

## **Which sanctions make North Korea angry?: Text analysis on Rodong Sinmun**

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### **I . Introduction**

North Korea blamed China for the first time after China changed its attitude to be in favor of sanctions against North Korea. Rodong Sinmun, a Worker's Party organ, reported on 4<sup>th</sup> May 2017 that China is crossing the red line of North Korea-China relation. <sup>1</sup>Accordingly, South Korean Foreign Ministry commented that the fact that North Korea criticized China proves the effect of sanctions against North Korea. <sup>2</sup> However, there was no counter-arguments on Korean government's explanation and we believe it is because there is practically no tool to measure the effectiveness of sanctions against North Korea.

The international sanctions against North Korea's nuclear test started after its first nuclear test in 2006 and reinforced so far for more than 10 years with repeated nuclear tests. Even though the sanctions continued for a substantial period of time, it was almost impossible to measure the effectiveness of sanctions, given there was no credible economic figures in North Korea due to the North Korea's closed economy. Existing research papers tried to figure out the effectiveness of sanctions through trade balance. However, as North Korea maintained low level of trade with other countries for prolonged period, it is also tough to measure the effectiveness of sanctions through trade indicators. Therefore, some research papers estimated that North Korea would suffer \$3.7bn of trade deficit, when the UN Security Council resolution fully implemented (Soonjik Hong, 2009) <sup>3</sup>, while others argued that the trade balance improved after implementation of sanctions against North Korea (Jaeyoung Hur,

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<sup>1</sup> Rodong Sinmun, 2017.05.04, "조중 관계의 기둥을 찍어버리는 무모한 언행을 더이상 하지 말아야 한다"

<sup>2</sup> Hankyoreh, 2017.05.05, "중국 대북압박 공조에…북 "붉은 선 넘고 있다" 맹비난"

<sup>3</sup> 홍순직. 2009, "UN 안보리의 대북 제재 영향과 대응 방향," 『통일경제』, 여름호: 36-45

2016)<sup>4</sup>.

It makes even tougher to discuss on effectiveness of sanctions that there are no clear agreement about the purpose and direction of the sanctions. The purpose of the sanction divided into two groups - 1) changing target's policies (B.Taylor, 2012)<sup>5</sup> and 2) punishing the target (Blanchard et al.,2014). For direction of the sanction, some argues that multilateral approach would be effective (Drezner, 2000)<sup>6</sup>, while others assets that individual sanction could have better results (Bonetti, 1998)<sup>7</sup>.

Therefore, in this paper, we would focus on finding out which sanction made North Korea more uncomfortable through analyzing the responses of North Korea on sanctions appeared in Rodong Sinmun. This could overcome the limitation of existing papers that focused on the effectiveness of sanctions. The purpose of this paper is to compare the responses of North Korea by sanction types (UN/US sanction, Japanese sanction and South Korean sanction) and North Korean regimes (Kim Jong Il regime and Kim Jong Un regime) and point out on which sanction the North Korea responded more sensitively. This paper could shed light on the direction of sanctions against North Korea amidst the absence of information on effectiveness of sanctions.

## II. Data and methods

### 1. Data

To measure the intensity of North Korea's response on sanctions against them, Rodong Sinmun was selected as the dataset. This is because Rodong Sinmun is a major press of North Korea, which controls and instigates all the media in North Korea. North Korea's media tend to be persuasive and assertive, rather than to be objective.<sup>8</sup> Of note, Rodong Sinmun reports in a clear tone on issues, either positive or negative way, which would be suitable to find out the reaction of North Korea on international sanctions.<sup>9</sup> Moreover, it is possible to collect data from Rodong Sinmun for a substantial period of time and analyze time-series responses of North Korea. It is practically the only legitimate North Korean media to access in South Korea,

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<sup>4</sup> 허재영, and 정진문. "대북 경제제재의 실효성 분석: 식량지원 중단을 중심으로." *한국과국제정치 (KWP)* 32.3 (2016): 89-123.

<sup>5</sup> Taylor, Brendan. *Sanctions as grand strategy*. Routledge, 2012.

<sup>6</sup> Drezner, Daniel W. "Bargaining, enforcement, and multilateral sanctions: when is cooperation counterproductive?." *International Organization* 54.01 (2000): 73-102.

<sup>7</sup> Bonetti, Shane. "Distinguishing characteristics of degrees of success and failure in economic sanctions episodes." *Applied Economics* 30.6 (1998): 805-813.

<sup>8</sup> 김영주. "[로동신문] 에 나타난 대남보도 논조 분석." *언론과학연구* 10.4 (2010): 80-121.

