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언론정보학과 석사학위 논문

The Ideological Evolution of Social Network Sites:
A Test of the Concentration and Polarization Hypothesis
(소셜 네트워크 사이트의 이념적 진화
: 이념 편중 가설과 양극화 가설에 대한 측정을 중심으로)

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Abstract

In the last decade, online sphere has been extensively transformed while going through the other dimension of development. The Web 2.0 idea where people can be more actively involved on the site has been materialized through invention of a novel online platform such as microblog or Social Network Sites (e.g., Myspace, Tumblr, Facebook and Twitter). Social network sites (SNSs) play the most pivotal role in changing people's contemporary lifestyle and exercise a remarkable impact on the events of the real world. Clearly the performance in civic engagement through social network sites is also very impressive and uniquely Twitter has been regarded as a key. In this study, I examine how ideological polarization among users has changed over time in Twitter by data mining and network analysis. Here I analyze followership between legislators and users and then compare the extent of political polarization and concentration in the respective years. The results show ideological polarization and concentration in Twitter has been more or less alleviated over time although its extent of change is very small. The result also indicates the liberal users are more likely to follow liberal legislators. Furthermore this liberal's like-minded followership is found to get distinctively bigger as time goes on. The findings suggest users in new media sphere do not linger at a stable status but rather dynamically changed. The current study is expected to

enrich the classic debates over online group polarization and to be one of cornerstones of new media study in political communication context.

Keywords: Twitter, Social Network Sites, Ideological polarization, Ideological segregation, Selective exposure, Evolution of social media

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Table of Contents

INTRODUCTION

LITERATURE

Ideological Polarization in Contemporary Politics

Polarization of Online Public Sphere

Twitter, the New Political Medium

RESEARCH QUESTIONS & HYPOTHESES

The Concentration Hypothesis

The Polarization Hypothesis

METHOD

The Network Representation

Measure: Classical Multidimensional Scaling (MDS)

Sample

RESULTS

Analysis 1

Analysis 2

DISCUSSION

Over-time Change of the Ideological Polarization in the Era of Social Media

Discrepancy Between Elite Polarization and Mass Polarization in Twitter

The Elemental Factors Swaying Followership of Users and Legislators

Limitations and Suggestions for Future Researches

Reference

List of Tables and Figures

Table 1. Number of Legislators and Followers

Table 2. The Magnitude of Followership Concentration Over Time

Table 3. The Strength of Partisan Divide Over Time

Table 4. The Strength of Intraparty Cohesion Over Time

Table 5. Demographic Composition of KBS panel data

Table 6. Partisan Selectivity in the Twitter Followership - All Panelists

Table 7. Partisan Selectivity in the Twitter Followership - Same Panelists

Table 8-(a). Predicted Marginal Effects of Each Party Identification Group

Table 8-(b). Predicted Marginal Effects of Within-party and Cross-party Following

Figure 1. Twitter Following as a Bipartite Network

Figure 2. The Distribution of Politician MDS score

Introduction

In the last decade, online sphere has been extensively transformed while going through the other dimension of development. The Web 2.0 idea where people can be more actively involved on the site has been materialized through invention of a novel online platform such as microblog or Social Network Sites (e.g., Myspace, Tumblr, Facebook and Twitter). The advent of smartphone, in addition, have made people enjoy a true meaning of ubiquity in the social communication situations. Indeed smartphone widely contributes to a social media boom because information on whom people are interested in are accessible anytime and anywhere by technologies enabling the real-time updates. Those upgraded online services emphasizing ubiquitous connectivity have attracted many people by its charm then it was a matter of time to make people socially wired from seconds to seconds. The size of SNSs users are enormously exploding at a global as well as a local scale. The number of the world-wide users of Twitter has jumped from 100 million in 2010 (June 2010, Sysmos in-depth report) to 500 million in 2012 (April 2012, Twitter official blog post).[1] Also Facebook is now reported that it has approximately 900 million monthly active users (Wall Street Journal, 2012). The size of Social Network Sites'

[1] Sysmos In-depth report(June 2010): http://mashable.com/2010/12/16/twitter-stats-2010
Twitter Official Blog post(April 2012): http://www.businessinsider.com/twitter-stats-2010-4

popularity seems to be huge but we should acknowledge that its power is more than such numerical influences represented by those big number of membership.

Social Network Sites undoubtedly have played the most pivotal role in changing our lifestyle. It has exercised remarkable impacts on the events of the real world. Also the performances in civic engagement through Social Network Sites are very impressive. Most recently New York Times published a feature article about Barak Obama, a presidential candidate trying to hold his presidency, who outperformed in social media campaign of 2012 election just like what he did in 2008. As many scholars conducting researches about Obama's successful campaign of mobilizing voters by social media have reported (Aakers and Chang, 2009; Harfoush, 2009), his 2008 campaign created 5 million supporters on social networks including 2.5 million followers on Facebook, and 50 million viewers who watched 14 million hours of video on YouTube, finally which led to 230,000 events and $639 million raised from 3 million donors. Notably according to analysis of New York Times, the 2012 campaign also built the similar results like the past and thanks to his campaign strategies he is re-elected as the 44th president of the United States (New York Times, 2012).

Not only but the voluntary political participation of citizens has been affected by the power of social media. Bond and his research team (Bond et al.,2012) claim the political mobilization message,

showing pictures of friends who said they had already voted, generated 340,000 additional votes in 2010 US Congressional Election. They find the message influenced the users who received them, the users' friends, and friends of friends. Pew Internet & American Project which is one of primary projects of the Pew Research Center recently briefs the results of the survey taken during 2012 presidential election campaign. According to their reports, 22% of social media users "shared their vote for presidential candidate on social media" and 35% of users "have used social networks to encourage others to vote" (Pew Research Center, 2012).

In the political realm Social Network Sites never stayed in only local. The Arab Spring of 2011 which broke out in Tunisia actively invited digital media to spread their messages while avoiding the government guard. The savvy activists effectively used social media tactics in order to appeal to the international citizens who agree with their movements trying to overthrow the dictatorship governments in the Arabic world. For example, the prominent blogger Mahmood al-Yousif in Bahrain tweeted during his arrest, immediately reaching to the local and international activists networks in @OnlineBahrain and @BahrainRights. Technicians, hackers and even technology firms like Google supporting democratization of North Africa and the Middle East countries helped activists and citizens to bypass Twitter, Facebook and Youtube blockade of the dictatorship governments. Meanwhile

individual activists scattered over the world collaborated by using social media to topple dictators (Khondker, 2011; Howard and Hussein, 2011; Howard and Park, 2012).

Amid this international phenomena - the social media craze in political communication, South Korea, one of the most wired countries in the world[2] was not exceptional. First of all, the number of Korean users of Twitter and Facebook amounts to about fifty million today. The rate of the number of social media users is striking. According to the recent report of Statistics Korea published in the early month of 2012 the size of social media use have snowballed. In 2010 Korean users of Twitter was 632 thousand but it has increased to 5.44 million in 2011. Also Facebook users has rapidly grown from 4.01 million (September, 2011) to 5.35 million (December, 2011) (Statistics Korea, 2012).

In the midst of political events Twitter was standing in the middle as a critical player in Korea. Particularly Seoul mayoral race held in October 2011 was at the zenith of social media election. In 2011 many liberal agendas such as policies of the halved university tuition or the free school lunch were salient while the demonstrators who are for those policies were spreading supportive messages through Twitter. The conservative sides were threatened by such movement rises so three major newspapers of Korea which are allegedly

[2] Please see OECD broad band portal about the specific statistics of the world trend (http://www.oecd.org/sti/broadbandandtelecom/oecdbroadbandportal.htm)

conservative advocators proclaimed Twitter is the liberally biased media putting politics in peril (e.g., Chosun Ilbo, 2011). In this political tension the incumbent Seoul mayor Sehoon Oh from the conservative Grand National Party resigned and the sudden vacancy of one of the most important offices in Korea was becoming a touchstone for the next year's presidential election. The liberal candidate from Democrat Party, Wonsoon Park took the seat in the end and a political punditry commented Twitter was an elemental factor of his victory since Twitter actually mobilized lots of young liberal voters (e.g., Donga Ilbo, 2010). In this light Choi, Lee and Kim (2012) find that turnout rate of Twitter users was higher than not-users and they also carried a lot of political messages voting for the candidate they like via SNSs during the Seoul mayorl race. Even in other political incidents of the last three years, social media especially Twitter has been considered imperative in Korea local politics (e.g., Chang, 2011; Shin and Lee, 2011).

Unfortunately despite of its importance in political communication, Twitter does not guarantee the bright future in democracy. A liberal bias in Korean Twitter has been academically verified as the conservative printed media have continuously argued (Chang, 2011; Hahn et al., 2011). Such an ideological imbalance in Twitter may lead to deteriorate Twittersphere so that Twitter would eventually fail to play a role as a catalyst facilitating a various information exchange among users. Not only but this distinctive

Twitter's ideological imbalance, communication scholars studying online media have warned the possibility of ideological polarization mainly caused by intensified selectivity of information of Social Network Sites. Political groups are easily insulated from their opponent groups since people are prone to avoid meeting others who have dissimilar perspectives. Therefore the classic self-exposure debate of media contents use should be more discussed in the era of a brand-new media. In this study, I will examine changes in ideological polarization in Twitter over time in Korea political environment by data mining and network analysis. How different groups of people interact each other on the web will be mainly discussed. The reason why I introduce 'polarization' as a keyword in this current analysis is that media and communication scholars have widely concerned about audience segregation by tailored media service and its detrimental outcome such as group polarization and enclave deliberation (Sunstein, 2001, 2004). I will examine how Twitter as new media altering online communication has been evolving in terms of audiences' political communicative actions and what would imply to the future political communication. This study is expected to enrich the previous academic debates over online group polarization and to be one of cornerstones of new media study in political communication.

Literature Review

Ideological Polarization in Contemporary Politics

The classics of voting behavior studies in political science contend people tend to incorporate their preexisting views to political affairs. Campbell and his colleagues assert in the book 「*The American Voters*」 partisanship provides voters with 'perceptual screen' (Campbell et al., 1960, p.133). As an indicator as well as a cognitive shortcut people's ideological preferences stemming from individual predispositions play a significant role in contemporary democracy. Not only on micro level, but also on macro level do ideological differences generate party competition while creating beneficial tension of democracy. Brady and Han note, in this vein, that "Political parties are organized around those differences, so there will always be some degree of polarization in a democracy" (Han and Brady, 2006; Campbell, 2006). Voters can take full advantage of those distinctions among parties to make their political decision**.** Therefore, there is little doubt that the both formal and informal politics are naturally polarized for this reason.

