

# 입법 발의안을 통한 대한민국 국회의원 네트워크 분석<sup>☆</sup>

## Network Analysis of Korean legislators using Bipartite Network Projection

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### 요 약

요약 본 연구는 국회의원 구성에 있어서 큰 변화를 갖는 17대 국회의 입법발의 결과를 토대로 국회의원 네트워크 분석을 하였다. 각 개별 국회의원들의 입법활동을 넘어서 전체 입법활동에서 국회의원간 협업관계를 파악하고자 하였다. 17대 국회에서 국회의원들이 제출한 대표발의안 총 5728건을 수집하여 국회의원간 이원모드 네트워크를 프로젝션을 통해 분석하였다. 입법발의안을 매개로 국회의원 간의 네트워크 분석을 결과, 입법과정에서 영향력이 큰 국회의원은 물론 여당과 야당의 입법발의 과정에서의 다른 정당의 국회의원들과의 협업관계의 양상이 다를 수 있다.

☞ 주제어 : 대한민국 국회, 네트워크 분석, 이원모드 네트워크 프로젝션

### ABSTRACT

In study we analyze the network about the legislators in Korean National Assembly. We focused on 17th National Assembly since there were full of important changes in composition. Mutual cooperation is necessary to pass the bills beyond their given mission in legislation. In order to find out the relationship of legislators based on the introducing bills, total 5728 bills in 17th National Assembly, we used bipartite network projection. We can find who is a highly influential legislator and the difference between a ruling party and a main opposition party in aspects of cooperative behavior.

☞ keyword : Korean National Assembly, Network analysis, bipartite network projection

## 1. INTRODUCTION

The Korean National Assembly approximately has 300 parliament members, who are elected every four years. The seventeen standing committees play a major role in making the bills in the legislative process. The legislative process is very important in the political process, because this is an act to choose a policy related livelihood or controversial issue [1]. The legislators, who elected by citizens, have the right to enact and amend the law according to the laws<sup>2</sup>. Legislators are

offered to play the role to make a bridge between their parties and standing committees in the National Assembly. Since the legislators launched to use the real-name system for bills initiative, the numbers of introducing bills in Korea have been rising steadily after the 15th Assembly. Legislators submitted and petitioned 6,387 bills to the Standing Committees and the twenty percentage of the bills were passed in 2004~2006. However, the percentage of approved bills fell after recording 62.9 percent in the 15th Assembly. The 16th parliament had 47 percent of bills passed, while 30.4 percent was passed in the 17th Assembly [2]. The National Assembly passes a bill through two-thirds of the members as a quorum accordingly to the majority rule<sup>3</sup>. In Korea the ruling party and the main opposition party comprise more than 80 percent of the total. The two parties had led to a confrontation on current issue related the livelihoods of the public. Therefore cooperation is

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<sup>2</sup> Constitution of the Republic of Korea, article 40 and 52

<sup>3</sup> Constitution of the Republic of Korea article 49 and National Assembly act article 109

necessary to muster the requisite numbers for a quorum, in addition to reconciling the imbalance and stabilizing the political world. It is essential to figure out the legislator and party. We want to find the relationship between the legislator and others using network analysis.

