Chapter 5 Changes in Trade and Economic Structure during the Past 25 Years: Have Green Growth, Low Carbon Strategies Made a Significant Impact in Northeast Asia?

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Abstract

This chapter made an empirical analysis on the change in the trade structures of environmental and pollution-intensive industries in Northeast Asia during the last 25 years. Both industries in South Korea and China have shifted to more export-oriented, in part due to China's accession to the WTO. Green growth strategy has significantly increased export of goods related to renewable energy in South Korea while has ambiguous trade impacts in China. While Japan has been net exporter in both industries, its export surplus in environmental industry decreased gradually, implying Japan receives side effects of green growth strategy in South Korea and China.

1. Introduction

Export-oriented growth has been an engine of economic growth in Northeast Asia since the late 1980s. International trade in the region has significantly increased in the decades since then (Table 5-1). Governments have often made selective interventions to foster specific industries through targeting and subsidizing credit that was clearly linked with specific export performance, making public investments in applied research, and sharing a wider range of information between the public and private sectors (World Bank, 1993). Countries also offered preferential measures to attract foreign direct investment. These measures accelerated export growth and increased per capita income. However, the current export-oriented growth has increased emission of untreated air and water pollutants and generation of solid wastes. In response, countries have gradually begun implementing stringent environmental regulations since the 1990s.

<Table 5-1 around here>

Stringent regulation, however, may impose too much cost on pollution-intensive industries and lead to the pollution haven effect. This effect occurs when a tightening of environmental regulations in one country deters exports (or stimulates imports) of dirty goods (Taylor, 2004) from other countries where environmental regulations are not as tight and industries are not required to reduce emissions (Mani and Wheeler, 1998). For example, the United States and Japan likely generated such an effect in Latin American and East Asia, respectively, during the period from 1960 to 1995

(Mani and Wheeler, 1998). East Asia, especially China, has increased inclusive carbon emissions and water consumption since 1985 to satisfy the import demands of the United States and Japan (Shimoda et al., 2009).

In response to increasing global concern about climate change and the emerging global climate regime, coupled with the 2008 global economic crisis, South Korea and China began to frame climate management as an economic opportunity. They regarded renewable energy as a strategic industry and made selective interventions to foster related industries by targeting and subsidizing credit through a green growth and low carbon strategy. Using this support, several wind turbine and solar photovoltaic cell manufacturers became world leading companies.

This chapter aims to explore how stringent environmental regulations and implementation of green growth, low carbon strategies in Northeast Asia have affected international trade, with a special focus on the impact on environmental and pollution-intensive industries since the 1990s. First we give definition for such "environmental" and "dirty" industries and provide an overview of our analytical methodology in sections 2 and 3. Then, in sections 4 and 5, this chapter explores the changes in production and trade for these industries in Japan, South Korea, and China.

2. Definitions of Environmental and Dirty Industries

2.1. Environmental industry

Along with the progress in international negotiations regarding climate change, the recognition of environmental goods (i.e., products from the environmental industry) as important factors in mitigating climate change has led to a growing controversy about the scope of the 'environmental industry,' and policies such as more favorable tariff treatment for environmental goods in international organizations such as the OECD and APEC (Steenblik, 2005: 3). In international trade negotiations by such agencies, the existing classification of goods used to account for the tariff on each product is also applied to environmental goods. Countries trading in environmental goods have compiled lists of goods to define them as such, but definitions are still far from complete and controversy remains between member countries. The OECD prepared its first report regarding the environmental industry in 1992 and has discussed the issue continuously. OECD/Eurostat (1999) attempted to define the environmental industry and classify goods and services into the following three main categories: pollution management,[1] cleaner technologies and products,[2] and resource management (OECD/Eurostat, 1999).

APEC has also discussed the issue since 1995 and members have repeatedly nominated definitions of environmental goods (Steenblik, 2005). In September 2012, the 20th APEC economic leaders' meeting agreed on a list of 54 products that could be classified as environmental goods (APEC, 2012).

In this chapter, the two lists are referred to and defined as environmental goods (produced by environmental industry). As a result of the trade data collection methods for product codes included in the two lists, data are only available for 186 codes in UN Comtrade (see Appendix). In the following, trade data of environmental goods means the data of those 186 goods.

2.2. Dirty industries

Mani and Wheeler (1998) defined dirty industries as those that have incurred high levels of abatement expenditure per unit of output in the United States and other OECD economies, based on Hettige et al (1994). For analytical purposes, however, they selected industries that rank high on actual emissions intensity (emissions per unit of output), namely, iron and steel, nonferrous metals, industrial chemicals, pulp and paper, and nonmetallic minerals. This chapter also uses the same five industries to determine what constitutes a dirty industry, given that they have the highest intensity of emissions, and analyzes these five pollution-intensive goods as the products from dirty industries.

3. Methodology

3.1. Environmental industry

Trade specialization coefficient (TSC) can be employed to see a country's trade specialization in the environmental industry. TSC is often used when measuring the competitiveness or trade structure of specific countries or industries (METI, 2013). TSC is defined as:

$$TSC=(X-M)/(X+M).$$

For a given industry, a TSC approaching 1 indicates a country's specialization in exports, and a TSC approaching -1 indicates a specialization in imports. Categories of environmental goods in OECD/Eurostat (1999) are used to define the environmental industry. The subcategory 'renewable energy plant' in the 'resource management' category is given special attention in this chapter to analyze the impact of low carbon strategies for green growth.[3]

3.2. Dirty industries

Mani and Wheeler (1998) employ the share of production in domestic manufacturing and import/export ratio to see if a country has become a pollution haven or generates a pollution haven effect. A country is classified as a pollution haven if it increases the share of production by dirty industries in domestic manufacturing while decreasing its import/export ratio. Companies in a country with much tighter discharge regulation may relocate their production sites to a country where regulation is lax. As a result, the pollution associated with the production of dirty industries

may be transferred to countries or regions with lax regulation, which will increase production and export. Conversely, a country generates a pollution haven effect or becomes more dependent on pollution havens if it reduces its share of dirty industries in domestic manufacturing and its import/export ratio increases.

In examining the change in the structure of dirty industries in Japan, South Korea, and China, data for manufacturing production is obtained from UNIDO (2013) and trade data is from UN Comtrade. Data collection is intended to cover as long a time series as possible and all the available data for Japan, South Korea, and China is used in the analysis of the years after the examination by Mani and Wheeler (1998). However, there are some missing data by year or product in each country due to limitations in the database. Therefore, time period is non-uniform in the analysis.

4. Growth in the Environmental Industry

At a first glance, trade of environmental goods has grown over the past 25 years in Japan, South Korea, and China (Figure 5-1). In particular, the value of trade in China has risen sharply from the middle of 2000s and now is several times higher than that of Japan and South Korea. In case of Japan and South Korea, the degree of increase is rather gradual compared to that of China, although total value is actually increasing greatly.

<Figure 5-1 here>

4.1. Specialization in the export or import environmental goods

TSC shows no remarkable trend throughout the period because almost all the shifts are within the small range of 0.3 (i.e., between -0.1 and 0.2). The only exception in the three countries is the downward trend in Japan, although its fluctuation is not so large. However, when focusing on short-term changes, TSC in South Korea rose sharply in 1998, and there was also a sharp rise in TSC in China in mid-2000s.

The TSC of environmental goods shows an upward trend in South Korea and China. TSC in South Korea rose sharply in 1998 and in mid-2000s, after the period of Asian economic crisis and China's accession to WTO. In the case of China, TSC was on an upward trend in the mid-1990s and began rising again in 2005. While TSC in Japan shows a downward trend, its level is still higher than in South Korea and China (Figure 5-2).

In the case of Japan shown in Figure 5-3, TSC for the category 'resource management' rose in the late 1990s and remained around 0.4 throughout the 2000s. However, it has been falling since 2010. A similar trend can be observed for its subcategory 'renewable energy plant.' In the case of the 'cleaner technologies and products' category, TSC fell in the late 1990s and began to rise again

beginning in 2002. The TSC for this category has remained at a high level compared to the other two countries.

In South Korea, The TSC of all categories rose in 1997 and 1998 immediately following the Asian economic crisis (Figure 5-4). In particular, the 'cleaner technologies and products' category has increased its export specialization since 1997 and maintained a level around 0.4~0.5. TSC also had an upward trend in mid-2000s.[4] In particular, the TSC of the 'resource management' category and its subcategory 'renewable energy plant' both drastically shifted to an export specialization sharply after 2008. South Korea turned to net exporter in those categories in 2010.