<sup>9</sup> 주정화. "[로동신문] 을 통해 본 김정은 정치스타일." *사회과학연구* 30.2 (2014): 55-80.

as the Information Center on North Korea under Ministry of Unification does not provide data for Korean Central Television (KCTV) and Korean Central News Agency (KCNA). However, considering that state-run media in North Korea use similar tones, it is still meaningful to limit the analysis dataset as Rodong Sinmun.

The analysis period would be from 9<sup>th</sup> Oct 2006, when there was the 1<sup>st</sup> nuclear test of North Korea, to 31<sup>st</sup> Dec 2016. The subject of analysis would be 1,220 articles that contains the keyword of ‘sanction’ for the analysis period.

< Table 1 > The number of articles used for analysis

(\* : The year when there are nuclear tests)

Year	Number of articles	Year	Number of articles
2006*	45	2012	39
2007	65	2013*	196
2008	21	2014	16
2009*	45	2015	132
2010	11	2016*	630
2011	20		

## 2. Method

### 2.1. Macro analysis: Topic modeling and clustering

This report is applied the latent Dirichlet analysis (LDA) to figure out the major topics regarding sanctions in Rodong Sinmun. LDA is famous for topic analysis and the topics consist of words that are highly likely to appear in the same document.<sup>10</sup> For example, words like ‘Chongryon (the General Association of Korean Residence in Japan)’, ‘Man Gyong Bong 92’, and ‘Japanese authorities’ fall in a single topic when analyzing Rodong Sinmun in 2006. However, researchers have full discretion to define the topics derived from LDA. ‘Topicmodels’ package of ‘R (an open-source statistics program)’ was used for analyzing topics. To eliminate noises, words that are 1) irrelevant to the paper despite their high frequency (like ‘we’ and ‘nation’) and 2) less shown than 2 times in a document were ignored. Moreover, clustering, which categorizes similar documents using algorithms, was employed to double-check the result of topic modeling. ‘Cluster’ package of ‘R’ was used for clustering.

<sup>10</sup> Blei, David M., Andrew Y. Ng, and Michael I. Jordan. "Latent dirichlet allocation." *Journal of machine Learning research* 3.Jan (2003): 993-1022.

## **2.2 Micro analysis: Sentiment analysis and Word-network analysis**

After classifying major topics in Rodong Sinmun, sentiment analysis was applied to find out North Korea's responses on each topic. Sentiment analysis identifies attitudes of speakers (or authors) within positive, neutral and negative. In this paper, 'Sejong Dictionary' in 'KoNLP' package of 'R' was used to extract 6,746 nouns from 1,220 articles in Rodong Sinmun that contains keyword of 'sanction'. A negative word dictionary was built by assigning 1 point for each negative word extracted from sentiment analysis. Unlike normal cases that assign -1 for negative words, 0 for neutral words and 1 for positive words, 0 was assigned for both neutral and positive words in this paper, as it has little meaning to distinguish neutral word from positive word to figure out North Korea's responses on sanctions against them. Sentiment word dictionary of 'Openhangeul', which was developed by Yonsei University, was used to categorize negative words and non-negative words. After that, extra coding was required for words that are only used in North Korea and not screened by 'Openhangeul'. To find out differences by sanction types, time-series data were re-categorized by topics found in the macro analysis. In addition to this, sentiment analysis on Kim Jong Il regime and Kim Jong Un regime was proceeded to find out sentiment changes in different regimes. Using 'Sentimentr' package of 'R', the negative word score was calculated by matching extracted words with the negative word dictionary.

On top of that, word-network analysis was added to figure out major arguments formed with similarity of words in each topic. Words were set as a vector and cosine value of words was used to see the similarity of words. 'Krkwic' of Yeungnam University was used for word-network analysis.

## **III. Results**

### **1. Macro analysis: Topic modeling and clustering**

When using Maximum Likelihood Estimation of Dirichlet Distribution, the number of topics was 15 for 6,746 extracted words. However, there were some topics that overlap each other, which could undermine the meaning of the research. By repeatedly running 'Topicmodeling' with less topics, we drew the optimized number of topics as 5. Table 2 shows the top 15 words of high frequency by 5 topics. We decided to define 5 topics as 1) sanctions imposed by Japan, 2) sanctions imposed by UN/U.S.3) North Korea regime campaign, 4) sanctions imposed by South Korea, and 5) sanctions to North Korea's allies. According to our analysis, the sanction sender was stood out as the important indicator of North Korea's interests. The details on the North Korea's response by sanction senders would be followed in

micro analysis. In Rodong Sinmun, North Korea seems to identify the UN with the US as a sanction sender. Therefore, we also bundled the UN and the US as one sanction sender for our 'Topic modeling' and micro analysis.

