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Green Trade and Economic Growth under the New Climate Regime

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By classifying the international trade data categorized by industries into green goods and services for the period of 1980-2015, this study investigates the general and country-specific trends of share of green trade, exports, and imports to total trade, exports and imports. The general findings are that the share of world trade, exports and imports have increased over the period, and the shares of OECD, as high income country group have shown different trends of those of non-OECD countries as low income country group. Further, three countries-South Korea, U.S. and China-that represent different stages of economic development show different trends of three shares over time. In particular, three shares of China tended to decrease over time with lower values which are in contrast with those of South Korea and U.S. Even though more sophisticated tests are necessary, the rigorous findings through consideration of international trade pattern of green and non-green goods of this study suggests that the persuasion of developing countries to the agreement of international community to reduce greenhouse gas emissions need to consider both transboundary transmission of greenhouse gases and their health impact.

1. Introduction

Hydrocarbon based technological progress opened up an opportunity for mass production, and as a result, an unprecedented global economic growth has improved quality of life significantly. However, the benefits of high economic growth have not been achieved without a cost. The heavy consumption of fossil fuels as a growth engine leads to possible exhaustion of the resources in the future and further, the climate change issue is followed by the accumulation of greenhouse gas (GHG) emissions. Especially accumulated GHGs have a serious impact on human beings from individual health to national security (Kang, 2015). Zhang et al. (2017) found that about 3.45 million premature death in 2007 were related to fine particulate matter ($PM_{2.5}$).

The international community have been discussing to achieve sustained development by switching from traditional economic growth strategy to eco-friendly economic growth strategy. The new growth strategy has been named as 'green economy' by UNEP (2011) and 'Green Growth' by the Presidential Commission of Future and Vision (2009) and OECD (2012) (Kang, 2015).

Since the main source of GHG emissions are developing countries with an increasing rate, the efforts of international community dominated by developed countries cannot achieve the target to control for the emissions without the support of developing countries. Therefore, the Paris Agreement or the post-2020 New Climate Regime cannot be successful without the collaborative efforts of developing countries. Thus, developing countries have agreed to join the global agenda to reduce GHG emissions. However, developing countries argue that developed countries should provide various international support to them as the current issue of climate change is a result of historical GHG emission of developed countries and also, they lack adequate technologies, financial capacity, and human resources to pursue the global agenda.

More important assertion by developing countries is the fact that part of the products produced in developing countries are consumed by developed countries through international trade. Thus, developing countries believe that consumers in developed countries are partially responsible for the GHG emissions in developing countries. Several recent studies show how GHG emissions have transboundary transmissions through international trade (Yunfeng and Laike, 2009; Peters et al., 2011; Lit et al., 2014). And Zhang et al. (2017) find that 22% (762,400) out of 3.45 million death due to $PM_{2.5}$ in 2008 were related to the consumption of goods and services produced in other regions.

Due to the negative effects of imported products, developed countries have suggested policies to promote imports of eco-friendly products which is often referred to as 'green protectionism'. These policies impose penalties on non-green products such as the cars with less efficient fuel usage etc.

The global demand for the products produced in the developing countries will be reflected by imports of developed countries; thus, developing countries need more investment on green products to persuade developing countries to join the international effort to reduce GHG emissions.

By examining the trade patterns of green and non-green products using the international trade data categorized by industries, this study investigates general trend of global green and non-green trade which provides an insight into the possible channel of economic growth of developing countries. For international trade, the U.N. Comtrade data is used, which reports the data by industry classification of SITC Rev.2. The green and non-green industries are categorized by the classification of the Green Goods and Services (GGS) by the U.S. BLS (Bureau of Labor Statistics). Since the GGS is identified by the North American Industry Classification System (NAICS) 2012, and the U.N. Comtrade data follows SITC Rev.2 classification, several correspondence tables are used for matching two different codes (Muendler, 2009).

By identifying the trade pattern of green and non-green industries, economic growth strategies through trade of developing countries should focus on promoting more exports. Thus it can be inferred that developing countries need to invest more on producing exportable goods. General finding of this study is that there are increasing trends of world share of green trade, exports and imports to total trade, exports, and imports, respectively. Also, the shares of OECD countries are relatively higher than those of non-OECD countries. Further, the share of green imports in non-OECD countries tended to decrease until 1999 and then increased to about 0.5 in 2015 which is still lower than that of the OECD countries.

The trends of South Korea, U.S. and China provides interesting issues that need to be further examines. For South Korea, the shares of green trade, exports and imports have increased from about 0.45 in 1980 to 0.55 in imports and about 0.75 of exports in 2015. In U.S., the shares of green imports and exports in 1980 were about 0.4 and 0.65, respectively, and then increased to about 0.8 and 1.1, respectively. However, China tends to show different trends with those of South Korea and U.S. The shares have decreased from about 0.6 in 1986 to about 0.5 in 2015.