The TSC of all categories in China shifted upward from 2005 to 2008, several years after China's accession to the WTO (Figure 5-5). In particular, the TSC of the 'resource management' category has risen sharply since the mid-2000s and China has shifted to an export specialization, which has exceeded that of Japan. The TSC of 'cleaner technologies and products' decreased in 2009 and 2010. However, it has increased again in 2011.

<Figure 5.2~5.5 around here>

4.2. Summary

The shifts in the TSC of environmental goods in South Korea and China imply that the impact of the green growth and low-carbon strategies on the trade structure of such goods is rather small, especially when compared with the impact of the Asian economic crisis and China's accession to the WTO. South Korea has become more specialized in the export of environmental goods in the period after those two events, while China also became more export-oriented since it joined the WTO.

However, radical shifts in the TSC of the 'renewable energy plant' subcategory in South Korea may show that green growth strategies may have actually had a significant impact on transforming the trade structure of such products and industries to being more export-oriented.

There seemed to be no radical shift in the TSC of Japan over the past 25 years. Despite this fact, Japan still has the highest level of TSC among the three countries examined in this chapter.

5. Change in Trade Patterns of Dirty Industries

Trade in dirty industries shows the same trend as that of the environmental industry. South Korea, China, and Japan have increased trade in dirty industries during the past 25 years, with China having the largest increase among them (Table 5-1).

5.1. Production and dirty industry share of the manufacturing sector

Production in dirty industries in Japan dropped around 2000, but rose again since then, becoming 30 percent higher than the 1988 level. The dirty industry share of all manufacturing rose since 2003, reaching 5 percent (Figure 5-6).

South Korea has steadily increased production in dirty industries, except for one interruption in 1998, reaching 4.3 times larger in 2012 than in 1988. On the other hand, the dirty industry share of all manufacturing has increased only slightly (Figure 5-7).

China has increased production in dirty industries throughout the period, eventually became about six times larger in 2012 compared with the 2003 level (Figure 5-8). The dirty industry share in all manufacturing also continued to rise gradually, reaching 3 percent in 2012.

While all three countries have increased both the production value and share of all types of dirty industries, their rates of increase differ slightly in terms of production value. The rate of increase in production value in Japan is smaller than that in the other two countries.

<Figure 5-6~5.8 around here>

5.2. Import-export ratio

As shown in Figure 5-9, the import/export ratio of dirty industries in Japan has stayed below 1 throughout the period. The ratio fell slightly over the period, but with a slight increase in 2011. Its import-export ratio for trade with the US and ASEAN decreased in the 1990s, while the ratio has increased since the late 1990s (Figure 5-10). The ratio for South Korea has been decreasing. The import/export ratio for China has decreased since the Asian economic crisis, but began to increase in 2010.

In South Korea, the ratio dropped below 1 in 1998. It drifted just over 1 throughout the 2000s and again shifted just a bit below 1 in 2011. It is noted that import/export ratio has increased for trade with Japan, China, and US since the Asian economic crisis (Figure 5-11).

The import/export ratio in China dropped drastically in mid-1990s and mid-2000s and fell below 1 in 2008. It kept shifting downward throughout the period, although it rose temporarily in 2009 when overall trade decreased, especially in export. China's import/export ratio with South Korea and ASEAN decreased after rising briefly following the Asian economic crisis period (Figure 5-12).

<Figure 5-9~5.12 around here>

5.3. Summary

In Japan, South Korea, and China, the domestic production share of dirty industries has shown

an upward trend over the period. The import/export ratio has trended downward in China and has also decreased slightly in Japan and South Korea. Overall, these three countries have become pollution havens, as pollution-generating production shifts to these countries from other countries.

However, this does not exclude the possibility that these countries also generate a pollution haven effect toward particular trade partners. For example, South Korea seemed to generate a pollution haven effect in the 2000s against China, Japan, and the ASEAN 6 countries. South Korea has increased its import/export ratio for trade with Japan and China while only marginally increasing its share of dirty industries in the 2000s. Similarly, Japan continues to generate pollution haven effects against ASEAN countries, as its import/export ratio with ASEAN has risen gradually.

There does not appear to be a trend of dependence on the import of dirty industries in other countries after the green growth and low carbon strategies were implemented in South Korea and China. Instead, the shifts in the import/export ratio of these countries show that trade in dirty industries has become more specialized in export.

6. Discussion

This section discusses the results above with a focus on the shift in the value of exports or imports and the share of overall trade for environmental and dirty industries (Figures 5-13 and 5-14).

<Figure 5-13 and 5-14 around here>

6.1. Japan

Japan has been a net exporter of both environmental and pollution-intensive goods during the past 25 years. The TSC of the environmental industry is still around 0.4, which is largest of the three countries. The import/export ratio in Japan has also been the lowest throughout the period.

However, the TSC of environmental goods is decreasing gradually, just like that of trade overall in Japan over the last 25 years. Such a trend seems to be unchanged after the government of Japan specified green innovation as growth field in its New Growth Strategy in 2009. The share of trade for environmental goods has been almost flat since 2009. The impact of the strategy on the trade of environmental goods seems to be marginal in Japan.

6.2. South Korea

South Korea became a net exporter in the ‘cleaner technologies and products’ category after the 1997 Asian economic crisis. Export from the environmental industry has significantly increased since China’s accession to the WTO. After the 2008 global economic crisis, TSC drastically

increased in ‘resource management’ category and the ‘renewable energy plant’ subcategory. Growth in the export of environmental goods seems to have accelerated during this same period, while import value has remained almost flat since 2010 (Table 5-2). The trade share of environmental goods has also shown an upward trend as a whole.

<Table 5-2 around here>

However, exports by dirty industries have also grown, although the extent is not as large as for the environmental industry. Now South Korea is a net exporter in these industries and net export value is growing. Growth of exports in dirty industries also seems to have accelerated in the last three years. The trade share of dirty industries has remained almost the same since 2009, which has had an upward trend during the 2000s.

These results imply that South Korea has focused on export promotion in both environmental and dirty industries. Green growth seemed to accelerate such a shift in trade structure by focusing on the export of certain specified goods.

6.3. China

Accession to the WTO has significant impacts on the trade structure of China. It accelerated the increase in TSC for almost all categories of environmental goods, especially resource management and renewable energy plant. The trade share of environmental goods has had an upward trend over the same period. In a similar way, the import/export ratio of dirty industries has decreased over the same period, while its share of overall trade has been on a decreasing trend. These results imply that China’s accession to the WTO had a significant impact on China’s trade structure and resulted in a shift to more export-oriented trade.

Trade value has been increasing steadily, not only in exports but also in imports for both environmental and dirty industries. Such a trend is consistent throughout the period. Moreover, growth in both imports and exports seems to have accelerated since 2010 in those industries. Low carbon strategies may have impacts on promoting overall trade in both industries, while keeping with the broader trend of structural change to more export-oriented trade.

7. Conclusions

Major findings can be summarized as follows.

First, South Korea and China have shifted to export specializations following pivotal events: the Asian economic crisis and China’s accession to the WTO. In particular, the shift to export specialization in the environmental industry seemed to be accelerated by China’s accession to the

WTO for both South Korea and China. Moreover, the trade share of environmental goods increased rapidly in the same period. Dirty industries in China also seem to have shifted to more export-oriented trade since then. Compared to such events, the impact of green industrial policy seems to be limited.

Second, the way in which green industrial policy influences trade varies by country. It caused a drastic shift in TSC in the 'resource management' category and its 'renewable energy plant' subcategory, and accelerated export growth of environmental goods in South Korea. In China, implementation of low carbon strategies accelerated trade growth while not generating a drastic shift in TSC or import/export ratio. This may suggest differences in the central focus of the policy.

Japan seems to have kept more export surplus than other two countries for both industries and is less dependent on dirty industry imports. However, the TSC of 'resource management' in Japan has fallen below that of China over the last three years. Policy influences on the trade of environmental and pollution-intensive goods in the last several years seems quite marginal in Japan.