Pioneering political scientists, however, have raised concerns about severely polarized mass and elites although it is more or less clear ideologically distant groups are endogenous to politics. According to Pool and Rosenthal (1984, 1991), representative democracy of the US

has been suffering. Assessment of roll-call voting records of congress in their researches show ideological distance among politicians are getting bigger. Abramowitz and Saunders (2005) conduct panel data analysis and conclude that mass public is also polarized. The other relevant studies also discover polarization among different kinds of polities such as party activists (e.g., Aldrich, 1995; Aldrich and Rhode, 2000; Layman, Carsey, and Horowitz, 2006) Fiorina and Abrams (2008), on the contrary, refute the polarization arguments of the US politics and strongly maintain those approaches are mistaken. Uninformed electorates about politics have ambivalent positions on public affairs so the extent to which the mass is politically divided simply corresponds to the degree of competition among polemic elites. Some also similarly argue elite polarization is not linked with mass polarization (Fiorina, Abrams and Pope, 2005) and it happens only temporarily in accordance with institutional changes (Burden, 2001).

The key academic interest about ‘polarization’ of the western politics are threefold: ‘who are polarized’, ‘how much polarized’, and 'why polarized'. When it comes to the first question, Rohde and Barthelemy (2009) summarize the pattern of ongoing ‘polarization debates’ by introducing three categories of polarization – elites, mass and activists. They suggest three polities’ development of polarization have been actively studied. Han and Brady (2007), on the other hand, argue political polarization in only both elite and public is a yardstick of

measuring the polarized political realm. As such it could be meaningful to study about who are polarized as heated debates over elites and mass polarization raised awareness of the value of political communication. However, it is more important to introduce a substantive question in advance: why does polarization need to be seriously considered?

As political scientists wary of the polarized nation constantly claim, representative democracy itself would be collapsed if magnitude of polarization is unbearably large. Huntington (1975) argues that rising polarization in the mid-1960's American politics generated distrust about government, as those who had strong positions on issues became dissatisfied with the compromising policies of government (Huntington, 1975, p.78). In accordance with the polarized public as Huntington diagnose, elites have become more likely to strategically shift their position to the more extreme poles (see also Brady, Han and Pope, 2007). The exact causal relation between elites and publics in polarization has not been determined. Nevertheless the polarization of two over time could be last by a law of inertia. To pursue rational discussion of citizens as normative theory of democracy emphasizing the harmonious and reasoned discussion among polities are a rudimentary element for healthy democracy. In his infamous 'public sphere' theory Jürgen Habermas (1991) states "the public of 'human beings' engaged in rational-critical debate was constituted into one of 'citizens' wherever

there was communication concerning the affairs of the 'common wealth'" (Habermas, 1991, p.106-107). What is important, therefore, in communication of civil society people can be engaged in open discussion when the public share the common grounds. Accordingly inference from such normative views of civic communication can be made that losing the common ground will shut the door through which people can enter the rational discussion. Furthermore, as we think of Everett Rogers's definition of communication, "a process in which the participants create and share information with one another to reach a mutual understanding" (Rogers and Kincaid, 1981), polarization that characterized as stressing 'Us and Them' will apparently prevent people from attaining reciprocal benefits from understanding.

In addition polarization could make social costs highly increase for likely uncooperative actions of agents. Many social science studies keep warning the detrimental outcomes of individuals' selfish choices in cooperation situation (e.g., Hardin, 1968; Olson, 1965). Price of anarchy (PoA) of game theory (e.g., Christodoulou and Papadimitriou, 2005) and increasing social cost suggested in Coase's theorem (Coase, 1960) would be good examples for this. Likewise Frye (2002, 2010) argues that political polarization has led to a "war of attrition" in which people have failed to agree on coherent measures to address the economic crisis.

In sum, polarization does really matter and thus whether politics

is polarized should be rigorously investigated. These days as the western academia seriously consider, studies about Korean politics have recently started to examine whether polarization of the mass and elites are also true in Korea. The recent finding of Lee (2011) reveals that representativeness of Korean politics seem to be at risk when considering the empirical evidences showing greatly polarized congress members in comparison to the mass polarization. Furthermore today's dramatic changes in communication environment seem to stimulate polarization phenomenon. Many researchers have argued online public sphere is getting more segregated.

Polarization of Online Public Sphere

The emergence of advanced online media now refuels disputes over the fragmented online public sphere. The new media capable of offering a bulk of choices to the audience has altered the media consumption landscape while unprecedentedly empowering users to a great extent in choice. Nowadays users can actively join the chains of distribution and production of contents so that they are not anymore left submissive in terms of participation (Harrison and Barthel, 2009; O'Reilly, 2007). In the same vein politically motivated users can voluntarily be more engaged in the current affairs and take actions in offline politics. The feature of web 2.0 enabling people to make themselves possibly exposed to diverse views while markedly reducing cost of information acquisition

let society think of a groundbreaking change in democracy. In spite of the rosy-colored side of online democracy as some scholars have constantly underscored (e.g., Gandy, 2002; Reingold, 2000) the actual political communication among the citizens discovered by a battery of studies are not exercised in the public sphere that we all might imagine.

Cass Sunstein (2001, 2007) brings the term 'enclaves deliberation' in his book 'Republic.com' to evoke danger of the polarized online space. In the latest edition of his book he states "new technologies emphatically including the Internet make it easier for people to surround themselves with the options of like-minded but otherwise isolated others and to insulate themselves from competing views"(Sunstein, 2007, p. 63-64). The fragmented publics are reluctant to talk with their counterparts and instead, are more willing to deliberate within their own enclaves. The in-groups 'wall themselves off' from the opposed views. Yet, of course, the term is rather symbolic than empirical.

Relatedly, a large number of researchers have found people's communication in blog and online boards are being polarized. Adamic and Glance (2005) studying links of political blogs demonstrate political blogs had links of news media websites corresponding to their liberal-conservative leanings. For example, most of conservative blogs attach the links of *The Washing times*, the *WSJ Opinion Journal* or the *New York Post*. Similarly Lawerence, Sides and Ferrell (2010) also find blog users are more polarized than either non-blog-users or viewers of

TV news, and they are as polarized as US senators. Haragittai and his colleagues (2008) who investigate blogs' contents conclude that bloggers are much more likely to link to the other blogs sharing the same view. Krebs (2000) demonstrates even Amazon book sales follow buyers' ideological status. He showed the pattern of purchasing book is even bipolarized along with each ideological camp.

Why do people eventually end up reinforcing their political views and limiting consumption of information? To answer this question it is necessary to look back on chronology of media development. Interestingly mass media has also been attributed to the fragmented public sphere. The early tests of cognitive dissonance hypothesis (e.g., Festinger, 1987) report partisan voters tend to expose themselves more to the candidate or party they prefer (e.g., Lazarsfeld, Berelson, and Gaudet, 1948). Most notably, intrusion of cable networks to the television news outlets heightened the level of fragmentation. Iyengar and Hahn (2009) verify that the presence of ideological news channel increases the likelihood of consumption of the channel sharing a viewer's ideological stance. Fox news, for instance, has succeeded in attracting the conservatives' viewership. The news articles labeled by Fox news is chosen by a large majority of the subjects whose ideology leaned to right according to their experiment findings. Prior (2005) demonstrates, in similar context, discrepant consumption of TV programs (entertainment-oriented versus information-oriented) produce 'divide' in

political knowledge. The comparable results are also suggested by studies on Korean cable news network (e.g., Cho, Kim and Kang, 2009). In short, communication technology which expands choices in selecting information magnifies audience segregation no matter what media type people would take. Following economic law of cognitive psychological orientation people are prone to choose information palatable to them instead of consuming cross-cutting views which challenge their precedent viewpoints (Mutz, 2002; Wojcieszak and Mutz, 2009). As Downs professed earlier, average citizens frequently entrust certain entities with a task of seeking political information and this time ideological position is a good signal for them to find appropriate agents (Downs, 1956). Then if this selective exposure and choice of information are inevitable in modern political communication is ideological polarization between two competing poles mainly elicited by selectivity an ultimate outcome? And would the most recent Social Network Sites maximizing users' autonomy in information consumption aggravate polarization more than the past? Lots of studies dealing with polarization issue have usually relied on cross-sectional data so that it failed to fully capture dynamics of polarization phenomenon per se. In the next section I will look through the previous researches about Twitter as one of leading Social Network Sites and its potential of online public sphere.

Twitter, the New Political Medium

Twitter was launched in 2006 and Facebook founded earlier in 2004. Their expansion in the international market has been in parallel with introduction and distribution of smaprtphone. It took five years (2004-2009) to record 150 million total users, but it hit 300 million users within eight months in 2009 (Economist, 2010, p.56). The speed of growth was absolutely amplified in the period when the first iphone was introduced in March 2008 and started to be sold in 80 countries in the early months of 2009 (Apple Inc.,2009). The present situation is more clearly showing why Social Network Sites conquer our lives. According to the latest updates about the co-evolving relationship between mobile devices and social networks (comScore, 2012) Facebook and Twitter users spend more time on mobile devices than on computers or laptops. Twitter users use 2 hours services on mobile as compared to 20.4 minutes on the website and Facebook users use 7 hours on smartphone which is 1 hour more than on computers (Forbes, 2012).

In this trend Twitter interestingly appears more distinctive from the other social media in terms of political communication. Unlike Facebook which is more personal and private network Twitter is greatly used as news media rather than the offline friends' network. As Kwak and his colleagues suggested (Kwak et al., 2009) Twitter cannot be categorized as a social network in the conventional sense. The

structure of communication in Twitter which based on 'following' scheme is rather a broadcasting system that let users transmit 140 worded short information to lots of strangers. The only small part of Twitterers like CNN or Oprah Winfrey accounted for 90% of all tweets (Wu et al., 2011; Heil and Piskorski, 2009). In other words ordinary users are exposed to mass of information they intend to selectively receive (Zao and Rosson, 2011). Thus political impacts Twitter might have is different from the one Facebook might exert. Hence Twitter as a major political player has been widely studied for the latest three years. Indeed there have been the considerable amount of trials to demonstrate the power of Twitter in the political arena.

For instance, the prediction of election while taking Twitter as an alternative of opinion polling instead of the traditional survey sheets has been realized by a plenty of modelings based on knowledge of computer and information science (e.g., Conover et al., 2011; Bermingham, and Smeaton, 2011; Tjong, et al., 2012; Skoric et al., 2012).[3] A variety of studies over Twitter in computer science have carried a meaningful implication which social scientist might think noteworthy because the studies have kept challenging the obstacles of empirical methodologies social scientists have confronted. A big data they easily cook with their expertise is a main source of computer

[3] See also Gayo-Avello's (2012) summary of the previous studies about Twitter's predicative capacity over public opinion.

science's Twitter studies. An and her research team (An et al., 2010) for example, was dealing with 14 million audience members following news media accounts. Bakshy's team of Twitter study (Bakshy et al., 2009) tracked 1.6 million Twitter users of 74 million diffusion events to assess to what degree a certain user has a 'influence' on the other.

More critically, Twitter's network has been regarded as a fascinating subject in terms of operating a field study since Twitter virtually has the population-sized actors in network. A cascade, contagion, diffusion and any possible network dynamics associated with information delivery have been experimented (e.g., Aral et al., 2009; Chang, 2011; De Choundhury et al., 2011; Lerman and Gosh, 2010; Romero et al., 2011; Zamal, 2011). Some studies have tried to invent fake accounts to see how the picture of contagious political information would look like (e.g., Mustafaraj and Metaxas, 2010; Ratkiewicz, 2011). Nevertheless what is the most interesting about Twitter study of computer/information science to political communication scholars would be discussion over online public sphere such as political polarization or democratic divide in Twitter.

