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Master's Thesis of Graduate School of International Studies

# South Korea's Economic Dependence on China: Analysis Focused on the Technology Industry

한국에 중국 경제 의존도: 기술산업 중심 분석

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# South Korea's Economic Dependence on China: Analysis Focused on the Technology Industry

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## **Abstract**

As South Korea and China has deepened their economic relationship since 1990s, the economic relationship between the two countries also became closer. China, as the world manufacture factory, has many trade partners and trades for a variety of goods, while South Korea has a limited number of major trade partners. China, among South Korea's major trade partners, made the biggest contribution to South Korea's trade volumes since 2004. Because of the peaceful economic and political relationship during that period of time, South Korea rapidly increased its economic dependence on China. However, the continuous disputes happened between the two countries posed great challenge to the economic relationship between China and South Korea. This paper conduct research on the level of South Korea's economic dependence on China, focusing on the technology industry. Considered the complex economic relationship between the two sides throughout decades, the paper first conducted a review of the historical trade background between South Korea and China and analyzed their trade activities in the technology sector. Then, Country Impact Index (CII) and Trade Dependence (TD) were used as two quantitative measures to gauge the level of South Korea's economic dependence on China. The results shown that South Korea has greatly increased its economic dependence on China since 1990s. Additionally, even though South Korea tried to decrease its economic dependence on China after the breakout of THAAD and US-China trade war, the current outcomes can be hardly seen in reality. At least the quantitative results generated from CII and TD indicated that South Korea did not

made obvious decrease its economic dependence on China. Then this paper also did qualitative hypothesis test on why specific measures of South Korea failed to achieve expected results. Here, both South Korea's internal efforts to decrease its economic dependence on China and external pressure which might lead South Korea to reduce its trade with China were both discussed from various aspects. In conclusion, South Korea failed to reduce its economic dependence on China can be attributed to two major factors: 1) South Korean companies are still interested in new market opportunities in China; and 2) China wants to keep the trade relationship with South Korea for the technology sector.

**Keywords:** South Korea-China relationship, economic dependence, technology, semiconductor

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## 초록

1990년대 이후 한국과 중국의 경제 관계가 깊어지면서 양국 간 경제 관계도 더욱 가까워졌다. 중국은 세계 제조 공장으로서 교역 상대국이 많고 다양한 상품을 거래하는 반면, 한국은 주요 교역 상대국이 한정되어 있다. 한국의 주요 교역국 중 하나인 중국은 2004년 이후 한국의 무역량에 가장 큰 기여를 했다. 그 기간 동안 평화적인 경제와 정치적 관계 때문에, 한국은 중국에 대한 경제적 의존도를 빠르게 증가시켰다. 그러나 양국간의 계속되는 분쟁은 중국과 한국의 경제 관계에 커다란 도전을 뒀다. 본 논문은 중국에 대한 한국의 경제적 의존도를 조사한다. 이 신문은 수십 년 동안 양측의 복잡한 경제 관계를 고려하면서 한국과 중국의 역사적 무역 배경에 대한 상세한 검토를 실시했다. 이어 한국의 대중국 경제 의존도를 가늠하는 양적 척도로 국가영향지수(CII)와 무역 의존도(TD)가 활용됐다. 그 결과는 한국이 1990년대 이후 중국에 대한 경제적 의존도를 크게 증가시켰다는 것을 보여주었다. 또 사드, 미중 무역전쟁 발발 이후 한국이 중국에 대한 경제적 의존도를 낮추려 해도 현실에서는 이런 결과를 거의 볼 수 없다. 적어도 CII와 TD에서 도출된 정량적 결과는 한국이 중국에 대한 경제적 의존도를 분명히 줄이지 않았다는 것을 보여주었다. 그 후 논문은 한국의 구체적인 조치가 왜 기대한 성과를 거두지 못했는지에 대한 질적 분석을 실시했다. 여기에 중국에 대한 경제적 의존도를 낮추려는 한국의 내부 노력과 한국이 대중국 무역을 축소할 수 있는 외압이 모두 다양한 측면에서 논의되었다. 결론적으로, 한국이 중국에 대한 경제적 의존도를 낮추지 못한 것은 두 가지 주요 요인으로 볼 수 있다: 1) 한국 기업들은 여전히 중국의 새로운 시장 기회에 관심을 가지고 있고 2) 중국은 기술 분야를 위해 한국과 무역 관계를 유지하기를 원한다.

**키워드 :** 한중 관계, 경제 의존도, 기술, 반도체

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# **I. Introduction**

South Korea, as the fourth-largest Asian economy, is now getting huge pressure from both its critical military alliance the United States and its longtime trade partner China. South Korea is caught in the middle of this two-side situation because of the escalating disputes between U.S. and China. Compared with other Asian countries, South Korea shown less aggressive attitude towards the growing military power of China. This is not because that South Korea is unaware of China's growth, but because that South Korea's extremely complex relationship with China. South Korea, on the one hand, has to consider China's alliance with North Korea for the Korea Peninsula issue. On the other hand, South Korea has to be extremely careful about its economic relationship with China because of its high level of economy dependence on China's market.

South Korea has been traded with China since the late twentieth century, when two countries established their official diplomatic relationship. Following the diplomatic normalization, ROK (Republic of Korea)-China trade relationship has been tightened quickly. Although the Korean financial crisis, which broke out in 1997, had inevitably reduced South Korea's trade with China, the situation got better soon after China entered World Trade Organization (WTO) in 2001. Later in 2004, exceeding the United States and Japan, China become the largest investor and exporter of South Korea. By far, China is still the No.1 trade partner of South Korea, comprising around one fifth to a quarter of both South Korean imports and exports.



After the sign of China-South Korea Free Trade Agreement (FTA) in 2015, trade between the two sides targeted a new high at over \$300 billion a year.

Two characteristics of the ROK-China trade have been repeatedly mentioned and highlighted by previous scholars. One is that a large part of South Korean export to China was aiming at reexporting to the developed world including Europe, the United States and Japan, so that South Korea can extend its exporting life cycle (Cheong, 2006). Another worth-mentioning trait is that among various traded goods between South Korea and China, electrical machinery, semiconductors, chemicals and other technology-related were the most widely traded sectors. Technology industry is thus a crucial part for the trade between the two sides.

Started from June 2019, the recent trade friction between South Korea and Japan provided new opportunity for South Korea and China's trade within the technology industry as South Korea regard it as a way to reduce the negative impact of its trade friction with Japan (Nam and Wang, 2020). However, recent US-China dispute, including THAAD (Terminal High Altitude Area Defense) and trade war, led a unprecedentedly tough and sensitive situation for the trade between South Korea and China, posing huge potential risk for South Korea's economic growth. For example, in responding to South Korea's choice of THAAD deployment, China started a sort of economic retaliation towards South Korean business, entertainment industry, tourism and etc. And meanwhile, policy changes and restrictions have serious influenced the high technology industry, such as the semiconductor. Therefore, to minimize the negative effect brought by this intensified political

relationship, South Korea has tried to reduce its economic dependence on China's economy through various ways.

This paper will first cover the broad background of the trade relationship between South Korea and China and their technology industry development through the literature review chapter. It will also try to evaluate South Korea's economic dependence on China's market through different methodologies. Then, the paper will discuss on South Korea's internal efforts to decrease its economic dependence on China's economy and the current achievements of those efforts. Meanwhile, it will analyze the external trade restrictions given by other countries such as the United States, as well as their policy effectiveness. Moreover, this paper will demonstrate on thoughts of why certain steps of South Korea reducing its economic dependence on China's market might take "forever". With a focus on the trade within high-technology industries between South Korea and China, the paper will particularly concentrate on the semiconductor and automobile sectors. The rest of the paper is structured as follows: Chapter II will give a detailed overview of previous literatures related to this field; Chapter III will explain the methodology used by this paper; Chapter IV will demonstrate the technology industry related descriptive data and quantitative results generated based on the methodology mentioned in Chapter III; Chapter V will test the two proposed research hypotheses through qualitative analysis; Chapter VI will give recent case studies of trade deals between South Korea and China to further prove the result obtained from Chapter V; lastly, the chapter VII will wrap up and provide the conclusion for this research.

## II. Literature Review

China's accession to the WTO brought many new economic opportunities for not only South Korea, but other East Asian countries, such as Singapore and Thailand. According to Haltmaier *et al.* (2007)'s analysis of China's economic role in Asia, China has become "an independent engine of growth" which provides independent sources of economic growth to countries and regions including South Korea, Taiwan and etc. Later research based on Haltmaier *et al.* (2007) proved the significant role of China, specifically exports to China, in Asian economy's recovery from Global Financial Crisis during 2008. Following the quick step of China's trade liberalization and its geographical proximity with South Korea, China has become South Korea's largest trade partner. Consisted only 3.43% of Korea's total export in 1992, China made straight growth from 1998 to 2005 and increased its share in South Korea total export to 26.5% in 2015. Combine extensive import tariff cuts and tariff exemptions, China shown great potential of economic profits in the processing industry and thus attracts many new trade partners. Additionally, China provided low labor costs compared to the developed world. Thus, as also pointed out by Cheong (2006) as a typical trait of trade between South Korea and China, China has gradually become a platform to process those high-tech intermediate input from countries like South Korea and Japan and then export the final goods to the advance countries such as the United States and European Union. Among all these trade partners, South Korea is the country who have 14.97%, the largest share of China's processing imports (Yu and Tian, 2012). As South Korea and China deepened their trade

relationship in various aspects, economist realized the issue of South Korea's economic dependence on China's market.

## **2.1 Economic Dependence**

Economic dependence of a country or region is generally defined as a situation which a substantial, if not entirely, part of a country or region's economic growth depends on external factors, specifically imports, exports, and external technology and finance. Therefore, countries with high level of economic dependence on other countries usually has a huge gap between its domestic demand and domestic resource-use (Brewster and Girvan, 1973). Although today's global business made it almost impossible for a country to develop based on a solely self-sufficient way, high level of economic dependence is still an undesirable situation for any country or region and should to be cured. Economic dependence will cause an inherently unstable state for a country and thus hinder the country from predicting economic performance and planning economic growth in an appropriate approach. In terms of the ROK-China case, if South Korea keeps growing its economic dependence on China, the disparities of international power will become larger, as well as international inequalities.

As South Korea become more economically dependent on China, any tiny fluctuation of China' market can post great risk to South Korean financial markets. Park Chan-woo, a senior researcher at Korean International Trade Association

(KITA) pointed out that South Korea's increasing economic dependence on China will bring more harm than benefits in the future, especially during a period when Chinese protectionists surged and competition between Chinese and South Korean companies is intensifying. But according to the Federation of Korean Industries (FKI), South Korea's dependence on China's foreign investments and exports, unfortunately, has increased, following the COVID-19 pandemic. Though South Korea's overall foreign trade volume has decreased for 10.6%, China's market still absorbed 24.3% of South Korea's export in the first seven months in 2020, which is even 1.5% higher than what China achieved in 2019. China's presence is more important when compared with other South Korean trade partners. India, Central and South America, and the European Union has decreased 35.5%, 34.3%, 11.5% of their import volume from South Korea, respectively. A more astonishing fact is that even though the overall FDI in South Korea plunged for 22.4%, China's direct investment in South Korea in 2020 increased for more than 2.5 times comparing with that of 2019. The FKI believes that the increasing trend of South Korea's economic dependence on China might be because of China's fast recovery from the COVID-19 pandemic. Regardless of what causes South Korea to continuously increase its economic dependence on China, which this paper will discuss later, majority of scholars and researchers acknowledged South Korea's current high level of economic dependence on China.

## **2.2 Technology Industry of South Korea and China**

As briefly mentioned in the Chapter I, technology industry accounts for a large percentage of trade and investment between South Korea and China. Actually, technology industry has been an important sector for all kind of trade around the world and it probably has the most powerful effect, both directly and indirectly, on a country's economy growth. This is why countries, developing or developed, are all paying attention and giving special focus on their domestic technology development as well as their technology industry cooperation with overseas countries. Indeed, development of technology industry is an important factor to enhance a country's competitiveness, especially under the age of digital transformation. Sophisticated technology application and advanced technology innovation can lead to a rapid regional economic growth of a country through attracting investment and adding new value (Bercovitz and Feldman, 2007). In other words, a nation's technological superiority is one of the most important determinants for its global competitiveness. This explains why countries have been seeking for ways to acquire new techniques by any means. Especially for South Korea, where technology industry is a domestic dominant industry, analyzing its technology industry trade with China, its largest trade partner, will at least partly reveal the mysteries behind South Korea's high level of economic dependence of China.

