Sub-Theme: 14.6. Social Media and New Information Flows

# Social Media Information flow and public representation

# : A case of S. Korean politicians on Twitter

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**Abstract**

This paper examines Twitter networks of South Korean politicians. We have constructed the Following-follower and the Mention network between politicians and analyzed their relationship through various statistical tests and network analysis. Unlike other politician's network such as bill cosponsorship and hyperlink network, the Twitter politician network lies in the embeddedness context, implying the network boundary is relatively fixed and politician's social networking activities has constantly exposed to the public. Hence, social pressure of connecting other politicians based on reciprocity is imposed to politicians so that reciprocity principle makes the Following-follower network as a network of social ritual. For the Mention network, the embeddedness makes politicians consider the public gazes when they choose whom to talk to. As a result, 'mention' messages tend to direct toward politicians who has gained popularity from the public in Twitter so that the Mention network between politicians represents a network of political support.

Keyword: Politician network, Twitter, Social ritual, political support, embeddedness

## I. Introduction

How do we understand personal network between politicians on Twitter? How does a Twitter-mediated network, such as Following-Follower and mention(and/or reply) network, reflect their personal relationships?

In the era of social media, politicians do 'follow' and 'make friends with' public as well as other politicians. We are particularly interested in the way in which politicians follow, send messages to their peer politicians. A hidden aspect of political network in online public sphere can be revealed by thee identification of information subscribing and communication network.

Often studies of political network have used indirect method to construct political network, such as bill cosponsoring (Fowler 2006) or hyperlink network (Park, Kim & Barnett 2004; Hsu and Park 2010). Although the studies have delineated the networks of politicians, network of personal relationships in open and "networked public sphere (Benkler 2006)" may have different characteristics from these studies. Furthermore, while politicians have been rapidly adopted on Twitter, the influence of Twitter is increasing in offline politics, not to mention in online space. Thus, finding distinctive features of political networks in Twitter sphere can enhance our knowledge of socio-communicational structure between politicians.

## II. Theoretical Background and Consideration

### The background

While the impact of Twitter in offline politics increases, research on personal network of politicians in Twitter has been relatively unexplored. Since political research on social media has typically addressed social media as a tool for political mobilization or election campaigns (Web Ecology Project, 2009; Plokowiak & Ebermann, 2010), they often lack of network analysis for personal relationships between politicians. Even in the case of Twitter studies that concentrated on politicians, they tend to remain the adoption and use of Twitter by politicians and do not speak to structural aspect of politician's network on Twitter. For instance, Chi and Yang (2010) found that peer pressure played a crucial role in Twitter adoption by members of the U.S. House of Representatives (the 111th Congress). Regarding their use of Twitter, politicians use Twitter as a one-way communication tool

rather than two-way interactive one (Glassman, Straus and Shogan 2009).

In addition, researches on Twitter network did not fully conceptualize how we distinguish relationships on Twitter. Despite Huberman et al (2008) indicated that hidden network of connections underlies “declared” set of friends and followers, they have not pointed out how we understand this hidden network. Therefore, differentiation of several kinds of politicians’ network on Twitter such as following-follower network, mention and reply network will not only offer insight to understand politicians’ network in social media but also provide empirical support to elaborate social media networks. This is, ultimately, linked to enhance knowledge for multiplex characteristics of personal networks (Verbrugge, 1979) in the era of social media.

In order to understand politicians Twitter network and to find its “hidden” structure, the characteristic of Twitter platform as an environment for promising online public sphere need to be explicated. Although studies have pointed out features of social media as a social space and discussed online space as a promising public sphere of deliberative democracy, these two perspectives are seldom incorporated. For example, Naaman el al. (2010) has pointed out that Twitter as one of “social awareness streams” that “the nature of communication and conversation are public and conducted in a highly connected social space” but they did not specifically discuss how political message contents are consumed. On the other side of token, Habermas states that “public sphere as an intermediary system of communication between formally organized and informal face-to-face deliberations in arenas” is just imagination (2006:411) so that he has not seen this arena is now ongoing process through electronic communication system of social media. In addition, specific discussion of Twitter environment still remains a description of basic features such as 140 character limitation or its mobile transmission feature.