As a matter of fact, there are only few Twitter studies conducting specific researches about the substantive political issues except the predictability of Twitter on the election results. The number of study about political polarization in Twitter is even more less (e.g.,

Conover et al., 2011; Gruzd, 2012; Nam, 2011; Yardi and Boyd, 2010).[4] From time to time, the presumable ideological positions of Twitter users are considered a good topic for information science but it mostly focuses on how ideological preferences can be accurately estimated (e.g., Boutet et al., 2012; Mislove et al., 2011). Notwithstanding the foregoing findings about 'homophily' phenomenon in Twitter could be good referable studies for the current analysis. According to big data analysis of physics online media are evidently divided. Earlier the scientists tried to map out the entire American users of blog and Twitter and they found the high level of ideological segregation in two media (e.g., Lazer et al., 2009; Miller, 2011). Hence we could speculate that Twitter is a political new medium that inherits the communication environment of ideological segregation from the previous blogsphere. Yet whether polarization by political preferences in Twitter would be exacerbated in the future should demand more concrete theoretical and methodological backgrounds. In the next section, for this reason, I propose two hypotheses regarding ideological evolution of Twitter to figure out the future of a political divide in Twittersphere.

[4] I will invite details of these four previous studies to discuss the findings of the current analysis in the last two section.

Research Questions and Hypotheses

Although, at the cross sectional level, previous research has demonstrated that social media could consists of the segregated enclaves, little previous research has attempted to document how this relatively new medium evolves over time. Would the seemingly ideological imbalance on Social Network Sites ease over time as their user base becomes wider? Is it possible that the extensively demonstrated ideological divide on social media only transitional? Alternatively, is it possible that ideological polarization on social media may intensify even further? Answers to these questions will have important normative implications concerning social media's potential for providing an online space with meaningful deliberation. In the current analysis, as will be described shortly, I assess two aspects of Social Network Sites' ideological evolution: (1) concentration and (2) polarization.

The Concentration Hypothesis

One of the potential concerns regarding Social Network Sites has to do with "ideological concentration" or the process in which a particular ideological group becomes increasingly predominant. So argue that SNS's have a tendency to facilitate certain views while leaving out the others. More specifically, some suspect that SNS's are a medium dominated by liberal ideologues. Conceptually, the liberal ideology is

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closely related to participatory behavior and political activism (e.g.,, Inglehart & Klingemann, 1976; Abromowitz, 1973; Levenson and Miller, 1976). Accordingly, the intrinsic features of SNS's are highly compatible with their ideological beliefs. No less importantly, a disproportionately large proportion of SNS users are young voters, and young voters tend to be liberal. Such a liberal bias in Twitter has been seriously considered in both America and Korea (e.g., An et al., 2010; Pew research center, 2012, Chang , 2011; Chang and Kim, 2011; Hahn et al., 2011).[5]

However, it is possible that this imbalance might correct itself over time. Jennings and Zeitner (2003) address in their longitudinal study those who used to possess high influences already in offline political activities are dominant online also. However, the authors demonstrate as time goes by, the concentration of those who are more

[5] In the latest survey taken in Pew research center the size of liberal and young users are much more bigger than their counterparts. The group of liberal and young users (18-29 years) account for respectively 79% and 92% of the total Twitter users. It has been convinced even among the academic researchers. For example, An and her team (An et al., 2011) document a vast majority of users who follow the traditional media in Twitter is liberally tilted (89% versus 1%). In the case of Korea, liberal media hypothesis is strongly supported by the recent findings. Chang (2011) documentes that on average those who voted for the two liberal parties' candidates in the 18th General Election had 13 (Democratic Party) and 36 (the Democratic Labor Party) followers. In sharp contrast, on average those who had voted for the conservative party's (Grand National Party) candidate only had four followers. Likewise, based on a content analysis of 2,660 Tweets composed by 1,991 users, Chang and Kim (2011) show that a vast majority of Tweets (61%) could be classified as expressing liberal views whereas only 10% could be classified as expressing conservative views. These findings strongly suggest that, at the cross sectional level, there seems to be a substantial liberal tilt among Twitter users. Similarly Hahn et al. (2011) convincingly demonstrated a clear cross national contrast between the U.S. and South Korea. The authors' results suggested that liberals made heavy political use of Twitter in South Korea as demonstrated in other previous studies. Although, in the representative sample of Korean citizens, conservatives had a slight advantage over liberals (19.3% and 23.2%), when gauged by the pattern of followership, liberals had an advantage of 15.5% (32.4% versus 16.9%).

politically sophisticated in the Internet use is resolved. Contrary to Sunstein's arguments of strong enclaves deliberation which even possibly happens to ordinary citizens, polarization could be just a tip of the great iceberg of the online network. In the other words, ideological polarization among people with different views could be only for the political activists' business since the average users have really no interests in online political activism.

Furthermore, as taking perspectives from media economy studies, a group polarization in online space might need a reconsideration. Napoli (2011)'s recent project about the audience evolution calls for reinterpretation of Anderson's previous work of 'the long tail law'. Anderson's previously argued in his book 「*The long Tail: Why the future of business is selling less of more*」 (Anderson, 2008, 2010) that summation of minor tastes and needs would outnumber the mainstream contents. Napoli, however, contradicts Anderson's argument and states it is impossible for audience autonomy to be fully exercised in contents consumption. Rather consumption is highly concentrated on a majority of traditional contents as we witnessed before in the era of mass media. Therefore, 'self-exposure' settings of online services such as filtering or sorting function would not be that critical matters. It might make sense that individuals do consume contents in different ways at the beginning, but sooner or later people inevitably reach at a certain point where the

major contents are dominant as exactly the mass media age did. Accordingly, it may possible that ideological imbalance could be ameliorated over time in the near future.

In summary, considering debates over the concentration of a certain group in online media the concentration hypothesis can be stated as follows:

Hypothesis 1: The severity of ideological concentration on a given social network site is likely to increase over time.

The Polarization Hypothesis

Second of all, I propose a more essential related debate over online public sphere. It is about social media such as Twitter will polarize ideological stance of users in online. Twitter basically functions by the following scheme which let users autonomously choose the likeable newsfeed items among a plenty of options. Therefore previous works on social networks provide a useful starting point for theoretical discussion of social media's evolution, advancing our understanding of why dysfunctional and more polarized social network structures may emerge. The classic Schelling's model (1969) of residential segregation allows us to form theoretical predictions concerning the structural evolution of networks. Attempting to model

residential segregation patterns, the author's work starts off by challenging the common view that a strict preference for homogenous communities, or discrimination, is a necessary condition for the emergence of residential segregation. Schelling's path-breaking model (1969) assumes that actors only have a very small aversion from being connected to others who are dissimilar to themselves, whereas no actor strictly prefers a segregated network (i.e., explicit discrimination). The author's work demonstrates that, even with such a weak form of in-group preference or bias, segregated networks emerge regardless of the level of aversion, suggesting that weak preferences against being a local minority in the community can ultimately produce stark patterns of aggregate level segregation.

As in the models of residential segregation, network scholars had assumed the importance of "homophily," or agents' attraction to others similar to themselves, in driving endogenous networking choices. The Schelling model, however, triggered a paradigm shift, by showing that the emergence of network segregation does not require such a strong assumption, namely the attraction aspect of 'homophily.' According to Schelling's model, only a mild aversion from dissimilar network partners, coupled with a random selection of new partners, may be sufficient to produce segregated networks. In sociological research, this pattern has been documented in a wide variety of networks, ranging from race- and gender-oriented segregation in high school friendship

networks (e.g., Moody, 2001) to value- and belief-oriented segregation in political networks (e.g., Lazarsfeld and Merton, 1954).

Not surprisingly, given the similarity between residential and network segregation patterns, Schelling's work on residential segregation provides useful insights into why segregated networks emerge and persist in online communities including Social Network Sites. Accordingly, a few recent studies propose models explaining how Social Network Sites would evolve over time. Most notably, Henry, Prałatb, and Zhang (2011) provide a network analogue to the Schelling segregation model, introducing a mathematical, Markov-chain model of network segregation. As in the Schelling model, the authors predict increasing segregation based on a very weak set of assumptions where actors have no strict preference for forming ties with similar network partners, but are subject to possibly an infinitely small bias for cutting ties with dissimilar actors. As with Schelling's original model, the authors' model analytically demonstrates that the persistence of segregated network structure of Social Network Sites is inevitable regardless of any initial network topology. In short, the authors' application of the Schelling model underscores that homophily processes (or a deliberate bias for forming attribute-close relationships) are not a necessary condition for the emergence of network segregation. Therefore, their findings suggest that segregation may emerge quite

quickly on Social Network Sites, even for very slight aversion tendencies.

Moreover much online interaction can be characterized as meeting 'like-minded' individuals, leading to a fragmented public sphere (e.g., Shapiro, 1999; Stroud, 2008; Sunstein, 2001, 2007). The new media technologies granting users power to screen out uncomfortable messages (Garrett, 2006). More importantly the argument that people prefer to approach supportive over non-supportive information precedes the onset of new media. As a means of minimizing dissonance (Festinger, 1957), the theory predicts that people would seek out information they expected to agree with. More direct tests of whether people deliberately avoid exposure to disagreeable information, however, yielded mixed results suggesting that dissonance avoidance was a relatively weak motive for the acquisition of information (e.g., McGuire, 1968; Sears, 1968). While some controlled studies uncovered traces of motivated exposure to in-party sources (e.g., Bartlett et al., 1974), others did not (e.g., Chaffee and Miyo, 1983). Even though people are psychologically attracted more to palatable messages it still remains debatable whether people will be more ideologically segregated in political communication. Also, it may raise a question about which one should be blamed for bisecting users in online sphere. Is it a matter of an individual psychological path to make a decision or a mere environmental effects of tailored media? To be clear, I stress that I

cannot deeply discuss here which one exactly causes the polarization in Twitter. The phenomenon could be mainly caused by either the only one factor or both. Rather I want to focus on tasks of clarifying alleged ideological imbalance and polarization in Twitter. Accordingly, the last polarization hypothesis is proposed as follows:

Hypothesis 2: The severity of ideological polarization on a given social network site is likely to increase over time.

Method

I attempt to use a novel method for analysis of the ideological segregation in Twitter followership. Since the rise of Twitter as one of critical political media, media researchers have widely tested Twitter although data availability is profoundly limited. Many scholars have tried to predict users' political interaction by using the traditional survey method (e.g., Chang, 2011; Chang and Kim, 2011). Yet the conventional survey retains a risk of generating misleading results because a random sampling of Twitter users are almost impossible. As another approach, some take advantage of tweets that users are posting on Twitter (e.g., Gruzd, 2012). The primary difficulty associated with this approach stems from the retrieval of large-scale data. To illustrate this point, currently the only way to collect data on a large quantity of tweets is to use a Twitter-provided API. Unfortunately, it may take weeks or even months. Accordingly, most analyses of tweets examined either a brief time period (e.g., Adamic and Glance, 2005) or a limited number of issues (e.g., Yardi and Boyd , 2010) but this limits the generalizability of findings.

