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Master's Thesis of Graduate School of International Studies

Economic Sanctions of Japanese  
Government on Korea and Their Impacts  
on Korea-Japan Economic  
Interdependence

일본 정부의 대한국 경제 제재의 배경 및 한일경  
제 상호의존에 미치는 영향에 관한 연구

August 2020

Graduate School of International Studies  
Seoul National University  
International Cooperation Major  
Furusato Fumi

Economic Sanctions of Japanese  
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Interdependence

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# Abstract

Liberalists have long claimed that economic interdependence promotes interstate peace while its validity has been questioned by scholars of other schools. Korea-Japan relations before July 1, 2019 used to be a good case to endorse liberalists' argument. Despite continuous diplomatic, historical and nationalistic antagonism, Korea and Japan have not been sacrificing their economic cooperation. However, Japanese government has taken an unconventional policy decision on July 1, 2019. Many observers evaluated that Korea-Japan relations have been the worst ever recently especially due to the Korea's Supreme Court ruling to order compensations for the wartime forced labour victims. This thesis aims to explain Japanese government's extraordinary behaviour using the concept of interdependence posed by Robert Keohane and Joseph Nye. Impacts of the economic sanctions and Korea's reaction to the sanctions are examined with three behavioural patterns of organisation members suggested by Albert Hirschman; Exit, Voice and Royalty.

Analysis suggests that Japan has intended to disturb Vulnerability of Korea in the semiconductor industry in order to induce its compromise on the wartime forced labour issue. Due to Japan's dominance in the semiconductor components market and Korea's dependence on Japanese materials, Japan itself presumed that it holds Sensitivity in the industry. However, detailed observation showed that the sanctions were not the best choice to seriously damage the Korean semiconductor

and display industry. The sanctions were not imposed on items that are used for key products of Korean semiconductor industry. In addition, Japanese companies made their best efforts in order not to lose their Korean customers by establishing subsidiaries or factories or negotiating with Korean semiconductor manufacturers. As a result, the sanctions imposed back in July 2019 did not critically hit the Korean economy. The unintended results of sanctions were Japanese firms' behaviours to remain in the global semiconductor supply chain in response to Samsung and SK Hynix's supply diversifications.

The most meaningful impact of Japan's economic sanctions was observed in the global semiconductor supply chain. Samsung and SK Hynix has diversified sources of semiconductor materials, which led to the smaller existence of Japanese companies and increasing influence of Korean and other foreign enterprises. Despite desperate efforts of Japanese firms, Korean semiconductor producers eventually partly exited Japan's export market. Korea has continuously voiced their dissents to the sanctions while expanding domestic production and finding non-Japanese trade partners. Domestic chemical producers and foreign suppliers took it as their opportunity to provide their products with global semiconductor giants such as Samsung and SK Hynix.

**Keywords:** Korea-Japan relations, economic interdependence, economic sanction, issue linkage, semiconductor.

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# I. Introduction

Whether economic interdependence can contribute to interstate peace or not has been a long debated question. Liberalists have believed in its peace building effect that economic interdependent states would not start conflict considering its opportunity cost. On the other hand, realists tend to focus on competition caused by active economic interactions. They also simply do not assume that economic interdependence is a critical determinant of conflict occurrence, since they emphasise security interests more than economic interdependence. The current global economy effectively shows that entwined national economies can be a bargaining leverage. Many scholars argue that a less dependent country is able to manipulate their interdependence so that a more dependent counterpart can make compromise in the fear of losing benefits of the economic interdependence. A less independent thus powerful country is prone to link issues that need not be necessarily negotiated together which is called side payments or issue linkage strategy. By making one issue linked to the other, a country can effectively reap a wanted result.

Korea-Japan relations before 1 July, 2019 were a typical case to endorse the peace building effect of economic interdependence. Diplomatic difficulties did not hinder their economic cooperation, they have been rather more and more economically interdependent regardless of the recent upheaval.



Therefore, this thesis delves into the background of Japan's economic sanctions on Korea and their impacts on Korean semiconductor industry. In order to analyse the background of Japan's economic interdependence, the concept of interdependence defined by Robert Keohane and Joseph Nye are going to be applied. Albert Hirschman's behavioural patterns of organisational members which are exit, voice and royalty will be used to evaluate response of the Korean chipmakers.

The thesis poses three hypotheses; Japanese government imposed economic sanctions on Korea on the assumption that Japan itself assumes Sensitivity while Korea has Vulnerability in the semiconductor components (H1); Japan has utilised issue linkage strategies by linking economic issues to diplomatic issues to induce Korea's compromise on the wartime forced labour issue (H2); Korea already voiced their dissent several times through diplomatic channels and it would partly exit the Japan's export market thus it is not likely to go back to the royalty (H3).

Before the thesis will verify the above hypotheses, it explains the structure of Korea-Japan economic interdependence in the semiconductor and display industry. The significant personality of their interdependence is that Japan dominates the global semiconductor and display materials market while Korea overwhelmingly occupied the complete product market globally. Korea's dangerously high dependency makes its Vulnerability if Japan limits its export.

Japan's so called economic sanctions can be divided into two; abolishment of preferential treatment to Korea for the specific three materials while maintaining its original status as "white countries"<sup>1</sup> on 4 July and removal of Korea from its "white countries" on 28 August.

Contrary to Japan's official rationale, it is almost impossible to consider its export control separately from the conflict due to the wartime forced labour issue. There has been no cases where Korea has let strategic materials leaked to the third countries without proper export controls. Official remarks of Japanese politicians also amplify this doubt.

However, examining relevant legal documentations, it is quite evident that the design of Japan's economic sanctions were not the best to give the Korean economy a critical damage. Fluorinated polyimide is necessary for display production, but Japan limited export of a material to make fluorinated polyimide instead of regulating the chemical itself. Resist is a chemical to paint on a wafer before drawing electrical circuits. Only a small part of all kinds of resist were under the new export control, which did not lead to a devastating effect on semiconductor production in Korea. Japan imposed regulations only on resists optimised to be used with light which is longer than 1nm and shorter than 193 nm. As a result, Korea's main products such as DRAM and NAND flash are not influenced by the sanctions, only the most cutting edge EUV resist id expected to

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<sup>1</sup> Exactly speaking, METI already has removed Korea from the so called white list countries on 4 July, 2019 but still maintained preferential treatment. The changes made on export control to Korea will be detailed in Chapter V Section 2 with explanation of structure of Japan's export management system.

experience decrease of import from Japan. Lastly, hydrogen fluoride that is used for cleansing process of semiconductor production, is the least dependent for its import on Japan. The HF is also the most likely to realise Korean domestic production (Kim Hyuna 2019).

Japanese semiconductor related firms' strategic thinking also prevented the sanctions from becoming very effective. Not only Japanese chemical makers but also semiconductor equipment producers rushed to secure their Korean customers fearing that Korea would de-Japanise their supply chain. If Japanese government was aware of these restraints, Japan has attempted to show its resolve for further sanctions such as limitations on export quota or complete export prohibition, without hurting the Korean semiconductor industry, at least yet. Absence of appropriate rationale for additional export control on Korea and design of sanctions endorse the above statement. However, if it was only a miscalculation of Japanese policymakers, their plan was ironically disturbed by Japanese firms' behaviours.

Impacts of Japan's economic sanctions were not devastating contrary to most of Japanese media's predictions. In the short run, some Korean chipmakers experienced a slight drop of their stock price. However, in the long run, no fundamentally damaging effect was observed. Due to enough stocks held by Korean semiconductor producers, factories did not face stoppage of production. They successfully gained semiconductor materials from alternative routes. At the same time, domestic and non-Japanese foreign chemical producers took this opportunity to complete contract with Korean semiconductor giants such as

Samsung and SK Hynix. Furthermore, newly introduced export control was smoothly operated without delay thus materials were successfully exported to Korea. Japan decided to relax regulations for resist at the end of December, 2019. Rather the most meaningful change was diversification of the global semiconductor supply chain. By Samsung and SK Hynix switching from Japanese companies to Korean or other foreign producers, diversification of the global semiconductor supply chain was observed.

## **II. Literature review**

Despite numerous conflict and controversies, Japan and Korea have not sacrificed their cooperations on the economic aspect. They are one of the largest and most important trade partners to each other, and numerous Korean and Japanese companies branch out to its neighbouring country. Their severe diplomatic issues seems not to have influence their economic interdependence, at least before 1 July, 2019. This chapter reviews existing literatures on economic interdependence and its effects to prevent conflict. Under the assumption that Japanese government technically imposed economic sanctions by regulating export of materials that Korea assumes high dependency on, background and effectiveness of economic sanctions will be also covered. Lastly, a diplomatic strategy called issue linkage is to be examined on the basis of discussions made in the former researches, for Japan's export controls are allegedly called its policy decision to link diplomatic issue to economic issue.

### **1. Economic Interdependence**

Economic interdependence of Korea and Japan and its benefits are well recognised by both governments, which is probably the reason why the two have kept the economic cooperation intact. However, the sudden declaration of export controls on the specific three items exported to Korea is an extraordinary move of Japanese government. Japan and Korea have especially the high level of

interdependence in the semiconductor industry, which supposedly cannot be easily sacrificed by diplomatic conflict. A change to Korea-Japan economic interdependence casts a question to the long standing debate on whether economic interdependence actually promotes peace by reducing conflict.

Liberalist scholars long emphasised the role of economic interdependence to reduce conflict. This commercial liberalism has its roots in the days of enlightenment and works of Montesquieu, Kant and Adam Smith (Chang and Krasner, 2017). Most of liberal thinkers cite “opportunity cost” that is generated when countries are economically interdependent. A conflict between the economically interdependent actors might do harm to the benefits such as ease of trade transactions and economic surplus, which makes economically interdependent actors hesitate to be involved in conflict (McMillan, 1997 and Copeland, 2015).

On the other hand, realist scholars assume that economic interdependence rather promotes conflicts or it is not very much related to peace. Realist tradition highlights the competition and conflict by clash of interests caused by economic interaction. At the same time, they also value security interest much more than economic interdependence, which leads them to consider that peace is a result of military deterrence (Chang and Krasner, 2017, McMillan, 1997, Copeland, 2015).

However, some scholars point out that interdependence of states can be asymmetry and the less dependent actor will manipulate the interdependence to their advantage. They also raise a perspective that less interdependent state will

take advantage of the interdependent relationship to their advantage (Keohane and Nye, 1989, Hirschman, c1980).