This study is organized as follows. Section 2 discuss the background of the study by discussing the green trade and the new climate regime. Section 3 introduces data source and summary statistics. Section 4 shows various graphical analysis for green and non-green trade and Section 5 concludes.

2. New Climate Regime and Green Trade

Since the Industrial Revolution, the world has experienced unprecedented growth in per capita income which has contributed to worldwide improvement of standard of living. However, as this economic development strategy relied heavily on fossil fuels as the main production resource, the consumption of fossil fuel exponentially

increased to a point where the global environment can no longer sustain the GHG emissions. Since 1980s, the concern for the sustainable future slowly formed a global consensus on the need to take action against climate change. After series of global agendas, in 2015, the representatives of 195 countries has agreed on the Paris Agreement at 21st Conference of the Parties (COP21) of United Nations Framework Convention on Climate Change (UNFCCC). The Paris Agreement has three main objectives: hold the increase of global average temperature below 2 °C above pre-industrial levels; support adaptation and foster climate resilience; and assist financial flow towards mitigation and adaptation. Due to the property of negative externality, the CO_2 emission has global impact, meaning that people outside the emitting countries are also influenced by the emissions. Therefore, the international community must cooperate and work together to combat climate change.

The efforts to reduce CO_2 emission by developed countries alone are not enough to achieve the objectives of the Paris Agreement, but every country needs to pull their weights whether being a developed or developing country. The statistics on CO_2 emissions clearly shows that the efforts of developing countries are equally important. The world CO_2 emissions from fuel combustion increased from 13.9 and 20.5 $GtCO_2$ in 1971 and 1990, respectively, to 32.4 $GtCO_2$ in 2014 with an increase of 57.9% for 1990-2014. For 1990-2014, the OECD total CO_2 emissions increased by 7.8% while that of the non-OECD countries increased by 118.5%. In 2014, the CO_2 emissions of China was 9.1 $GtCO_2$ with an increase of 333.1% between 1971 and 2014. And USA (5.2 $GtCO_2$) and India (2.0 $GtCO_2$) with an increase of 7.8% and 280.8%, respectively, for 1991-2014 were followed (IEA, 2016, p.II.4). Therefore, the statistics shows that the developing countries have been emitting more CO_2 with higher rate of increase.

Even though the developing countries are emitting more CO_2 with higher rate of increase, the developing countries are resisting the concept that all countries should bear equal burden in combating the climate change. As the current climate change issue has been triggered by past activities of the developed countries, these countries should accept their historical responsibility and bear greater burden. The developed countries have already accumulated sufficient wealth and technological assets to adapt to climate change while the developing countries are at greater risk without adequate adaptation capacities (Ikeme, 2003, p.200). Furthermore, another important argument by the developing countries is the source of CO_2 emissions. Historically the developing countries, especially China, has been treated as the factory of the world and exploited for its cheap labor and resources. Even though CO_2 emissions took place in developing countries, the final products are exported and consumed by the citizens of the developed countries.

There are several studies on the transboundary transfers of GHG and CO_2 embodiment in export products. Yunfeng and Laike (2009) examined China's international trade from 1997-2007, and the results shows that 10.03% to 26.54% of

China's annual CO_2 emission are from manufacturing of export goods. On the other hand, the CO_2embodied in imports good were only 4.40% in 1997 and 9.05% in 2007. Thus, the rest of the world avoided emission of 150.18 Mt CO_2 in 1997 and 593 Mt CO_2 in 2007 through trade with China.

By using a trade-linked global database for CO_2 emissions for 113 countries and 57 economic sectors between 1990 and 2008, Peters et al. (2011) find that the CO2 emissions from the production of goods and services have increased from 4.3 Gt to 7.8 Gt for 1980-2008. Further, the share of the emissions of global emissions in 2008 increased to 26% from 20% of the global emissions in 1990. Wiebe et al. (2012) studied the amount of CO2 emission embodied in international trade for 48 sectors in 53 countries and two regions from 1995 to 2005. The findings shows that net-CO2 imports of OECD countries increased by 80% in 10 years meaning that the developed countries are externalizing the environmental burden through international trade. And through atmospheric modelling, Lit et al. (2014) find that 36% of carbon monoxide and 17% of black carbon emitted in China in 2006 were mainly due to the production for exports.