In the current analysis, therefore, I estimate the political preferences of Twitter users based on their "followership" pattern. Here I basically replicate the methodology that Hahn and his colleagues established to analyze the same data of 2011 (Hahn et al., 2011). Based

on the previous work of Hahn and the co-authors I am following two steps to get measures. The first phase is to build the network representation of Twitter followership. The second phase is to elicit MDS scores of legislators from co-follower matrix. Twitter's characteristic of following function is made a full use of by the current work. Users in Twitter are mutually connected by "following" setting. If people want to get newsfeeds from whom people they want to be connected an individual user just click the 'follow' button. This interface will allow the previous researchers to make an adequate methodology where users' political preference are inferred by ideological distribution of politicians they follow.

The Network Representation

As the past work showed, estimation of individual followers' political stance will be predicted based on followership. The logic behind the proposed method in their study is that followership can be represented as the bipartite network which very similar to the roll-call vote network political science scholarship has suggested. In the legislation process of American politics, legislators' roll-call voting to the bills have been recorded since 1989.[6] So political scientists came up with the method which allows to build the relation between legislators and bills they voted (e.g., Poole and Rosenthal, 1985; Clinton et al., 2004). Since

[6] http://www.senate.gov/reference/glossary_term/roll_call_vote.htm

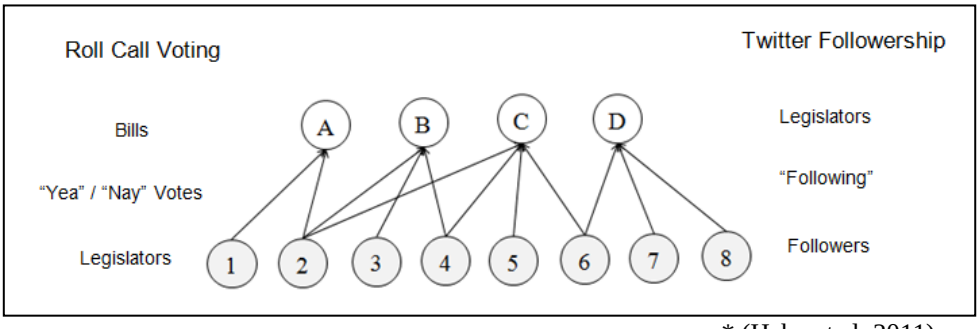
an observer's subjectivity might intervene in measurement it is hard to accurately estimate a legislator' ideological position. However, estimation of individual legislators' ideal points based on their roll call vote records provides its utility of accuracy. As the earlier studies suggested the current work also identifies groups based on the similar pattern of legislators and users' followership.

In Twitter a link between a follower and a followee is made when one party chooses to follow the other. To construct a proper network for analysis this study presumes that there is a link between a group of users and a group of legislators when a user decides to choose at least one of legislators in Twitter. To be more specific, two networks are linked by the relationship generated by 'follow' scheme. <Figure 1> shows how such a bipartite network of Twitter followership can be drawn (see <Figure 1>[7]). As shown in <Figure 1> Twitter followership and roll call vote of legislators can be represented as bipartite networks. When portraying the relationship between two sets in roll-call voting, the legislator circle A, B, C...D is linked to the set of bills (the circle labeled by the number from 1 to 4). The existence of links between two groups rests on the legislators' voting decision - "yea" or "nay". If the legislators cast a 'nay' vote to the bill, the link disappears. On the other hand, if they vote 'yea' to the bill the link is made. In a similar fashion,

[7] <Figure 1> is borrowed from Hahn and his research team's paper (Hahn et al., 2011).

an individual user can decide to 'follow' or 'not-follow' the legislators' accounts and the link made between two groups is up to the users' choice.

<Figure 1> Twitter Following as a Bipartite Network*



* (Hahn et al.,2011)

Measure: Classical Multidimensional Scaling (MDS)

After constructing bipartite network of Twitter followership, I calculate ideological distance among legislators in Twitter. For doing it I adopt mulitidimensional scaling method by which computes theoretical location of subjects. Here are several steps to obtain the ideological score a MDS method suggests. First of all, the dissimilarity $\delta_t(i, j)$ between two legislators i and j are defined on basis of the number of co-followers, so that legislators followed by a similar set of "followers" are closely located in the matrix. I also adopt Kulczynski dissimilarity[8]

[8] According to the previous explanation, Kulczynski dissimilarity has its utility when the range of $|F_x|$ varies widely. In addition, Kulczynski dissimilarity is often recommended as an alternative to Jaccard dissimilarity, (Hahn, et al., 2011; Hubálek, 1982) another commonly used measure of dissimilarity. More importantly the Kulczynski dissimilarity measures are applicable to binary data because it presuppose the distances between two objects can be applied to virtually any kind of binary data.

which is based on Kulczynski similarity when computing the distances between two objects. The equation of measuring the proximity between two objects are defined as below:

$$\delta_t(i, j) = 1 - \frac{1}{2}\left(\frac{|F_i \cap F_j|}{|F_i|} + \frac{|F_i \cap F_j|}{|F_j|} \right),$$

Here F_x denotes the set of Twitter users who follow the legislator x and $|F_x|$ denotes the size of the set (Hahn, et al., 2011). After dissimilarity of all legislators are measured, the classical multidimensional scaling method is used for grouping the legislators who share a similar set of followers. Multidimensional scaling is a type of cluster analysis are given and in principal it bases on Euclidean distance when dissimilarities of objects are given. Here I used STATA, the popular statistics package, for obtaining a 'dissimilarity' matrix. While UCINET or any other commonly used network analysis software are providing the function of MDS, STATA facilitates to obtain MDS scores with very simple command. Furthermore it does not require any specific form of matrix data. MDS scores can be computed in any number of dimensions but I only measure scores of two dimensions as the earlier work did. What the past study found in the first dimension score of MDS I also discover the lowest dimension of scores identify the given legislators' ideological positions in Twitter.[9]

[9] It is also a conventional way to limit only two dimensions of scores for analysis in the precedent studies of political science (e.g. Poole & Rosenthal, 1984, 1985).

The follower's political preference is computed by taking the average MDS scores of legislators he or she is following. Subsequently, the distance between each Twitter user T_j and the mean Liberal (Lib) and the mean Conservative legislator (Con) are computed. Also, each user's Euclidean distance to the mean Twitter user (M) is measured. Then for each T_j, min($|T_j -$ Lib, $|T_j - M|$, $|T_j -$ Con|) is calculated where T_j is regarded a conservative party supporter if min($|T_j -$ Lib|, $|T_j -$ M|, $|T_j -$ Con|) = $|T_j -$ Rep| and a liberal party supporter if min($|T_j -$ Lib|, $|T_j -$ M|, $|T_j -$ Con|) = $|T_j -$ Lib|. Similarly if min($|T_j -$ Lib, $|T_j -$ M|, $|T_j -$ Con|) = $|T_j - M|$, T_j is regarded an independent.

Sample

The sample are members of the 18th Korean National Assembly (May, 2008 – March 2012) their Twitter followers. The analysis is limited to the legislators with active Twitter accounts who had maintained their seats from the beginning of the current term to the given data collection period. I made a full use of Twitter's Open API for collecting data[10]. Next, I forged the proper data collection environment to crawl appropriate Twitter data through a clouding virtual server service provided by Amazon.com (http://aws.amazon.com). The acquired Twitter API information (i.e., consumer key, access key) allows me to

[10] Twitter now opens API to encourage technicians to develop a various kinds of application for Twitter users (http://dev.twitter.com).

crawl all lists of followers who followed at least one of legislators in Twitter. To facilitate a data collection task I used python which is one of widely used computer programming software. This program automatically computes the number of followers of legislators and matrix between followers and legislators.

Since a test of the proposed hypotheses requires an examination of temporal change, a data collection took place three times. The initial data collection (t1) was administered on September, 2010. On June, 2011, the follow-up data collection was completed (t2). Lastly on March, 2012 (t3) data collection was completed where the number of users of Korean Twitter hit more than 5 million. In our data the growth rate of legislators' followers is remarkable. Accordingly, the timing of data collection seems suitable for assessing the proposed hypotheses.

<Table 1> Number of Legislators and Followers

	Legislators	Followers
t_1	158(280) (56.4%)	126,289
t_2	195(269) (72.5%)	318,417
t_3	265(293) (90.4%)	653,665

At t1, of 280 legislators who had kept their seat since the beginning of the 18th National Assembly, 158(56.4%) maintained active Twitter accounts. This number of legislators' Twitter registration has increased

to 195 of 269 (72.5%) at t2 and 261 of 293 (90.4%) at t3 (See <Table 1>). At t1, 126,289 users were following at least one of the 158 legislators. The number of followers had grown exponentially at t2 where 318,417 were following at least one of the 195 legislators. Finally it drums up to 653,665 followers in 2012 (t3).

