Telematics and Informatics 35 (2018) 245–254

Contents lists available at ScienceDirect

Telematics and Informatics

journal homepage: www.elsevier.com/locate/tele

Does social media use really make people politically polarized? Direct and indirect effects of social media use on political polarization in South Korea

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ARTICLE INFO

Keywords:
Political polarization
Social media
Political engagement
Media panel
Structural equation model

ABSTRACT

To help inform the debate over whether social media is related to political polarization, we investigated the effects of social media use on changes in political view using panel data collected in South Korea (N = 6411) between 2012 and 2016. We found that, although there were no direct effects of social media use, social media indirectly contributed to polarization through increased political engagement. Those who actively used social network sites were more likely to engage in political processes, which led them to develop more extreme political attitudes over time than those who did not use social network sites. In particular, we observed a clear trend toward a more liberal direction among both politically neutral users and moderately liberal users. In this study, we highlight the role of social media in activating political participation, which eventually pushes the users toward the ideological poles. The implications of these findings are discussed.

1. Introduction

Political polarization has been the subject of academic debate and exploration because of its potentially negative consequences on democratic societies. When people feel strongly about their political identity and group, they tend to draw boundaries based on political affiliations and perceive the world in terms of group membership (Green et al., 2002; Iyengar et al., 2012). As a result, strong partisanship can create intergroup conflicts such as in-group favoritism and outgroup antipathy (Tajfel and Turner, 1979; Turner and Oaks, 1986; Turner et al., 1987). Extreme political ideology can also prevent people from having civil discussions with the opposing side and finding common ground between them. Therefore, on the whole, increasing political polarization raises concerns.

In recent years, changing media environments have often been considered a major factor that contributes to political polarization. Some scholars (e.g., Sunstein, 2017) argue that the explosion of partisan news media outlets and the rise of social networking sites potentially make people more politically biased and extreme. This argument is based on the premise that widely available media sources exacerbate selective exposure in which people choose to consume messages that they already agree with and avoid messages with which they disagree. Some empirical evidence also suggests that disproportionately heavy exposure to arguments only supporting one's own view increases confidence in his or her belief and ultimately pushes that person's attitudes further from the center (Iyengar and Hahn, 2009; Prior, 2013; Stroud, 2010).

Despite the alleged link between social media use and political polarization, there is limited empirical research on the effects of

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https://doi.org/10.1016/j.tele.2017.11.005
Received 10 August 2017; Received in revised form 1 November 2017; Accepted 6 November 2017
Available online 09 November 2017
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social media on political polarization. One recent study (Boxell et al., 2017) investigated this issue using aggregate data (population level) and concluded that social media is not a major driver of the recent polarization because political polarization mainly increases among the older groups who are the least likely to use social media. However, most previous empirical studies are not specifically related to the causal effects of social media; rather, they have focused on the extent to which social media space is divided along party lines and the degree to which selective exposure is operating in social media. Even these findings are mixed at best. Some studies found that social media is polarized (Barberá et al., 2015; Conover et al., 2011; Gruzd and Roy, 2014; Hong and Kim, 2016; Shin and Thorson, 2017), while others found that the platforms are not clearly divided (Bakshy et al., 2015; Kim, 2011; Lee et al., 2014; Yardi and Boyd, 2010).

Our research investigates a direct link between social media usage and political polarization using a national online sample of South Korean adults collected between 2012 and 2016. Specifically, we assess the role of social media by tracking changes in the political view of survey respondents over 4 years. In this analysis, we examine the individual's political engagement as a potential mediator of the effects of social media on polarization. Political engagement has received considerable attention in previous research as an outcome of social media use but not as a pathway to polarization. Our results offer an account of how social media affects users' political ideology directly or indirectly. In addition, we examine the effects of social media use in two different groups: political neutrals (those holding a politically central position) and moderate partisans (those who are moderately conservative or moderately liberal). This differentiation allows us to comment on whether social media use has effects only on already somewhat partisan users, or such use has also effects on neutrals. Moreover, our study broadens the scope of the discussion on political polarization by using non-US centric data.

In this paper, we demonstrate the role of social media as a catalyst for activating public interests and civic engagement, the ultimate variable directly responsible for political polarization among both neutrals and moderate partisans. In summary, we argue that the effect of social media on polarization is conditional and indirect. Future research should consider political engagement as an important mediator of social media use and political polarization.

2. Literature review

2.1. Social media and politics

Across the globe, social media has increasingly become an important venue for interacting with others, reading the news, and entertainment. Although motivations for social media use and usage patterns may vary widely among individuals, the adoption of social media is an unequivocal trend that has increased every year over the last decade. A survey conducted by Pew Research (Pousher, 2016) reports that seven in ten American Internet users used at least one social networking site (hereafter, SNS) such as Facebook or Twitter in 2016, showing a 20% increase from 5 years previously (2011). This trend is comparable to that observed in other developed countries such as Canada, Australia, and the U.K.

The growth rate of social media adoption in South Korea has been one of the fastest in the world. According to a survey conducted by the Korean Internet and Security Agency (KISA), 65.2 percent of Korean Internet users used SNSs regularly in 2016. The rapid spread is often credited to the country's fast Internet service and abundant free WiFi access (Choi and Park, 2014). In particular, due to the high penetration of smartphones among Koreans, over 90 percent of Korean Internet users access SNS via their phones (KISA, 2016). In particular, the social media usage via smartphones in Korea is related to political activities and interests (Ok, 2011). Additionally, the social media market in Korea is known for its strong preference for homegrown SNSs. The KISA survey reports that, of ten most frequently used SNSs in Korea, six were homegrown social network services such as *Kakao Story*, *Naver BAND*, and *Daum Café* along with their global counterparts such as Facebook and Twitter.