Since China is trying to gain more market share in the technology industry, especially the high-tech ones, in the global market, researchers have been keen about digging the change of China's participation in the global technology industry. Based on Lall (2000)'s classification of technological sophistication, Shin and Choi (2016)

generated the graph of change in the composition of Korea's manufacturing exports to China. Obviously, before 2000, China mainly imports those low-technology manufacturing products like textile, but after then, China largely decreased its imports of South Korea low-tech manufacturing product to less than 10% of China's total manufacturing imports from South Korea now. Instead, China quickly increased its imports from South Korean high-tech manufacturing products from 10.8% in 1994 to 48.7% in 2004. Although we see a percentage decrease of the high-technology manufacturing products imported by China from South Korea to 28.8% in 2014, it is not because the total trade volume was reduced, but because the trade of non-manufacturing sector between South and China has increased (Shin and Choi, 2016). Even if this is not an evaluation of the total trade between South Korea and China, it is easy to tell that China has the tendency to trade more high-technology goods than low-technology goods with South Korea. Therefore, an analysis focused on the high-technology industry between South Korea and China as a way to understand South Korea's economic dependence on China should be informative and practical.

To take a more decisive look in the high-technology industry, this paper decided not to cover the whole high-technology industry but only on two representative sectors — semiconductor and automobile. The reasons for choosing these two sectors are simple: firstly, semiconductor and automobile trade between South Korea and China composed a considerably large part of their total trade volume. For the chip export particularly, it is currently the most important export

product which supports South Korea's export-driven economy. More importantly, China is the largest market for South Korea to export its semiconductor production. According to KITA's report in 2020, in the first seven months, South Korea exported over USD 20 billion semiconductors to China, and that accounted for more than 40% of South Korea's total semiconductor export during that period. The second largest South Korea semiconductor importer, Hong Kong, which accounted for 20.8% of South Korea's total semiconductor export, is also closely related to mainland China. By the end of 2020, for South Korea's top exported goods, semiconductor is at the first place, accounting for 19.4% of total export value; automobile is at the second place, accounting for 7.3% of South Korea total export value. For the import side, semiconductor is also among the top of all kinds of goods South Korea imported in 2020, accounting for 10.8% of South Korea total import value. In addition, import of semiconductor's parts and accessories was also among of top three imported goods. Secondly, these two industries are both in quite sensitive trade condition which governments give special regulations and control in recent years.

Before going further for the two high-tech sectors, background of South Korea's and China's semiconductor and automobile industries were also nicely considered separately by the paper. South Korea joined to the semiconductor industry in mid-1960. Though South Korea is an advanced economy now, back to 1960s, like other developing countries, South Korea only worked on simple assembly of semiconductor. However, instead of only doing those simple assembly work, South Korea improved its current scale of industry to produce "mass-



producing frontier VLSL (very large scale integrated) circuits, such as 1M DRAM (dynamic random access memory) and 1M ROM (read only memory and 256K SRAM (static RAM)”, by itself and joined the competition with the western world. After “transitional stage”, when South Korean semiconductor industry expand its business activities, the country moved its semiconductor industry towards the “expansion” and “take-off” stage, during which investment in technology research and innovation had been addressed. And now, South Korea semiconductor industry is at a “self-supportive” stage, that is, the country is able to solely develop the frontier semiconductors by South Korea companies and has successfully expanded its business scope (Byun and Ahn, 1989). South Korea semiconductor industry indeed gave an impressive performance in such a short time span and quickly caught up with those well-developed countries or regions. As of 2020, as a national industry, South Korean semiconductor industry has surpassed Japanese semiconductor industry, becoming the third-largest semiconductor industry transfer, accomplishing USD 437.3 billion of its global semiconductor sales. Major South Korean semiconductor companies such as Samsung, MEGULAR and SK Hynix accounted for around 95% of the global market share of DRAM. Among them, Samsung alone, obtained nearly half of the global market. The latest prediction of South Korean semiconductor industry made by the Ministry of Trade, Industry and Energy (MOTIE) and the Korea Semiconductor Industry Association (2021) said that South Korea’s semiconductors export will reach above USD 100 billion in the end of 2021 and return back to the country with most investment in its semiconductor facilities.

With the increasing demand of productions in this field, the global market of semiconductor and memory market is expected to grow, and thus South Korean semiconductor export is also expected to grow for a good percentage. This prediction also mentioned that the semiconductor industry will act as a vitalizer to South Korean's economic growth through exports and new investments.

Governments clearly understand the huge benefits that technology industry can bring to a country's economic growth, and therefore, many countries have set up new laws and regulations to promote technology innovation and development. For example, Chinese government has implemented new policies in 2018 to promote its domestic scientific and technology development. It is true that China nowadays has more presence in the global semiconductor market, comparing with the situation several years ago. However, China still faces a huge gap between its production and consumption of semiconductor. According to the data in 2017, China's total import of semiconductors worth USD 312 billion with a USD 227.4 billion trade deficit. Even if China's domestic semiconductor production of USD 23.7 billion was included, the country still has a total demand worth USD 251.1 billion for semiconductor productions and that demand actually accounted for more than half of global semiconductor production (Hwang, 2019). In other words, although China has become the largest consumer of the global semiconductor industry since 2005, China's domestic production still only accounted for a small portion even till now. As reported by China's Ministry of Industry and Information Technology in 2018, 30 top Chinese companies were dependent on foreign imports of CPU (central

processing unit) and other related chips for their computer system and servers because the domestically produced CPUs were only at half or even less efficient as the imported ones. South Korea, both as a close neighbor of China and a sophisticated manufacturer of semiconduction, ended up becoming a super important import of South Korea.

The next part of the literature review moves on to the South Korean automobile industry. South Korean automobile industry is now among the top five global producer of passenger cars. The industry is, for sure, an export-oriented industry which creates US 74.7 billion, accounting for more than 10 percent of South Korea's total exports as of 2013. With outstanding presence in the global market, South Korean automobile industry provided for about 12% of South Korea total employment opportunities. As the automobile industry is related to many industrial sectors including steel, glass, transportation and etc., the whole industry has grown very quickly and can be regarded as an important indicator of South Korea's overall economic growth (Yoon, 2021). Started from mid twentieth century, South Korea automobile industry were originally worked in a way which local companies cooperated with foreign companies. Later, South Korean companies tended to localized auto parts and formed a large scale of production system for exports. Hyundai's car model Excel was a successful example of this attempt, achieving the sales of 16 million units in the United States, as one of the most popular car models in the western world. A big change of the South Korea automobile industry happened after the Asian financial crisis, during which the Kia motors was merged to Hyundai

Motor Company, Hyundai hereafter. As of now, Hyundai Motor Group has obtained over 80% market share of South Korean national car manufacturing market. After becoming a South Korean national automobile brand, Hyundai has actively participated in overseas investments and plant building as the company wanted to expand its global business. Eventually, in 2012, Hyundai's overseas production became its major production as the amount produced in foreign countries exceeded that produced in domestic plants. In one single year of 2013, Hyundai's Chinese plant produced 1 million units of automobile, becoming one of the largest Hyundai foreign factories (Lee and Mah, 2018). Nevertheless, under the influence of COVID-19 pandemic, South Korea-made automobiles encountered a large fall of sales around the world, especially in China. Even if currently China's overall automobile demand is growing back to the previous level as the pandemic issue got better in China, there is no obvious increase in demand for South Korea-made automobiles (Cho, 2020). Even worse, Hyundai has closed some of its Chinese plants to reduce the profit loss during the pandemic. Since Hyundai has made huge investment in the Chinese automobile market, the current Chinese automobile market poses challenges for its future market strategy in China.

Compared with China's demand for South Korean semiconductor industry, China, as the world's largest automobile producing country, seems to have far less demand for South Korea-made automobiles. Following Deng Xiaoping's lead of a more open China's economy, Chinese government has implemented policies to encourage the domestic industry by promoting joint ventures. This kind of business

partnership became a new source to attract foreign direct investments (FDI) inflows into China's domestic market. At the same time, this practice helped China to replace those imported Japanese-made automobiles and thus reduced the outflow of foreign exchange reserves. In late twentieth century, Chinese government functioned more policy tools such as the "Big Three, Small Three, and Mini Two" policy to protect major domestic automobile manufacture and promote their development. Chinese government also realized that, instead of just producing rudimentary models repeatedly, Chinese automobile manufacturers need to gain more advanced technologies and therefore, Chinese government announced the "Tenth Five-Year Plan for the Automotive Industry", which created cooperation platform for China automobile companies such as Shanghai Automotive Industry Corporation (SAIC) and Beijing Automotive Industry Holding Co., Ltd (BAIC) with reputed automobile manufacturers such as Volkswagen and Citroen. Until 2013, FDI inflow into China's automotive industry was accounted for more than half of the world amount, and South Korea is among one of the major investors (Lee and Mah, 2018).

### **2.3 Why Decreasing Economic Dependence is Important to South Korea?**

If China and South Korea economic relationship stays in a stable condition, their closely traded sectors or industry, as well as their national economy growth might be able to gain great benefits. However, several recent issues have brought critical concerns regarding the relationship between South Korea and China. In the

literature review chapter, this paper will mainly consider two major issues' influence on South Korea and China's economic relationship: South Korea's deployment of THAAD (Terminal High Altitude Area Defense) and US-China trade disputes. Last but not least, the impact of China's slowdown of economic growth to ROK-China trade relationship will also be discussed briefly.

The THAAD issue is about South Korean government's consent of the THAAD system's landing on South Korea's continent, in responding to North Korea's incessant provocations, and meanwhile, strengthening its military alliance with the United States. Despite the longtime cooperation between ROK-China, South Korea started the THAAD dispute, which lasted for approximately 18 months, posing the largest obstacle ever for development of relationship between South Korea and China, economically, politically, and culturally. China saw South Korea's action as a betrayal of its previous economic support; on the other hand, South Korea was also disappointed by China's later "relentless economic bully". Actually, the ROK-China relationship has been extremely dramatic during the presidency of Chinese president Xi Jinping and the former South Korea president Park Geun-hye. In 2013, Park and Xi came out with the concept of a "strategic cooperation partnership", which involved many cooperative opportunities including the South Korea and China's Free Trade Agreement (FTA). That period has indeed been a sweet period for South Korea and China relationship, almost all the cooperative industries between the two countries had grown substantially. Therefore, before the final announcement of THAAD deployment, many Korean commentators still

believed that South Korea will be very careful when dealing with its relationship with China, as South Korea has been increasingly depending on China, not only for economic aspects but also on North Korea affairs. But the sudden deployment of THAAD has led the two sides relationship to the worst situation ever, followed by China's large scale of economic retaliation to South Korea. Lotte, as one of South Korean largest company, was the headline victim of China's economic retaliation. Closing more than 100 of its Chinese stores, Lotte suffered a lot from this dispute. Since nearly a quarter of Lotte's overseas business was made in China, China economic retaliation lead Lotte Mart experienced a 76.9% of sales decrease in 2017 and Lotte Mart left the China' market in 2018. Beyond Lotte Mart, other Lotte business all faced different levels of distortion, amounting to a total loss of USD 1.78 billion in 2017. Other South Korea hot industries such as tourism, cosmetics, and entertainment, all had substantial loss in 2017. Another industry suffered badly from the THAAD disputes was the South Korean electric vehicle batteries, which mainly produced by Samsung SGI and LG Chem. Originally Chinese government subsidized purchases of electric vehicles products from companies listed by China's Ministry of Industry and Information Technology, but China removed all South Korean companies' names from the list since the breakout of THAAD disputes. As buyers have to pay 40%-50% price without Chinese government subsidies, many buyers ended their contract with South Korean electric vehicle batteries manufacturers. Though it is not 100% sure that Chinese government removed the South Korean companies' names from the list because of the THAAD disputes,

many Korean commentators believed that there was some sort of connections between the two events. Lastly, as a major South Korean industry, and also a core industry for this paper, the automobile industry incurred big losses during the THAAD disputes. On top of all, boycotts and vandalism brought the immediate influence on Hyundai and Kia's business in mainland China. In terms of the world total sales, Hyundai and Kia had an 8.7% decrease in the first half of 2017 compared to its global sales in the same period of 2016. Regarding the Hyundai and Kia's Chinese sales, it plunged for 30% in 2017, which led to greatly reduced South Korean market share in the mainland China automobile industry. This also intensified South Korean automobile companies' competition with similar automobile companies within the mainland China's market, ending up with aggressive price competition. Indeed, having less access to South Korean products might bring some inconvenience to some Chinese customers, but their material loss is so small when compared with that of South Korean suppliers (Lim, 2019). This situation is consistent with Armstrong (1981)'s theory that if economic interdependence is a situation where two countries rely on each other's economy equally, then the economic dependence is a situation of asymmetrical interdependence. South Korea and China are exactly in the latter situation, where South Korea suffered economic vulnerability while China has economic power on hand. Although current relationship between South Korea and China is not as intense as that during the THAAD dispute, there is no sign of a full recovery of the bilateral relationship. Despite the fact that China now provided new business opportunities for South Korea, it seems hard for both sides to trust each



other as much as they did in the past. For the post THAAD era, South Korea might have to reduce its economic dependence on China and form a more balanced economic development (Han, 2018).