## **2. Economic Sanctions**

Japan's export control that came into effect on 1 July, 2019 is generally recognised as economic sanctions by international observers and media. This section is to examine which factor can let a country choose economic sanction as a foreign policy tool and how effective economic sanction can be.

Baldwin (1985, 51) mentions that there is little literature on economic sanctions in the first place, but mostly those scarce literature deny its utility. Drezner (1999, 10) categorises backgrounds of economic sanctions into two: domestic politics approach and signalling approach. The first approach considers the main actor as the domestic audience. When they recognise their country is experiencing inappropriate diplomatic treatment, they will pressure the government to make any retaliatory measures. In this case, economic sanctions are not the best choice, rather an option to choose when there is few other means. Economic sanctions work almost as symbols to satisfy the domestic citizens, thus their actual effectiveness is not the priority. The latter approach explains that countries impose economic sanctions to signal their resolve to use military forces. Scholars of this theory assume that no actor has complete access to perfect information, thus there might be misperception of counterpart's resolve. Therefore, countries can prove their will to start military conflict without making the counterpart country that they

are only bluffing. The author made an assessment that economic sanctions are rarely successful in both streams of theories (Drezner, 1999).

### **3. Issue Linkage**

Right after 1 July, 2019, the world media and observers made an assessment on Japan's policy decision. Most of them criticises Japanese government, based on an assumption that Japan has linked the diplomatic issue, namely the forced labour issue, to the economic issue. Linking issues that do not necessarily need to be discussed in the same arena is called Issue Linkage Strategy (Keohane and Nye, 1989, Poast, 2013, 288, Axelord and Keohane, 1985, 239). According to Poast (2013, 287), issue linkage strategy is applied since it raises possibility of agreement success or it can effectively keep countries tied to an agreement. Poast explains issue linkages are grouped within a concept called side-payments in the international cooperation literature. They define side-payments in two ways : financial payments or material concessions (Poast, 2013, 289). However, the author also made a point that issue linkage strategy is rarely used, citing the costs accompanied (Poast, 2012, 299). Issue linkages are also being discussed as diplomatic tools to make both parties better off by some scholars (Wagner, 1988, 462, Haas, 1980, 371).

Nevertheless, issue-linkages are controversial in its efficacy. While scholars such as Friman (1993) assert that different theorists agree that side-



payments can effectively foster cooperation, Tollison and Willet (1979, 425) argue that they rather exacerbate issues.

#### **4. Issues of the Existing Literatures**

As elaborated above, the existing researches on economic sanctions tend to focus on bilateral perspective when analysing result and influence of economic sanctions. Instead, this thesis pays attention to influence on the global supply chain of semiconductor as well. In addition, the existing literatures only deal with the inter-governmental interactions for analysis of economic interdependence and sanctions. However, the economic sanctions imposed by Japan has had a huge impact on both Korean and Japanese firms and their future businesses. A focus on interactions between Korean and Japanese semiconductor related companies and how they are trying to get accustomed to the new environment is another point that this thesis puts its focus on. Lastly, this thesis also pays much attention to political aspect of economic sanction too, instead of only focusing on economic aspect.

### **III. Research Background and Research Questions**

#### **1. Research background**

Even though Korea-Japan relations have never been the best ever since the beginning of their diplomatic relations, there are many conflicts especially in the recent years. There are many diplomatic issues left between the two, but they have been only exacerbating these days. At the end of 2018, the tensions between the two countries further heated up due to a series of Korea's Supreme Court decisions to order Japanese enterprises that were involved in the forced labour mobilisation during the World War II to compensate their victims. The Supreme Court ruled that Nippon Steel should compensate the victims on 30 October, 2018. In response to this, Japanese government condemned this legal decision and requested its Korean counterpart to intervene with this issue. However, Korean government kept showing its stance not to disturb the autonomy of the judiciary.

Amidst an upheaval of Korea-Japan relations, Reconciliation and Healing Foundation for the former Korean females who had been forced to serve sexual slavery was dissolved by the Korean government on 21 November. Some Japanese media reported that it might be interpreted as Korean government's will to nullify or renegotiate the "reversible" agreement on the comfort women issue back in 2015 or at least make it a mere formality (Onchi, 2019). Furthermore, there was another Supreme Court ruling for the forced labour compensation on another Japanese

company called Mitsubishi Heavy Industries in November, 2018. Japanese Foreign Minister Kono and Chief Cabinet Secretary Suga condemned the court ruling, while mentioning the possibility of countermeasures (The Asahi Shimbun 2018). Korean government also expressed their resolve to take countermeasures too while it maintained the autonomy of the Supreme Court and its decisions. The Japanese government's standpoint on these Korean court rulings for the forced labour compensation has never changed. It considers any issue related to what happened during the wartime and colonial period has been solved since both parties abandoned rights to claim compensation according to the Agreement on the Settlement of Problems concerning Property and Claims and on Economic Co-operation between Japan and the Republic of Korea concluded in 1965.

While the two countries did not change each attitude, movement for the forced labour compensation did not slow down on 2019. On 8 January, Daegu District Court admitted seizure of Nippon Steel's assets in Korea. In addition, Chief Cabinet Secretary Suga accused that the Supreme Court decisions were contradictory to the international law because of the above mentioned the treaties concluded in 1965. He also stressed that the treaties applied to the judiciary too (Cho, 2020). In the beginning of 2019, Japanese government requested "consultations through diplomatic channels", which is the first step for dispute settlement between the two as speculated by the treaty. On the other hand, Korean government continuously kept the autonomy of judiciary from the political influence. While there had been no response from Korean government on

diplomatic consultations after two requests from Japan, Daejun District Court additionally approved seizure of Mitsubishi Heavy Industries' assets on 22 March. Finance Minister Aso implied possibility of sanction measures if Japanese firms will have actual damages on their business activities (The Nikkei 2019a). Furthermore, Korean Prime Minister Lee Nakyeon showed Korean government stance about the Supreme Court rulings by mentioning that there are limitations on measures that Korean government can take (Maeil Business Newspaper, 2019a). This Korean PM's disappointing remark pushed Japanese government to request an arbitration board with a third country, then Japanese Foreign Minister Kono talked to a press (Maeil Business Newspaper, 2019a).

Finally Japanese government requested establishment of an arbitration board in 19<sup>th</sup> May, according to the Agreement on the Settlement of Problems concerning Property and Claims and on Economic Co-operation between Japan and the Republic of Korea. The treaty prescribes that the two countries should try to solve any conflict through diplomatic consultations. If the consultations do not successfully lead to reconciliation, they are supposed to establish an arbitration board which consists of three arbitrators. Korea and Japan should choose one arbitrator each within thirty days after a request is made and the two arbitrators choose the third arbitrator within another thirty days. According to the treaty, the deadline for arbitrator selection was 18<sup>th</sup> June. Korean government did not choose an arbitrator by the deadline, but instead suggested to compensate the victims of the wartime forced mobilisation with funding by Japanese and Korean firms. Korea

showed its willingness to respond to dispute settlement with an arbitration board if Japan would accept its suggestion. Nevertheless, this offer was rejected by the Japanese side (Seo, Jeon and Lee 2019).

On 1<sup>st</sup> July, 2019 the Ministry of Economy, Trade, and Industry of Japan announced export controls to Korea on three specific materials mainly used for semiconductor and display production, which are key industries of Korea; fluorinated polyimide, resist and high-purity hydrogen fluoride (HF). President Moon of Korea accused Japan's export controls by calling them sanctions, while he also warned that Korea will need to take some measures too if Korean enterprises will be inflicted damages upon (Seong 2020). The President also promised government's active support for Korean enterprises affected by the Japan's sanctions through governmental measures such as deregulations on the industries and simplification of licensing and permission procedures at the meeting with top 30 Korean companies (Seong 2019b). The President Moon also made a point that Korea should take advantage of this opportunity to lessen the dependency on components imported from one single country and securing domestic production system.

Amidst a series of unfruitful dialogues by government officials, a cabinet decision was formalised to remove Korea from its "white countries"<sup>2</sup> on 2 August.

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<sup>2</sup> So-called White List Countries are the countries categorised in the Group A of Japanese government's classification of its trade partners. The country list is established according to the security level of export controls.

Korean Blue House on the other hand, declared abandonment of General Security of Military Information Agreement (GSOMIA) on 23 August. However, Korean Prime Minister Lee Nakyeon gave Japan an opportunity adding that they could re-consider abandonment of GSOMIA if Japan would abolish the export controls on semiconductor components that came into effect on 4 July (Kang 19). Regardless of an opportunity to re-consider the export controls, Japan still removed Korea from its white list countries on 28<sup>th</sup> August. Korea was officially deprived of preferential treatment on its trade with Japan at this timing. Korea finally filed a complaint to WTO on 16 September.

Nevertheless, the worst scenario was prevented to happen at the last minute. GSOMIA Korean government announced conditional suspension of GSOMIA termination and WTO dispute settlement process a few hours before the official termination of GSOMIA, which was the midnight of 22<sup>nd</sup> November. According to the first deputy director of the Blue House National Security Office Kim Yugeun, both governments agreed to present their own measures to improve the current severe situations of Korea-Japan relations at the same time (KTV National Broadcast 2019). The first deputy director held a policy briefing at 6pm of 22nd, announcing its decision to temporarily nullify its previous decision on GSOMIA abandonment made back in August. He also declared that it would stop the WTO complaint procedure as long as the Korea-Japan Export Control Dialogue continues without interruption. On the other hand, Director-General of Trade Control Department of METI, Okada Yoichi also held a press conference at 6:10, which was 10 minutes

delayed from the originally planned time 6pm. Okada declared that Japan would respond to Korea’s request to hold Director-General level talks. Even though the Director General denied the link between their decision and GSOMIA termination, ANN News reported that one METI executive told that Japan could not help taking some measures since the US was eagerly opposing termination of GSOMIA (ANNnewsCH 2019).

Since then, the Director-General Level Export Control Dialogue has been held twice in December 2019 and March 2020, but neither of them generated a successful result. On the other hand, all the three materials under additional export controls have been exported to Korea with permissions obtained from METI. In addition, Japan deregulated export controls for resist. Japanese government declared that inclusive export permission had been enabled for resist, since “healthy export history” has been accumulated (The Nikkei 2019b).