With the rise of social media, scholars have paid considerable attention to the intersections between social media and politics (Kim, 2011). There may be two reasons for increasing interest in this topic. First, political content is prevalent and popular on social media. In fact, the vast majority of social media users indicate that they see at least some political messages in their daily news feeds, and about 25% of users (i.e., Facebook and Twitter) indicate that "a lot" of the content to which they are exposed daily is politics (Duggan and Smith, 2016). Second, social media holds the potential for deliberative democracy. Social media can contribute to the healthy functioning of a democracy by providing opportunities to exchange political views, elaborating on problems facing the community, and reducing the costs of participating in collective action (Tufekci and Wilson, 2012). Therefore, examining how social media use affects political activities and other outcomes is an important inquiry.

In particular, the influence of social media on political polarization has emerged as an important inquiry in disciplines across the social sciences. Although there is a widespread belief that social media should be blamed for the recent rise of polarization due to its ability to create echo chambers in which like-minded individuals reinforce their previous beliefs, these discussions are mostly anecdotal and based little on causal inferences. Of related research, the most empirically active area has been the extent of political polarization occurring in social media (Bakshy et al., 2015; Barberá et al., 2015; Bennett and Segerberg, 2012; Bond and Messing, 2015; Kim, 2011; Lee et al., 2014; Yardi and Boyd, 2010). However, the findings from these studies are mixed at best, fueling the debate over the role of social media in contemporary politics.

What is largely missing from the current understanding is investigation of a causal link between social media use and political polarization. Previous studies generally assumed that selective exposure (or the lack thereof) leads to political polarization (or less polarization) and thus focused on the degree of information filtering on social media. This line of research is aimed at diagnosing the current state of the political landscape in social media rather than the effects of social media. In addition, investigation of a direct connection between social media and polarization is needed because selective exposure does not always increase polarization. Some

studies (Isenberg, 1986; Sunstein, 2009) argue that experiencing political disagreements can actually increase the divide in the opinions of the members participating in political discussion and exacerbate polarization. In other words, the amount of exposure to agreement or disagreement – despite its important role in the democratic process – cannot be equated with political polarization.

Therefore, our study examines whether individuals who use social media will develop polarized political preferences by directly measuring the shift in an individual's political view toward a greater extreme *over time*, rather than using the degree of selective exposure as a proxy. There are a few exceptional studies (Garimella and Weber, 2017; Yardi and Boyd, 2010) that took a longitudinal approach to political polarization such as changes in opinions and emotions in social media messages. However, these studies compared the salience of polarized political expressions posted on social media at the aggregate level rather than using panel data and tracking changes that actually occurred in individuals. In this sense, our method helps ascertain the causal effects of social media use on political polarization. Additionally, this study uses a large nationally representative sample of South Korean adults and adds an international perspective to previous U.S. centric studies.

2.2. Political landscape in South Korea

Despite its relatively short history of democracy, South Korea has made significant progress toward establishing a democratic political system (Kihl, 2015; Shin and Chang, 2011). In 1987, South Koreans elected their president democratically for the first time in almost 20 years after numerous civilian protests against the authoritarian regime. Since then, South Korea has held free and fair elections at all levels of government, alternating in power between conservative and liberal political coalitions. Although there have been occasional setbacks as seen in the recent presidential corruption scandal which led to the impeachment of the former President in 2016, Korea remains a stable democratic society.

The contemporary Korean political landscape is characterized by the emergence of partisan cleavage between the left (liberal) and right (conservative) ideological spectrum (Chaibong, 2005; Chang, 2008; Jou, 2010). In general, conservatives are more concerned about economic growth and market principles, while liberals pay more attention to equal distribution of wealth and human rights. In addition, conservatives see North Korea as a threatening regime whereas liberals perceive North Korea as a kin nation (Chae and Kim, 2008; Chang, 2008; Kim, 2011). It is important to note that political parties in South Korea frequently change their names and leaders. However, despite the frequent shifts, there have always been two major parties –one conservative and the other more liberal –which were clearly recognized by voters. Therefore, the left–right ideological dimension provides more meaningful heuristic value for Koreans than party identification (Jou, 2010).

Both conservatives and liberals in Korea actively use social media for political discussion, campaigning, and information dissemination in a partisan manner. A number of studies (Choi and Park, 2014; Hahn, Ryu, & Park, 2015; Kim and Yun, 2007; Park et al., 2016) have examined political use of social media among South Koreans and observed political fragmentation and polarization. For example, conservative Twitter users tend to mainly follow conservative news sources, whereas liberal users mainly follow liberal news sources (Hahn, 2005). Twitter users also tend to share messages that are only favorable to the presidential candidate they support, showing a sharp division in terms of political ideologies (Park et al., 2016). In addition, political protests against the opposing ideology are often mobilized through social networking sites (for more information, see Choi and Park, 2014).

In summary, we ask whether social media use is significantly related to a polarized political view using the case of South Korea. In doing so, we explore such relationships in two different groups: one focusing on neutral positions shifting towards a greater extreme (either conservative views or liberal views) and the other focusing on shifts of moderate conservatives and moderate liberals toward a greater extreme (either very conservative views or very liberal views). In other words, we differentiate between polarization among neutrals and polarization among moderate partisans. Since some previous research showed that political media usually affects partisan more than neutral views (Prior, 2013), examining the extent of social media effects on these two different groups may shed new light on how social media influences changes in users' political views across partisan strength levels.