However, challenges remain for this research. First, a causal relation between the change in trade patterns and trade volume and green industrial policy was not examined directly in this chapter. Trade itself is influenced by many factors. While there are suggestive results that have been observed, such as the shift in TSC of South Korea for specific environmental goods, that seem to be the result of the strategy government has adopted. However, it remains unclear exactly how much influence on trade are due to the policy decision, rather other factors such as the Asian economic crisis, China's WTO accession, and so on. There seems to be room for further research on this topic.

In terms of environmental goods, the Harmonized System classification does not perfectly fit with environmental goods in actuality. Therefore, both environmental goods and the other types of goods are counted in trade statistics with no classification in each code. Indeed, the list provided by APEC agrees with many of the 'ex-outs,' the annotation that is used for each produce (Zhang, 2011). Since we currently have no way to reorganize the data extracted from UN Comtrade in accordance with such annotations, we have directly used the data based on the 6-digit Harmonized System code. Consequently, our research includes data that may not directly relate to environmental goods. There is also room to study and improve the classification and treatment of trade data.

References

APEC (2012), 2012 Leaders' Declaration, Vladivostok Declaration – Integrate to Glow, Innovate to Prosper- ANNEX C: APEC List of Environmental Goods., http://www.apec.org/Meeting-Papers/Leaders-Declarations/2012/2012_aelm/2012_aelm_annexC.aspx (accessed on September 24, 2013).

Hettige, H., Martin, P., Singh, M. and Wheeler, D.(1994), *IPPS: The Industrial Pollution Projection*

System, Policy Research Working Paper no.WPS1431, The World Bank Policy Research Department Environment, Infrastructure and Agriculture Division

Mani, M. and Wheeler, D. (1998), In Search of Pollution Havens? Dirty industry in the world economy, 1960 to 1995, *Journal of Environment & Development*, 7(3): 215-247.

Ministry of Economy, Trade and Industry, Japan (2013), Supporting industries and companies with potential to advance into foreign markets, *White Paper on International Economy and Trade 2013*, http://www.meti.go.jp/english/report/downloadfiles/2013WhitePaper/2-3.pdf (accessed on August 1, 2014).

OECD/Eurostat (1999), The Environmental Goods and Services Industry: Manual on Data Collection and Analysis, OECD, Paris

Shimoda, M., Watanabe T., Yeh Z. and Fujikawa K. (2009), Inter-linkage between industrial structure and environmental burden in East Asia, in Mori A., (ed.), *Economic Development and Environmental Policy in East Asia*, Kyoto: Minerva Shobo, 40-57 (in Japanese).

Steenblik, R. (2005), Environmental goods: A comparison of the APEC and OECD lists, *OECD Trade and Environment Working Paper, No.2005-04*, OECD Joint Working Party on Trade and Environment.

Taylor, S.M. (2004), Unbundling the pollution haven hypothesis, *Advances in Economic Analysis & Policy* 4 (2): 1-26.

UN Comtrade, http://comtrade.un.org/db/ (last access date: December 10, 2013)

UNIDO (2013), *INDSTAT4*, CD-ROM.

Zhang, Z. (2011), Trade in environmental goods, with focus on climate-friendly goods and technologies, *East-West Center Working Papers, Economic Series No.120*, East West Center.

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[1] This category includes products related to air control, management of water and waste, environmental monitoring and assessment, etc. The product codes included are shown in the Appendix.

[2] This category includes cleaner and more resource efficient products. Product codes are cited in the Appendix.

[3] Product codes included in these categories are shown in Appendix.

[4] In the case of the 'resource management' category, there is lack of trade data after 2007 for some products. Therefore, this chapter holds off on examining the rise and fall of TSC in the mid-2000s in this category.

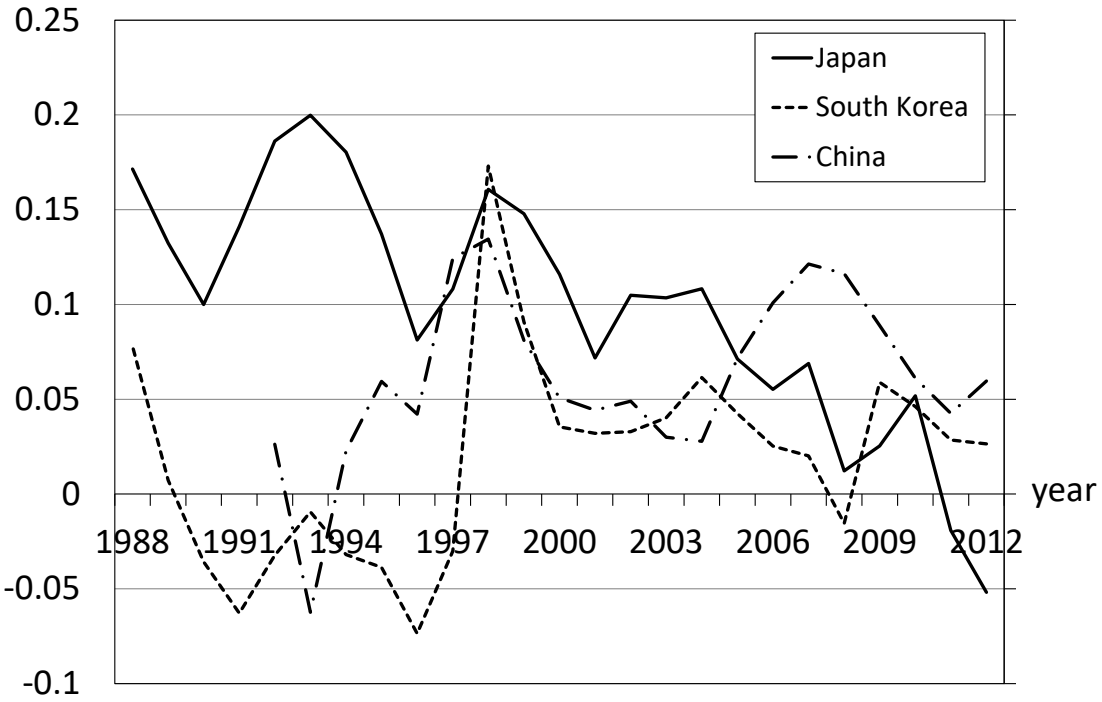

Figure 5-1. Shift in TSC in Japan, South Korea, and China during the past 25 years

Source: Author's compilation of data from UN Comtrade

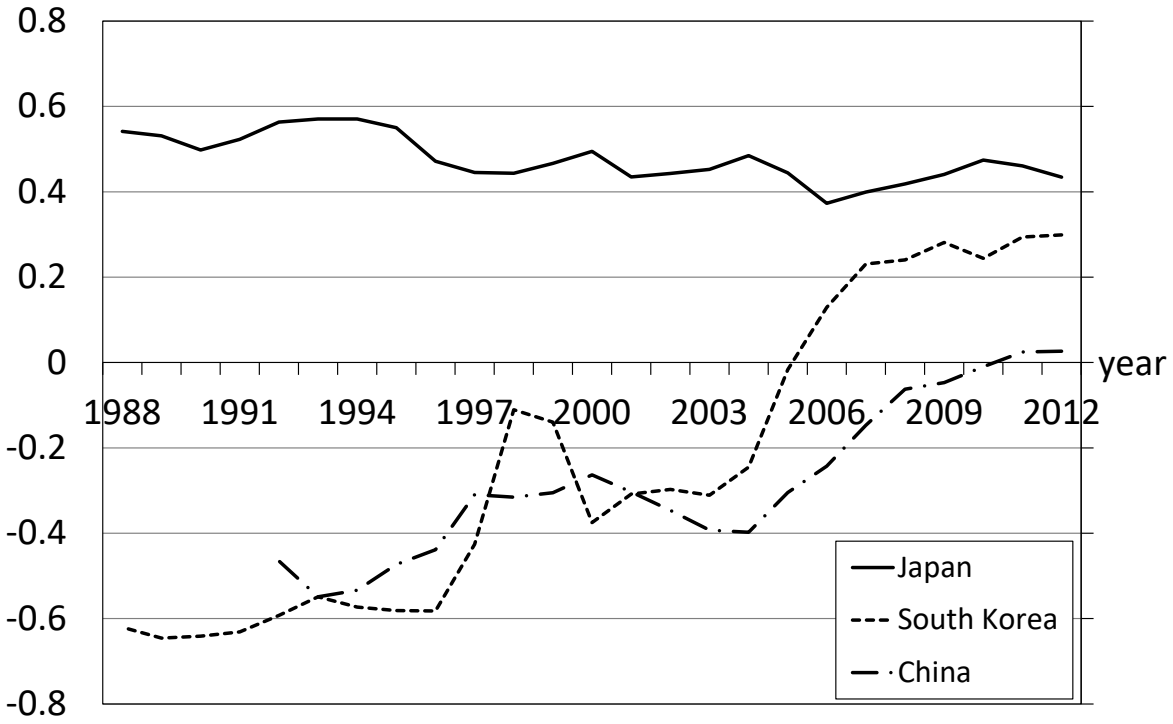

Figure 5-2. Shift in TSC of environmental goods in Japan, South Korea, and China during the past 25 years

