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United Nations Sanctions
on North Korea’s Luxury Goods Imports:
Impact and Implications

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Analysis of the Impact of UN Sanctions on North Korea's Luxury Goods Imports

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Abstract

The UN Security Council has been levying sanctions against North Korea in response to its provocative actions. The year 2017 presented North Korea with the strongest economic sanctions it ever faced. It is clear that the top five North Korean items banned from export to China suffered a sharp downturn in 2017. However, North Korea's imports from China in 2017 recorded USD 3.33 billion, recovering the average of the past five years and the impact of sanctions on North Korea's imports from China do not appear to be statistically significant. Upon this backdrop, this paper aims to analyze the economic impacts of UN sanctions on North Korea's imports, especially focusing on banned luxury goods imports from 2004 to 2017 by investigating bilateral trade flows between North Korea and its 71 trading partner countries. The analysis is based on applying difference-in-differences methods to the gravity model. The results of our difference-in-differences test show that UN Resolutions were ineffective in decreasing North Korea's luxury goods imports. This is because the scope of restricted import items is not as extensive as for exports. Items prohibited from being exported to North Korea, such as luxury goods, only account for around 5–9 percent of North Korea's total imports in 2017. Thus, a clearly defined list of the prohibited luxury goods must be proposed by the UN Security Council. The coverage of the provisions of UN resolutions must be expanded in order to improve the impact of UN sanctions on North Korea and provisions enforcing transparency on sanctioning countries must be strengthened. Most importantly, sanctions alone may not be strong enough to change the behavior of the North Korean regime. Thus, the UN Security Council must come up with more intelligent sanction measures and couple these improved sanctions with negotiations to positively alter North Korea's behavior.

JEL codes: F51, P2, D74

Keywords: North Korea (DPRK), Economic Sanctions, Nuclear, United Nations

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1. Introduction

UN Resolutions 1695 and 1718 were enacted in 2006 after North Korea's missile test and first nuclear test, respectively. The UN Security Council condemned in the strongest terms Pyongyang's first nuclear test of 2006, and reaffirmed that North Korea must immediately suspend all activities related to its ballistic missile and nuclear programs in a complete, verifiable and irreversible manner. The UN Resolutions 1695 and 1718 were the strongest sanctions leveled against North Korea at that time. The Security Council penalties against North Korea are only growing more stringent with time; bilateral sanctions imposed by the United States and countries neighboring North Korea are also growing more extensive and harsh.

On September 3, 2017, the North Korean regime successfully conducted its sixth underground nuclear test. Following the nuclear test, the UN Security Council (UNSC) announced that it would enact the strongest sanctions against North Korea to date – Resolution 2375 (September 11, 2017). On September 15, 2017, the regime successfully launched another long-range missile. Six days later, President Trump issued Executive Order 13810, following enactment of the Countering America's Adversaries through Sanctions Act, which directed the imposition of additional sanctions in connection with Iran, Russia and North Korea.

The year 2017 presented North Korea with the strongest economic sanctions it ever faced. The United Nations Security Council followed up its two rounds of sanctions imposed on Pyongyang in 2016 with another three sets of sanctions in 2017. More than ever, the sanctions imposed by the UN Security Council in 2017 had clear objectives. The heightened control over imports and exports of individual items translated into stronger sanctions that would not only affect North Korea's foreign trade but impact its entire economy. The most prominent sanction is UNSCR 2371 (August 5, 2017). This resolution completely prohibited the procurement of anthracite coal, iron, iron ore, lead, lead ore and seafood from North Korea. Of particular note is that it froze the employment of additional North Korean nationals working overseas, to reinforce the restriction on foreign export earnings by the country. Further, it banned the opening of new joint ventures or the expansion of existing joint ventures with the regime. UNSCR 2375 (September 11, 2017), adopted in response to the sixth nuclear test conducted by Pyongyang, included even harsher sanctions on North Korea's imports and exports. The resolution limited North Korea's imports of crude oil and refined petroleum to 500,000 barrels during the fourth quarter of 2017, then restricted the supply of refined petroleum for 2018 to 2 million barrels, which accounts for 55 percent of the current supply, and capped the volume to 4 million barrels for crude oil, which equals current levels. All supply or transfer of natural gas liquids and condensates to North Korea were also banned completely. The resolution proceeded to ban the regime's exports of textiles such as fabrics and clothes, ended future work authorizations for North Korea's overseas laborers, and forbid the renewal of visas for those nationals already employed in other countries. Not only were new joint ventures with North Korean entities or individuals prohibited, but any such existing joint ventures were to be closed within 120 days of the adoption of the resolution. Stronger sanctions on cargo transfer took shape in the prohibition of North Korean vessels shipping cargo on the high seas.(Jeong, 2018)

UNSCR 2397 (December 22, 2017) was adopted in response to North Korea's launch of an intercontinental ballistic missile (ICBM) on November 29, 2017. The resolution called for the repatriation of all North Korean nationals earning income abroad to North Korea within 24 months of the adoption of the resolution. Crude oil transferred to North Korea was subject to a ceiling of 4 million barrels per year, provided it was used exclusively for the livelihood purposes of North Korean nationals; petroleum products were also capped at 500,000 barrels a year, on the condition they were only for livelihood purposes and that the member state involved notified the UN Security Council Sanctions Committee of such export every 30 days. Further, Resolution 2397 completely banned imports of food and agricultural products (HS codes 07, 08, 12), machinery (HS code 84), electrical equipment (HS code 85), earth and stone including magnesite and magnesia (HS code 25), wood (HS code 44), and vessels (HS code 89) from North Korea.

In line with the sanctions by the UN Security Council, the United States also stepped up its bilateral sanctions against North Korea. In August 2017, as part of a comprehensive Act prescribing sanctions against Iran, Russia, and North Korea, the United States enacted the Korean Interdiction and Modernization of Sanctions Act; the Treasury Department's extended list of entities subject to sanctions only made the measures more effective. A presidential executive order was also introduced, issuing sanctions against companies or individuals of third countries trading with North Korea.

Yet, questions have constantly been raised over the effectiveness of the UN resolutions and sanctions. North Korea has been strongly resisting UN sanctions; this resistance leads to a cycle of UN sanctions followed by strong repercussions by North Korea. Do UN sanctions have any impact on the North Korean economy? Were the UN sanctions not strong enough to penalize North Korea's threats at all?

Up until 2016, the sanctions against North Korea only reinforced China's leverage over the country; thus, the sanctions were not having much impact without China joining the international community in its goal of putting North Korea in a tighter spot. Statistics show that as of now, China was a faithful participant when it came to sanctions imposed against North Korea in 2017. North Korea's exports to China recorded USD 1.65 billion in 2017, which is down 37.3 percent from the USD 2.63 billion in 2016. (Appendix-1) The top six items account for approximately 85 percent of North Korea's exports to China. It is clear that the top five banned items exported to China from North Korea suffered a sharp downturn in 2017 (Appendix-2). However, North Korea's imports from China in 2017 recorded USD 3.33 billion, recovering the average of the past five years and the impact of sanctions on North Korea's imports from China do not appear to be statistically significant (Appendix-3).