The on-going US-China disputes is another essential issue for South Korea and China economic relationship. As the trade and technology disputes between US and China has becoming more and more controversial, the Trump Administration did whatever it can do to restrict other country or region's high-technology trade with China, including South Korea and Taiwan. In terms of South Korea and China relationship, the United States has as strong intention to strengthen its relationship with South Korea. Put it in another way, the United States wants South Korea to stand on the same side with it regarding the US-China disputes. Although both current presidents of South Korea and the United States are both liberal, the change of U.S. administration from Trump to Biden did not relief any pressure on South Korea's balance of its alliance with U.S and economic relationship with China. U.S. Secretary of State Antony Blinken and Defense Secretary Lloyd Austin arrived in South Korea during March this year and discussed with Korean government on those sensitive issues such as North Korea's nuclear threat and strengthening of South Korea-U.S. alliance. It is obvious that the United States wants South Korea to be more on its own side with its other Asian alliance as to get ready for China's aggressive growth (Shin, 2021). However, South Korea is in an extremely hard situation of choosing a clear side in the US-China disputes. Experienced the billions of dollars of huge economic loss brought by the THAAD disputes, South Korea is

hesitant at the moment because Seoul does not want to worsen its relationship with Beijing again. For now, since current South Korean president Moon Jae-in is in his final year of presidency, he needs the support from both the China and the United States to make further political progress on South Korea's issue with North Korea. Therefore, in responding to the United States invitation of joining the Quadrilateral Security Dialogue, or the Quad, which is comprised by the United States, India, Japan, and Australia, as an informal strategic dialogue, whose recent focus is on balancing "China's growing power", South Korea only agreed to work with "Quad" as they remained "openness, transparency and inclusiveness". And meanwhile, Seoul has been emphasizing that South Korea will not take part in any activity that "excludes or contains a particular country". From South Korea's careful approach when it deals with the China issue, it is easy to tell that South Korea knows well about its dependence on China. So that if South Korea maintains or further increases its economic dependence on China, South Korea will eventually become more vulnerable in the global market.

In generally, South Korean economy, a very export-oriented one, depends a lot on shipping goods abroad. From 2010 to 2014, the amount of export averaged around half of South Korean GDP, which is very high. Also, the trade to GDP ratio is also very high in South Korea, which indicated a high level of openness of South Korea economy. Nevertheless, the biggest problem for South Korea export is not that it is trading too much, but that the country is trading unevenly. As mentioned earlier, being the largest trade partner of South Korea, China took more than one

fourth of South Korea's exports. However, Chinese economy did not depend on South Korea as much as South Korea depended on China. According to the World Bank data (2015), South Korea only provides less than 10% of China's import and takes around 4% of China's export. The trading asymmetry made South Korean economy heavily depends on Chinese economy and any change or slowdown of China's economic growth might bring huge effects to South Korea as well (Denney, 2015). This is how concerns about influences of China's economic slowdown on South Korea's economy rose since 2016, during which Chinese economy grew only 6.7% annually, marking the lowest growth in the past two decades (China Daily, 2016). Kim Seong-tea (2019), a fellow of the Korea Development Institutes pointed out that China's economic slowdown could bring large impact on South Korea's economic development. Since both China and the United States have been increasing their tariffs in the trade war, South Korea, as a country to depend on both sides, might experience negative economic growth of 0.3% if the US-China trade war gets fiercer.

Combining all these factors introduced in the literature review chapter, from the overall economic relationship to the technology industry, it is not hard to tell that South Korea is now having too much economic dependence on China's market, leading South Korea's economy very sensitive to global trend. It is thus crucial for South Korea to decrease its economic dependence on China. Following this idea, the rest parts of this paper will give detailed illustration of how South Korea did to reduce its economic dependence on China and the measurements of South Korea's achievements on that.

### **III. Methodology**

To analyze South Korea's efforts in term of reducing its economic dependence on China's market and their outcomes, this paper poses two hypotheses: Hypothesis 1 (H1): South Korea has tried to decrease its economic dependence on China's market, but most measures were ineffective overall; If H1 is true, then Hypothesis 2 (H2): South Korea failed to decrease its economic dependence on China's market not only because South Korea companies cannot give up the highly profitable China's market but also because China's high dependence on technologies from South Korea.

This chapter will introduce both quantitative and qualitative analysis to verify these two hypotheses. Firstly, this paper prepared a brief and simple descriptive data demonstration of South Korea's trade volume, especially for its trade with China, as well as South Korea's top traded technology industries in recent decades such as semiconductor and automobile. But since an overview of South Korea's trade performance only gave a basic understanding of South Korea's economic development, which might not be able to provide deep understanding of South Korea's economic dependence on China's market, this paper tried to analyze South Korea's economic dependence on China with more quantitative approaches.

Since existing literatures does not provide any comprehensive research method on how to gauge the exact level of one country's economic dependence on another, this paper adopted two indexes, which were designed by previous

researchers on determine a country's economic impact and trade dependence on another country, to better approach the level of South Korea's economic dependence on China.

### **3.1 Country Impact Index (CII)**

This measurement is designed by Cheong (2006) to measure one country's economic impact on another. On the top of all, it has several assumptions based on orthodox economic theories. It assumes two factors as major forces to promote a country's economic progress: 1) factor accumulation, which means an increase in the quantity of a factor, can be either physical capital or human capital; and 2) productivity enhancement, which indicates the increase of output with the same amount of input, is mostly associated with technology or knowledge improvements. Other factors such as economy openness, balance of payments, current account transactions and etc., were also mentioned by Cheong as variables which might determine a country's economy influence on the other country, and thus, could be considered when calculating the CII. Actually, military alliance is also related to a country's power to influence the other country, but for the objective of this research, Cheong (2006) chose not to address this issue, so do this paper.

CII, or the Country Impact Index, was generated by four variables which are regarded as essential for a country to impact other economically: market access (M), funding source (F), resources (R) and technology transfer (T). The logic for choosing

these variables were simple: as country A has more accessibility to country B's market, A can influence B's economy easier; if country A is a source of fund of country B's development, A will also have great ability to impact B; the more fund country A gives to country B, directly or indirectly, the more influence A can bring to B; lastly, if country A owns technology ability which country B needs for development, A's influence B should not be neglected. Basically, CII has a positive relationship with all four variables, that is, the greater the M, F, R, T are, the greater the CII is, and the larger effect a country has on the other.

Specific categories of data used in this calculation is shown on the Table 1 below. Cheong's analysis is very informative because Cheong calculated not only the CII of China to South Korea, but also the CII of the United States to South Korea. As South Korea has strong alliance with the United States in various aspects, comparison between the two CIIs provided more research possibilities for this paper. One thing to be aware of is that the CII is a very primitive index because weight is not assigned to each variable. Despite the research data is a relatively primitive one, it provided good research intuition for later analysis on one of this paper's core issues — China's economic impact on South Korea.

**Table 1. Variables Considered by CII**

CII Variables	Components of Variables
Markets	FDI Outflow (Stock) Exports Migration

Funding	Net Trade Surplus Loans Travelers-Inbound Travelers-Outbound
Resources	Imports Energy Resources Source of Guest Workers
Technology	FDI Inflow Where Students Graduate Where Students Go to Study

Source: adopted from *Impact of China on South Korea's Economy*, Cheong Young-rok, 2006

Cheong (2006) has generated the CII value based on data of 2005. This research has been very informative because it not only calculated the CII of both China and the United States to South Korea but also used the data in 2005. Comparing impacts brought by both countries provided a better understanding of China's economic impact on South Korea. In addition, 2005 is a good year for analysis because during 2005 trade between South Korea and China, for the first time, hit the target trade volume of over USD 100 billion.

The paper originally tended to calculate the new CII value of the United States and China based on data from more recent years. However, due to limited access to the statistical data (some of the data used by Cheong (2006) are no longer available at KITA (the original source) or not open to public), this paper failed to retrieve the exact same data set which used by Cheong (2006). But still, since considering the CII should be a nice measurement of China's economic impact on South Korea, the paper calculated the partial CIIs after 2005 with existing data and predict possible changes of CII value based on Cheong's results the next chapter.

### **3.2 Trade Dependence (TD)**

A country will become economic dependent to a dominant country only if foreign trade is crucial to its economic growth and the dominant country accounts for a large percentage of its total trade volume (Armstrong, 1981). With this logic, Armstrong (1981) concluded three essential conditions of economic dependence: “a high magnitude of a nation’s investment controlled by another nation”, “the inability to find easy substitutes for a commodity or a trading partner” and “the intense demand for a commodity”. Then, based on the three conditions, Armstrong (1981) designed three factors: Trade magnitude (TM), Trade Partner Concentration (TPC) and Commodity Concentration (CC).

Trade magnitude (TM) is generated from the product of indicator of foreign trade importance and indicator of the amount of total trade conducted with dominant nation.

➤ Indicator of foreign trade importance:  $X_i = a_i / GNP_i$

where:

$a_i$  = the value of total exports of nation, and total imports of nation<sub>i</sub>

$GNP_i$  = the GNP of nation<sub>i</sub>

$X_i$  = the percentage of exports and imports as a part of economic production of nation<sub>i</sub>



- Indicator of the amount of total trade conducted with dominant nation:  $Y_{ij} = a_{ij}/a_i$

where:

$a_i$  = the value of the total exports and imports of nation<sub>i</sub>

$a_{ij}$  = the value of total exports and imports of nation<sub>j</sub> from nation<sub>i</sub>

$Y_{ij}$  = the percentage of impact of exports and imports to nation<sub>j</sub> upon total exports of nation<sub>i</sub>

- Combining both indicators through multiplication yields: **Index of Trade Magnitude:  $TM = X_i Y_{ij}$**

Both the Trade Partner Concentration (TPC) is Commodity Concentration (CC) are aimed to measure the distribution of a country's trade partners and commodities. For TPC, Armstrong (1981) generated based on the number of trade partners a country has and how much does it trade with each trade partner. That is, first calculating a country's export to each of its trade partner as a percentage of its total exports; and then the concentration index can be generated by adding up of all the squared percentages and then taking the square root of the sum. For CC, Armstrong (1981) used the exact same way of calculation: calculating a country's exported commodity as a percentage of all commodities exported and then generate the concentration results in the same way as did for TPC.

- **Trade Partner Concentration (TPC):**  $\sqrt{\sum_{i=1}^n (X_1^2)}$

where:

$X_i$  = the exports of nation A to nation B as a percentage of total exports of nation A.

➤ **Commodity Concentration (CC):**  $\sqrt{\sum_{i=1}^n (Y_i^2)}$

where:

$Y_i$  = the exports of commodity (y) as a percentage of total commodity exports.

One thing to note in this measurement is that although developed countries like South Korea, usually have more than 200 trade partners around the world, Armstrong's analysis only suggested to use to a country's top 5 trade partners. But as data is more available nowadays comparing to that of 1981 when Armstrong did the analysis, this paper included the top 10 trade partners in the calculation. Same for the commodity concentration calculation, this paper considered 10 top commodities exported by South Korea.

