Issues and Possibilities of Environmental Goods Negotiations[†]

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Abstract: This study highlights the issues and possibilities surrounding Environmental Goods (EGs) negotiations. EGs generally refer to environmentally friendly goods. For example, solar panel, wind power generation and so on. EGs' Trade has attracted worldwide attention since the early 2000s owing to it becoming a subject of liberalization in the Doha Round, EGs could contribute to environmental preservation and Sustainable Development by global dissemination. The purpose of this study is twofold: first, it is an analysis of the reality of the negotiations. Second, it is an investigation of the expected roles of EGs negotiations. With respect to the former, using the results of the analysis based on primary sources, we confirm that despite the North-South divide in the EGs negotiations, many lists containing candidate EGs are proposed, but no objective criteria are set to ensure their environmental impact. Regarding the latter, we examine through regression analysis whether trade in EGs has an environmental effect, and confirm that it does indeed have an environmental performance in each country, although the effect varies by importing country and lists.

Keywords: Environmental Goods (EGs), EGs negotiations, EGs' trade

JEL Classification Numbers: F13, F14, F18

1. Introduction

This study highlights the issues and possibilities of Environmental Goods (EGs) negotiations. EGs generally refer to environmentally friendly goods. However, there is no established definition or classification. Providing a definitive concept is difficult as we are dealing with issues that involve the diverse nature of environmental problems. As we later explain, this is a significant problem for negotiations. The OECD has provided typical definitions, it is necessary to "measure, prevent, limit, minimize or correct environmental damage to water, air and soil, as well as problems related to litter, noise and ecosystems. This includes cleaner technologies, products and services that reduce environmental risk and minimize pollution and resource use" (OECD/Eurostat 1999 p.9). For example, solar panels, wind power generation, and so on. This definition is too abstract and broad. Unfortunately, deriving a practical standard from this definition is difficult.

EGs' trade has attracted worldwide attention since the 2000s. This is because it became a subject of liberalization in the Doha Round, the mandate in paragraph 31 (iii) of the Doha Ministerial Declaration calls for negotiations on "the reduction or, as appropriate, elimination of tariff and nontariff barriers to environmental goods and services." Its purpose is win-win-win, that is, free trade, environment, and

development. Basically, EGs' trade is expected to contribute to environmental preservation and Sustainable Development via global dissemination. However, as is well known, the Doha Round negotiations stalled, and the stage for negotiations shifted to APEC in 2009.

There are two essential challenges in EGs negotiations, that is, there are two uncertainties. Ultimately, certain information must be provided for them. First, regarding uncertainty, as described above, it has no definition and classification in the WTO. Basically, there is no standard for identifying EGs. Second, there are no criteria for judging the effects of EGs' trade. Essentially, EGs' trade is more effective than normal goods trade. However, unclear concepts and hypotheses for "contents of liberalization goals" and "determination of effects." For new research themes, we must reconstruct research results[1].

The purpose of this study is twofold: first, it is an analysis of the reality of the negotiations. On what issues do conflicts arise, and what are the outcomes of the negotiations? Second it is an investigation of the expected roles of EGs negotiations. This study does not examine or present a hypothesis but rather analyses it from real trade trends. As appropriate, we will approach these issues while reviewing previous research.

A study on EGs negotiations has the following three benefits: First, it is a new liberalization theme that can contribute to environmental objectives beyond mere trade liberalization. Second, this is a theme that can verify whether WTO rules have been modified or new roles have been granted. Thus, this theme could provide us with insights into designing new trade rules. Third, it is a theme that analyses the role of modern markets in addressing environmental problems. Essentially, it is a theme that can examine the new role of international trade. As mentioned above, a study on EGs negotiations requires not only quantitative but also qualitative analysis.

This study is structured as follows. Section 2 analyses the realities of EGs negotiations and the deliverables of the negotiations. Section 3 examines the possibility of EGs negotiations through a data analysis of EGs' trade. Section 4 concludes this study and presents future issues.

2. The reality of EGs negotiations

Before explaining the details, examine the outline of the negotiations.

The main points of controversy are the following two points. The first is on the way in which EGs are identified. The definition and classification of EGs must be clarified. The second is about the way in which EGs are liberalized. Not only tariffs but also nontariff barriers are under discussion.

We also check three approaches in progressing negotiations. The first approach is the "conceptual approach," wherein an attempt is made to conceptualize EGs with no definition or classification. However, the approach has had little success. The second approach is the "list approach," in which lists are created containing specific items and EGs are identified. Many of the proposals are centered on developed countries. The third approach is the "project approach," wherein each country designs its own projects and liberalizes them according to their content and duration. This is proposed mainly in developing countries,

which might be opposed to one-size-fits-all. The project approach is of a contrasting nature to the list approach, which aims for unified liberalization based on a common list.