Source: Author's compilation of data from UN Comtrade

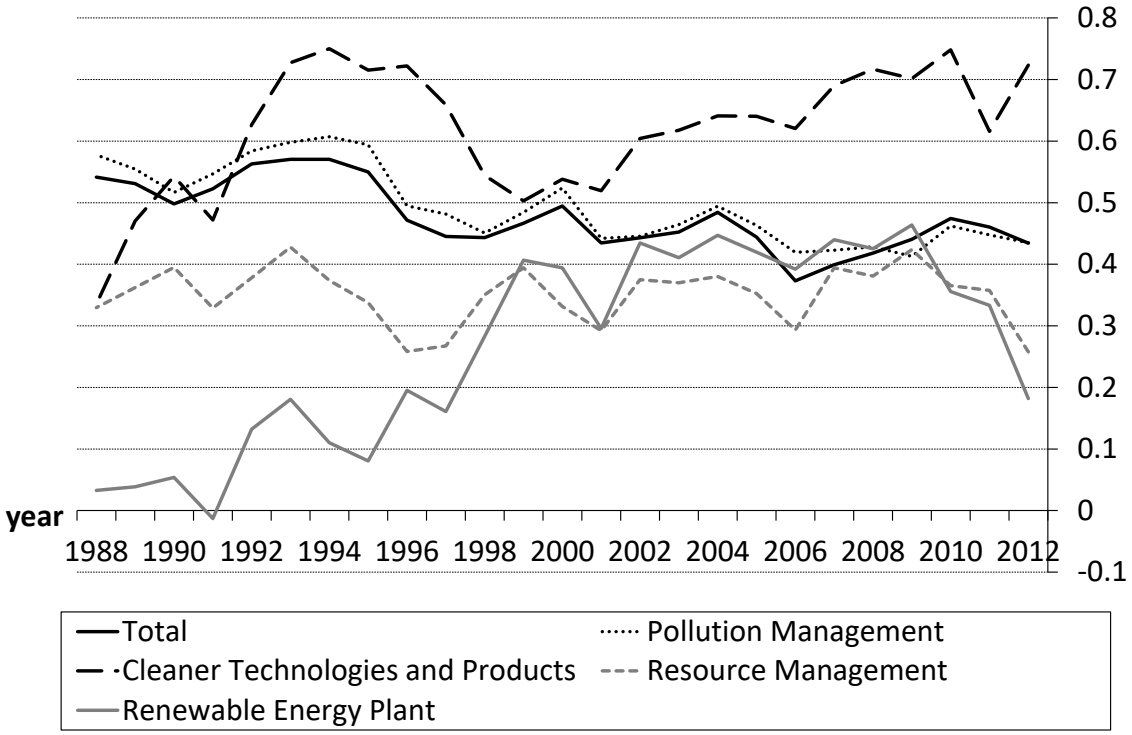

Figure 5-3. Shift in TSC of environmental goods in Japan during the past 25 years

Source: Author's compilation of data from UN Comtrade

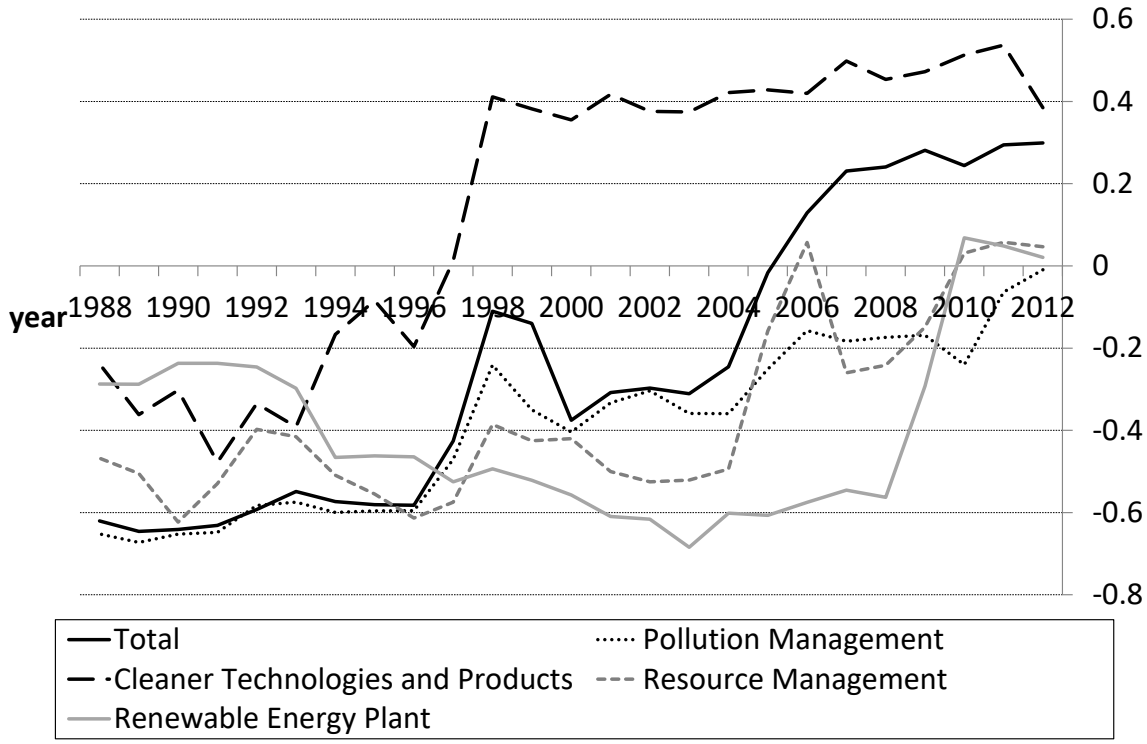

Figure 5-4. Shift in TSC of environmental goods in South Korea during the past 25 years