RQ1: Is social media use associated with polarized political ideology for neutrals such that neutrals become conservative or liberal?

RQ2: Is social media use associated with polarized political ideology for moderate conservatives and moderate liberals such that moderate conservatives become very conservative or moderate liberals become very liberal?

Furthermore, we attempt to identify specific mechanisms through which social media use affects political polarization. It is possible that social media use does not directly influence users' political viewpoints, but indirectly affects polarization by increasing interest in politics and stimulating participation in the political process. Previous studies found that social media use is positively associated with political participation such as street marches, community work, and petitions (Boulianne, 2015; Valenzuela et al., 2016). That is, exposure to political information on social media increases political interest and participation in public affairs. In particular, social media use is found to be a stronger predictor of political participation among youth than any other demographic (Xenos et al., 2014).

This increased political engagement and participation can ironically lead to more extreme political views given the reciprocal relationship between behavior (e.g., political participation) and attitude (e.g., political ideology). For instance, Quintelier and Van Deth (2014) explored recursive relationships between political participation and political attitudes and found that political behavior reinforces political belief to a greater extent than political belief reinforces political behavior. This finding indicates that increased political participation and engagement by social media leads one to develop a stronger political attitude further from central or moderate positions. Based on this logic, we examine the mediating role of political participation between social media use and polarized political view.

RQ3: Does political participation mediate the effect of social media use on polarized political ideology?

3. Method

3.1. Data and analytic sample

We used data from the Korea Media Panel (KMP) Survey conducted by the Korea Information Society Development Institute (KISDI). KMP has collected annual survey responses from 6750 individuals in 3085 households contacted through stratified random sampling by region, gender, and age since 2010. This has resulted in longitudinal data tracking the same individuals over time. KMP collects information on respondents' media behaviors such as whether respondents used social media actively each year, which social media they frequently used, what types of media devices they owned, and how much they spend on media content and services. In addition, the survey included questions measuring the degree of respondents' political engagement and their political views in 2012 and 2016. For this study, we used media panel survey data collected between 2012 and 2016. We removed respondents who were aged under 15 or who had at least one missing value among key variables (n = 322, 4.8%). The final study sample consisted of 6411 individuals.

3.2. Key independent variable

3.2.1. Social media use

This measure was derived from the binary response to whether a respondent actively used at least one SNS at the time he or she was surveyed. A score of 0 indicates no significant social media usage that year and 1 indicates active social media usage. The *social media use* variable is created by simply summing the answers over 5 years; thus, the value ranges from 0 to 5. For example, if a respondent actively used social media every year during the period, the cumulated social media usage equals 5. If a respondent used social media in 2014, 2015, and 2016, then the value equals 3. It should be noted that respondents voluntarily provided weekly activities through an open media diary format. Although these diary data do not allow us to quantify social media usage due to inconsistent responses and unstructured comments, close examination of the diary content reveals that those who indicated active use of social media did indeed use the social media sites in meaningful ways.

3.3. Outcome variable

Political polarization: In the survey, participants were asked "how politically conservative or liberal are you?" They responded using a scale ranging from 1 (extremely liberal) to 5 (extremely conservative) with the moderate as the mid-point. This is one of the standard methods used by previous researchers to identify South Koreans' political orientation (e.g., Kim et al., 2012). Although some studies ask specifically which political party survey participants prefer, given the longitudinal panel survey and frequent name changes of political parties in Korea, the PMP survey asked respondents to indicate their general political orientation.

Our measure of political polarization was derived from the changes in the respondent's political orientation between 2012 and 2016. Specifically, we measured polarization in two different groups: political neutrals and moderate partisans. For neutrals, if their viewpoint deviated from the center in any direction from 2012 to 2016, we coded their polarization as 1. If their view remained unchanged between 2012 and 2016, their polarization was coded as 0. Similarly, for moderate partisans (i.e., whose view is either conservative or liberal), if their viewpoint shifted towards more extreme (i.e., very conservative or very liberal), their polarization was coded as 1. If their view did not change from 2012 to 2016, their polarization was coded as 0. This resulted in a dichotomous variable with six categories: "no polarization of neutrals," "polarization of neutrals toward conservative," "polarization of neutrals toward liberal," "no polarization of moderates," "polarization of moderate conservative toward extreme conservative," and "polarization of moderate liberal toward extreme liberal."

3.4. Mediation variable

Political engagement: This variable focuses on concrete acts of civic participation, which is measured by seven items as follows: (1) I regularly read news about politics, (2) I read posts related to politics on the Internet with great interest, (3) I post or share ideas related to politics or politicians on the Internet, (4) I meet people to talk with and share ideas about politics or politicians, (5) I follow other topics rather than having an interest in politics, (6) I reveal the party and politicians I support honestly when I am surveyed, and (7) I vote. Responses were measured using five-point Likert scales. The fifth item was reverse coded. Political engagement was calculated by summing the seven items above for each individual. The average Cronbach alpha value of the seven items was high enough (0.79) to support their reliability.

3.5. Models

To estimate the direct association between social media use and polarized political ideology and to identify the mediation effect of political participation between social media use and political polarization, we used the structural equation modeling (SEM) technique. Our model involves three equations (Eqs. (1)(3)), in which an individual's political engagement is influenced by social media use (see Eq. (2)) and the predicted social media use and political engagement jointly affect political polarization among neutrals and moderate partisans (see Eq. (3)). Therefore, in Eq. (3), the coefficient γ_1 represents the direct effect of social media on political polarization and γ_2 represents the indirect effect of social media on political polarization mediated by political participation.

Table 1
Descriptive statistics of key variables.