Other researches have also shown that global emission transfers through trade also affect the health of the people in the partner countries even though the partner countries do not produce the products. Global emission transfers through international trade are associated with the transboundary health impact as well. The recent study by Zhang et al. (2017) find about 3.45 million premature death in 2007 were related to fine particulate matter ($PM_{2.5}$). Out of total worldwide death due to $PM_{2.5,}$ about 12% (411,100) were caused by air pollutants emitted by the goods and services produced in the regions other than that the death occurred. And 22% (762,400) were related to the consumption of goods and services produced in other regions.

The arguments by the developing countries are not unfounded, and it would be unfair to point fingers at the developing countries for emitting large amount of CO_2 without examining the context. In fact, the developing countries are not opposing the global efforts to tackle climate change, but rather requesting the developed countries to support their efforts in the form of financial support, capacity building and technology transfers. If appropriate support can be given to the developing countries, not only would the international cooperation on climate change progress forward, but provided an opportunity for the developing countries to employ environmentally friendly growth strategies.

Munasinghe (1995) suggests the concept of 'sustainomics' that developing countries do not necessarily have to follow the traditional path of development that the current developed countries have pursued. Based on the Environment Kuznets curve (EKC) hypothesis, the relationship between the environment and per capita income is an inverted-U-shape. When per capita income is low, the economic activities have minimal impact on the environment, but as the economy grows the

environmental degradation is accelerated by exploiting more natural resources and emitting more pollutants. After the turning point, the economy transition to service sector and desire for better environment gains more strength (Stern, 2004, p. 1420).

Therefore, Munasinghe (1995) argues that rather than reaching the peak turning point of the EKC, the developing countries has the potential to lower the turning point by tunneling through the curve. The key point is that the developed countries should aid the developing countries and assist the developing countries to decouple the economic growth and environmental degradation. International cooperation will help developing countries to follow the new path which guarantees low environmental pollution for the same level of production.

In order to persuade developing countries to join the international agreement for the new climate regime and encourage them to take actions against the GHG emissions, it is important to provide various international cooperative policy strategies. The global trade in green products through international trade has been steadily increasing, especially due to the global effort to tackle climate change. However, in the case of developing countries, the green industries are scarce due to lack of experts and technological assets. Thus, the developed countries should assist the developing countries through technology transfers and capacity building in the green industries. The export-led economic growth strategy would be more beneficial for the developing countries rather than traditional growth strategy of developing domestic markets. If developing countries invest more on the production of product with less GHG emissions, they can have advantage in exporting the products to further promote the economic growth.

3. Data and descriptive statistics

Developing countries are relying heavily on trade to promote the export oriented industries. The developing countries focus on producing cheap products expecting comparative advantage in the world market, but unless there is a real increase of exports, the export-led economic growth would not be possible. Therefore, the opportunity to increase the actual volume of export products serves as a strong incentive for the developing countries. In other words, the developed countries should persuade the developing countries to actively participate in the global agenda to reduce CO_2 emissions by promoting the concept that the investment into the green industries will provide more export opportunities to the developed countries, which will eventually lead to economic growth.

In order to find the international trade pattern of the green goods and service, this study has matched the Standard International Trade Classification (SITC) Rev.2 code with the GGS classification of the North American Industry Classification System

(NAICS) 2012.[1] For international trade data, UN Comtrade database for 1976-2015 is used, which is released by the United Nations Statistics Division. Then, for the classification of the good and service, the GGS survey conducted by the U.S. Bureau of Labor Statistics (BLS) in 2011 is used. However, as the two datasets – SITC Rev.2 and GGS classification – cannot be directly matched, several intermediate steps were required, which are described below.

First, the correspondence table of SITC Rev. 2(4-digit) and International Standard Industrial Classification of All Economic Activities (ISIC) Rev.2 provided by Muendler (2009) was used to match the classification codes. Second, the classification codes are matched using the correspondence table of ISIC Rev.2 and ISIC Rev.3.1.[2] Third, the classification codes are matched using the correspondence table of ISIC Rev.3.1 and NAICS 2002.[3] Lastly, the correspondence table of NAICS 2002 and 2007 is matched with the correspondence table of NAICS 2007 and 2012.[4] After a series of classification code matching, the corresponding classification codes of NAICS 2012 and SITC Rev. 2 were ready for use.

The GGS of NAICS 2012 classifies industries into five different categories: (i) energy from renewable resources (BLS1), (ii) energy efficiency (BLS2), (iii) pollution reduction and removal, greenhouse gas reduction, and recycling and reuse (BLS3), (iv) natural resources (BLS4), and (v) environmental compliance, education and training, and public awareness (BLS5).[5] Table 1 summarizes the distribution of various definition of green goods and services. Out of 1,082 industries in 6-digit NAICS classification, 325 industries were identified as GGS (BLS). By aggregate definition, 229 industries in goods production and 96 industries in service sectors are identified as GGS. For other classifications, BLS1 includes 50 industries in goods production and 10 industries in service sector, while BLS5 only includes 45 industries in service sectors.

