Dear Reviewers and Editors,

Thank you to the reviewers for dedicating their time and effort to this paper, and thank you to the editors for facilitating that process. I/we believe that the manuscript has been substantially improved as a result of your suggestions. My/our responses to your comments are detailed in the response letter uploaded along with the paper.

Best regards,

Author/s

Editor Comments

COMMENT: R1 and R3 are quite supportive but point at various methodological and analytical issues. Please make sure to correct for these issues where possible.

RESPONSE: Every effort has been made to address methodological and analytical issues raised by R1 and R3 wherever possible, and the revisions have been detailed below. These changes have resulted in a more straightforward model specification through all stages of the analysis, and robustness checks have been performed to further bolster the evidence shown in the article.

COMMENT: R2 is more critical, mostly on theoretical grounds. Please make sure to work on the theory following this reviewer's comments.

RESPONSE: The theory has been clarified and improved according to R2's comments, and the revisions have been detailed below. Specifically, the paper theorizes that social media facilitate exposure to cross-cutting views because (a) social media connections are multidimensional, but not limited by geographic space and (b) social norms promote the sharing of news and political information. From there, engagement with cross-cutting news content promotes a cognitive process of reflection and elaboration that results in the perception of disagreement.

COMMENT: Also, please expand your 'data quality disclaimer' in the Discussion as this is a serious limitation.

RESPONSE: The data quality disclaimer has been expanded on pg. 23:

> "Another limitation stems from the use of an opt-in internet panel. Strictly speaking, opt-in samples are not probability samples, which means they may not be representative of the target population. However, the sample is comparable to that population in terms of demographics and, most importantly, social media use. Additionally, online samples produce model estimates comparable to those based on probability samples when the purpose of the study is to explain theoretical relationships (Baker et al., 2013; Eckman, 2016). Finally, these data are cross-sectional, and therefore cannot be used to make causal inferences."

References

Baker R., Brick J. M., Bates N. A., Battaglia M., Couper M. P., Dever J. A., Gile K. J., Tourangeau R. (2013). Summary report of the AAPOR task force on non-probability sampling. *Journal of Survey Statistics and Methodology, 1*, 90-143. doi: 10.1093/jssam/smt008

Eckman, S. (2016). Does the inclusion of non-internet households in a web panel reduce coverage bias? *Social Science Computer Review, 34*(1), 41-58. doi: 10.1177/0894439315572985

Reviewer 1 Comments

COMMENT: This is a good paper about a topic of current interest in the social networks literature: exposure to disagreement. The hypotheses are straightforward, the data seem appropriate to test them, and the results largely confirm the authors' expectations. This all said I have some comments and questions below I would like to see addressed before I endorse publication. I recommend revise and resubmit.

RESPONSE: Thank you for these positive comments. Every effort has been made to revise the paper based on your suggestions, which have made the manuscript even stronger.

COMMENT: Abstract: There is no Abstract, please provide one.

RESPONSE: Thank you for pointing out this oversight. An abstract has now been provided in the revised manuscript, and it is also included here:

> "This paper investigates political disagreement on social media in comparison to face-to-face and anonymous online settings. Social media such as Facebook and Twitter articulate multidimensional relationships and promote cognitive processes of elaboration and reflection that facilitate the perception of disagreement. Analyses of an online survey of adults in the United States show that (a) social media users perceive more political disagreement than non-users, (b) they perceive more of it on social media than in other communication settings, and (c) news use on social media is positively related to perceived disagreement on social media. Results are discussed in light of their implications for current debates about the contemporary public sphere and directions for future research."

COMMENT: Page 1: The main premise of the paper assumes that there is less homophily in online relationships than in "real world" relationships. Evidence/citations should be provided to back up that claim. Please apply this comment to the rest of the paper.

RESPONSE: This comment is very much appreciated because it offers an opportunity to clarify this point for the readers. The paper claims that people encounter less disagreement in anonymous online settings in comparison to face-to-face settings. In anonymous online settings, people tend to migrate to particular sites for specific reasons (Wellman & Gulia, 1999), meaning that homophily in this case is one-dimensional, and, when it comes to politics, it also means that people tend to visit like-minded sites (Davis, 1998; Hill & Hughes, 1998; Sunstein, 2007). Therefore, it is not necessarily true that there is less homophily in online relationships, but rather homophily in these environments typically lacks the multi-dimensionality of face-to-face relationships, which arguably helps to sustain disagreement in relationships and networks (Huckfeldt, Johnson, & Sprague, 2004).

The paper also claims that there are different dynamics for social media than for anonymous online settings. Social media articulate existing offline relationships. However, they do so in a way that cuts across social barriers that limit informational diversity in face-to-face settings (e.g., local context; Brundidge, 2010), and makes political considerations posted by a relatively wider

range of individuals more salient than face-to-face settings on a daily basis (Kwon, Stefanone, & Barnett, 2014). Thus, while social media largely translate offline relationships to online platforms, they do so in such a way that promotes exposure to political disagreement relative to face-to-face settings (Bakshy, Messing, & Adamic, 2015; Barbera, 2014; Barnidge, 2015; Kim, 2011; Kim et al., 2013).

The introduction has been amended for clarity on pg. 2, and citations have been added to support claims made in this section.

> "Social media are important new venues for political communication because they connect individuals with civil society through egocentric social networks (Rojas, 2015), and this paper examines the extent to which these networks facilitate political disagreement in comparison to other communicative settings. In face-to-face settings, disagreement is relatively uncommon (Mutz, 2006; Mutz & Martin, 2001) because, despite the fact that face-to-face relationships are characterized by overlapping dimensions of social similarity (Huckfeldt, Johnson, & Sprague, 2004; Walsh, 2004), discussion is bounded by local context (Huckfeldt et al., 2004) and social norms often discourage dissent (Eliasoph, 1998; Walsh, 2004). Meanwhile, anonymous online settings — including message boards and community forums such as reddit.com — display high degrees of interest-based homogeneity (Davis, 1998; Hill & Hughes, 1998), which means that people tend to visit like-minded discussion sites (Sunstein, 2007) and interact with people with whom they largely agree (Gaines & Mondak, 2009; Wojcieszak & Mutz, 2009).
>
> Social media such as Facebook and Twitter, on the other hand, articulate multidimensional relationships that are not necessarily defined by political preferences or bounded by geographical space (Barberá, 2014; Brundidge, 2010; Ellison, Steinfeld, & Lampe, 2007) and promote cognitive processes of elaboration and reflection (Cho et al., 2009; Shah et al. 2007) that result in the perception of disagreement. Therefore, social media likely facilitate political disagreement (Bakshy, Messing, & Adamic, 2015; Barberá, 2014; Barnidge, 2015; Kim, 2011; Kim, Hsu, & Gil de Zúñiga 2013). Employing a survey of adults in the United States, this paper tests the claim that social media facilitate the perception of political disagreement and whether news on social media helps to explain these perceptions."

References

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COMMENT: Page 3: The paper makes a distinction between "early" social media and the newer types of social media addressed in this study (as I read on further in the paper I now see that this is Twitter and Facebook). I would clarify here, or even earlier in the paper, what type(s) of social media this paper is addressing. In line with comment #1, adding this to the Abstract would also help.

RESPONSE: This point has been clarified on pg. 2, in the same excerpt shown above:

> "Meanwhile, anonymous online settings — including message boards and community forums such as reddit.com — display high degrees …"
>
> "Social media such as Facebook and Twitter, on the other hand …"

Additionally, the text on pg. 5 has also been edited. The example of an anonymous online medium is repeated, and the term "early" online media has been dropped here and throughout the manuscript.

> "Anonymous online media — message boards or sites such as reddit.com, for example — exhibit comparatively lower levels of multidimensionality in social affiliation."

COMMENT: Pages 4-6: The hypotheses depend on a treatment group (social media users) and a control group (non-users). But, (a) how many people do not use social media these days, and (b) are non-users systematically different than users in ways that might bias the results?

RESPONSE: Recent estimates indicate that about 25% of Americans adults who use the Internet currently do not use social media. For example, a 2015 report by the Pew Research Center (Duggan, Ellison, Lampe, Lenhart, & Madden, 2015) estimates that 26% of American adults who use the Internet do not use social media, and an update to that report suggests a similar figure (24%; Perrin, 2015). Similarly, in the current sample, 24% do not use social media (76% users).

The analysis below below, which also provided the matching criteria, shows that social media users are (a) younger than non-users ($B_{age} = -.04$, $SE = .01$, $p < .001$) and (b) are more likely to be female ($B_{female} = .56$, $SE = .20$, $p < .01$). Looking more closely at the extent of these differences, the gender discrepancy is, perhaps, more important that the age discrepancy. For example, the exponentiated coefficient confidence intervals for gender show that females are up to 2.62 times more likely to use social media than males. Meanwhile, the exponentiated estimate for age ranges between .96 and .98, which is statistically different from but substantively close to 1. The finding that females are more likely to use social media than males also fits with current reports about social media use in the United States. For example, Duggan et al. (2015) report that 77% of females use social media, while only 66% of males do.

More generally, these findings emphasize the need to correct for systematic differences between social media users and non-users with the matching procedure, which aims to minimize these differences and construct comparable groups based on criteria that include both age and gender.

Table. *Logistic (Logit) Regression Model showing Systematic Difference in Social Media Use (1 = User, 0 = Non-User) along Demographics and Political Orientations*

Variable	Estimate	Std. Error	Exp. Coefficient	95% LL	95% UL
Intercept	2.42***	.44	11.30	4.86	27.19
Age	-.04***	.01	.97	.96	.98
Gender (1 = Female)	.56**	.20	1.76	1.17	2.62
Education	-.08	.07	.93	.81	1.06
Income	-.03	.07	.97	.85	1.11
Political Efficacy	-.04	.13	.96	.75	1.23
Political Knowledge	.00	.10	1.00	.82	1.23
Political Interest	.10	.10	1.10	.90	1.34
Strength of Ideology	-.04	.06	.96	.86	1.09
Strength of Partisanship	.24	.15	1.27	.94	1.71

Notes: McFadden's Pseudo R^2 = .07, Nagelkerke R^2 = .11. N = 615. *p < .05, **p < .01, **p < .001.

References

Duggan, M., Ellison, N. B., Lampe, C., Lenhart, & A., Madden, M. (2015). Social media update 2014. Report for the Pew Research Center: Internet, Science, and Tech division. Retrieved from http://www.pewinternet.org/2015/01/09/social-media-update-2014/.

Perrin, A. (2015). Social media usage: 2005-2015. Report for the Pew Research Center: Internet, Science, and Tech division. Retrieved from http://www.pewinternet.org/-2015/10/08/social-networking-usage-2005-2015/.

COMMENT: Page 6: Please specify the "geographic and demographic parameters" used in the sampling process.