Dependent variables	(%)				N
Political polarization of neutrals					
Toward conservative	38.1				2217
Toward liberal	19.7				2217
Political polarization of moderate partisans					
Toward extreme conservative of moderate conservatives	22.5				1398
Toward extreme liberal of moderate liberals	14.0				413
Independent and mediation variables	Mean	S.D.	Min	Max	N
Social media use	1.46	1.68	0	5	6411
Political engagement	18.09	4.30	7	33	6411
Covariates	(%)				
Male	42.4				6411
Age in 2012					
15–17/18–29/30–49/50–65/66+	3.8/9.3/41.0/25.6/20.4				6411
Educational attainment					
Below high school/High school/College or above	31.7/37.5/30.8				6411
Marital status					
Never married/Married/Others (Divorced, lose)	15.8/71.7/12.5				6411
Income range (Unit in 10,000 KRW)					
No income/1–199/200–399/400–499/500+	40.5/34.5/20.7/4.3				6411
Regions					
(1) Seoul/Incheon/Gyoung-gi	33.0				6411
(2) Busan/Daegu/Ulsan/Gyoungbuk/Gyoungnam	30.0				
(3) Gwangju/Jeonbuk/Jeonam	16.7				
(4) Daejeon/Chungbuk/Chungnam	16.5				
(5) Gangwon/Jeju	3.9				

Notes: The sample of political polarization of neutrals was limited for those who were neutrals in 2012 (N = 2217). Political polarization of moderate partisans toward conservative is limited for those who were moderate conservatives (N = 1398) and political polarization of moderate partisans toward liberal is limited for those who were moderate liberals in 2012 (N = 413). KRW is Korean Won.

The general specifications of the model are presented as follows. In this model, the observations (individuals) are indexed by *i*. To minimize the confounding effects, in all equations we consider various covariates, denoted by a vector **X**, which includes respondents' gender, age, marital status, and educational attainment in the baseline year. To eliminate bias related to income and regional-specific effects on the dependent variables, we included income and regional fixed effects, denoted by ***Inc FE*** and ***Reg FE***, in all models.

$$Social\ media\ use_i = \alpha_0 + \alpha_1 \boldsymbol{X_i} + \alpha_2 \boldsymbol{IncFE_i} + \alpha_3 \boldsymbol{RegFE_i} + \varepsilon_i \quad (1)$$

$$Political\ engagement_i = \beta_0 + \beta_1\ Social\ media\ use_i + \beta_2 \boldsymbol{X_i} + \beta_3 \boldsymbol{IncFE_i} + \beta_4 \boldsymbol{RegFE_i} + \mu_i \quad (2)$$

$$Political\ polarization_i = \gamma_0 + \gamma_1 Social\ media\ use_i + \gamma_2 Political\ engagement_i + \gamma_3 \boldsymbol{X_i} + \gamma_4 \boldsymbol{IncFE_i} + \gamma_5 \boldsymbol{RegFE_i} + \nu_i \quad (3)$$

4. Results

4.1. Descriptive results

Table 1 shows descriptive statistics of the variables used in our study. Among the total respondents (n = 6411), the numbers of neutrals, conservatives, and liberals were 2217, 2858, and 1336 in 2012, and 2215, 2919, and 1277 in 2016, respectively. From 2012 to 2016, 38.1% of neutrals shifted towards conservative while 19.7% of neutrals shifted towards liberal. Among 1811 moderate conservatives or moderate liberals in 2012, 20.6% moved towards a more extreme view in 2016. Specifically, 22.5% of moderate conservatives and 14.0% of moderate liberals became very conservative and very liberal, respectively. The mean value of the cumulated social media use during 2012–2016 was 1.46 (SD = 1.68), and the mean value of political participation in 2016 was 18.09 (SD = 4.30). The most widely used SNSs mentioned by the survey respondents were Facebook (27.4%), Twitter (18.2%), and Cyworld (Korean domestic SNS, 17.5%) in 2012; and Kakao-story (Korean domestic SNS, 46.6%), Naver-band (Korean domestic SNS, 11.4%), and Instagram (2%) in 2016.

4.2. Direct effects of social media on political polarization

Figs. 1 and 2 show the coefficients and statistical significance levels for the main paths from social media use to polarization among neutrals and moderate partisans, respectively. With respect to the direct effects of social media use on the political polarization of neutrals, social media use was negatively associated with a shift towards conservative ($\beta = -0.043$, $p < .05$), and

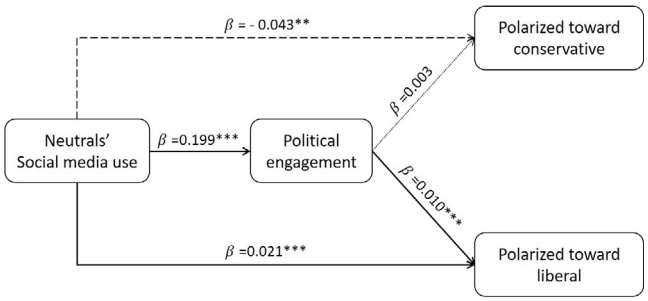

Fig. 1. The path diagram from using social media to political polarization of neutrals, toward conservative, and liberal. *Notes:* Robust standard errors in parentheses $^{***}p < .01$, $^{**}p < .05$. Straight, dashed, and dotted line mean statistically significant positive, negative and insignificant relationship, respectively. See Appendix 1 for the coefficients and standard errors of all variables in all models.