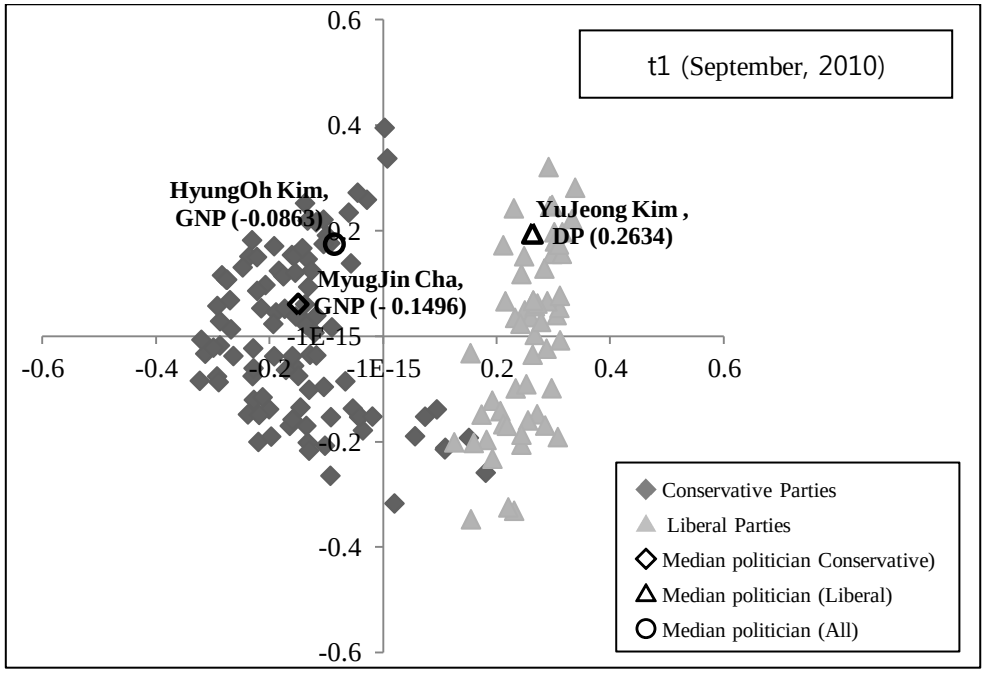
Results

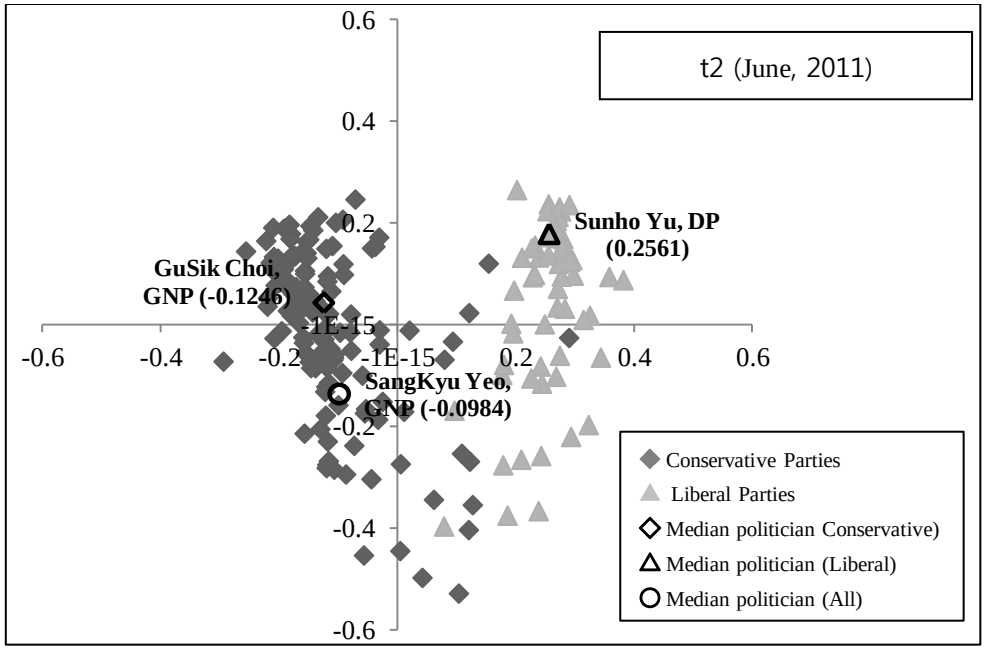
Analysis 1: A test of the concentration hypothesis and the polarization hypothesis

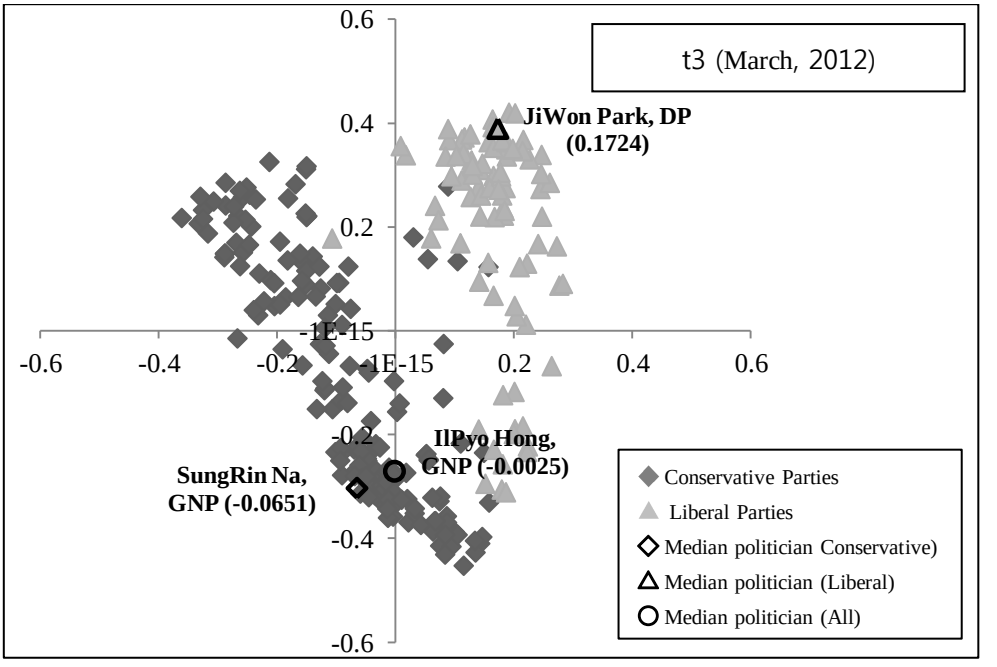
I test vitality of two hypotheses by computing each elite politicians and their citizen followers' MDS scores and analyze change of polarization between two competing groups. Initially I examine how users and politicians are ideologically divided in Twitter. The visualization of each legislators' MDS herein presented provides a good snapshot of ideological distributions changing over time. Two each dimension scores of MDS in the plot are represented by X and Y axis. (see <Figure 2>). As <Figure 2> clearly shows, two competing political powers (conservative versus liberal) are separated in two lowest dimensions. Legislators of different parties visibly line up in the first dimension of MDS. The left side (negative value) in X-axis indicates a group of conservative parties (Grand National Party (GNP), Liberty Forward Party(LFP), and Korea Coalition for the Future (KCF)) and the right side (positive value) indicates a group of liberal parties (Democrat Party(DP), Democrat Labor Party(DLP), and New Progressive Party(NPP)). Thus it legitimizes analysis can focus on the first dimension of score.[11]

[11] Note that MDS scores of legislators at time 3 (March 2012) showed different results from the previous years. Dimension two rather than dimension one of MDS is more correlated with the expected ideological distribution of politicians. Thus I employed the second dimension scores of MDS for analysis.

<Figure 2> The Distribution of Politician MDS score







When looking at the distances between median scores of each party, legislators are completely divided along with their partisan membership. To illustrate the median MDS score of politicians of the conservative parties(GNP, LFP,KCF) is -0.1496 and the one of the liberal parties (DP,DNP,NPP) is 0.2634 in 2010. Correspondingly their mean score of followers respectively are split in X-axis (-.01167 versus 0.2457). However, as time goes by, the legislators are converging on the middle and the gap between median politicians of two groups is getting smaller. For example, the median score of conservative legislators have shrunken to -0.0984 in 2011 and to -0.0025 in 2012 and the liberal score have fallen to 0.2561 in 2011 and to 0.1724 in 2012. Also the size of differences between time intervals is getting bigger: 0.0190(t1-t2) and

0.0595(t2-t3) in the conservative case and 0.0073(t1-t2) and 0.073 (t2-t3) in the liberal case. The average difference between two has changed from 0.0393(conservative) to 0.0405(liberal) during the last three years. Additionally legislators who had kept her or his seats for three years (n=134) also show the bigger tendency of converging on the middle point than going toward to each pole(26.9% versus 21.6%).[12] In this preliminary analysis I discovered the ideological distance between two challenging parties has been getting closer across time. However the mere comparison of legislators' scores do not perfectly verify the proposition that polarization of Twitter followership has eased over time. To confirm the result I take two assessments about changes in the extent of concentration and polarization (H1 and H2).

I first assess whether the severity of ideological concentration on Twitter has increased over time. In doing so, I propose np (1 – p) as a measure of ideological concentration where n is the total number of Twitter users following at least one legislator at each time point, and p is the proportion of Twitter users classified as supporters of the ruling party (in this analysis, a group of conservative parties). Accordingly, p (1 – p) approaches its maximum as p approaches .5 at which neither party has a clear dominance over the other. Accordingly, p (1 – p) increases as ideological concentration decreases. In order to test for the validity of

[12] To facilitate an accurate comparison task I computed the standardized scores of MDS. The equation for obtaining the standardized score follows the commonly used approach: $\frac{(x-\bar{x})}{s}$.

Hypothesis 1, I examine the change in the magnitude of np (1 – p) from t1 to t3. The result reveals more or less relaxed polarization: p (1 – p) increases across time in general (see <Table 2>).

As the table indicates the magnitude of concentration of followership in Twitter is found having the mixed pattern though it largely supports the previous analysis' result. Especially the third column of the table indicates the size of concentration at the time points. At t2 the magnitude of partisan concentration in followership increases (0.239 →0.250) but at t3 concentration trend decreases (0.250→ 0.244). Yet it is the extent of increase/decrease over time is diminutive (0.011 and -0.006). Accordingly Hypothesis 1 which refers to over time increase of ideological concentration in Twitter followership should be rejected since the changes in the magnitude of which a certain party dominates in Twitter is very weak regardless of the direction of change.

<Table 2> The Magnitude of Followership Concentration Over Time

	p	$(1-p)$`	p (1 – p)	n	np (1 – p)
t_1	0.395	0.605	0.239	126,289	30177.2604
t_2	0.514	0.486	0.250	318,472	79553.7833
t_3	0.425	0.575	0.244	653,665	159719.748

In testing the next second hypothesis (polarization hypothesis) definitely defining the operational concept of polarization is required. So far there have been a plenty of efforts to set the proper definition of polarization in social science studies. Although there is no consensus to have been made in understanding polarization, the earlier researches may help to make a suitable operational definition for the present analysis. First, DiMaggio, Evans and Bryson (1996) offer a straightforward definition of polarization, which is simply movement towards the poles of a distribution. Fiorina (2005) also adopts a similar definition. It is characterized by a wide dispersion of preference between groups. In statistical terms, this rendering requires a large difference of central tendency (i.e., mean and median) between two groups.

Adopting this operational definition of polarization, one straightforward way of gauging the severity of polarization would be to test for the partisan difference in the mean (or median) MDS scores. In doing so, I regress the MDS scores of legislators on a single dummy variable denoting the conservative party. Subsequently I examine the changes in R^2 incurred by the inclusion of the party dummy. This captures the extent to which Twitter followership is polarized in accordance with partisan lines. Therefore, a greater R^2 change indicates a sharper partisan divide. By comparing the amount of

variation explained by partisan divide at t1, t2 and t3, I assess whether partisan divide has increased or decreased over time.

The alleviated polarization in followership persists in the results of a simple regression. The results show to the extent which twitter followers and legislators are polarized has reduced over time in a general sense (see <Table 3>). In regression on Twitter users' MDS score, R^2 has diminished from 0.6466 (t1) to 0.5277 (t3). Again R^2 of the regression on legislators' MDS also decreases from 0.8223(t1) to 0.5321(t3). However how much R^2 has lessened over time is dissimilar in each case. Changes of the followers' ideological positions are not as sharp as changes of legislators' MDS.

<Table 3> The Strength of Partisan Divide Over Time

	R-squared	
	Followers	Legislators
t_1	0.6466	0.8223
t_2	0.5326	0.8078
t_3	0.5277	0.5321
t_2- t_1	-0.1140	-0.0152
t_3- t_2	-0.0049	-0.2750

When comparing t2 with t3, as for the degree of polarization decrease, followers' cases are showing much smaller than politicians' (-0.0049 versus 0.2750). That is to say the polarization level of the follower

group has little change. To some extent it demonstrates that there is discrepancy between elite polarization and mass polarization in Twitter as the earlier conjectures over polarization of offline politics have insisted.