RESPONSE: The survey firm, SSI, maintains online panels of subjects that they construct based on commonly used demographic and geographic parameters, including age, gender, education, income, and place of residence. These panels are constructed in such a way that they are comparable to U.S. Census statistics for a given population of interest.

The parameters used in the panel construction process have been articulated on pg. 10:

> "First, subjects were randomly selected from an online panel constructed with geographic and demographic parameters, including age, gender, education, income, and place of residence, in such a way that they are comparable to the U.S. Census statistics for the population of interest."

COMMENT: Page 6: Subjects were sampled based on their likelihood of completing the study. If I understand correctly these decisions were based on responses to the screener questionnaire. What was the content of the screener? To wit, are the individuals who were selected to participate systematically different than those who were excluded? For example, if the screener

included questions about politics the sample might be more politically engaged than the general population, which would potentially bias the results.

RESPONSE: You raise a valid concern about the screening process given the description in the paper. However, it must be emphasized that there were only three screening criteria: Whether respondents were over the age of 18, whether they were U.S. residents, and whether they had Internet access. Respondents who answered in the affirmative to each of these questions were eligible for the study. No questions about politics were used in the screening process.

It must also be emphasized that the screening process did not calculate the likelihood that respondents would complete the survey based on their interests, but rather on their past survey completion record. The survey firm, SSI, maintains these estimates, which are intended to maximize the likelihood of obtaining complete responses, and not to match respondents with topics of interest. This part of the sampling process has been clarified on pg. 10:

> "Next, subjects were randomly presented with screening questions asking whether respondents are over the age of 18, whether they are U.S. residents, and whether they had Internet access, in order to determine their eligibility for the study. Finally, subjects were randomly invited to take the study based on their likelihood to complete it based on their past completion of surveys. This final step is taken to maximize the likelihood of obtaining complete responses."

COMMENT: Page 6: When describing the data collection process please provide IRB approval information, including the institution, date of approval, and protocol number.

RESPONSE: This information has been provided below, but the name of the institution has been withheld for the blind review process. The institution name will be inserted into the final manuscript.

> Institution: Education and Social/Behavioral Sciences IRB, [UNIVERSITY NAME]
>
> Submission ID number: 2015-0118
>
> Date of Approval: 03/25/2015

Additionally, this information has been included in the manuscript as a note, which is referenced on pg. 10 and appears on pg. 23:

> "This study was approved by the [UNIVERSITY NAME]'s Education and Social/Behavioral Sciences Institutional Review Board on March 25, 2015 (Submission ID: 2015-0118).

COMMENT: Page 7: The name generator measures do not account for discussion frequency. That is, I might have someone in my ego net that I disagree with, but I might not discuss politics with them as frequently as I do more agreeable alters. Can this somehow be accounted for in the analysis?

RESPONSE: Although this is a very good suggestion for future research, discussion frequency was not measured in the name generators portion of the current survey. This limitation has been included on pg. 22:

> "Third, discussion frequency was not measured in the name generators portion of the survey, and therefore the study cannot distinguish between disagreement that does or does not arise from discussion on social media."

Although the paper is limited in this way, its theory suggests that discussion is not necessary to perceive disagreement in social media contexts because users can get a sense of what others think and feel about a topic without directly engaging in discussion (Kwon, Stefanone, & Barnett, 2014; Schultz & Roessler, 2012). Furthermore, the name generator items specifically ask respondents to name "somebody who frequently posts about politics or public affairs," and, therefore, it can be assumed that the named individuals frequently post about politics on social media and that the respondents have been exposed to that content.

References

Kwon, K. H., Stefanone, M. A., & Barnett, G. A. (2014). Social network influence on online behavioral choices: Exploring group formation on social network sites. *American Behavioral Scientist 58*(10), 1345-1360. doi: 10.1177/0002764214527092

Schulz, A. & Roessler, P. (2012). The spiral of silence and the Internet: Selection of online content and the perception of public opinion climate in computer-mediated communication environments. *International Journal of Public Opinion Research, 24*(3), 346-367. doi: 10.1093/ijpor/eds022

COMMENT: Page 8: Do the results vary across Facebook and Twitter? For example, due to character limits less information can be conveyed in a Twitter post than a Facebook post.

RESPONSE: It seems quite plausible that there are meaningful differences in exposure to disagreement across social media platforms. However, disagreement was not measured relative to specific platforms, but rather with the more general wording "on social media." This issue has been noted in the limitations on pg. 22:

> "Fourth, the study does not measure political disagreement separately on Facebook and Twitter. Future research should investigate the differences between these prominent social media platforms, which could be important as patterns of use continue to shift and change."

COMMENT: Page 12: What covariates were included in the matching procedure? Please apply this comment to the rest of the results.

COMMENT: Page 13: I would explain and justify these modeling choices for the reader. Please apply this comment to the rest of the results.

RESPONSE: In light of these and other reviewer's comments, the matching criteria and covariates have changed somewhat. These changes have results in a more straightforward model specification across all stages of the analysis.

As shown in the tables and notes below, the matching criteria used are age, gender, income, education, political knowledge, political interest, political efficacy, strength of ideology, and strength of partisanship. Covariates that are considered exogenous to social media use but may affect estimates of disagreement are also specified, including face-to-face political talk, email political messaging, offline news use, and online news use.

Repeated-measures analyses control for all these same variables and frequency of social media use. Finally, the OLS analysis layers on social media political messaging and disagreement in other settings while estimating the relationships between disagreement and news use, network size, and network diversity.

Modeling choices for all stages of the analysis have been explicitly described in the Analysis section on pages 15-17. Please note that some of this text has been refashioned from the Results section, which has been streamlined and edited accordingly.

> "**Analysis**
>
> To analyze where social media users perceive more political disagreement, a repeated-measures analysis was conducted with both the name generator items (which has two categories within individuals: social media and face-to-face) and the general disagreement indicators (three categories: social media, face-to-face, anonymous online) using a hierarchical linear modeling (HLM) technique that treats individual respondents as a second-level variable with a random intercept while assessing mean levels of disagreement in each medium at the first level. These models assess differences within individual users across communication contexts while controlling for demographics (including age, gender, education, and income), political orientations that may affect the perception of disagreement (including political efficacy, political knowledge, political interest, strength of ideology, and strength of partisanship), and communication variables that are conceptually prior to social media use but possibly related to the perception of disagreement (including face-to-face political talk, email political messaging, offline news use, and online news use). Finally, the models control for frequency of social media use itself. All control variables have been mean-centered, so that the model intercept is interpretable as the mean of political disagreement in the reference category (social media), adjusted at the mean of all other variables. The lone exception to this rule is the gender variable (1 = female), which was not mean centered. Thus, results are reported among males (where female = 0; note that the coefficient is not statistically significant in either model, nor does female interact with other variables in the models).
>
> To assess differences in perceived political disagreement between social media users and non-users, the nearest-neighbors matching technique was combined with ANOVA-by-regression to estimate the "treatment" effect of social media use on political disagreement. A simple comparison of means between these two groups would introduce

selection bias into the estimation process due to systematic differences between social media users and non-users; by constructing more comparable groups along key criteria, matching procedures have been shown to produce less biased estimates (Abadie, Diamond, & Hainmueller, 2015; Busso, DiNardo, & McCrary, 2014; Nielsen, 2014). First, propensity scores were constructed with a logistic regression (logit) model predicting social media use (1 = user, 0 = non-user) based on the demographic (age, gender, education, and income) and political orientation variables (political efficacy, political knowledge, political interest, strength of ideology, and strength of partisanship). Next, the nearest neighbor method was used to randomly match non-users to each user. This procedure yielded improvement in balance in most matching variables.[2] Because there were more users than non-users, users were randomly selected for the matching procedure. Once the groups were constructed, the "treatment" effect of social media use was estimated through an ANCOVA-by-regression (OLS) procedure. These models control for communication variables that are conceptually prior to social media use but theoretically related to the perception of political disagreement, including face-to-face political talk, email political messaging, offline news use, and online news use. These covariates were mean-centered to ease the interpretation of the intercept (the mean for the non-users group at the mean of the covariates). Means differences were also re-estimated using bootstrapping techniques (1,000 simulations).

To analyze the proposed mechanisms for exposure to disagreement on social media (social media news use, social media news network size, and social media news network diversity), ordinary least squares (OLS) regression is used to assess the relationships between these variables and political disagreement on social media among the subgroup of social media users. These models control for the same demographics, political orientations, and communication variables as before. Additionally, they control for disagreement in other communication settings (face-to-face and anonymous online) and political talk on social media. A final model is submitted to a three-fold cross-validation comparing a "full" model to a "null" model, and mean squared prediction errors (MSPEs) are reported."

Given that the matching criteria have changed somewhat, the footnotes describing the logit results and improvement in balance have also changed. These results are presented in the note referenced on pg. 16 and shown on pgs. 23-24:

"[2] The following logit coefficient estimates (with standard errors in parentheses) predicting social media use (1 = social media user) were used as propensity scores: $P_{\text{social media use}} = 1 / 1 + e^{-(2.42(.44) - .04(.01)_{\text{age}} + .56(.20)_{\text{female}} - .08(.07)_{\text{education}} - .03(.07)_{\text{income}} - .04(.13)_{\text{political efficacy}} + .00(.10)_{\text{political knowledge}} + .10(.10)_{\text{political interest}} - .04(.06)_{\text{strength of ideology}} + .24(.15)_{\text{strength of partisanship}}}$. McFadden Pseudo $R^2 = .07$, Nagelkerke $R^2 = .11$, N = 615. Percent improvement for propensity score variables are as follows: distance = 20.00, age = 21.80, gender = 11.02, income = 53.49, education = 11.52, political efficacy = -105.15, political interest = 14.03, political knowledge = 26.18, strength of ideology = 68.75, strength of partisanship = -24.69.

For the purposes of this response letter, logit results are also shown in the table below (please note this is the same table shown above regarding your comment about systematic differences between social media users and non-users):

Table. *Logistic (Logit) Regression Model showing Systematic Difference in Social Media Use (1 = User, 0 = Non-User) along Demographics and Political Orientations*

Variable	Estimate	Std. Error	Exp. Coefficient	95% LL	95% UL
Intercept	2.42***	.44	11.30	4.86	27.19
Age	-.04***	.01	.97	.96	.98
Gender (1 = Female)	.56**	.20	1.76	1.17	2.62
Education	-.08	.07	.93	.81	1.06
Income	-.03	.07	.97	.85	1.11
Political Efficacy	-.04	.13	.96	.75	1.23
Political Knowledge	.00	.10	1.00	.82	1.23
Political Interest	.10	.10	1.10	.90	1.34
Strength of Ideology	-.04	.06	.96	.86	1.09
Strength of Partisanship	.24	.15	1.27	.94	1.71

Notes: McFadden's Pseudo R^2 = .07, Nagelkerke R^2 = .11. N = 615. *p < .05, **p < .01, **p < .001.