< Table 2 > Result of Topic modeling

<b>Japan</b>	<b>UN/U.S.</b>	<b>Campaign</b>	<b>S.Korea</b>	<b>Friendly Nations</b>
Japanese Government	U.S.	Respected	Foreign Invasion	U.S.
DPRK	Marshal	Korean People's Army	Park Geun Hey	Russia
Korean Residents in Japan	Army	DPRK	North-South Relations	Iran
Chongryon	Sanction	People	Puppet	Nations
Japanese Reactionaries	DPRK	Party Members	US Military	Emphasis
Japanese Authorities	People	Marshal	Collusion	Venezuela
Statement	US Imperialist	Kim Jong Un	Sanction	Sanction
Man Gyong Bong 92	Nuclear Weapons	US Imperialist	Talks	People
Anti DPRK	Anti DPRK	Workers	S.Korea Authorities	Foreign Invasion
Chongryon Workers	Foreign Invasions	Historic	South Korea	Peace
Wanton	UN Security Council	Speech	Park Geun Hye Group	Independence
Arrest	Peace	70-Day Campaign	Suprem Leader	China
Violation	Independence	Resolution	Traitor Park Geun Hey	Protection
Overseas Koreans	Imperialism	Mt.Paekdu	Viciousness	UN Security

				Council
Reactionaries	Resolution	Counstruction	Gaeseong Industrial Complex	Indiscrimination

To see the changes in importance of topics in chronological order, we calculated the similarities between topics and years (Table 3). In 2006-2008, the degree of similarity with sanction imposed by Japan was high, as Japan driven sanctions to North Korea was concentrated for the period including banning Man Gyong Bong 92 ferry to enter Japan. The topic of sanction imposed by UN/US had high similarity with the articles in 2015-2016, when UN Security Council and the US put pressure on North Korean sanctions. The similarity with sanction imposed by South Korea was high in 2009-2011. For that period, President Lee Myung Bak took a firm line on North Korea and South-North relation was strained. The regime campaign topic was highly related to the articles in 2012 and 2014, while sanction to North Korea's allies had high similarities with articles in 2012 and 2015. For the mentioned years, there was no nuclear test in North Korea.

< Table 3 > Similarity between topics and years (Min: 0, Max: 1)

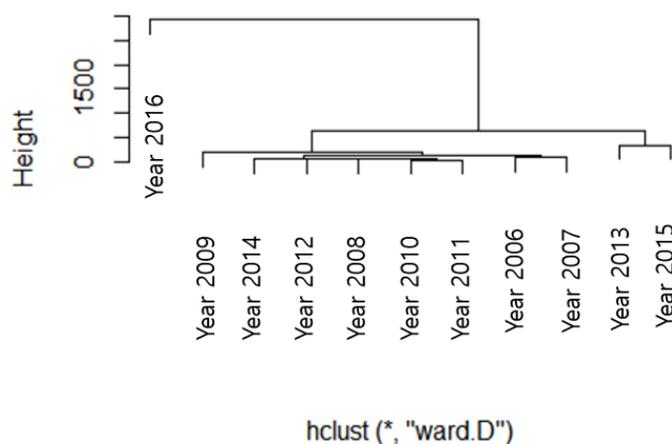
(\* : The year when there are nuclear tests)

Year	Japan	UN/U.S.	Campaign	S.Korea	Friendly Nations
2006*	0.16904	0.00000	0.00000	0.00000	<b>0.83095</b>
2007	<b>0.99999</b>	0.00000	0.00000	0.00000	0.00000
2008	0.22931	0.00001	0.00001	0.00001	<b>0.77065</b>
2009*	0.00000	0.00000	0.00000	<b>0.99999</b>	0.00000
2010	0.00001	0.00001	0.00001	<b>0.99995</b>	0.00001
2011	0.00002	0.00002	0.00002	<b>0.99993</b>	0.00002
2012	0.00001	0.00001	<b>0.99997</b>	0.00001	<b>1.00000</b>
2013*	0.00000	0.00000	0.00000	0.00000	0.00001
2014	0.00001	0.00001	<b>0.99997</b>	0.00001	0.00001
2015	0.00000	<b>1.00000</b>	0.00000	0.00000	<b>1.00000</b>
2016*	0.00000	<b>1.00000</b>	0.00000	0.00000	0.00000

As 'Topic modeling' is just a mechanical analysis dependent on algorithm, the reliability of

the topic should be reviewed. We adopted ‘Clustering’ analysis to examine the relevance of the topics. Figure 1 shows the result of ‘Clustering’ analysis using Ward Clustering Algorithm. Even though the process and algorithm were different, the results in Figure 1 and Table 3 proves that the similarity between topics and years are relevant and the macro analysis drew reasonable results.