**Embeddedness of Twitter Platform**

The coexistence of both of their colleague politicians and the public in a common social networking platform shapes two different contexts of embeddedness on Twitter. The embeddedness argument emphasizes the influence of inter-personal relationship in human behavior (Granovetter, 1985). On Twitter, one way of the embedded context influences the relationship between politicians by

re-defining the networking boundary of politicians, differing from other types of politician's network, such as bill cosponsorship or the hyperlink network of politician's homepages or blogs. In the hyperlink network of politician's homepages or blogs, it is an independent action of politicians to choose and link other politicians because the politician's site is not tethered by a given platform to find other politicians and to be accessed by them by using their sites. In the bill cosponsorship network, a politician's decision to cosponsor a certain bill considers not only the content of the bill but also the relationship with other politicians who pass the bill to sign. The boundary of relationship, in this case, is those people considering signing rather than politicians as a whole in legislative institutions. Although the bill cosponsorship network reveals "important information about the social support network between legislators" and it "helps to identify the most influential legislators" (Fowler, 2006), it works as signaling device to other politicians about the content of the bill and persuasive power to sign on the legislation in an individual level (Wilson and Young, 1997; Fowler, 2006). On Twitter, it is neither choosing others without a clear cut of network boundary nor a limited set of people to support a bill signing. Joining Twitter means all of politicians on Twitter are immediate subjects of the selection because they are present in the same media platform. Then, how does the embedded context of the Twitter network boundary influence relationship between politicians on Twitter?

The other embedded context influencing relationship between politicians is the co-existence of the public on the same media platform. When people submit contents in social media, they consider two groups of audiences: the traditional audience of situations that contents are made and a hidden audience who have access to the contents (Hogan, 2010). The existence of two different audiences influences the content of social media. Social media users use a strategy to post a content that is normatively acceptable, finding the context of the lowest common denominator between people. As such, for politicians, this audience effect restrains politician's social relationship on Twitter as a public representation of personal relationship. In a similar vein, this effect has been found in the hyperlink network of politicians. Often a hyperlink network is a "declared" network as a representational network rather than a real relationship network (Shumate and Lipp, 2008). Therefore, the hyperlink network from blogs of politicians tends to reflect offline popularity and influences and is generally consistent with offline relation and partisanship of politicians (Hsu and Park, 2010; Park et

al., 2008; Park and Kluver, 2009; Kim et al., 2010). It may be one of ways to show up one's affiliation with other politicians to the public. Then, do politicians' relationships on Twitter reflect only a representation to the public or is there other meaning?

**Politicians Twitter network: Social ritual and political support**

*(1) Following-follower network: Network as Social Ritual*

Since politicians are embedded in Twitter, the Following-follower relation may be influenced by social pressure that more intensively imposed to politicians than the other types of politician's network. Social networking behavior of politicians needs to weigh personal relationship with peer politicians and its representation to the public. It has already indicated that politicians consider offline social and political relation when politicians generate a hyperlink to other politicians (Park and Kluver, 2009). In Twitter, this course of action will be guided by more intensive social pressure to connect other politicians as many as possible and mutually connected. Regarding the communication networks of 'Mention', social pressure to communicate other politicians may be less intense than following Twitter accounts of other politicians. Not only 'mentioning' requires more active involvement in the communication but also Twitter is, for most of politicians, one of many ways to communicate between politicians. Furthermore, 'mention' requires more commitment than simple 'following'.

Therefore, the Following-follower network between politicians would be the densest network among hyperlink networks of personal homepages or blog and even other types Twitter networks of Mention and Reply. Additionally, reciprocity of relationship in the Following-follower network is also higher than Mention network because of the social pressure. The bill cosponsoring relationship has already indicated that personal relationship between politicians is based on reciprocity of relationship (Burkett and Skvoretz, 2001). If all these are true, the Following-follower Twitter network between politicians can be seen as a network of social ritual as a way of making social gestures to other politicians and representing one's relation to the public.

*(2) Network as Political Support: Mention network*

Although Twitter is one of many ways to communicate between politicians, politicians

maintain social relation with other politicians through direct communication. The question is why and with whom they communicate. One of possible answers to the question is that the embeddedness context influences on selecting to whom to talk so that Politicians may communicate with other politicians who have popularity in Twitter. By leaning public recognition of other politicians, a politician may not only promote his visibility in Twitter but also send political support to the popular politicians. According to the network theory of market, this is how network status signals market participants. A connection between two actors is “a pipe of conveying resources” between them as well as “an informational cue to make inferences” about judging values one or both of connected actors (Podolny, 2001).