To corroborate the result of a brief polarization test I also employ an alternative way of measuring the severity of polarization. As the second test of polarization, I assess the level of intraparty cohesion. The distance between two parties captures one aspect of polarization. Another important aspect of polarization can be within-group homogeneity gathering near the poles of a particular political preference (e.g., Poole & Rosenthal 1997, Stonecash et al. 2003). As intraparty heterogeneity decreases, members of the party more strongly cohere around the party. In order to assess this possibility, I examine the within-party variance in MDS scores. By comparing the within-party variance in the MDS scores at t1, t2 and t3, I assess whether the within party cohesion has increased over time. The results of variance tests are reported in <Table 4>.

<Table 4> The Strength of Intraparty Cohesion Over Time

	Followers:		Legislators:	
	VAR_{Lib}	VAR_{Cons}	VAR_{Lib}	VAR_{Cons}
t_1	0.0806	0.0868	0.0492	0.1058
t_2	0.0823	0.0704	0.0532	0.0920
t_3	0.0859	0.1252	0.2039	0.2280
t_2- t_1	0.0017	-0.0164	0.0040	-0.0138
t_3- t_2	0.0036	0.0548	0.1507	0.1360
F (H_0: $VARt_1 = VARt_2$)	1.0403	0.6575	0.8566	1.3242
F (H_0: $VARt_2 = VARt_3$)	0.9177	0.3165	0.0680	0.1626

Like the previous results the intra-group cohesion has also decreased. In other words, changes of the within-group variance has enlarged. Both of liberal and conservative groups reveal similar patterns. For example, variance of the liberal group of followers has increased 0.0017 and 0.0036 in two time intervals (t1-t2 and t2-t3). Similarly, the conservative group of legislators shows increasing variance from t1 to t3 (respectively 0.0040 and 0.1507). Variance tests made about two partisan groups unfold that the intra-party members (followers and politicians) have been less cohered as time goes on.

Although variance has been evidently going up generally the conservative groups at t2 show the deviant result. In gauging the level of variance at t2, the conservative groups in both followers and legislators show the decreasing trend (-0.0164 and -0.0138). More

importantly, however, the over time changes are not significant according to F-test (two-sample variance-comparison test). It means there have been little changes in within-group cohesion as the time passes.

In the current two tests of Hypothesis 2, ideological polarization in Twitter followership found diminished or barely changed. Hence, the second hypothesis that proposed ideological polarization increases over time is rejected as well. Nevertheless the previous analyses are still limited within a series of very simple tests. So more rigorous examination is obviously required to understand over-time changes of ideological segregation in Social Network Sites. In the next analysis I adopt the panel data in order to articulate whether Twitter has been ideologically fragmented or not. Moreover, the panel data analysis will show which factors have significant influences over Twitter followership.

Analysis 2: Panel data analysis

To investigate which factors have exercised influences over ideological polarization in Twitter I attempt to take a panel data analysis. In doing this, I adopt KBS citizen panel data constructed by Korean Broadcasting System, one of the biggest public broadcasting stations in South Korea. KBS citizen panel launched in March, 2011. Online panels are based on the past pool of KBS citizen panels which had regularly been managed by traditional RDD system. The body of panels now amounts to approximately 100,000 members which have raking sampling weights. A KBS citizen panel has a profound strength when it comes to tracking social media users' behavior because it contains distinctive information of Twitter accounts of panelists. This provides a huge benefits to do a robust analysis. The summary of demographics of KBS citizen panel is rendered in <Table 5>. The brief summary of demographics delineates characteristics of citizens who are following legislators in SNSs. Interestingly male users who are mostly college graduates and liberal consist of a majority of the entire panelists. The male users absolutely outnumber the female users all the time (76.4% versus 23.60%, the average proportion of three time points) and metro residents with college degree are more likely to use Twitter to get newsfeeds from politicians he or she is following. Needless to say, the proportion of liberal party

supporters is bigger than the conservative party supporters. [13]

<Table 5> Demographic Composition of KBS panel data

	t_1	t_2	t_3
Age			
18-35 years	37.1%	54.1%	41.6%
36-55 years	54.9%	40.5%	49.4%
More than 56 years	8.0%	5.4%	9.0%
Gender			
Male	80.0%	75.1%	74.1%
Female	20.0%	24.9%	25.9%
Metropolitan Resident			
Yes	58.6%	43.5%	42.9%
No	41.4%	56.5%	57.1%
Education			
Less than High School	11.5%	15.3%	15.4%
Some College	20.0%	23.8%	24.5%
College Graduate	68.5%	60.9%	60.1%
Party Identification			
Conservative Parties	21.8%	25.2%	23.1%
Liberal Parties	26.9%	24.8%	26.3%
Independent	51.2%	50.0%	50.7%
N	490	1,107	1,427

Taking account of those characteristics of panelists I built the model estimating probability of following one of legislators at the given time point. The dependent variable is whether a panel follows one of the legislators accounts. So it is a binary variable; if a panel chooses to follow a legislator in Twitter it is 1, otherwise 0. The independent

[13] It is the same result as the previous studies about Korean Twitter users' found Twitter is liberally biased in the composition of user body (Chang, 2011; Hahn et al., 2011).

variables coming to the model are as follows; the computed MDS score of each legislators, dummy variables of followers' party identification (the independent is baseline) and interaction terms of MDS score and followers' party identification dummy variables. And the control variables are the basic information of followers and followees; the number of being elected as a legislator(Min=1, Max=6), gender of legislators(female =1), age of legislators, gender of users(female=1), dummy variables of the age group of users(the oldest group (more than 56) is baseline), dummy variables of college education(college graduate=1), political participation index(Min=0, Max=5) and the weekly viewership of TV entertainment programs(1=barely, 2=sometimes, 3=often, 4=very often). Because the dependent variable in this model is binary, the normal method designed for panel analysis is inappropriate. Therefore, I adopt generalized estimating equations (GEE) which assumes within-subject correlations of the repeated observations (i.e. working correlation structure) where the outcome variable is not normally distributed. The GEE method is an extension of GLM (Generalized Linear Model) providing useful model which presumes the exponential distribution family (e.g., Poisson or Binomial or Gaussian). As in GLM, binary variables are typically modeled as a binomial distribution with a logit link in GEE (Zorn, 2011). Strictly speaking, the citizen panels coming to data are not time-ordered. It is of course a panel analysis data of three time points, yet each year's data

panels are considered separately measured. Therefore, the current analysis employs 'exchangeable working correlation structure' which supposes $\rho=Corr(Y_1,Y_2)$ is identical to all possible pairs of s and t (Agresti, 2007).[14]

The first regression table displays the results of data analysis which include all panels who are following at least one of the given legislators in Twitter. The size of panel has increased across time (490 in 2010, 1,107 in 2011, and 1,427 in 2012). The impacts of each variable on followership are various per time intervals. The basic demographical variables of users and politicians (e.g., gender, age) significantly affect the possibility of following. More specifically, it seems male users who belong to the older age group are more likely to follow one of legislators. In the case of politicians' effects, how many time he or she has been elected as a legislator and his or her gender affect the followers' choice about legislators. What is interesting in this analysis, in particular, is that political participation emerges significant in the last term. It can be interpreted that in aftermath of Twitter insanity political participation finally plays a significant role in followership at expense of strong demographical backgrounds.[15]

[14] Even though a researcher may choose an incorrect working correlation (e.g., independent working correlation) GEE can suggest valid estimates of parameters and standard errors notwithstanding the selected working correlation structure is unrealistic one (Agresti, 2007).

[15] However how much users overtly join the offline political events would be a key factor as to followership is another issue because it seems to exercise a far smaller effect (0.0041, $p<0.05$).

<Table 6> Partisan Selectivity in the Twitter Followership - All Panelists

	t_1	t_2	t_3
Politician-MDS	0.0354**	0.0120**	0.0115**
	(0.0037)	(0.0024)	(0.0014)
Reported party support - Conservative	-0.0020	0.00015	0.0048
	(0.0042)	(0.0029)	(0.0065)
Reported party support - Liberal	0.0028	0.0046	-0.0005
	(0.0040)	(0.0030)	(0.0058)
Conservative * MDS score	-0.0555**	-0.0308**	-0.0225**
	(0.0066)	(0.0041)	(0.0051)
Liberal * MDS score	0.0481**	0.0590**	0.1240**
	(0.0062)	(0.0042)	(0.0042)
Politician- # of being elected	0.0124**	0.0110**	0.0101**
	(0.0005)	(0.0003)	(0.0004)
Politician - Female	0.0291**	0.0315**	0.0274**
	(0.00156)	(0.0009)	(0.0010)
Politician -Age	-0.0007**	-0.0009**	-0.0011**
	(0.0001)	(0.0001)	(0.0001)
Female	-0.0070*	-0.0092**	-0.0171**
	(0.0042)	(0.0029)	(0.0058)
Age Group 1 : 18-35 year	-0.0076	-0.0103**	-0.0355**
	(0.0066)	(0.0046)	(0.0100)
Age Group 2 : 36-55 year	-0.0077	-0.00940**	-0.0282**
	(0.0062)	(0.0043)	(0.0095)
College Graduate	0.0039	0.00509	-0.0011
	(0.0051)	(0.0033)	(0.0069)
Political Participation	0.0010	0.0011	0.0041**
	(0.0012)	(0.0009)	(0.0020)
Entertainment Program Viewer	-0.0023	0.0017	0.0004
	(0.0034)	(0.0022)	(0.0048)
Constant	0.0451**	0.0514**	0.110**
	(0.0354)	(0.0120)	(0.0115)
Number of panel	490	1,107	1,427
Wald $\chi 2$	1311.05	3057.49	3027.38

Standard Errors in parentheses / * p<0.10 ** p<0.05

The computed MDS score and interaction terms of MDS by followers' party identification also show significant effects on followership between registered politicians and users. Most notably, coefficient changes of MDS score and its interaction terms are constantly decreasing. The magnitude of politicians' MDS score effects on following has lessened from t1 to t3 (0.0354, 0.0120 and 0.0115, $p<0.05$). In this light, the effects of interaction terms also draw a reducing trend over time in general. For example, the effect of conservative party supporters' interaction term has been weaken from t1 to t3 (-0.0555, -0.0308 and -0.0225, $p<0.05$). The reason why the interaction term of conservative party indicates negative values is that MDS score of conservative politicians are titled to left (negative side of X axis) in the lowest dimension. On the other hand, the liberal party group has a bit different pattern from the conservative. Between t1 and t3 the effect of interaction term of the liberal party group has gradually increased (0.0481, 0.0590, and 0.1240, $p<0.05$).