We would like to review the representative research results in this field. The first theme is the analysis of identification. This is a representative initial research theme. There are research results on the (abstract) definition of EGs and the specific item list of EGs. Representative results of the former can be found in Chaytor (2002), Carpentier et al. (2005), Hino (2008), and Xinqiang (2012). Chaytor (2002) and Carpentier et al. (2005) discuss how EGs should contribute to the "conceptual approach" and are necessary to achieve win-win, while Hino (2008) and Xinqiang (2012) caution against controversies that lean towards the "list approach" and highlight the importance of conceptual considerations. Representative results of the latter can be found in Steenblik (2005), Sugathan (2013), Zugravu-Soilita (2016), and Haneda (2019). As for the analysis of item lists, Steenblik (2005) provides a detailed analysis of the early lists, and Sugathan (2013) summarizes the lists. Zugravu-Soilita (2016) presents a unique list of environmentally preferable products (EPPs), while Haneda (2019) created an ingenious list by utilizing the IPC Green Inventory.

The second theme is the analysis of "liberalization negotiation." While overall research output is limited, the results of the economic analysis of the WTO negotiations are UNCTAD (2004) and Hino (2005, 2007, 2011). Among those that analysed APEC are Vossennar (2013, 2016) and Hino (2014). Rather than addressing the negotiation process in parts, this study analyses both negotiations inclusively. For that purpose, we take advantage of the content of Hino (2019) based on primary sources, which is the only systematic outcome of economic analysis in this field.

We divide the EGs negotiations into three periods according to the nature of the negotiations. The nature of the negotiations is based on changes in key issues and reflects changes in the attitudes of major countries. The period from 1997 to 2006 is the "initial period." The basic structure of the negotiations became clearer as the proposals of the major countries had come together. The period from 2007 to 2008 is referred to as the "promotion period." It was a period when some countries' positions had changed, and negotiations had made significant progress. The period from 2009 to 2012 is referred to as the "transition period." The stage for negotiations had shifted to APEC, and a successful conclusion was reached.

The characteristics of the negotiations in each period are examined in detail. Here, we can use a diagram with the following characteristics: The vertical axis indicates the purpose of the trade. It is expressed from economic to noneconomic purposes. Noneconomic purposes have been added since the WTO era, for example, concerning the environment. It was not in the GATT era. On the other hand, economic purposes have been inherited since the GATT era. The horizontal axis indicates how commitment is made. On the right side of the horizontal axis, it is expressed as one-size-fits-all. On the other side, it is expressed as special and differential treatment (S&D).

Figure 1 illustrates the structure of the negotiations at the "initial period." In the first quadrant, the "Free Trade group" including the US and NZL, had been primarily positioned. This group treats EGs similar to ordinary goods and aims for liberalization to gain economic merits. In the fourth quadrant, the "Environmental group," including EU, Switzerland and Norway had been primarily positioned. The EU

made proposals that could modify free trade rules by changing the way in which production process and production method (PPM) standards are operated. These countries were willing to accept the argument of using non-product-related PPM to differentiate their products to consider the environmental impact of the production process and its methods. In the second and third quadrants, the "S&D group," including India, Brazil, Argentina, and China, had been positioned. In this way, at the "initial period," there were conflicts among the three groups; therefore, we could confirm three-way conflicts. We might highlight the "diversification of the principles" of the WTO rules from such tripartite arguments (Hino 2005). The EGs negotiations had surpassed the traditional argument of a one-size-fits-all liberalization for economic purposes, and the generation of rules for new purposes can be foreseen. Regarding trends in other major countries, Japan had not made as clear statements as those mentioned above. However, like the US and EU, it has developed and proposed its own list of items and is in favor of a one-size-fits-all liberalization. Therefore, it could be said to be close to "Free Trade group" and "Environmental group." Australia, Canada, and Taiwan had a similar attitude.

Figure 1. The structure of the negotiations at the "initial period"
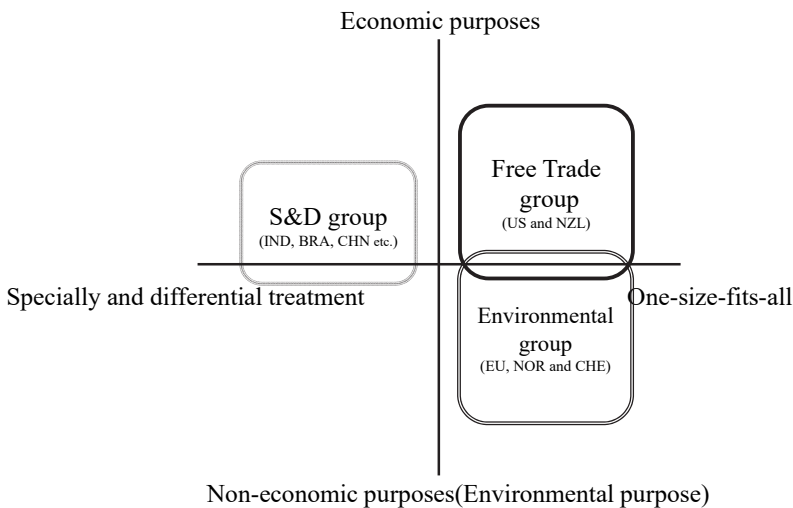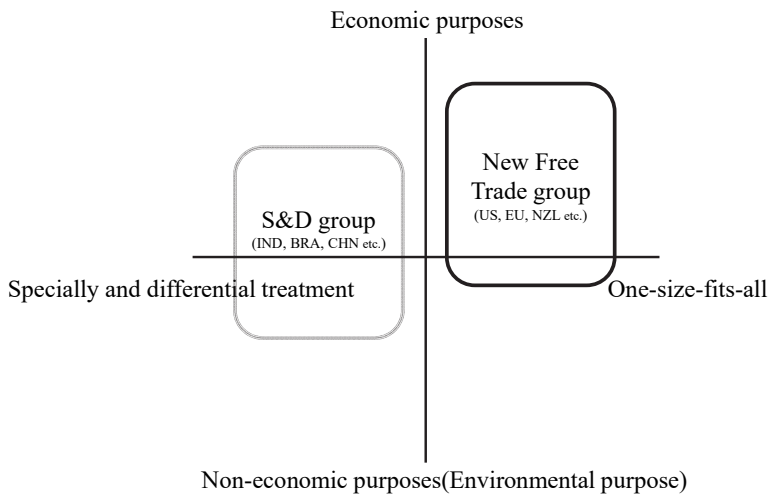