The results have been streamlined and updated on pgs. 17-19:

"**Results**

The first set of hypotheses (H1a & H1b) posits that people will perceive more disagreement on social media than elsewhere, and repeated-measures analyses were conducted to test this prediction (see Table 1). At the level of individual respondents, both models show relatively low levels of variation within subjects, as indicated by the fact that the residual variance (i.e., variance not explained by the within-subjects term) is larger than the within-subjects variance in both models. For the name generators, the within-subjects variance is .01 (vs. residual variance of .99); for the general indicators, the within-subjects variance is .52 (vs. residual variance of 1.33). These figures yield relatively low intra-class correlation coefficients (ICC = .01, for the name generators; ICC = .28, for the general indicators).

Both models also show significant differences by medium. The fixed intercept term for the name generators (the mean of the social media category) is 1.22 (SE = .06, p < .05), while the mean in the face-to-face discussion category is significantly lower at .83 (B = -.39, SE = .06, p < .05). This difference is illustrated in Figure 1. Differences are also detected with the general indicators. Social media users perceive more political disagreement on social media (B = 1.94, SE = .10, p < .05) than in interpersonal talk and anonymous online settings (face-to-face: B = -.35, SE = .08, p < .05; anonymous online: B = -.70, SE = .08, p < .05). These results provide strong support for H1a and H1b. Social

media users generally perceive more political disagreement on social media than they are elsewhere.

The second hypothesis predicts that social media users would perceive more political disagreement than non-users, and a matching procedure combined with ANOVA-by-regression was used to test this prediction. Adjusted means were then re-estimated using bootstrapping techniques with the same model formula. Results, which which strongly support H2 and are shown in Table 2, show that estimated means in the users group (1.26 in the name generators model [B = .39, SE = .10, $p < .05$] and 1.62 in the general indicators model [B = .81, SE = .11, $p < .05$]) are higher than the non-users group (.89 [*SE* = .07, $p < .05$] in the name generators model and .57 in the general indicators model [*SE* = .11, $p < .05$]). These differences are also illustrated in Figure 1, and they show that in the matched sample, social media users perceive more political disagreement than non-users.

If using news from diverse sources is the mechanism through which social media users perceive political disagreement, then one or more indicators of social media news use and/or news networks should be positively related to political disagreement on social media. Results of these tests (OLS regression) are shown in Table 3. Of the three indicators — social media news use, social media news network size, and social media news network diversity — only social media news use is significantly related (B = .03, SE = .01, $p < .05$). The full model (mean squared prediction error [MSPE] = 173.98) performed better than the null model (MSPE = 195.28) in a three-fold cross-validation. Because of the relatively high R^2 statistic (.49), models were also estimated without interpersonal and anonymous online disagreement (both of which were strongly related to social media disagreement). When either is removed, explained variance decreases while the coefficients change little. These results support H3a, but not H3b and H3c, showing that news use and political disagreement are positively associated on social media."

And, finally, the revised tables:

Table 1. *Estimated Differences in Political Disagreement across Communication Contexts among Social Media Users*

	Political Disagreement			
	Name Generators		General Indicators	
Variable	B (Var.)	SE (SD)	B (Var.)	SE (SD)
Fixed Effects: Mean Differences				
Intercept (Social Media)	1.22*	.06	1.94*	.10
Medium (Face-to-Face)	-.39*	.06	-.35*	.08
Medium (Anonymous Online)	--	--	-.70*	.08
Fixed Effects: Covariates				
Age	.00	.00	-.01*	.00
Gender (1 = Female)	.04	.07	.00	.11
Education	.01	.02	.09*	.03
Income	.01	.02	.00	.03
Political Efficacy	-.05	.04	.08	.06
Political Knowledge	.00	.03	-.04	.05
Political Interest	.10*	.03	.17*	.05
Strength of Ideology	-.04*	.02	.00	.03
Strength of Partisanship	-.10*	.05	.15	.08
Face-to-Face Political Talk	.00	.00	.00*	.00
Email Political Messaging	.12*	.03	.43*	.05
Offline News Use	.00	.00	.01	.01
Online News Use	.00	.00	-.01	.01
Social Media Use	.02*	.00	.00	.01
Random Effects				
Intercept (Subject)	(.01)	(.04)	(.52)	(.72)
Residual	(.99)	(.99)	(1.33)	(1.15)
Log Likelihood	-1552.2		-2074.5	

Notes. Cell entries are unstandardized beta coefficients (B), standard errors (SE), variances (Var.), and standard deviations (SD) estimated by maximum likelihood (ML) from a mixed effects linear model with a repeated-measures (within-subjects) design predicting political disagreement. The reference group for the medium variable is social media. Covariates are mean-centered. For name generators, N = 575, observations = 1097. For general indicators, N = 435, observations = 1225. *p < .05.

Table 2. *Estimated "Treatment" Effect of Social Media Use on Political Disagreement (Top) and Estimated Mean Differences in Political Disagreement between Social Media Users and Non-Users (Bottom)*

	Political Disagreement			
	Name Generators		General Indicators	
Variable	B	SE	B	SE
"Treatment"				
Intercept ($M_{Non\text{-}Users}$)	.87*	.07	.81*	.08
Social Media Use (1 = User)	.39*	.10	.81*	.11
Covariates				
Face-to-Face Political Talk	.00	.00	.01*	.00
Email Political Messaging	.00	.05	.41*	.06
Offline News Use	.01	.01	.00	.01
Online News Use	.00	.00	.01*	.01
R^2	.07		.41	
"Treatment" Group	M	SD	M	SD
Social Media Users	1.26	.07	1.62	.08
Non-Users	.87	.07	.81	.08

Notes. Cell entries (top) are unstandardized beta coefficients (B) and standard errors (SE) from ordinary least squares (OLS) regression analyses. Covariates are mean centered so that the intercept is interpretable as the mean of the non-users group, adjusted at the mean of the covariates. The coefficient for social media use is interpretable as the difference from the intercept, adjusted at the mean of the covariates. For the name generators, N = 287 and for the general indicators, N = 258. *p < .05. Cell entries (bottom) are bootstrapped adjusted means (M) and standard deviations (SD) (simulations = 1,000) derived from the same model formula.

Table 3. *The Relationships between News Network/ Use Variables and Political Disagreement on Social Media (General Indicators)*

	Social Media Political Disagreement (General Indicators)
Variable	B (SE)
Intercept	1.33 (.33)*
Age	-.01 (.00)*
Gender (1 = Female)	.09 (.15)
Education	.03 (.05)
Income	-.05 (.05)
Political Efficacy	-.06 (.09)
Political Knowledge	-.06 (.07)
Political Interest	.01 (.07)
Strength of Ideology	.01 (.04)
Strength of Partisanship	.12 (.10)
Face-to-Face Political Talk	.00 (.00)
Email Political Messaging	.01 (.08)
Offline News Use	.00 (.01)
Online News Use	.00 (.01)
Face-to-Face Political Disagreement	.33 (.05)*
Anonymous Online Political Disagreement	.42 (.05)*
Social Media Use	.00 (.01)
Social Media Political Messaging	.00 (.00)
Social Media News Use	**.03 (.01)***
Social Media News Network Size	**.00 (.00)**
Social Media News Network Diversity	**-.17 (.31)**
R^2	.49

Notes. Coefficients are unstandardized beta coefficients (B) with standard errors (SE) from ordinary least squares (OLS) regression model predicting political disagreement on social media. N = 349, *p < .05.

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Busso, M., DiNardo, J., & McCrary, J. (2014). New evidence on the finite sample properties of propensity score reweighting and matching estimators. *The Review of Economics and Statistics, 96*(5), 885-897. doi:10.1162/REST_a_00431

Nielsen, R. A. (2014). Case selection via matching. *Sociological Methods & Research*. Advance online access. doi: 10.1177/0049124114547054

COMMENT: Pages 6-12: Given the extensive set of variables included in the analysis I was surprised to not see strength of partisanship and/or strength of ideology. I would have included at least one, if not both, of these as controls.

RESPONSE: Thank you for this comment. The exclusion of these variables, was, admittedly, an oversight that has been corrected. All analyses now control for strength of ideology and strength of partisanship, as shown in the tables above. Measurement of these variables is reported on pg. 14.

> "*Strength of political ideology* used standard measures, which asked respondents to place themselves on an 11-point scale where 0 = Liberal and 10 = Conservative. This item was recoded with 0 at the midpoint. The absolute value was then taken as the final measure (M = 2.05, SD = 1.80). Finally, *strength of partisanship* was constructed using two survey items. The first asked which party respondents identified with (Green, Democratic, Republican, Libertarian), and the second asked how strong that identification is (1 = Not that strong, 2 = Strong). Respondents who did not identify with a party received a score of 0 on the final variable, while the strength of partisanship score was taken for those who did identify with a party (M = 1.27, SD = .75)."

COMMENT: Page 12: The matching technique throws away a great number of cases because there are far more social media users than non-users. Do the results change if the matching procedure is not used? I would also acknowledge that while matching can help improve causal inferences it cannot account for unobserved difference between treated and untreated subjects (e.g., Arceneaux et al. 2006).

RESPONSE: You are justified in wondering whether the matching procedure substantially changes estimates of disagreement. For the purposes of this response letter, disagreement means have been estimated without using the matching procedure, and results are included below. The matching results have also been included here so you can easily compare.

There are two points to note from this comparison. First, results are quite robust to the particular method used. Both matching and non-matching estimation produce similar conclusions. But, second, the mean estimates, particularly for the general indicators, are substantively different. Ostensibly, the matching procedure yields less biased results, and therefore more reliable estimates of the mean differences between users and non-users.

Additionally, your suggestion has been taken, and the limitations of the matching procedure regarding the inability to account for unobserved differences is noted on pg. 23:

> "Results from the matching procedure should also be interpreted with caution. While matching procedures have been shown to reduce selection bias in mean comparisons of non-randomly assigned groups (Abadie et al., 2015; Busso et al., 2014; Nielsen, 2014), it cannot account for unobserved differences between treated and untreated subjects (Arceneaux, Gerber, & Green, 2006)."

