.005)	0.000
Education	0.245	(0.059)	0.000
Income	0.042	(0.034)	0.216
Interest	0.592	(0.120)	0.000
Partisan intensity	0.285	(0.078)	0.000
Knowledge	0.263	(0.060)	0.000
Contact	0.452	(0.301)	0.133
Network Knowledge	0.079	(0.097)	0.415
Network size	0.311	(0.077)	0.000
Intercept	−1.448	(0.443)	0.001
N	1353		
Log-likelihood	−555.02		
$\chi^2_{(11)}$	381.83		
Pseudo R^2	0.260		

straightforwardly by looking at the change in predicted probability, and, as such, we hypothesize $\delta_{Diversity} \in (-0.1, 0.1)$, where we define δ as the change in probability in participating.[15] We find support for our second hypothesis as well ($p < 0.05$). Moving from the minimum to the maximum of the diversity measure results in $\delta = 0.075$. Worth noting is that the coefficient for diversity is in fact positive.

The results of a model predicting other forms of political participation are presented in Table 3. The entries again represent coefficients, standard errors, and two-sided p values from a logistic regression in which having participated is coded as one. Our formal expectations are identical to those of the model predicting turnout: We expect the coefficient for disagreement to be negative and diversity to be unrelated to participation.[16] Here, we find support for our two hypotheses ($p < 0.05$): Disagreement is associated with a decrease in participation, whereas diversity has no systematic relationship with participation ($\delta = -0.041$ when moving from the minimum to the maximum of diversity). Taken together, the results from both models indicate that the two concepts should not be treated interchangeably, and that diversity has no systematic relationship to political participation.

We summarize the results from these two models in Fig. 7, which presents the relationship of both social network characteristics to each of our participation measures in the form of predicted probabilities.[17] In both panels the solid line represents disagreement and the dashed line represents diversity. The figure demonstrates that

[15] The research hypothesis is tested against "each of the component null hypotheses" (Rainey 2014, p. 1086), $H_0^1 : \delta \in (-\infty, m]$ and $H_0^2 : \delta \in [m, \infty)$.

[16] In this model, we again define m as 0.1 to test our second hypothesis.

[17] Predicted probabilities are calculated using an observed values approach (Hanmer and Kalkan 2013).

Table 3 Logistic regression predicting participation

	Coefficient	Std. Err.	*p* value
Disagreement	−0.114	(0.054)	0.035
Diversity	−0.065	(0.093)	0.480
Age	0.009	(0.005)	0.047
Education	0.075	(0.055)	0.175
Income	0.042	(0.023)	0.074
Interest	0.564	(0.125)	0.000
Partisan intensity	0.226	(0.080)	0.005
Knowledge	0.076	(0.051)	0.135
Contact	0.432	(0.206)	0.036
Network knowledge	0.032	(0.103)	0.754
Network size	0.079	(0.067)	0.236
Intercept	−4.608	(0.409)	0.000
N	1353		
Log-likelihood	−590.72		
$\chi^2_{(11)}$	136.96		
Pseudo R^2	0.104		

increased exposure to disagreement is associated with a decreases in the likelihood of participating, but exposure to multiple points of view has no deleterious impact on political participation. And, as Nir (2005, p. 438) notes, diversity "may actually help some potential voters make up their minds, rather than hinder the crystallization of their voting preferences". In other words, competitive political environments may not harm the political process by dampening participation. Indeed, only those who find themselves in the minority in one-sided environments appear more likely than their fellow citizens to drop out of the political process.[18] Lastly, worth noting is that Klofstad et al. (2013) find no impact of partisan disagreement on participation in the 2008 ANES. Their result, in conjunction with those presented here, suggests that the impact of disagreement might be conditional. With only two data points, we can only speculate, but perhaps the impact of disagreement is muted in ideologically charged elections. Similarly, measuring the average partisan difference between the respondent and her discussion network—as Klofstad et al. (2013) do—rather than differences in candidate preferences—as we do here—may be consequential for our conclusions regarding disagreement's impact on behavior. Certainly, the two results indicate that both the broader political context matters and investigating exactly how should be a future area of research. More important, in our view, is that researchers are mindful of the properties of their measures and the concepts under investigation as they continue to

[18] We wish to note that the findings in this section are robust to how we measure each of the concepts. We estimated six models with each possible combination of the various measures of each concept. This empirical pattern is both reassuring as well as consistent with our conclusions in the previous sections regarding the likely validity of previous studies making different measurement choices. We nonetheless reiterate our call to adopt the measures preferred in this paper on both conceptual and methodological grounds.