Separately consider on each of the three factors (TM, TPC, and CC) does provide some good intuition to analysis on a country's economic dependence, but the result could be unpersuasive: a country with high concentration of trade partners might have a low dependence on other country because the trade magnitude is low. Also, for a country with high trade magnitude, it might have low concentration of trade partners. Therefore, Armstrong (1981) came up with the indicator of trade dependence:

➤ ***TRADE DEPENDENCE (TD) = Trade Magnitude (TM) \* Commodity Concentration (CC) \* Trade Partner Concentration (TPC)***

This paper calculated the trade dependence of South Korea on China for year 1995, 2000, 2005, 2015 and 2019, covering a 25-year time range, to see the change of level of South Korea's economic dependence on China's economy. It also prepared the TPC and CC value of the United States to give a more comprehensive understanding of South Korea TPC and CC value in the world. Considering South Korea's effort of decreasing of its economic dependence on China in different time period, this paper will evaluate South Korea's outcomes in the empirical results and analysis sections.

## **VI. Empirical Results**

### **4.1 Descriptive Data**

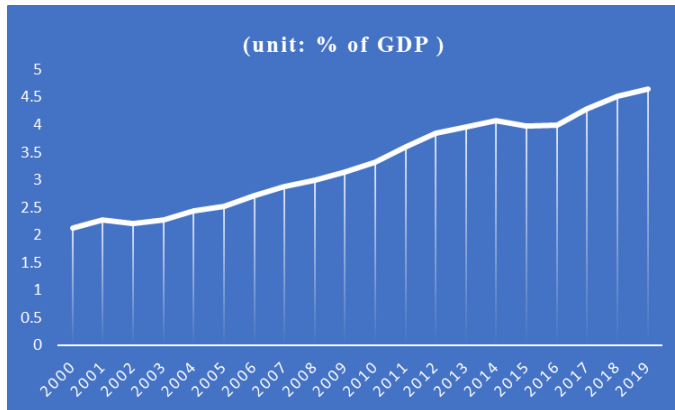
Started from USD 2.71 billion trade volume in 1970, in just five years, South Korea quickly grown its trade volume to USD 11.31 billion in 1974. The country kept this rapid trend of growth for almost two decades, until 1997, during which the Asian Financial Crisis hurt South Korea's economy a lot. As one of the results, South Korea total trade volume had an obvious decrease in 1998, as shown by the Graph below. Thus, South Korean government began a very aggressive approach to increase in its trade volume and to invite foreign direct industry for all industries (Cheong, 2006). The second downturn of South Korea total trade volume happened

during 2008, the Global Financial Crisis. As the country has become increasingly dependent on foreign trade, South Korea got an even sharper decrease of trade volume in 2008. Fortunately, the economic recovery of South Korea has been relatively quick this time partly because of South Korea's continuous effort to restructure its financial sector after the Asian Financial Crisis, so that trade volume grown back in a high speed. The third trade volume decrease happened during 2016, due to the global economic downturn, especially the weak demand and shrinking investment for South Korea's major traded product, semiconductor (Jung, 2019). During the same year, there was the THAAD deployment in South Korea, so this could also be one reason which led to the decrease of South Korea's total trade volume but not for sure. The analysis section will touch more from this perspective to see whether THAAD directly or indirectly reduce the trade volume of South Korea. The latest sharp decrease of South Korea's total trade volume was because of the COVID-19 pandemic, during which South Korea export plunged in the mid of 2020 at the fastest speed ever since the Global Financial Crisis (Roh and Kim, 2020).

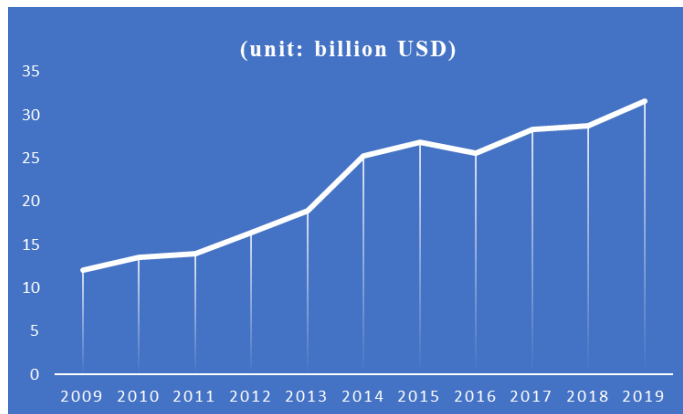
Since 2000, South Korea's Trade Volume as a percentage of its nominal GDP has been above 50%, despite several fluctuations. If consider the exports and imports separately, for most of time, South Korea export volume is slightly more than its import volume in the same year. For the general trend, in the first ten years of 2000, foreign trade rapidly grown its importance in South Korea's GDP, reaching 86.1% of South Korea nominal GDP in 2011. But from 2011 to recent years, foreign trade importance encountered some decrease, especially in 2016, reducing to a little

above 60% of South Korea's nominal GDP. Although in 2019 South Korea trade volume was at 63.7% of its GDP, a relatively low for the country, foreign trade still acted as a crucial part of South Korea economy compared with that of China, as China's foreign trade only accounted for less than 40% of China's GDP in 2019 (World Bank, 2021). Then, it would be useful to look at South Korea's export to China in the recent two decades. Accounted for only 10.7% of South Korea's total export in 2000, China became the largest importer of South Korea since 2003, surpassing both Japan and the United States. In 2018, China reached the highest percentage ever, in terms of its portion of South Korea's total export, at 26.8%. Although the pandemic crisis last year brought great challenges to the trade between South Korea and China, China still consisted 25.9% of South Korea annual total exports in 2020. As mentioned in previous chapters, technology has been a major traded industry between South Korea and China, South Korean government has also given great emphasis on South Korean domestic R&D. South Korea gross domestic spending on R&D as a percentage of its GDP increased more than two times from 2.12% to 4.64% (See Graph 1), indicating South Korea's enthusiasm of technology development. Following the rapid increase of R&D investment, South Korean foreign trade related to technology products and service has also increase for about 2.6 times (See Graph 2), increasing from USD 12.02 billion in 2009 to USD 31.63 billion in 2019.

**Graph 1. South Korea Gross Domestic Spending on R&D (2000-2019)**



**Graph 2. South Korea's Value of Technology Goods and Service Trade Overseas (2009-2019)**



Data Source: OECD

Technology industry is the most important trade industry for South Korea with no doubt. Based on the latest available data (2019) from COMTRADE, electronic integrated circuits and microassemblies were the largest traded product in South Korea, accounted for 14.6% of its total exported value. Then motor cars and other motor vehicles principally were the second largest traded product, composed 7.5% of the total. According to the latest report made by KITA, so far in 2021, South Korea top ten traded industries included semiconductor, automobile, ship building,

petroleum, synthetic resin, automobile parts, steel, display and sensor, wireless communication equipment, and computer. To give a more persuasive and straightforward explanation of why semiconductor and automobile industry can be regarded as two representative trade sectors in South Korea, the paper prepared this simple table below (See Table 2). “Export Value” presents the total value of trade made by semiconductor and automobile industry, and the second line, “% of Total Export” presents of the percentage which semiconductor and automobile accounted for South Korea’s total trade volume. The last line “Rank” shows the rank of semiconductor and automobile industry among all the traded goods, based on the trade volume.

Semiconductor industry can be seen as the strongest industry in South Korea, as it has been the No.1 exported goods for eight continuous years since 2013. Even before 2013, Semiconductor had been a crucial sector for South Korea foreign trade. As of 2020, Semiconductor composed almost one fifth of total South Korea export volume and composed more than double of the second traded goods, automobile. Automobile has also been a major industry for South Korea, which ranked from two to four among the top traded goods in South Korea during the past ten years.

**Table 2. South Korea Semiconductor & Automobile Industry Trade Performance (2010-2020)**

(unit: million USD)

Semiconductor (반도체)											
Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Export Value	50,707	50,147	50,431	57,144	62,647	62,917	62,228	97,937	126,706	93,930	99,177
% of Total Export	10.9	9.0	9.2	10.2	10.9	11.9	12.6	17.1	20.9	17.3	19.4
Rank	1	3	2	1	1	1	1	1	1	1	1
Automobile (자동차)											
Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Export Value	35,189	44,987	46,775	48,229	48,400	45,238	40,155	41,690	40,887	43,036	37,399
% of Total Export	7.5	8.1	8.5	8.6	8.5	8.6	8.1	7.3	6.8	7.9	7.3
Rank	3	4	3	3	3	2	2	3	3	2	2

Data Source: Korea International Trade Association (KITA), 2021

The brief overview of South Korea trade performances and its trade with China were provided to demonstrate South Korea's high level of dependence on foreign trade, and technology industry's importance to the country. Combining the preliminary finding based on historical data, the empirical results from Country Impact Index (CII) will give a more comprehensive measurement and creative predictions on China's economic impact on South Korea's economy.

#### **4.2 Country Impact Index (CII)**

There is no doubt that China became the largest trade partner of South Korea since 2004, so it is common for people to assume that China might bring the biggest influence on South Korean economy after 2004. Previous literatures have conducted different measurements to calculate China's influences on South Korean economy, but the results turned out that, China is important, but might not be as much important as we assumed, regarding its impact on South Korean economy, at least during mid-



2000s. Given Cheong (2006)'s calculation of China and the United States' CII to South Korea (See Table 3), it is surprising to see that, even though China became the largest investor and exporter of South Korea since 2004, the China's CII (2.81) in 2005 is only a little more than half of the CII of the United States (4.84) in the same year. Although this is not saying that South Korea has is more economic dependent on the United States than on China, it demonstrated US's dominance of South Korean economic growth during the mid-2000s. However, as Cheong emphasized, this CII calculation was based on data from 2005, which was just at the beginning of China's rapid development and the relatively early stage of China and South Korea's economic cooperation. Thus, Cheong noted China's increasingly tight trade relationship with South Korea and indicted a highly possible trend of rapid growth of China's CII to South Korea after 2005.

**Table 3. CII of the United States and China to South Korea (2005), in shares**

<b>CII Variables</b>	<b>Components of Variables</b>	<b>United States</b>	<b>China</b>
Markets	FDI Outflow (Stock)	0.26	0.24
	Exports	0.15	0.22
	Migration	0.30	0.07
Funding	Net Trade Surplus	0.46	1.00
	Loans	1.00	0.00
	Travelers-Inbound	0.09	0.12
	Travelers-Outbound	0.07	0.24
Resources	Imports	0.12	0.15
	Energy Resources	0.75	0.03
	Source of Guest Workers	0.01	0.57
Technology	FDI Inflow (Stock)	0.30	0.01
	Where Students Graduate	0.80	0.01
	Where Students Go to Study	0.53	0.15

Total		4.84	2.81
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Data Source: results adopted from *Impact of China on South Korea's Economy*, Cheong Young-rok, 2006; original data source from Korea International Trade Association (KITA), 2006

Though this paper eventually did not get access to the latest data of all components used in the CII measure, it gathered all available statistics in 2018 and made predictions of the CII's change from 2005 to 2018. Among the 13 components of variables involved in the CII calculation, this paper was able to gather eight factors (See Table 4); for the rest five unavailable factors, this paper put N/A instead.

Firstly, this paper only considered the CII results except those N/A variables. The partial CII of the United States to South Korea is only 1.49 in 2018, while the partial CII of the China to South Korea is 1.82 for the same year. For the *Market* variable, China had an overall increasing trend of the FDI Outflow (Stock), that is to say South Korean is doing more direct investment in China than in the United States. Also, South Korea has more exports to China than to the United States, and the gap of export volume between the United States and China is growing larger. For the *Funding* variable, the gap of share between the United States and China decreased but South Korea's trade with China still accounts more for South Korea total net trade surplus. The Travelers, both inbound and outbound, seems to have no big change for the United States, but South Korea is having more Chinese visitors. For the *Resources* variable, the United States remains at a similar level of share in 2018, comparing to that in 2005. However, China become more important for South Korea's economy as South Korea is importing more from China. Lastly, for the

*Technology* variable, the United States still accounts for around 30% of South Korea's total FDI Inflow (Stock); while China has increased from 1% in 2005 to 8.5% in 2018, in terms of its share of South Korea's total FDI Inflow (Stock). Besides, smaller portion of Korean students choose to go to the United States for study abroad, but a larger portion of South Korean students favors study abroad in China. This preliminary result is not surprising as South Korea and China indeed strengthened their economic relationship from various aspects, as illustrated in the literature review chapter.

Though CII results in 2018 indicated that China had more influence on South Korean economy, the finding was different if only considered the *Technology* variable. Indeed, the gap between technology variable of China and the United States' CII on South Korea reduced to 0.24, comparing to the value of 1.46 in 2005 (See Table 3&4). However, even after 13 years (2005-2018), China still had very limited impact on South Korea regarding its technology area. This result might be regarded as a supportive, not direct, evidence to proof H2 because China is showing less power and dominance in the technology trade with South Korea.