Upon this backdrop, this paper aims to analyze the economic impacts of UN sanctions on North Korea's imports, especially focusing on banned luxury goods imports from 2004 to 2017, by investigating bilateral trade flows of North Korea with its trade partners. The analysis is based on applying difference-in-differences methods to the gravity model, which is widely used to evaluate the effect of policy change on trade flow.² This paper also examines North Korea's imports in 2017 with a focus on trade between North Korea and China, comparing statistics from recent years. And finally, we will derive some conclusions from the analysis.

² As of now, we cannot conduct research on the effectiveness of the UN Resolution 2375 against North Korea, since we need North Korea's trade data for 2017 and 2018.

2. Literature Review

Compared to studies on other regions, there is a limited selection of empirical literature regarding North Korea's economy, especially on the effects of sanctions on North Korea. This is mostly due to the lack of data and materials related to North Korea in general and severe deficiencies in available data for North Korea's economy. However, compared to other studies on North Korea, studies on the pattern of bilateral trade flows of North Korea are conducted much more frequently. This is because trade occurs in both parties and even if the exporting country does not report the data, the importing country does. Thus, even if there is no foreign trade data from the subject country, it is still possible to understand the general pattern of the trade by looking at the trade partner's data. Currently, Korea Trade-Investment Promotion Agency (KOTRA), International Monetary Fund (IMF), and United Nations (UN) provide statistical references on North Korean trade. These agencies gather data on North Korean trade by using mirror statistics. However, since statistical data from KOTRA and the IMF do not provide detailed trade data on each product type, the UN data is the only figure that can be used to perform our analysis according to product type.³

Based on the aforesaid data, South Korean scholars have been actively conducting research on North Korea's international trade. Earlier studies on North Korea's trade or the impacts of economic sanctions against North Korea were conducted by KOTRA, Lim (1998), Lee (2004), Kim (2007), Kim (2007), Ko (2008) and Jeong and Bang (2011). Although the research of these authors focused on North Korea's trade with different aspects and methodology, two papers are relevant to our analysis, namely a report conducted by Kim (2007) and a working paper conducted by Jeong and Bang (2009, 2011).

Kim (2007) performed a qualitative analysis to ascertain the validity of sanctions on North Korea. Economic sanctions are classified into three groups: trade, financial, and others (sanctions on service transactions such as communication and transportation). Factors that influence the validity of sanctions are also classified into three groups: economic, behavioral, and attributable factors. Kim evaluates the validity of sanctions against North Korea through major economic indicators such as North Korea's GDP and trade. Despite the continuous sanctions against North Korea, the size of its economy has been growing since 1998. The steady growth is interesting considering North Korea's dependency on international trade is at a minimal level. The study, however, does not explain what kind of impact the sanctions had on North Korea's trade. Kim (2011) conducted another analysis of the impact of UN economic sanctions on North Korea using the exactly same methodology applied by Jeong and Bang in 2009. However, his research focused on the year 2009, in which the world trade volume drastically fell due to the global financial crisis at that time. Thus, the year 2009 is not an appropriate year to analyze the effectiveness of economic sanctions against North Korea.

Additionally, aforementioned Jeong and Bang (2011) attempted to analyze the effectiveness of the international community's sanctions on North Korea. The weakness of this paper was that it focused on North Korea's overall trade flows rather than concentrating on prohibited luxury goods. Congruent

³ International organizations (IMF, UNCTAD, etc.) only release North Korea's annual trade data. When considering the objectives of the study, using monthly or quarterly data is more appropriate. However, due to the limitation of data, annual data is used in this study.

with most analysts, this report also insisted that the UN sanctions on North Korea are ineffective for penalizing North Korea economically. However, the argument of this report is inaccurate due to the aforesaid reason of focusing solely on overall trade flows.

Studies by international researchers are usually written from the perspective of international political science. Gartzke and Boehmer (2001), Chang, Haggard and Noland (2006), Ruediger Frank (2006), and Chesnut (2007) are researchers of note in this area. Outside of these studies, there are very few reports related to the topic. Haggard and Noland (2008) provide an effort to reconstruct North Korea's foreign economic relations from the political economy perspective, while Hughes (2006) provides insights of Japanese sanctions towards North Korea from an international political science perspective. The paper by Haggard and Noland (2008), which is relevant to our study, forecasted the future possibility of expanded regional economic cooperation by analyzing North Korea's major trading partners. Another relevant paper to our study is a paper published by Noland (2009).

Noland attempts to pinpoint empirical evidence on North Korean trade with China and South Korea both before and after the UN sanctions in 2006. He insists, through a visual inspection of data and time-series models, that UN sanctions have not had any effect on North Korea's trade with its two principal partners. Although his study is in-depth and he ambitiously tries to empirically analyze the impact of UN sanctions on North Korean trade, there are some areas for improvement. First, even though he attempted to show the trends of Chinese luxury goods exports to North Korea based on HS code and SITC, his empirical analysis does not focus on banned luxury goods, which is the main object of UN sanctions. What he conducted in the research is a time-series analysis with the monthly import and export data between China and North Korea, and South and North Korea. Thus, the real impact of the UN sanctions, with a focus on prohibited luxury goods, cannot be estimated in his research. Moreover, Noland did not show a strong correlation between Chinese luxury goods exports and China's overall exports to North Korea. In other words, the high share of China's exports in overall trade is not necessarily indicative of an increase of China's luxury goods exports to North Korea.⁴ Second, in the same vein, the impact of the sanctions must be analyzed under the consideration of all potential trade partners, even though China and South Korea are North Korea's major primary trading partners. This is due to the fact that, from the North Korean point of view, they can import prohibited luxury goods through many other countries.

There is also a report on the assessments of UN Resolution 1874 that was passed in 2009, published by the U.S. Congressional Research Service.⁵ This report focused on four key areas of sanctions enforcement: the ban on financial transactions related to North Korea's trade in WMD and WMD technology; search of sea-borne traffic; inspecting North Korea's air cargo; and the ban on financial support for trade with North Korea, except for humanitarian goods. Even though this report provides a good representation of the aforesaid sanction's implications, it did not prove what the impact of UN Resolution 1874 was on North Korea. This report also insisted that the economic effect of Resolution 1874 is not likely to be great unless China cooperates extensively.

⁴ North Korea's luxury goods imports accounted for only about 5.3% of North Korea's total imports in 2007. For more details, please refer to Appendix 8.

⁵ The U.S. CRS report is not relevant to our study, because the object of the analysis is UN resolution 1874, which passed in 2009. The object of our study is the effectiveness of UN resolution 1695 and 1718 which passed in 2006 after North Korea's first nuclear test.

3. Methodology and Data

3.1. The Model Specification

In this section, we conduct an empirical analysis to evaluate the impact of sanctions on North Korea's banned luxury goods imports.⁶ Unlike the previous studies, this paper focuses on the North Korea's prohibited luxury goods imports rather than North Korea's overall trade flows. The 'Difference-in-Differences' methodology, which compares figures before and after the policy changes occur, was used to measure the effect of a treatment induced by the imposition of economic sanctions.⁷ This technique is widely used to measure the spillover effect induced by policy changes, and we also used this technique for this purpose of analysis. The equation for Difference-in-Differences estimation technique takes the following form:

$$Y_i = \gamma_0 + \gamma_1 T_i + \gamma_2 t_i + \gamma_3 (T_i \cdot t_i) + \eta X_i + \epsilon_i \quad (1)$$

where γ_1 = the specific effect of the treatment group; γ_2 = common time trend of the control and treatment group; γ_3 = effect of the treatment group; η = effect of each of the variables, which influences dependent variable Y_i .