Table. *Ordinary Least Squares (OLS) Models Showing Mean Differences between Social Media Users and Non-Users without Matching Procedure*

	Political Disagreement			
	Name Generators		General Indicators	
Variable	B	SE	B	SE
Intercept ($M_{\text{Non-Users}}$)	.90***	.08	.87***	.10
Social Media Use (1 = User)	.36***	.08	.69***	.10
Age	.00	.00	-.01*	.00
Gender (1 = Female)	.02	.07	.04	.09
Education	.02	.02	.06*	.03
Income	.01	.02	.01	.03
Political Efficacy	-.06	.04	.07	.05
Political Knowledge	.00	.03	-.01	.04
Political Interest	.10**	.03	.16***	.04
Strength of Ideology	-.04	.02	-.02	.03
Strength of Partisanship	-.16**	.05	.12	.06
Face-to-Face Political Talk	.00	.00	.00***	.00
Email Political Messaging	.07	.04	.39***	.04
Online News Use	.00	.00	.01	.00
Offline News Use	.01	.00	-.01	.01
R^2	.12		.44	

Notes: Control variables are mean centered. The intercept is interpretable as the mean of the non-user group, adjusted at the mean of the control variables, and the coefficient for Social Media Use is interpretable as the mean difference of the user group in comparison to the non-user group, adjusted at the mean of the control variables. For the name generator outcomes, N = 522. For the general indicator outcomes, N = 583. *$p < .05$, **$p < .01$, **$p < .001$.

Table 2. *Estimated "Treatment" Effect of Social Media Use on Political Disagreement (Top) and Estimated Mean Differences in Political Disagreement between Social Media Users and Non-Users (Bottom)*

	Political Disagreement			
	Name Generators		General Indicators	
Variable	B	SE	B	SE
"Treatment"				
Intercept ($M_{Non\text{-}Users}$)	.87*	.07	.81*	.08
Social Media Use (1 = User)	.39*	.10	.81*	.11
Covariates				
Face-to-Face Political Talk	.00	.00	.01*	.00
Email Political Messaging	.00	.05	.41*	.06
Offline News Use	.01	.01	.00	.01
Online News Use	.00	.00	.01*	.01
R^2	.07		.41	
"Treatment" Group	M	SD	M	SD
Social Media Users	1.26	.07	1.62	.08
Non-Users	.87	.07	.81	.08

Notes. Cell entries (top) are unstandardized beta coefficients (B) and standard errors (SE) from ordinary least squares (OLS) regression analyses. Covariates are mean centered so that the intercept is interpretable as the mean of the non-users group, adjusted at the mean of the covariates. The coefficient for social media use is interpretable as the difference from the intercept, adjusted at the mean of the covariates. For the name generators, N = 287 and for the general indicators, N = 258. *p < .05. Cell entries (bottom) are bootstrapped adjusted means (M) and standard deviations (SD) (simulations = 1,000) derived from the same model formula.

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Busso, M., DiNardo, J., & McCrary, J. (2014). New evidence on the finite sample properties of propensity score reweighting and matching estimators. *The Review of Economics and Statistics, 96*(5), 885-897. doi:10.1162/REST_a_00431

Nielsen, R. A. (2014). Case selection via matching. *Sociological Methods & Research*. Advance online access. doi: 10.1177/0049124114547054

COMMENT: Page 14: Please explain why a comparison of means would introduce selection bias into the analysis. Apropos of an earlier comment, is this because individuals who do and do not use social media are systematically different from each other?

RESPONSE: You are correct that selection bias would be introduced due to the systematic differences between social media users and non-users. These differences are presented in the logit model above, in response to your earlier comment.

Because the goal of the analysis is to compare two groups that are not randomly assigned, as they would be in a controlled experiment, the matching procedure reduces selection bias by constructing two groups that are as comparable as possible along specific observed criteria. As you noted earlier, the matching procedure cannot account for unobserved differences between the groups, and, once again, this limitation has been noted in the section described above on pg. 23.

> "Results from the matching procedure should also be interpreted with caution. While matching procedures have been shown to reduce selection bias in mean comparisons of non-randomly assigned groups (Abadie et al., 2015; Busso et al., 2014; Nielsen, 2014), it cannot account for unobserved differences between treated and untreated subjects (Arceneaux, Gerber, & Green, 2006)."

COMMENT: Page 18: The point about observational data and establishing causation is well taken. Please remove all causal language from the description and discussion of the results.

RESPONSE: All causal language has been removed from the results and discussion section. Examples are highlighted below, and this limitation has also been noted in the discussion.

On pgs. 19-20:

> "The findings also provide additional evidence that news use may potentially act as a mechanism the perception of political disagreement on social media. Social media use is associated with having more diverse social and information networks (Bakshy et al., 2015; Barberá, 2014; Lee et al., 2014), and engaging with this relatively more diverse news content promotes cognitive elaboration and reflection processes that results in the perception of disagreement (Barnidge, 2015; Kim, 2011; Kim et al., 2013). Because this study cannot establish causality in this relationship, future research should focus on testing the effect of social media news use on perceived disagreement in a controlled experiment."

On pg. 21:

> "Social media users perceive more political difference than non-users, and they perceive that difference on social media more than they do elsewhere. This conclusion implies that communication within the egocentric networks of social media users is relatively more diversified, rather than more normalized, than communication among non-users."

And in the limitations, on pg. 23:

> "Finally, these data are cross-sectional, and therefore cannot be used to make causal inferences."

COMMENT: The figures need confidence intervals.

RESPONSE: Confidence intervals have been included in the new graphs, which have been consolidated into a single figure shown below:

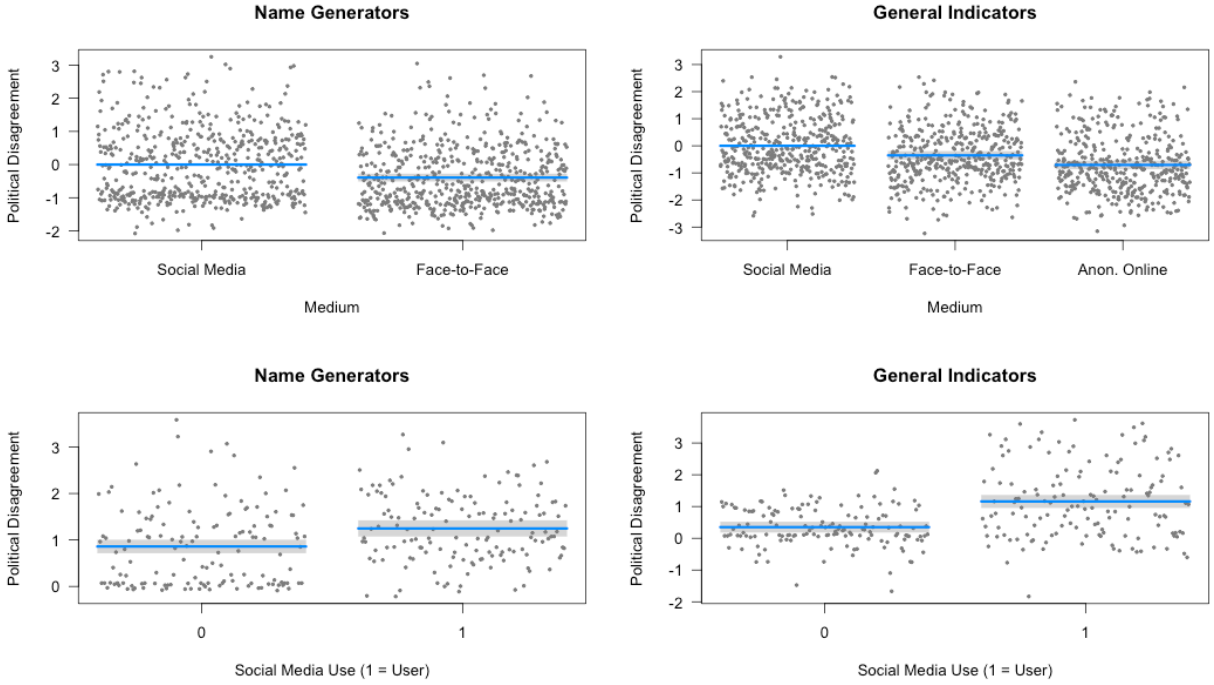

Figure 1. (Top) Mean differences in perceived political disagreement in various communication settings for the name generators (left) and general indicators (right) among social media users, as estimated from the model shown in Table 1. (Bottom) Mean differences in perceived political disagreement between social media users and non-users for the name generators (left) and general indicators (right), as estimated from the model shown in Table 2.

Reviewer 2 Comments

COMMENT: All in all, the paper is interesting and addresses an important issue. As the authors note, not many datasets are suitable to assessing the relative occurrence of exposure to disagreement within online social networks, face-to-face, and in anonymous online spaces. The data are appropriate and the analytical methods quite sophisticated (although the descriptions of the methods overshadow the substantive meaning of the results). My major concern regards the theory and the literature review, which would need to be rewritten and substantially re-thought before the paper can be published.

RESPONSE: Thank you for these comments. The manuscript has been substantially revised in line with your suggestions regarding the theory and literature review, and these revisions have made the paper much stronger, theoretically, than it was before.

COMMENT: The paper lacks a clear and strong theoretical framework and the current literature review seems quite disorganized and a bit superficial. The authors write that "comparisons are missing from the literature that would allow fundamental theoretical claims" regarding disagreement, and later advance their testable propositions, which are – in essence – empirical hypotheses that have little to do with "theoretical claims." The paper would be much stronger if the authors – theoretically – developed the argument for why different kinds of online settings should expose people to more disagreement (i.e., what is it about the internet / social media that should generate more disagreement or perception thereof; what it is about anonymity versus online social media; shouldn't' we actually expect greater exposure to disagreement from anonymous spaces). Such a systematic and theoretically (not empirically) grounded review is currently missing from the paper. Some related concerns include:

- What are the theoretical frameworks that the authors draw on/combine/expand?

RESPONSE: Your comment is well taken and substantial revisions have been made to improve the theoretical coherence of the paper. The paper now makes clear the distinction between exposure to cross-cutting views and the perception of political disagreement, and offers a theoretical rationale how one results in the other and why this is more likely on social media.

Briefly, the paper theorizes that social media facilitate exposure to cross-cutting views because (a) they are characterized by the same multidimensional relationships as in face-to-face settings, only without the limitations imposed by geographic space and (b) social norms encourage expression and the posting of political content.

From there, the paper goes on to theorize that news use, specifically, promotes cognitive elaboration and reflection, which could potentially lead to one of several social-psychological processes that leads to the perception of disagreement, including (1) social judgment, (2) dissonance reduction, or (3) social identification.

The revised manuscript reflects this theoretical clarity at all stages, beginning with the introduction on pg. 2, which uses the language of perception and related cognitive processes:

> "Social media such as Facebook and Twitter, on the other hand, articulate multidimensional relationships that are not necessarily defined by political preferences or bounded by geographical space (Barberá, 2014; Brundidge, 2010; Ellison, Steinfeld, & Lampe, 2007) and promote cognitive processes of elaboration and reflection (Cho et al., 2009; Shah et al. 2007) that result in the perception of disagreement. Therefore, social media likely facilitate political disagreement (Bakshy, Messing, & Adamic, 2015; Barberá, 2014; Barnidge, 2015; Kim, 2011; Kim, Hsu, & Gil de Zúñiga 2013)."