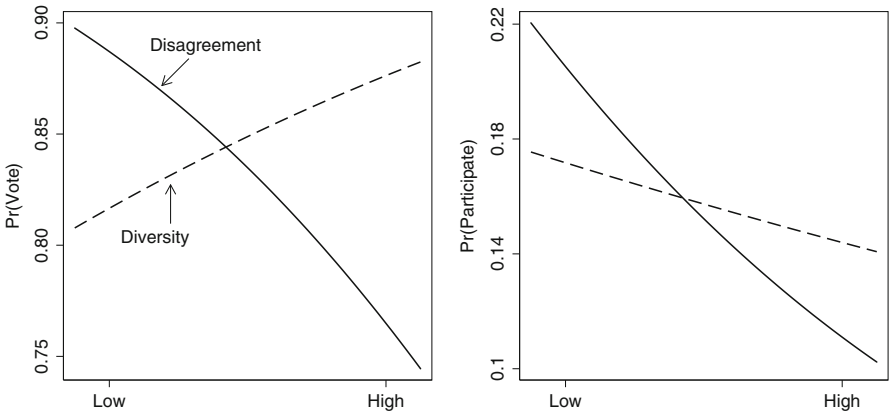

Fig. 7 The impact of disagreement and diversity on participation

explore the contours of social network effects on individuals' political attitudes and behavior.

Conclusion

In this paper, we endeavored to contribute to the expanding literature addressing the importance of discussion networks for political participation by examining several measures of political discussion. Despite long-standing evidence testifying to the effects of political communication on an array of political attitudes and behavior, as well as the keen insights gleaned from the recent resurgence of research in this area, scholarship has produced puzzlingly contradictory results regarding the impact of key network characteristics on political participation. Given the depth and breadth of the evidence on these questions, we argued that the literature could be helped through conceptual clarity and improved operationalization of key concepts.

We concluded that the literature identifies two politically relevant characteristics of discussion networks, disagreement and diversity. Disagreement is recognized as the extent to which an individual's viewpoint is in the minority, whereas diversity is captured by the presence or absence of a mix of viewpoints. Although previous scholarship implicitly examines the separate effects of these two characteristics, we argued that formally distinguishing the characteristics and explicitly evaluating competing measures of each can improve the operationalization of basic concepts. More specifically, we argued that the literature to date is less rich than it might be due to the lack of agreed upon measures of each of these two related, yet distinct concepts.

We attempted in this paper to fill the lacuna in the literature by systematically comparing several popular measures of both disagreement and diversity, and we recommended that scholars adopt a particular measure of each on theoretical and methodological grounds. Namely, evidence showed that the exposure to disagreement measure and Nir's (2005) measure of diversity best account for the full range

of variation in the amount of disagreement and diversity present in an individual's political discussion network. We further noted that Simpson's *D* is well suited to measure diversity in settings in which more than two types of respondents are present (Eveland and Hively 2009). We believe that our preferred measures will enable future researchers to identify more completely the precise nature, timing, and magnitude of network effects on political attitudes and behavior.

Substantively, we believe that we have advanced the literature by demonstrating that disagreement is associated with lower rates of political participation, including voting. We also showed, consistent with Nir (2005), that network diversity is unrelated to political participation. Our evidence suggests that individuals who are surrounded mostly by disagreeing discussion partners are more likely than their fellow citizens to withdraw politically. Conversely, the result for the effect of diversity may signal optimism for the ability of individuals in a democratic society to associate with fellow citizens holding a mix of political views without "tuning out" from the political process. These results are largely consistent with previous work investigating the impact of disagreement and diversity on participation, despite the numerous and often conflicting and confusing terminology adopted in those studies. Although we argued in favor of particular measures of disagreement and diversity, we believe that the most important contribution of this project is that we illustrated using both simulated and empirical data that disagreement and diversity are distinct concepts that hold different consequences for individuals' political involvement.

Future research must be tasked with testing further the implications in this paper, but we believe that our results testify to the importance of distinguishing disagreement and diversity as independent predictors of political thought and action. In addition to participation, previous research has examined the impact of social networks on attitude change and strength (Ben-Nun Bloom and Levitan 2011), correct voting (Sokhey and Djupe 2014), and political tolerance (Mutz 2002b). Scholars also have explored the moderating role of party systems (Smith 2015), generalized trust (Matthes 2013), neighborhood context (McClurg 2006), and indifference and alienation (Jang 2009) in the relationship between discussion networks and participation. In each of these fertile research areas, future work should examine if disagreement and diversity have different effects.