< Figure 1 > Result of ‘Clustering’ analysis



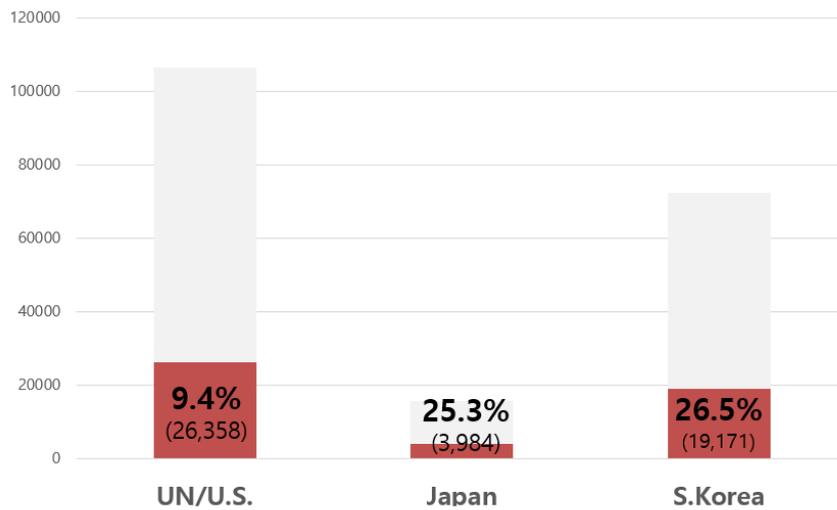
## 2. Micro analysis

### 2.1. Sentiment analysis

After categorizing articles by sanction sender using ‘Topic modeling’, we proceeded with sentiment analysis for those articles. The negative score appears as follows – UN/US (26,358), South Korea (19,171) and Japan (3,984). However, the negative score moves up when the absolute number of article increases. Therefore, we calculated the proportion of negative words out of total words to examine the response of North Korea.

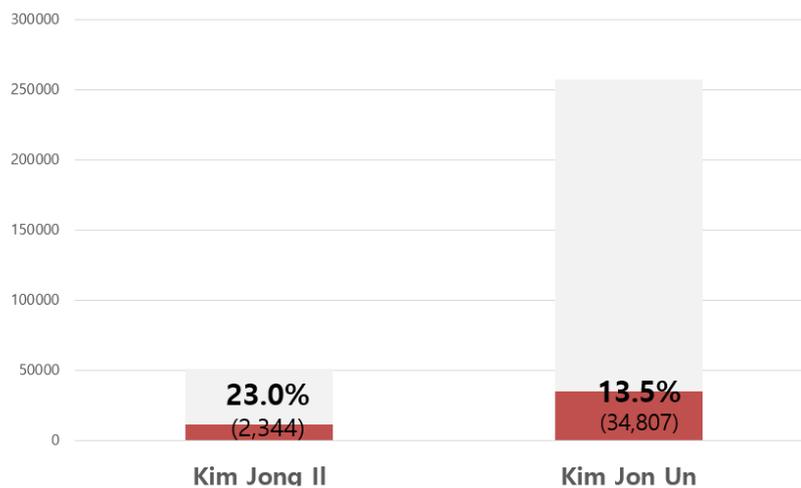
Figure 2 presents that North Korea reacts much more sensitively to the sanctions from South Korea and Japan than the sanctions from UN/US. Rodong Sinmun moderately condemned sanctions from the UN and the US using rhetoric, while strongly attacked South Korea and Japan for the shutdown of Gaesong Industrial Complex and the suppression of ‘Chongryon’. Considering that the annual cash wiring from ‘Chongryon’ to North Korea was c. ¥ 4-5bn before the Japanese sanction and the 70% of the profits from Gaesong Industrial Complex went to Worker’s Party of North Korea, we believe North Korea responded more aggressively on the sanctions that practically harmed North Korea by shutting down the cash inflow.

< Figure 2 > Sentiment analysis by sanction senders in 2006-2016



In addition to this, we separated articles by regimes in North Korea (Kim Jong Il regime and Kim Jong Un regime) and ran sentiment analysis to check the differences between the two regimes. For sanctions imposed by UN/US, the number of negative words came out more in Kim Jong Un regime, while the negative word proportion was higher in Kim Jong Il regime (Figure 3).

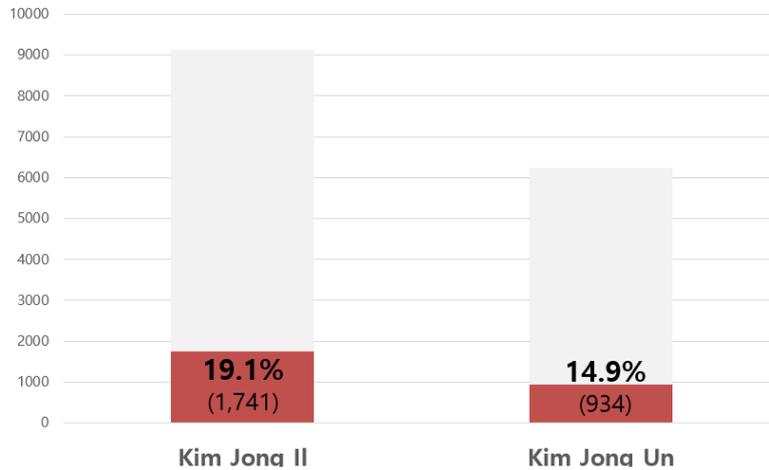
< Figure 3 > Sentiment analysis on the UN/US sanctions by North Korean regimes