Source: Author's compilation of data from UN Comtrade

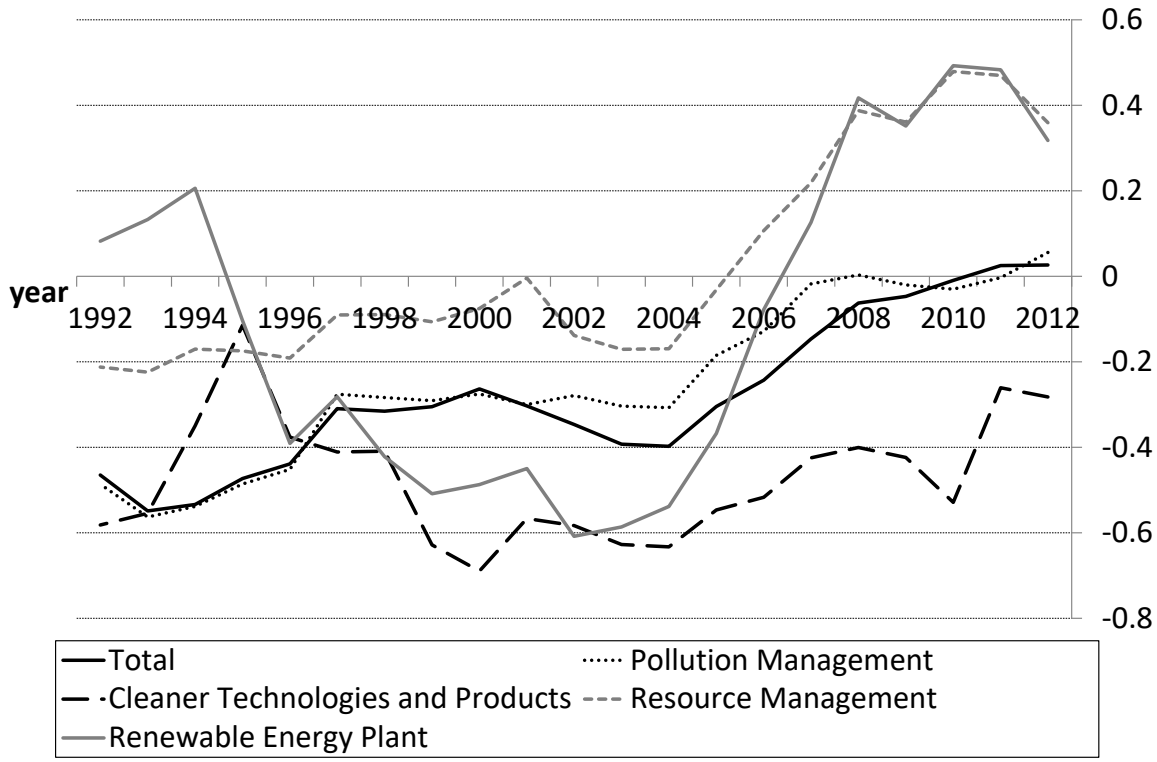

Figure 5-5. Shift in TSC of environmental goods in China during the past 25 years

Source: Author's compilation of data from UN Comtrade

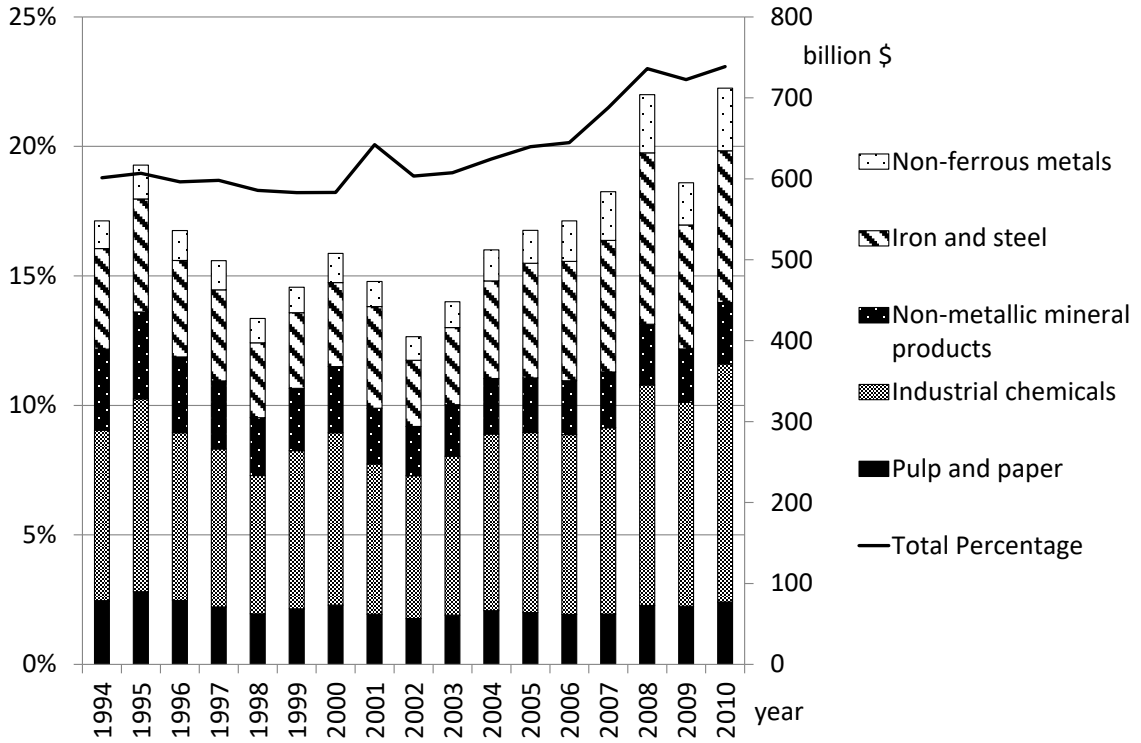

Figure 5-6. Shift in production value and share of all manufacturing for dirty industries in Japan

Source: Author's compilation of data from UN Comtrade

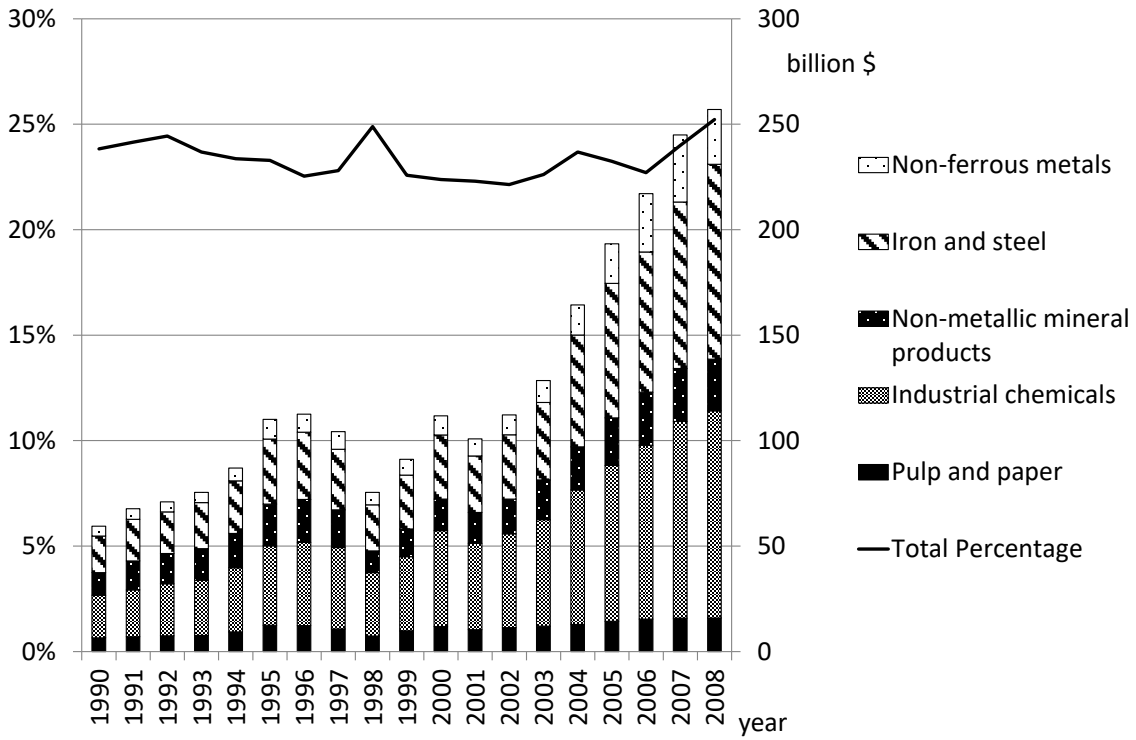

Figure 5-7. Shift in production value and share of all manufacturing for dirty industries in South Korea