Acknowledgments We would like thank Adam Chamberlain for providing helpful comments in his role as discussant of a previous version of this paper that we presented on a panel at the 2014 annual meeting of the Southern Political Science Association.

References

Adcock, R., & Collier, D. (2001). Measurement validity: A shared standard for qualitative and quantitative research. *American Political Science Review*, *95*, 529–546.

Ansolabehere, S., & Hersh, E. (2012). Validation: What big data reveal about survey misreporting and the real electorate. *Political Analysis*, *20*(4), 437–459.

Barabas, J. (2004). How deliberation affects policy opinions. *American Political Science Review*, *98*(04), 687–701.

Bello, J. (2012). The dark side of disagreement? Revisiting the effect ofdisagreement on political participation. *Electoral Studies*, *31*(4), 782–795.
Ben-Nun Bloom, P., & Levitan, L. C. (2011). We're closer than I thought: Social network heterogeneity, morality, and political persuasion. *Political Psychology*, *28*(4), 643–665.
Ben-Nun Bloom, P., & Bagno-Moldavsky, O. (2015). The conditional effect of network diversity and values on tolerance. *Political Behavior, 37*(3), 623–651.
Berelson, B. R., Lazarsfeld, P. F., & McPhee, W. N. (1954). *Voting: A study of opinion formation in a presidential campaign*. Chicago: University of Chicago Press.
Bernard, H. R., Johnson, E. C., Killworth, P. D., McCarty, C., & Shelly, G. A. (1990). Comparing four different methods for measuring personal social networks. *Social Networks*, *12*(3), 179–215.
Breckler, S. J. (1994). A comparison of numerical indexes for measuring attitude ambivalence. *Educational and Psychological Measurement*, *54*(2), 350–365.
Campbell, A., Converse, P. E., Miller, W. E., & Stokes, D. E. (1960). *The American voter*. Chicago: University of Chicago Press.
Carr, D. B., Littlefield, R. J., Nicholson, W. L., & Littlefield, J. S. (1987). Scatterplot matrix techniques for large N. *Journal of the American Statistical Association*, *82*(398), 424–436.
Cleveland, W. S. (1993). *Visualizing data*. Summit, NJ: Hobart Press.
Cliff, N. (1993). What is and isn't measurement. In G. Keren & G. Lewis (Eds.), *A handbook or data analysis in the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum.
Converse, P. E. (1966). Religion and politics: The 1960 election. In A. Campbell, P. E. Converse, W. E. Miller, & D. E. Stokes (Eds.), *Elections and the political order* (pp. 96–124). New York: Wiley.
Delli-Carpini, M., & Keeter, S. (1996). *What Americans know about politics and why it matters*. New Haven: Yale University Press.
Erisen, E., & Erisen, C. (2012). The effect of social networks on the quality of political thinking. *Political Psychology*, *33*(6), 839–865.
Eveland, W. P., Jr., & Hively, M. H. (2009). Political discussion frequency, network size, and "heterogeneity" of discussion as predictors of political knowledge and participation. *Journal of Communication*, *59*(2), 205–224.
Eveland, W. P., Jr., Hutchens, M. J., & Morey, A. C. (2013). Political network size and its antecedents and consequences. *Political Communication*, *30*(3), 371–394.
Hanmer, M. J., & Kalkan, K. O. (2013). Behind the curve: Clarifying the best approach to calculating predicted probabilities and marginal effects from limited dependent variable models. *American Journal of Political Science*, *57*(1), 263–277.
Hill, R. A., & Dunbar, R. I. M. (2003). Social network size in humans. *Human Nature*, *14*(1), 53–72.
Huckfeldt, R., Mendez, J. M., & Osborn, T. (2004). Disagreement, ambivalence, and engagement: The political consequences of heterogeneous networks. *Political Psychology*, *25*(1), 65–95.
Huckfeldt, R., Sprague, J., & Levine, J. (2000). The dynamics of collective deliberation in the 1996 election: Campaign effects on accessibility, certainty, and accuracy. *American Political Science Review*, *95*(3), 641–651.
Huckfeldt, R., Johnson, P. E., & Sprague, J. (2004). *Political disagreement: The survival of diverse opinions within communication*. New York: Cambridge University Press.
Hunter, P. R., & Gaston, M. A. (1988). Numerical index of the discriminatory ability of typing systems: An application of Simpson's index of diversity. *Journal of Clinical Microbiology*, *26*(11), 2465–2466.
Jacoby, W. G. (1999). Levels of measurement and political research: An optimistic view. *American Journal of Political Science*, *43*(1), 271–301.
Jang, S.-J. (2009). Are diverse political networks always bad for participatory democracy? Indifference, alienation, and political disagreement. *American Politics Research*, *37*(5), 879–898.
Kenny, C. B. (1992). Political participation and effects from the social environment. *American Journal of Political Science*, *36*(1), 259–267.
Klar, S. (2014). Partisanship in a social setting. *American Journal of Political Science*, *58*(3), 687–704.
Klofstad, C. A., Sokhey, A. E., & McClurg, S. D. (2013). Disagreeing about disagreement: How conflict in social networks affects political behavior. *American Journal of Political Science*, *57*(1), 120–134.
Klofstad, C. A., McClurg, S. D., & Rolfe, M. (2009). Measurement of political discussion networks. A comparison of two name generator procedures. *Public Opinion Quarterly*, *3*(73), 462–483.
Knoke, D. (1990). *Organizing for collective action: The political economies of associations*. Piscataway, NJ: Transaction Publishers.