For sanctions imposed by Japan, Kim Jong Il regime also recorded higher negative word proportion (19.1%) than Kim Jong Un regime (14.9%). It proves that North Korea responded

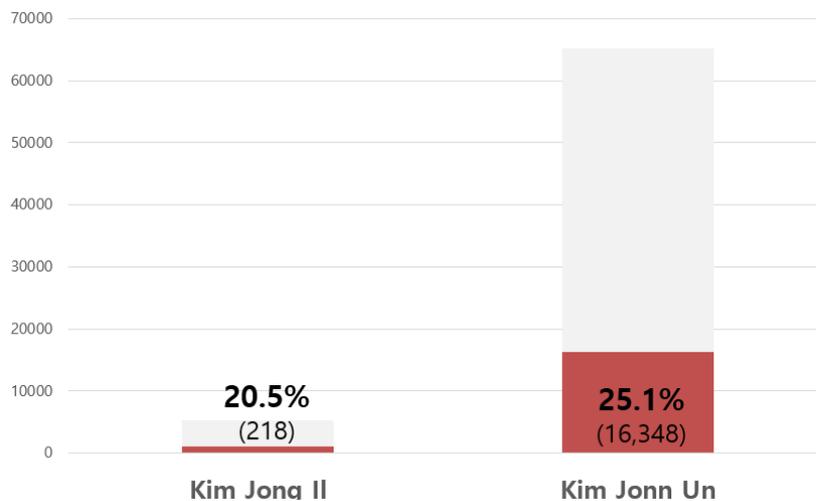
aggressively on the suppression of 'Chongryon' by Japan, which was concentrated in 2006-2008 (Figure 4).

< Figure 4 > Sentiment analysis on the Japanese sanctions by North Korean regimes



The sanction from South Korea is a different story. Unlike aforementioned sanctions, Kim Jong Un regime showed higher negative word proportion than Kim Jong Il regime. After the shutdown of Gaesong Industrial Complex, Rodong Sinmun intensively covered condemnation of President Park Guen Hey. There were lots of slangs in Rodong Sinmun to denigrate South Korean government and President Park. The level of attack in Rodong Sinmun was escalated in Park's administration (Kim Jong Un regime in North Korea) compared to Lee's administration (Kim Jong Il regime) (Figure 5).

< Figure 5 > Sentiment analysis on the South Korean sanctions by North Korean regimes