Source: Created based on data from Chapter 2 in Hino (2019)

Figure 2 illustrates the structure of the negotiations at the "promotion period." At this period, the "New Free Trade group" had been formed here by the fact that the proposal of "Environmental group" to modify the rules of free trade was virtually withdrawn and approached "Free Trade group." The background to this phenomenon may be that they have stepped up to the "Free Trade group" in order to (1) to achieve an early outcome in the run-up to the first phase of the Kyoto Protocol, and (2) to keep developing countries in check, which had more different attitudes towards trade liberalization and environmental initiatives. On

the other hand, although the "S&D group" had made various proposals, there had been no change in their basic arguments. Due to various proposals and debates, the situation reminds us of the North-South divide and a return to the debates of the GATT regime.

Figure 2. The structure of the negotiations at the "promotion period"

Source: Created based on data from Chapter 3 in Hino (2019)

Figure 3. The structure of the negotiations at the "transition period"
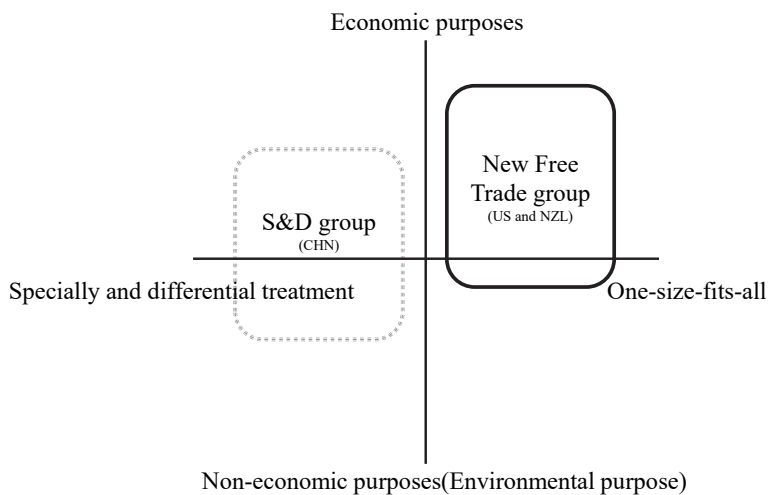
Source: Created based on data from Chapter 4 in Hino (2019)

Figure 3 illustrates the structure of the negotiations at the "transition period." There had been no major changes in the statements of each country; however, there had been changes in the negotiating countries, especially as many of the "S&D group" are not APEC economies. The only economies of APEC and "S&D groups" are in China. As noted above, the major APEC economies – Japan, Australia, Canada, and Taiwan – had been close to the "New Free Trade group." Therefore, the "New Free Trade group" which has gained relatively momentum, had settled the argument in the form of one-size-fits-all. This is a key factor that has led to the agreement.

We will focus on the list of items that are representative deliverables of the negotiations. Each item in the list is assigned a six-digit HS classification, which identifies the EGs. Although a number of lists have been proposed (see Table 1), there is no inspection or examination of the grounds of the proposed item using environmental standards such as ecolabels. Because there is no definition or classification, the "conceptual approach" has been unsuccessful. It might be secured by "procedure legitimacy." However, all these lists are unlikely to have similar environmental effects. Verification is required on this.

Table 1. Proposed status of the full list by time period

Period	APEC	WTO
Initial	(・OECD list) ・A1 list	・Japan list, Taiwan list, EC list 　Korea list, NZL list, Canada list 　US list, Switzerland list, ・Qatar list
Promotion		・Friends list, WB list
Transition	・A2 list	・J list ・Saudi Arabia list, Philippines list 　Qatar 2nd list, SGP list

Source: Adapted from Table4-3 in Hino (2019)

Table 2. Comparison of HS codes of Four lists

	OA1	WB	A2	J
OA1	171　(72)	15　[8.8]	38　[22.2]	0　[0.0]
WB	38　[70.4]	43　(0)	11　[26.6]	0　[0.0]
A2	15　[34.9]	11　[20.4]	54　(6)	2　[4.7]
J	0　[0.0]	2　[3.5]	0　[0.0]	57　(55)

Source: Adapted from Table4-2 in Hino (2019)

Note: the numbers indicate duplicate numbers, and [ ] indicates the duplication rate.

The numbers in the colored cells indicate the number of HS in each list, and

( ) indicates the number of original HS.