Source: Author's compilation of data from UN Comtrade

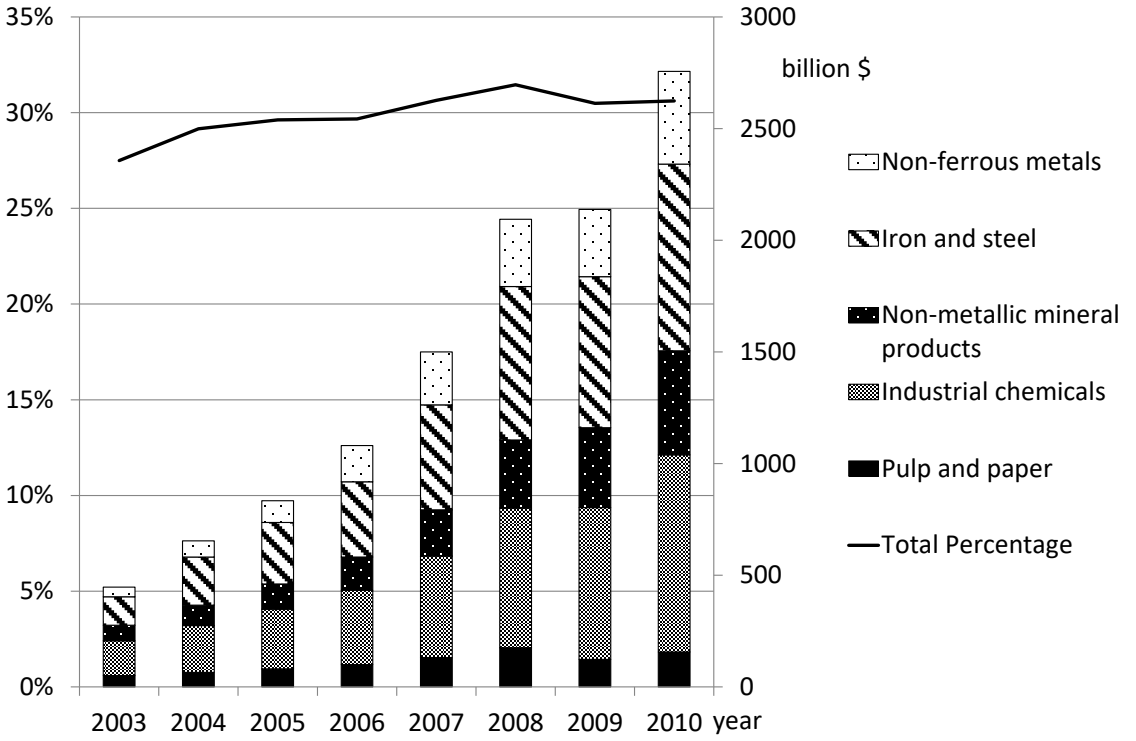

Figure 5-8. Shift in production value and share of all manufacturing for dirty industries in China

Source: Author's compilation of data from UN Comtrade

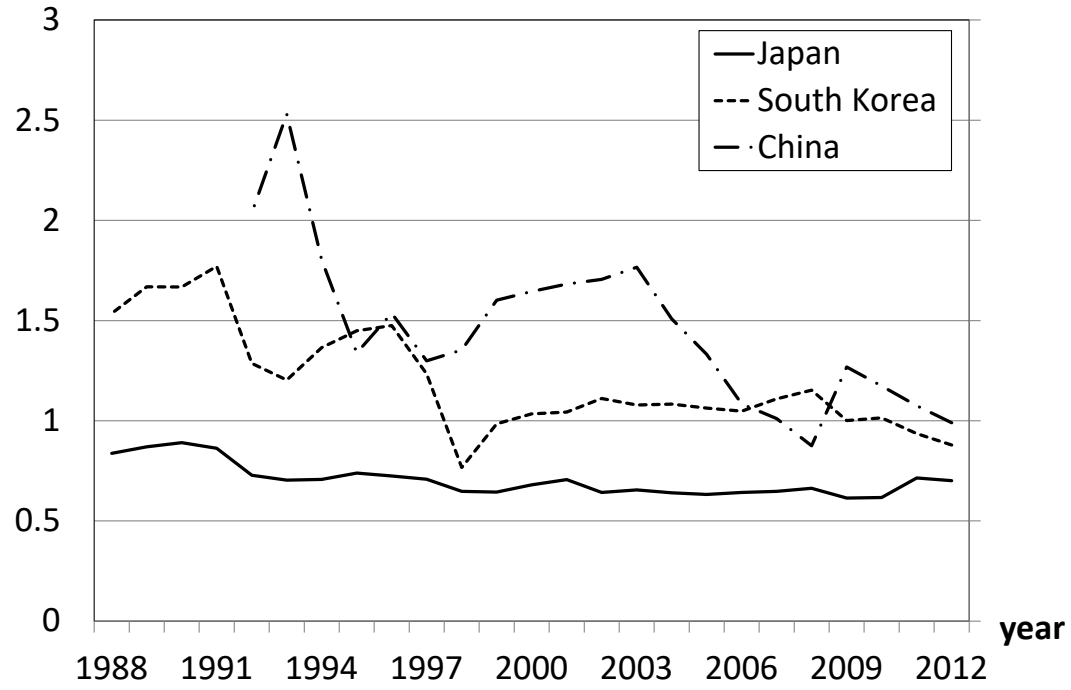

Figure 5-9. Shift in import/export ratio of dirty industries in Japan, South Korea, and China

Source: Author's compilation of data from UN Comtrade

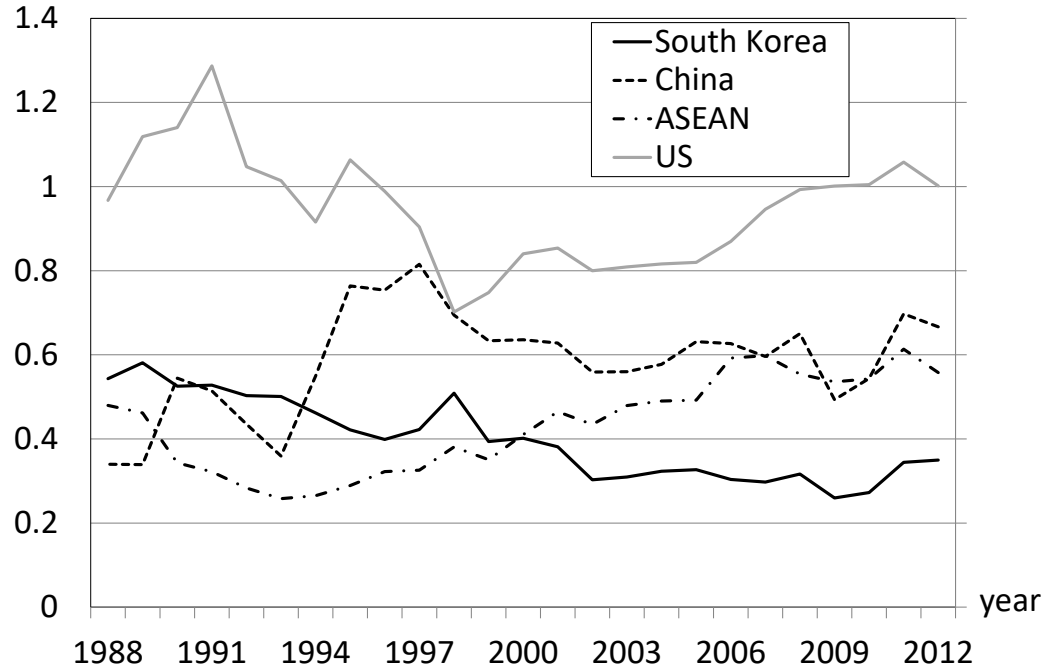

Figure 5-10. Shift in import/export ratio of Japan with specified trade partner

Source: Author's compilation of data from UN Comtrade

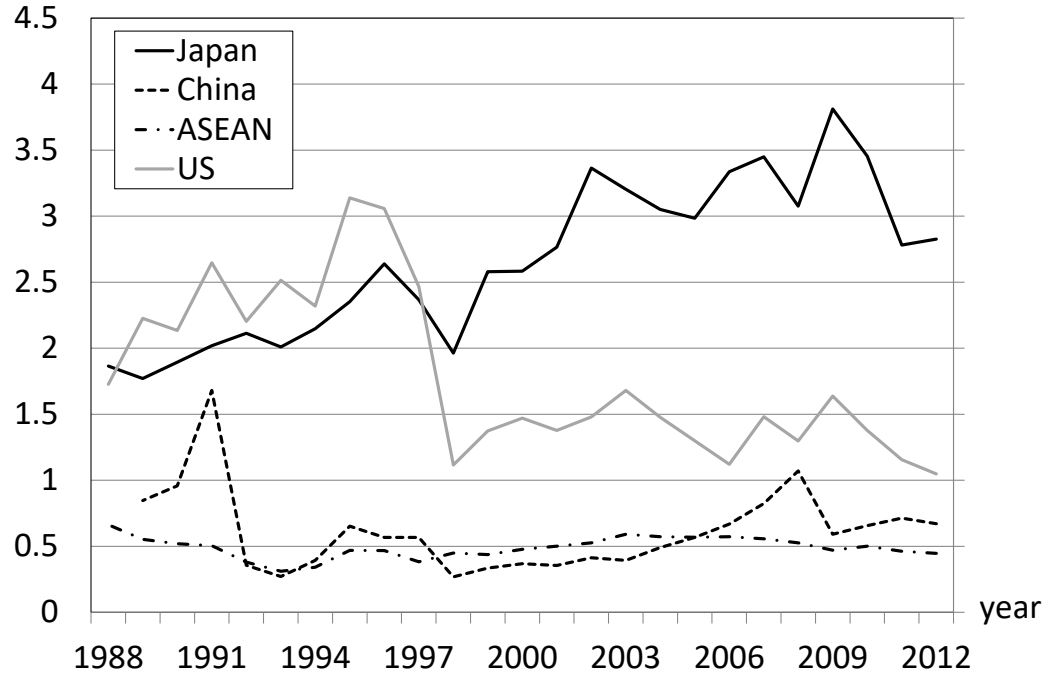

Figure 5-11. Shift in import/export ratio of South Korea with specified trade partner

