Article

East Asian Way of Linking the Environment to Trade in Free Trade Agreements

Journal of Environment & Development
2018, Vol. 27(4) 382–414

DOI: 10.1177/1070496518794234
journals.sagepub.com/home/jed

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Abstract

This study examines how East Asian countries have responded to the challenges that the trade–environment nexus presents. A total of 85 free trade agreements (FTAs) concluded by 15 East Asian economies are analyzed by using ordered logistic regression and generalized ordered logistic regression techniques. The results show that East Asian countries incorporate strong and specific environmental provisions in their bilateral FTAs when they share concern about environmental issues. These findings reject the view that East Asian countries have adhered to collective ideas that favor weaker and ill-defined environmental commitments related to trade. It is notable that environmentally conscious East Asian countries have responded positively to trade–environment linkages with like-minded partners. Meanwhile, the results partially support the conventional view that an environmentally conscious big country can bully environmentally less conscious small countries into making strong and specific environmental concessions.

Keywords

East Asia, trade–environment nexus, issue linkage, free trade agreement, international environmental cooperation

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> During the past 30 years, Asia has lost half its forest cover, and with it countless unique animal and plant species. A third of its agricultural land has been degraded. Fish stocks have fallen by 50 percent. No other region has as many heavily polluted cities, and its rivers and lakes are among the world's most polluted. . . .While rapid economic development has created dynamism and wealth, Asia has at the same time become dirtier, less ecologically diverse, and more environmentally vulnerable. (Asian Development Bank [ADB], 1997, p. 199)

East Asia is one of the most dynamic regions in the history of postwar economic development and was dubbed the "East Asian miracle" (World Bank, 1993). Its growing share in global trade flows best illustrates the region's remarkable economic takeoff. During the 1970–2010 period, the region's global share soared from about 15% to more than 30%, with its exports growing 3 times faster than in the rest of the world for the most recent 10-year period. In value-added terms, intraregional trade also grew on average by more than 10% per year, 2 times faster than in other parts of the world (International Monetary Fund, 2014, p. 47).

The rapid economic growth, however, came with high environmental costs. As East Asia's economic transformation has taken place faster than anywhere else, the environmental impact has been worse. Significant portions of environmental liabilities have been attributed to the "grow now, clean up later" mantra (Angel & Rock, 2009, p. 232; Bøas, 2000, p. 419; Iwami, 2001, p. 620). Critics note that the practice of downplaying the environmental consequences of export-oriented industrialization has prevented many in the region from embracing global environmental standards when trading in goods and services. East Asian countries are allegedly skeptical about linking environmental considerations to trade policy because they fear that it could lead to an increase in *green protectionism* or *eco-imperialism*. Their environmental concerns tend to be "directed towards problems directly affecting living conditions and population health, not towards broader environmental issues such as global warming and biodiversity" that have significant trade policy implications (Lian & Robinson, 2002, p. 110).

In contrast to the prevailing view, however, various kinds of policy responses to the trade–environment nexus have emerged over the past decade. Recent empirical studies have found that the cross-national transfer and diffusion of environmental policies has also taken place in the non-Western world, including East Asia, and that the gap between the West and the non-West has been narrowing over time (Sommerer & Lim, 2016). A closer look also reveals that East Asian countries have begun to use not only the World Trade Organization (WTO) but also free trade agreements (FTAs) as an effective policy platform to promote environmental cooperation among trading partners (Bernauer & Nguyen, 2015; Monteiro, 2016; Morin, Pauwelyn, & Hollway, 2017).

East Asian countries now realize that it is becoming increasingly difficult to keep trade discussions decoupled from the environment. Because they are highly

dependent on trade, both developed and developing countries in the region have to respond to foreign consumer preferences for ecologically friendly products by imposing higher environmental standards. It is not a coincidence that East Asian countries began to participate proactively in negotiations in the WTO Committee on Trade and Environment (CTE), which is designed to carry out the tasks of clarifying trade and environment issues and determining whether any modification to multilateral trade rules is needed. Not surprisingly, the number of submissions to the CTE from the developing world has increased in the new millennium (Harashima, 2008, pp. 18–24).