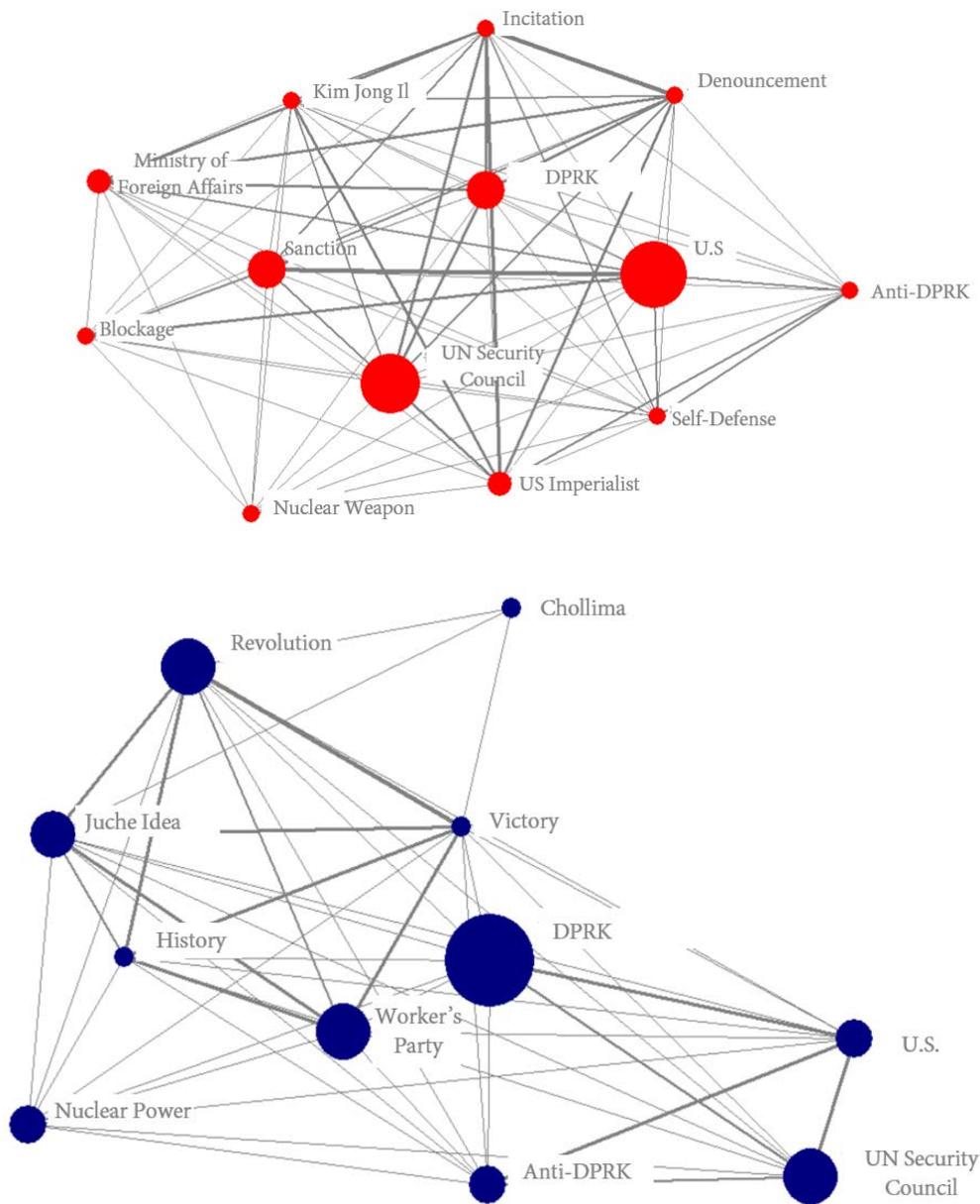
## 2.2. Word-network analysis

To find out more details on North Korea's response in Rodong Sinmun, we measured cosine similarity that shows the similarities in patterns among high frequency words. Figure 6 shows the result of Word-network analysis on sanctions imposed by UN/US. The size of the circle represents the frequency of the word and the thickness of the line indicates the similarities between the words. During Kim Jong Il regime, the sanction sender (the UN and the US) was highlighted, while the words that stood for sanction target (North Korea) including 'the Democratic People's Republic of Korea (DPRK)' and 'Worker's Party' mostly appeared during Kim Jong Un regime. In Kim Jong Il regime, hostile words toward UN Security Council including 'Denouncement', 'Incitation' and 'Blockage' showed up frequently. In Kim Jong Un regime, words like 'Worker's Party', 'Revolution', 'Juche Idea', 'Victory', 'Chollima' and 'History' stood out and also had strong relevance among them. Moreover, Kim Jong Il regime focused on criticizing the UN and the US, while Kim Jong Un regime emphasized propaganda words like 'Revolutionary Idea' to overcome the economic sanctions. North Korea actually demanded its people to have revolutionary spirits through '70-Day Campaign' in Feb 2016.<sup>11</sup> When we read Rodong Sinmun in Feb 2016, it addressed that North Korean should be 'Mallima riders', which is faster than 'Chollima', to get over the UN/US sanctions.

< Figure 6 > Word-network analysis on the UN/US sanctions by North Korean regimes  
(Top figure: Kim Jong Il regime, Bottom figure: Kim Jong Un regime)