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[1] Another classification by STEPI(Science & Technology Policy Institute) in Korea is based on the number of patent citations of 77 green technologies is also useful definition of green industries. For example, the number of green industries with more than 250 citations was 219 industries out of the 1,145 codes of the 5-digit KSIC (Korea Standard Industry Classification). However, this definition includes relatively more manufacturing incustries. See Kang (2011) for more detailed explanation.

[2] UN statistics Division (https://unstats.un.org/unsd/cr/registry/regso.asp?Ci=25&Lg=1, retrieved on retrieved on April 10, 2017.).

[3] U.S. Census Bureau (https://www.census.gov/eos/www/naics/concordances/concordances.html, retrieved on April 10, 2017.).

[4] U.S. Census Bureau (https://www.census.gov/eos/www/naics/concordances/concordances.html, retrieved on April 10, 2017.).

[5] See the BLS homepage (https://www.bls.gov/ggs/, retrieved on May 30, 2017) for more detailed explanation on the definition of GGS.

Table 1: Distribution of Various Definitions of Green Industry

Code	BLS	BLS1	BLS2	BLS3	BLS4	BLS5
Goods	229	50	99	88	66	0
Services	96	10	33	34	8	45
Total	325	60	132	122	74	45

Note: The code is 6-digit NAICS classification.
Source: BLS homepage(http://www23.statcan.gc.ca/imdb/p3VD.pl?Function=getVD&TVD=118464&CVD=118465&CLV=0&MLV=5&D=1, retrieved on 05.20.2017)

In order to examine the share of green and non-green industries, GGS classification is transformed into 2-digit NAICS classification based on Green and Non-green classification, shown in Table 2. Under the 2-digit NAICS classification, 56 out of 63 Agriculture, Forestry, Fishing and Hunting industries are identified as GGS. Furthermore, 115 out of 365 Manufacturing industries are identified as GGS. However, since the SITC Rev. 2 does not include service sectors classification codes, the detailed classification for service sectors is not discussed in this study.

Table 2: Green and Non-green Classification by NAICS 2012

Code	Description	Green	Non-Green	Total
11	Agriculture, Forestry, Fishing and Hunting	56	7	63(88.9%)
21	Mining, Quarrying, and Oil and Gas Extraction	0	29	29(0%)
22	Utilities	10	4	14(71.4%)
23	Construction	48	2	50(96.0%)
31-33	Manufacturing	115	250	365(31.5%)
Others	Service	96	466	562(17.1%)
Total		325	758	1,083(30.1%)

Note: The code is 2-digit NAICS classification.
Source: BLS homepage (http://www23.statcan.gc.ca/imdb/ p3VD.pl?Function= getVD&TVD= 118464&CVD=118465&CLV=0&MLV=5&D=1, retrieved on May 20.2017)

Afterwards, the 4-digit SITC Rev.2 classification is transformed into 1-digit SITC Rev.2 classification based on Green and Non-green classification, shown on Table 3. The total number of green industries is 290 (36.80%) out of 788 industries. Furthermore, high share of green industries is seen in Chemicals and related products (SITC5), manufactured goods classified chiefly by materials (SITC6) and machinery and transport equipment (SITC7).

Table 3: Green and Non-green Classification by SITC Rev.2

Sector	Description	Green	Non-green	Total(%)
0	Food and live animals chiefly for food	51	43	94(11.9)
1	Beverages and tobacco	0	11	11(1.4)
2	Crude materials, inedible, except fuels	43	61	104(13.2)
3	Mineral fuels, lubricants and related materials	0	20	20(2.5)
4	Animal and vegetable oils, fats and waxes	0	18	18(2.3)
5	Chemicals and related products, nes	62	33	95(12.1)
6	Manufactured goods classified chiefly by materials	67	124	191(24.2)
7	Machinery and transport equipment	50	109	159(20.2)
8	Miscellaneous manufactured articles	16	72	88(11.2)
9	Not classified elsewhere	1	7	8(1.0)
Total		290(36.8)	498(63.2)	788(100.0)

Note: The code is 1-digit SITC Rev.2 classification.
Source: UN TRADE STATISTICS homepage (https://unstats.un.org/unsd/tradekb/ Knowledgebase/ 50262/ Search-SITC-code-description, retrieved on May 20.2017)