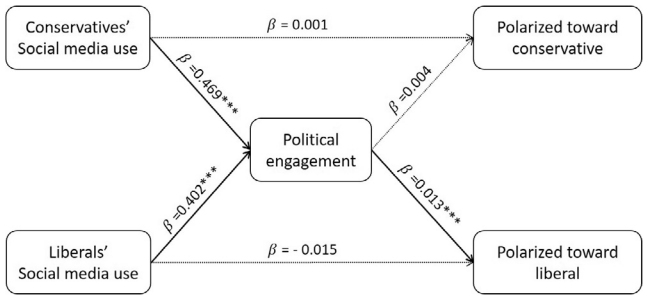

Fig. 2. The path diagram from using social media to political polarization of moderate partisans, toward conservative, and liberal. *Notes:* Robust standard errors in parentheses $^{***}p < .01$. See the note in Fig. 1 for the means of each line. See Appendix 2 for the coefficients and standard errors of all variables in all models.

positively associated with a shift towards liberal ($\beta = 0.021$, $p < .01$). Contrary to the outcomes observed among neutrals, social media use did not show any direct effects on the polarization of moderate partisans (see Fig. 2). That is, social media use did not influence a shift in moderate partisans toward extreme ideologies.

4.3. Indirect effects of social media on neutrals' political views

As shown in Fig. 1, for neutrals, social media was indirectly associated with a shift towards liberal that was mediated by political engagement. Specifically, social media use was positively associated with political engagement ($\beta = 0.199$, $p < .01$), which was also positively associated with political polarization toward liberal ($\beta = 0.010$, $p < .01$). Similar to neutrals, social media use showed an indirect yet positive effect on polarization for moderate liberals via increased polarization (see Fig. 2). Social media use by liberals has a positive association with political engagement ($\beta = 0.402$, $p < .01$), and in turn, political engagement has a positive association with political polarization toward very liberal ($\beta = 0.113$, $p < .01$). For moderate conservatives, there was no direct or indirect effect of social media use on view changes toward extreme conservative, even though we found a positive association between social media use and political engagement.

4.4. Robust analysis

We also conducted an additional analysis that explores the opposite effect of social media use on political polarization, namely political neutralization. The purpose of this analysis was to take into account respondents who moved in the opposite direction of polarization between 2012 and 2016. For example, in the previous main analysis, we did not test whether extreme partisans become more moderate because of social media use. Therefore, in the additional analysis, we focused on extreme partisan groups and investigated whether their ideology changed from extremely conservative to moderately conservative (or neutral) and from extremely liberal to moderately liberal (or neutral). For both extreme conservatives and extreme liberals, we coded their neutralization as 1, if their viewpoint changed toward neutral from 2012 to 2016. We also coded their neutralization 0, if their view remained unchanged between 2012 and 2016. The results of this analysis indicate that there were no neutralizing effects of social media use on users' political attitude (see Fig. 3). In other words, extreme partisans did not become more moderate due to their use of social media.

5. Discussion

This study investigated whether social media is associated with political polarization using a large nationally representative panel of South Koreans over time. Unlike previous studies that focused on the extent of polarization occurring on social media, our study examined the effects of social media on political polarization by measuring a shift of an individual's political view toward a greater

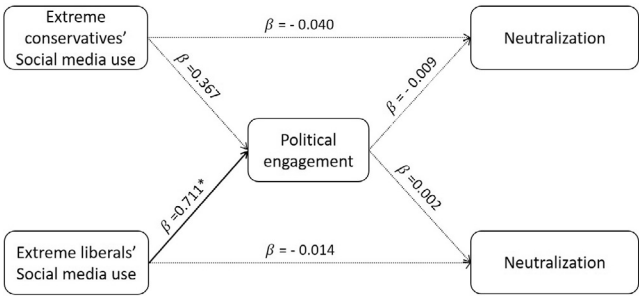

Fig. 3. The path diagram from using social media to political polarization of extreme partisans, toward Neutralization. *Notes:* Robust standard errors in parentheses $^{*}p < .1$. See the note in Fig. 1 for the means of each line.

extreme. Our study takes a longitudinal approach tracking the same individual's media use and political views over 4 years and provides evidence that social media indirectly affects political views through political engagement.

Our results indicate that social media did not directly push users into political extremes, whether they were neutrals or moderate partisans. Actually, social media use was negatively associated with a shift of neutrals toward a conservative view, but positively associated with a shift toward a liberal view. This means that neutrals who used social media regularly during the data collection period were more likely to become liberal than those who did not use social media. Unlike neutrals, social media was not related to polarization in any direction for moderate partisans. That is, social media did not cause moderately conservative users to become very conservative or cause moderately liberal users to become very liberal.

However, we found some evidence that social media indirectly affected polarization through increased political engagement. Social media use was positively associated with political engagement such as sharing political news online, engaging in political discussions offline, and voting, consistent with some previous studies (Boulianne, 2015; Valenzuela et al., 2016). Ironically, this increased political engagement led the users to develop a more extreme political attitude over time. Importantly, this pattern was observed in both neutrals and moderate partisans in our study. This indicates that social media use caused not only moderate partisans, but also politically neutral individuals, to actively participate in politics and subsequently pushed them towards political poles.

The fact that social media-induced political engagement propels polarization is somewhat contradictory to the commonsense notion. In general, a high level of political participation is considered to be a token of a healthy democracy: The more people that come out to vote, seek political knowledge, and deliberate political issues with others, the better the outcomes for institutions and societies. However, our study indicates that increased political awareness and participation crystalizes individuals' political opinions and moves them further away from the moderate position.