To make results above more persuasive, this paper considered the possible changes or influences which those N/A components might bring to the result above. For the *Migration* components, according to the Statistics Korea, marriage is the most common reason for migration, and marriage cases between China and South Korea is way more than marriage cases happened between South Koreans and Americans. So, this paper predicted that China might have increasing share for the

migration components. For the *Loans* components, it is actually interesting to find that South Korea's debt to GDP ratios in 2018 were relatively low comparing to that in 2005. Even if we cannot say *Loans* variable will definitely have less influence on the final result but there is possibility that *Loans* variable will bring less influence on the CII result in 2018 that it did in 2005. For the Energy *Resources* and *Source of Guest Workers*, this paper actually failed to any valid statistics for them. However, since in 2005, China has more share on Source of Guest Worker and the United States has more share on Resources, these two components might be able to countereffect their influences on the CII results, though this is only a proper guess. The last missing components *Where Students Graduate*, this paper also does not have any access to the data. Also, since the gap of share between the United States (0.80) and China (0.01) in this component is pretty big, this paper can hardly give a prediction on that, and prefers to leave this variable unknown.

**Table 4. Partial CII of the United States and China to South Korea (2018), in shares**

<b>CII Variables</b>	<b>Components of Variables</b>	<b>United States</b>	<b>China</b>
Markets	FDI Outflow (Stock)	0.15	0.04
	Exports	0.14	0.26
	Migration	N/A	N/A
Funding	Net Trade Surplus	0.37	0.53
	Loans	N/A	N/A
	Travelers-Inbound	0.06	0.31
	Travelers-Outbound	0.08	0.13
Resources	Imports	0.12	0.23
	Energy Resources	N/A	N/A
	Source of Guest Workers	N/A	N/A

Technology	FDI Inflow (Stock)	0.32	0.09
	Where Students Graduate	N/A	N/A
	Where Students Go to Study	0.24	0.23
Total (Except N/A)		1.49	1.82

Data Source: Korea International Trade Association (KITA), Statistics Korea, Korea Tourism Organization, Office of the United States Trade Representative, Korean Educational Development Institute (KEDI)

To combine those actual results and predictions above, China is having greater economic impact on South Korea in 2018 than in 2005. However, two weakness of this method should be aware. Firstly, because of the missing data, it is hard to say that China gained more economic dominance in South Korea's economic growth than did the United States. Secondly, since some components of variables (Travelers-Inbound, Travelers-Outbound and Where Students Go to Study) were not provided in continuous years, this paper failed to calculate CII change as a trend, but only two separate years. Therefore, it is significant to consider the possibility that CII might have big fluctuations during from 2005 to 2018. But overall, one thing for sure is that China decreased its gap with the United States, in terms of the economic impact on South Korea.

Next, this paper will present the empirical results of Trade Dependence (TD) to further prove that South Korea's trade dependence on China's market has increased tremendously in the past two decades and have no obvious trend of decrease these years.

### **4.3 Trade Dependence (TD)**

To gauge South Korea’s trade dependence on China’s market, the paper first calculated two indicators of trade magnitude (See Table 5). South Korea’s foreign trade importance has remained at a high level since 1995 and reached a peak in 2010, at 80.73% of its gross national product (GNP). But soon after 2010, the foreign trade importance to South Korea has been decreasing. In 2019, the indicator of foreign trade importance dropped to 59.87%, which is a little more than the 1995 level and even less than the 2000 level. However, South Korea’s trade with China experienced a relatively constant growth, despite the influences brought by South Korea’s foreign trade importance level. China has been increasing its share in South Korea’s trade during the past 25 years, from 6.21% in 1995 to 23.27% in 2019.

**Table 5. Trade Magnitude Indicators**

(unit: million USD)

Year	1995	2000	2005	2010	2015	2019
Total Export + Import of South Korea	266,453	332,759	545,581	891,589	963,243	1,046,019
GNP of South Korea	532,851.64	518,606.35	892,240.42	1,104,402.05	1,465,056.83	1,747,192.99
Indicator of Foreign Trade Importance	50.01%	64.16%	61.15%	80.73%	65.75%	59.87%
Total Export + Import of South Korea	266,453	332,759	545,581	891,589	963,243	1,046,019
Total Export + Import from China to South Korea	16,545	31,254	100,563	188,412	227,374	243,432
Indicator of Amount of Total Trade Conducted with Dominant Nation	6.21%	9.39%	18.43%	21.13%	23.61%	23.27%

Data Source: World Bank & Korea International Trade Association (KITA), 2021

Combining both indicators, the paper generated the Trade Magnitude (TM) value between South Korea and China (See Table 6). South Korea’s TM with China was very low during mid 1990s because of its low trade volume with China, but the

TM value double in just five years in 2000. This rapid growth trend suddenly stopped in 2015, during which South Korea's foreign trade importance consisted of a low portion of GNP. The TM value has stayed at a similar level since 2010 with a small decrease from 0.17 in 2010 to 0.14 in 2019.

The second factor influencing the South Korea's trade dependence on China's market is the Trade Partner Concentration (TPC). TPC value almost stayed at the same level in the past 25 years, ranging from 0.28 to 0.31. But for the overall trend, South Korea has been increasing its TPC, that is, South Korea is trading more with its large trade partners and depending more on certain major trade partners, such as China. Compared to the TPC value of the United States in the same period (See Table 5), TPC of South Korea remains at an overall higher level. What is worth mentioning in this discussion is that China, South Korea's largest trade partner, accounts for 25.9% of South Korea's total export volume, but the United States, its second largest trade partner, only accounted for 14.5%, a little more than half of China's share. Other South Korea trade partners all accounted for less than 10% of South Korea total export volume in 2020. However, large trade partners of the United States accounted for relatively similar shares of the United States total export volume. For example, China, Mexico, and Canada, as top three US trade partner, accounted for 18.6%, 13.9% and 11.6% of US total export volume, respectively.

The last factor, Commodity Concentration (CC), seemed to remain at a very constant level for South Korea, ranging from 0.28 to 0.31. However, CC of South Korea is actually high when compared with that of the United States (See Table 6&7).

CC of the United States were less than half of South Korea's CC. In other words, South Korea only focused on few kinds of goods for foreign trade, such as the semiconductor and automobile. According to KITA's 2020 report, as the largest traded industry of South Korea, semiconductor accounted for 19.4% of South Korea total trade volume, nearly three times of the second largest traded industry automobile, which only accounted for 7.3% of South Korea total export volume. Compared with South Korea, the United States has a more balanced distribution among its traded goods: top five of its largest traded industries all accounted from 3% to 5% of its total trade volume. Both the high level of TPC and CC indicated that if South Korea wants to find new trade partners, specifically, countries other than China, or substitute its traded commodities, specifically, semiconductor and automobile, it will face huge cost, comparing to countries with low TPC and CC index. One worth mentioning aspect of the CC results is that for all years calculated in this paper, most of the commodities were in technology industry, especially for more recent years. Except petroleum and resin related products are more on the energy industry, rest of the top 10 traded commodities were all in technology field. Therefore, CC results in this paper could be a good reflection of how much South Korean technology industry focused on certain products, such as semiconductor and automobile.

Finally, the Trade Dependence (TD) index of South Korea were generated based on TM, TPC and CC (See Table 6). South Korea's trade dependence on China increased quickly from 1995 to 2010, but this high rate of growth stopped in 2010,



followed by some decreases of the TD index from 2010 to 2019. Reducing its TD index with China from 0.01075 to 0.00976, South Korea achieved a decreased of 9.27% of its trade dependence on China. However, this does not necessarily mean South Korea has less economic dependence on China, because the reason that led to this decrease of TD is South Korea's total foreign trade importance indicator, instead of its trade volume with China (See Table 5). Two things can be told from the result of this measure is that 1) South Korea increased its trade dependence on China from 1995 to 2010 in a rapid manner; 2) South Korea did not have obvious outcomes in terms of decreasing its trade dependence on China from 2010 to 2019.

**Table 6. South Korea Trade Dependence on China**

Year	1995	2000	2005	2010	2015	2019
Trade Magnitude (TM)	0.03	0.06	0.11	0.17	0.16	0.14
Trade Partner Concentration (TPC)	0.28	0.29	0.29	0.29	0.31	0.31
Commodity Concentration (CC)	0.19	0.21	0.21	0.22	0.21	0.22
Trade Dependence (TD)	0.00162	0.00373	0.00685	0.01075	0.01002	0.00976

Data Source: World Bank & Korea International Trade Association (KITA), 2021

**Table 7. TPC and CC of the United States**

Year	1995	2000	2005	2010	2015	2019
Trade Partner Concentration (TPC)	0.27	0.29	0.29	0.26	0.27	0.26
Commodity Concentration (CC)	0.10	0.11	0.09	0.10	0.12	0.12

Data Source: Korea International Trade Association (KITA), 2021

## V. Hypothesis Test

South Korea has been aware of its high level of economic dependence on China many years ago and realized the potential risks if continuing the growth of this trend. As two countries are having even tighter trade relationship for technology industry, this chapter also focused on changes related to the technology industry. According to the quantitative empirical results in the last chapter, South Korea failed to achieve a fruitful outcome in terms of reducing its economic dependence on China's market. Before discussing why those measures failed in practices, this chapter will start by introducing what are some major efforts South Korea did to reduce its economic dependence on China's market and then analysis on the reason behind.

### **5.1 Internal Efforts**

Having a friendly and cooperative relationship for more than twenty years, Seoul raised special concerns regarding its economic relationship with China after the deployment of THAAD as well as the US-China disputes. It would be easier to understand South Korea government's concern when looking at other statistical data between the two sides: Besides the increase of trade volume between the South Korea and China, FDI also increased at an astonishing speed. South Korea increased its FDI in China from USD 0.14 billion in 1992 to USD 4.8 billion, while China increased its FDI in South Korea from USD 1.05 million to USD 2.7 billion. Moreover, the number of visitors travelled between the two countries has also increased exponentially: from 130 thousand people in 1995 to 8.8 million in 2018

(Han, 2018). This high level of economic dependence on China will eventually pose South Korea in a hard situation if China wants to use economic power to give pressure on South Korea's decision, just as China did during the THAAD disputes. According to the study conducted by Pew Research Center (2020), South Korean people's opinion on China changed a lot before and after the THAAD issue. Before 2016, especially in 2015, during which South Korea and China engaged in many cooperative activities as mentioned by the paper earlier in the literature review section, more than half of South Korean people vote favorable to China. However, the vote results substantially changed after 2016. More than 60% of South Korea people voted for an unfavorable impression to China, as China's economic retaliation hurt many sectors of South Korea's economy. In other words, receiving the influence brought by THAAD dispute, South Korea public had an overall tendency to decrease the country's economic dependence on China's market. Among different industries, South Korean technology industry acted most aggressive in reducing their dependence on China's market, at the same time, decreasing China's importance in the global supply chain.

The first attempt made by South Korea companies was to reduce their presence in Chinese market. In the beginning of 2000s, South Korea companies had great interest in China's market and South Korea companies open more than 20,000 of branches in China. Nevertheless, the annual number of cases of Korean companies having operations or branches in China decreased to less than 500 in 2018 China (Export-Import Bank of Korea, 2020). Especially after 2017, numbers of South

Korea companies started to prepare their lefts or at least decrease their presences in China's market. Instead, South Korea companies are targeting at a new region — Southeast Asia. Vietnam is a country which has been favored by South Korea companies and investors in recent years because of its manufacturing ability and relatively stable and predictable political status.

Samsung announced to close its TV production factory in Tianjin city of China and decided to move its TV production factory to Vietnam in November 2020. Even if Samsung is one of the world's top sellers of flat-screen TVs, it is still hard the company to directly face the intensified market competition in China's market, as Chinese TV production companies are having better techniques and higher qualities. Also, the increasing labor cost in China posed challenges to Samsung's profits. Even worse, boycott triggered by THADD deployment was almost a fatal blow to Samsung's sales in China. Other than the negative impact brought by THAAD dispute, US-China trade friction also acted as a significant factor which led the plunge of South Korean investment in China. Realizing that China is market has been very unstable and risky for South Korea companies, Samsung closed the Tianjin TV production factory, which has been set up since 1993, after closing its smartphone factories in both Tianjin and Huizhou earlier in 2019. Instead of struggling for its market hard in China, South Korean companies like Samsung have been growing their investments in Vietnam: Samsung's investment in Vietnam had a 26-fold increase from USD 670 million in 2008 to USD 17.3 billion in 2018. Besides, since Samsung is planning to build R&D center in Hanoi, South Korea

technology companies were not just seeing Vietnam as a production center but also a good place for its Asian research and development base (Ngoc, 2020).