Since sanctions against North Korea have been in place for a long time, it is difficult to see the "effect" of economic sanctions at a specific point in time. Thus, in order to examine the effect of sanctions on North Korea's luxury goods imports, it is proper to use Resolution 1695 and 1718, following North Korea's first nuclear test in 2006, as reference points. In 2006, Resolutions 1695 and 1718 were considered to be the toughest sanctions hitherto seen against North Korea (Hong 2009). For the purpose of this analysis, we use the year 2006 as the turning point of international policy change. The recent sanctions on North Korea in 2009 could also be used as a turning point of policy change, but we decided not to choose this time because the world economy in 2009 was in deep recession. Thus international trade in 2009 had fallen in almost every country, a situation that makes it difficult to conduct precise analyses on the effectiveness of UN sanctions against North Korea.

UN sanctions in 2006 were implemented as follows: Resolution 1695 authorized UN member states to inspect North Korea in accordance with international authority and legislation. The resolution, which is consistent with international law, banned all UN member states from selling materials,

⁶ This is a different point from my previous study. Since North Korea's luxury goods imports account for 5-9 % of North Korea's total imports (please refer to Appendix 14), there is a high probability that the result of this analysis would be biased if we would conduct this analysis based on North Korea's overall goods imports.

⁷ References of Difference-in-Differences estimates and reliability of the estimation are from John Mullahy (1999), Marianne Bertrand, Esther Duflo, and Sendhil Mullainathan (2003).

technology, or financial resources that could be used in any WMD program in North Korea. Furthermore, Resolution 1718, which was adopted on October 14, 2006, banned all UN member states from conducting a transfer or sale of missiles, battle tanks, and nuclear-related products and technology. It prohibited not only member states from exporting luxury goods but also authorized member states to inspect all cargo to and from North Korea.⁸ Even though the UN Security Council encouraged the member states to implement the aforesaid sanctions, the council unfortunately failed to provide a detailed list of banned goods. It implied that UN member states should submit their own implementation plan, which would include a list of banned goods. More to the point, UN member states hold no obligation for creating a comprehensive list of banned goods. Therefore, fewer than half of member states have submitted national implementation reports as required by the resolutions and fewer still include a list of luxury goods (UN Security Council 2012, p. 20). As of March 2012, 93 member states have submitted their implantation reports. This is just 48% of the United Nations membership (UN Security Council 2012, p. 21).⁹ Because of the aforesaid reasons there is no identical list of sanction goods. In our research we use the list of banned goods which is classified with HS code by a research paper published by the U.S. Congressional Research Service.¹⁰ This is the most comprehensive list of banned goods available. Our paper attempts to examine the effects of economic sanctions on North Korea's imports with regard to the banned goods following the sanctions enacted by the UN Security Council in 2006. For the purpose of further analysis, we make the following assumptions:

Assumption 1. The trade pattern of North Korea has similar characteristics with the gravity model, which contains the features of “regular” trade.

Assumption 2. The UN sanctions against North Korea impact North Korea's imports of banned goods.

Assumption 3. North Korea's trade under sanctions may have been influenced more by the sanction implementation plan of submitted states, rather than of non-submitted states.

First, we have to set up a control and treatment group in order to utilize the Difference-in-Differences method. To perform a more sophisticated analysis, we have classified North Korea's previous trading partners into two types: states that have submitted their sanction implementation plan to the UN Security Council and those that have not submitted their plan. We assume here that plan submitted states participate more actively in the sanctions on North Korea when compared to non-submitted states, even if the latter expresses political support for the resolution and willingness to implement plans. When relying on the aforesaid assumptions, the control group comprises of

⁸ UN Security Council (2006) SC/8853, available at: <https://www.un.org/press/en/2006/sc8853.doc.htm>, accessed 19 September 2018.

⁹ As of 19 September 2018, 65 Member States have submitted reports on the implementation of resolution 2397 (2017), (33.6%). 82 Member States have submitted reports on the implementation of resolution 2375 (2017), (42.4%). This is the percentage of the United Nations 83 Member States have submitted reports on the implementation of resolution 2371 (2017), (43.0%) membership. The total number of UN member states is 193 (<http://www.un.org/en/sections/member-states/growth-United-Nations-Membership-1945-present/index.html>)

¹⁰ For more details, please refer to Appendix 6 (Luxury Items listed by Major Countries).

non-submitted states, while the treatment group comprises of sanction plan submitted states. As part of a proxy variable, we use this submitting propensity of member states. In other words, we can classify member states into countries in favor of the resolutions and those that are not likely to implement them. We believe that it is the most unbiased method for performing this analysis with the available statistical data. We also defined time dummies to examine the effect of sanctions on North Korea's nuclear test. We defined 2004 and 2005 as the time period before the UN sanction and the years 2006 and 2007 as the time in which effects were shown after the UN sanction.

In equation (1) above, Y_i represents imports of luxury goods of North Korea's trading partners; X_i represents variables used in the gravity model, including the distance between North Korea and its trading partners; trading partner's GDP; and dummy variable for landlockedness of trading partner's country. The resulting equation (1) takes the following form:

$$Y_{ijt} = \gamma_0 + \eta X_{ijt} + [\gamma_1 T_i + \gamma_2 t_i + \gamma_3 (T_i \cdot t_i)] + \epsilon_{ijt} \quad (2)$$

where X_{ijt} represents $Distance_{ij}$, GDP_{jt} , $Landlock_j$, $t = \text{year } 2004-2007$.

In the following equation (3), γ_3 explains the economic effects of UN sanctions on North Korea's trade, since $(E_{11} - E_{10}) - (E_{01} - E_{00}) = \gamma_3$:

$$E(E_{\text{submitted country}} | E_i = 1, \text{Post05}_t = 1) = [\gamma_0 + \gamma_1 + \gamma_2 + \gamma_3] \equiv E_{11} \quad (3)$$

$$E(E_{\text{submitted country}} | E_i = 1, \text{Post05}_t = 0) = [\gamma_0 + \gamma_1] \equiv E_{10}$$

$$E(E_{\text{submitted country}} | E_i = 0, \text{Post05}_t = 1) = [\gamma_0 + \gamma_2] \equiv E_{01}$$

$$E(E_{\text{submitted country}} | E_i = 0, \text{Post05}_t = 0) = [\gamma_0] \equiv E_{00}$$

In general, the gravity model is used to explain the normal bilateral trade pattern. The gravity model, in its basic form, predicts bilateral trade flows based on the economic size of two countries and the distance between them. Based on assumptions of the gravity model, the volume of trade between two countries is proportional to the countries' economic sizes and the inverse of the distance between them.