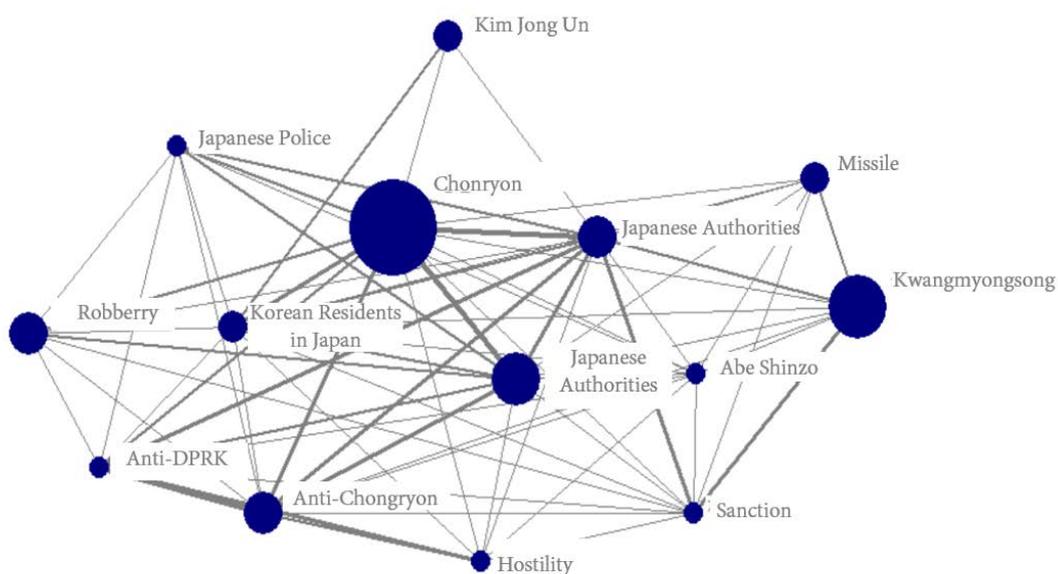
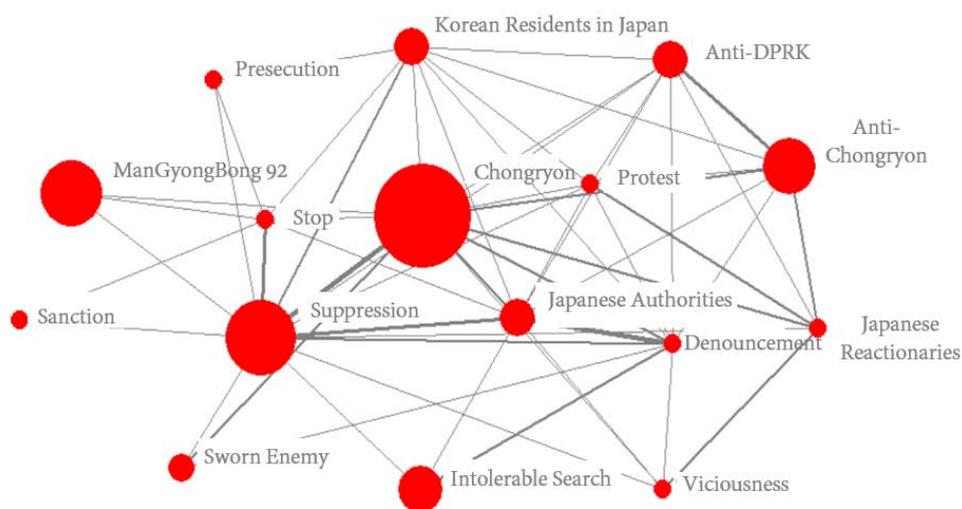
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<sup>11</sup> Rodong Sinmun, 2016년 2월 3일, "동무는 만리마를 대가라는 물음에 떳떳이 대답하자"



Meanwhile, there were no meaningful differences between two regimes in terms of the Japanese sanctions (Figure 7). The mostly-appeared words are largely similar, but the relevance between the words was stronger in Kim Jong Un regime.

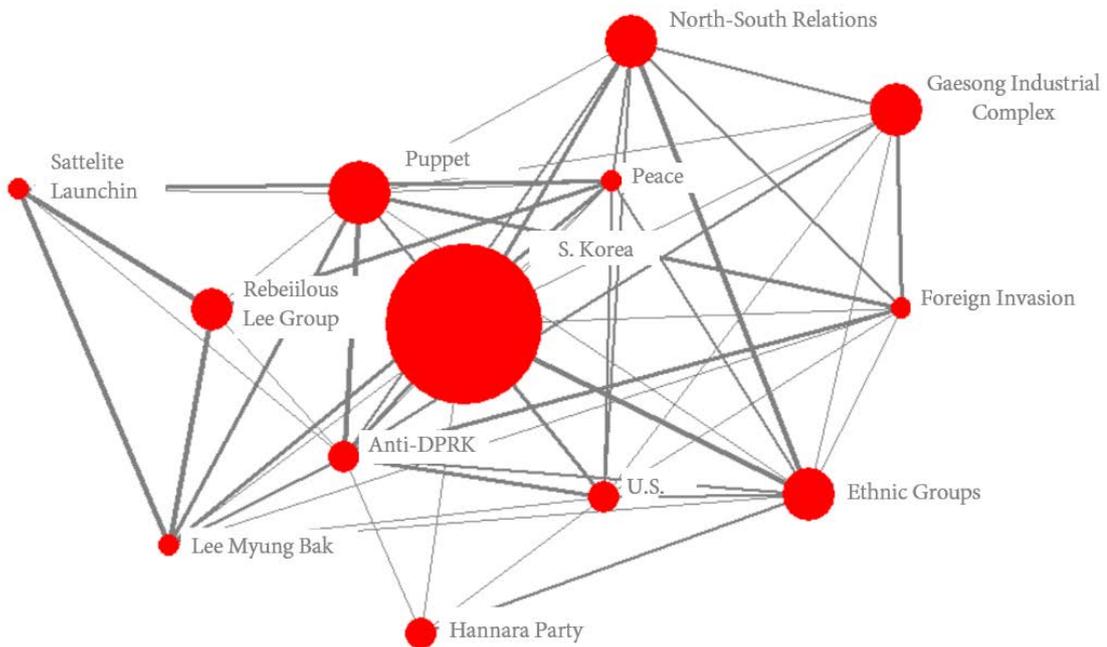
< Figure 7 > Word-network analysis on the Japanese sanctions by North Korean regimes  
(Top figure: Kim Jong Il regime, Bottom figure: Kim Jong Un regime)