A particularly important list of four points, representative of each period, is as follows: OECD list(O) and APEC 1st list(A1), combined and abbreviated as the OA1 list. The former was created by the OECD in 1999, while the latter was created owing to consultations at APEC in 1999, before the Doha Round. These lists are an initial list with high similarity[2], which is the origin of the list proposed by each country. Second, the WB list (World Bank list), consists of climate change-related products proposed by the US and EU in WTO negotiations. It is a compilation of the arguments of the "New Free Trade group," a list representative of the "promotion period." Third, the A2 list (APEC 2nd list) created by consultation in 2012 at APEC. It is the most recent list agreed upon internationally and is representative of the "transition point." Fourth, the J list (Japanese 2nd List), proposed by Japan, consists of energy-saving equipment (products). It is an ingenious list that includes many resource-saving products. Table 2 illustrates the relationships among the four lists. Mentioning the technical issues, the HS classifications utilized by the respective lists are not identical. In this study, we use the HS2002 classification, which is suitable for obtaining long-term data. Therefore, only the OA1 list, HS1996 to HS2002, is converted.

The A2 list has high similarity with the OA1 list and WB list, and J has high originality. The OA1 and A2 lists consist mainly of Traditional goods (to address an environmental problem). The WB list consists of traditional goods related to climate change. The J list consists of the resource-saving type of EPP, which has a relatively low environmental impact compared to similar products.

3. The Effect of EGs' trade

In this section, we conduct an empirical analysis of the effects of EGs' trade. The list used for analysis is the following: 4 + 1. The four lists are as described above. Additionally, a list obtained by summation of the items included in the four lists was used. This list is called "SUM." Certainly, duplicate lists were deleted so that they were not counted twice. There are 46 countries in the sample, including major countries[3]. The analysis period is from 2003 to 2012, that is, one in which negotiations were active and trade expanded steadily, albeit partly due to the financial crisis of 2008.

In this study, we focus on imports. Imports have a pro-developmental effect (Hirschman 1958) and are a major technology transfer channel. Imports are expected to bring goods and information from abroad and facilitate the diffusion and establishment of technology in the country. The average global share of imports of EGs from 46 countries in 2003 to 2012 was 91.0%[4]. In sum, the total imports of the 46 countries accounted for more than 90% of the world's total imports; therefore, global trends in the EGs' trade can be examined from these countries.

The import status of the five lists is shown in Figure 4. As the number of items included in each list is different, the indexed data are shown here. There are no major differences in the trends on each list; they are upward trends, albeit a temporary downward trend occurred due to the financial crisis of 2008. Looking at the growth rate, the items on the WB list have the highest growth rate, with trade growth nearly tripling

Figure 4. Trade value by lists in 46 countries (2003=100)
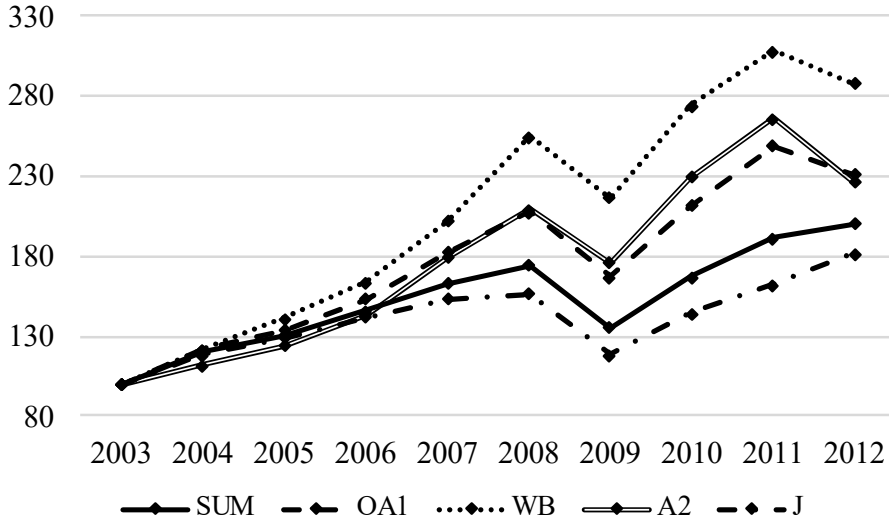
Source: PC-TAS

Figure 5. Trends in the ratio of imports in the top 10 developed and developing countries (%)
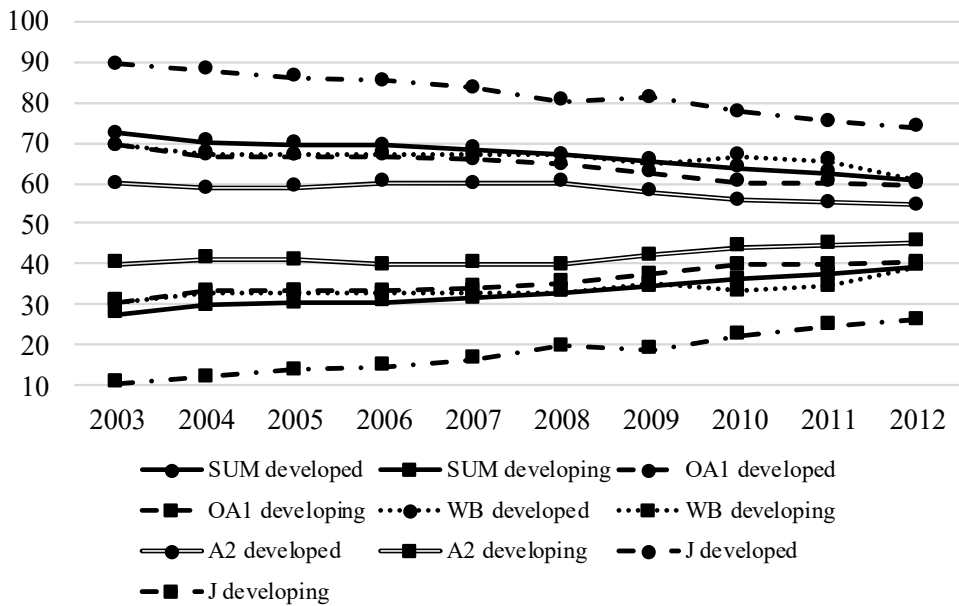
Source: PC-TAS