It implies that a politicians will have more linkage of communication from other politicians as (s)he have more public followers and more Twitter message postings because the gravity of political engagements with the public attracts other politicians. However, this will be only valid for the ‘mention’ linkage between same political groups because of partisan polarization over the Internet. Studies of Internet politics have revealed that political polarization according to political viewpoints is one of characteristics (e.g. Bimber 2000; Hindman 2009; Sunstein 2007 ). In the case of politician’s network, it is also found that community structure of those networks can expect political behavior of collaboration between politicians without any prior knowledge about politician’s political orientation (Park, H.W. and M. Thelwall 2008; Zhang, Friend, Traud, Porter, Fowler and Mucha, 2008).

If the linkage increases as the active engagement and popularity with the public increase, the indegree centrality distribution of the Mention network, which indicates the number of communication from others, will be the form similar to power-law distribution because the Mention network linkages between politicians will tend to follow the principle of preferential attachment, new linkages of connection preferentially link already well-connected nodes in a network (Barab$\acute{a}$si and Albert, 1999). In contrast to this, the Following-follower network will tend to follow linear function because of reciprocity principle of making network linkages. If all these are true, the Mention network can be seen as political support network as a way of sending support for political engagements with the public.

## III. Data and Method

*Data*

We define politicians as a member of the 18th National Assembly and 12 well-known political figures (e.g., mayors of politically important cities and potential candidates of future presidential campaign) in Korea. According to this definition, total 309 politicians are identified. Two types of data sets were collected: personal attribute and relational Twitter data set. The data for personal attributes were drawn from the website of an NGO that made an official request for data on National Assembly members. Personal information on political figures was obtained through their personal websites or blogs. The personal attribute of politicians includes demographic information of politicians such as age, gender, educational level and political information such as party affiliation and the number of incumbency in the National Assembly. The relational data were collected from Twitter in November 2010 by using an API-based research application. Our application automatically has retrieved data of politicians, such as Following-follower, Mention and Reply network. Among those 310 politicians, 192 politicians had an account in Twitter. Since three politicians have set their accounts as 'protected', the final number of politicians collected through our application is 189. Table 1 indicates the distribution of politicians used in our analysis.

< Table 1 about here >

As seen in Table 1, the party distribution of the politicians is heavily skewed to the ruling party (the Grand National Party) while the number of politicians in opposition parties ranges from one to fifty-six. Although it is originated from the 2008 election result, it seems less desirable to use the raw number of politicians according to their party affiliation in our analysis. Therefore, we have decided to distinguish politicians into two political groups of ruling party (the Grand National Party) and opposition parties by considering reflecting political landscape of competition between parties in Korea.

*Method*

Based on these datasets, we have deployed various methods of statistical and social network analysis. To achieve the purpose of study, we believe the combination of those two methods

will provide more enhanced interpretations and understanding patterns of relationship between politicians. For statistical analysis, we have conducted logistic regression and negative binominal regression. In terms of network analysis, we have used diverse means of network analysis measurement to compare and find characteristics of the networks. Unfortunately, the limited space only allows us briefly to explain these means as we report the result of analysis.

Before reporting analysis results, we would like to note a few things. First, by definition, the Following-follower network is a directed binary network and the Mention network is a directed valued network (so does the Reply network). It means that the frequency of communication can be occurred multiple times between politicians meanwhile the frequency subscribing other Twitter account can only be once. Therefore, indicators of network analysis may be affected by raw number relationship when we compare two types of networks. We have adjusted this difference by treating the Mention (and sometimes Reply) network as a binary network of zero (no 'mention' at all) and one (at least one 'mention') when it is necessary. We will indicates when we treated the Mention network as a binary network

Second, the numbers of politicians who actually made relationship with other politicians are different. For the Following-follower network, all of politicians have connected each other in our dataset. However, for the Mention network, only 128 politicians among 189 politicians are 'mentioned' to other politicians (it is 116 politicians for the Reply network). Although this is a reality of two networks, this difference also may influence indicators of network analysis. To remedy any potential impacts caused by the difference, we have conducted validation tests for confirming our analysis.