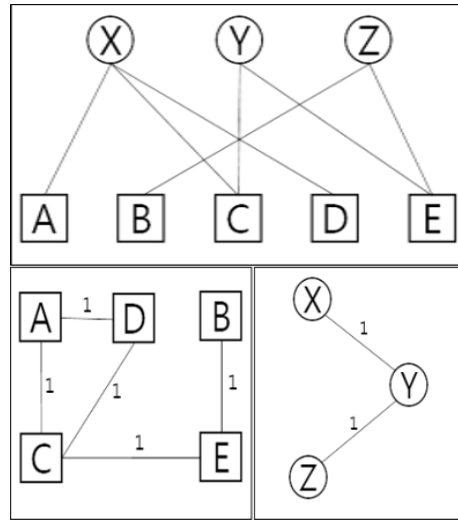
## 2. BACKGROUND AND RELATED WORK

### 2.1 BACKGROUND

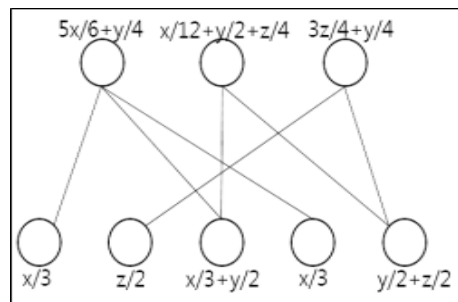
One-mode networks have one set of nodes that are similar to each other, the rows and columns refer to the same set of entities like (case X case) matrix. In contrast, two-mode networks have two dimensional matrix such as (person X case) matrix if the rows and columns index different sets of entities for instance the rows might correspond to legislators while the columns correspond to standing committees. The bipartite network is divided into two sets  $x$  and  $y$ , as shown Figure 1. The connection between two nodes divided into two disjoint sets. For example set  $X, Y, Z$  presents the three legislators and set from  $A$  to  $E$  presents the five committees. As affiliation matrix, two-mode networks can show the relation between rows and the columns in other words, the specific object (person) and certain events (affiliation, activities) include as indicating in the network [3][4].

Bipartite network projection is the way to transform one-mode network from two-mode network as shown Figure 1 and 2 respectively. Bipartite network projection is a method extensively used for compressing information. Because the one-mode projection is always less informative than the original bipartite graph, therefore an appropriate method for weighting network connections is often required. The proper weighting methods could present the features of the network without information loss. In Figure 2, the resource-allocation process consists of two steps first from  $X$  to  $Y$ , then back to  $X$ . In this way, the weighting method can be directly applied in extracting the hidden information of networks.

Tao Zhou assumed that a certain amount of resources like recommendation power are associated with each  $X$  node, and the weights  $W_{ij}$  represent the proportion of the resource  $j$  that would like to distribute to  $i$  and this is different from  $W_{ji}$  [5].



(Figure 1) Bipartite networks of  $X$  and  $Y$  projection



(Figure 2) The resource-allocation process in bipartite network

### 2.2 RELATED WORKS

Previous studies had heavily focused on two parts. One is the matter about collaboration factors and collaboration determinants which were the legislators would like to associate for introducing the bill. This study put weight on the quantitative analysis to determine the parameters as political parties and region of origin and so on. There was an attempt to find the factors in the voting process after introducing the bill to standing committees.

Fowler discussed who introduced the bill and who build a cooperative system in legislative process. He explained a new measure of connectedness which means the frequency of co-sponsorship and the number of cosponsors on each bill to

make inferences from the social distance between legislators. Connectedness predicts which members will pass more bills. He considered the similar social relation contribute to political support [6]. Another study tried to examine how co-signing networks in the 17th National Assembly Standing Committee of health had formed and evolved. Through this study he identified some characteristics on the formation of co-signing networks. The distinguishable factors were legislator's own party, reciprocity and transitivity which had influence on proposing bills [7][8]. Lee Hyun-chul explained the characteristics of member to introduce the bill and to vote. His work focused on the classification the factors which effect on bill proposal. He found out freshmen, the opposition party, the proportional representatives had the high rate of introducing bills [9]. Lee Hyun-woo pointed out the dominant factors that effect on the co-sponsorship network. He recommended the factor like party, local constituencies and experience of social community as acting decision-making mechanism in the Standing Committees [10].

Most of previous studies were carried on quantitative analysis such as ratio of introducing bills and passing bills. In addition they tried to find factors to make legislators propose bills in the specific terms or Standing Committee. It is difficult to understand the whole legislative work and the relation between legislators. Previous works could not explain the possible consequence which depended on the characteristic of political parties or specific Assembly.

As extending scope of study, we found out a strong standing committee and the relation each other by using bipartite network projection view of legislators in the 18th and 19th National Assembly [11].

## 2.3 THE FEATURES OF 17TH NATIONAL ASSEMBLY

The 17th National Assembly had the distinguishing features. This Assembly was the first in 16 years where the ruling party held a large majority giving it some leeway to endorse bills, budget plans and appointments of public officials. For abiding a Supreme Court judgment, with the two different votes, electors selected 243 district representatives from each election district and 56 proportional representations in proportion to the votes for each party nationwide for the first time. The

parliament had an unprecedented number of new, with more than 62 percent of the first timers. The number of women legislators was also at an all-time high at 39, or 13 percent of the total.