Additionally, language about "missing comparisons" has been removed from the introduction in favor of this more theoretical approach.

> "Employing a survey of adults in the United States, this paper tests the claim that social media facilitate the perception of political disagreement and whether news on social media helps to explain these perceptions."

Next, political disagreement has been defined on pg. 3:

> "Political disagreement is the perception of difference resulting from an encounter with cross-cutting information, and it holds a central place in theories of deliberative democracy because it encourages reflection about previously held ideas (Price, Capella, & Nir, 2002) and promotes tolerance of oppositional views (Mutz, 2006)."

Additionally, the argument about why social media promote exposure to cross-cutting views has been expanded in the literature review from pgs. 4-6.

> "**Cross-Cutting Information across Communication Settings**
>
> **"**Prior research points toward two social factors that facilitate or limit exposure to cross-cutting information: the multidimensionality of social affiliation and social norms of discussion and dissent. First, research shows that exposure to cross-cutting views is more likely to occur where social affiliation is not strictly defined by political interests or preferences (Gaines & Mondak, 2009; Huckfeldt et al., 2004; Wellman & Gulia, 1999; Wojcieszak & Mutz, 2009). In other words, people are more likely to encounter cross-cutting views from people with whom they affiliate for non-political reasons. Second, social norms that govern specific communicative settings can also encourage or discourage cross-cutting views (Eliasoph, 1998; McKuen, 1990; Walsh, 2004). In other words, specific groups and individuals establish particular tendencies when it comes to expressing dissent, depending on the nature and purpose of social interaction.
>
> These two factors — the multidimensionality of social affiliation and social norms — also provide useful dimensions along which to compare various communication settings in terms of their likelihood to promote exposure to cross-cutting views. Face-to-face relationships are characterized relatively high levels of multidimensionality in social

affiliation (Huckfeldt et al., 2004). Although people exhibit selectivity in social affiliation, politics is not always at the forefront of people's minds when choosing discussion partners, and two individuals are more likely to disagree about politics in these cases (Huckfeldt et al. 2004). Therefore, interpersonal social networks tend to sustain overlapping and multidimensional patterns of social affiliation, which may promote disagreement. However, at the same time, social norms often discourage disagreement in face-to-face conversation. Most individuals seek common ground with discussion partners (Conover, Searing & Crewe, 2002; MacKuen, 1990; Walsh, 2004), and many social and political groups actively discourage disagreement (Eliasoph, 1998). Thus, face-to-face settings exhibit a high degree of multidimensionality in social affiliation, but are also governed by social norms that may limit disagreement.

Anonymous online media — message boards or sites such as reddit.com, for example — exhibit comparatively lower levels of multidimensionality in social affiliation. Research shows a tendency toward interest-based selectivity on these online media, which means that people migrate to particular forums for specific reasons (Wellman & Gulia, 1999). When it comes to politics, people tend to visit like-minded discussion forums, which are characterized much more by agreement than by disagreement (Davis, 1998; Hill & Hughes, 1998; Sunstein, 2007). The prominent exception is sites not specifically dedicated to politics (Gaines & Mondak, 2009; Wojcieszak & Mutz, 2009), but these sites are exceptional precisely because political discussion occurs with social ties not specifically selected for politics. In addition to low levels of multidimensionality in social affiliation, anonymous online media also feature social norms that often discourage disagreement. For example, disagreement is often met by "flaming" or "ad hominem" attacks — a way for those in the majority to police the norms of the message board (Davis, 1998; Hill & Hughes, 1998). Thus, individuals are likely exposed to *less* cross-cutting information than they are in face-to-face settings.

In comparison to both face-to-face and anonymous online settings, social media likely promote exposure to cross-cutting information because they (a) exhibit higher levels of multidimensionality in social affiliation and (b) are governed by social norms that do not discourage disagreement. Most people use social media to articulate social connections rather than to establish connections with new people (although some sites, such as Twitter, are more commonly used for this purpose than others, such as Facebook or Instagram; boyd & Ellison, 2007; Ellison et al., 2007), and therefore social media networks are characterized by the same overlapping dimensions of social affiliation as face-to-face settings. But, in addition, social media articulate relationships that cut across geographic obstacles for information sharing and discussion (Brundidge, 2010), making a wider range of political considerations more salient on a day-to-day basis (Kwon et al., 2014). Therefore, social media diversify communication within social networks even if they don't diversify social networks themselves, with the result that individuals are more frequently exposed to information from across the political spectrum (Bakshy, Messing, & Adamic, 2015; Barberá, 2014; Barnidge, 2015; Brundidge, 2010; Kim, 2011; Kim et

al., 2013). Furthermore, the norms governing social media tend to promote information sharing and commenting on political posts (Bakshy, Rosenn, Marlow, & Adamic, 2012; Brundidge, 2010; Loader & Mercea, 2011), and interpersonal recommendations for news articles may trump partisan news cues in terms of informational selectivity (Messing & Westwood, 2014). Thus, social media networks exhibit high degrees of multidimensionality in social affiliation, and social norms encourage posting and discussion about politics. Therefore, social media settings likely promote exposure to cross-cutting information in comparison to both face-to-face and anonymous online settings."

Next, literature about how engagement with news content promotes cognitive elaboration and reflection has been included on pgs. 6-7:

"**Engagement with Social News and the Perception of of Disagreement**

Recent research suggests that social media may promote news use. About 50% of adult internet users in the United States get news from social media (Mitchell, Gotfried, Kiley, & Matsa 2014), and there is a positive relationship between general use and news use in various political contexts (Gil de Zúñiga, Jung, & Valenzuela, 2012; Valenzuela, Arriagada, & Scherman, 2012). This development is important because news use is associated with cognitive reflection and elaboration (Cho et al., 2009; Shah et al., 2007). These processes of reflection and elaboration mediate the relationship between news use and subsequent perceptions, changes in opinion or attitudes, or behavior. Thus, the ways that people process information largely facilitates the perception of political disagreement."

Finally, several potential social-psychological theories that could help explain how elaboration and reflection might result in the perception of disagreement are discussed on pgs. 7-8:

"Several social-psychological theories help to explain why cognitive elaboration and reflection could result in the perception of political disagreement. First, social judgment theory holds that people have "latitudes" of rejection and acceptance for political ideas (Sherif & Hovland, 1961). If, upon critical reflection, an individual determines that an idea falls outside of their latitude of acceptance, the individual will be more likely to perceive disagreement with the source of the idea. Second, cognitive dissonance theory (Festinger, 1957) suggests that when a cognitive conflict arises — for example, between a previously held opinion or preference and a new perspective or idea — individuals will resolve this conflict by developing consistent attitudes and opinions relative to their pre-existing beliefs. Thus, if a new political idea conflicts with an individual's previously held attitudes or beliefs, they will be more likely to perceive that disagreement has occurred. Finally, social identity theory proposes that the presence of an "out-group" makes "in-group" identification more likely (Tajfel, 1982). If a new political idea is accompanied by visible or implicit social cues that suggest the message source belongs to

an oppositional political group, an individual becomes more likely to contrast their own social identity with the identity of the out-group. Thus, social identity processes could also make the perception of political disagreement more likely."

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COMMENT: On p. 3, the authors cursorily outline the idea that an indirect engagement with political discussion provides more opportunities for exposure to disagreement. Yet, this paragraph does not offer any rationale for this claim, and – in general – the diverse ideas outlined that important paragraph do not connect well with each other.

COMMENT: Other minor issues include:
- The authors mention congruence versus perception-based studies; it would be beneficial to define what is meant by each.

COMMENT: Also, are we interested in exposure to disagreement from others or to dissimilar political views in general? Are there differences between these two concepts that would lead us to expect differential patterns of relationships between various communicative forms and exposure to disagreement / dissimilar political views?

RESPONSE: These comments are appreciated because they offer opportunities to clarify thee points. The purpose of the section "Political Disagreement" (now on pgs. 3-4) was to establish that this study relies on perception-based measures of disagreement and to make a case for doing so. As such, the discussion of indirect engagement has been saved for later in the paper, while the section in question has been edited and the case for perception-based measured has been expanded. In line with your comments, congruence versus perception-based studies have been defined more clearly. Additionally, the difference between disagreement and incongruent political information has been clarified here.

"**Political Disagreement**

Political disagreement is the perception of difference resulting from an encounter with cross-cutting information, and it holds a central place in theories of deliberative democracy because it encourages reflection about previously held ideas (Price, Capella, & Nir, 2002) and promotes tolerance of oppositional views (Mutz, 2006). But differences in the conceptualization and operationalization of political disagreement have led to divergent conclusions about how often individuals encounter political disagreement in their daily lives (Klofstad, Sokhey, & McClurg, 2012). The now-classic studies on political disagreement defined it either as the lack of congruence between two discussants (e.g., Huckfeldt et al., 2004), as judged by some third-party observer (e.g., a researcher), or the perception of difference with one's own political views (e.g., Mutz, 2006), as

> judged by respondents themselves. The two approaches differ in terms of *whose* judgment to trust about whether two individuals disagree, and this difference is not trivial: Congruence-based studies generally find more evidence of disagreement, while perception-based studies usually find less. That is, third-party observers tend to report more political difference, while the subjects being observed typically report less.
>
> The present study adopts the latter approach (i.e., the perception-based approach) to observing political disagreement for several reasons. First, a perception-based approach allows for a distinction between the perception of difference and exposure to politically cross-cutting information. While exposure to cross-cutting information may be necessary for the perception of disagreement, individuals could potentially be exposed to cross-cutting information without perceiving disagreement. And, after all, if individuals do not perceive that disagreement has occurred, it will have less of an effect on their behavior (Mutz, 2006). While political incongruence has been shown to have subtle effects on voting preferences (Huckfeldt & Sprague, 1995), the *experience* of disagreement has more dramatic effects on the ways people engage with politics (Mutz, 2006). Additionally, perception-based measures offer stricter standards for hypothesis testing than congruence-based measures because they are less susceptible to type II error — that is, the reporting of a false positive result that occurred because a third party introduced variability and/or measurement error into the observation process."

The discussion of direct versus indirect engagement now appears for the first time on pg. 7:

> "In offline environments, these cognitive processes are greatly aided by political discussion — that is, *direct* engagement with cross-cutting news and social opinion through discussion and/or commentary with others. And while research shows that news use on social media promotes political expression (Gil de Zúñiga et al., 2012; Valenzuela et al., 2012), other recent research suggests that commenting on news articles is relatively rare (Hampton et al., 2014). However, social media users do necessarily need to comment on these threads in order to perceive that they disagree with others; rather, they can "lurk" around the conversation and get a sense of what others think and feel about news articles through a process called social opinion monitoring (Kwon et al., 2014; Schulz & Roessler, 2012). While people have always monitored their social environments for political opinion (Noelle-Neumann, 1984 [1993]), social media arguably enhance people's ability to do so because these platforms provide opinion indicators in both aggregated (i.e., "likes" or "shares") and individual form (i.e., comments). These social media affordances expose people to more indicators social opinion (Schulz & Roessler, 2012), which gives people more opportunities to *indirectly* engage via cognitive elaboration and reflection (Cho et al., 2009) and therefore to perceive political disagreement (Barnidge, 2015)."