## IV. Results

### Preliminary Analyses of the Data

*(1) Adoption*

In order to discern personal attributes that may influence politician's Twitter adoption, we have conducted regression analyses. We first examined whether personal attribute such as the demographic information and the political information brings any difference of politician's Twitter

adoption. In particular, we have interested in factors affecting the existence of Twitter account and late Twitter adoption.[1]

<Table 2 about here >

An intriguing result of Table 2 is that the more experience in the National Assembly, the more probability of having Twitter account. As one number increases in the frequency of incumbency in the National Assembly, the probability that a politician has a Twitter account increases about 31%, after controlling for other variables. However, it was not related to early adoption. The Result of negative binominal Regression shows only one factor influencing early adoption. If a politician belongs to the opposition parties, (s)he will join the Twitter about 0.25 day earlier than a member of the ruling party. Although party affiliation is statistically significant, the adoption gap between two political groups is relatively small. One reason for this may be the fact that politicians have gradually adopted Twitter. Figure 1 shows the accumulated frequency of Twitter adoption. After the first adopter, it took more than two months (72 days) till other politicians started to adopt and more than 17 months that all of politicians in our dataset has adopted.

<Figure 1 about here>

*(2) Group Affiliation*

We also examined whether the politician's Twitter network can reveal political affiliation between politicians without prior knowledge about political orientation of politicians as previous research on the cosponsorship network of legislators has studied. In order to do so, we have divided each network into two groups by using CONCOR (CONvergence of iterated CORelation) method, one of blockmodeling methods based, and matched the network groups with the attributed-based political affiliation groups. Then, we have conducted correlation analysis between network classification of groups and political group affiliation. The result in Table 3 indicates that network blocks indeed can expect political affiliation groups. Only a few of politicians are classified into different network groups compared with their political groups: 4 out of 189 in the Following-follower network and 8 out for 128

[1] Although we have also interested in the number of Twitter messages and personal variables, the goodness-of-fit of our model was not statistically significant.

in the Mention network.[2] Therefore, the politician's networks in Twitter are generally clustered with political affiliation groups of the ruling party and the opposition parties.

<Table 3 about here>

<Figure 2 about here>

**Comparison of the politician's Twitter networks**

*(1) Network as Social Ritual: the Following-follower network*

We have compared two types of the politician's network to identify characteristics each network. First we look at network property of each network mainly focusing on cohesiveness. According to Table 4, the Following-follower network is the densest network among three types of the Twitter networks. Interesting point is that this highest level of density stems from (dyad-based) reciprocity and cross-linkages between different political affiliation groups. The (dyad-based) reciprocity is 0.631 in the Following-follower network meanwhile that of the Mention and Reply networks are 0.235 and 0.184, respectively. In addition, E-I index[3], which measures the proportion of external ties over internal ties within a group shows that the Following-follower network has relatively closer to zero, meaning that the following-follower network has a relative high proportion of cross-linkages between politicians in the ruling party and in the opposition parties. Therefore, politicians 'follow' other politicians mainly based on mutual relationship. They 'follow' and 'followed by' each other and this tendency are relatively open to politicians in other political affiliation groups.

< Table 4 about here>

Then, does the embeddedness context of Twitter give the social pressure to politicians, making relationship with other politicians, as we argued earlier? According to Table 5, the embeddedness context works as a social pressure to connect other politicians. The Following-follower network is indeed the densest network among all types of networks.[4]

<Table 5 about here>

[2] Overall, three politicians are classified into different groups in both of Twitter networks.
[3] E-I index is ranged from -1 (all ties in the network are external ties to different group) to 1 (all ties in the network are internal ties within a group). For details, see Wasserman and Faust (1995).
[4] Note that Hsu and Park (2010) has excluded isolate nodes when they calculated density so that the actual density of hyperlink networks are smaller than as it appear in Table 5

*(2) Validation Tests for differences between the networks*

Although we have found evidences that the Following-follower network has features of social ritual network, we have tested whether the differences are statistically significant. First, we have tested the density difference between different types of Twitter networks. As Table 6 indicates, the density difference between the networks is statistically significant. There is a marginal difference between raw difference and average bootstrap difference.

<Table 6 about here>

Second, we have conducted Exponential Random Graph Modeling (ERGM) to see how reciprocity between the Following-follower and the Mention network are statistically based on different configuration. Among various method to estimate structural parameters (Robins, Pattison, Kalish and Lusher 2007), we have used Monte Carlo Markov Chain maximum likelihood estimation to fit our model.[5] Our model is constructed to distinguish propensity of dyadic reciprocity pattern in two types of networks.

<Table 7 about here>

In our model, only one parameter, *ReciprocityAAB*, is statistically significant and the converged T-ratio is less than .01. Although *ReciprocityAABB* parameter is also significant, it is not stable because it was not converged. Therefore, our model suggests that 'mention' between politician occurs asymmetrically though there exists the reciprocity of the Following-follower relation. Moreover, this tendency occurs in quite a high frequency.