The parliament comprised 299 lawmakers, elected directly and through the proportional representation system in the general elections. The ruling Uri Party(UP) had a majority 152 seats, followed by the main opposition Grand National Party(GNP) with 121 seats, the liberalist Democratic Labor Party(DLP) 10, and the former ruling Millennium Democratic Party 9.

The remaining seven seats belong to the United Liberal Democrats and three independents. The progressive Democratic Labor Party won its first seats in Parliament.

After the election, Standing Committees need to be composed under National Assembly Law. There were seventeen committees which divide into the charge. In Table 1, we illustrated their field, quota and the number of members affiliated with each party. If the chairman of Standing Committee belonged to the party, this block was colored. Almost all bills abide by a committee's decision whether deliberate bills or not. Both ruling and opposition parties had a heated internecine struggles for distributing chairman of committee. The standing committees that need expert knowledge in assembly to play a crucial role. For this reason, we need to analyze the relationship between the legislators to work in standing committee.

## 3. STEPS OF NETWORK ANALYSIS

### 3.1 DATA COLLECTION

We collected the data about the bills from National Assembly Information System [12]. In this paper, we focused on the introducing bills by a legislator who represents more than ten legislators. In detail legislative process follows first ten or more of the legislators or government submit the bill introduction to the committee and after examination, discussion and vote in plenary session. After this process the bill was passed to send it to government for proclamation. We tried to find the difference between the ruling party and the main opposition party based on their party member's legislation activities in initial stage of legislative works.

(Table 1) The forming a committees in 17th National Assembly

Standing Committee	Quota	UP	GNP
House Steering	22	10	9
Legislation and Judiciary	16	7	7
National Policy	24	13	10
Economy and Finance	25	11	11
Foreign Affairs, Trade, Unification	26	13	12
National Defense	18	8	8
Public Administration	24	11	10
Education	18	9	8
Science and Technology and Information	20	9	10
Culture and Tourism	24	12	10
Agriculture, Forestry and Fisheries	19	10	7
Industry and Energy	22	10	8
Health and Welfare	20	10	8
Environment and Labor	16	6	8
Construction and Transportation	26	11	11
Information	12	6	6
Gender Equality and Family	16	7	7

### 3.2 METHOD USED IN THIS STUDY

The bipartite network projection provides the information between legislators that had submitted to common committee. We compared the ruling Uri Party(UP) with the main opposition Grand National Party(GNP) as selecting three legislators with the highest projection value. We picked out legislators and other legislators connected through more than ten committees out of seventeen by introducing bills.

## 4. RESULTS

### 4.1 NETWORK ANALYSIS IN THE RULING AND MAIN OPPOSITION PARTY

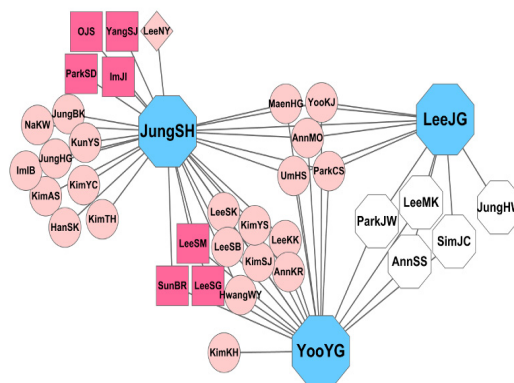
Legislators have submitted a representative proposal to two or more Standing Committees. We calculated the number of submission of the bills plus one without considering how many

proposals are submitted to same committee each pair of members. For example, if each lawmaker submitted a proposal to the common committee, it means the projection value is increased by 1 or if a pair of members keeps submission to the same committee, the projection value will rise. We can understand a relation between the legislators. Through this way we realized who involve more each other.