Next, I bring a set of panelists who have maintained their followership with legislator in Twitter for all three years. The same model in the earlier GEE analysis is used for analyzing this committed Twitter user group. The number of those who have kept their faith in followership is 441 at t2 and 326 at t3 (the number of the earliest followers is 490). Looking into the last term's demographic composition of panelists, the proportion of the liberal group (26.9% →

31.6%), the metro-residents group (58.6% → 59.5%), the college graduate group (68.5% → 69.0%) and the young adult group (18-35 years group, 37.1% → 39.1%) slightly have increased in comparison with the initial time point (t1), which means the liberal and more educated group of people have a tendency of using Twitter for longer duration. Expectedly this group of panels are not affected by the same variables in the same fashion as the previous analysis of all panelists showed. The effects of politician MDS and interaction terms are fluctuating. The degree of legislators' MDS effect on following declines from 0.0354 (t1) to 0.0212 (t2) but it goes up suddenly 0.0755 at t3. The effects of conservative interaction variable also reveals a similar pattern. At first, it appears decreasing (-0.0555 to -0.0528) but the effect becomes double at the last time point (-0.110). Nevertheless the liberal party interaction effect has consistently incremented like what I found in the first panel analysis. In the similar context, the controlled variables such as gender and age have affected significantly on followership as well. I will interpret more thoroughly this discrepant finding of the last group of the panel later in the discussion part of the article.

<Table 7> Partisan Selectivity in the Twitter Followership - Same Panelists

	t_1	t_2	t_3
Politician-MDS	0.0354**	0.0212**	0.0755**
	(0.0037)	(0.0044)	(0.0064)
Reported party support - Conservative	-0.0020	0.0005	0.0107
	(0.0042)	(0.0054)	(0.0145)
Reported party support - Liberal	0.0028	0.00360	-0.00406
	(0.0040)	(0.0052)	(0.0121)
Conservative * MDS score	-0.0555**	-0.0528**	-0.110**
	(0.0066)	(0.0078)	(0.0128)
Liberal * MDS score	0.0481**	0.0656**	0.0775**
	(0.0062)	(0.0072)	(0.0104)
Politician- # of being elected	0.0124**	0.0147**	0.0153**
	(0.0005)	(0.0006)	(0.0007)
Politician - Female	0.0291**	0.0359**	0.0311**
	(0.0016)	(0.0016)	(0.0021)
Politician -Age	-0.0007**	-0.00110**	-0.00136**
	(0.0001)	(0.0001)	(0.0001)
Female	-0.0070*	-0.00796	-0.0277**
	(0.0042)	(0.0057)	(0.0129)
Age Group 1 : 18-35 year	-0.0076	-0.0137	-0.0380*
	(0.0066)	(0.0086)	(0.0218)
Age Group 2 : 36-55 year	-0.0077	-0.0175**	-0.0364*
	(0.0062)	(0.0080)	(0.0207)
College Graduate	0.0039	0.0101	0.0106
	(0.0051)	(0.0067)	(0.0161)
Political Participation	0.0010	-0.000272	0.00147
	(0.0012)	(0.0016)	(0.0038)
Entertainment Program Viewer	-0.0023	-0.00235	-0.00767
	(0.0034)	(0.0044)	(0.0106)
Constant	0.0451**	0.0721**	0.151**
	(0.0110)	(0.0139)	(0.0329)
Number of panel	490	441	326
Wald $\chi 2$	1311.05	1457.59	1192.12

Standard Errors in parentheses / * p<0.10 ** p<0.05

Until here the results of analyses that I have reported demonstrate that the severity of polarization has not been worsen over time. However, the coefficients herein noted in the result table cannot be directly translated into plausible probabilities in terms of interpreting the findings accurately because currently I have used GEE method where the curvilinear shape of relation is presumed. On this account it calls for more specified analysis in order to estimate each variables' exact effects on Twitter followership In doing so, I made several scenarios for capturing more detailed changes in followership. Firstly I fixed potential effects possibly elicited from the control variables. I presumed the situation as follows. I limited the cases of the newly elected(the # of being elected=1) male politicians(Politician gender=0) and the male(User gender=0), college graduate users(Education=1), of 30-55 years old group(young user group =0, middle aged group=1) who shows the middle political participation(political participation index=3). I assumed TV entertainment program viewership is fixed at its mean in every case. Subsequently I calculate the predicted marginal effects of following at each term. To be more specific, I compute the median score of conservative, liberal legislators and all legislators. Finally I measure marginal effects that conservative party supporters and liberal party supporters are following a legislator who have the median scores of conservative, liberal and all legislators. This measures represent

values picturing ideological distribution of politicians on Twitter. The results are summarized in <Table 8-(a)> and < Table 8-(b)>.

<Table 8-(a)> Predicted Marginal Effects of Each Party Identification

User → Legislator	t_1	t_2	t_3	t_1- t_2	t_2- t_3
Conservative → Conservative	0.011	0.014	0.048	0.0031	0.0337
Conservative → Liberal	0.003	0.007	0.042	0.0041	0.0347
Liberal → Conservative	0.001	0.008	0.034	0.0071	0.0260
Liberal → Liberal	0.035	0.035	0.061	0.0003	0.0260

<Table 8-(b)> Predicted Marginal Effects of Within-party and Cross-party Following

User → Legislator	t_1	t_2	t_3	t_1- t_2	t_2- t_3
(Con-Con) - (Con-Lib)	0.008	0.007	0.006	-0.0010	-0.0010
(Lib-Lib) - (Lib-Con)	0.034	0.028	0.027	-0.0068	-0.0001

The within-party followership is always stronger than cross-party followership as I expected. Political segregation on Twitter is superior to the cross-ideology followership of Twitter users. This clarifies segregation between people along with the strength of partisanship do exist as offline politics and the other web 2.0 cases have shown.

However, notably the size of difference between within-party following and cross-party following has declined across time intervals.

In the case of conservative party supporters, the gap between within-party and cross-party following has become smaller (0.008, 0.007 and 0.006). Likewise the liberal group also shows the weaken within-party tendency over time (0.034, 0.028 and 0.027). In short, polarization between the respective partisan groups has alleviated over time although the extent of reduction in polarization is not big enough to alter the entire Twitter followership.

Discussion

Many related works of group polarization have anticipated that the severity of polarization would be exacerbated in the future largely because tendency of people's selective exposure which quite intrinsically embedded in a practice of cognitive psychology (e.g., Conover et al., 2011; Stroud, 2008). The over-time change in partisan divide on the web has not been measured many times but a majority of scholarship could easily speculate 'birds of feathers flock together' is always there. As outlined earlier the ordinary users who are politically active are more likely to gather around a homogeneous cluster sharing the same ideological stand (e.g., Adamic and Glance, 2002; Conover et al., 2011; Gruzd, 2012; Adamic and Glance, 2005; Trammell, Tarkowski, and Sapp, 2006;). Sunstein (2001, 2007), in this context, strongly warns of this insular online communication of groups dragging the politics to severe extremism. He also argues those who stuck in one group as for online interaction over the political agenda would reinforce their preexisting beliefs, which conclusively abets 'a culture of polarization'. When we follows his account of online political interactions the rational deliberation the normative theory of democracy underscores is impossible more in the future.

In the meantime it is also not difficult to make a conjecture that the relationship between elite politicians and ordinary citizens would be

more polarized by partisanship than the users' network. That is, online political discourse and interaction between elite politicians and users could only occur within a group in which people feel more comfortable. No less importantly, the public relation strategies of elite politicians are mainly planned to harvest more votes in the next election as the election studies in Dowsian stream have continually proposed (e.g., Hinich and Odershook, 1970; Erickson and Romero, 1990). As politicians are motivated to keep a good relation with their potential supporters they willingly utilize to full extent convenient information technology allowing them to reach the public fast and effectively. Indeed the Internet is the most efficient way to approach as well as appeal to the public. As the previous studies of the Internet election campaign and politicians public relation demonstrates, after the rise of candidate websites, e-mail and blogs (e.g., Gueorguieva 2007) have been useful campaign tools. Needless to say, social media allowing to inexpensively conveying campaign messages in real-time, is a perfect channel where politicians can make a good impression by uploading pictures or videos. Virtually it has made also quite impressive results (i.e., Obama 2008 election campaign). Among all of Social Network Sites, Twitter, one of the most popular social media today has been highly regarded as the most useful media for political campaigners due to its broadcasting power like the traditional news media (Kwak et al., 2010; Tumajasan et al., 2010). In political interaction between

politicians and citizens Twitter can be a great alternative that let both pursue proper political information from each other. However, as the past literature have documented, polarization is revisited as a concern. At cross-sectional level, the obvious segregation of ideology on social media has been discovered in various researches. Yet its temporal changes is still left questionable. In this current analysis I cast two questions: Will homogeneity of groups in social media, be persistent and magnified? Or will Twitter which more similar to the traditional media rather than participatory blogs encourage exposure of cross-ideological information coming from the current political leaders in the near future? For answering this question I test two hypotheses (concentration and polarization hypothesis) related to the conjecture over the evolution of ideological segregation on Social Network Sites. In this section, I will discuss more deeply the findings of the present study and its academic implications together with limitations for the future research.

Over-time Change of the Ideological Polarization in the Era of Social Media

To illustrate evolution of Korean citizens' and legislators' ideological polarization in Twitter I track three years data of Twitter followership. I measure ideological stance by adopting classical MDS method of cluster analysis and compute its difference across time. The results indicate quite fascinating dynamics First, I find a clear segregation in

accordance with partisanship. Most notably, legislators visibly line up in the lowest dimensions of MDS and their followers are also divided into two partisan groups (<Figure 2-(a)> to <Figure2-(c)>). However, the in-depth analysis does portray a different picture. In the tests of two hypotheses that I suggested earlier, the extent of polarization has not been intensified as the most of scholars has been worried. Even though it is a little, polarization of two competing groups has been weaken during the three periods. For example, R-squared value in regression of MDS on a conservative dummy variable has diminished (<Table 3>) and the within-group cohesion of two partisan groups have declined (<Table 4>). Also the domination of one party is found not to have been worsen as compared to its beginning (<Table 2>). In panel data analysis, MDS scores of politicians which represent his or her ideological stance estimated by the number of co-followers are getting more weakly influential and the significant effects of interaction terms of MDS score by the legislators' partisanship have shown the lessen polarization over time (<Table 6>). The further computation of marginal effects in several cross-party and within-party following scenarios also support the previous findings (<Table 8>). To summarize, it is not deniable that a quite strong ideological segregation exists in Twitter but changes over time in polarization are not getting severe. The findings of this study might contradict to the precedent studies that have examined a group polarization yet the longitudinal

studies examining over time changes have documented polarization is not substantially getting worse by time goes on. Although there are scant studies on over-time changes of ideological polarization in online sphere the latest Yard and Boyd's group polarization analysis supports the findings of this current study. According to their study, changes in cross-talk about the death of George Tiller in Twitter did neither decrease nor increase within the first 24 hours of data collection. And they observed little change in relative opinion extremity as well (Yardi and Boyd, 2010). No polarization over time trend is captured also by the past Internet study. Most notably, Getznow and Shapiro (2011)'s study demonstrate that there are little temporal change of ideological polarization on the Internet. Based on the longitudinal analysis of the survey data the authors report there is no evidence that the Internet is more segregated over time. They further comment " If anything, segregation has declined as the Internet news audience has grown (p.1819)." Again the results of this current analysis that also found a little declining trend of polarization corroborate these latest works' findings.