In this regard, we suggest two directions for future research. First, we need to better understand the nature of political participation spurred by social media. For instance, questions include whether increased participation is the result of politically slanted experiences on social media or the result of open-minded deliberation and information processing. If the former is a stronger influence, social media may indeed contribute to polarized politics. Second, this finding may serve as an opportunity to think about polarization from a different perspective. If social media increases political engagement via greater understanding of political issues, a stronger political attitude at the end would not necessarily be bad. Similarly, Abramowitz and Saunders (2008) found that intense polarization in the mass public has potentially positive effects because a clear gap between two ideologies or parties clarifies political choices and increases interest in the political process.

Moreover, although it was not the focus of our study, we found that the indirect effects of social media use were associated with shifts towards liberal views, but not shifts towards a conservative view. This pattern was found in both neutrals and moderate partisan groups. Specifically, increased political engagement by social media use led neutral users to become liberal or very liberal over time. Increased political engagement also directed moderately liberal users to move further toward very liberal. This may be because online space in South Korea – and particularly social media – is generally populated predominantly by younger individuals who are more likely to be liberal than older individuals (Hahn et al., 2015). Therefore, greater exposure to liberal views online may have influenced neutrals and moderately liberal users in that direction. Alternatively, our findings could reflect the political climate of South Korea when the second wave of data collection took place. The second wave survey was conducted in August 2012, when the approval rating of South Korea's president (Park Geun-Hye), a leader of the conservative party, started to decline. However, such an influence, if any, would have been minimal since administration of the second wave survey was long before the corruption scandal that led to the impeachment of the president.

Our study has a number of limitations. First, we measured the intensity of social media use by summing annual binary responses over 5 years, rather than measuring the frequency of social media usage. Our measure may not be able to differentiate between heavy use and light use. However, our supplementary weekly diary data confirm that those who indicated active use of social media did indeed use at least one social networking site regularly. Second, we operationalized political polarization in terms of an individual's political view changes toward a more extreme position. Therefore, we do not suggest that our findings are related to the disappearance of ideologically moderate individuals. Future research may need to focus on the relationships between social media use and changes in the distribution of political ideology in the population.

6. Conclusion

For several years, scholars have attempted to better understand how the emergence of new media has changed political attitudes and behaviors. Recently, the focus has been social media. Popular accounts often point to social media as a reason for increasing political polarization through the means of selective exposure and creation of echo chambers. However, there is limited empirical research that shows such effects. Therefore, we sought to identify how use of social media is associated with political polarization at the level of the individual, based on panel data collected from a large number of South Koreans in the period from 2012 to 2016. In this paper we tested not only the direct effects of social media with regards to polarization, but also the indirect effects, while paying attention to political engagement.

Taken together, our findings suggest that social media plays a certain role in increasing political polarization. We found that social media promotes political interests and engagement thereby indirectly affecting users' political views. Thus, we can attest that political engagement (e.g., sharing political news online) induced by social media is one mechanism that contributes to polarization. Our findings also indicate that we cannot treat social media use uniformly. It is possible that only certain types of social media use, including political discussion and news consumption, are related to greater political participation (e.g., Lee and Myers, 2016). More research is needed to identify the micro-processes by which social media stimulates political participation that is prone to greater partisanship.

Acknowledgements

Changjun Lee would like to acknowledge funding from the European Research Council under the European Union's Horizon 2020 research and innovation programme (grant agreement No 715631, TechEvo).

Appendix A.

Appendix 1
Details for the coefficients and standard errors of the structural equation models in Fig. 1.

	Political polarization of neutrals toward conservative			Political polarization of neutrals toward liberal		
	Social media use	Political engagement	Toward conservative	Social media use	Political engagement	Toward liberal
Social media use		0.199***	−0.043***		0.199***	0.021***
		(0.072)	(0.008)		(0.072)	(0.007)
Political engagement			0.003			0.010***
			(0.002)			(0.002)
Male	−0.258***	1.659***	0.009	−0.258***	1.659***	0.004
	(0.062)	(0.210)	(0.025)	(0.062)	(0.210)	(0.021)
Age in 2012 (Ref.: 65+)						
15–17	2.678***	0.215	−0.249***	2.678***	0.215	0.245***
	(0.166)	(0.591)	(0.069)	(0.166)	(0.591)	(0.057)
18–29	2.206***	0.214	−0.241***	2.206***	0.214	0.134***
	(0.148)	(0.521)	(0.061)	(0.148)	(0.521)	(0.050)
30–49	1.283***	0.198	−0.219***	1.283***	0.198	0.071**
	(0.100)	(0.348)	(0.041)	(0.100)	(0.348)	(0.034)
50–65	0.211**	0.454	−0.081**	0.211**	0.454	−0.023
	(0.089)	(0.300)	(0.035)	(0.089)	(0.300)	(0.029)
Educational attainment (Ref.: Below high school)						
High school	0.561***	1.026***	−0.026	0.561***	1.026***	0.029
	(0.080)	(0.272)	(0.032)	(0.080)	(0.272)	(0.026)
College or above	1.246***	1.682***	−0.010	1.246***	1.682***	0.098***
	(0.096)	(0.334)	(0.039)	(0.096)	(0.334)	(0.032)
Marital status (Ref.: Never married)						
Married	−0.459***	1.267***	0.012	−0.459***	1.267***	0.037
	(0.103)	(0.347)	(0.041)	(0.103)	(0.347)	(0.034)
Others	−0.580***	0.894**	−0.058	−0.580***	0.894**	0.069
	(0.132)	(0.445)	(0.052)	(0.132)	(0.445)	(0.043)
Constant	0.104	13.431***	0.421***	0.104	13.431***	−0.088
	(0.196)	(0.662)	(0.084)	(0.196)	(0.662)	(0.069)

Fixed effects						
Income range	Yes	Yes	Yes	Yes	Yes	Yes
Regional	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	2217	2217	2217	2217	2217	2217

Note: Robust standard errors in parentheses $^{***}p < .01$, $^{**}p < .05$, $^{*}p < .1$.