(Table 2) The five legislators with the highest projection value in UP and GNP

Legislator	The number of proposals	The projection value	The number of committees
Lee JG	34 bills	1559	9
Yoo YG	24 bills	1537	12
Jung SH	76 bills	1474	12
Kim SM	35 bills	1322	9
Kang CI	41 bills	1295	9
Ann SS	95 bills	1737	15
Lee MK	53 bills	1659	12
Sim JC	51 bills	1657	13
Jung HW	41 bills	1638	12
Park JW	85 bills	1571	12

Lee Jong-gul took the first place with 1559 projection value as a reelected member and Yoo Yoon-geun was ranked second, followed by Jung Sung-ho, Kim Sun-mi, Kang Chang-il in Uri Party. Except Lee Jong-gul, these members were first year lawmakers. Kim Sun-mi was one of 39 women politicians in parliament.



(Figure 3) the three legislators with the highest projection value in Uri Party

In Table 2 Lee Jong-gul was ranked top in the ruling party, followed by Yoon-geun, Jung Sung-ho view of projection value. In particular, Lee Jong-gul and Yoon-geun, overlapped with more than ten committees to act which they submitted the representative proposals. They had relation all of the main opposition party members with the highest projection value such as Ann Sang-su, Lee Myung-ku, Sim Chae-chul.

In the Figure 3, in the case of the ruling Uri Party, it was drawn as a square shape, the opposition Grand National Party as a circle, Korea Democratic Party as a diamond, in the case of the other parties as a triangle. Who had the highest projection value was drawn as an octagon and relevant party was colored. Through the Figure 3, we illustrated the companion in the more than ten common committees.

This figure introduced the relationship between three key personnel who had a wide legislative activity field and others. Despite of the ruling party they were less involved in variety party and legislators. The 'Uri' party did not have a similarity of legislative activity area with their own party members. They introduced the bills to ten Standing Committees which was numerically on average.

We pointed out Jung Sung-ho as a singularity. He leded legislation actively in the quantity of introducing bills and had a high projection value in his own party. Lee Jong-gul was a signature because he had a high projection value with the key personnel in the ruling Uri party. However Lee Jong-gul involved with legislators less than Jung Sung-ho in the aspect of the number of legislators and committees.

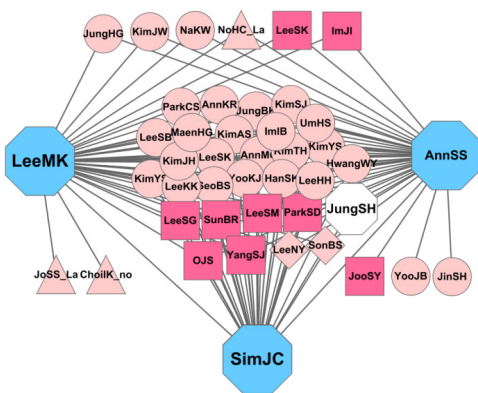
As shown in Table 2, Ann Sang-soo took first place with the highest 1737 projection value as election for the third term and Lee Myung-ku was ranked second, followed by Sim Chae-chul, Jung Hwa-won, Park Jae-wan in GNP. Lee Myung-ku, Jung Hwa-won and Park Jae-wan were first year lawmakers.

In the case of the main opposition GNP had wider and various relationship with other party. In this way GNP grew to hold a lot of influence in the legislative body as a cohesive group. While they introduced bills at a very wide range of legislation they could collect information and provide much more information to their party. It was a kind of virtuous circle in one way in the situation with fewer members than majority.

In particular, Lee Myung-ku hold the second rank overlapped the committees submitted the bills with Jo Sung-soo and Noh Hoi-chan in the liberalist Democratic Labor Party, Choi In-ki as independent.

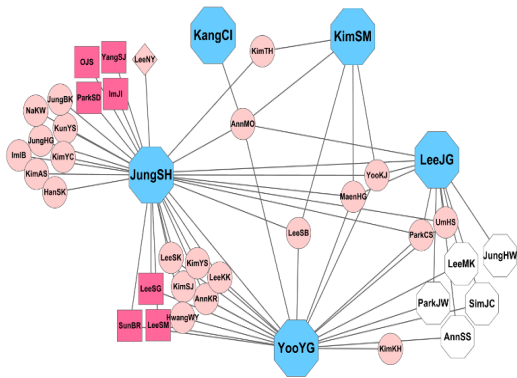
The overall of this figure introduced the GNP's relationship between key personnel and others. As the main opposition party they were more involved in various parties and legislators. The intersection result of them was thirty member who were the own and opposition party including Korea Democratic Party. The GNP had a similarity of legislative activity area with their party members. They introduced the bills to a wide-ranging area as thirteen standing committees on the average. Three key personnel in GNP had a similar legislative activities area with Jung Sung-ho of the ruling party member with the highest projection value.