Dates	Korea	Japan
30/10/18	Supreme Court Ruling (Nippon Steel) *Korean government, autonomy of judiciary	Japanese government requested Korean government intervene with the Court's and stop the infringement of international law
29/11/18	Supreme Court Ruling (Mitsubishi Heavy Industries)	
08/1/19	Daegu District Court admitted seizure of Nippon Steel's assets in Korea	
09/1/19		Requested "consultations through diplomatic channels"*
23/1/19	Meeting of foreign ministers, Korea did not make a clear answer to Japan's request	
12/2/19		A second request for "consultations through diplomatic channels"*
22/3/19	Daejun District Court approved seizure of Mitsubishi Heavy Industries' assets	
15/05/19	Korean PM Lee Nakyeon, "limitations of governmental measures"	
20/5/19		Request to Establish an Arbitration committee according to the 1965 Treaty with a third-country (deadline : 18 June)*
19/6/19	Willing to accept Japan's request for arbitration committee, if Japan accepts its suggestion to compensate for the forced labour victims with fundings by Japanese and Korean firms	Japan rejected Korea's suggestion
01/07/19		Declaration of export controls on the three items Start of public questionnaire to citizens on Korea's removal of white list countries

Table 1. Timeline up until the Economic Sanctions.

## **2. Research Questions**

Japan's economic sanctions are unconventional in the history of Korea-Japan relations. Even though antagonism and numerous controversies had been long salient in the arenas of politics and diplomacy, the both governments tacitly agreed that neither of them would sacrifice economic cooperation. Rather, the two have been continuously intensifying the degree of economic interdependence despite numerous diplomatic hardships. The two countries have failed to make complete reconciliation by narrowing the legal and historical recognition gap since the end of the colonial rule. While Korea has consistently claimed its and their citizens' right for compensations on many aspects, Japan has never changed its standpoint that every issue stemmed from the colonial rule and wartime atrocities have been solved now, since both parties have abandoned every right to claim for compensation based on the Agreement on the Settlement of Problems concerning Property and Claims and on Economic Co-operation between Japan and the Republic of Korea. The two countries are the most important trade partners to each other, and economic interactions stemmed from cultural attractions of both countries are However, on 1<sup>st</sup> July, 2019, Japan has made a policy decision that goes against the history and practices of Korea-Japan economic cooperation.

Declaration of stricter export controls to Korea came as surprise. Not only non-cooperative economic policy decision has not been observed between Korea and Japan, but also most of the existing literature on economic sanction denies its



utility. Moreover, economic cooperation of Korea and Japan has been a model case to support the validity of liberalist school of thought that economic interdependence can promote peace and reduce conflict occurrence. Japan's extraordinary policy announcement has again cast a question to a long-standing debate on conflict-prevention effect of economic interdependence. Furthermore, issue linkage strategy which allegedly Japanese government has used to induce Korea's compromise had been rarely used because of its prohibitively high costs. Therefore, Japan's policy decision to control export to Korea is against the existing literature and history of Korea-Japan relations.

Therefore, the main research question of this thesis is why and for what Japan chose economic sanctions instead of any other means, on the timing of 1<sup>st</sup> July. Japanese government could have chosen another means to induce its wanted response from Korea. Another research question of this thesis is about effects of Japan's economic sanctions on Korea and how Korean semiconductor industry has reacted to the new environment after the tightened export control.

## **IV. Model**

### **1. Existing Perspectives**

Opinions of domestic and foreign observers do not vary in analysing the background of so-called economic sanctions on Korea imposed by Japan. Most of the media coverage unanimously agreed that Japan's export curbs are retaliatory measures reacting to the Korean Supreme Court rulings made on Japanese firms. They also criticise Japanese policy decision as an inappropriate measure that connects a diplomatic issue to economic issue.

In addition, several Korean newspapers reported that the economic sanctions are the PM Abe's political strategy for the sake of his declining popularity and next House of Councillor election (Maeil Business Newspaper 2019c; Park 2019). Also, a Korean newspaper reported that 2019 economic sanctions were not only to retaliate Korea for the forced labour issue but also contain rapid growth and global success of Korean economy (HANKYOEH 2019).

Among Japanese domestic opinions, there are some voices to support the official rationale of Japanese government too (Furukawa 2020). Fuji TV reported that they gained access to the list of 156 illegal exports of materials that can threaten national security (Watanabe 2019). Fuji TV explained they obtained the document through a Korean parliament's member. It did not clarify the details of the document and show evidence of its validity thus it is difficult to blindly believe

the documents are authentic. These opinions are not the main stream even in Japan either after all.

On the other hand, some Japanese sources report that retaliatory plan has been existent for a long time in the Liberal Democratic Party. According to a Japanese tabloid *Bunshun*<sup>3</sup> (2019), the party had a plan of retaliation to break the stagnant Japan-Korea relations, already back in 2013. According to the article, Hagiuda Koichi, Special Advisor to the President, disclosed the party's idea to buy out Korean won and deprive benefits of price competitiveness generated by depreciated Korean won. Indeed, the Finance Minister Aso referred to possibility of countermeasures several months before the initiation of tightened export controls (The Nikkei 2019a).

## **2. Analytical Framework**

This research utilises Robert Keohane and Joseph Nye's theory on interdependence in order to comprehend the structure of Korea-Japan economic interdependence, dynamism of Japan's economic sanctions and Korea's reactions. A strategic concept called Issue Linkage mentioned by the two authors is also to be applied to assess Japan's policy decision. In analysing interactions between the Japanese and Korean semiconductor related firms and their reaction to the new

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<sup>3</sup> The original article was published in 2019. This online article cited a Korean newspaper's reaction to its old article. *Donga Ilbo* introduced *Bunshun*'s article back in 2013 to highlight the fact that retaliatory plan was already being discussed in LDP in 2013.

environment, it also relies on a work by Albert Hirschman on alternative choices that organisation members have.

Keohane and Nye (1989, 8-19) define interdependence as a relationship that accompanies mutual costly effects, even though the costs are not necessarily symmetrical. They point out that there are two different aspects to analyse interdependence; Sensitivity and Vulnerability. Sensitivity describes how quickly changes can affect an actor and also the degree of the cost. On the other hand, Vulnerability is related to the existence and costs of alternative choices when an actor loses access to the current choice. Vulnerability involves changes of policy framework while the framework remains unchanged for an actor with Sensitivity. Keohane and Nye apply this framework to explain power relations of the states. As many other scholars also point out, interdependence can be manipulated and taken advantage of by a stronger or less dependent state. Keohane and Nye (1989, 30-32) explain that a country with Sensitivity can take leverage to a country with Vulnerability so that it can generate a wanted result. The authors also pointed out a country with dominance might attempt to link unrelated issues so that it can reap concessions from a less influential states when they are under interdependence. They named this strategy Linkage Strategies<sup>4</sup>.

Hirschman explains that when any organisation has deteriorated in terms of its quality or benefit it offers to its members, its members have three options: exit

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<sup>4</sup> Keohane and Nye called this strategy Linkage Strategies. The same concept is generally called Issue Linkage, or Side Payments in the International Relations field of study.

the organisation, voice their complaints in order to improve the current situation, or being loyal to the organisation. According to Hirschman (1970), when there are many alternatives, members are likely to leave for those alternatives. He also adds a point that pressuring members when they express dissent only leads to exit. Nevertheless, if the members are loyal to the organisation, they are likely to remain. This thesis assumes Korea is a member of the Japan's semiconductor materials export market. Japan's semiconductor materials export market is an organisation that Korea belongs to. Under these assumptions, this thesis analysed how Korea has been behaving in the face of the changing market environment offered by Japan.

### **3. Hypotheses**

Hypotheses are established based on the analytical frameworks introduced above. First, this thesis tries to explain Japan's intention behind economic sanctions relying on the concept of interdependence posed by Keohane and Nye. Considering the structure of Korea-Japan economic interdependence in the semiconductor industry, Japan can be considered as an actor with Sensitivity while Korea assumes Vulnerability. Korea and Japan play significant roles in each other's semiconductor industry. The whole structure of their interdependence is as follows; Japan provides most of semiconductor materials to Korean chipmakers which almost monopolise the global market. Korean semiconductors are necessary

for production of PC, smartphones, TV and other digital devices that are core products of many Japanese and other foreign digital device manufacturers.

Japan, which is a key provider of semiconductor, more or less dominates the global semiconductor material market. Japan especially occupies a large portion of the market share for the three semiconductor materials that were sanctioned by Japan back in July. For example, Japan boasts approximately 90% of the global market share for Fluorinated Polyimide, 70% for Hydrogen fluoride, 90% for Resist (REUTERS 2019). Especially, Korea is highly dependent on Japanese materials for its semiconductor production. Korea imports 93.7% of Fluorinated Polyimide, 43.9% of Hydrogen fluoride, and 91.9% of Resist from Japan (KITA 2019). On the other hand, Korea offers its semiconductors such as DRAM and NAND flash memory to Japanese digital device makers. In addition, there are many more Japanese companies that are involved in the supply chain that manufacture semiconductor-related equipment and machines.

Even though Japan also depends on Korea's semiconductors, it is also the fact that Japan is able to take leverage of Korea's dependency in order to indirectly coerce Korea to do what Japan desires. Korea also has few alternative sources to import semiconductor components, given that Japanese companies almost monopolise the global market. Therefore, Korea can be analysed as an actor with Vulnerability according to the Keohane and Nye's interdependence theory. Vulnerability is about whether an actor has alternative choices and also how costly they are in case it will be deprived of the current choice. Firstly, it will be very

costly to find alternatives, or even switch from Japanese materials to others, given that it takes long for semiconductor manufacturers to test new materials and ride them onto the production line. Second, it was unknown if Korea was able to find substitutes that can be used instead of Japanese components. Rather, its possibility seemed very slim at least before 1<sup>st</sup> July, 2019.

Judging from the history of Korea-Japan economic cooperation and Japan's unconventional policy decision, a hypothesis on the background of Japan's economic sanctions can be established; Japanese government imposed economic sanctions on Korea on the assumption that Japan itself assumes Sensitivity while Korea has Vulnerability in the semiconductor components (H1). This supposition can effectively explain extraordinary policy decision made by Japan.