4. Empirical Results

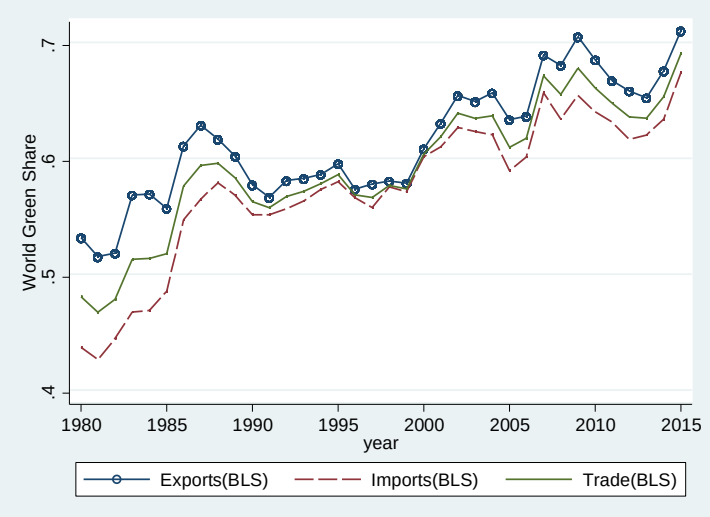
4.1 General Trends of Green Trade, Exports and Imports

The empirical investigation is conducted through graphical analysis by using the matched data of various definition of the green and non-green trade pattern. Since the number of the countries in the 1970s were less than 50, the sample for the analysis is restricted to the period after the 1980s.

[Figure 1] describes the general trend of green share of world exports, imports and trade. The graph shows an increasing trend of green exports, imports and trade with relatively higher ratio of green exports than that of green imports.[6]

The share of green exports to total exports was 53.2% in 1980 and then increased to 62.8% in 1987. There was a fluctuation over the years but with an overall increasing trend until 2015. The share was 71.1% in 2015. The share of green imports shows similar trends with the share of green exports. In 1980, the share of green imports was 43.8% in 1980 with an increasing trend and reached 67.6% in 2015. Similarly the share of green trade shows an increasing trend over time.

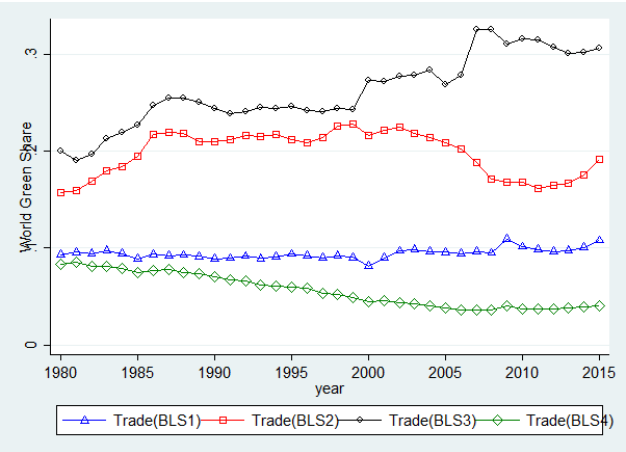
[6] The share is derived by dividing green exports, imports and trade by world exports, imports and trade.



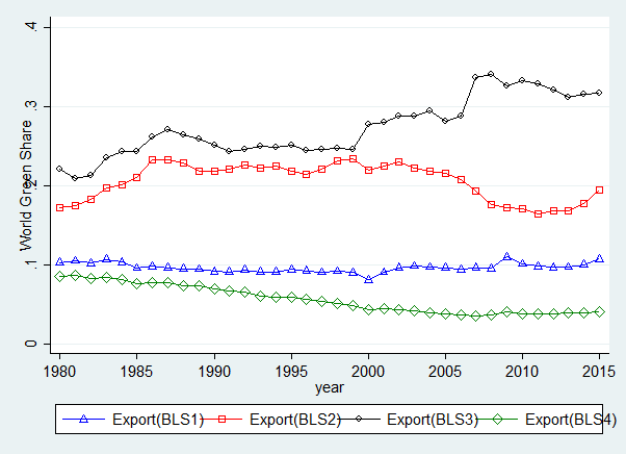
[Figure 1] Share of World Green Trade, Exports and Imports

[Figure 2], [Figure 3] and [Figure 4] show the trends of green trade, exports and imports by detailed classification of GGS. BLS5 of service industries that are not included in the trade is excluded from the graph.