Perhaps equally significant, but little noticed, is the attempt at linking the environment to trade through FTAs. With the interest of East Asian countries in economic regionalism surging dramatically, the geographic diffusion of preferential trading agreements has been at the forefront of many scholars' minds (Aggarwal & Koo, 2008, 2016; Koo, 2012; Solís, Stallings, & Katada, 2009). The most important locus of trading agreements has been the active pursuit of FTAs at the bilateral level. As of June 2018, 23 East-Asia-specific FTAs have been concluded. If one includes trans-regional accords with countries outside East Asia, the number would rise to 87.[1] Many, if not all, FTAs include environmental provisions with varying degrees of strength and scope (George, 2014; Monteiro, 2016; Morin et al., 2017).

Many East Asia scholars have written about the environmental consequences of the region's economic growth and industrialization and about the issue of harmonizing multilateral trade rules with environmental standards (ADB, 1997; Haque, 2005; Kim, 2006). However, few have joined the debate about whether and to what extent preferential agreements can aggregate individual trade policy preferences around a joint position vis-à-vis the trade–environment nexus and thus facilitate both the establishment and the implementation of environmental norms and procedures.

This study focuses on the trade–environment nexus within the bilateral FTAs concluded by East Asian economies. Using individual cases and quantitative methods, this study aims to answer the following questions. To what extent do East Asian economies accept environmental provisions in their bilateral FTAs? Under what conditions are they induced to do so?

The remaining parts of this study unfold in four sections.

The ''Theoretical and Empirical Background'' section offers theoretical background and a linkage framework to guide an empirical analysis of the trade–environment nexus espoused in East Asian FTAs. This section first explicates the mechanisms and concepts of issue linkage with a focus on three ideal types: tactical, substantive, and fragmented linkages. Then, it raises the question of how trade is connected to the environment and discusses the debate between neoclassical and ecological perspectives. This section also examines how the global trading regime centered on the WTO has addressed and incorporated the nexus issue in trade rules and negotiations. It is noted that while having

made significant progress in relating trade to the environment, the multilateral trading forum alone falls short of resolving the inherent tension between trade and the environment and that the ''problem of big numbers'' induces countries to use FTAs as an alternative mechanism.

The ''Estimation Model'' section evaluates 85 bilateral FTAs concluded by 15 East Asian economies, including 10 Association of Southeast Asian Nations (ASEAN) members as well as China, Japan, South Korea, Taiwan, and Hong Kong. This section develops a system of codification and directly compares the contents of FTAs across all groups in terms of the *strength* and *scope* of environmental provisions, if any. This section finds that East Asian FTAs cover a wide range of environmental issues in relation to their bilateral trade while nesting their agreements to the WTO rules and multilateral environmental agreements (MEAs). Then, this section unravels the causal mechanism behind the trade–environment nexus in East Asian FTAs. This study uses ordered logistic regression (OLOGIT) and generalized ordered logistic regression (GOLOGIT) techniques to estimate the model.

The ''Estimation Results'' section finds that consensual knowledge about environmental matters promotes the trade–environment nexus in terms of both the *strength* and *scope* of environmental provisions in East Asian FTAs. These statistical findings effectively reject the view that East Asian countries have adhered to collective ideas that favor weaker and ill-defined environmental areas of cooperation related to trade. Environmentally conscious East Asian countries have responded positively to the trade–environment linkage through their FTAs with like-minded partners within and outside the region. In the meantime, fragmented linkage hypotheses find partial statistical support: Only the asymmetric distribution of knowledge in favor of a stronger trading partner has a statistically significant causal impact on the *strength* and *scope* of trade–environment linkages. These findings indicate that the distribution of power has a conditional effect on the ways in which trade and the environment are connected.

The ''Conclusions and Future Research'' section summarizes the key findings and draws policy implications. The evaluation of the trade–environment nexus is a topic for future research. It remains to be seen whether the trade–environment linkages found in East Asian FTAs will be effectively implemented and thus induce countries to promote trade and the environment at the same time.

Theoretical and Empirical Background

Why Link Trade and the Environment?

Although there is an emerging consensus that the environment and trade are connected, the questions of how and to what extent remain controversial. A neoclassical perspective stresses the positive influence of trade on

environmental quality. In contrast, an ecological view questions the ability of the trade system itself to promote sustainable development and thus assumes a negative relationship. Between these two extremes, there is a continuum of intervening views, including skepticism about the intentions of those who link trade and the environment, rather than the nexus itself, and the domestic sources of trade–environment nexus such as citizen perception, civil liberty, and income level (Jayadevappa & Chhatre, 2000; Prakash & Potoski, 2006).