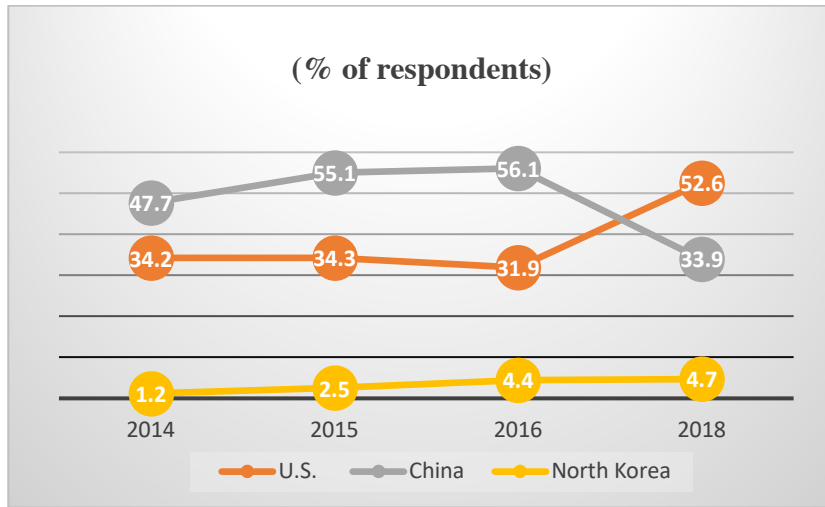
Samsung did not achieve all this new investment in one day. Actually, Samsung started to targeting Vietnam market several years ago. Back to 2018, Samsung has been investing Vietnam research and development enter as well as eight smartphone production factories. During that that, Samsung's investment in Vietnam created over 25% of Vietnam total export volume. In responding to South Korea generous investments in Vietnam, Vietnam government has also made commitment to smooth South Korea's investment to the country through policy tools. For instance, Samsung's TV production will be no longer recognized as manufacture goods but an "export processing enterprise (EPE)", which requires no import and export duties if 90% of the company's productions were used to export (Nguyen, 2020). Thus, Vietnam provides more attractive investment environment for South Korean companies and investors. If the production goes well in Vietnam, Vietnam will soon become the largest production base of Samsung outside South Korea. Later, when Samsung's Vietnam business has been developed to a certain extent, Samsung might be able to shapely reduce its dependence again on Chinese factories. More importantly, Vietnam can be regarded as a gateway for Samsung, or other South Korea technology companies, to access the Southeast Asia market. If things work out, South Korea will have more trade opportunities with countries like Singapore and Thailand, which have great economic power and potential globally, so that South Korea will be able to substantially reduce its economic reliance on China's market.

As many South Korean changed their target market from China to Vietnam, the gap between South Korea's investment in China and Vietnam has been decreasing in the past several years. By 2019, sales created by South Korea investment in China grown for a little more than 10% in a five-year period, but sales created by South Korea investment in Vietnam grown for 148.4% within just five years (Jung, 2019). South Korea has gradually become the one of the biggest foreign investors in Vietnam. Following Samsung's huge investment in Vietnam, more South Korean technology companies began doing investment in Vietnam. For instance, LG Electronics prepared billions of USD of budgets and set up new production house, which focused on TV and smartphone production, in Haiphong, a northern port city in Vietnam. These large Korean chaebols' bold investments in Vietnam encouraged other South Korean high-technology industries to participate in this trend. As South Korea's largest trade sector, many semiconductor and chip suppliers opened their factories in Vietnam subsequently.

Even if China has recently eased some economic sanction on South Korean companies and investors, the large scale of South Korean companies leaving China's market is unlikely to stop and those companies left China's market will hardly return to China's market again. That is to say, South Korea's economic dependence on China's market tends to decrease and economic relationship between the two sides will be less likely to return back to the previous peaceful environment in the future. According to a survey, responded by South Korean people, asking which country has greatest economic influence on South Korea's economy (See Graph 3), 47.7%

of South Korean people regarded China as the most important country for South Korea's economy in 2014 and this percentage increased to 55.1% in 2015 and 56.1% in 2016. Basically, more than half of South Korean people believed that China is the country which could impact the most on South Korea's economy. The result of this survey is also consistent with South Korea and China's economic relationship in 2015, during which numbers of cooperative policies were announced between the two. Even compared with South Korea's essential military alliance, the United States, which was regarded as most important by only 31.9% of South Korean people in 2016, China shown far greater presence in South Korean people's mind. However, after 2016, South Korean people changed their impression on China's economy. In 2018, only 33.9% South Korean thought China still obtained greatest power to influence South Korea's economy, and more than half of the nation believed the United States could bring more economic influences. According to another survey conducted by the same institution, in terms of South Korea's most important future partner, 32.6% of South Korean people named China in 2016 but this percentage decreased to only 22.3% immediately after the broke out of THAAD issue and is expected to decrease further in the future.

**Graph 3. Which Country is Most Important to South Korea's Economy (2014-2018)**



Data Source: The ASAN Institute for Policy Studies, 2018

Besides South Korean companies or individual's tendency to decrease economic dependence on China's market, South Korean government has also made actions to address the issue. Actively establishing Free Trade Agreements (FTA) with new trade partner has been the major movements for South Korean government. Partially implemented since 2019, South Korea's FTA implementation with a group of Central American countries finally went into the fully implemented stage. Starting from March 2021, Panama will start to follow the FTA, as it has completed with the domestic procedures. Early in 2018, South Korea, as one of Asian economic leading power, signed the trade pact with five Central America countries including Panama, Honduras, Nicaragua, Costa Rica, and EI Salvador. With the FTA, South Korea and the countries mentioned above, will lift tariff on more than 95% of the traded goods. With this agreement, South Korea will reach a higher level of shipments towards Central America countries, especially for automobiles and steel, which are most popular Korean made goods, as well as other high-technology products (Kang, 2021).



During Trump's presidency, the escalating tension between China and United States put South Korea in a very hard position. And the situation has even been worsened by the current pandemic issue. This is why South Korea reached other Asian countries such as Indonesia, Malaysia, and Philippines. Among them, the Comprehensive Economic Partnership Agreement (CEPA), an agreement similar to FTA but in a broader perspective, was signed between South Korea and Indonesia. South Korea is expected to interact with more Asian countries so that the country can keep its foreign trade in a more stable environment. Lastly, the Vietnam-South Korea FTA (VKFTA) has to be mentioned here because Vietnam has become a main country for South Korea investment as discussed earlier. Officially became effective in late 2015 after two years discussion along with eight rounds of talks, VKFTA built tighter connection between the two countries, cutting from 85% to 95% of imported tariff for goods imported from one country to the other. Even though South Korean government's efforts of decreasing economic dependence on China have only been partly mentioned here, it is for sure that South Korea government has a more ambitious plan for diversifying its trade partners.

To recover South Korea's decreasing volume of export because of the COVID-19 and worldwide trend of protectionism, South Korean government expects to strengthen trade relationship with existing trade partners other than China and reach more free trade deals with new trade partners in 2021. This can be proved by South Korean governments unremitting effort to negotiate with United Kingdom about the bilateral FTA in January this year. As the European continent has been a

great source of South Korea foreign trade, South Korea hope to maintain good trade relationship with the United Kingdom after the Brexit. With the settle down of its negotiation with the United Kingdom, South Korea is now under 17 free trade deals with more than 56 countries or regions, and more than half of South Korea's export can be attributed to those free trade deals. If South Korea's free trade pact with Japan can end up with a good result probably later this year, South Korean free trade partners will account for around 77% of South Korean foreign trade volume in the future (Kang, 2021).

From the analysis above, it seems that South Korea had tried really hard to explore new trade opportunities and thus South Korea is supposed to achieve a fruitful accomplishment in terms of decreasing its overly economic dependence on China's market. However, the reality does not go that way easily. One of the biggest obstacles here is that South Korea's investments on its new trade partners, especially Vietnam, were aimed for export purpose. Export volume of Vietnam not only depends on South Korea's investment, but also depends on other countries who imported Vietnam's goods. Put it in a clearer way, if imported countries decrease their demand for Vietnam's production, South Korea, as a major investor, will suffer at the same time. China, as the leading importer of Vietnam's goods, has the strong power to influence Vietnam's export volume. The escalating tension between the United States and China regarding the trade war has accelerated the spread of protectionism in mainland China. China tended to set more economic sanctions to protect its domestic industry, especially high-technology related sectors, which is

also the most heavily invested sector of Vietnam by South Korea. As trade between China and Vietnam is expected to become more important for Vietnam's foreign trade, South Korea's foreign trade can still be influenced by China to a large extent. Secondly, some developing countries like Vietnam could be hard for South Korea to cooperate with in some perspectives. For example, developing countries might not be as transparent as developed countries in terms of government bureaucracy, political structure, financial regulations and etc. Although Vietnam's corruption ranking only averages around 100 out of 180 countries from 1997 to 2020, South Korea might still find problems, such as information asymmetry and unethical conducts, when partnered with Vietnam. Besides developing trade partners like Vietnam, South Korea also face challenges when cooperating with the developed world. South Korea is not the only country that wants to expand foreign business on the European continent. As one of the top global destination of foreign trade and investment, Europe has huge market potential which attracts many strong economies around the world like China and the United States. Although South Korea is a very competitive player in globally, there is still a long way to go if South Korea wants to gain larger market share in the European market because South Korea does not have many crucial and close military, political or security ties with European countries. Finally, even if South Korea's plan of diversifying its trade partners goes well and more FTAs will be made in the near future, that does not necessarily mean that South Korea will soon decrease its economic dependence on China's market. Diversifying the trade destination of South Korea cannot be achieved overnight: since China's

market accounts for such a large portion of South Korea's foreign trade volume, South Korea's shift will only be able to move slowly.

Some other efforts to decrease economic dependence on China's market were also conducted in South Korea but few of them had actual impacts. One example to mention here is South Korean government has been encouraging South Korean multinationals to relocate their foreign factories or branches, especially those in China, back to South Korean continent. According to the report provided by Korean Institute for Industrial Economics & Trade data, only less than 100 out of thousands of South Korean companies moved part of their China's production back to South Korea from 2014 to 2020. Some more companies might be willing to consider reduce its production in China but moving back to South Korea is an unfavorable choice for them. This is because South Korea requires high production cost domestically and regulations in South Korea is stricter than those in foreign countries. Currently salary level for South Korean workers could be several times higher than workers doing the same work in China and Vietnam. Comparing to large potential of foreign market as well as support provided by foreign government, business environment in South Korea seems impossible to attract South Korea multinationals' re-shoring. Overall, South Korean internal efforts to decrease its economic dependence on China's effort have made some preliminary attempts but can hardly be regarded as fruitful or effective considering its current outcomes. This finding is also consistent with the H1 posed by this paper as well as the change of Trade Dependence (TD) calculated in the previous chapter. More complex

obstacles and limitations are still awaiting to be solved by South Korean government and investors and therefore, reducing the economic dependence on China's market though South Korea's internal approaches might be extremely difficult to achieve in a short-run.

## **5.2 External Pressure**

South Korea is of course a country who almost urgently hopes to decrease its economic dependence on China's market, but there are actually other global economy leading countries which are more than happy to see South Korea cooling down its economic relationship with China: The United States might be the country that is most glad to see South decreases its economic dependence on China's market. Trade war between the United States and China led both countries to increase their tariffs and to implement stricter trade regulations when trading with each other. In order to protect their own benefits, both the United States and China has taken actions. Chinese government and social media have been widely promoting the protectionism so that Chinese people will consume more domestic goods and less foreign goods. The United States has been doing the same thing as China did. Among numbers of those newly designed trade regulations, the United States' restriction on Huawei is the one that influenced not only the trade between the United States and China, but also heavily affected the trade between South Korea and China. In 2019, former president of the United States, Donald Trump signed a document to prohibit

American firms from trading with overseas telecom companies which might bring potential risks to the national security of the United States. Following this document, Huawei become a blacklisted company for American firms and indeed, the United States government was trying to block all types of trade involved Huawei products. As Huawei has a huge market share not only in the United States but also in many other countries which have close alliance with the United States, either economically or politically. Major alliance of the United States including Canada, the European Union, Australia were all urged by the United States to stop using Huawei's products for 5G network services. And later, countries and regions like South Korea and Taiwan, two world-class leading semiconductor manufacturers, were also invited to join this campaign to block Huawei from their businesses.