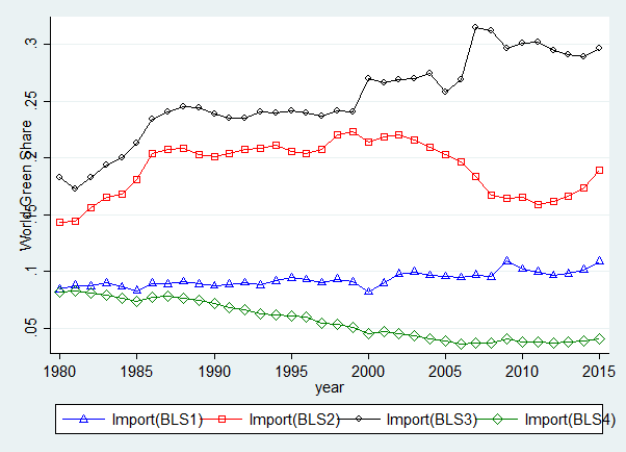
From three graphs, it can be seen that the green trade share of BLS3(pollution reduction and removal, greenhouse gas reduction, and recycling and reuse) shows significantly increasing trend from about 20% in 1980 to above 30% in 2015. And the green trade share of BLS1(energy from renewable resources) tends to show smoothly increasing trend over time. However, the green trade share of BLS4(natural resources) shows a decreasing trend over time even with stable share after 2010. The findings here should be carefully interpreted that some industries are overlapped for the BLS definitions as shown in [Table 1].



[Figure 2] World Share of Green Exports by BLS



[Figure 3] World Share of Green Trade by BLS

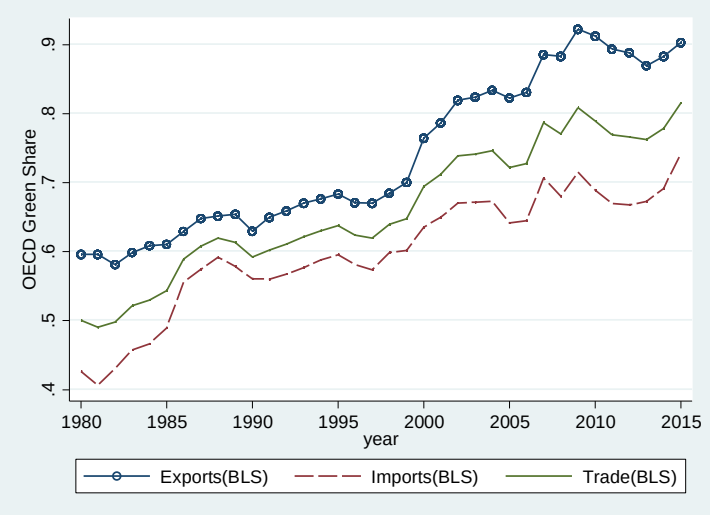


[Figure 4] World Share of Green Imports by BLS

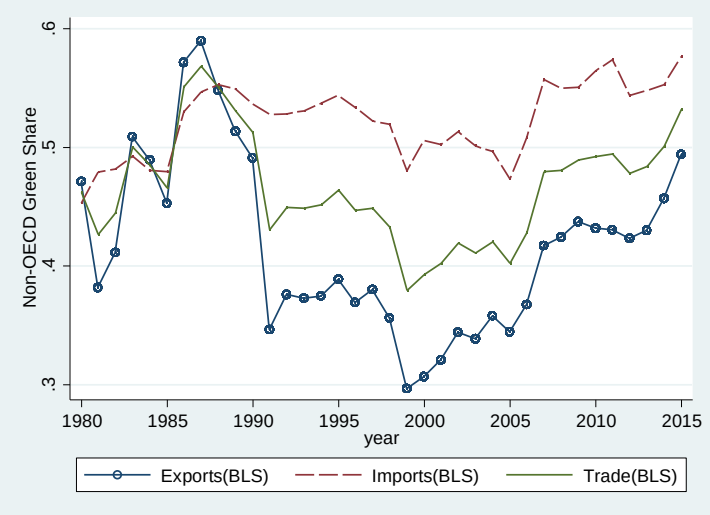
[Figure 5] and [Figure 6] show the trend of green exports, imports, and trade by OECD and non-OECD countries. This is to compare the trends of developed and developing countries. OECD countries show very consistently increasing trends of green trade while non-OECD countries indicate more fluctuating trends of green trade.

For OECD countries, the shares of green exports and green imports were 47.1% and 45.3%, respectively, in 1980. They increased to 90.2% and 74.1%, respectively, in 2015. These trends have reflected significant increases in green trades over 1980-2015. However, the shares of green exports and imports of non-OECD countries have tended to fluctuate significantly over periods. Especially the share of green exports has decreased over 1980-1999 and then started to increase afterwards. For example, the shares of green exports in 1980 and 1981 were 47.1% and 38.2%, respectively. The share decreased to 29.7% in 1999 with a peak at 57.2% in 1986. After 1986, the share started to increase consistently to 49.4% in 2015. Comparing to the share of

green exports, the share of green imports has tended to show less fluctuation. The share remains similar after the end of the 1980s.