First of all, Korea and Japan are economically interdependent especially in the semiconductor industry. In other words, not only Korea which is vulnerable in their interdependence but also Japan is dependent on Korea's semiconductors for production of various electronic devices. According to the analytical framework provided by Keohane and Nye, an actor with Sensitivity is able to quickly adapt to changes as well as the cost of adaptation is not too high. Considering Japan has made an extraordinary move to regulate its export of three strategic materials to Korea, Japan had a strategic thought that it would be impossible for Korea to find alternative sources for semiconductor materials whether they are from the third countries or from domestic Korean enterprises. Thus, H1 supposes that Japan strategically considered that export curbs on the three semiconductor materials

would effectively disturb Korea's Vulnerability by depriving access to the items that Korea has high dependency on.

Besides, it is debatable whether Japan actually had Sensitivity in Korea-Japan semiconductor interdependence. The aftermath of economic sanctions and behaviours of Japanese semiconductor related firms showed Japan's assumption was not completely right, which will be discussed in the latter chapters.

Also, even though PM Abe and his cabinet officials repetitively denies connection of Japan's export control revision and controversy related to the wartime forced labour issue, it is highly likely that the two are related. PM Abe utilised a strategy called Issue Linkage also discussed by Keohane and Nye (1989, 30-32). Issue linkages are also called side payments in the international cooperation field. Issue linkage is a negotiation strategy to raise possibility of negotiation success by linking issue that does not necessarily need to be discussed in the same arena. While Issue Linkage is being recognised as effective diplomatic tools to foster international cooperation, it also might be utilised to manipulate the interstate relations for one's advantage (Poast 2013; Keohane and Nye 1989, 30-32). In case of the Japan's economic sanctions, Japan has utilised issue linkage strategies by linking economic issues to diplomatic issues to induce Korea's compromise on the wartime forced labour issue (H2), so that Korea would make compromise on the latter wanting not to lose semiconductor materials imported from Japan. How Japanese government has linked the two issues are salient in the governmental interactions.



Also effects of Japan's economic sanctions and Korea's response can be analysed with Hirschman's concept of exit, voice and loyalty. The Korean Blue House has publicly condemned export controls and requested its withdrawal. Korean semiconductor producers on the other hand, actively sought for alternative sources and tried to diversify their sources of material import. The latter chapters will describe the changed environment surrounding semiconductor-related Korean and Japanese firms and how companies tried to adapt to it. Korea already voiced their dissent several times through diplomatic channels and it would partly exit the Japan's export market thus it is not likely to go back to the royalty (H3).

## **V. Background of Japan's economic sanctions on Korea**

This chapter tries to verify H1 by delving into the details of Japan's export controls and removal of Korea from its white country list; Japanese government imposed economic sanctions on Korea on the assumption that Japan itself assumes Sensitivity while Korea has Vulnerability in the semiconductor components (H1). Even though Japan has assumed it assumed Sensitivity against Korea, Japan's economic sanctions failed to give a dramatic influence over Korean industry and policymakers. At first, the export controls seemed so powerful that Korean chipmakers would be in trouble of semiconductor production immediately. The cost that Japan has to deal with were larger than it expected, and those costs were mainly endured by Japanese semiconductor-related companies.

### **1. Structure of Economic Interdependence in the Semiconductor Industry between Korea and Japan**

One of the important premises for a country to take advantage of its trade partner is the fact that they are interdependent. Korea and Japan have been intensifying trade dependence on each other, especially in semiconductor industry. Semiconductor industry can be characterised by globalisation of the supply chain and consolidation of production to a few highly specialised firms. According to

Goodman, Kim and VerWey (2019), Korea and Japan are both globally competitive actors in the semiconductor industry. However, Japanese companies have global competitiveness in the semiconductor components while Korean counterparts are globally competitive in the complete products. Therefore, Japan and Korea are both dependent on each other for semiconductor production, since they have dominant presence in each different stages of the global value chain.

Adding to the fact that the supply chain of the semiconductor industry is globalised, the industry itself is monopolised by a few key players due to the high fixed costs. Mainly Japanese firms dominate the world market of semiconductor materials while a few Korean giants monopolises the global market of complete semiconductor products such as DRAM and NAND. Since a small number of firms occupy a large percentage of different value chain market, disruption of one section can influence the whole global semiconductor value chain.

Japan has overwhelmingly high market share in the three strategic items listed above. Some Japanese media reported that approximately 90% of Fluorinated Polyimide, 70% of Hydrogen fluoride, and 90% of Resists are provided from Japanese enterprises (REUTERS 2019).

A few Korean firms have a global dominance in memories used for semiconductor productions such as DRAM and NAND. Only three firms including Micron Technology, Samsung, and SK Hynix occupied more than 90% of the global DRAM market share in 2013 and 2014 (Bauer, Burghardt, Tandon and Thalmayer 2016). In addition, in the NAND segment Samsung has continuously

occupied almost 30% of the market (Bauer, Burghardt, Tandon and Thalmayer 2016). The global memory market is almost monopolised by only a few firms; DRAM market's major players are Micron, Samsung, and SK Hynix while NAND markets are dominated by Micron/Intel, Samsung, SanDisk/Toshiba, and SK Hynix. The Korea Herald reported that executive from Amazon, Google and Microsoft headed to Korea to check and discuss the situation after the Japan's economic sanctions. Samsung provides the three US tech giants with DRAMs, which is a key component of semiconductor (Kang Hye-ryeong 2019). Adding to the fact that Korean chipmakers almost monopolise the memory market, approximately 20% of the whole Korean export are occupied by semiconductors (KIEP 2019).

According to Korea International Trade Association (KITA 2019), Korea's import of Hydrogen Fluoride from Japan accounted for 43.9% at the end of May 2019. For Resist, Korea's import was occupied for 91.9% by Japan, and 93.7 % of the whole Fluorine Polyimide import was from Japan. While Korea has become less dependent on Japan for Hydrogen Fluoride compared to 72.2% of 2010 import dependency on Japan, it has been continuously dependent on the other two materials.

## **2. Japan's Export Control System**

Japan, as a member of the international society, commits to the global mission of non-proliferation of Weapons of Mass Destruction (WMS). Considering that international cooperation cannot be successful without international

cooperation, Japan participates in international export control regimes such as WA, NSG, AG and MTCR (Security Export Control Administration Division, METI 2011). For the above stated cause, Japan carries out export controls according to the domestic law called Foreign Exchange and Foreign Trade Act (FEFTA). FEFTA not only covers items and technologies regulated by those international regimes but also items that are not mentioned in those international agreements but should be carefully watched so as not to be mistakenly utilised. Regulations on export controlled items and technologies are also described in legislations of lower level such as Cabinet orders, Ministerial orders, and Directives or Public Notices. Below FEFTA, there are two Cabinet Orders; Export Control Order for regulated goods and Foreign Exchange Order for regulated technologies. FEFTA arrays regulated goods and technologies in the Appended I. Item (1) ~ (16) of Export Control Order and Foreign Exchange Order. Article 25 and 48 force exporters to gain an export license as to export items or technologies restricted by FEFTA, and Export Control Order and Foreign Exchange Order. Further details of export managements are shown in Ministerial Orders, or Directives or Public Notices. The change on the export controls on Korea was delivered as a Directive from Security Export Licensing Department of METI (2019a).

Procedures to obtain export licenses for goods and technologies restricted by the two Orders differ according to the security level of each country's export control. Japanese government used to divide destination areas and countries into 3

groups<sup>5</sup> for the ease of export controls. Countries are categorised into three groups in the Appended Table III, the Appended Table III.2 and Appended Table IV. Countries of the Appended Table III used to be generally called “white countries.” White countries were granted to go through preferential treatment that permits them a simple export procedure. 27 Countries listed in the Appended Table III are countries that partake in the international export management regimes and execute high level export controls. Part 2 of the Appended Table III countries are countries to which export of weapons and related items are banned according to the resolution of the UN Security Council (UN Embargo Countries). Other countries that are concerned of inappropriate use of exported goods and technologies are listed in the Appended Table IV (METI 2015). Korea originally belonged to white countries.

For items and technologies regulated by the international standards, an export license is necessary no matter which area they are going to be exported to. This type of export management is called List Regulation. Items and technologies that are subject to List Control are specified in the Item (1)-(15) of Export Control Order and Foreign Exchange Order respectively.

However, when transferred to White Countries, exporters are allowed to apply for a “bulk license” issued from the Minister of METI. Once exporters gain a

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<sup>5</sup> This country division only deals with countries that are subject to preferential treatment and ones that especially need careful export controls. All the countries are also arranged in 12 groups (currently 13 groups) listed in the Appendix of the Appended Table I of the Export Trade Control Order. The countries listed in the “I area. 1” (い地域①) are so-called “white countries.”, which corresponds to the countries in the Appended Table III.

bulk license, they can continuously export the equivalent items and technologies for 3 years without gaining permission for each export (METI 2020a). For exports to non-White Countries, exporters can only apply for an “individual license.” Individual license needs to be obtained every time regulated items and technologies are to be exported. FEFTA also applies to export controls of items that are not listed in the international agreements. Export to non-White Countries applies to Catch-all Regulation, when those items and technologies might be utilised for production or proliferation of WMD or exporters have received a notification from the METI Minister. The items and technologies that are not listed in the international standards but its unwanted used are concerned, apply to Catch-all Regulations. Those items and technologies are arrayed in the Item (16) of Export Control Order and Foreign Exchange Order for each. Obviously, exporters are only able to apply for an individual license under the Catch-all Regulation.


Hierarchy	Legislations	Goods	Technologies
<b>High</b>  <b>Low</b>	<b>Act/Law</b>	Foreign Exchange and Foreign Trade Act (FEFTA)	
		Article 48 "In exporting particular kind of goods to particular areas, an export license is necessary"	Article 25 "In exporting particular kind of technologies to particular areas, an export license is necessary"
	<b>Cabinet Orders</b>	Export Control Order Regulated goods listed in Appended Table Item (1)~(16)	Foreign Exchange Order Regulated technologies listed in Appended Table Item (1)~(16)
	<b>Ministerial Orders</b>	The Commodity Watch List	
	<b>Directives Public Notices</b>	Directive on Operation of Export Control Order	Directive on Transactions or Actions Offering Technologies that Need Permissions According to FEFTA Article 25 paragraph (1) and Article 17 paragraph (2)

Table 2. Japan’s Export Control System and Legal Backgrounds.