3.2. Data

This study presents a panel dataset of 71 importing countries. Appendix 4 provides detailed information on countries included in this analysis. Definitions and sources of variables used in equation (2) are presented in Appendix 5. It is almost impossible to obtain reliable trade data originating from North Korea. Thus, we built the bilateral trade data based on the UN COMTRADE database, World Bank and Korea Customs Service¹¹ to track the performance of North Korean trade with trading partners. For the classification of prohibited luxury goods we used the lists of luxury goods, which were submitted by UN member states and compiled with the HS code by the U.S. Congressional Research Service (Appendix 6). The dummy variable for landlocked countries comes from the CEPII database and the trading partner's GDP variable comes from the United Nations statistical database. Finally, the dummy variable for plan submitted or non-submitted states was obtained from the UN Security Council. Based on the assumptions of the gravity model we expect that trade flows between two countries are correlated positively with the GDP and negatively with the distance between them.

The time dummy, which categorizes the effect of UN sanctions on North Korea, and the resolution implementation plan dummy are expected to have a negative sign due to the sanction by the UN member states. This assumes North Korea's trade decreases more following the resolution declaration and the relevant decrease in trade depends more on implementation plan submitted states than non-submitted states. Consequently, the D-in-D variable, which represents interaction between the time dummy and resolution implementation plan dummy, is expected to have a negative sign.

Cross-regional regression in simple Ordinary Least Squares (OLS) does not take account of unobserved country-specific factors, so it leads to biased and inconsistent estimates. Thus, in this study, using a random effect panel data model, which is evaluated by the Generalized Least Squares (GLS) model, allows us to capture unobserved country-specific effects and the unobservable differences between countries. In other words, we assume that the country-specific constant terms are randomly distributed.¹² Basic statistics of the analysis are given in Appendix 7.

3.3. Estimation Results

Appendix 8 and Appendix 9 list the impacts of UN sanctions on North Korea's imports of luxury goods based on equation (2). Data from Appendix 8 shows that North Korea's import patterns are similar to that of normal countries. Pooled OLS and random effect in Appendix 8 support that the estimated result is statistically significant. In other words, North Korea's volume of imports is proportional to sizes of economies while inversely proportional to distance between the countries as the gravity model suggests. This means that there were many imports from geographically close

¹¹ Korea Customs Service does not release the inter-Korean trade data, which is classified into HS code, to the public. The data was obtained for use in this study through the Ministry of Unification in Korea.

¹² To decide between fixed or random effects we run a Hausman Test. Random Effect is a more preferred estimation method than that of fixed effects. Hausman's test statistic (m) is as follows: $m = \hat{q}'\widehat{\text{Var}}(\hat{q})^{-1}\hat{q}$. Where $\hat{q} = (\hat{q}_F - \hat{q}_R)$, $\widehat{\text{Var}}(\hat{q}) = \text{Var}(\hat{q}_F) - \text{Var}(\hat{q}_R)$.

countries. A big portion of North Korea's import of banned goods from China highlights these characteristics of the gravity model.¹³

In the case of our assumption 2, which stated that UN sanctions against North Korea impact North Korea's imports of banned goods, we could not find any statistically significant results. Even though the UN sanction dummy in Appendix 8, which represents the impact of UN sanctions since 2006, shows negative signs in pooled OLS and random effect, this data is not statistically significant.

Assumption 3, which asserted that a decline in North Korea's imports depend more on implementation plan submitted states rather than non-submitted states, was not found in the results of the empirical analysis. As can be seen in Appendix 13, some countries like Japan drastically cut luxury goods exports to North Korea since the UN sanctions in 2006, but other countries like Brazil ramped up luxury goods exports. Singapore and Hong Kong's shares of luxury goods exports to North Korea remained stable. All these facts reflected by the estimates of the implementation dummy¹⁴ variable were statistically insignificant in pooled OLS and random effect, are shown in Appendix 8.

The estimation of the interaction effect of dummy variables A and B, which represents the Difference-in-Differences variable, is the key interest of this paper. Looking at the result of the estimation, pooled OLS and random effects have negative signs, but this result of estimation is statistically insignificant at the 0.05 confidence level. The same table shows that estimation of the Random effect is statistically significant at the 0.1 level. If we re-estimate the Random effects with the time dummy, which controls for unobserved time effects, the result of the interaction effect of dummy variables A and B is statistically significant at the 0.1 significance level.¹⁵ Since the North Korean trade data we used in this analysis were built from the mirror statistics based on North Korea's trade partner countries, it is rational to choose significance level of 0.05 in order to minimize the probability of Type I error. In sum, North Korea's imports of luxury goods were statistically insignificant, compared to the time prior to imposition of UN sanctions against North Korea. This suggests that there is a limit to stating, with certainty, that UN sanctions have had an effect on North Korea's imports. Also, we expected that there would be a larger decrease of imports from implementation plan submitted states compared to non-submitted states, but this assumption turned out to be statistically insignificant, thus it did not come as a surprise that we were unable to derive such characteristics. Overall, it is difficult to conclude that UN sanctions against North Korea were effective in curtailing North Korea's import of luxury goods.

4. Conclusion

In this study, we conducted an empirical analysis based on the Difference-in-Differences method combined with the gravity model in order to evaluate the impact of UN sanction on North Korea's

¹³ Please refer to Appendices 10, 11, 12 for information about the share of China's luxury goods export to North Korea.

¹⁴ As aforesaid, random effect is a more robust estimation method than that of pooled OLS. Panel data is used to observe the unobserved country-specific factors, but there is a limitation to observing them fully. Particularly in the model used in equation (2), even if the control variable is strictly exogenous, estimation using random or fixed effect in panel data will lead to biased estimation. In order to resolve such issues, we can rely on the dynamic panel model suggested by Arellano and Bond (1991). This study similarly carries the dynamic panel model by including the year (time) dummy variable into the random effect model.

¹⁵ Refer to Appendix 9. Impact of UN sanction on North Korea's imports (random effects, time dummy included)

imports of luxury goods. For the analysis of our model, we used the list of prohibited luxury goods based on the HS code, which was provided by the U.S. Congressional Research Service. Based on this list with HS code classification, we built the bilateral trade data by using the UN COMTRADE database, World Bank and Korea Customs Service to track the performance of North Korean trade with 71 trading partner countries.

The result of our empirical analysis indicates that UN Resolutions 1695 and 1718, drafted in response to North Korea's first nuclear test in 2006, turned out to be ineffective in decreasing North Korea's imports of luxury goods in any way. This supports the results of other researchers such as Noland (2009), who insisted that UN sanctions on North Korean imports had no significant impact. Even considering the effects of different objects through various analysis methods yields the same results.