Therefore, our statistical tests confirm difference in density and reciprocity between two networks, implying the Following-follower network is indeed influenced by the embeddedness context of social ritual. In addition, our ERGM result shows that the Mention network has a different logic of asymmetric relation in network composition. Next, we will examine the Mention network regarding to this asymmetric relation.

[5] The program we used is XPNet developed by the MelNet team. For details about the program, visit http://www.sna.unimelb.edu.au/index.html

*(3) Network as a Political Support: the Mention network.*

Our previous E-I index result revealed politicians mostly sent 'mention' messages to other politicians in the same political group and it is asymmetric. Hence, we have investigated indegree centrality of a politician based on 'mention' from same political group.

The result is that politicians tend to send their 'mention' to politicians who enjoy high public visibility in Twitter. Table 8 presents two factors contributing to increases of indegree centrality of a politician measured by 'mention' from same political group; total number of 'followers' and of Twitter messages. The regression analysis result in Table 8 shows that an increase in the number of a politician's total Twitter 'follower' leads an increase of the indegree centrality of a politician in the Mention network. The effect of the number of Twitter message postings is larger than the number of 'followers'.

< Table 8 is about here >

Furthermore, the tendency of 'mentioning' to popular politicians is only the Mention network phenomenon. Figure 3 shows the distribution of indegree centrality of two types of network, measured by 'mention' from same political group. The indegree distribution in the Mention network tends to follow power-law distribution meanwhile that in the Following-follower network follows linear function. Since the nodes size of the Mention network is too small, the finite-size bias may be present in verifying whether the distribution of each political group exactly follows power-law distribution. However, rough estimation of fitting data indicates that scaling parameter for each indegree distribution is about 3.5 for the ruling party and 3.1 for the opposition parties.[6]

In sum, politicians have a tendency to send 'mention' to other politicians who actively engages with public. In doing so, they support a popular politicians in Twitter within same political group.

<Figure 3 about here>

**V. Conclusion and Discussion**

We have examined politician Twitter networks. Unlike previous study, we have interests in

[6] This characteristic of the distribution only applies to the politicians at least have one indegree centrality.

pattern of relation between politicians rather than politicians' Twitter activity as an individual person. Our main finding is that following-follower network is a social ritual network between politicians and mention network is a political support network. These characteristics of politicians Twitter network lies in the platform-wise characteristic of Twitter which provides embedded contexts to politicians. In particular, for the Following-follower network, the embeddedness characteristic of Twitter defines relatively clear boundary of relationships so that it brings social pressure to 'follow' other politicians. Therefore, the network density of the Following-follower network is the highest in other forms of network between politicians in the Internet. In addition, since the embeddedness context also affects whom get 'following', it brings high level of reciprocity compared with other politician's network in Twitter. These results support the Following-follower network is a network of social ritual.

For the Mention network, the embeddedness context works in a different way to consider the public. Politicians tend to send 'mention' politicians who enjoy popularity in Twitter. In doing so, politicians send political supports to the popular politicians for engaging with the public within same political group. The analysis results confirm that the indegree centrality of the Mention network is highly skewed and have a tendency to follow power-law distribution. In addition, the more a politician has a public 'followers' and they post Twitter messages, the more the politician gets indegree from politicians in same political group.

Although we have revealed some of network property in two types of politicians network, this research has some limitations. First, the research result could only be applied to Korean context. Results from other countries may differ. Second, our data may reflect political landscape at the time of data collection. Depending upon political issues, such as election, the Mention network may bring different result. Finally, we have not examined the content of 'mention' messages. Further research for analyzing the content of 'mention' message between politicians will be fruitful how politicians send political supports to other politicians and how politician's messages differ according to political groups.