Source: Security Export Control Administration Division, METI 2011; Web Seminar, Centre for Information on Security Trade Control 2011; Araki Eisuke 2020.

### 3. Details of the Economic Sanctions

The so-called economic sanctions by Japanese government are two step procedures; tightening of the export controls on particular three items from 4th of July and removal of Korea from its “white list” countries. In order to avoid confusion, the first will be called Sanction 1 and the latter will be called Sanction 2.

By imposing Sanction 1, Japanese government speculated that exporters are subject to application of “individual export licenses” for the three strategic items exported to Korea such as Fluorinated polyimide, Resist, and Hydrogen Fluoride even though Korea was still one of the White-countries at a time of



Sanction 1. Therefore, Japanese chemical producers now have to apply for an individual export license every time they export the three items to Korea.

The above-mentioned three materials are so-called “strategic items” (전략 물질/戰略物質). They are generally utilised for cutting edge electronic devices but can also be used to develop weapons and weapons of mass destruction if fallen into the wrong hands. Fluorinated polyimide, Resist, and Hydrogen Fluoride are listed in the List of Dual-Use Goods and Technologies and Munitions List, according to the Wassenaar Arrangement for the sake of safe and stable global security environment<sup>6</sup>.

In addition, METI has renewed categories of its export partners by categorising countries into group A to D. METI has decided to call the so-called “white countries” Group A countries. The old “white countries” are now called Group A countries, while group B countries are countries that are not included in the group A but join the export control regime and meet certain requirements of export control. Countries that belong to the Appended Table III. 2 and Appended Table IV are in group D. Others are grouped into group C (METI 2019b). Korea belongs to Group B. However, at this timing, Korea was still entitled to preferential treatment like countries in Group A.

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<sup>6</sup> The Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Goods and Technologies was agreed to establish in 1995. The aims of the agreements is promotion of transparency on transfer of the arms and cutting edge but also dual-use materials and technologies so that they will not be utilised by terrorists. Both Republic of Korea and Japan are the members of the arrangement, which means they have to apply export controls to the goods appearing in the List of Dual-Use Goods and Technologies and the Munitions List.

Sanction 2 assumes totally different characteristics compared to Sanction 1. At the same time with declaration of newly revised regulation on the three strategic items on 1 July, METI started calling for opinions from Japanese citizens on removal of Korea from the white list countries. As a result of questionnaire, over 40,000 citizens sent in their opinions and over 95% of them mostly agreed with Korea’s removal from the white list countries (e-GOV 2019). On 2 August, 2019, the Japanese Diet decided to eliminate Korea from the Appended Table III of the Export Controls Order. Even though Korea was newly added to Group B, it was still entitled to treatment that white list countries deserve. However, Sanction 2 eliminated preferential treatment for Group B country, which only refers to Korea. Therefore, exports to Korea are not subject to Bulk license anymore.

	Before 1 July, 2019		After 1 July, 2019	
Korea in Export Control Order	the Appended Table III	the Appendix of the Appended Table 1 the “I area. 1” (Ⅰ地域①)	Group B (after 28 Aug)	the Appendix of the Appended Table 1 the “Ri ara” (Ⅱ地域)
	White country= preferential treatment		Non-white country= abolishment of preferential treatment (after 28 Aug)	

Table 3. Korea in Japan’s Export Control System, before and after 1 July, 2019.

#### 4. The Three Strategic Items Targeted

In this section, characteristics of the three semiconductor components that were subject to extra export control by Sanction 1 are described in detail in order to show how the export controls on semiconductor materials can threaten Korean

semiconductor industry. Related legislations of export curbs should be reviewed to understand the purpose and personality of Japan's policy choice.

Japan's export controls system is based on the law called Foreign Exchange and Foreign Trade Act. By Sanction 1, Japanese government switched the export permission of the three strategic items from Bulk Licenses to Individual Licenses. Items specified by METI that are going to be under export controls are as follows; Hydrogen fluoride: the Appended Table I. 3. Paragraph (1) of the Export Trade Control Order / The Commodity Watch List Article 2. Paragraph(1). Item 1 "He", Fluorinated polyimide: the Appended Table I. 5. Paragraph (17) of the Export Trade Control Order /The Commodity Watch List Article 4. Item 14 "Ro", Resist: the Appended Table I. 7. Paragraph(19) / The Commodity Watch List Article 6. Item 19 (METI a).

As briefly mentioned above in the section V.2., even though dual-use of the three materials (Fluorinated Polyimide, Resist, Hydrogen Fluoride) by terrorists are worried, they are necessity of semiconductor and smartphone production. Fluorinated Polyimide is used to production of smartphone display, Resists are used to print circuits to wafers and Hydrogen Fluoride is necessary for washing process of semiconductors (Goodman, Kim and VerWey 2019).

Looking at Resist, the Commodity Watch List only lists resists that are optimised for waves between 1nm and 193 nm. Semiconductors that are currently in the market utilise resists that are optimised for 193 nm and over. Resists for under 193 nm are called EUV resist, the most cutting edge kind of resist that

Samsung Foundry has started applying to DRAM for the first time in March 2020 (Samsung Newsroom 2020). The shorter the wavelength is, the more cutting edge the technology is. Semiconductor has been developed and the wavelength to use for its production has been made shorter and shorter. Currently, Samsung applies ArF resist with 193 nm wavelength for DRAM while it utilises KrF resist with 248 nm wavelength for NAND Flash memory (Kim Youngmin 2019). Therefore, export controls were not targeted on the semiconductor materials that are Samsung's most popular products.

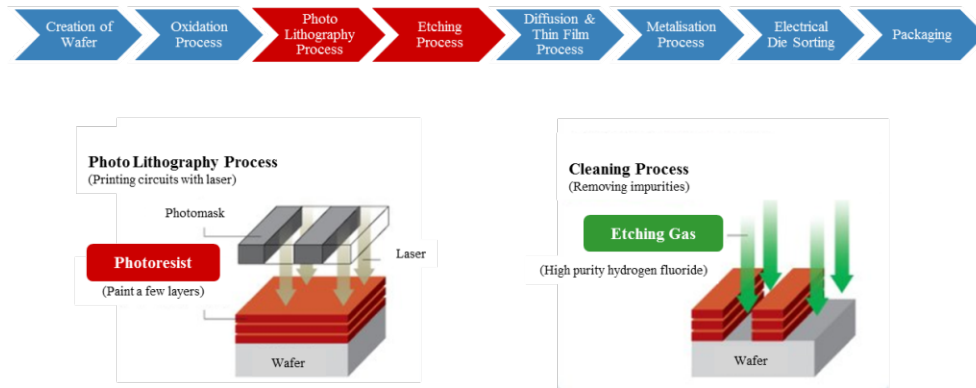
Export restriction of Fluorinated Polyimide also was not introduced to hit the Korean display production very hard. A report by KIEP (2019) confirmed that Japanese chemical producers provide the materials to make Fluorinated Polyimide, instead of Fluorinated Polyimide itself. Therefore, there are alternative sources for Korean display producers to access to the substance through a different route. At first, there were voiced of worry that Samsung's new smartphone called "Galaxy Fold" needs Fluorinated Polyimide, but it turned out that a different kind of Fluorinated Polyimide is used for the Samsung's new smartphone (Kim Sungmin 2019).

Hydrogen Fluoride is used for production of both DRAM and NAND, and also display manufacturing. However, Hydrogen Fluoride is the least dependent on Japan's exports among the three strategic materials (43.9%). There is enough room for importing the substance from the third countries.

Items under New Export Controls	the Export Trade Control Order	The Commodity Watch List	Commercial Usage	Kore's Dependence of Japan (%)
Hydrogen Fluoride	the Appended Table I. 3. para. 1	Article 2. para.1. item (1). As raw materials of chemical warfare agent, chemicals that apply to anything of the following or mixture of chemicals that contains more than 30% of anything of the following out of the total weight. (f). Hydrogen fluoride.	Cleaning impurities	43.90%
Fluorinated Polyimide	the Appended Table I. 5. para. 17	Article 4. item(14). Fluoride compound that applies to any of the following. (b). Fluorinated Polyimide that contains more than 10 % of fluorine compound out of the total weight.	Dispalys of smartphones	93.70%
Resist	the Appended Table I. 7. para. 19	Article 6. item (xix). Resists that apply to any of the following or the substrates to which they have been applied a: Resist used for semiconductor lithography that apply to one of the two (1) Resist optimised for the use with light of 15nm-193nm wavelength (2) Resist optimised for the use with light of 1nm-15nm wavelength b : Resist designed for electron beam or ion beam that has sensitivity lower than 0.01 C / mm2 c: Deleted. d: Resist optimised for surface imaging e: Resists designed or optimised for use in imprint lithography equipment falling under item (xvii), (f), 2, which are thermoplastic or photocrosslinkable	Printing circuits with raser	91.90%

Table 4. Regulated Items and Relevant Legislations

Source: Kim 2019; METI 2020a; Japanese Law Translation.



Graphic 1. Process of semiconductor manufacturing and use of the regulated items.

Source: Made by the author referring to articles of Kim Youngok 2019; Samsung Semiconductor.

Detailed examinations of Japan's economic sanctions revealed that it was impossible for the regulations to hit the Korean economy critically. Even though the three items that highly contribute to the Korean semiconductor industry were regulated, items that support the sales of the industry were not damaged critically. The export controls targeted on the most cutting edge type of resist, not the ones that are main source of the Korea's semiconductor sales. Fluoride Polyimide is not a semiconductor component itself, thus there are still some alternative routes remained to import the relevant semiconductor material. Korea is the least dependent on Japan for Hydrogen fluoride with approximately 40% of dependency rate, which can be imported from the third countries or domestic producers as well.

##### **5. The Puzzle of Sudden Economic Sanctions ; Pinpoint Attack on Korea's Sensitivity and its Results**

In the former section, it was revealed that the economic sanctions targeted the exact point where Korea is holding Vulnerability against Japan, that is, the semiconductor industry. Nevertheless, detailed examination of the export controls unravelled the fact that the Japan's sanctions were not the best policy tools to critically damage the Korean semiconductor industry. The sanctions were not able to do so either, despite they brought about a confusion and chaos to both Korean and Japanese semiconductor industry at first.

