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

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Abstract

This paper aims to analyze the economic impacts of UN sanctions on North Korea's banned luxury goods imports. The analysis is based on applying Difference-in-Differences Methods to the gravity model. The results show that North Korea's luxury goods import patterns reflect the aforesaid model. The result of Difference-in-Differences shows that UN Resolutions 1695 and 1718 were ineffective in decreasing North Korea's luxury goods imports. This paper also found that four countries, primarily China, accounted for 91.4% of North Korea's luxury goods imports in 2007, and the share of North Korea's luxury goods accounted for about 5.3% of North Korea's overall imports.

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Contents

1. Introduction

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, on September 21, 2017, 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. North Korea announced that it planned to firmly retaliate against the UN sanctions and it is expected that there will be much stronger sanctions against North Korea in the coming months.

The UN Security Council has been laying sanctions against North Korea in response to the country's provocations, which have previously included missile launches and nuclear tests. 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. 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?

North Korea's nuclear tests and missile launches are viewed as threatening to its own international trade. However, there are not enough in-depth studies that emphasize the impact of sanctions on North Korea's foreign trade. Obviously, many scholars have warned of the possibility of North Korea's radical international policies being detrimental to its trade, but the mere possibility does not automatically mean actual impact. The reason such studies are rare is due to a severe deficiency in data on North Korea.

This paper attempts to answer the aforesaid questions and to analyze the effects of UN sanctions on North Korea by investigating patterns of bilateral trade flows of luxury goods of North Korea with its trade partners through the use of the Difference-in-Differences method combined with the gravity model, which is widely used to evaluate the effect of policy change on trade flow.[2]

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

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[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.

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 (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.

Additionally, 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 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), 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

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[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.

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.

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

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[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.

[6] This is a different point from our previous study. Since North Korea's luxury goods imports account for 5-6 % of North Korea's total imports (please refer to Appendix table 8 of this paper), 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. The authors thank to the referee for this comments.

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:

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

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 trade, 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, 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

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[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).

[8] UN Security Council (2006) SC/8853, available at: http://www.un.org/News/Press/docs/2006/sc8853.doc.htm, accessed 10 January 2013.

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). 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.[9] 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 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, Yi represents imports of luxury goods of North Korea's trading partners; Xi 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:

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[9] For more details please refer to <Appendix 1> Luxury Items listed by Major Countries

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

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

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

$$E(E_{submitted\ country}|E_i = 1, Post05_t = 1) = [\gamma_0 + \gamma_1 + \gamma_2 + \gamma_3] \equiv E_{11} \qquad (3)$$

$$E(E_{submitted\ country}|E_i = 1, Post05_t = 0) = [\gamma_0 + \gamma_1] \equiv E_{10}$$

$$E(E_{submitted\ country}|E_i = 0, Post05_t = 1) = [\gamma_0 + \gamma_2] \equiv E_{01}$$

$$E(E_{submitted\ country}|E_i = 0, Post05_t = 0) = [\gamma_0] \equiv E_{00}$$

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 2> provides detailed information on countries included in this analysis. Definitions and sources of variables used in equation (2) are presented in <Appendix 3>. 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 Service[10] 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.[11] 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.

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[10] 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.

[11] Please refer to <Appendix 1>

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 4>.

3.3. Estimation Results

<Appendix 5> and <Appendix 6> list the impacts of UN sanctions on North Korea's imports of luxury goods based on equation (2). Data from <Appendix 5> shows that North Korea's import patterns are similar to that of normal countries. Pooled OLS and random effect in <Appendix 5> 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 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 5>, 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 7>, 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 dummy[14] variable were statistically insignificant in pooled OLS and random effect, are shown in <Appendix 5>.

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[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: $m = \hat{q}'\widehat{Var}(\hat{q})^{-1}\hat{q}$, where $\hat{q} = (\hat{q}_F - \hat{q}_R)$, $\widehat{Var}(\hat{q}) = Var(\hat{q}_F) - Var(\hat{q}_R)$.