We pointed out the GNP had strengthen ties among its members with Ann Sang-su, Lee Myung-ku, Sim Chae-chul as the center. In the case of Ann Sang-Su as a member of the GNP submitted the 95 representative proposals out of 6,387 as a total. He was ranked top in the highest projection value and in the number of introducing bills as he introduced the bills to all Standing Committees except the Science and Technology and Information committee. He played a leading role in legislative process quantitatively as well as qualitatively in GNP



(Figure 4) the three legislators with the highest projection value in Grand National Party

#### 4.2 THE EXPANSION OF 4.1 RESULTS



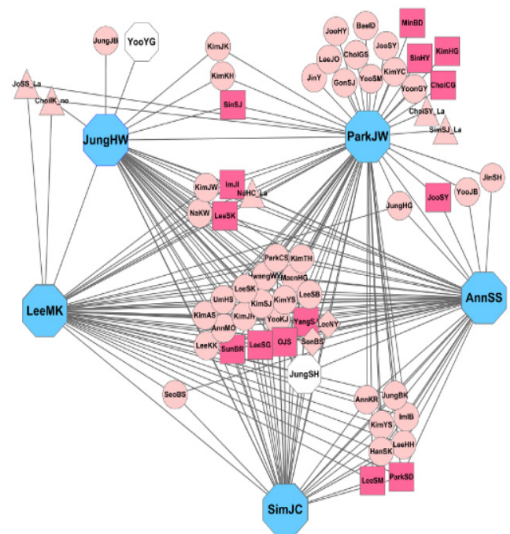
(Figure 5) the five legislators with the highest projection value in Uri Party

Kim Sun-mi, Kang Chang-il in Uri Party were included for check the results. They would be a partnership and it will be a legislative experience as first-term lawmaker while submitting the proposals to nine committees. They did not have a really close group and require realign of the party themselves.

Despite of expansion to five legislators Uri Party kept the same structure as Figure 3. At the same time, Uri Party was described a loosely affiliated connectivity. The key personnel also did not have been intertwined with themselves.

However the GNP had been the leader in parliament. We included Jung Hwa-won, Park Jae-wan for expansion. The key personnel had been intertwined with themselves and different party at the same time. Jung Hwa-won, Park Jae-wan can take advantage of the existing relationships with three key figures in their party like Lee Myung-ku and Jung Hwa-won submitted the proposals same committee which Jo Seung-soo in the liberalist Democratic Labor Party, Choi In-ki as independent also introduced to.

The GNP would build the own infrastructure or strategy about introducing bills to the committees that was effective, usable and consistently applied legislative process. From this study we noticed that the GNP was a structured collection of practices that described the characteristics of wide and various working field. The GNP controlled internally to lead legislation together with legislators from both own party and other parties.



(Figure 6) the five legislators with the highest projection value in Grand National Party

#### 5. DISCUSSION AND CONCLUSION

The new appraisal based on this study will play an important role in making the voices of the voters. According to the constitutional law the information related to legislation must be presented to the general public. The information about the legislative process and the results is a kind of Big Data which has features like volume, variety, velocity plus complexity and value [13] [14]. We are able to have an automated legislative information system for decision support and automation through Big Data solution in anytime, anywhere in line with SNS [15].

This study attempts to identify the most influential legislator among the ruling party and the main opposition party in the 17th Assembly. We want to obtain the results which parties carried out their responsibility to the fullest in the unicameral legislature. In addition this study provides information to establish strategies about legislative activities to the political party and its members, to appraise the legislators more process-centered. We want to find the meaningful information to measure the legislator's work from a view of process in National Assembly.

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