over the past decade. In contrast, the items on the J list have the lowest growth rate: 1.8 times. The J list, which is below the SUM level, is expected to grow further.

Figure 5 presents the trend in the total share of imports calculated for the top 10 developed and developing countries regarding trade. Since the number of developed and developing countries discussed in this study is different, we compare the total proportions of the top 10 countries in both. Although the share of developed countries is high, the share of developing countries is approaching. The future and importance of developing country markets could be confirmed. Looking at trends by lists, the J list has the highest share of developed countries, and the A2 list has the lowest share of developed countries.

To show the characteristics of this estimation model, we would like to review the previous researches of the empirical analysis. Analysis results could be broadly divided into verification results for either "liberalization effect" or "trade effect."

The differences between the two verifications are as follows: The former examines how much EGs' trade will increase by reducing and eliminating tariff and nontariff barriers. The explanatory variable in this estimation is the volume of trade. This estimate verifies the "win" (free trade) in win-win-win, which is the objective of EGs negotiations. This might be a theoretically expected effect. This is because if the trade cost decreases, trade volume will increase. The latter examines how much the environmental performance of the country changes with the growth of EGs' trade. The explained variable is the environmental result. It must not be a theoretically expected effect. This is because, as mentioned above, the environmental effects of EGs have not been examined by objective criteria but have only guarantee by procedural legitimacy. This estimate verifies the "win–win" in win-win-win. Essentially, it is an examination of the relationship between "free trade" and "environmental preservation". This is an extremely important verification work, as it will verify the fundamental significance of EGs negotiations.

There are many empirical analyses of the "liberalization effect." For example, Avery and Boada (2002), Jha (2008), Matsumura (2016), Jacob and Møller (2017), Cantore and Cheng (2018), and so on. However, the verification of the trade effect is limited. Zugravu-Soilita (2016) examines the direct and indirect effects of the "trade effect" only for the transition countries from 1995 to 2003. An analysis of total trade focusing on two lists (OA1 list and EPP list) shows different results depending on the environmental result, with the estimates with CO2 as the dependent variable confirming the greatest effect, while an analysis of import data focusing on the type of EGs confirms a direct effect for end-of-pipe and the opposite of the hypothesis for cleaner technology. Although both conclusions are important, owing to the specificity of the timing and selection of the target countries, we must be cautious in generalizing these conclusions.

In this study, the Environmental Performance Index (EPI) is used as an explained variable. EPI represents the environmental performance of a country's policies numerically and is an indicator to judge changes in environmental performance. It takes a value from 0 to 100, and the higher the value, the better the performance. It can capture the comprehensive environmental performance of the country concerned, rather than being limited to a specific environmental problem. Since EGs are associated with a variety of

environmental problems, it may be inappropriate to make certain environmental results, such as greenhouse gases, an explained variable in a comprehensive analysis using multiple lists.

In this study, we use the "backcasted" scores published in the 2014 edition to capture the changes in the years from 2002 to 2012. Data were obtained from the EPI's home page[5].

In this estimation, we use four explanatory variables: IM, GDP, GDPper, and ET. IMPORT(IM) uses a one-period lag of the value divided by the real GDP of each country. The reason for this is to deal with endogeneity. Not only could imports improve EPI, but improvements in EPI could also lead to an increasing use of EGs, which in turn could lead to increased imports. However, in the case of lag, the point is shifted. The data were obtained from the PC-TAS. The second is real GDP (GDP). It is a variable that could capture the size effect, which could assume a negative correlation with EPI. Data were obtained from the World Bank's home page[6], measured in purchasing power parity with 2011 as the base year. The third is real GDP per capita (GDPper). This shows the average income level of the concerned people. In general, higher income levels are said to be associated with greater environmental awareness. Therefore, the higher the value, the higher the EPI is expected to be, and a positive correlation can be assumed with the EPI. Data were obtained from the World Bank's website, using 2011 as the base year, measured regarding purchasing power parity. The fourth is the environment-related tax revenue (ET). This variable captures the environmental policies and institutions of the country. EGs' trade and environmental policies are expected to be related to each other, with a higher ET indicating that a country's environmental institutions are strict or strong. It is assumed that such countries will show high environmental performance, influenced by enriched policies and institutions[7]. The data, expressed as a percentage of GDP, were obtained from the OECD's home page[8].