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COMMENT: Also later the arguments do not really hang together (e.g., on the one hand the authors mention interest-based selectivity, according to which online spaces should be politically diverse; but immediately later note that this may result in like-minded political communities).

RESPONSE: This comment also offers an opportunity for clarification. The paper argues that interest-based selectivity results in less political diversity, not more. If you were unclear about this point, the readers may also be confused. Therefore, the text in question has been edited for clarity on pgs. 5:

> "Research shows a tendency toward interest-based selectivity on these online media, which means that people migrate to particular forums for specific reasons (Wellman & Gulia, 1999). When it comes to politics, people tend to visit like-minded discussion forums, which are characterized much more by agreement than by disagreement (Davis, 1998; Hill & Hughes, 1998; Sunstein, 2007). The prominent exception is sites not specifically dedicated to politics (Gaines & Mondak, 2009; Wojcieszak & Mutz, 2009), but these sites are exceptional precisely because political discussion occurs with social ties not specifically selected for politics."

COMMENT: The hypotheses are not theoretically grounded (especially H3, which suddenly addresses several previously unmentioned issues and concepts).

COMMENT: Related to the above and to the lack of theoretically-driven empirical models - many concepts are not explicated or defined (e.g., Social media news network size, Social media news use, Social media news network diversity). If these concepts are important, they should be outlined and defined in the theory section. In a similar vein, numerous variables appear in the methods section without having been mentioned earlier (e.g., positive evaluation, closeness, etc.).

RESPONSE: Your point is well taken, and literature about news use, news network size, and news network diversity has been added. First, on pg. 6, news use is discussed in light of its tendency to promote processes of cognitive elaboration and reflection:

> "Recent research suggests that social media may promote news use. About 50% of adult internet users in the United States get news from social media (Mitchell, Gotfried, Kiley, & Matsa 2014), and there is a positive relationship between general use and news use in various political contexts (Gil de Zúñiga, Jung, & Valenzuela, 2012; Valenzuela, Arriagada, & Scherman, 2012). This development is important because news use is associated with cognitive reflection and elaboration (Cho et al., 2009; Shah et al., 2007). These processes of reflection and elaboration mediate the relationship between news use and subsequent perceptions, changes in opinion or attitudes, or behavior. Thus, the ways that people process information largely facilitates the perception of political disagreement."

Network size and diversity are discussed on pgs. 8-9:

> "Users who have larger and more diverse news networks on social media should be more likely to encounter cross-cutting information, thus increasing the chances that cognitive elaboration and reflection processes result in the perception of political disagreement. Larger, more diffuse networks are better at spreading information in social networks (Adar & Adamic, 2005; Bakshy, Karrar, & Adamic, 2009; Cha, Mislove, & Gummed, 2009), increasing the likelihood that users will be exposed to a given news story. Additionally, larger networks are also more likely to expose users to news posts from across sides of the political spectrum (Bakshy et al., 2015; Barberá, 2015) because they contain more weak ties (Granovetter, 1973). Therefore, users who have larger and more diverse news networks on social media should be encounter more cross-cutting information, thus making it more likely that cognitive elaboration and reflection processes result in the perception of political disagreement."

Finally, the hypotheses have been grouped together at the end of this section (pg. 9) and tied to the theoretical perspective described above:

> "Because social media networks (a) increase the likelihood of exposure to cross-cutting information and (b) promote cognitive reflection and elaboration processes that result in the perception of political disagreement, this study proposes that social media facilitates the perception of political disagreement in comparison to both face-to-face and anonymous online settings. But there are various ways to formulate that belief as a prediction. The first approach involves comparing individual social media users' perceived political disagreement to those same users' perceptions in other settings:
>
> > H1: Social media users will perceive more political disagreement on social media than in (a) face-to-face or (b) anonymous online settings.
>
> By contrast, the second approach involves comparing social media users to non-users:
>
> > H2: Social media users will perceive more political disagreement than non-users.
>
> Assuming that news networks and news use largely drives both exposure and promotes cognitive processes, it follows that social media news use, news network size, and news network diversity will be positively related to political disagreement on social media:
>
> > H3: Among social media users, (a) social media news use, (b) social media news network size, and (c) social media news network diversity will be positively related to the perception of political disagreement on social media.

COMMENT: Other theoretical possibilities are not mentioned or tested (e.g., those who often turn to news are more interested, more knowledgeable, more strongly opinionated and – as such

– they have a greater latitude of rejection and for this reason perceive more disagreement). In fact, the social judgment theory could provide one of the possible theoretical anchors for the tested claims (others may include cognitive dissonance theory, for instance).

RESPONSE: You are quite right to point out that these and other theories could help to explain how cross-cutting information could result in the perception of political disagreement. On pgs. 7-8, several theoretical possibilities for how cognitive elaboration and reflection could result in the perception of political disagreement, including social judgment theory, cognitive dissonance theory, and social identity theory:

> "Several social-psychological theories help to explain why cognitive elaboration and reflection could result in the perception of political disagreement. First, social judgment theory holds that people have "latitudes" of rejection and acceptance for political ideas (Sherif & Hovland, 1961). If, upon critical reflection, an individual determines that an idea falls outside of their latitude of acceptance, the individual will be more likely to perceive disagreement with the source of the idea. Second, cognitive dissonance theory (Festinger, 1957) suggests that when a cognitive conflict arises — for example, between a previously held opinion or preference and a new perspective or idea — individuals will resolve this conflict by developing consistent attitudes and opinions relative to their pre-existing beliefs. Thus, if a new political idea conflicts with an individual's previously held attitudes or beliefs, they will be more likely to perceive that disagreement has occurred. Finally, social identity theory proposes that the presence of an "out-group" makes "in-group" identification more likely (Tajfel, 1982). If a new political idea is accompanied by visible or implicit social cues that suggest the message source belongs to an oppositional political group, an individual becomes more likely to contrast their own social identity with the identity of the out-group. Thus, social identity processes could also make the perception of political disagreement more likely."

COMMENT: Also, some methodological decisions are not immediately clear (e.g., the cap of 200 facebook friends; many people have substantially more and so the tested relationships should be different for that long tail). Further, the measures of exposure to disagreement should perhaps be weighted by the political talk items. What if some respondents report never discussing politics online and face to face? Also, the inclusion of all the numerous variables certainly contributes to explained variance in the models, yet seems to represent a kitchen-sink strategy whereby all potentially relevant concepts are included without prior theoretical guidance.

RESPONSE: You raise three valid and important methodological concerns in this comment. First, your suggestion to lift the cap on the network size variable has been taken. Because this variable was used to construct the network diversity variable, the descriptions for both measures appear on pg. 12-13:

> "**Social media news network size.** Theory suggests that social media news use acts as a mechanism for exposure to political disagreement because social media expand information networks (Barbera, 2014; Brundidge, 2010), and therefore it is also important to examine the role of social media news network size. Respondents were asked how many (a) family members, (b) friends, (c) coworkers or classmates, and (d) other acquaintances post news or political commentary on (1) Facebook and/or (2) Twitter. The same filtering strategy was used as described for social media news use. Scores were added within media and then averaged (M = 35.21, SD = 80.67, min = 0.00, max = 920.00).
>
> **Social media news network diversity**. Theory also suggests a prominent role for social media news network diversity. The variable was created by taking the proportion of each social tie category out of the total network size. From an ecological perspective, perfect diversity would mean that the categorical proportions are equal, that is, they would all be .25. But from a socio-structural perspective, diversity refers to the prevalence of certain types of social ties over others (e.g., Granovetter, 1973). Hence, the best measure is one that captures a weighted deviation from ecological equality (i.e., from .25). Therefore, each category's deviation from .25 was calculated and assigned the following weights: family members = *-1, friends = *-.5, coworkers or classmates = *1, other acquaintances = *1. The measure thus considers coworkers, classmates, and acquaintances to be more diverse, and it considers friends and family to be less diverse (M = 0.29, SD = 0.22)."

Second, although it is a very good suggestion for future research to weight disagreement by discussion frequency, discussion frequency was not measured in the name generators portion of the current survey. This limitation has been included on pg. 22:

> "Third, discussion frequency was not measured in the name generators portion of the survey, and therefore the study cannot distinguish between disagreement that does or does not arise from discussion on social media."

Although the paper is limited in this way, its theory suggests that discussion is not necessary to perceive disagreement in social media contexts because users can get a sense of what others think and feel about a topic without directly engaging in discussion (Kwon, Stefanone, & Barnett, 2014; Schultz & Roessler, 2012). Furthermore, the name generator items specifically ask respondents to name "somebody who frequently posts about politics or public affairs," and, therefore, it can be assumed that the named individuals frequently post about politics on social media and that the respondents have been exposed to that content.

References

Kwon, K. H., Stefanone, M. A., & Barnett, G. A. (2014). Social network influence on online behavioral choices: Exploring group formation on social network sites. *American Behavioral Scientist 58*(10), 1345-1360. doi: 10.1177/0002764214527092

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communication environments. *International Journal of Public Opinion Research, 24*(3), 346-367. doi: 10.1093/ijpor/eds022

Third, model specification has been updated across all stages of the analysis in line with your previous comments.

As shown in the tables and notes below, the matching criteria used are age, gender, income, education, political knowledge, political interest, political efficacy, strength of ideology, and strength of partisanship. Covariates, which are considered exogenous to social media use but may affect estimates of disagreement, now include face-to-face political talk, email political talk, offline news use, and online news use.

Repeated-measures analyses control for all these same variables and frequency of social media use. Finally, the OLS analysis layers on social media political messaging and disagreement in other settings while estimating the relationships between disagreement and news use, news network size, and news network diversity.

Modeling choices for all stages of the analysis have been explicitly described in the Analysis section on pages 15-17. Please note that some of this text has been refashioned from the Results section, which has been streamlined and edited accordingly.

"Analysis

To analyze where social media users are exposed to political disagreement, a repeated-measures analysis was conducted with both the name generator items (which has two categories within individuals: social media and face-to-face) and the general disagreement indicators (three categories: social media, face-to-face, anonymous online) using a hierarchical linear modeling (HLM) technique that treats individual respondents as a second-level variable with a random intercept while assessing mean levels of disagreement in each medium at the first level. These models assess differences within individual users across communication contexts while controlling for demographics (including age, gender, education, and income), political orientations that may affect the perception of disagreement (including political efficacy, political knowledge, political interest, strength of ideology, and strength of partisanship), and communication variables that are conceptually prior to social media use but possibly related to the perception of disagreement (including face-to-face political talk, email political messaging, offline news use, and online news use). Finally, the models control for frequency of social media use itself. All control variables have been mean-centered, so that the model intercept is interpretable as the mean of political disagreement in the reference category (social media), adjusted at the mean of all other variables. The lone exception to this rule is the gender variable (1 = female), which was not mean centered. Thus, results are reported among males (where female = 0; note that the coefficient is not statistically significant in either model, nor does female interact with other variables in the models).