The top ten export countries of luxury goods to North Korea can be found in Appendix 13. The data shows that North Korea's share of luxury goods imports from China increased from 30.9% in 2004 to 96.6% in 2017, while its imports from additional major trade partners Thailand, Japan and Germany decreased during the same period. North Korea's luxury goods imports dependence on China has been increasing consistently as well as other goods imports from China. However, unlike the sanction on North Korea's exports to China in 2017, sanctions on North Korea's luxury goods imports from China were not rigorously implemented. This is because the scope of banned import items is not as extensive as it is for exports. The top five commodity groups accounted for over 80 percent of North Korea's exports to China in 2017, while items prohibited from export to North Korea, such as luxury goods, only account for 8.9 percent of North Korea's total imports. Most of all, China did not make the ban on luxury goods items to North Korea public. Since China holds the key to whether the sanctions will be truly effective, due to its undeniable influence on North Korea's trade, if China continues to impose its sanctions against North Korea, based on the announcements made by China's Ministry of Commerce in 2017, and extends the list of luxury goods to North Korea, North Korea's imports from China in 2018 are expected to fall significantly compared to the previous year.

A salient point in Appendix 13 is that Brazil's share of luxury goods imports by North Korea has been increasing since the UN sanction on North Korea in 2006. Brazil was the second largest trade partner in North Korea's luxury goods imports in 2007. Countries like Germany and Canada were among the top ten luxury goods exporters to North Korea. This means, as our empirical study indicates as well, that nations that submitted plans for the implementation of sanctions did not rigorously implement the provisions of the resolutions. This was possible because there is no clearly defined list of prohibited luxury goods proposed by the UN Security Council. Since North Korea's imports of luxury goods is relatively small (304,410,386 US\$ in 2017, accounting for 8.9% share of overall imports) (Appendix 10), the coverage of the provisions of UN resolutions must be expanded in order to strengthen the impact of UN sanctions on North Korea. Considering the fact that even states who have submitted sanction implementation plans still trade luxury goods with North Korea, provisions enforcing transparency on sanctioning countries must be strengthened. Additionally, a clearly defined list of the prohibited luxury goods must be proposed by the UN Security Council.

Most importantly, sanctions alone may not be strong enough to change the behavior of the North Korean regime. Thus, the UN Security Council must come up with more intelligent sanction measures than it previously has and couple these improved sanctions with negotiations to positively alter North Korea's behavior. The wisest option we have at hand is to impose tough sanctions on North Korea, while at the same time offering carrots as incentives for nuclear dismantlement. The international community, including the United States, must put forward stringent sanctions strong enough to assure North Korea that giving in to the incentives will be much better than facing further economic sanctions or other forms of military pressure in the future. The key here is that the international community must present comprehensive incentives acceptable by North Korea. It is vital to convince North Korea that such incentives, offered by the international community and the United States, will be provided without fail.

What North Korea wants most is to improve its relations with the United States and engage in negotiations. As a key party concerned with the North Korean nuclear threat, the United States should enact a legal framework on incentives to be provided to North Korea, as in the Cooperative Threat Reduction Program based on the Nunn-Lugar Act¹⁶ to guarantee the predictability and transparency of compensation and to explicitly prescribe the content, period, scale and effect of assistance. The United States must also clarify the political, security and diplomatic rewards that would be provided if an agreement with North Korea is concluded, so as to avoid using sanctions for sanctions' sake. In political terms, the United States could offer to establish diplomatic ties with North Korea and build a peace regime; in economic terms, options could include humanitarian assistance to or investment in North Korea. However, most importantly, such political and economic rewards must be accompanied by extremely tough sanctions as enforcement mechanisms that will take immediate effect upon any violation of the denuclearization pledge by North Korea.

¹⁶ The Nunn-Lugar Act was initiated in the early 1990s by US Senators Sam Nunn and Richard Lugar. Through the Cooperative Threat Reduction Program based on this Act, the US outlined its commitments to support funds, technology, equipment and labor to assist the dismantling of weapons of mass destruction from the Former Soviet Union, inherited by Russia, Ukraine and Uzbekistan, etc.

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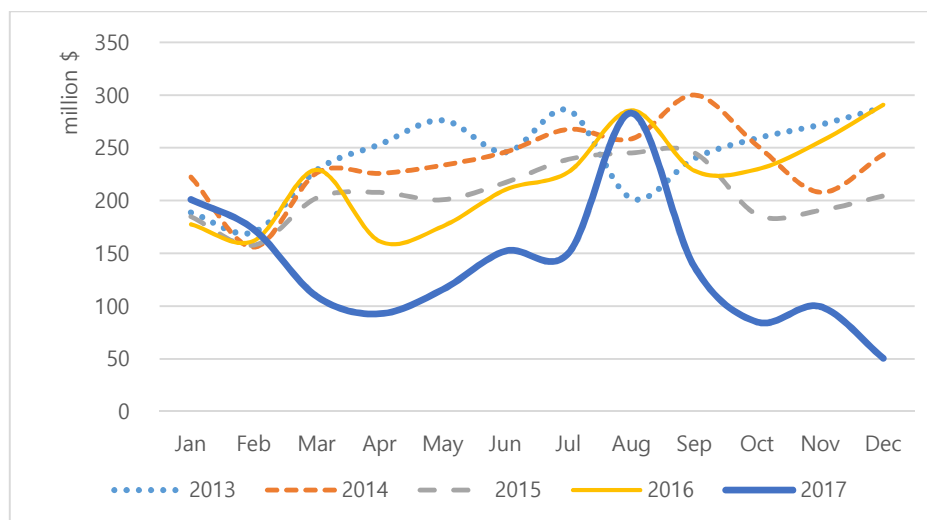
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Appendix 1. North Korea's monthly exports to China



Source: Based on KITA statistics.

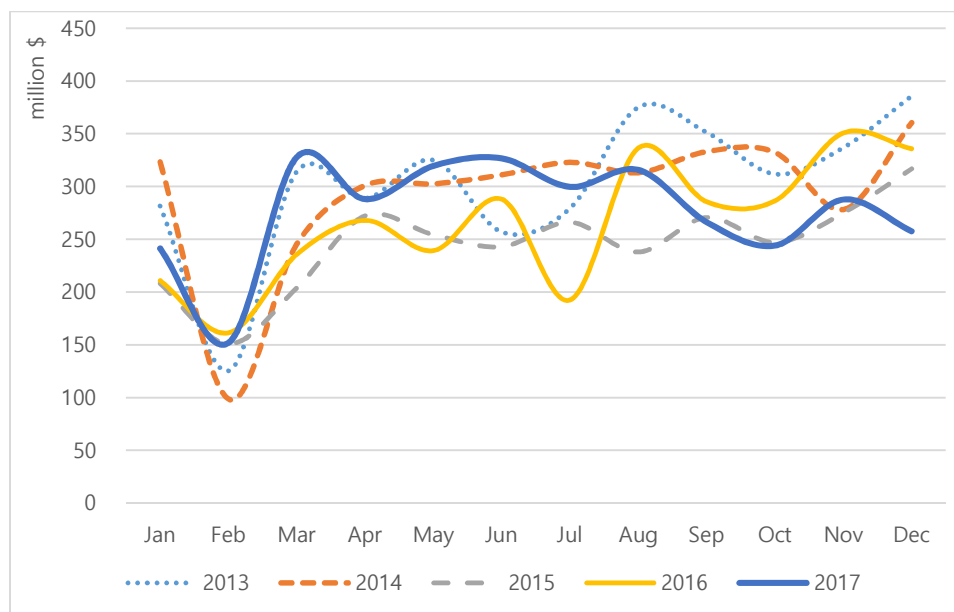
Appendix 2. Performance of North Korea's key export items to China (HS-2)