[Figure 5] Share of Green Trade, Exports and Imports of OECD Countries

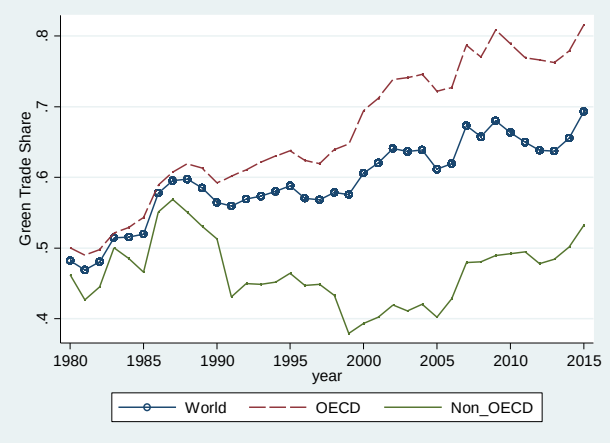


[Figure 6] Share of Green Trade, Exports and Imports of non-OECD countries

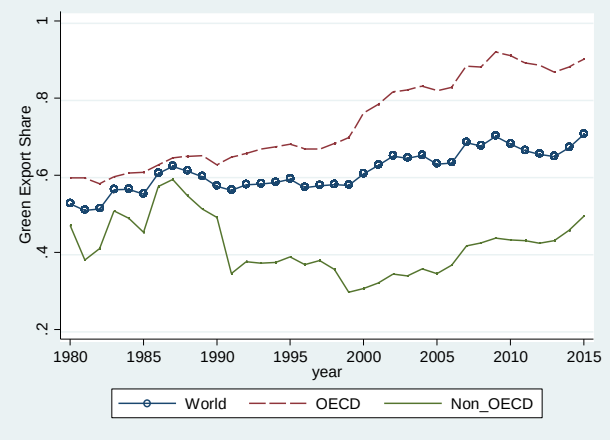
[Figure 7], [Figure 8] and [Figure 9] compare the share of green trade, exports, and imports among World, OECD and non-OECD countries. Three figures show that the share of green trade, exports and imports of the OECD countries show relatively higher share and more rapidly increasing trend than those of the non-OECD countries.

For example, the share of green trade of the OECD countries (about 0.5) in 1980 was slightly higher than that of the non-OECD countries (about 0.47). That value of the OECD countries increased to above 0.8 while that of non-OECD countries increased slightly above 0.5 after it decreased to less than 0.4 in 1999. Thus, the trends imply that the share of green trade of the non-OECD countries fluctuated more than that of the non-OECD countries and does not increase significantly.

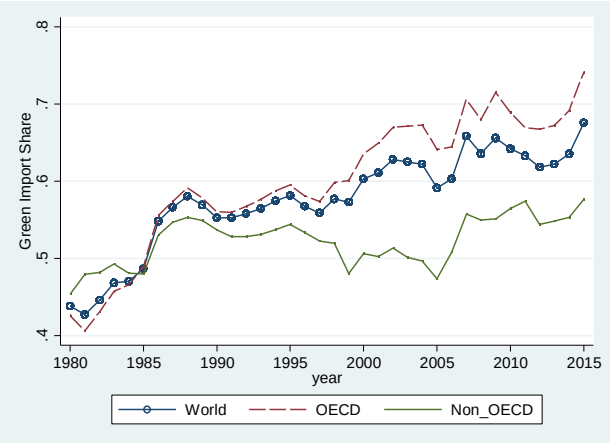
The trend of green exports and imports shows similar patterns between OECD and non-OECD. The share of green exports of the OECD countries shows increasing trends over the whole period while that of the non-OECD countries fluctuates more with initially decreasing and then increasing trend over the period.



[Figure 7] Share of Green Trade of World, OECD and Non-OECD



[Figure 8] Share of Green Exports of World, OECD and Non-OECD



[Figure 9] Share of Green Imports of World, OECD and Non-OECD

4.2 Share of Green Trade, Exports and Imports by Countries

Three figures below indicate the trends of green exports, imports and trade by countries: South Korea, U.S. and China.

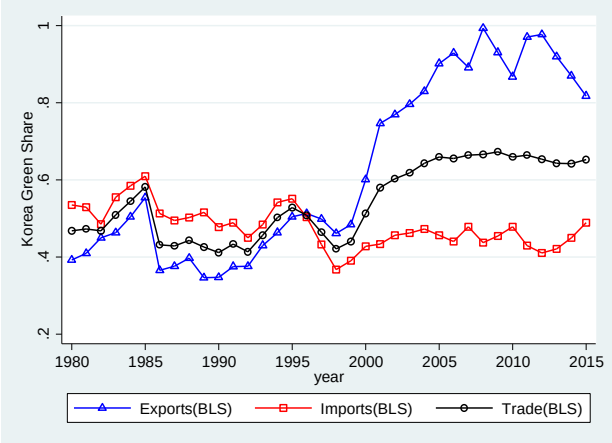
Even though South Korea shows general increasing trend of green trade share in [Figure 12], the trend shows a little fluctuation over the period. The shares of green exports, imports and trade have been stabilized at around 0.5 until the end of the 1990s. After 2000, the share of green exports started to increase significantly to about 0.8 in 2015 while that of the green imports has decreased and afterwards kept stable at just above 0.5.