Source: Author's compilation of data from UN Comtrade

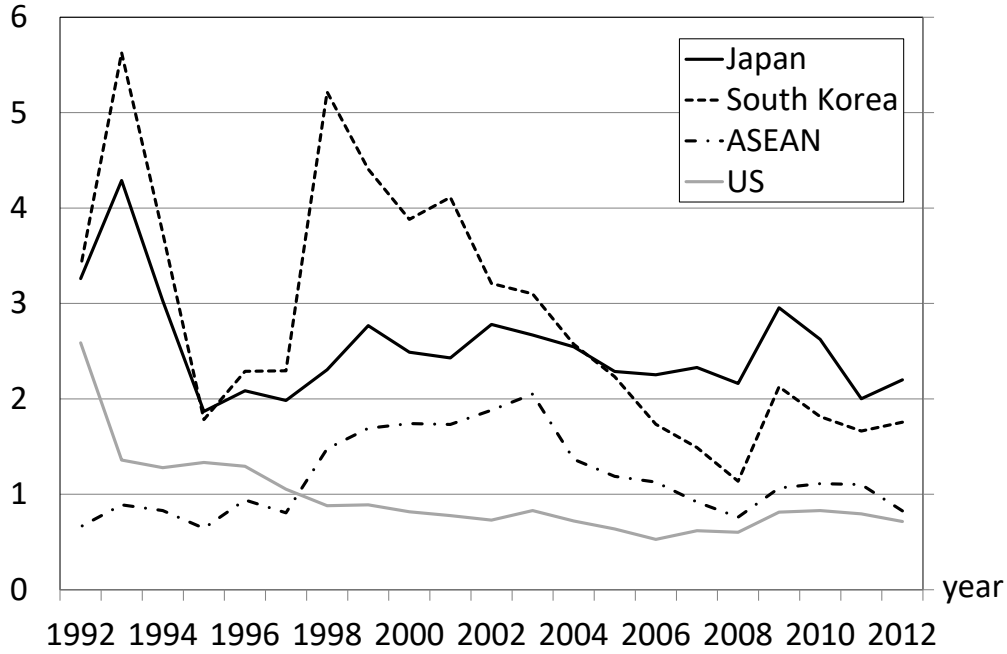

Figure 5-12. Shift in import/export ratio of China with specified trade partner

Source: Author's compilation of data from UN Comtrade

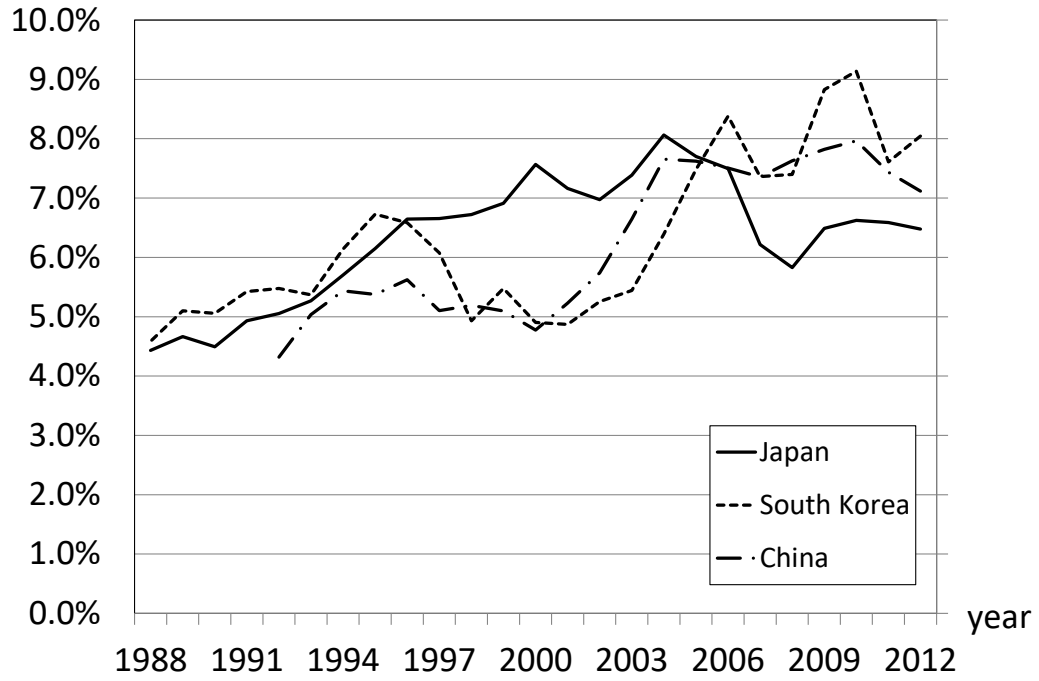

Figure 5-13. Share of overall trade of environmental goods in Japan, South Korea, and China

Source: Author's compilation of data from UN Comtrade

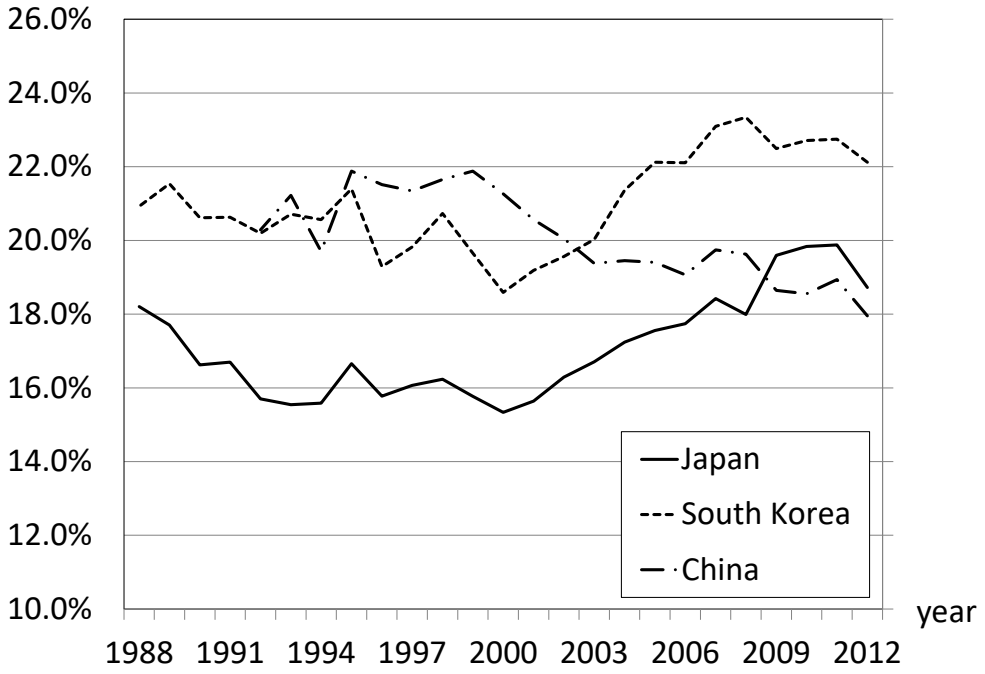

Figure 5-14. Share of overall trade in dirty industries in Japan, South Korea, and China