(Unit: USD thousand, %)

	Classification		2014		2015		2016		2017	
	Item	HS	Export volume	Increase Rate	Export volume	Increase Rate	Export volume	Increase Rate	Export volume	Increase Rate
1	Articles of apparel and clothing accessories (not knitted or crocheted)	62	622,034	24.6	633,206	1.8	611,500	-3.4	496,741	-18.8
2	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes	27	1,146,386	-17.5	1,057,042	-7.8	1,187,115	12.3	412,722	-65.2
3	Ores, slag and ash	26	339,349	-18.3	204,662	-39.7	225,351	10.1	187,493	-16.8
4	Fish and crustaceans, molluscs and other aquatic invertebrates	3	143,257	25.9	108,476	-24.3	190,094	75.2	162,822	-14.3
5	Edible fruit and nuts; peel of citrus fruits or melons	8	111,277	243.3	43,033	-61.3	50,833	18.1	78,893	55.2
6	Articles of apparel and clothing accessories (knitted or crocheted)	61	118,985	35.4	166,097	39.6	111,872	-32.6	65,254	-41.7
Total exports			2,841,476	-2.4	2,483,944	-12.6	2,634,400	6.1	1,650,670	-37.3

Source: Based on KITA statistics.

Appendix 3. North Korea's monthly imports from China



Source: Based on KITA statistics.

Appendix 4. Countries used in the analysis

Austria, Bahrain, Belgium, Brazil, Brunei Darussalam, Bulgaria, Burundi, Cambodia, Canada, Chile, China, Hong Kong, Macao, Colombia, Croatia, Czech Republic, Denmark, Dominica, Ecuador, Estonia, Finland, France, Georgia, Germany, Guatemala, Hungary, India, Indonesia, Ireland, Italy, Jamaica, Japan, Kyrgyzstan, Lebanon, Madagascar, Malaysia, Mali, Mauritius, Mexico, Mongolia, Netherlands, Pakistan, Peru, Poland, Rep. of Korea, Russian Federation, Rwanda, Saudi Arabia, Senegal, Seychelles, Singapore, Slovakia, Slovenia, South Africa, Spain, Sri Lanka, Suriname, Sweden, Switzerland, Tanzania, TFYR of Macedonia, Thailand, Tunisia, Turkey, Uganda, Ukraine, United Kingdom, Uruguay, Vietnam, Yemen, Zimbabwe

* Asian countries including Myanmar, Laos, and Taiwan were omitted due to lack of trade data with North Korea.

Appendix 5. Variable identification

Variables	Definition	Sources
Trade	Imports of luxury goods of country i and country j	UN COMTRADE, World Bank (Inter Korean trade data from the Ministry of National Unification)
Distance	Distance between country i and country j	CEPII database
GDP	GDP of country j	World Bank, World Development Indicators
Landlockedness Dummy	Landlockedness of Countries	CEPII database
Implementation Dummy	Sanction implementation plan submitted states (or Non-submitted States)	UN Security Council

Appendix 6. Luxury items listed by major countries

HS Number	Description
Luxury Items Listed by the United States	
24	Tobacco
2203-2208	Alcoholic Beverages
33	Perfumery, Cosmetic Products
42	Leather Art; Saddlery, Etc
5007	Woven Fabrics Of Silk Or Silk Waste
621410	Shawls, Scarves Etc Of Silk Or Silk Waste Not Knit
4303	Articles Of Apparel Etc. Of Furskin
4304	Artificial Fur And Articles Thereof
8703	Motor Cars & Vehicles For Transporting Persons
870710	Bodies F Mtr Car/Vehicles For transporting Persons
871110	Motocycles (Incl Mopeds), Pist. Eng. Cyl, Not, Exc 50Cc
871120	Motorcycles (Including Mopeds), Cycl, Exc50Cc, Nt250C
871190	Motorcycles (Including Mopeds),Nesoi, Side Cars
890310	Inflatable Yachts, Vessels, For Plesure, Sports
890399	Yachts Etc For Pleas, Sport, Nesoi; Row Bts, Canoes
57	Textile Floor Coverigns
71	Precious Stones
8528	Tv Recvrs, Incl Video Monitors & Projectors
8521	Video Recrdng/Reproduc Appar Wheth/Nt Video Tuner
8522	Parts And Accessories For Items 8519 To 8521
847130	Portable Digtl Automatic Data Process Mach Not > 10 Kg
91	Clocks and Watches
97	Art and Antiques
92	Musical Instruments
6911	Ceramic Tableware Etc. Of Porcelain Or China
6912	Ceramic Tablewre, Kitchnwre Etc, Earthenware Etc
9506	Artls & Equip F Genrl Physcl Exerc Etc; Pools; Pts
701321	Drinking Glasses Other Than Glass-Ceramics, Of Lead Crystal
701331	Table/Kitchenware (Exc Drinking Glasses) O/T Glass-Ceramics, Of Lead Crystal
701333	Other Drinking Glasses, O/T Of Glass-Ceramics, Of Lead Crystal
701341	Table/Kitchenware, Excl Drinking Glasses, O/T Glass-Ceramics, Of Lead Crystal
701391	Glassware, Nes Of Lead Crystal, Other Than That Of 70.10 Or 70.18
960839	Fountain Pens, Stylograph Pens And Other Pens, O/T Indian Ink Drawing Pens
Additional Luxury Goods Listed by the European Union, Australia, Canada, and Japan	
9006	Photographic Cameras; Photographic Flash Light App O/T Discharge Lamps Of 85.39
9007	Cinematographic Cameras & Projectors, W/N Incorp Sound Record Or Reprdc App
8471	Computers no portables less 847130
160250	Prepared Or Preserved Bovine Meat Etc. Nesoi
1604	Prep Or Pres Fish; Caviar & Caviar substitutes
1605	Crustaceans, Molluscs Etc. Prepared Or Preserved

Source: Nikitin, M.B., Manyin, M.E. and Chanlett-Avery, E., 2009. "North Korea's Second Nuclear Test: Implications of U.N. Security Council." Congressional Research Service.

Appendix 7. Basic statistics of the analysis

Variable	Avg.	Std.	Min.	Max.
Import (log)	11.31	3.30	2.94	18.51
Distance (log)	9.06	0.62	5.29	9.88
GDP(log)	24.28	2.23	1849	29.17
Landlockedness Dummy	0.19	0.39	0	1
UN Sanctions Dummy	0.48	0.50	0	1
Implementation Dummy	0.32	0.47	0	1

Appendix 8. Impact of UN sanctions on North Korea's imports of luxury goods

Variables		Pooled OLS			Random Effects		
		(1)	(2)	(3)	(1)	(2)	(3)
Basic Control Variables	Distance (log)	-1.178*** (0.158)	-1,176*** (0.159)	-1.183*** (0.158)	-1.084*** (0.263)	-1.094*** (0.261)	-1.095*** (0.263)
	GDP(log)	0.922*** (0.082)	0.799*** (0.118)	0.934*** (0.091)	0.877*** (0.114)	0.737*** (0.157)	0.917*** (0.118)
	Landlockedness dummy	0.455 (0.451)	0.295 (0.453)	0.668 (0.458)	0.668 (0.651)	0.464 (0.644)	0.790 (0.666)
Control Variables	UN sanctions dummy (A)	-0.250 (0.359)			-0.330 (0.254)		
	Implementation Dummy (B)		0.741 (0.497)			0.745 (0.704)	
	A*B (interaction)			-0.220 (0.482)			-0.604* (0.361)
Constant		-1.985 (2.830)	0.669 (3.450)	-2.296 (2.983)	-1.685 (4.111)	1.480 (4.880)	-2.638 (4.217)
Observation		187	187	187	187	187	187
R-squared		0.451	0.458	0.450	0.460	0.472	0.456

Note: 1) The numbers in parentheses are robust standard errors.