[13] Please refer to <Appendix 7> 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

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 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, 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 is a same result from other researchers such as Noland (2009), who insisted that there is no significant impact of UN sanctions on North Korean imports. Even considering the effects of different objects through the various analysis methods led to same results.

The top ten export countries of luxury goods can be found in <Appendix 8>. Here it is seen that North Korea's share of luxury goods imports from China increased from 28.7% in 2004 to 48.6% in 2007, while its imports from additional major trade partners Thailand, Japan and Germany decreased during the same period. The argument that China did not rigorously implement the resolutions provisions has also been proved by our research. A salient point in the table is that

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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 6> Impact of UN sanction on North Korea's imports (random effects, time dummy included)

South Korea and Brazil's shares of luxury goods imports of North Korea have been increasing since UN sanction on North Korea in 2006. Brazil was the second largest trade partner in North Korea's luxury goods imports in 2007. Even though South Korea has halted humanitarian assistance to North Korea since North Korea's first nuclear test in 2006, luxury goods trade between South and North Korea has been increasing. This was due to the expansion of the Kaesong Industrial Complex (KIC) in North Korea, where South Korean manufacturers export the raw material to KIC and import to South Korea after processing these materials. In any case, the total share of North Korea's imports of luxury goods from the aforesaid four countries accounts for 91.4% of the total in 2007. Thus, if these four countries, primarily China, do not actively implement the UN resolutions provisions, there is a good chance that future sanctions will fail.

Since North Korea's import of luxury goods is relatively small (226,366,993 US$ in 2007 accounting for 5.7% share of overall imports),[16] the coverage of the provisions of UN resolutions must be expanded in order to improve the impact of UN sanctions on North Korea. Considering the fact that even sanction implementation plan submitted states 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 did previously and couple these improved sanctions with negotiations to positively alter North Korea's behavior.

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[16] Please refer to <Appendix 7 and 8>.

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<Appendix 1> 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 2> 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 3> 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 4> 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 5> Impact of UN sanction 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 6> Impact of UN sanction 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 7> Top ten export countries of luxury goods to North Korea

(Unit: US $)

	2004	2005	2006	2007
China	47,432,499	62,089,117	83,120,592	109,943,917
Thailand	42,885,964	30,183,776	15,474,065	6,184,080
Singapore	17,707,725	31,499,338	19,645,588	18,355,653
Japan	15,195,021	9,364,658	6,992,279	136,370
Germany	12,047,000	8,552,000	6,764,000	2,766,000
Rep. of Korea	11,126,000	19,409,000	28,529,000	36,207,584
India	5,657,955	1,732,695	1,829,430	950,988
Mexico	4,000,000	3,212,497	3,880,541	1,785,402
Hong Kong	3,533,272	1,634,394	1,449,364	1,987,223
Brazil	433,653	371,411	356,356	42,403,580
Total imports of luxury goods (Including all trade partners)	**165,078,510**	**177,968,954**	**174,348,826**	**226,366,993**

Source: UN COMTRAD database, Ministry of Unification in South Korea

<Appendix 8> Top ten export countries of luxury goods to North Korea

(Unit: %)

	2004	2005	2006	2007
China	28.7	34.9	47.7	48.6
Thailand	26	17	8.9	2.7
Singapore	10.7	17.7	11.3	8.1
Japan	9.2	5.3	4	0.1
Germany	7.3	4.8	3.9	1.2
Rep. of Korea	6.7	10.9	16.4	16
India	3.4	1	1	0.4
Mexico	2.4	1.8	2.2	0.8
Hong Kong	2.1	0.9	0.8	0.9
Brazil	0.3	0.2	0.2	18.7
Share of luxury goods in North Korea's overall imports	**6.0**	**5.7**	**4.7**	**5.3**

Source: UN COMTRAD database, Ministry of Unification in South Korea