**Table 1 Number of Politicians in Data**

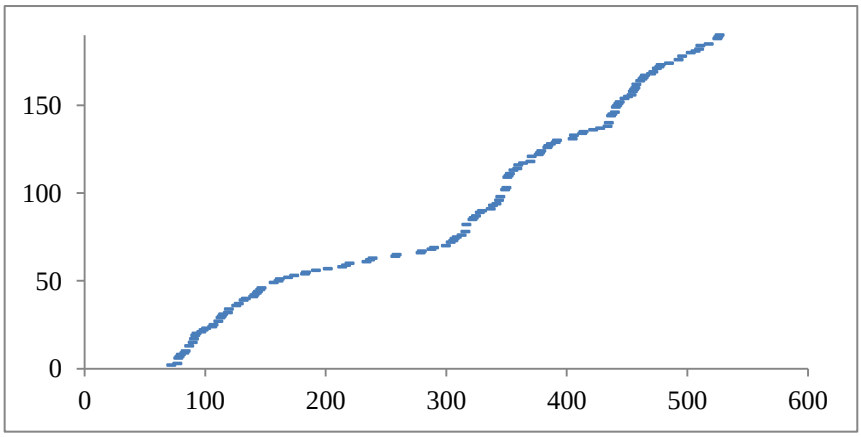
| | *Total* | *number of politicians having Twitter account* | *Ruling party vs Opposition Parties* |
|---|---|---|---|
| Grand National Party | 173 | 110 | 110 |
| Democratic Party | 92 | 56 | |
| Democratic Labor Party | 5 | 5 | |
| New Progressive Party | 3 | 3 | |
| Liberty Forward Party | 16 | 4 | |
| Creative Korea Party | 2 | 2 | 79 |
| Future Hope Alliance | 8 | 3 | |
| Fed of citizen-centered Party | 1 | 0 | |
| Citizen Participatory Party | 1 | 1 | |
| Independent | 8 | 5 | |
| Total | 309 | 189 | |

**Table 2 Regression Analyses of Politicians' Twitter Adoption**

| | Existence of Twitter Account | Lateness of Twitter Adoption (Days from 1st adopter) |
|---|---|---|
| | Logistic Regression | Negative Binomial Regression |
| Age | 0.951** | 1.011 |
| Male | 1.003 | 1.058 |
| Education | 1.034 | 1.005 |
| Opposition Parties | 0.841 | 0.743*** |
| # of incumbency | 1.311* | 1.026 |
| d.f. | 5 | 181 |
| $G^2$ | 16.308 | 201.500 |
| N | 306 | 187 |

* P< .05 ** P < .01

**Figure 1. Accumulated number of Twitter adoption by days from 1st Adopted Politicians**




X-axis: Days from the adoption date of 1st Adopted politicians (2009.3.31)
Y-axis: Accumulated number of adopted politicians

**Table 3. Correlation between network classification of groups and political affiliation groups**

| | *Attribute* | *Network* | |
|---|---|---|---|
| | Affiliation Groups | Following-follower | N |
| Affiliation Groups | | | 189 |
| Following-follower | 0.957** | | |
| Mention | 0.920** | 0.871** | 128 |

** P < .01
† Groups are coded into 0 and 1 for correlation analysis.

**Table 4. Comparison Following, Mention and Reply network between politicians : Cohesiveness Network Property**

| | *Following-follower* | *Mention* | *Reply* |
|---|---|---|---|
| Density | 0.204 | 0.040 | 0.017 |
| Clustering coefficient | 0.628 | 0.235 | 0.184 |
| Avg. Geodesic Distance | 1.896 | 2.895 | 3.385 |
| Reciprocity (dyad-based) | 0.631 | 0.184 | 0.155 |
| E-I Index* | -0.558 | -0.752 | -0.752 |

* Based on 5000 times permutation and politicians are divided into two political affiliation groups.
† Networks of Mention and Reply are treated as binary network.

**Table 5. Network Density for the homepage, blog, and Twitter networks politicians**

| | No. of nodes (%) | Density |
|---|---|---|
| Homepage[1)] | 115 | 0.002 |
| Blog [1)] | 71 | 0.005 |
| Twitter 2009 September [1)] | 20 | 0.263 |
| Twitter 2010 April [1)] | 35 | 0.192 |
| Twitter 2010 November | 189 | 0.203 |

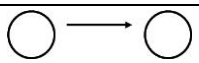
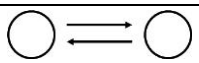
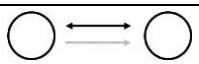
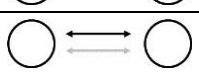
1) Based on members of 18th National Assembly and excluded isolate nodes
- Source: Hsu & Park (2010)

**Table 6. Density Difference between Three Twitter Networks Between Politicians**

| | (1)-(2)† | (1)-(3)† | (2)-(3)† |
|---|---|---|---|
| Difference in Density | 0.164 | 0.187 | 0.023 |
| Avg. Bootstrap Difference§ | 0.163 | 0.185 | 0.022 |
| Bootstrap S.E for Difference§ | 0.015 | 0.013 | 0.008 |
| Bootstrap T-statistic | 9.396 | 13.041 | 2.202 |
| Significance | <0.001 | <0.001 | <0.05 |