2) *** p<0.01, ** p<0.05, * p<0.1

**Appendix 9. Impact of UN sanctions on North Korea's imports of luxury goods
(Random Effects, Time Dummy included)**

Variables	(1)	(2)	(3)
Distance (log)	-1.078*** (0.263)	-1.069*** (0.262)	-1.090*** (0.262)
GDP(log)	0.882*** (0.116)	0.788*** (0.162)	0.924*** (0.120)
Landlockedness Dummy	0.654 (0.653)	0.505 (0.647)	0.785 (0.676)
UN Sanctions Dummy (A)	-0.520* (0.284)		
Implementation Dummy (B)		-0.627 (0.722)	
A*B (interaction)			-0.885* (0.487)
Constant	-1.800 (4.131)	0.227 (4.952)	-2.805 (4.258)
Observation	187	187	187
R-squared	0.460	0.467	0.471

Appendix 10. North Korea's luxury goods imports from 2004 to 2017

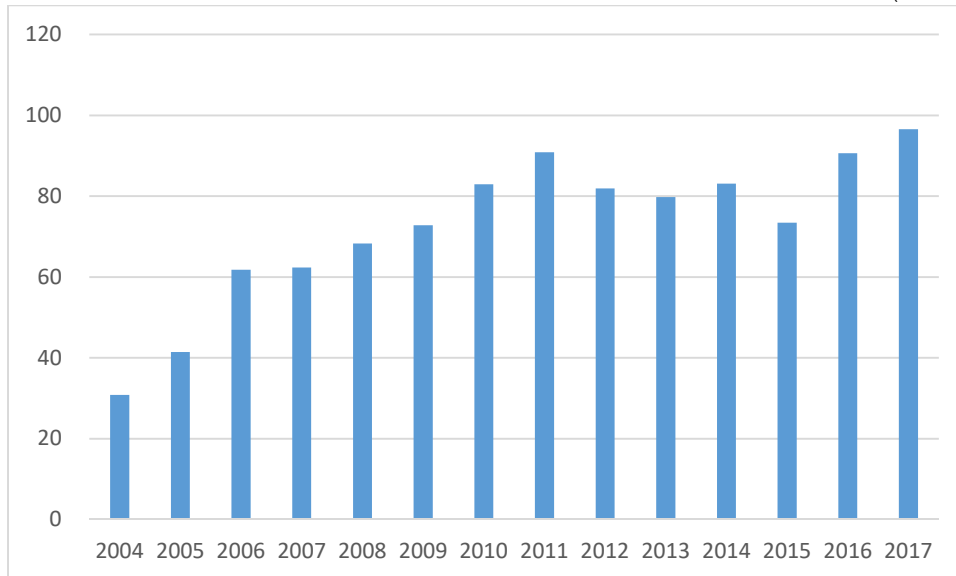
(Unit: USD)

year	2004	2005	2006	2007	2008	2009	2010
total import (UNComtrade)	155,225,565	150,068,860	134,938,700	175,958,051	238,667,021	214,328,557	196,763,794
China (China Customs)				109,904,650	163,030,412	156,179,028	163,263,628
China (UNComtrade)	47,887,170	62,204,001	83,362,337	109,816,862	162,976,607	156,170,982	163,244,972
China, Hong Kong SAR (UNComtrade)	3,456,031	1,632,745	1,418,096	1,971,096	2,111,183	1,633,341	2,910,434
China & Hong Kong (UNComTrade)	51,343,201	63,836,746	84,780,433	111,787,958	165,087,790	157,804,323	166,155,406
year	2011	2012	2013	2014	2015	2016	2017
total import (UNComtrade)	151,642,856	253,165,730	291,081,519	329,161,511	289,845,509	237,641,761	304,410,386
China (China Customs)	137,738,623	199,024,941	229,598,080	270,931,923	210,125,896	211,248,980	257,641,307
China (UNComtrade)	137,845,177	207,464,960	232,244,922	273,665,935	212,880,099	215,442,830	294,146,230
China, Hong Kong SAR (UNComtrade)	2,810,542	7,561,813	7,134,507	5,047,250	3,099,815	3,711,273	2,812,564
China & Hong Kong (UNComTrade)	140,655,719	215,026,773	239,379,429	278,713,185	215,979,914	219,154,103	296,958,794

Source: UN COMTRAD database, China Customs Statistics

Appendix 11. Share of North Korea's luxury goods imports from China

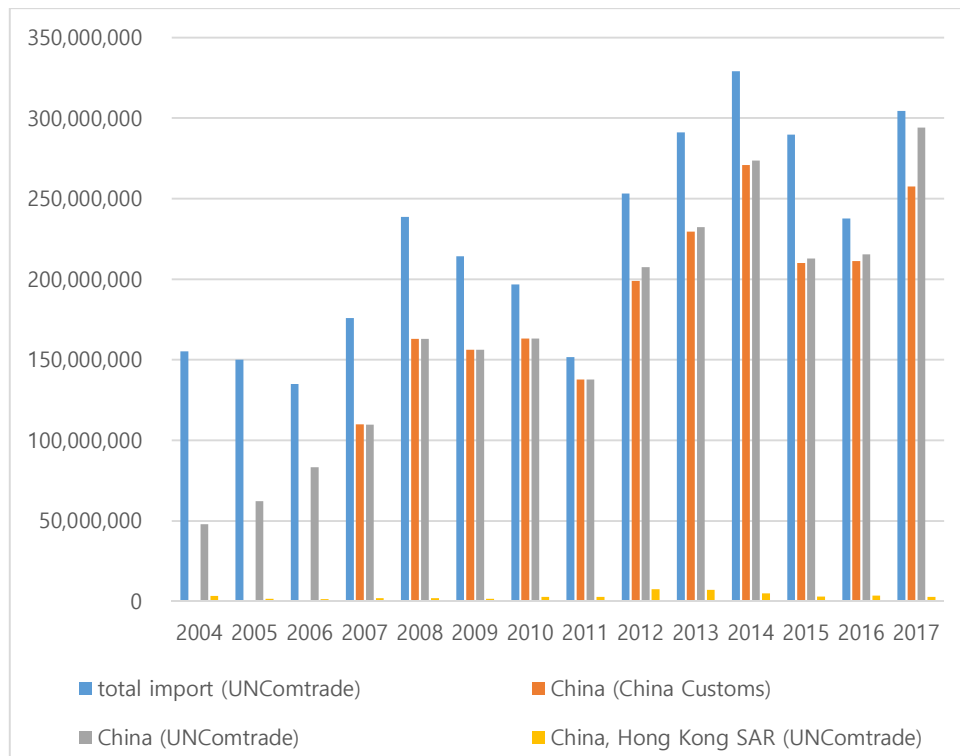
(Unit: %)