To assess differences in overall exposure to political disagreement between social media users and non-users, the nearest-neighbors matching technique was combined with

ANOVA-by-regression to estimate the "treatment" effect of social media use on political disagreement. A simple comparison of means between these two groups would introduce selection bias into the estimation process due to systematic differences between social media users and non-users; by constructing more comparable groups along key criteria, matching procedures have been shown to produce less biased estimates (Abadie, Diamond, & Hainmueller, 2015; Busso, DiNardo, & McCrary, 2014; Nielsen, 2014). First, propensity scores were constructed with a logistic regression (logit) model predicting social media use (1 = user, 0 = non-user) based on the demographic (age, gender, education, and income) and political orientation variables (political efficacy, political knowledge, political interest, strength of ideology, and strength of partisanship).[2] Next, the nearest neighbor method was used to randomly match non-users to each user. This procedure yielded improvement in balance in most matching variables.[3] Because there were more users than non-users, users were randomly selected for the matching procedure. Once the groups were constructed, the "treatment" effect of social media use was estimated through an ANCOVA-by-regression (OLS) procedure. These models control for communication variables that are conceptually prior to social media use but theoretically related to the perception of political disagreement, including face-to-face political talk, email political messaging, offline news use, and online news use. These covariates were mean-centered to ease the interpretation of the intercept (the mean for the non-users group at the mean of the covariates). Means differences were also re-estimated using boostrapping techniques (1,000 simulations).

To analyze the proposed mechanisms for exposure to disagreement on social media (social media news use, social media news network size, and social media news network diversity), ordinary least squares (OLS) regression is used to assess the relationships between these variables and political disagreement on social media among the subgroup of social media users. These models control for the same demographics, political orientations, and communication variables as before. Additionally, they control for disagreement in other communication settings (face-to-face and anonymous online) and political talk on social media. A final model is submitted to a three-fold cross-validation comparing a "full" model to a "null" model, and mean squared prediction errors (MSPEs) are reported."

Given that the matching criteria have changed somewhat, the footnotes describing the logit results have also changed. These results are presented in the note referenced on pg. 16 and shown on pg. 23-24:

"[2] The following logit coefficient estimates (with standard errors in parentheses) predicting social media use (1 = social media user) were used as propensity scores: $P_{\text{social media use}} = 1 / 1 + e^{-(2.42(.44) - .04(.01)_{\text{age}} + .56(.20)_{\text{female}} - .08(.07)_{\text{education}} - .03(.07)_{\text{income}} - .04(.13)_{\text{political efficacy}} + .00(.10)_{\text{political knowledge}} + .10(.10)_{\text{political interest}} - .04(.06)_{\text{strength of ideology}} + .24(.15)_{\text{strength of partisanship}})}$. McFadden Pseudo $R^2 = .07$, Nagelkerke $R^2 = .11$, N = 615. Percent improvement for propensity score variables are as follows: distance = 20.00, age = 21.80, gender = 11.02, income = 53.49, education = 11.52, political efficacy = -105.15, political interest = 14.03, political knowledge = 26.18, strength of ideology = 68.75, strength of partisanship = -24.69.

For the purposes of this response letter, logit results are also shown in the table below:

Table. *Logistic (Logit) Regression Model showing Systematic Difference in Social Media Use (1 = User, 0 = Non-User) along Demographics and Political Orientations*

Variable	Estimate	Std. Error	Exp. Coefficient	95% LL	95% UL
Intercept	2.42***	.44	11.30	4.86	27.19
Age	-.04***	.01	.97	.96	.98
Gender (1 = Female)	.56**	.20	1.76	1.17	2.62
Education	-.08	.07	.93	.81	1.06
Income	-.03	.07	.97	.85	1.11
Political Efficacy	-.04	.13	.96	.75	1.23
Political Knowledge	.00	.10	1.00	.82	1.23
Political Interest	.10	.10	1.10	.90	1.34
Strength of Ideology	-.04	.06	.96	.86	1.09
Strength of Partisanship	.24	.15	1.27	.94	1.71

Notes: McFadden's Pseudo R^2 = .07, Nagelkerke R^2 = .11. N = 615. *p < .05, **p < .01, **p < .001.

The results have been streamlined and updated on pgs. 17-19:

"**Results**

The first set of hypotheses (H1a & H1b) posits that people will perceive more disagreement on social media than elsewhere, and repeated-measures analyses were conducted to test this prediction (see Table 1). At the level of individual respondents, both models show relatively low levels of variation within subjects, as indicated by the fact that the residual variance (i.e., variance not explained by the within-subjects term) is larger than the within-subjects variance in both models. For the name generators, the within-subjects variance is .01 (vs. residual variance of .99); for the general indicators, the within-subjects variance is .52 (vs. residual variance of 1.33). These figures yield relatively low intra-class correlation coefficients (ICC = .01, for the name generators; ICC = .28, for the general indicators).

Both models also show significant differences by medium. The fixed intercept term for the name generators (the mean of the social media category) is 1.22 (SE = .06, p < .05), while the mean in the face-to-face discussion category is significantly lower at .83 (B = -.39, SE = .06, p < .05). This difference is illustrated in Figure 1. Differences are also detected with the general indicators. Social media users perceive more political disagreement on social media (B = 1.94, SE = .10, p < .05) than in interpersonal talk and anonymous online settings (face-to-face: B = -.35, SE = .08, p < .05; anonymous online: B = -.70, SE = .08, p < .05). These results provide strong support for H1a and H1b. Social media users generally perceive more political disagreement on social media than they are elsewhere.

> The second hypothesis predicts that social media users would perceive more political disagreement than non-users, and a matching procedure combined with ANOVA-by-regression was used to test this prediction. Adjusted means were then re-estimated using bootstrapping techniques with the same model formula. Results, which which strongly support H2 and are shown in Table 2, show that estimated means in the users group (1.26 in the name generators model [B = .39, SE = .10, $p < .05$] and 1.62 in the general indicators model [B = .81, SE = .11, $p < .05$]) are higher than the non-users group (.89 [*SE* = .07, $p < .05$] in the name generators model and .57 in the general indicators model [*SE* = .11, $p < .05$]). These differences are also illustrated in Figure 1, and they show that in the matched sample, social media users perceive more political disagreement than non-users.
>
> If using news from diverse sources is the mechanism through which social media users perceive political disagreement, then one or more indicators of social media news use and/or news networks should be positively related to political disagreement on social media. Results of these tests (OLS regression) are shown in Table 3. Of the three indicators — social media news use, social media news network size, and social media news network diversity — only social media news use is significantly related (B = .03, SE = .01, $p < .05$). The full model (mean squared prediction error [MSPE] = 173.98) performed better than the null model (MSPE = 195.28) in a three-fold cross-validation. Because of the relatively high R^2 statistic (.49), models were also estimated without interpersonal and anonymous online disagreement (both of which were strongly related to social media disagreement). When either is removed, explained variance decreases while the coefficients change little. These results support H3a, but not H3b and H3c, showing that news use and political disagreement are positively associated on social media."

And, finally, the revised tables:

Table 1. *Estimated Differences in Political Disagreement across Communication Contexts among Social Media Users*

	Political Disagreement			
	Name Generators		General Indicators	
Variable	B (Var.)	SE (SD)	B (Var.)	SE (SD)
Fixed Effects: Mean Differences				
Intercept (Social Media)	1.22*	.06	1.94*	.10
Medium (Face-to-Face)	-.39*	.06	-.35*	.08
Medium (Anonymous Online)	--	--	-.70*	.08
Fixed Effects: Covariates				
Age	.00	.00	-.01*	.00
Gender (1 = Female)	.04	.07	.00	.11
Education	.01	.02	.09*	.03
Income	.01	.02	.00	.03
Political Efficacy	-.05	.04	.08	.06
Political Knowledge	.00	.03	-.04	.05
Political Interest	.10*	.03	.17*	.05
Strength of Ideology	-.04*	.02	.00	.03
Strength of Partisanship	-.10*	.05	.15	.08
Face-to-Face Political Talk	.00	.00	.00*	.00
Email Political Messaging	.12*	.03	.43*	.05
Offline News Use	.00	.00	.01	.01
Online News Use	.00	.00	-.01	.01
Social Media Use	.02*	.00	.00	.01
Random Effects				
Intercept (Subject)	(.01)	(.04)	(.52)	(.72)
Residual	(.99)	(.99)	(1.33)	(1.15)
Log Likelihood	-1552.2		-2074.5	

Notes. Cell entries are unstandardized beta coefficients (B), standard errors (SE), variances (Var.), and standard deviations (SD) estimated by maximum likelihood (ML) from a mixed effects linear model with a repeated-measures (within-subjects) design predicting political disagreement. The reference group for the medium variable is social media. Covariates are mean-centered. For name generators, N = 575, observations = 1097. For general indicators, N = 435, observations = 1225. *p < .05.

Table 2. *Estimated "Treatment" Effect of Social Media Use on Political Disagreement (Top) and Estimated Mean Differences in Political Disagreement between Social Media Users and Non-Users (Bottom)*

	Political Disagreement			
	Name Generators		General Indicators	
Variable	B	SE	B	SE
"Treatment"				
Intercept ($M_{Non\text{-}Users}$)	.87*	.07	.81*	.08
Social Media Use (1 = User)	.39*	.10	.81*	.11
Covariates				
Face-to-Face Political Talk	.00	.00	.01*	.00
Email Political Messaging	.00	.05	.41*	.06
Offline News Use	.01	.01	.00	.01
Online News Use	.00	.00	.01*	.01
R^2	.07		.41	
"Treatment" Group	M	SD	M	SD
Social Media Users	1.26	.07	1.62	.08
Non-Users	.87	.07	.81	.08

Notes. Cell entries (top) are unstandardized beta coefficients (B) and standard errors (SE) from ordinary least squares (OLS) regression analyses. Covariates are mean centered so that the intercept is interpretable as the mean of the non-users group, adjusted at the mean of the covariates. The coefficient for social media use is interpretable as the difference from the intercept, adjusted at the mean of the covariates. For the name generators, N = 287 and for the general indicators, N = 258. *p < .05. Cell entries (bottom) are bootstrapped adjusted means (M) and standard deviations (SD) (simulations = 1,000) derived from the same model formula.