Korea is highly dependent on Japan for imports of semiconductor and display components, which Japan more or less dominates the world market. Thus it

would not be easy to find alternatives for the three strategic items restricted by Sanction 1. It is possible to find alternative foreign sources or improve domestic technologies, but this strategy is time-consuming and accompanies uncertainty, as Lee Juwan from Hana Institute of Finance observed (Lee 2019). It takes a certain length of time to test utility and applicability of materials used for semiconductor and display production as well, even if possible alternative sources will be found. Even though Korean domestic firms quickly started testing semiconductor materials of other foreign and domestic origins, replacing the three materials with non-Japanese materials in a short term seems unrealistic according to the researcher. Most importantly, high tech industry necessitating the three items under export controls is one the core industries of Korea. By restricting access to items that play key roles in Korea's economy, Japan tried to touch Korea's Vulnerability and translate it into a diplomatic leverage.

Furthermore, Japan's extraordinary policy choice can be explained that Japan has imposed sanctions believing that it has Sensitivity in the semiconductor industry against Korea. An actor with Sensitivity can quickly adapt to changes in the interdependent relations, and it would not be costly. It also does not need to change its policy framework. The fact that Japan has relied on economic sanctions effectively shows its strategic thinking that export curbs will induce Korea's concession because of Korea's high dependency on Japan. In addition, this belief is supported by assumption that the cost that Japan has to bear with will not be too

much of a burden and Japan will not need to make a drastic change on its policy framework.

However, it is debatable whether these assumptions were correct and Japan meets conditions of an actor with Sensitivity. As detailed below, **cost** of the export controls were never cheap for Japanese semiconductor related companies. Semiconductor equipment firms as well as chemical companies rushed to secure business ties with its Korean business partners by establishing subsidiaries or factories in Korea. Their concerns for losing their Korean customers, and in the larger scale, losing out of the global semiconductor supply chain, had them make the best efforts to keep providing their products regardless of Japanese government's intentions. If the cost of export controls for Japan were not significant, Japanese companies would not have made such hasty move. In addition, the cost of economic sanctions also includes Japan's international reputation as well. It might have been easy for Japan to legitimise its export curbs using the rationale that they are amiable to WTO regulations and only a result of export control system review. However, many foreign observers and media condemned Japan's export controls as outdated retaliatory measures that do not follow rules of international free trade. They also immediately pointed out that Japan tried to link diplomatic issue and economic issue, which possibly have tainted reputations on Japan's diplomatic skills and sincerity.



## **VI. Issue Linkage : from Direct to Indirect Linkages**

On this chapter Hypothesis 2 will be examined: Japan has utilised issue linkage strategies by linking diplomatic issues to economic issues to induce Korea's compromise on the wartime forced labour issue (H2), so that Korea would make compromise on the latter issue wanting not to lose semiconductor materials imported from Japan.

It is almost a standardised perspective of both Korea and Japan's media and academia that the tightening of export control is an economic retaliation against Korea's Supreme Court decision back in October (The Nikkei 2019c; Maeil Business Newspaper 2019b). However, the Japanese government strongly denies that they are retaliations against the Korean Supreme Court rulings relating to the wartime forced labour issues and hands-off attitude of Korean government. The very first statement of the export controls toward Korea has been published by the Ministry of Economy, Trade and Industry (METI). In the statement, METI raised two main reasons of renewed export controls; undermined trust between the two states and existence of "inappropriate cases" found in Korea's export control system.<sup>7</sup> The Ministry explained that international export control system is structured based on the interstate trusteeship, but it needs to apply more strict

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<sup>7</sup> In the English version of METI's news release on 1 July, METI explained that "METI has recently found that certain sensitive items have been exported to the ROK with inadequate management by companies" (METI 2019). On the other hand, the Japanese version only mentions those cases as "inappropriate cases" (不適切な事案). (METI 2019).

controls on exports to Korea now that their trust has been heavily damaged. Also it revealed that it has confirmed “certain sensitive items have been exported to the ROK with inadequate management by companies” (Ministry of Economy, Trade and Industry 2019). Prime Minister Abe (The House of Representatives 2019) also mentioned that new export regulations are only a result of review and management of export controls regarding to the national security. At the same time, Prime Minister Abe took Korea’s imperfect export controls in relations to the security matters as its reason, adding that there has been no dialogue on export controls between both parties for three years. He emphasised that export controls of July, 2019 were not retaliatory measures against the Korea’s Supreme Court rulings and upheaval of the wartime forced labour issue (The House of Representatives 2019). However, Prime Minister Abe refused to explain the details of those “inappropriate cases” referring to the security reasons (The House of Representatives 2019).

Sanction 1 especially targeted three specific strategic items that are to be exported to Korea. Japanese government and METI continuously explained the additional export controls were due to the “inappropriate cases” found in Korea’s export controls, but no relevant figure specified what those cases were. They also denied the link between additional export controls and Korean Supreme Court rulings on Japanese companies regarding the forced labour issue. If the revision of export controls were authentically because of the “inappropriate cases”, there should have been cases where Korea neglected export controls of the specific three strategic items that Japan required individual export license by the revision this

time. Considering that there was no incident related to strategic items being handed over to the third country for unwanted use, Japanese government suddenly decided to revise the export control system. In addition, METI especially switched the export control system to individual licenses for the three strategic items for Korea only, regardless of the non-existence of problematic export history from Korea.

However, PM Abe cited Korea's attitude on the forced labour issue and comfort women agreement as the reasons of export controls. He said it is difficult to privilege a counterpart who cannot keep its words for the forced labour issue and comfort women agreement, at the party debate hosted by the Japan National Press Club (The Nikkei 2019d). Also on the TV show of Fuji TV, he explained that a series of controversy related to the wartime forced labour issue made it clear that Korea cannot keep country-to-country promise thus it is very natural to consider Korea cannot abide by the export control related regulations too (The Yomiuri Shimbun 2019a). Chief Cabinet Secretary Suga also once explained that Korea did not prepare a satisfying solution for the wartime forced labour issue up until the G20 summit, which hurt Japan's trust for Korea (The Sankei 2019).

It is questionable whether what the "undermined trust" has been undermined due to the attitude of Korean government for the Supreme Court rulings. Contradictions of Japanese standpoints can be easily realised in official remarks of PM Abe and other officials at different occasions. According to Japan, Korea's attitude on the wartime forced labour issue and comfort women issue has destroyed Japan's trust toward Korea. It is now impossible for Japan to carry out

export controls properly under the trusteeship with Korea, due to the reason described above. However, Japan has decisively denies the connection of export controls to the Supreme Court rulings of the forced labour issue. Therefore, it is difficult to separate Japan's economic sanctions from the diplomatic issues. Japan has never showed any documents to prove that the "inappropriate cases" actually exist either.

Frustration of Japanese government has been observed before its decision to sanction Korea. Japanese government has continuously sought to solve the forced labour issue as specified by the Agreement on the Settlement of Problems concerning Property and Claims and on Economic Co-operation between Japan and the Republic of Korea, but its efforts have never been successful. Two Supreme Court rulings were made on Nippon Steel and Mitsubishi Heavy Industries in the late 2018, which Japanese government strongly condemned and requested Korean counterpart to "deal with properly". However, Korean government has shown its unwillingness to intervene in the Korean court rulings. After Daegu District Court approved seizure of Nippon Steel's assets in Korea in January 2019, Japanese government finally requested consultations through diplomatic channels to Korea according to the dispute settlement process specified by the above mentioned treaty. Japan sent another request to Korea in February the same year, but Korean government did not make clear response to its request. Deajun District Court, in March, additionally approved seizure of Mitsubishi Heavy Industries' assets in Korea. Also Korean Prime Minister Lee Nakyeon commented that there were

limitations for governmental measures to deal with Court rulings. Right after Korean PM's remark, Japan has stepped into another stage of dispute settlement. Japan requested to establish an arbitration board that consists of three arbitrators on 20<sup>th</sup> May. The deadline for the two countries to pick one arbitrator each was set on 18<sup>th</sup> June, but Korea did not respond to this request either. Instead, The Korean government suggested a plan to compensate the wartime forced labour victims with funding by Japanese and Korean enterprises, which was a condition for Korea to accept establishment of an arbitration board. However, this Korea's suggestion was firmly rejected by Japan. In the Japanese government's standpoint, compensation for victims of the wartime forced labour has been all solved thus it is out of question to compensate them now. Not only the Korean government did not step in, it also let assets of the sued Japanese companies in Korea be liquidified. As Finance Minister Aso revealed, LDP had long considered a various retaliatory measure (The Nikkei 2019a). Japanese government has stepped in to economic sanctions finally, allegedly being triggered by the asset liquidification.

Dates	Korea	Japan
30/10/18	Supreme Court Ruling (Nippon Steel) *Korean government, autonomy of judiciary	Japanese government requested Korean government intervene with the Court's and stop the infringement of international law
29/11/18	Supreme Court Ruling (Mitsubishi Heavy Industries)	
08/1/19	Daegu District Court admitted seizure of Nippon Steel's assets in Korea	
09/1/19		Requested "consultations through diplomatic channels"
23/1/19	Meeting of foreign ministers, Korea did not make a clear answer to Japan's request	
12/2/19		A second request for "consultations through diplomatic channels"
22/3/19	Daegu District Court approved seizure of Mitsubishi Heavy Industries' assets	
15/05/19	Korean PM Lee Nakyeon, "limitations of governmental measures"	
20/5/19		Request to Establish an Arbitration committee according to the 1965 Treaty with a third-country (deadline : 18 June)*
19/6/19	Willing to accept Japan's request for arbitration committee, if Japan accepts its suggestion to compensate for the forced labour victims with fundings by Japanese and Korean firms	Japan rejected Korea's suggestion
01/07/19		Declaration of export controls on the three items Start of public questionnaire to citizens on Korea's removal of white list countries

Table 5. Governmental Interactions up until the Sanctions.

The clear linkage between the Supreme Court rulings related to the forced labour issue and export controls was gradually changed by Japanese government into an indirect linkage. Right after the declaration of export curbs, flaws of Japanese rationale were salient in officials' remarks. However, after domestic and overseas media and observers pointed out the invalidity of Japan's rationales on the export controls, Japan started citing GATT Article 21. It also continuously emphasised that the export curbs were not retaliatory measures, even though it still failed to bring an understandable reasoning.