The shares of U.S. in [Figure 13] are slightly different from those of South Korea. The shares of green exports and imports tend to consistently increase over the period. The shares of green exports and imports in 1980 were about 0.55 and 0.4, respectively. Since then they have increased continuously to about 1.1 of green exports and about 0.8 of green imports without any decreasing years. Especially since 2005, those shares have significantly increased.

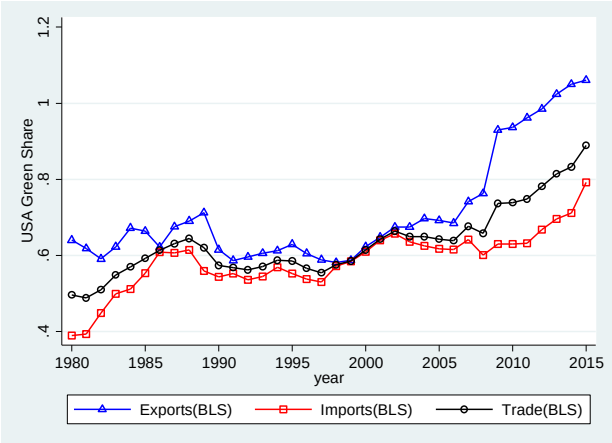
The shares of China in [Figure 13 are quite contrasting with those of both South Korea and U.S. Since 1985, when the trade data are available, the shares of green exports and imports have continuously decreased until 2005 and then increased. Further the values are lower than those of two countries. The shares of green exports and imports have remain lower at about 0.4. As of 2015, the values of green exports of South Korea and U.S. were about 0.8 and 1.1, respectively and the values of green imports of two countries were about 0.6 and 0.8, respectively. These values can be contrasted with values of 0.5 of green exports and 0.4 of green imports of China.

In summary, it can be inferred that China has been importing and exporting relatively lower shares of green products. This indicates that larger share of non-green

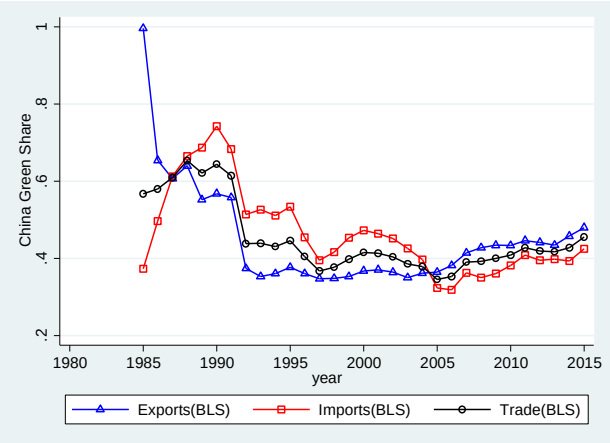
products are produced and consumed.



[Figure 10] Share of Green Exports, Imports and Trade of Korea



[Figure 11] Share of Green Exports, Imports and Trade of U.S.



[Figure 12] Share of Green Exports, Imports and Trade of China

5. Conclusion

This study aims to investigate general or country-level trends of trade, exports and imports of green product by using international trade data and classified green-goods.

The findings of the study are that there are increasing trends of world share of green trade, exports and imports to total trade, exports, and imports, respectively. Further, the share of OECD countries, as high income countries are relatively higher than those of non-OECD countries. Three countries (South Korea, U.S. and China) at different stage of economic development are examined. Three countries show different trends of the share of both green exports and imports. The shares of green trade, exports and imports of South Korea have increased from about 0.45 in 1980 to 0.55 in imports and about 0.75 of exports in 2015. In U.S., the shares of green imports and exports in 1980 were about 0.4 and 0.65, respectively and then increased to about 0.8 and 1.1, respectively. However, China tends to show different trends with those of South Korea and U.S. The shares have decreased from about 0.6 in 1986 to about 0.5 in 2015.

Through this study, the shares of green trade, exports and imports have shown different trends as well as values even though the overall world shares have tended to increase over the period. Thus it is necessary to investigate the factors that determine these different patterns of green trade, exports and imports with more sophisticated econometric methodology by controlling for more independent country-specific variables. Then we can persuade the developing countries to join the agreement of international community to reduce GHG emissions and to achieve the global temperature target.

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