† (1) Following Network (2) Mention Network (3) Reply Network
§ Using 5,000 Bootstrap Samples

**Table 7. Multivariate Exponential Random Graph Modeling : Following-follower and Mention Network**

| | Multiplex relation | Configuration | Estimate | S.E. |
|---|---|---|---|---|
| ArcA | Following only |  | -2.642 | 0.025 |
| ArcB | Mention only | | -6.092+ | 0.122 |
| ReciprocityA | Following and Follower |  | 3.592 | 0.052 |
| ReciprocityB | Symmetric Mention | | 2.786 | 0.997 |
| ReciprocityAAB | Following-follower and Asymmetric Mention |  | 3.344*+ | 0.135 |
| ReciprocityABB | Following and Symmetric Mention | | -10.410+ | 3.487 |
| ReciporictyAABB | Symmetric Following and Mention |  | 20.066* | 6.932 |

* P < .05

+ indicates parameters are converged at convergence t-ratios < .10
(Note) Network A and black line indicate the Following-follower network
Network B and gray line indicate the Mention network

**Table 8. Negative Binomial Regression**
**: Factors influencing Indegree centrality in same political group network**

| | Estimator | S.E | Odd Ratio |
|---|---|---|---|
| Constant. | -2.830 | 0.539 | |
| Latenss of Twitter Adoption (Days from 1st Adopter) | 0.001* | 0.001 | 1.001 |
| Number of Follower(log) | 0.282*** | 0.077 | 1.326 |
| Number of Tweet Message(log) | 0.432*** | 0.059 | 1.541 |
| Opposition Parties | 0.142 | 0.176 | 1.152 |
| d.f. | | | 90 |
| $\chi^2$ | | | 93.946 |
| N | | | 95 |

* P < .05 *** P <.0001

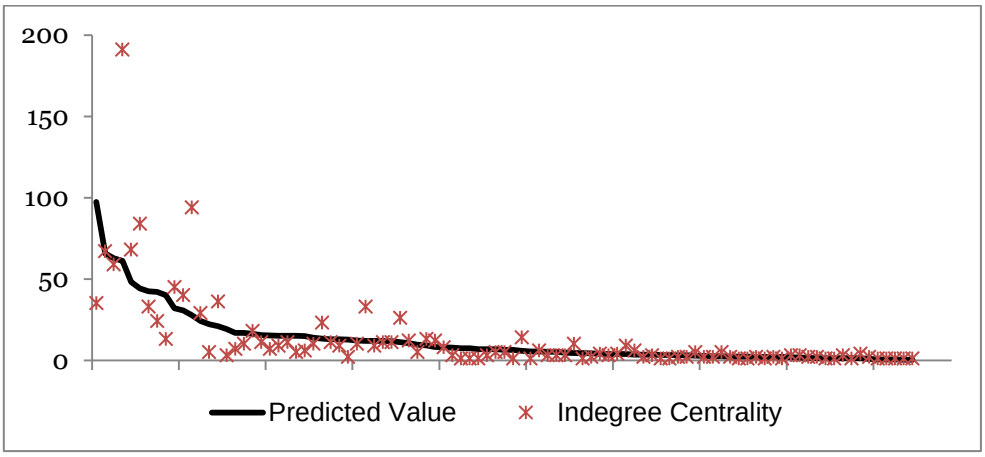
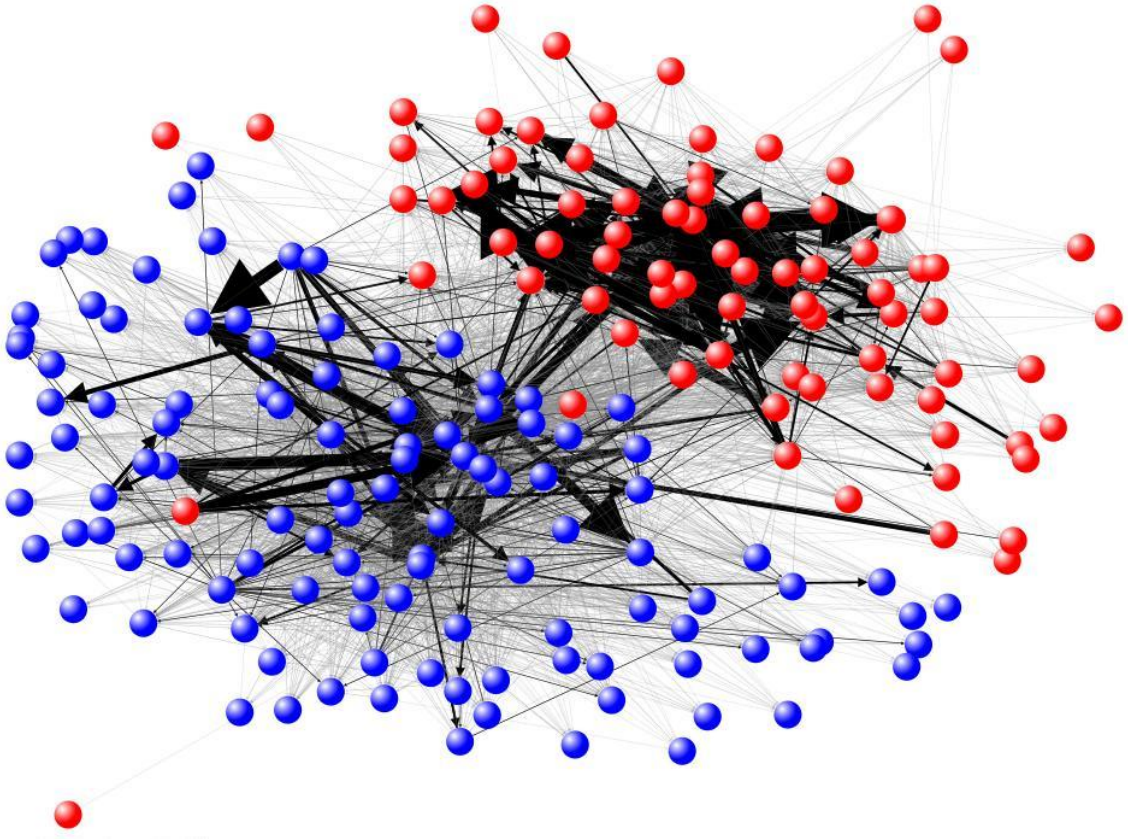