Appendix 2
Details for the coefficients and standard errors of the structural equation models in Fig. 2.

	Political polarization of moderate conservative toward extreme conservative			Political polarization of moderate liberal toward extreme liberal		
	Social media use	Political engagement	Toward conservative	Social media use	Political engagement	Toward liberal
Social media use		0.469***	0.001		0.402***	−0.015
		(0.117)	(0.012)		(0.151)	(0.012)
Political engagement			0.004			0.013***
			(0.003)			(0.004)
Male	−0.053	0.805***	0.002	−0.273	1.111**	0.040
	(0.061)	(0.267)	(0.028)	(0.175)	(0.538)	(0.042)
Age in 2012 (Ref.: 65+)						
15–17	2.403***	−2.387**	−0.074	2.492***	−1.175	−0.061
	(0.259)	(1.169)	(0.124)	(0.789)	(2.454)	(0.191)
18–29	1.941***	−1.682*	−0.072	1.691**	−1.819	−0.220
	(0.194)	(0.881)	(0.093)	(0.732)	(2.265)	(0.176)
30–49	1.010***	−0.692*	−0.146***	0.835	−1.346	−0.209
	(0.089)	(0.409)	(0.043)	(0.648)	(1.996)	(0.155)
50–65	0.132**	0.864***	−0.091***	0.281	0.630	−0.172
	(0.064)	(0.282)	(0.030)	(0.637)	(1.958)	(0.152)
Educational attainment (Ref.: Below high school)						
High school	0.321***	0.991****	−0.014	1.026**	2.164	0.161
	(0.073)	(0.321)	(0.034)	(0.476)	(1.470)	(0.115)
College or above	1.051***	1.994****	−0.048	1.867***	2.841*	0.172
	(0.098)	(0.447)	(0.048)	(0.481)	(1.506)	(0.118)
Marital status (Ref.: Never married)						
Married	−0.189	−0.565	−0.006	−0.321	0.199	−0.040
	(0.148)	(0.648)	(0.068)	(0.288)	(0.886)	(0.069)
Others	−0.277*	−1.176	0.015	−1.027*	2.575	−0.240*
	(0.163)	(0.715)	(0.076)	(0.556)	(1.715)	(0.134)
Constant	0.335*	15.498***	0.256**	0.338	16.791***	−0.174
	(0.196)	(0.858)	(0.101)	(0.738)	(2.268)	(0.188)
Fixed effects						
Income range	Yes	Yes	Yes	Yes	Yes	Yes
Regional	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	1398	1398	1398	413	413	413

Note: Robust standard errors in parentheses $^{***}p < .01$, $^{**}p < .05$, $^{*}p < .1$.

Appendix B. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.tele.2017.11.005.