Ending the business relationship with Huawei will for sure bring some economic losses to countries like Canada or Australia, but not as huge as the loss that South Korea will face if the country chooses to block its trade with Huawei. As demonstrated in the previous chapters, semiconductor is the most important trade industry for South Korea without doubt. The money generated by South Korean semiconductor industry accounts for a considerable portion of its total trade volume and Huawei, is among the top buyers of South Korean made semiconductors. If South Korea end its trade with Huawei, that means the largest semiconductor companies in South Korea such as Samsung and SK Hynix might lose their largest customer. Take an example of SK Hynix, China's demand alone can account for almost half of its total sales volume; for Samsung, Huawei is also its top five buyers.

The worst thing is that South Korean semiconductor and related high-technology companies including both those leading players like Samsung, SK Hynix, LG Electronics, and some small manufacturers all have their production factories in China. That is to say, if South Korea implement unfavorable policies towards Huawei or other Huawei related affiliates, Chinese government may start the economic retaliation again, as it did during the THAAD dispute, to give pressure or restriction on China-based South Korea factories. In this situation, South Korea was really caught in the middle, and had no choice but to be extremely careful when dealing with Huawei related issues.

At first, blacklisting Huawei by the United States was expected to bring huge effects on South Korea's trade with China because South Korea might be forced to trade less with major Chinese technology company, Huawei. However, it seems that this impact has not yet shown up, considering the following trade volume of technology industries between South Korea and China. One anecdote good to be mentioned here is that right after the United States' announcement of its decision to block Huawei, a group of South Korean investors and politicians visited Shenzhen China to see its technology development on the 5G network services, robotics, smart city and etc. This communication between South Korea and China was even planned by South Korea in order to stabilize its economic relationship with China. Despite the United States continuously asking South Korea to join this boycott of Huawei, South Korea business and political executives mentioned that they found some possibility to trade with China as they did before through some alternative ways

(Park and Yang, 2019). According to the regulation refined by the Commerce Department's Bureau of Industry and Security in May 2020, the United States will ban all kinds of supplies of semiconductor related production to Huawei, if that production involves US technology. Therefore, South Korea semiconductor manufacturers have to apply for licensing waiver from the United States government to legally support semiconductor to Huawei and its affiliated technology companies in China. After a further restriction made by the United States government in August 2020, it seems harder and harder for South Korean companies to get approval from the United States government to provide semiconductor productions to not only Huawei, but the whole mainland China. As a result, South Korean companies will face more procedures before trading with high-technology companies in China and they will also need to do a more thorough research on the export destination of their semiconductor production. These difficulties will certainly lead higher cost and hurt South Korean companies' profits at least in a short term. However, if consider this trend in a long run perspective, South Korea might find new trade partners and gradually replacing China's importance in its semiconductor foreign trade business. This long run perspective also leads some Korean commentators pointed out that the boycott of Huawei led by the United States could actually benefit Samsung Electronics in some perspectives. Huawei has been a very strong player in the 5G network service market and was also the first mover in this market, followed by Samsung and other technology companies. But in the first quarter of 2019, Samsung gained a larger market share than did Huawei, and thus Samsung could gain more



control of the global 5G network as well as the smartphone market. If so, boycott of Huawei might act as a factor to bring South Korea companies to a more profitable level and with more diversified trade partners. In this way, South Korea has the possibility to reduce its economic dependence on China's market at a lower level. Nonetheless, some Korean commentators Ju-min Park and Heekyong Yang (2019) still believed that the benefit brought by the United States' boycott of Huawei to South Korea will eventually be outweighed by the loss of trade volume with China's companies.

Before Trump's regulation on semiconductor export moved into effect in September 2020, South Korea had no sign of decreasing its semiconductor export to China. Instead, there was a great increase of semiconductor trade between China and South Korea as the semiconductor trade volume of the first nine months in 2020 has increased by 7.8%, comparing to that in 2019. Though South Korea had some difficulties in trading with its largest semiconductor buyer China since mid-September, the total exported value of South Korean semiconductor in 2020 was around USD 99.2 billion, increased by about 6% from the total exported value in 2019. Also, although South Korea's total export value to China has decreased from USD 136 billion in 2019 to USD 132 billion in 2020, China's share of South Korean exports has increased from 25.1% in 2019 to 25.9% in 2020. The key point here is that South Korea's increasing trade with China in 2020 was not because of other industries' trade growth compensating the hard time for the semiconductor industry. Instead, it is South Korea's semiconductor export growth that led the total exports to

reach a 6.9% higher level in 2020 than 2019. South Korea's latest economic recovery from COVID-19 might also be regarded as an indirect effect of its rebounded export volume of semiconductors.

This phenomenon in South Korean semiconductor industry seemed to be a rare case when considering China's economic retaliation and China's growing trend of protectionism. As China has been disappointed by South Korea's close tie with the United States and China has been trying to protect its domestic industries, only South Korea's willingness to trade with China will hardly be able to maintain its export volume to China and meanwhile, achieve such a high volume of semiconductor trade between the two sides. That is to say, the continuously increased trade activities between South Korea and China can also be attributed to China's increasing demand of semiconductors in recent years. Huawei might have a hard time under the trade restrictions, but other China's high-technology companies could quickly occupy the market. It is the same case happened during THAAD: many Chinese companies ended their business relationship with South Korean companies and some South Korea chaebol were also affected by China's economic backlash. However, in 2017, the total bilateral trade between South Korea and China increased for around 15%. The growth of semiconductor industry alone, would be able to account for all other losses encountered by South Korea during the THAAD disputes. In other words, China's economic retaliation is highly selective (Lim, 2019). Chinese government mainly protected industries which have advanced development or at least similar development level as its South Korean competitors. For example,

Chinese people boycotted Lotte Mart without any concern because China has many domestic supermarket franchises, so Lotte Mart was more likely to be regarded as a strong competitor of its domestic supermarket industry. It is the same for South Korea tourism industry: Chinese people have a lot of choices other than going to South Korea for their vacation and government policy of restricting group travels to South Korea will not cause any big loss or problem for China's economy. Indeed, China's reactions to different South Korea industries are so polarized that China can disrupt some industries to a large extent but keep some industries untouched.

When China tends to pose a general economic retaliation on South Korea's economy, the influence on each sector is not uniform. High-technology industry such as semiconductor has a unique position which might be irreplaceable in a short run for China. The fundamental reason behind this phenomenon is that China is highly dependent on foreign technologies. Looking back to 2006, Chinese government revealed that China's foreign technology dependence exceed 50%, that is to say more than half of China's technology production relied on foreign imports (Cheng, 2006). That was a period of time during which only three out of ten thousand of companies in China has their independent intellectual property rights. In order to quickly catch up the developed world, China has been actively seeking for more technology supports. In the past ten years, China has made great achievement in terms of its domestic technology development, but many key inputs of China's high-technology productions were still relied on foreign technologies. South Korea, both a close neighbor and a world leading semiconductor producer, has therefore become an ideal

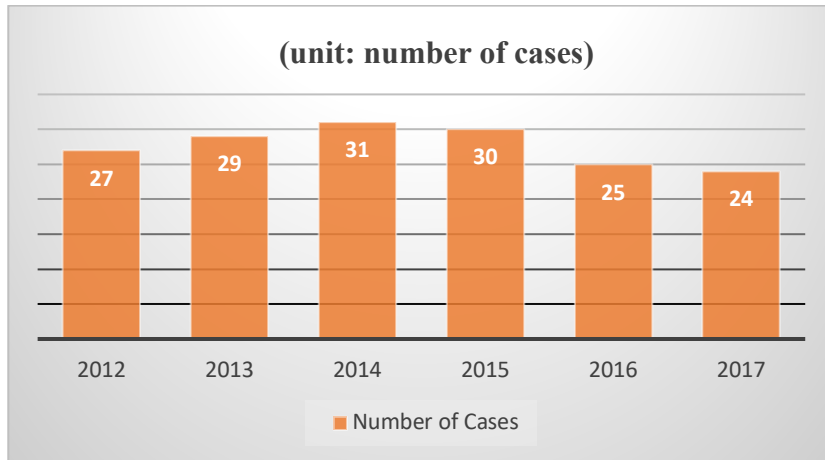
trade partner for China's high-technology industry. As time goes by, imports from South Korean semiconductor companies have gradually become a crucial link for China's high-technology industry production. Nevertheless, aiming to become a global superpower, China is not satisfied with its technology development so far, especially for the high-technology sector related productions like the memory chips and so on. In addition, the current intensified political and economic conflicts between South Korea and China, as discussed earlier in this paper, are actually signals of an unstable trade relationship. Therefore, just as South Korea government actively encourages South Korean companies to decrease their economic dependence on China's market, Chinese government warns Chinese technology companies to decrease their foreign technology dependence and prompt them to address the localization of technologies.

China's ambition to turn the country into a superpower has been greater than any other country before, and its enthusiasm for cutting-edged technologies has been enormous. Thus, concerning the United States aggressive attempts to hinder Chinese technology development, Chinese government focuses on domestic innovation, gives huge budget on domestic technology development, and tends to make Chinese technology industry more self-sufficient. However, technology development is not something that can be achieved overnight, especially under the interferences from United States. Compared to solely emphasizing on domestic research and development centers, China wants to gain key technologies in a faster way, as

technology development is essential for a country's global competitiveness. That is how the technology leakage issue raised between the two sides.

Before analyzing China's attempts to obtain South Korean key technology skills, it would be informative to look at South Korea overall industrial technology leakage situation in general. South Korea technology development has unprecedented achievement in the past several decades. As the country grown into a major semiconductor factory around the world, many countries became curious about South Korean technologies in industries such as semiconductor, electronics, and shipbuilding. As a result, South Korea became an attractive target for countries seeking for rapid growth, such as China, for its leading capabilities in the high-technology industry. The number of industrial technology leakage case from South Korea to foreign countries (See Graph 4) has been pretty high in the past ten years, especially for 2014 and 2015, during which the number of industrial technology leakage hit at least 30 cases annually. 2014 and 2015 were special years for China and South Korea because the economic relationship between the two countries were the closest. After 2015, although the number of leakage cases happened per year decreased to around 25, there were still no sign of an obvious decrease in the future.

**Graph 4. Industrial Technology Leakage Overseas Cases in South Korea  
(2012-2017)**



Data Source: National Industrial Security Center (NISC) of the National Intelligence Service (NIS) in South Korea, 2017

China basically employed two ways, a benign approach and a nefarious one, to obtain South Korea key technology skills (Ge, 2021). The major way for China to learn from South Korean technology is to hire skilled South Korean engineers, in other words, acquiring migrating engineers. Chinese technology companies provide very alluring work conditions to attract South Korean engineers. Usually, Chinese employer will cover South Korean engineers' living expenses and even provided good housing and their children's education fee. Moreover, the salary level of South Korean engineers in China can be more than double of the salaries received by engineers who work for South Korean companies. Providing these tempting conditions, Chinese semiconductor related companies started to widely advertise their position available in South Korean job-hunting platforms. According to Japan's Nikkei Financial News, BOE Technology, a leading Chinese display manufacture, recruited around 120 South Korean engineers. Among these hired Korean engineers, about 50% of them had previous work experiences at Samsung and were familiar

with South Korean OLED screen technology. Another example showing China's rampant hiring is that the one patent recently filed by China's Semiconductor Manufacturing International Corporation (SMIC) had more than 60 South Korean engineers involved. China's hiring of South Korean engineer is quite debatable because China is not hiring South Korean engineer for as normal employees but as a two-year contract worker. That is to say, after learning the essential knowledge that South Korean engineers have, some China companies will immediately end their contracts with Korean engineers and find for new engineers in Chinese companies' unknown fields. A sad fact for South Korea technology is that the hiring strategy is only a small part of China's attempts to obtain South Korean technologies. Instead, corporate espionage became a more urgent issue for South Korean high-technology industry. China now prefers to directly buy technology secrets from former employees at South Korean major technology companies like Samsung and thus it is common to see from news that South Korean engineers were arrested because of illegally leaking South Korean top technology trade secrets to China. What is worse for South Korean technology industry is that Chinese hackers are trying to get access to South Korea key technologies at the same time. Based on National Intelligence Service (NIS)'s report (2015-2019), 83 out of 123 technology leakage cases happened in South Korea involved China's presence. To sum up the factors mentioned above, China can be regarded as the biggest threat for South Korean technology industry in almost all aspects. In order to protect South Korea trade secrets, as to maintain South Korea's leading position in the global high-technology

industry, South Korean government gives heavier punishments and penalties for technology leaks and South Korea technology companies are also trying to strengthen their security protections.