Missing data is dealt with as follows: There are missing values in ET, especially in developing countries[9]. Since the source of the data is the OECD, the use of data from non-OECD member countries is essentially limited. However, excluding data from these countries would make the sample extremely biased towards developed countries. This study takes the second-best measure, mean imputation. The average of all non-OECD countries for which data are available is calculated and filled in missing values. Other missing values are also present in some developing countries, and measures have been taken to remove the missing values except for ET. Originally, there should have been a sample size of 460 for 46 countries multiplied by 10 years, but the actual sample size is 451. Appendix Table 2A shows the descriptive statistics for the variables used in the analysis and Appendix Table 2B shows the correlation matrix of explanatory variables. Although the correlation coefficients between GDP and IM are high, we use GDP to control for scale effects, referring to the theoretical estimation model presented by Antweiler et al. (2001).

Trade data, such as interest rates, are known as nonstationary data. In this study, three types of unit root tests were conducted: the Levin-Lin-Chu test, the Fisher-type ADF test, and the Fisher-type PP test, and if any of the null hypotheses could not be rejected, it was judged to be nonstationary. The significance level was set at 5%, and lag orders were selected according to Schwarz's Bayesian information criterion. The results of the test confirmed that all variables were I(1)[10].

Table 3. Estimation results (explained variable = EPI)

	Total	developed country	developing country	Total	developed country	developing country	Total	developed country	developing country	Total	developed country	developing country	Total	developed country	developing country
ΔL.lnIM_SUM	0.00402 [0.00365]	0.00089 [0.00367]	0.00822* [0.00457]												
ΔL.lnIM_OA1				-0.00132 [0.00458]	-0.00276 [0.00742]	-0.00128 [0.00445]									
ΔL.lnIM_WB							0.00255 [0.00171]	0.00038 [0.00168]	0.00373 [0.00292]						
ΔL.lnIM_A2										-0.00038 [0.00156]	-0.00222 [0.00180]	0.00199 [0.00294]			
ΔL.lnIM_J													0.00618** [0.00295]	0.00538* [0.00278]	0.00759* [0.00413]
ΔlnGDP	-0.00832*** [0.00226]	-0.00674*** [0.00151]	-0.11226** [0.03972]	-0.00745*** [0.00219]	-0.00630*** [0.00155]	-0.10956*** [0.04174]	-0.00763*** [0.00217]	-0.00658*** [0.00115]	-0.10746** [0.04158]	-0.00757*** [0.00218]	-0.00654*** [0.00115]	-0.10776** [0.04146]	-0.00902*** [0.00219]	-0.0075*** [0.00123]	-0.11438*** [0.03807]
ΔlnGDPper	-0.01379 [0.02953]	0.03461** [0.01277]	0.02397 [0.04047]	-0.0090 [0.02781]	0.03427** [0.01242]	0.04093 [0.04114]	-0.00984 [0.02747]	0.03389** [0.01245]	0.03990 [0.04034]	-0.00959 [0.02758]	0.03252** [0.01276]	0.03988 [0.03986]	-0.02654 [0.03044]	0.02654** [0.01161]	0.01522 [0.03995]
ΔlnET	-0.00057 [0.00326]	-0.00350 [0.00740]	0.00061 [0.00298]	-0.00012 [0.00345]	-0.00331 [0.06693]	0.00129 [0.00341]	-0.00006 [0.00323]	-0.00323 [0.00716]	0.00128 [0.00311]	-0.00008 [0.00346]	-0.00311 [0.00733]	0.00109 [0.00325]	-0.00098 [0.00323]	-0.00161 [0.00745]	0.00014 [0.00306]
_cons	0.00454*** [0.00133]	0.00185** [0.00077]	0.01027*** [0.00316]	0.00532*** [0.00144]	0.00234** [0.00107]	0.01143*** [0.00332]	0.00487*** [0.00135]	0.00196*** [0.00068]	0.01080*** [0.00320]	0.00516*** [0.00138]	0.00206*** [0.00064]	0.01086*** [0.00336]	0.00439*** [0.00133]	0.00127* [0.00066]	0.01059*** [0.00314]
R-squared	0.15931	0.2362	0.23803	0.15539	0.23835	0.2262	0.15892	0.23598	0.23244	0.15524	0.24562	0.2275	0.17063	0.24969	0.24636
N	356	199	157	356	199	157	356	199	157	356	199	157	356	199	157
Group	46	25	21	46	25	21	46	25	21	46	25	21	46	25	21

Note: * $p<0.1$, ** $p<0.05$, *** $p<0.01$. The numbers in parentheses are robust standard errors.

We adopt a two-way fixed-effects model using the difference variable in this estimation11. This is a simple and useful estimation method that can be controlled for time and individual-specific effects. Estimates are made for 46 countries, the developed and developing country groups, respectively. In this analysis, we assume a simple linear relationship between the dependent and explanatory variables and use the following estimation equation:

$$\Delta lnEPI_{it} = a_0 + a_1\Delta lnIM_{it-1} + a_2\Delta lnGDP_{it} + a_3\Delta lnGDPper_{it} + a_4\Delta lnET_{it} + v_i + c_t + \varepsilon_{it}$$

The coefficients for a_0…a_4 are estimated; i = 1…N for country, t = 1…T for time; v_i for individual-specific fixed effects; c_t for time-fixed effects; and ε_it for error term, respectively. The sign of each expected coefficient is unknown for a_1>0, a_2<0, a_3>0, and a_4>0. As explained above, the hypothesis of this estimate is that imports of EGs' trade improve the environmental performance of countries. To accommodate the heterogeneous variance, a robust standard error was used for the analysis.