Dates	Korea	Japan	Japan's Rationale
1 July 19		Declaration of export controls on the three items	METI, "inappropriate cases"
2 Jul 19			Suga, "No satisfactory resolution for the forced labour issue until G20 meetings, trusteeship damaged"
3 Jul 19			Abe, "Cannot privilege a country which cannot keep its words for the forced labour issue and comfort women issue"
4 Jul 19		Export controls on the three items came into effect	Abe, "Korea should obey the common sense of international rule"
5 Jul 19			Japan, "GATT Article 21 can apply to its export controls"
7 Jul 19			Abe, "inappropriate cases", "the forced labour issue made it clear that Korea cannot keep its words, it is natural to think that it cannot execute export controls properly"
9 Jul 19			Suga, export curbs "only a result of review of export control system"
12 Jul 19		Korea-Japan working level meeting	
02 Aug 19		Declaration of Removal of Korea from White-Countries (came into effect on 28 Aug)	
15 Aug 19			Abe, "not a retaliatory measure" at the National Diet
22 Aug 19	Korea, Declaration of GSOMIA Abandonment		
22 Nov 19	Conditional Suspension of the GSOMIA Termination Declaration & WTO Dispute Settlement Process	METI, "Agree to resume the Director General-Level Talks"	




Table 6. Japan's Rationale on its Export Controls over Time; from Direct Linkage to Indirect Linkage.

## **VII. Impacts of Japan's Economic Sanctions**

This chapter will test the hypothesis 3; Korea already voiced their dissent several times through diplomatic channels and it would partly exit the Japan's export market thus it is not likely to go back to the royalty (H3). The influence of Japan's economic sanctions using the framework suggested by Hirschman will be analysed. Not only influence on Korean chipmakers but also the one on Japanese chemical producers will be looked into. For the sake of explanation, impacts of the sanctions will be divided into the short-term effect and long-term effect.

### **1. Predictions Made by Experts**

Not only Korean and Japanese observers but also foreign experts made numerous expectations and predictions on how much Korea will be influenced by Japan's export curbs on its core industries and the global trend of semiconductor market. Generally, most of them agreed that the sanctions will not destroy the Korean economy completely. Some Japanese media outlets mentioned stoppage of the semiconductor factories in the near future (Yomiuri Shimbun 2019b). Most of the Japanese media outlets considered the economic sanctions would be a critical blow to the Korean economy, considering the sanctions targeted Korea's key industries (Yomiuri Shimbun 2019b). However, voices of concern were heard from the semiconductor chemical industry. Sanctions would backfire and influence Japanese semiconductor materials producers negatively (The Nikkei 2019e). Their



main concern is that Korean chipmakers would exit the Japanese export market. Regardless of the fact that numerous foreign media condemned Japan's export control policy, there are not many articles that casted light on negative influence that Japanese producers and the whole economy of Japan might be inflicted on. On the other hand, Korean President Moon publicly remarked that the damages due to the economic sanctions would rather be larger for Japan (Seong 2019c).

Reactions from the media and industry in Korea were mixed. It seems that most of researchers and experts agreed that the sanctions would give any kind of negative effect on the Korean semiconductor industry and whole Korean economy, at least in the short run. However, even within the circle of experts and scholars, opinions on the degree of damages Korea will have to bear varied. Some made an assessment that the Korean economy will be heavily damaged, while the others predicted the influence of sanctions will be limited. It seems that most of the observers and industry experts agree that semiconductor production would not stop immediately at least (Kim Hyuna 2019). A researcher Lee Juwan assumed that it would be nearly impossible to completely convert sources of semiconductor materials to another country within a short amount of time. Never the less, the author also added a point that Korean chipmakers can translate shortage of semiconductor stocks into a price bargaining leverage (Lee 2019). At the same conference, researcher Jo Kyungeob also pointed out that demand for Korean semiconductors will not be held back due to the price rise given that Korean semiconductor producers occupy almost 70% of the world market share (Jo 2019).

However, GDP loss because of the material shortage will be serious according to his simulation results. If 15% of materials run short, loss of Korean GDP will be 0.12%, if shortage rate is 30%, GDP loss will be 2.2%. The researcher also warned that China will replace Korea as the number one chipmaker in the industry.

Goodman, Kim and VerWey implied the possibility that Japanese producers might lose its current dominance in the Korean import share. They explained Korean semiconductor companies would try their best to find alternative foreign or domestic sources of the semiconductor chemicals, for they do not know when the import of Japanese materials will be cut down due to the political issues (Goodman, Kim and VerWey 2019).

Another report by Korea Institute for International Economic Policy also endorsed the Korean government's opinion (2019). The institute reported that the sanctions imposed by Japan would not lead to stoppage of production. The possibility of Japanese firms losing their competitiveness in the world market was also mentioned in the report. However, reduction of semiconductor production and accompanying damage on the Korean economy will be expected if Japan imposes limitations on export quota in the future according to the report.

## **2. Short-term Impacts**

Korean import of Japanese Resist which accounted for 91.9% of the country's import almost doubled to \$45 million July 2019, which can be interpreted as stockpiling by Korean chipmakers in order to secure Resist in stock.

Korea's import of Resist from Japan in August drastically reduced to \$29 million. For hydrogen fluoride, the sudden increase of import was not observed. The import value rather decreased suddenly from \$5.6million in 2018 to less than \$1.0 million in July 2019. In contrast, import from Taiwan showed an increasing trend slightly instead. Fluorinated polyimides import was relatively stable, though there was a slight increase compared to a last few years (Goodman, Kim and VerWey 2019).

Stability of DRAM and NAND prices also prove that there was not worry for inventory. At the time of 7 days after the introduction of export controls, prices of DRAM and NAND have not been changed (Kim Sungmin 2019). DRAMeXchange, a marketing research agency, also endorses the stability of semiconductor prices due to the enough stock. The marketing agency stated that there might be a short-term price raise because of the reduced supply of semiconductors not only because of Japan's export curbs but also the outage of Toshiba semiconductor factory back in June 2019. However, it also pointed out that Samsung and SK Hynix supposedly holds inventory that can last for 2.5 month. In addition, it admitted possibility for Korean chipmakers to find alternative route to secure semiconductor materials. Therefore, the agency denied that Japan's export curbs will not drastically reverse the structure of demand and supply (DRAMeXchange 2019a).

The academic circle in Korea was worried for another sanction, since a wider range of export control or limitation of the export quota was assumed to be critical. However, Japan did not impose additional sanctions, and gave exporters of

the three strategic items permissions without delay. Samsung successfully gained export permission on Resist on 7 August, followed by another permission for Hydrogen Fluoride later the same month (Min 2019). Fluorinated Polyimide too, was allowed to be exported to Korea by the middle of September. Furthermore, export controls were deregulated for resist since proper export history was accumulated enough.

Contrary to the reports by some Japanese media, Samsung and SK Hynix were reported to have enough inventory that can last for 2 to 3 months (DRAMeXchange 2019b; Kim Hyuna 2019). In addition, Korean chipmakers have made excessive production and stocks before the introduction of Japan's export curbs. Therefore, export curbs did not make Korean economy plunge all of a sudden. A month after the export curbs, DRAMeXchange (2019c) made a judgement that export controls would not hit the Korean semiconductor industry hard, considering that METI Japan set up a personnel for smoother and faster reviewing of the controlled items. Also a KIEP report highlighted that Japanese components makers were more heavily influenced in terms of stock prices than Korean chipmakers (KIEP 2019)<sup>8</sup>.

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<sup>8</sup> At the time of 16 July, Samsung Electronics and LG Display experienced 0.32% and 3.92% drop of stock price respectively, SK Hynix's stock price rather rose by 9.5%. On the other hand, most of the representative Japanese semiconductor components makers saw stock price drop; -2.47% (JSR), 1.04% (TOK), -9.55% (Fuji Film), -2.20% (Sumitomo Chemical), -6.47% (Stella Chemifa), -3.76% (Shinetsu Chemical) (KIEP 2019).

### **3. Long-term Impacts : Diversification of the Global Supply Chain**

As a long-term influence of the sanctions, the most meaningful change was that the global semiconductor supply chain was more diversified due to the smaller existence of Japanese firms and increasing market influence of foreign firms. Korean chipmakers such as Samsung and SK Hynix sought alternative sources of the semiconductor materials that Japan regulated export, which led to diversification of the global semiconductor supply chain. At the same time, Korean and other non-Japanese semiconductor related companies found it an opportunity to supply their products to global semiconductor giants, while Japanese companies were on the edge of losing out of the global market. As a result, efforts of Japanese companies to secure their Korean customers were observed, which allegedly was not expected by Japanese government.

While Korean semiconductor firms such as Samsung and SK Hynix flew to Japan to discuss the situation after the export curbs, they also ended up diversifying their sources of semiconductor materials. Samsung and SK Hynix successfully imported semiconductor components from the third countries such as the US, Singapore, and Taiwan (Shin 2019). Following diversification of production partners of Samsung and SK Hynix, Korean domestic “hidden champions” such as Soulbrain, Foosung, and ENF Technology gained an opportunity to provide Korean semiconductor giants with their materials (Shin 2019). Especially a media coverage revealed that LG display which used to import a liquid type of Hydrogen fluoride from Japan’s Stella Chemifa now switched to a

Korean company Soulbrain (Wow!Korea 2020). It is also known that Soulbrain has constructed additional production facilities in Gongju already at the end of October 2019. On the other hand, SK Materials also has dove into production of a gas type of Hydrogen fluoride, which used to be provided with Samsung and SK Hynix by Japanese Showo Denko (Yoon & Kang 2019).