Source: Author's compilation of data from UN Comtrade

Year			1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Japan	Total	trade	572.7	601.6	670.3	779.0	760.1	759.9	668.8	727.6	859.0	752.7	754.3	855.4	1021.0	1110.8	1225.8	1336.6	1543.9	1132.7	1463.9	1678.6	1684.4
		export	339.7	360.9	395.6	442.9	410.9	421.1	388.1	417.6	479.3	403.4	416.7	472.0	565.8	594.9	646.7	714.3	781.4	580.7	769.8	823.2	798.6
		import	233.0	240.7	274.7	336.1	349.2	338.8	280.6	310.0	379.7	349.3	337.6	383.5	455.3	515.9	579.1	622.2	762.5	552.0	694.1	855.4	885.8
	Environmental goods	trade	28.9	31.7	38.2	47.9	50.5	50.6	45.0	50.3	65.0	53.9	52.6	63.2	82.3	85.5	91.9	83.1	90.0	73.5	97.0	110.6	109.1
		export	22.6	24.9	30.0	37.1	37.2	36.5	32.4	36.9	48.6	38.7	38.0	45.9	61.1	61.8	63.1	58.1	63.8	52.9	71.5	80.8	78.3
		import	6.3	6.8	8.2	10.8	13.4	14.0	12.5	13.4	16.4	15.2	14.7	17.3	21.2	23.8	28.8	25.0	26.2	20.6	25.5	29.8	30.9
	Dirty industries	trade	89.9	93.5	104.5	129.8	119.9	122.1	108.6	114.8	131.7	117.7	122.9	142.9	176.0	195.0	217.4	246.2	277.8	221.9	290.4	333.7	315.4
		export	52.0	54.9	61.2	74.6	69.5	71.5	65.9	69.8	78.4	69.0	74.8	86.4	107.3	119.5	132.4	149.4	167.1	137.5	179.6	194.6	185.3
		import	37.9	38.6	43.3	55.2	50.4	50.6	42.7	44.9	53.3	48.7	48.1	56.5	68.7	75.5	85.0	96.8	110.7	84.4	110.8	139.1	130.0
South Korea	Total	trade	158.4	166.0	198.4	260.2	280.0	280.8	225.6	263.4	332.7	291.5	314.6	372.6	478.3	545.7	634.8	728.3	857.3	686.6	891.6	1079.6	1067.4
		export	76.6	82.2	96.0	125.1	129.7	136.2	132.3	143.7	172.3	150.4	162.5	193.8	253.8	284.4	325.5	371.5	422.0	363.5	466.4	555.2	547.9
		import	81.8	83.8	102.3	135.1	150.3	144.6	93.3	119.8	160.5	141.1	152.1	178.8	224.5	261.2	309.4	356.8	435.3	323.1	425.2	524.4	519.6
	Environmental goods	trade	8.7	8.9	12.2	17.5	18.4	17.1	11.1	14.4	16.3	14.2	16.5	20.3	30.6	40.8	53.2	53.6	63.4	60.6	81.5	82.1	85.9
		export	1.8	2.0	2.6	3.7	3.9	4.9	4.9	6.2	5.1	4.9	5.8	7.0	11.5	20.1	30.0	33.0	39.3	38.8	50.7	53.2	55.8
		import	6.9	6.9	9.6	13.8	14.6	12.2	6.2	8.2	11.2	9.3	10.7	13.3	19.0	20.8	23.2	20.6	24.1	21.8	30.8	29.0	30.1
	Dirty industries	trade	32.0	34.4	40.8	55.7	54.0	55.6	46.8	51.8	61.9	55.9	61.6	74.6	102.2	120.7	140.3	168.2	200.1	154.4	202.5	245.6	236.1
		export	14.0	15.6	17.2	22.7	21.8	24.9	26.5	26.1	30.4	27.4	29.2	35.9	49.1	58.5	68.5	79.7	93.0	77.2	100.5	126.8	125.7
		import	18.0	18.8	23.5	32.9	32.2	30.7	20.3	25.7	31.4	28.6	32.4	38.7	53.1	62.2	71.8	88.5	107.2	77.3	102.0	118.8	110.4
China	Total	trade	165.5	195.7	236.6	280.9	289.9	325.2	324.0	360.6	474.3	509.7	620.8	851.0	1154.6	1421.9	1760.4	2176.2	2563.3	2207.2	2973.8	3641.8	3867.0
		export	84.9	91.7	121.0	148.8	151.0	182.8	183.8	194.9	249.2	266.1	325.6	438.2	593.3	762.0	968.9	1220.1	1430.7	1201.6	1577.8	1898.4	2048.8
		import	80.6	104.0	115.6	132.1	138.8	142.4	140.2	165.7	225.1	243.6	295.2	412.8	561.2	660.0	791.5	956.1	1132.6	1005.6	1396.0	1743.4	1818.2
	Environmental goods	trade	7.1	9.9	12.9	15.1	16.3	16.6	16.8	18.4	22.6	26.6	35.6	56.5	88.4	108.4	132.1	160.0	195.5	172.6	236.8	270.8	275.2
		export	1.9	2.2	3.0	4.0	4.6	5.7	5.8	6.4	8.3	9.3	11.6	17.2	26.6	37.7	50.0	68.3	91.6	82.2	117.2	138.8	141.2
		import	5.2	7.6	9.9	11.1	11.7	10.9	11.1	12.0	14.3	17.4	24.0	39.4	61.8	70.7	82.1	91.8	103.9	90.4	119.6	132.0	133.9
	Dirty industries	trade	33.6	41.5	46.6	61.5	62.4	69.4	70.2	78.9	100.9	104.8	124.5	164.9	224.6	275.9	335.6	429.7	503.1	411.5	551.8	689.7	694.4
		export	11.1	11.8	16.6	26.3	24.6	30.2	29.8	30.3	38.1	39.1	46.0	59.6	89.5	118.4	161.1	213.7	268.2	181.4	253.8	332.5	348.9
		import	22.5	29.8	30.0	35.2	37.8	39.2	40.4	48.6	62.7	65.7	78.5	105.3	135.1	157.6	174.6	216.0	234.9	230.1	297.9	357.3	345.5

Table 5-1. Changes in trade of Japan, South Korea, and China during the past 25 years (in billions of US dollars)

Source: Author's compilation of data from UN Comtrade

Year			1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Japan	Total	export	100	106	116	130	121	124	114	123	141	119	123	139	167	175	190	210	230	171	227	242	235
		import	100	103	118	144	150	145	120	133	163	150	145	165	195	221	249	267	327	237	298	367	380
	Environmental goods	export	100	110	133	164	164	162	143	163	215	171	168	203	270	273	279	257	282	234	316	357	346
		import	100	108	130	170	211	222	198	212	260	241	232	274	336	376	456	395	414	325	403	472	488
	Dirty industries	export	100	105	118	143	134	137	127	134	151	133	144	166	206	230	254	287	321	264	345	374	356
		import	100	102	114	146	133	134	113	119	141	129	127	149	181	199	224	255	292	223	292	367	343
South Korea	Total	export	100	107	125	163	169	178	173	188	225	196	212	253	331	371	425	485	551	474	609	725	715
		import	100	102	125	165	184	177	114	146	196	173	186	219	275	320	378	436	532	395	520	641	636
	Environmental goods	export	100	114	147	207	218	277	280	351	288	278	329	395	653	1136	1700	1867	2226	2197	2867	3007	3155
		import	100	100	139	200	211	176	89	119	162	134	155	192	275	300	335	298	349	315	446	420	436
	Dirty industries	export	100	112	123	163	156	178	189	187	217	196	208	257	351	418	490	570	665	552	719	907	899
		import	100	104	131	183	179	171	113	143	175	159	180	215	295	346	399	492	595	429	567	660	614
China	Total	export	100	108	142	175	178	215	216	229	293	313	383	516	699	897	1141	1436	1684	1415	1858	2235	2412
		import	100	129	143	164	172	177	174	206	279	302	366	512	696	819	982	1186	1405	1248	1732	2163	2256
	Environmental goods	export	100	116	157	208	239	299	301	334	436	485	609	898	1392	1971	2616	3571	4792	4301	6132	7258	7387
		import	100	146	188	212	224	207	211	229	273	332	458	752	1179	1350	1568	1752	1983	1726	2283	2521	2557
	Dirty industries	export	100	106	150	238	222	273	270	274	345	353	416	539	810	1070	1457	1933	2426	1641	2296	3007	3155
		import	100	132	133	156	168	174	179	216	279	292	348	468	600	700	775	959	1043	1022	1323	1586	1534

Table 5-2. Growth of exports and imports in Japan, South Korea, and China (1992=100)

Source: Author's compilation of data from UN Comtrade