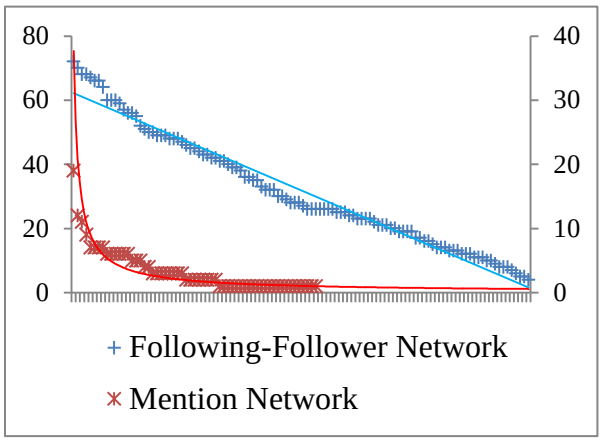
**Figure 2. Politician's Twitter network: Following-Follower and Mention Network**



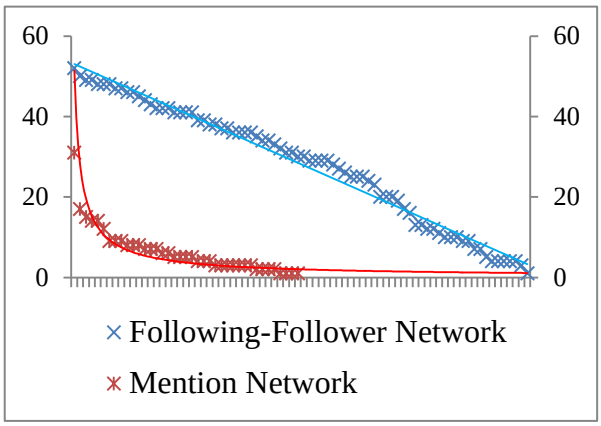
* Gray line indicates following-follower relation and black line indicates mention relation.
Blue: Ruling Party Red: opposition parties

**Figure 3. Distribution of Indegree centrality from same political groups : the Following-follower network and Mention Network**

(1) Ruling Party




(2) Opposition Parties




Note: excluded zero indegree centrality in the Mention

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