Krosnick, J. A., Narayan, S., & Smith, W. R. (1996). Satisficing in surveys: Initial evidence. *New Directions for Evaluation*, *1996*(70), 29–44.

Kwak, N., Williams, A. E., Wang, X., & Lee, H. (2005). Talking politics and engaging politics: An examination of the interactive relationships between structural features of political talk and discussion engagement. *Communication Research*, *32*(1), 87–111.

La Due Lake, R., & Huckfeldt, R. (1998). Social capital, social networks, and political participation. *Political Psychology*, *19*(3), 567–584.

Lazarsfeld, P. F., Berelson, B. R., & Gaudet, H. (1944). *The people's choice: How the voter makes up his mind in a presidential campaign*. New York: Duell, Sloan and Pearce.

Leighley, J. E., & Nagler, J. (2013). *Who votes now?: Demographics, issues, inequality, and turnout in the United States*. Princeton: Princeton University Press.

Leighley, J. E., & Matsubayashi, T. (2009). The implications of class, race, and ethnicity for political networks. *American Politics Research*, *37*(5), 824–855.

Leighley, J. (1990). Social interaction and contextual influence on political participation. *American Politics Quarterly*, *18*(4), 459–475.

Levitan, L. C., & Visser, P. S. (2008). The impact of the social context on resistance to persuasion: Effortful versus effortless responses to counter-attitudinal information. *Journal of Experimental Social Psychology*, *44*(3), 640–649.

Levitan, L. C., & Visser, P. S. (2009). Social network composition and attitude strength: Exploring the dynamics within newly formed social networks. *Journal of Experimental Social Psychology*, *45*(5), 1057–1067.

Lupton, R. N., Singh, S. P., & Thornton, J. R. (2015). The moderating impact of social networks on the relationships among core values, partisanship, and candidate evaluations. *Political Psychology*, *36*(4), 399–414.

Marsden, P. V. (1987). Core discussion networks of Americans. *American Sociological Review, 52*(1), 122–131.

Marsden, P. V. (2004). Recent developments in network measurement. In P. J. Carrington, J. Scott, & S. Wasserman (Eds.), *Models and methods in social network analysis* (pp. 8–30). Cambridge: Cambridge University Press.

Matthes, J. (2013). Do hostile opinion environments harm political participation? The moderating role of generalized trust. *International Journal of Public Opinion Research*, *25*(1), 23–42.

McClurg, S. D. (2003). Social networks and political participation: The role of social interaction in explaining political participation. *Political Research Quarterly*, *56*(4), 448–464.

McClurg, S. D. (2006). The electoral relevance of political talk: Examining disagreement and expertise effects in social networks on political participation. *American Journal of Political Science*, *50*(3), 737–754.

McClurg, S. D., Wade, M. L., & Wright-Phillips, M. V. (2013). He said, she said: Sex, social networks and voting behavior. *American Politics Research, 41*(6), 1102–1123.