Table 3 shows the estimated results. The following are two noteworthy results: first, the J list held true to the hypothesis in all cases. Second, SUM in developing countries holds true for the hypothesis. Moreover, we would like to check for robustness. Instead of importing EGs, we use two similar international economic activities – total imports(M) and inward FDI (FDI) – to examine them. Table 4 shows the estimated results; neither is significant. We found that there is no positive correlation between international economic activity and EPI.

Table 4. Robustness tests (explained variable = EPI)

	Total	developed country	developing country	Total	developed country	developing country
ΔL.ln$M$	-0.00049	0.00614	-0.00145			
	[0.00589]	[0.00404]	[0.00941]			
ΔL.lnFDI				0.00058	0.00039	0.00208
				[0.00049]	[0.00051]	[0.00190]
ΔlnGDP	-0.00662**	-0.00880***	-0.10514**	-0.00758***	-0.00657***	-0.12453**
	[0.00247]	[0.00203]	[0.04434]	[0.00247]	[0.00151]	[0.04456]
Δln$GDPper$	-0.01247	0.03433**	0.03536	-0.00592	0.05274***	0.04988
	[0.02779]	[0.01245]	[0.04662]	[0.03224]	[0.01810]	[0.04848]
ΔlnET	-0.00068	-0.00330	0.00078	-0.00014	-0.00120	0.00082
	[0.00350]	[0.00724]	[0.00362]	[0.00460]	[0.00719]	[0.00503]
_cons	0.00478***	0.00107	0.01063***	0.00505***	0.00196*	0.01044***
	[0.00150]	[0.00089]	[0.00348]	[0.00166]	[0.00096]	[0.00365]
R-squared	0.16235	0.24188	0.22987	0.16925	0.26315	0.24861
N	349	199	150	316	166	150
Group	46	25	21	46	25	21

Note: * p<0.1, ** p<0.05, *** p<0.01. The numbers in parentheses are robust standard errors.

The considerations that can be drawn from the above results are as follows: there is certainly an environmental effect in the import of EGs. However, this effect is never high. Developing countries definitely have the environmental effects of EGs' imports. The J list has a high environmental effect. The results of this analysis imply that the identification and liberalization of the J list should be a priority.

EGs' trade could provide a means of transferring environmental technology through the technology transfer embodied in goods and information on how to use those goods. Particularly, the impact on developing countries where environmental technologies have not been widespread is significant. This may be the reason why the J list, which had the lowest share, was more effective. Basically, achieving stronger environmental effects would be possible by globally promoting technologies that are only distributed in certain regions and countries rather than those already distributed globally.

4. Conclusion

This study analyses the reality and the expected roles of environmental goods negotiations. The reality is that there is an intricate conflict of interest among countries over the identification and liberalization of EGs, and, in the end, the conflict between the "New Free Trade group" and the "S&D group" has taken on a North-South divide. A diverse list was proposed as a deliverable of negotiations. However, no objective criteria have been established to ensure environmental effects. Thus, knowledge of the judgment or selection criteria is required. EGs negotiations are instrumental in facilitating trade that improves a country's environmental performance. It is not an aspiration but a certain effect that occurs in reality. However, this effect is never high. One of the implications of our empirical analysis is to facilitate the global dissemination of lists (items) that are distributed in a particular region or country. More specifically, the identification and liberalization of the J list should be prioritized.

Finally, we present the challenges ahead. The first is in conducting an analysis of the EGA (Environmental Goods Agreement) negotiations, which are outside the scope of this study. The plurilateral negotiations, launched in 2011, involving the United States, the EU, China, and other countries belonging to "New Free Trade group" and the "S&D group", are noteworthy but are yet to be concluded.

The second is a further examination of the environmental effects of EGs. Verifying the effects of exports and total trade as well as imports, while using fully modified OLS (FMOLS) and dynamic OLS (DOLS) is necessary. As a result, we might be able to examine the environmental effects of the A2 list and other lists in a different way.

The third is to examine the effects of various policies. In addition to examining the effects of liberalization, the impact of technical assistance, international aid, and Multilateral Environmental Agreements and so on is also required. These policy analyses are complementary to this study, which focuses on imports to examine the effects of trade in EGs.

Notes

[1] Hino (2019) presents an examination of the various concepts and hypotheses.

[2] According to Hino (2019), the correlation between the value of trade measured from both lists is 0.9995 for exports and 0.9996 for imports.

[3] See Appendix Table 1 for a list of sample countries.

[4] Calculated with PC-TAS.

[5] https://epi.envirocenter.yale.edu. Accessed 26 April 2020.

[6] http://data.worldbank.org/indicator. Accessed 26 April 2020.

[7] Cantore and Cheng (2008) also used ET as a proxy variable for environmental policy. Another possible proxy is the Environmental Policy Stringency Index, although it is not available due to its incompatibility with this estimation.

[8] https://stats.oecd.org. Accessed 26 April 2020.

[9] Thailand, Indonesia, Vietnam, Brazil, Russia, and Saudi Arabia in all years, and India and Singapore in 2003 and 2004, respectively, have deficits.