Table 3. *The Relationships between News Network/ Use Variables and Political Disagreement on Social Media (General Indicators)*

	Social Media Political Disagreement (General Indicators)
Variable	B (SE)
Intercept	1.33 (.33)*
Age	-.01 (.00)*
Gender (1 = Female)	.09 (.15)
Education	.03 (.05)
Income	-.05 (.05)
Political Efficacy	-.06 (.09)
Political Knowledge	-.06 (.07)
Political Interest	.01 (.07)
Strength of Ideology	.01 (.04)
Strength of Partisanship	.12 (.10)
Face-to-Face Political Talk	.00 (.00)
Email Political Messaging	.01 (.08)
Offline News Use	.00 (.01)
Online News Use	.00 (.01)
Face-to-Face Political Disagreement	.33 (.05)*
Anonymous Online Political Disagreement	.42 (.05)*
Social Media Use	.00 (.01)
Social Media Political Messaging	.00 (.00)
Social Media News Use	**.03 (.01)***
Social Media News Network Size	**.00 (.00)**
Social Media News Network Diversity	**-.17 (.31)**
R^2	.49

Notes. Coefficients are unstandardized beta coefficients (B) with standard errors (SE) from ordinary least squares (OLS) regression model predicting political disagreement on social media. N = 349, *p < .05.

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COMMENT: Some sentences are not immediately clear; the authors may want to better develop the argumentative connections between sentences and ideas (e.g., "… perspective because, as prior research has shown (e.g., Mutz, 2006), the experience of disagreement has more dramatic effects on the ways people engage" and "Moreover, a perception-based approach

allows for the inclusion of indirect interaction with political content on social media;" "The typical face-to-face discussion is only moderately contested," "Most people use social media to articulate social connections rather than to establish connections with new people")

RESPONSE: Thank you for pointing out these weak spots in the writing. Every effort has been made to unpack the specific claims you mentioned. First, on pg. 3-4, regarding the experience of disagreement and the perception-based approach:

> "Political disagreement is the perception of difference resulting from an encounter with cross-cutting information, and it holds a central place in theories of deliberative democracy because it encourages reflection about previously held ideas (Price, Capella, & Nir, 2002) and promotes tolerance of oppositional views (Mutz, 2006). But differences in the conceptualization and operationalization of political disagreement have led to divergent conclusions about how often individuals encounter political disagreement in their daily lives (Klofstad, Sokhey, & McClurg, 2012). The now-classic studies on political disagreement defined it either as the lack of congruence between two discussants (e.g., Huckfeldt et al., 2004), as judged by some third-party observer (e.g., a researcher), or the perception of difference with one's own political views (e.g., Mutz, 2006), as judged by respondents themselves. The two approaches differ in terms of *whose* judgment to trust about whether two individuals disagree, and this difference is not trivial: Congruence-based studies generally find more evidence of disagreement, while perception-based studies usually find less. That is, third-party observers tend to report more political difference, while the subjects being observed typically report less.
>
> The present study adopts the latter approach (i.e., the perception-based approach) to observing political disagreement for several reasons. First, a perception-based approach allows for a distinction between the perception of difference and exposure to politically cross-cutting information. While exposure to cross-cutting information may be necessary for the perception of disagreement, individuals could potentially be exposed to cross-cutting information without perceiving disagreement. And, after all, if individuals do not perceive that disagreement has occurred, it will have less of an effect on their behavior (Mutz, 2006). While political incongruence has been shown to have subtle effects on voting preferences (Huckfeldt & Sprague, 1995), the *experience* of disagreement has more dramatic effects on the ways people engage with politics (Mutz, 2006). Additionally, perception-based measures offer stricter standards for hypothesis testing than congruence-based measures because they are less susceptible to type II error — that is, the reporting of a false positive result that occurred because a third party introduced variability and/or measurement error into the observation process."

Second, with regard to face-to-face discussion on pgs. 4-5:

> "These two factors — the multidimensionality of social affiliation and social norms — also provide useful dimensions along which to compare various communication settings

> in terms of their likelihood to promote exposure to cross-cutting views. Face-to-face relationships are characterized relatively high levels of multidimensionality in social affiliation (Huckfeldt et al., 2004). Although people exhibit selectivity in social affiliation, politics is not always at the forefront of people's minds when choosing discussion partners, and two individuals are more likely to disagree about politics in these cases (Huckfeldt et al. 2004). Therefore, interpersonal social networks tend to sustain overlapping and multidimensional patterns of social affiliation, which may promote disagreement. However, at the same time, social norms often discourage disagreement in face-to-face conversation. Most individuals seek common ground with discussion partners (Conover, Searing & Crewe, 2002; MacKuen, 1990; Walsh, 2004), and many social and political groups actively discourage disagreement (Eliasoph, 1998). Thus, face-to-face settings exhibit a high degree of multidimensionality in social affiliation, but are also governed by social norms that may limit disagreement."

And finally, with regards to relational articulation on social media, on pg. 6:

> "Most people use social media to articulate social connections rather than to establish connections with new people (although some sites, such as Twitter, are more commonly used for this purpose than others, such as Facebook or Instagram; boyd & Ellison, 2007; Ellison et al., 2007), and therefore social media networks are characterized by the same overlapping dimensions of social affiliation as face-to-face settings. But, in addition, social media articulate relationships that cut across geographic obstacles for information sharing and discussion (Brundidge, 2010), making a wider range of political considerations more salient on a day-to-day basis (Kwon et al., 2014)."

Reviewer 3 Comments

COMMENT: I enthusiastically recommend publication of this article. It represents a very strong contribution to a growing body of work on how social media usage affects the consumption of political information, and political behavior more generally. The findings here help bridge a clear gap in previous work -- the untested underlying assumption that social media usage increases exposure to political disagreement with respect to face-to-face interactions. Given the heated academic and journalistic debate on social media and echo chambers, filter bubbles, and ranking algorithms, I am confident this article will be highly cited. The findings also have important implications for the broader political communication literature on media effects -- as more and more people rely on platforms like Twitter or Facebook to keep up with current events, it's important to investigate the differences between these new sources and traditional media outlets, and the authors help illuminate this distinction. Despite some methodological caveats, which I describe below and the authors acknowledge in the paper, the methodology employed is rigorous and innovative.

RESPONSE: Thank you for these positive comments. The revisions you suggested have made the article even better, and your recommendations for extensions of this research are very helpful.

COMMENT: Perhaps the main weakness of this article is that the analysis relies exclusively on self-reported measures of media consumption and exposure to disagreement, which are known to present biases. The ideal study for the research question here would track individuals' actual consumption of social media content and conversations about politics, but this ideal research design is obviously beyond the scope of this paper. The authors briefly acknowledge these limitations in the conclusions sections, which I found convincing, but the article would perhaps benefit from a lengthier discussion of how these potential problems may bias the analysis, perhaps connecting it to the broader literature on measurement of media exposure.

RESPONSE: Thank you for this suggestion. A lengthier discussion of the paper's observation strategy has been included on pgs. 20-21:

> "The first set of issues is related to the measurement of disagreement. First, the article relies on self-reported measures of media consumption and exposure to political disagreement, and these kinds of measures are susceptible to bias. Closed-ended items (such as the ones used for news exposure and the general indicators of disagreement) are known to promote over-reporting, while open-ended items typically promote under-reporting. While this study has used both measurement strategies to gain additional leverage over the research problem, future research would ideally track individuals' actual consumption of social media content in order to triangulate observations for more powerful estimation of exposure to political disagreement. A closely related second issue is the conceptual and empirical slippage between the name generators and the general indicators of political disagreement, which exhibit distinct patterns of association with

antecedent and outcome variables. Future research could approach this issue in a systematic manner (see, e.g., Klofstad et al., 2013)."

COMMENT: My other minor concern is related to the final analysis in the paper, which shows that exposure to news and political commentary on social media increases exposure to disagreement, whereas network size and diversity do not. However, precisely because of its "social" nature, if social media users are more exposed to disagreement, by construction it needs to be because more diverse information is being shared by their network of friends and acquaintances. I wonder if the reason for the negative result for the two network variables could be due to higher levels of measurement error in these variables than in the news use variable -- i.e. network diversity is computed as a sum of weighted differences with respect to equal exposure, whereas news use is just how many days respondents saw political content. Another potential explanation is that news use is endogenous to exposure to disagreement: individuals who want to "hear the other side" may need to consume more information (e.g. follow more media outlets) in order to achieve their desired level of media consumption. I don't think there's an easy way to address these concerns with the data the authors use, but perhaps they should also acknowledge this issue in the text of the paper.

RESPONSE: You are absolutely correct to suggest that a significant relationship between news network diversity and disagreement would provide strong evidence of the theory. But, rather unexpectedly, this prediction was not borne out in the analysis.

Thank you for offering potential explanations for these non-findings. Each has been addressed in the limitations section. The possibility that the non-finding could be due to higher levels of measurement error are discussed on pg. 22:

> "While the hypotheses regarding social media news network size and diversity are theoretically grounded, these predictions were not borne out in the analysis. It is possible that there is no relationship between them and exposure to political disagreement on social media; however, this non-finding could also be due to increased measurement error introduced by the computation involved in variable construction."

Just afterwards, a comment on the endogeneity issue has been added on the same page.

> "Alternatively, it is also possible that the influences of network size and diversity are cancelled out by news use, which may be endogenous to political disagreement. It could be that individuals who are motivated to "hear the other side," which ostensibly arise from prior encounters with the other side, consume news in order to do so. More research is needed to untangle these issues regarding the relationship between political disagreement and news use, as well as the roles played by news networks."

COMMENT: Finally, the analysis here could be extended to many other interesting questions. For example, are there any differences between Facebook and Twitter? Facebook is generally

considered to reduce exposure to disagreement because of their newsfeed ranking algorithm. It would be interesting to validate this claim. Also, what about conservatives vs liberals? Previous studies have found that conservatives tend to be less exposed to disagreement on social media, but it might be the case that they are just less exposed to disagreement in general and this has nothing to do with social media. I'm flagging these here as suggestions for potential extensions of the paper, and not necessarily changes to be introduced in the current manuscript.

RESPONSE: Thank you for these suggestions. These are very interesting avenues for future research. Unfortunately, the study did not measure political disagreement separately on Facebook and Twitter, but rather used more general wording about "social media."

A comment about platform-specific measures of political disagreement has been included in the limitations section, and opportunities for future research have been highlighted on pgs. 22.

> "Fourth, the study does not measure political disagreement separately on Facebook and Twitter. Future research should investigate the differences between these prominent social media platforms, which could be important as patterns of use continue to shift and change. Future research could also focus on the differences between conservatives and liberals, as prior research has shown that conservatives are less likely to be exposed to disagreement on social media. However, prior research has not shown whether this is due to social media or because they are exposed to less disagreement, more generally."