References

Abramowitz, Alan I., Saunders, Kyle L., 2008. Is polarization a myth? J. Politics 70 (2), 542–555.
Bakshy, E., Messing, S., Adamic, L.A., 2015. Exposure to ideologically diverse news and opinion on Facebook. Science 348 (6239), 1130–1132.
Barberá, P., Jost, J.T., Nagler, J., Tucker, J.A., Bonneau, R., 2015. Tweeting from left to right: is online political communication more than an echo chamber? Psychol. Sci. 26 (10), 1531–1542.
Bennett, W.L., Segerberg, A., 2012. The logic of connective action: digital media and the personalization of contentious politics. Inf. Commun. Soc. 15 (5), 739–768.
Bond, R., Messing, S., 2015. Quantifying social media's political space: estimating ideology from publicly revealed preferences on Facebook. Am. Political Sci. Rev. 109 (1), 62–78.
Boulianne, S., 2015. Social media use and participation: a meta-analysis of current research. Inf. Commun. Soc. 18 (5), 524–538.
Boxell, Levi, Gentzkow, Matthew and Shapiro, Jesse, 2017. Is the Internet Causing Political Polarization? Evidence from Demographics, No 23258, NBER Working Papers, National Bureau of Economic Research Inc.
Chae, H., Kim, S., 2008. Conservatives and progressives in South Korea. Washington Q. 31 (4), 77–95.
Chaibong, H., 2005. The two South Koreas: a house divided. Washington Q. 28 (3), 57–72.
Chang, W., 2008. The cyber balkanization and structural transformation of the public sphere in Korea. J. Contemp. East. Asia 7 (2), 29–48.
Choi, S., Park, H., 2014. An exploratory approach to a Twitter-based community centered on a political goal in South Korea: who organized it, what they shared, and how they acted. New Media Soc. 16 (1), 129–148.
Conover, M., Ratkiewicz, J., Francisco, M.R., Gonçalves, B., Menczer, F., Flammini, A., 2011. Political polarization on twitter. ICWSM 133, 89–96.
Duggan, M., Smith, A., 2016. The Political Environment on Social Media. Pew Research Center. Retrieved from http://www.pewinternet.org/2016/10/25/the-political-environment-on-social-media/.
Garimella, V.R.K., Weber, I., 2017. A Long-Term Analysis of Polarization on Twitter. arXiv preprint arXiv:1703.02769.
Green, D., Palmquist, B., Schickler, E., 2002. Partisan Hearts and Minds: Political Parties and the Social Identities of Voters. Yale University Press, London, England.
Gruzd, A., Roy, J., 2014. Investigating political polarization on Twitter: a Canadian perspective. Policy Internet 6 (1), 28–45.
Hahn, C., 2005. The two South Koreas: a house divided. Washington Q. 28 (3), 57–72.
Hahn, K., Ryu, S., Park, S., 2015. Fragmentation in the Twitter following of news outlet: the representation of South Korean users' ideological and generational cleavage. J. Mass Commun. Q. 92 (1), 56–76.
Hong, S., Kim, S.H., 2016. Political polarization on Twitter: Implications for the use of social media in digital governments. Government Information Quarterly 33 (4), 777–782.
Isenberg, D.J., 1986. Group polarization: a critical review and meta-analysis. J. Pers. Soc. Psychol. 50 (6), 1141–1151.
Iyengar, S., Hahn, K.S., 2009. Red media, blue media: evidence of ideological selectivity in media use. J. Commun. 59 (1), 19–39.
Iyengar, S., Sood, G., Lelkes, Y., 2012. Affect, not ideology: a social identity perspective on polarization. Publ. Opin. Q. 76 (3), 405–431.
Jou, W., 2010. The heuristic value of the left-right schema in East Asia. Int. Political Sci. Rev. 31 (3), 294–366.
Kihl, Y.W., 2015. Transforming Korean politics: democracy, reform, and culture. Defense Intell. J. 13 (1–2), 124–125.
Kim, Y., 2011. The contribution of social network sites to exposure to political difference: the relationships among SNSs, online political messaging, and exposure to cross-cutting perspectives. Comput. Hum. Behav. 27 (2), 971–977.
Kim, Y., 2011. The Politics of Coalition in Korea: Between Institutions and Culture. Taylor & Francis.
Kim, K.H., Yun, H., 2007. Cying for me, cying for us: relational dialectics in a Korean social network site. J. Comput. Mediated Commun. 13 (1), 298–318.
Kim, K., Kang, J., Yun, S., 2012. Moral intuitions and political orientation: similarities and differences between South Korea and the United States. Psychol. Rep. 111 (1), 173–185.
Korean Internet and Security Agency, 2016. 2016 survey on the Internet usage. Summary report. Available at < http://isis.kisa.or.kr/board/index.jsp?pageId=060100&bbsId=7&itemId=817&pageIndex=1 > .
Lee, J., Myers, T.A., 2016. Can social media change your mind? SNS Use, cross-cutting exposure and discussion, and political view change. Social Media Studies 2 (2), 87–97. http://dx.doi.org/10.15340/2147336622992. ISSN: 2147-3366 (Print) ISSN: 2148-7502 (Online).
Lee, J., Choi, J., Kim, C., Kim, Y., 2014. Social media, network heterogeneity, and opinion polarization. J. Commun. 64 (4), 702–722.
Ok, H., 2011. New media practices in Korea. International Journal of Communications, 5.Pablo Barberá (2015) How Social Media Reduces Mass Political Polarization. Evidence from Germany, Spain, and the U.S., Paper prepared for the 2015 APSA Conference.
Park, S., Park, Y., Lim, Y., Park, H., 2016. Expanding the presidential debate by tweeting: the 2012 presidential election debate in South Korea. Telematics Inform. 33 (2), 557–569.
Pousher, J., 2016. Social networking very popular among adult internet users in emerging and developing nations. Pew Research Center. Retrieved from < http://www.pewglobal.org/2016/02/22/social-networking-very-popular-among-adult-internet-users-in-emerging-and-developing-nations > .
Prior, M., 2013. Media and political polarization. Annu. Rev. Political Sci. 16, 101–127.
Quintelier, E., Van Deth, J.W., 2014. Supporting democracy: political participation and political attitudes. Exploring causality using panel data. Political Stud. 62 (Suppl. 1), 153–171.
Shin, G., Chang, P., 2011. South Korean Social Movement From Democracy to Civil Society. Routledge Press, London & NY.
Shin, J., Thorson, K., 2017. Partisan selective sharing: the biased diffusion of fact-checking messages on social media. J. Commun.
Stroud, N.J., 2010. Polarization and partisan selective exposure. J. Commun. 60 (3), 556–576.
Sunstein, C.R., 2009. Going to Extremes: How Like Minds Unite and Divide. Oxford University Press, NY.
Sunstein, C.R., 2017. #Republic: Divided Democracy in the Age of Social Media. Princeton University Press, NY.
Tajfel, H., Turner, J.C., 1979. An integrative theory of intergroup conflict. Soc. Psychol. Intergroup Relat. 33 (47), 74.
Tufekci, Z., Wilson, C., 2012. Social media and the decision to participate in political protest: observations from Tahrir Square. J. Commun. 62 (2), 363–379.
Turner, J.C., Oaks, P.J., 1986. The significance of the social identity concept for social psychology with reference to individualism, interactionism, and social influence. Br. J. Soc. Psychol. 25, 591–613.
Turner, J.C., Hogg, M.A., Oakes, P.J., Reicher, S.D., Wetherell, M.S., 1987. Rediscovering the Social Group: A Self-Categorization Theory. Blackwell, Oxford, England.
Valenzuela, S., Somma, N.M., Scherman, A., Arriagada, A., 2016. Social media in Latin America: deepening or bridging gaps in protest participation? Online Inf. Rev. 40 (5), 695–711.
Xenos, M., Vromen, A., Loader, B.D., 2014. The great equalizer? Patterns of social media use and youth political engagement in three advanced democracies. Inf. Commun. Soc. 17 (2), 151–167.
Yardi, S., Boyd, D., 2010. Dynamic debates: an analysis of group polarization over time on twitter. Bull. Sci. Technol. Soc. 30 (5), 316–327.