Despite these disputes happened in between the trade of South Korea and China, China's foreign technology dependence forced China to keep its trade with South Korean companies, especially for the technology industry, which is also the largest traded industry between the two countries. Even if the United States' regulation on semiconductor trade poses such a strong external pressure to the trade relationship between South Korea and China, it can hardly decrease the trade volume happen between the two sides in a short run. Then, it is now good to tell that the H2 posed in the methodology chapter is verified to be true because South Korea's high level of trade dependence is not only because that Korean companies refuse to give up profits in China's market, but also because China does not want certain major Korean industries, such as semiconductor, to leave China's market. The next chapter will provide two short cases studies happened in recent years to give a more comprehensive verification of both H1 and H2.

## **VI. Case Studies**

### **6.1 Hyundai & Kia's Investments in China**

Recent disputes have decreased South Korean companies' tendency to collaborate with Chinese companies or investment in China's market, but this does



mean that South Korean companies totally gave up the profitable market in China. Indeed, as mentioned in the literature review chapter, Hyundai & Kia both suspended some of their plants in China in order to save unnecessary cost under the COVID-19 situation. However, Hyundai & Kia still prefers to keep their business in China. In March 2021, Hyundai & Kia announced that they will target a 23% increase of sales in mainland China. Hyundai & Kia are expecting a sale over 800 thousand vehicles in China this year, nearly 200 thousand vehicles more than 2020. To cater Chinese customer's tastes, Hyundai prepared the second generation of Mistra, which is exclusively designed for Chinese customers, hoping this new car model could attract more buyers. At the same time, Hyundai is thinking to launch the IONIQ5, an all-electric model in China, probably later this year. Kia also plans for new launchings in 2021 to gain more market share in China's recreational vehicle markets (Choi, 2021). These actions were all showing that South Korean automobile companies still care about China's market, and they are reluctant to leave China's market without regret. Although Chinese customer's attitude towards South Korean products after THAAD disputes has largely hurt South Korean automobile manufacturers' enthusiasm in China's market, major South Korean automobile companies like Hyundai & Kia are still trying to recover their sales back to their previous sales volume in China's market before THAAD. As China's economic recovering from the pandemic crisis is faster than other countries, Chinese customers are more likely to have growing demand for automobiles. Therefore, it seems possible for Hyundai & Kia to achieve their sales goals in the end of this year.

Other than making effort in sales of traditional vehicle types, Hyundai is open to new investment opportunities in China. Early this year, after reaching the final contract with the government of China's south province of Guangdong, Hyundai officially announced to build the hydrogen fuel cell system production plant in China, as its first foreign plant of this type. Hyundai is intended to occupy the hydrogen vehicle market in China, which is also the largest automobile market in the world. As Chinese government is also promoting this kind of vehicle, aiming at providing one million hydrogen-powered vehicles in next 15 years, Hyundai is highly likely to gain success in its new investment in China's market. One thing to point out here is that Hyundai & Kia's decreased sales in China after THAAD were highly related to government's propaganda and government-controlled social media platforms: vast spread of protectionism in China were most effective on Chinese social media apps such as Weibo. In other words, if this time Chinese government is providing support for Hyundai's access to China's market, Hyundai might have a high possibility to gain profits. Actually, the overall South Korean automobile industry does show an obvious trend of recovery: South Korea's 2021 export volume for the automobile sector for the first quarter, almost reached USD 12 billion, which is around one third of South Korean annual total export volume for automobile industry in 2020.

It is also important to notice that comparing to several years before when South Korea and China's economic relationship was relatively stable, Hyundai & Kia stopped large investment in China's market and only left those necessary

productions and investments with huge profit potential in China. Just like Samsung moved some of its plants to Vietnam, Hyundai & Kia are moving some of their plants to India as to gain some market share in Southeast Asia. Same as the reason mentioned in the analysis part, Hyundai & Kia want to explore other newly emerging markets in Asia and to establish good relationship for its future global business development. In general, South Korean companies will not completely leave China's market and will still be interested in investing potential industries in China. However, South Korean companies indeed has more tendency to scale down their operations and productions in China, at least to a level which will receive less economic impact from China. In this way, some South Korean investments leave China's market but at the same time, some new investment inflowed. Therefore, it is hard to see an effective decrease of South Korea's economic dependence on China's market.

## **6.2 Wise Road Capital's Buyout of Magnachip Semiconductor Corporation**

One of the major reasons that South Korea failed to decrease its economic dependence on China's market is that China has great technology dependence on South Korea technology industry, which is also the largest exported industry of South Korea. Just as South Korea wants to decrease its dependence on China, China also wants to become more independent in the technology industry. Besides general trade with South Korean companies and some hiring strategies discussed in the

analysis chapter, China is trying to own some high-technology companies in South Korea — the most recent case should be Wise Road Capital’s Buyout of Magnachip.

Magnachip is both a designer and a manufacture of South Korean semiconductor industry which provide extensive services for a wide range of technology industries including communications, industrial, automobile and etc. Magnachip is not only served for domestic needs but also trade a lot with foreign buyers. The company has been established for more than 40 years so that it has sophisticated experiences in design, manufacturing of semiconductor, at the same time, the company has a large number of experienced experts in the semiconductor field. According to the data provided by Omida (2020), Magnichip accounted for 33.2% of market share in the OLED DDIC industry, as the second largest world OLED supplier, right behind Samsung’s share. Its OLED DDIC products are also provided for major South Korean technology companies such as Samsung and LG Display. And meanwhile, Magnachip is having rapid growth in the past four years: sales of its major chip products have increased more than 100%. On the other hand, Wise Road Capital, as a Beijing-based investment company, is actively seeking for opportunities in the semiconductor industry. Looking at Wise Road Capital’s deals in recent decades, most of them were focused on the high-technology industry, especially the semiconductor area. Certainly, the plan to buyout Magnaship can be regarded as a big step Wise Road Capital made in 2021.

With the definitive agreement reached in March 2021, all shareholders of Magnaship will receive USD 29 in cash from Wise Road Capital for each share they

held in Magnachip's common stock. Providing the best available offer for Magnaship, Wise Road Capital will need to pay an equity value around USD 1.4 billion. Even the CEO of Magnachip said that this agreement favored most stakeholders' interest, as well as customer and employee's benefit. Moreover, this deal will accelerate Magnachip's own technology development for new semiconductor products. Regarding this deal, South Korean technology companies has worried a lot because they think China's buyout of Magnachip will lead China to become more competitive in the OLED industry. As Magnachip's main product, OLED DDIC involves many cutting edged techniques, there is high possibility that top technology secrets will be passed to Chinese technology companies and thus bring potential threat to South Korean technology industry. Indeed, as estimated by many Chinese technology experts, Wise Road Capital's buyout of Magnachip will largely benefit China's development of the OLED product, especially under a time when global chip supply is in short. As previous deals reached by Wise Road Capital has prompted China's technology development, Chinese technology companies also have a high expectation for Wise Road Capital's deal with Magnachip.

However, the finalize of this deal is still under process. The key point of this deal is that whether or not South Korean government will allow China's buyout of Magnachip. As semiconductor is a core South Korean industry, any deal with foreign countries needs the approval from several different South Korea government authorities. Some Korean commentator said as China is trying to improve its DDIC and related semiconductor development, South Korea government might be very

cautious when deciding whether or not to allow the transaction. But there are some other South Korean commentators believed that although South Korea is a leading country for DDIC related technologies, but DDIC technology is not under official government protection and Magnachip's production process might be outdated. Therefore, South Korea government has high possibility to pass this deal. Compared with DRAM technology and other memory chip development, DDIC is not as important as the former ones to South Korean technology industry. That is to say, Wise Road Capital's buyout of Magnachip is very likely to success later this year.

Despite the fact that DDIC is not an extremely crucial sector for South Korea, China is expected to gain great benefit if the deal is finalized. In addition, this might also lead to an increase of the trade between South Korea and China, for the technology industry particularly. To some extent, China's technology dependence on South Korea might be larger factor to cause South Korean's increasing economic dependence on China's market, than the factor of South Korean companies' interests in China's market. This is because South Korea, as discussed earlier, has many potential trade partners, especially in Southeast Asia. Once South Korea developed a relatively mature market in Southeast Asia, South Korea companies are highly likely to move their productions in China as much as possible. Nevertheless, China does not have any world leading semiconductor companies so far, and most Chinese technology companies depend on imports from South Korean semiconductor companies. As the United States posed more restrictions on trade with China, China does not have many choices of trade partners. Previously, Taiwan, as an Asian

manufacturer with strong semiconductor production capability, was an alternative trade partner for mainland China. However, Taiwan Semiconductor Manufacturing Company (TSMC), a world-leading semiconductor chip manufacturer, is now also under control by the restriction posed by the United States. Basically, Taiwan semiconductor companies now have to do the same thing as South Korean companies do, in order to trade with Chinese buyers. The complex trade process including research and applying licenses truly made the trade between Taiwan and mainland China become tougher. In other words, China seems to have less choices but to keep the trade relationship with South Korea goes on within the high-technology industry.

## **VII. Conclusion**

The economic relationship between South Korea and China has become tighter since the two countries established official diplomatic relationship in 1990s. The strengthening of the two-side relationship went rapidly from 1995 to 2015 but suddenly stopped after the breakout of THAAD's deployment and US-China trade dispute. However, the problem for South Korea is that, at the time of 2015, South Korea, an export-driven country, has already built a close relationship with China and has a high level of economic dependence on China, especially the technology industry. This economic dependence is measure by two factors: China's impact on South Korea's economic growth and South Korea's trade dependence on China's

market. The empirical results gave a clear indication that South Korea is having great economic dependence on China. The worst thing is that even if South Korea government noticed that South Korea's high level of economic dependence on China might bring huge economic risks to South Korea whenever the two-side relationship gets worse, it is tough for South Korea to effectively decrease its economic dependence on China, at least for now.

South Korea government, leading companies as well as individual investors are all aware of the economic dependence issue, but their actions or plans to decrease South Korea's economic dependence in China's market is not very efficient or at least needs a longer time period to show practical effects. For example, South Korean major technology companies need time to find new trade partners and develop new foreign market after building a more stable relationship with those new trade partners. As South Korea and China's deep economics relationship had taken decades to reach, a new firm economic relationship will also need more time to achieve. And meanwhile, as most South Korea potential trade partners are in Southeast Asia, such as Vietnam, South Korea will have a harder time to trade with him not only because of the geographic distance but also their untransparent government regulations or so on.

Another important outcome of this paper is to understand that South Korea had a hard time decreasing its economic dependence is not just because South Korea companies are greedy but also China needs South Korean technologies to develop China's global competitiveness. As many high-technology productions in China



need South Korean made chips, China has to import a large amount of chips and related production from South Korea. After the United States put more restrictions on trade with Huawei, China has less choices of trade partners and further increased its trade volume with South Korean technology companies. Recently, Chinese companies were also actively seeking for investment opportunities in South Korea technology as well. This is why this paper believes that the process of South Korea decreasing its economic relationship in China might take “forever”. Although the word “forever” could be too exaggerate here, the above process indeed needs more time to verify its actual results.

South Korea should now focus on diversifying its export market in order to minimize the effect brought by the increasing protectionism rose after the US-China trade disputes and to prepare any possible economic retaliation from China, like the one China did right after the THAAD’s deployment. The new president of the United States Joe Biden has an obvious intention to invite South Korea to join its Quad allies and thus gather more countries to prepare for China’s growing ambition. Some people believe it’s better for South Korea to have a clearer position in the US-China disputes so that South Korea will not lose trust from both countries, but there are also people who think South Korea should be more careful when dealing with problem involving the United States and China. No matter which side will South Korea choose in the future, one of the important missions for South Korea to make its economic structure more diversified and decrease its economic dependent from both the United States and China.

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