Export curbs and possible shortage of semiconductor materials paved a way for the third countries to expand their share in the world market as well. The US chemical producer DuPont has decided to invest \$28 million from 2020 to 2021, in order to develop Resist used for EUV light and establish its production facilities. DuPont already has its production factory in Cheonan, where it is going to produce resist for EUV in the near future (Republic of Korea Policy Briefing 2020). EUV resist is included in the list of export regulations, but at the same time, is the very product that Japanese companies such as JSR, Shin-Etsu Chemical, TOK and Sumitomo Chemical have the strongest competency in. Therefore, Japanese company JSR has made an effort so as not to lose its share in the EUV resist market. Even though the cutting edge product EUV resist has not been mainly used for DRAM and NAND flash memory, Samsung has applying EUV resist for its DRAM production, which will boost demand for EUV resist and related equipment in the near future. According to a report, Samsung is considering of JSR, Shin-Etsu Chemical, TOK, Sumitomo Chemical and DuPont as possible provider for EUV resist (Yoon & Kang 2020). TOK is known as a company that was already producing EUV resist in Korea and providing it with Korean companies. Amidst

the hash competition with Korean and other foreign firms, TOK revealed that it was also considering of increasing EUV resist production in Korea (Kim Dongwook 2019). China is also a competent competitor in the market. Another US semiconductor equipment company called Lam Research has also established R&D centre in Yongin, investing \$100 million at the same time(Yoon Minhyuk 2019). According to a research analyst Okada Shigeki from Nomura Securities, **China** has been actively investing in the production of Hydrogen fluoride. He analysed that China only can cover 90% of the global production capability by 2020 or 2021 (The Nikkei 2019e).

Especially behaviours of Japanese semiconductor related companies were salient after the introduction of new export control system. Nikkei Asian Review reported that Samsung also ordered semiconductor materials from Belgium as well, according to a source (2019). An industry insider revealed that the Belgian company that Samsung purchased resist from is allegedly a joint venture founded by a Japanese chemical producer JSR and Belgian research institute called IMEC, according to the Nikkei (2019f). A producer of Hydrogen fluoride Stella Chemifa is considering possibility of export of the material to Korea from its production facilities located in Singapore (Kim Dongwook 2019). Another HF provider Morita Chemical Industries also announced that it can continuously provide the chemicals to Korean chipmakers from its Chinese factories (Kim Dongwook 2019). JSR, which also offers kinds of resists to Korea was also considering ArF resist production in Korea (Yoon & Kang 2019). Also it is reported that Japanese

companies including TOK requested meeting with Samsung and SK Hynix stressing that they can continuously provide the chemicals in a stable manner (Yoon Kihyung 2019).

Also, it was not only the Japanese chemical makers that urgently rushed to secure or increase production and supply facilities in Korea. Japan's export curbs also influenced other semiconductor related companies such as equipment producers and manufacturers of chemicals that are not subject to the export controls. The companies that are not directly related to the export controls also were urged to secure their Korean business, for Korean semiconductor giants were escalating de-Japanisation of its production. Taiyo Holdings has established a production facility of solder resist used for semiconductor packaging and display at Dajin. It also has decided upon investment of approximately \$1.4 million. Taiyo Holdings used to export the material from Japan but stepped into Korean domestic production because of the economic turbulence after July 2019. Kanto Denka Kogyo also, has switched from domestic production of Carbonyl sulfide used for semiconductor production to production in Korea. Their factories are located in Cheonan with R&D facilities that are prepared for better customer service (Kim Dohyun 2020). It is also known that ADEKA (Yoon Heeseok 2020) has started production of Cp Hafnium in Korea that are to be offered to Samsung. Cp Hafnium is used to cut down leakage current of electric circuits in semiconductor production. Toso has even established a Korean subsidiary and is preparing for mass production of quartz glass used for semiconductor production



equipment. TEL, a global equipment manufacturer has built a technical centre next to a Samsung Pyeongtaek campus so that the company can offer customer service to its important customer (Kim Dohyun 2020).

<b>Semiconductor Materials Regulated by Japan</b>	<b>Japanese Chemical Companies that Mainly Provided the Regulated Chemicals</b>	<b>Behaviours after the Export Curbs</b>
<b>Fluorinated Polyimide</b>	JSR	An joint venture founded by JSR and an Belgian research institute IMEC provided FP to Samsung
<b>Hydrogen fluoride</b>	Stella Chemifa	Considering of export of Hydrogen fluoride from its factories in Singapore
	Morita Chemical Industries	Announced that "it is possible to export HF from its production facilities in China"
<b>Resist</b>	JSR	Planning to produce ArF resist in Korea
	TOK	Requested meetings to Samsung & SK, considering of enlarging EUV resist production scale in Korea

Table 7. Japanese Companies' Behaviours after the Export Curbs

Dates	Korea(Non firms)	Korea (Firms)	Japan (Firms)	Japan(Non firms)
1 Jul 19				Declaration of export controls on the three items
4 Jul		Vice Chairman of <u>Samsung Electronics</u> met Chairman of Softbank group of Japan		Export controls on the three items came into effect
7 Jul		Vice Chairman of <u>Samsung Electronics</u> flew to Japan		
16 July		President of <u>SK Hynix</u> flew to Japan		
9 Aug			<u>Stella Chemifa</u> , considering of export of Hydrogen fluoride from its factories in Singapore <u>Morita Chemical Industries</u> , "it is possible to export HF from its production facilities in China" <u>TOK</u> , considering enlarging EUV resist production scale in Korea	
10 Aug		Samsung, imported Fluorinated Polyimide from an joint venture founded by <u>JSR</u> and an Belgian research institute IMEC		
22 Aug	Korea, Declaration of GSOMIA Abandonment	Japanese firms that locate their facilities in Korea such as <u>TOK</u> requested meetings to Samsung & SK		
31 Oct			<u>Kanto Denka Kogyo</u> completed construction of its Cheonan factory, planning to cater to Samsung & LG display	
22 Nov	Conditional Suspension of the GSOMIA Termination Declaration & WTO Dispute Settlement Process			METI, "Agree to resume the Director General-Level Talks", at a press conference (not related to GSOMIA)
28 Nov			<u>JSR</u> planning to produce ArF resist in Korea	
12 Dec			<u>Toso</u> established a Korean subsidiary, starting production of quartz glass products	
21 Jan 20			<u>TEL</u> , constructed customer service centre at Pyeongtaek (adjacent to Samsung Pyeontack Branch)	
02 Mar			<u>ADEKA</u> started preparing for semiconductor materials production at Jeonju	
18 May			<u>Taiyo Holdings</u> , planning to construct a Korean subsidiary	

Table 8. Interactions between Japanese and Korean Firms and Japanese Companies' Efforts to Secure their Korean Businesses.

\*Companies whose names are underlined are the companies that exported the three items falling under the export controls.

#### 4. Voice, Partly Exit, Loyalty?

Korea voiced their dissent through diplomatic channels repetitively. It also appealed to WTO calling Japan's export curbs fringes WTO regulations for free trade. Korea also continuously requested for Director-General talks to solve diplomatic and economic issues between both countries even before the introduction of additional export controls. However, Director-General talks did not bear fruit. Korean chipmakers started seeking for alternative sources for semiconductor chemicals as soon as the sanctions were imposed. As a result, a door was opened for domestic and foreign chipmakers that have been overwhelmed

by Japanese companies' dominance. Since some high quality materials are only produced by Japanese companies, Korean semiconductor producers still applied for an individual license to import their products. However, Japan's export curbs definitely changed structure of Korea-Japan interdependence in a sense that Korea left Japanese market, at least partly.

## **VIII. Implications**

Japanese government has allegedly considered economic sanctions would not harm its industry and companies and only threaten its Korean counterparts. However, limitations of sanctions were behaviours of Japanese companies to survive in the global semiconductor supply chain. Since Samsung and SK Hynix has started avoiding Japanese products in general, in the fear of extra export regulations and unstable supply of products, Japanese firms were on the edge of losing their largest customers. Not only the companies that produce the three regulated items but also other various semiconductor related firms rushed to secure their Korean customers. Even though Japanese government tried to lessen supply of the items that Korea is highly dependent on, Japanese firms only needed to remain in the global supply chain for its survival. Japanese firms' behaviours indirectly prevented the sanctions from being the most effective.

Besides, the Japanese legislation that METI cited in announcement of the export curbs was another reason why the sanctions did not hit the Korean industry very hard. The legislation did not target resists used for Samsung and SK Hynix's main products that supports their sales. Also only the material to produce Fluorinated polyimide was provided by Japanese chemical manufacturers. These conditions were factors that would lessen the effects of sanctions, which could be clearly observed before the actual implementation. If Japanese government was aware of those limitations, its intentions to regulate its exports to Korea would have been to threaten Korea by indirectly showing its resolve for further retaliations.

However, if Japanese government truly expected a critical damage inflicted on Korean semiconductor industry, the sanctions imposed back in July would be a miscalculation.

Also Japan's export curbs in July 2019 contributed to the existing literature and researches of economic sanctions. Japan's sanctions and its effects endorsed their assumption that economic sanctions rarely be successful. Japan's experience has also bore a case study that economic sanctions has danger of bearing unintended, mostly unwanted results.

## **IX. Conclusion**

The analysis through the concept of asymmetry interdependence effectively explained that Japan has imposed economic sanctions on Korea under an assumption that it has Sensitivity in the semiconductor industry while Korea assumes Vulnerability. However it is difficult to admit that this belief was completely right, considering that the costs of sanctions for Japanese companies and industry cannot be ignored. Also Japan has taken advantage of Korea-Japan interdependence in the semiconductor industry to induce Korea's compromise for the wartime forced labour issue. A new finding of this thesis is that the economic sanctions were not best designed to seriously damage the Korean semiconductor industry in the first place. However, it is not still unknown that Japanese government has intended this result or not. If Japanese government was aware of the technical restraints of its own sanctions, the sanctions were rather an expression of Japan's resolve for further sanctions, if Korea would not make compromise. If Japanese government expected a critical damage on Korean industry, strategic thinking and behaviours of Japanese semiconductor-related companies prevented realisation of Japan's expectation from coming true. Japan has turned to issue linkage strategy by linking economic issue to diplomatic

issue considering the personality of the controlled items and lack of appropriate cases of Korea's coarse export controls. Lack of evidence and security reasoning for export control and failure of governmental negotiations escalated Japan's frustration and triggered its policy decision to use sanction to break the stagnant Korea-Japan relations. Also Korean semiconductor industry was surprised and shortly shocked by the export controls, but it did not experience serious issues such as stoppage of manufacturing. They successfully found alternative domestic and foreign sources for semiconductor materials, which opened opportunities for non-Japanese chemical producers to provide their products with Korean semiconductor giants such as Samsung and SK Hynix. Despite Japanese firms' efforts to secure their Korean businesses, Korea partly exit the Japanese export market avoiding insecurities accompanying Japanese export controls. Korean semiconductor giants diversified their supply chain, which eventually led to diversification of the global semiconductor supply chain.

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