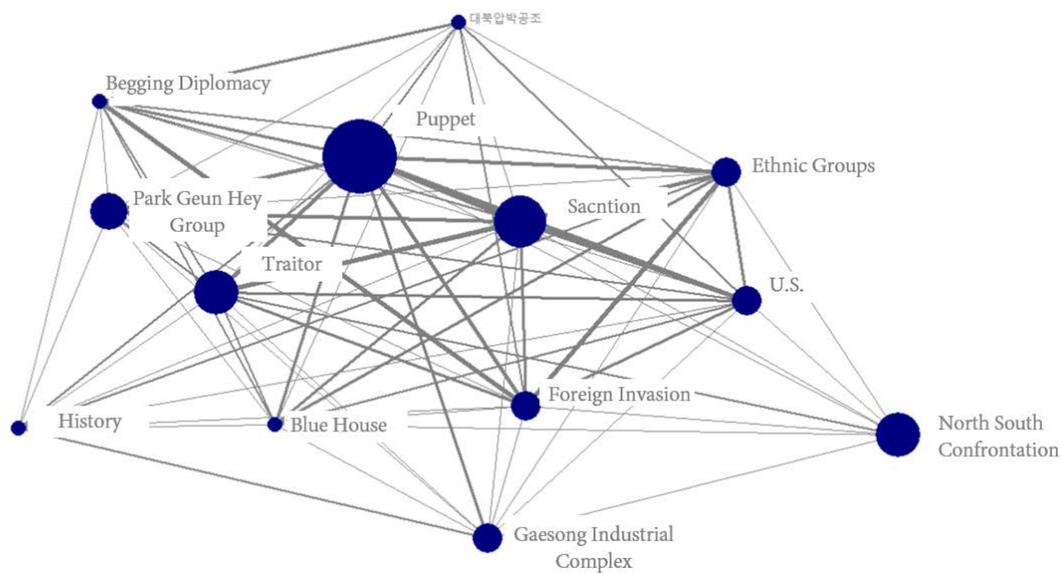


For sanctions imposed by South Korea, there were clear differences between the two regimes (Figure 8). In Kim Jong Il regime, even though there were words like ‘Puppet’, and ‘Rebellious Lee Group’, ‘South Korea’ was mostly used to indicate South Korea. However, in Kim Jong Un regime, ‘South Korea’ disappeared and ‘Puppet’, ‘Park Geun Hey Group’ and ‘Traditor’ were used frequently. Moreover, it is also notable that ‘North-South Relation’ in Kim Jong Il regime had been changed to ‘North-South Confrontation’ in Kim Jong Un regime. In Kim Jong Il regime, even though Rodong Sinmun condemned South Korean sanctions, it emphasized two

Koreas were in same ethnic group and urged South Korea to stop the sanctions. On the other hand, in Kim Jong Un regime, it focused on blaming South Korea and treated South Korea as an opponent. We believe it is relevant to the sentiment analysis result that negative word proportion of Kim Jong Un regime was high only in the articles regarding sanctions imposed by South Korea.

< Figure 8 > Word-network analysis on the South Korean sanctions by North Korean regimes (Top figure: Kim Jong Il regime, Bottom figure: Kim Jong Un regime)





#### IV. Conclusion

In this paper, we found out 3 meaningful responses of North Korea on international sanctions by analyzing Rodong Sinmun since its first nuclear test. Firstly, North Korea sees sanctions in 3 different types (UN/US sanction, Japanese sanction and South Korean sanction) and reacted more aggressively on sanctions from South Korea and Japan than sanctions from UN/US. We assume that it is because the disruption of trades with South Korea and Japan would have more direct effect than UN/US sanctions. It also indicates that if China, the largest trade counterparty of North Korea, joins the international sanctions against North Korea, the effectiveness of the sanctions would improve meaningfully. Secondly, Kim Jong Un regime was more sensitive than Kim Jong Il regime in terms of sanctions from South Korea. As the South-North relation got strained, North Korea became more hostile to South Korea. Lastly, after Kim Jong Un came to power, North Korea controlled its hasty denunciation on the UN/US sanctions and tried to overcome economic difficulties through ‘Mallima’ campaign. However, given ‘Mallima’ campaign is relevant to Line of Simultaneously Developing Two Fronts (Nuclear and economic developments), we need to check whether the nuclear development is impeded or accelerated through the sanctions against North Korea.

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