Source: UN COMTRAD database

Appendix 12. North Korea's luxury goods imports

(Unit: USD)



Source: UN COMTRAD database, China Customs Statistics

Appendix 13. Top ten export countries of luxury goods to North Korea

Unit: USD

year	country	value	year	Country	value
2017	China	294,146,230	2010	China	163,244,972
2017	China, Hong Kong SAR	2,812,564	2010	Singapore	16,595,955
2017	Russian Federation	2,382,797	2010	Brazil	3,697,153
2017	India	1,948,743	2010	China, Hong Kong SAR	2,910,434
2017	South Africa	1,286,253	2010	Malawi	2,170,015
2017	Bulgaria	572,402	2010	Canada	1,735,252
2017	Brazil	564,656	2010	United Rep. of Tanzania	1,656,547
2017	Germany	308,144	2010	India	1,111,897
2017	Italy	182,885	2010	Italy	636,610
2017	Denmark	42,260	2010	Other Asia, nes	602,897
2016	China	215,442,830	2009	China	156,170,982
2016	South Africa	4,277,883	2009	Brazil	36,247,672
2016	Philippines	3,847,579	2009	Singapore	8,306,459
2016	China, Hong Kong SAR	3,711,273	2009	Russian Federation	4,459,518
2016	India	1,847,120	2009	China, Hong Kong SAR	1,633,341
2016	Mongolia	1,708,444	2009	Germany	1,308,000
2016	Russian Federation	1,402,276	2009	India	1,121,432
2016	Singapore	1,179,761	2009	Malawi	1,065,134
2016	Cambodia	566,111	2009	Thailand	572,061
2016	United Arab Emirates	563,367	2009	Canada	519,979
2015	China	212,880,099	2008	China	162,976,607
2015	India	50,898,669	2008	Brazil	46,331,754
2015	Singapore	13,107,332	2008	Singapore	7,980,820
2015	Philippines	4,644,785	2008	Russian Federation	5,629,991
2015	China, Hong Kong SAR	3,099,815	2008	South Africa	4,656,613
2015	Germany	991,032	2008	China, Hong Kong SAR	2,111,183
2015	Bulgaria	966,030	2008	Thailand	1,537,597
2015	Thailand	819,418	2008	Germany	1,451,000
2015	Cambodia	375,392	2008	Netherlands	1,142,023
2015	Greece	369,628	2008	Mozambique	1,121,703
2014	China	273,665,935	2007	China	109,816,862
2014	Singapore	27,870,042	2007	Brazil	42,218,603
2014	Zambia	5,125,550	2007	Thailand	6,153,041
2014	China, Hong Kong SAR	5,047,250	2007	Singapore	4,371,068
2014	India	4,179,228	2007	Germany	2,726,000

2014	Malawi	3,708,964	2007	China, Hong Kong SAR	1,971,096
2014	Philippines	2,164,304	2007	Mexico	1,826,386
2014	Germany	1,004,712	2007	Viet Nam	1,476,827
2014	Thailand	949,643	2007	India	950,988
2014	Turkey	911,500	2007	South Africa	807,730
2013	China	232,244,922	2007	Canada	689,922
2013	Singapore	30,247,937	2006	China	83,362,337
2013	China, Hong Kong SAR	7,134,507	2006	Thailand	15,448,656
2013	Brazil	4,545,897	2006	Singapore	8,471,394
2013	Philippines	2,602,355	2006	Japan	7,061,522
2013	Saudi Arabia	2,286,136	2006	Germany	6,758,000
2013	Cameroon	2,223,534	2006	Mexico	3,848,268
2013	India	1,746,292	2006	India	1,829,430
2013	Malawi	1,497,617	2006	Italy	1,499,087
2013	Turkey	1,416,500	2006	China, Hong Kong SAR	1,418,096
2013	Germany	1,016,210	2006	Saudi Arabia	728,171
2012	China	207,464,960	2005	China	62,204,001
2012	Singapore	25,949,942	2005	Thailand	30,188,438
2012	China, Hong Kong SAR	7,561,813	2005	Singapore	22,867,229
2012	Malawi	2,461,159	2005	Japan	9,288,266
2012	Uganda	2,006,949	2005	Germany	8,577,000
2012	United Rep. of Tanzania	1,593,816	2005	Mexico	3,213,065
2012	India	1,129,397	2005	Saudi Arabia	2,131,017
2012	Germany	1,025,295	2005	Finland	2,012,583
2012	Mozambique	969,126	2005	India	1,732,695
2012	Italy	558,273	2005	China, Hong Kong SAR	1,632,745
2011	China	137,845,177	2004	China	47,887,170
2011	Russian Federation	2,966,802	2004	Thailand	42,564,895
2011	China, Hong Kong SAR	2,810,542	2004	Singapore	17,655,390
2011	India	2,071,468	2004	Japan	15,148,222
2011	Germany	1,367,942	2004	Germany	12,025,000
2011	Italy	1,292,808	2004	India	5,672,763
2011	Thailand	782,371	2004	Mexico	4,034,986
2011	Uganda	374,177	2004	China, Hong Kong SAR	3,456,031
2011	Canada	372,943	2004	Italy	1,674,514
2011	Chile	350,335	2004	United Kingdom	1,053,930

Source: UN COMTRAD database,

Appendix 14. Share of luxury goods in North Korea's overall imports

(Unit: %)

2004	2005	2006	2007	2008	2009	2010
6.9	6.2	5.0	5.6	5.5	7.2	5.4
2011	2012	2013	2014	2015	2016	2017
4.0	6.0	6.7	8.1	8.2	7.6	8.9

Source: UN COMTRAD database

Appendix 15. Comparison of North Korea's key import items from China (2014 – 2017)

(Unit: USD thousand, %)

Classification		2014		2015		2016		2017	
Item	HS	Import volume	Increase Rate	Import volume	Increase Rate	Import volume	Increase Rate	Import volume	Increase Rate
1 Electrical machinery and equipment and parts thereof; sound recorders and reproducers, and parts and accessories of such articles	85	419,769	65.3	332,361	-20.8	315,479	-5.1	338,133	7.2
2 Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	84	310,260	17.9	252,094	-18.7	268,607	6.6	267,599	-0.4
3 Plastics and articles thereof	39	193,431	36.2	168,037	-13.1	204,533	21.7	231,388	13.1
4 Man-made filaments; strip and the like of man-made textile materials	54	166,278	14.2	151,664	-8.8	187,042	23.3	218,834	17.0
5 Vehicles other than railway or tramway rolling stock, and parts and accessories thereof	87	210,517	-12.2	196,189	-6.8	254,802	29.9	202,422	-20.6
Total Imports		3,522,515	-3.0	2,946,464	-16.4	3,192,031	8.3	3,328,032	4.3

Source: Based on KITA statistics.