[10] The results of the detailed analysis are provided upon request.

[11] Although the random effects model is a preferable estimation method, it is unclear whether individual-specific effects are uncorrelated with explanatory variables. See Appendix Table 3 for estimation results.

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Appendix

Appendix Table 1. List of sample countries

developed countries		developing countires	
Australia	Spain	India	Costa Rica
Japan	Czech Republic	Indonesia	Chile
New Zealand	Germany	South Korea	Brazil
Canada	Norway	Singapore	Venezuela
USA	Hungary	Thailand	Mexico
Ireland	Finland	China	Romania
UK	France	Philippines	Turkey
Italy	Belgium	Viet Nam	Russia
Austria	Poland	Malaysia	Saudi Arabia
Netherlands	Portugal	Argentina	South Africa
Greece	Luxembourg	Uruguay	
Swiss	Israel		
Sweden			

Appendix Table 2A. Descriptive statistic

Variable	Mean	SD	Min	Max
IM_SUM	35753	58114	148	459084
IM_OA	13068	19232	62	107908
IM_WB	3225	4757	17	32300
IM_A2	5590	8433	19	62518
IM_J	21805	40485	73	327512
EPI	65.49	13.57	29.59	88.79
GDP	1534665	2728441	30162	15863049
GDPper	30145	18046	2783	97864
ET	1.94	0.82	0.18	4.19

Note: The unit of *IMPORT* (*IM*) and *GDP* is one million dollars

Appendix Table 2B. The correlation matrix

	IM_SUM	IM_OA	IM_A2	IM_WB	IM_J	GDP	GDPper	ET
GDP	0.8655	0.7068	0.8307	0.8203	0.8234	1.0000		
GDPper	0.2165	0.1666	0.0898	0.1337	0.2450	-0.0265	1.0000	
ET	-0.1659	-0.1366	-0.1924	-0.1520	-0.1479	-0.2957	0.2068	1.0000

Appendix Table 3. Randam effect model(explained variable = EPI)

	Total	developed country	developing country	Total	developed country	developing country	Total	developed country	developing country	Total	developed country	developing country	Total	developed country	developing country
ΔL.lnIM_SUM	0.00667 [0.00411]	0.00158 [0.00396]	0.00877* [0.00520]												
ΔL.lnIM_OA				0.00350 [0.00453]	-0.00048 [0.00718]	0.00410 [0.00449]									
ΔL.lnIM_WB							0.00363* [0.00192]	0.00132 [0.00164]	0.00461 [0.00319]						
ΔL.lnIM_A2										0.00097 [0.00148]	-0.00120 [0.00169]	0.00199 [0.00294]			
ΔL.lnIM_J													0.00702** [0.00312]	0.00526* [0.00277]	0.00711* [0.00440]
ΔlnGDP	-0.01252*** [0.0029]	-0.01157*** [0.00153]	-0.08096 [0.05028]	-0.01215*** [0.00308]	-0.01155*** [0.00158]	-0.08316* [0.04982]	-0.01204*** [0.00316]	-0.01138*** [0.00157]	-0.08657* [0.05113]	-0.01239*** [0.00319]	-0.01163*** [0.00156]	-0.10776** [0.04146]	-0.01256*** [0.00289]	-0.01166*** [0.00159]	-0.08152* [0.04862]
ΔlnGDPper	0.01675 [0.01614]	0.02537*** [0.00921]	0.03317 [0.04448]	0.02340 [0.01671]	0.02544*** [0.00939]	0.04546 [0.04664]	0.02401 [0.01669]	0.02450*** [0.00918]	0.05220 [0.04757]	0.02531 [0.01679]	0.02463*** [0.00951]	0.03988 [0.03986]	0.00815 [0.01571]	0.01716* [0.00997]	0.02818 [0.04380]
ΔlnET	0.00217 [0.00352]	-0.00160 [0.00585]	0.00356 [0.00372]	0.00291 [0.00350]	-0.00141 [0.00542]	0.00442 [0.00373]	0.00296 [0.00341]	-0.00114 [0.00560]	0.00434 [0.00366]	0.00290 [0.00356]	-0.00131 [0.00560]	0.00109 [0.00325]	0.00203 [0.00364]	0.00073 [0.00597]	0.00337 [0.00393]
_cons	0.00277** [0.00124]	0.00211** [0.00082]	0.00686** [0.00282]	0.00328** [0.00120]	0.00242** [0.00108]	0.00767*** [0.00274]	0.00340*** [0.00111]	0.00220*** [0.00072]	0.00792*** [0.00266]	0.00370*** [0.00110]	0.00239*** [0.00072]	0.01086*** [0.00336]	0.00276** [0.00120]	0.00164** [0.00070]	0.00715*** [0.00275]
R-squared	0.1517	0.2261	0.2091	0.1421	0.2250	0.1966	0.1473	0.2266	0.2039	0.1409	0.2280	0.1984	0.1604	0.2386	0.2134
N	356	199	157	356	199	157	356	199	157	356	199	157	356	199	157
Group	46	25	21	46	25	21	46	25	21	46	25	21	46	25	21

Note: * p<0.1, ** p<0.05, *** p<0.01. The numbers in parentheses are robust standard errors.