However, some deviant results of the current study require much more concrete interpretation. Despite of 'not increasing' trend of polarization distinctiveness of the liberal users in Twitter survive. In two analyses of panel data, I found uniquely liberal users' interaction term by MDS score are increasing at all time points (see the fourth row

in <Table 6> and <Table 7>). Liberal ideologues who predominate in social media are still keeping themselves from following the opposite party legislators. When I computed the predicted marginal effects of the liberals' following by politicians' and their partisanship, relatedly I found that the liberals have a bigger likelihood of following the legislators with the same ideological position. The predicted probability of the liberal's average within-party following (0.029) is bigger than the conservative's about four times (0.007). In the analysis about the panelists who continued to use Twitter it also shows the liberal's isolated interaction in followership. The group of the heavy users of Twitter who mostly comprised of male, liberal, and educated people are showing politicians' ideological positions has continuously played an important role in followership over time. There is a slight decrease in the effect size of legislators' MDS scores and the conservative partisans' interaction term between t1 and t2 but they doubles at t3. Furthermore, the effects of legislators' MDS scores as for the liberal group are significantly strong and they have increased over time as the initial panel analysis has bespoken.

The liberals' isolation in Twitter followership might demands more explanation. However, the previous studies can be invited to advance understanding of this group uniqueness. Liberal ideologues have been considered decidedly associative with activism (e.g., Abramowitz, 1973; Levenson and Miller, 1978). The foregoing studies

regarding personality of partisan activists depicted two opposite ideologues' locus of control. For example, conservatives are seen as those who think authority compatible, while the liberal activists are described as those who opposed to policies that conflict with their egalitarian view of political participation (e.g., Levenson and Miller, 1978, p. 202; See also Keniston, 1970)." Therefore the liberals are inclined to protect the balanced receipt of information and interaction even from the liberal outsiders in Korean politics. Not surprisingly, this coincides with locality of Korean media environment. Notably alternative media account of Twitter provides a useful theoretical background. Hahn and his co-authors (2011) recently demonstrate Twitter is to some extent an alternative source of news media which may substitute the mainstream news outlets. In particular, in Korea three major news companies and three major terrestrial broadcasting stations have been known as conservative (e.g., Choi, 2003; Lee, 2004, 2008). Against such a dominance of conservative media in the mainstream news market users who support liberal parties are more likely to trust information instantly from their liberal political leaders in social media. In fact, those who are politically sophisticated tend to trust online sources more than the traditional media according to the past findings (e.g., Choi, Watt and Lynch). Accordingly, in Korean politics the marginalized liberal are quite protective in forming more homogeneous clusters in followership because their motivation to use Twitter as 'news

media' is attributable to the wish of keeping social media as the last bastion of trustworthy and desirable news source.

Discrepancy between elite polarization and mass polarization on Twitter

As I previously noted in the literature review section, a polarization debates has been twofold as to the subject. Some argue that both of elite and mass polarization are severe in American politics (e.g., Abramowitz and Saunders, 2006). Despite of scarce academic researches over Korean elite politicians and mass polarization, it is not hard to suspect polarized and fragmented mass public corresponding to the elite politicians (Lee, 2011). However, the current analysis reframes the perspective on polarization of online public. I found a discrepancy between general Twitter users and politicians. As I plotted change of legislators' MDS scores in a series of time (<Figure 2>) politicians have kept come to the middle . Also R-square has declined for three terms and its magnitude is quite big enough to reconfirm the convergence pattern (<Table 3>). On the other hand, polarization of Twitter users' ideological distribution has not been changed a lot. As the same <Table 3> indicates, R^2 has seldom fluctuated. A small decrease is still found in parallel with falling legislator's MDS score but the degree of changes is extremely small. This might substantiate the conventional understanding of voters' ideological positions. In election

studies, when predicting the results of a race the ideological distribution of the population is supposedly fixed or unmoved. The renowned 'Normal Vote' concept (e.g., Boyd, 1972; Miller, 1979) explains that normal distribution of votes is formed already but it only changes depending upon an idiosyncratic development of each election. The ideological stance of a person cannot easily be altered as demographic conditions always outweighs any other factors. In Korea, education, generation, and predominantly region are taken into consideration as key factors to alter the election results.

The elemental factors swaying followership of users and legislators

Besides of ideology, demographic factors significantly sway followership. Fundamentally the effects elicited from politicians' demographic bases were found significant. The legislators political experiences strongly affect Twitter users' choice. The more they are experienced as a legislator the more likely Twitter users follow them. And the gender of politicians exerts some influences over following. Most popular political leaders and candidates in the upcoming elections are female politicians and they do have many followers in Twittersphere. For example, top 2 legislators in terms of the number of followers are both woman and the trend did not change for all three years. Geuhye Park who used to be a popular leader of the conservative party GNP and Junghee Lee who also used to lead the most liberal party DNP are

always ranked as top legislators who have the biggest numbers of followers. Ms. Park had been ranked as the number one at t1 and t2 in followership (42,685 and 107,352 respectively) but the number of Ms. Lee's followers got suddenly doubled at t3 (216,497 and 72,005 at t2). And younger politicians are advantaged by Twitter followership. Also younger politicians are more likely to appeal to young electorates who has taken up to more than 60% of the total Twitter users (Pew research center, 2012).

As for an user factor, gender and age do have considerable effects on followership while a user's education level or media usage do not have any significant effects on following. As <Table 6> and <Table 7> describe, education factor interestingly does not exercise any impacts during three time periods. This is similar to the recent findings of information science studies on Twitter. Nam (2011) document the education level of users does not practice any effects on SNS political use whereas more educated people have use more the Internet (Nam, 2011, p.93-95). A political participation index somewhat emerged as a key factor in the last year, which can be translated that the offline activists have continued to actively use Twitter on a political purpose even after the not-committed users had defected Twitter.

Limitations and Suggestions for Future Researches

The present study as an effort to show ideological evolution in Twitter

with a novel approach has nevertheless limitations. First as I only adopted the legislators of the 18th National Assembly and their followers as sample, political opinion leaders' accounts such as Wonsoon Park (Seoul city mayor) or Yeosu Lee (writer) were excluded in the analysis. According to one of the recent studies about Korean Twitter's power users (e.g., Lee et al., 2011) any of the current legislators are not included in the list of the so-called 'Power Twitterians'. The contents of political discourses initiated by power users and in the meanwhile forwarded by their followers don not come from legislators, but from the prominent journalists or political bloggers. Therefore the current study might have missed a big picture of political communication occurring in Twitter.com. Yet the study has still its strength when it comes to novelty of methodology where a researcher observe the hidden relationship between elite politicians and potential supporters in social media.

Secondly, as this current study only dealt with followership I did not conduct any analyses about retweets or contents of users' posting. In Twitter study, a 'retweet' which is seen as an action of engagement in a certain topic of messages in Twitter has been heavily adopted as a parameter assessing intensity of Twitter use (e.g., Cha, et al., 2010; Suh et al., 2011). Besides, some researchers have practiced a content analysis for redeeming weakness of quantative studies (e.g., Conover et al., 2011; Tumasjan et al., 2010). However, the primary difficulty of

content analysis of tweets is retrieval of a huge data. Thus I believe the method of this analysis which rather concentrated on inferring the accurate political preferences of Twitter users would be the most effective approach concerning the current study's questions.

Some political scientists who have studied political interaction among voters for long time propose contextual effects also need more attentions in scholarship (e.g., Huckefeld and Sprague, 1995). On this account, casting one vote in election should be thought as a fruit of daily process of political communication in social network where people lead their daily life. A political decision which regularly manifested in election, hence, cannot be ascribed only to individuals' preference structure. Instead social network in which people are socially communicating with others on daily basis could be a main source of political information. Likewise the social network built in a virtual society needs to draw more attention in the future reseraches. The growth of the number people who are using smartphones in is overwhelming making the social media's influences over political interactions never ignorable. Therefore, in the future research, political discourses in social media or similar kinds of online platform should be more keenly observed. In the meantime the studies should be able to suggest new methodology capable of hybridizing the strength of qualitative and quantative approaches.

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국문 초록

소셜 네트워크 사이트의 이념적 진화

: 이념 편중 가설과 양극화 가설에 대한 측정을 중심으로

오늘날 온라인 공간은 광범위하게 변화하며 또 다른 차원의 발전 국면을 맞이하고 있다. 사람들이 웹사이트에서 적극적으로 활동에 참여할 수 있는 웹 2.0 아이디어는 마이크로 블로그 혹은 트위터, 페이스북, 툼비르와 같은 소셜네트워크 사이트로 구체화되게 되었다. 특히 소셜네트워크 사이트(SNSs)는 현대인들의 생활방식을 바꾸는데 중추적인 역할을 했을 뿐만 아니라, 현실 세계에서 일어나고 있는 문제들에 대해서도 지대한 영향력을 행사하고 있다. 그 중에서도 소셜 네트워크를 통한 시민들의 정치참여는 두드러지게 나타나고 있으며 특히 트위터는 한국 정치 상황에서 정치적 커뮤니케이션의 주요 미디어로 활용되고 있다. 본 연구에서는 정치 미디어로 떠오른 트위터가 온라인 공론장으로서 역할을 다할 수 있는지를 평가하기 위해 트위터에서 발견되고 있는 이념적 양극화가 시간에 따라 심화되는지 데이터 마이닝과 네트워크 분석을

통해 알아보았다. 국회의원들과 그들을 트위터에서 팔로잉하는 일반 이용자들의 관계 변화를 시간에 따라 탐색하고 이를 바탕으로 2010 년부터 3 년간의 정치적 분화의 정도를 비교하였다. 분석 결과, 시간에 따라 트위터에서의 양극화는 어느 정도 감소되는 경향을 보이나, 그 변화의 정도는 매우 적은 것으로 나타났다. 또한 진보적인 이용자일수록 보수적인 이용자보다 더 자신의 이념적 성향과 맞는 의원을 팔로잉하는 경향이 있으며 그러한 경향은 시간에 따라 더욱 증가하는 것으로 나타났다. 본 연구의 결과들은 새로운 미디어 공간이 하나의 안정된 상태에 머무는 것이 아니라 역동적으로 진화하는 것임을 보여주고 있다. 때문에 본 연구는 트위터 등의 새롭게 등장한 온라인 서비스를 새로운 미디어 공간으로 파악하고, 그 동안 우려가 되었던 선택적 노출과 양극화 문제 논의라는 맥락 안에서 어떻게 미디어 공간이 역동적인 변화를 겪는지 추적하는 데에 그 의의가 있을 것이다.

키워드: 트위터, 소셜네트워크 사이트, 이념적 양극화, 이념적 분화, 선택적 노출, 소셜 미디어의 진화

학번: 2011-20154