Meffert, M. F., Guge, M., & Lodge, M. (2004). Good, bad, indifferent and ambivalent: The consequence of multidimensional political attitudes. In W. E. Saris & P. M. Sniderman (Eds.), *The issue of belief: Essays in the intersection of non-attitudes and attitude change* (pp. 60–100). Princeton, NJ: Princeton University Press.

Miller, W. E. (1956). One-party politics and the voter. *American Political Science Review*, *50*(3), 707–725.

Mutz, D. C. (2002a). The consequences of cross-cutting networks for political participation. *American Journal of Political Science*, *46*(4), 838–855.

Mutz, D. C. (2002b). Cross-cutting social networks: Testing democratic theory in practice. *American Political Science Review*, *96*(1), 111–126.

Mutz, D. C., & Mondak, J. J. (2006). The workplace as a context for cross-cutting political discourse. *Journal of Politics*, *68*(1), 140–155.

Neblo, M. A., Esterling, K. M., Kennedy, R. P., Lazer, D. M. J., & Sokhey, A. E. (2010). Who wants to deliberate-and why? *American Political Science Review*, *104*(3), 566–583.

Nir, L. (2005). Ambivalent social networks and their consequences for participation. *International Journal of Public Opinion Research*, *17*(4), 422–442.

Nir, L. (2011). Disagreement and opposition in social networks: Does disagreement discourage turnout? *Political Studies*, *59*(3), 674–692.

Pattie, C. J., & Johnston, R. J. (2009). Conversation, disagreement and political participation. *Political Behavior, 31*(2), 261–285.

Price, V., Cappella, J. N., & Nir, L. (2002). Does disagreement contribute to more deliberative opinion? *Political Communication*, *19*(1), 95–112.

Rainey, C. (2014). Arguing for a negligible effect. *American Journal of Political Science*, *58*, 1083–1091.

Richey, S. (2008). The autoregressive influence of social network political knowledge on voting behaviour. *British Journal of Political Science*, *38*(3), 527–542.

Rosenstone, S. J., & Hansen, J. M. (1993). *Participation and democracy in America*. New York: MacMillan.

Rudolph, T. J. (2005). Group attachment and the reduction of value-driven ambivalence. *Political Psychology*, *26*(6), 905–928.

Simpson, E. H. (1949). Measurement of diversity. *Nature*, *163*, 688–688.

Sinclair, B. (2012). *The social citizen: Peer networks and political behavior*. Chicago: University of Chicago Press.

Smith, A. E. (2015). The diverse impacts of politically diverse networks: Party systems, political disagreement, and the timing of vote decisions. *International Journal of Public Opinion Research*, *27*(4), 481–496.

Sokhey, A. E., & Djupe, P. A. (2014). Name generation in interpersonal political network data: Results from a series of experiments. *Social Networks*, *36*, 147–161.

Sokhey, A. E., & McClurg, S. D. (2012). Social networks and correct voting. *The Journal of Politics*, *74*(03), 751–764.

Sondheimer, R. M., & Green, D. P. (2010). Using experiments to estimate the effects of education on voter turnout. *American Journal of Political Science*, *54*(1), 174–189.

Song, H., & Eveland, W. P., Jr. (2015). The structure of communication networks matters: How network diversity, centrality, and context influence political ambivalence, participation, and knowledge. *Political Communication*, *32*(1), 83–108.

Stevens, S. S. (1951). Mathematics, measurement and psychophysics. In S. S. Stevens (Ed.), *Handbook of experimental psychology*. New York: Wiley.

Thompson, M. M., Zanna, M. P., & Griffin, D. W. (1995). Let's not be indifferent about (attitudinal) ambivalence. In J. Krosnick (Ed.), *Attitude strength: Antecedents and consequences* (pp. 361–386). Hillsdale, NJ: Erlbaum.

Thornton, J. R. (2011). Ambivalent or indifferent: Examining the properties of measures of partisan ambivalence. *Political Psychology*, *32*(5), 863–884.

Ulbig, S., & Funk, C. (1999). Conflict avoidance and political participation. *Political Behavior*, *21*(3), 82–265.

Verba, S., & Nie, N. H. (1972). *Participation in America*. Chicago: University of Chicago Press.

Visser, P. S., & Mirabile, R. R. (2004). Attitudes in the social context: The impact of social network composition on individual-level attitude strength. *Journal of Personality and Social Psychology*, *87*(5), 779–795.