Neoclassical trade experts contend that if environmental quality is a normal good, increases in income due to gains from trade will boost the demand for environmental quality as well as the ability of governments to afford costly technologies for environmental protection. The so-called environmental Kuznets curve thus hypothesizes an inverse U-shaped relationship between a country's per capita income and its level of environmental degradation: Increased incomes are associated with an increase in pollution in poor countries, but a decline in pollution in rich countries (Aklin, 2015; Dasgupta, Laplante, Wang, & Wheeler, 2002). This literature is important because many in the trade policy community have argued that trade and growth may actually be good for the environment (Prakash & Potoski, 2006; Vogel, 1997).

Ecological economists argue the opposite: Unrestricted trade in goods and services will only cause severe environmental damages (Lang & Hines, 1993), and trade instruments do not provide an appropriate measure for environmental protection (Anderson & Blackhurst, 1992). They deny the environmental Kuznets curve assumptions by arguing that economic growth may result in irreversible environmental degradation. Aside from the harmful effects of long-distance trade on the environment due to transportation emissions, they also argue that trade liberalization may damage the environment by giving governments incentives to relax environmental policies to give their producers a competitive edge. According to Copeland and Taylor (2003), "trade may [also] encourage a relocation of polluting industries from countries with strict environmental policy to those with less stringent policy . . . because of concerns over international competitiveness" (p. 3).[2]

There is also an abundance of charges linking environmental considerations to trade policy as an implicit protectionist measure. In particular, developing countries argue,

> The trade–environment area has an above average risk of being exploited by special interest groups to their own benefit at the expense of the general interest. The risk is that traditional protectionist groups will manipulate environmental concerns in order to reduce competition from imports. (Bøas, 2000, p. 416)

In effect, Western countries are afraid of losing their high standards of living through eco-dumping from the developing world, and they are thus tempted

to establish trade barriers based on environmental concerns. However, this strategy may easily become *eco-imperialism* (Hoekman & Kostecki, 2009, pp. 613–621).

In the contemporary trade policy community, the neoclassical perspective prevails. Although environmental protection was not one of the top priorities of the General Agreement on Tariffs and Trade (GATT) in 1947, the GATT rules do provide general exceptions to its obligations for trade liberalization.[3] During the Uruguay Round negotiations, environmental issues attracted the attention of the negotiating parties, and certain environmental aspects were incorporated in the WTO and its covered agreements.[4] The importance of sustainable development was also stressed in the preamble to the Marrakesh Agreement establishing the WTO.[5]

In addition, the Doha Declaration of 2001 asked the CTE to focus on negotiations about the trade liberalization of environmental goods and services, "a subject that had not been discussed separately in WTO negotiations" (Harashima, 2008, p. 20). A CTE Special Session (CTESS) was created and mandated to negotiate these issues, "particularly the relationship between the WTO's agreements and those of other agencies, and market access for environmental goods and services."[6]

Among WTO members, however, there is no unanimous consent on the extent to which trade and the environment are connected. It is no wonder that the conflict between the North and the South has been a serious issue in the CTE negotiations. The suspended Doha Development Round focused on only a few issues related to trade and the environment. The more controversial issues, such as various imperatives of climate change, were avoided. Some critics go so far as to contend that "the WTO's efforts to reduce trade–environment tensions and conflicts can be best understood as palliatives" (Vogel, 2013, p. 36).

Diffusion of Environmental Norms in East Asian FTAs

It is a commonly held belief that the multilateral forum alone falls short of resolving the collective action dilemma inherent in environment-related trade issues. The so-called problem of big numbers has thus induced countries to use FTAs as an alternative mechanism to link trade and the environment. In a multilateral forum in which countries' interests tend to be diversified, it is difficult to reach consensus on a controversial issue such as trade and the environment. For this reason, adherents of the preferential approach argue that bilateral or plurilateral FTAs can significantly reduce the transaction costs related to aggregating the interests of a great number of actors into a common policy position while making it easier to monitor compliance with agreements. Preferential agreements can also help promote environmental protection by requiring countries recalcitrant about linkages to the environment to

accept higher policy standards in exchange for countries with high standards lifting their trade barriers and granting access to their domestic markets (Aggarwal, 2013; Bechtel & Tosun, 2009).[7]

East Asia has witnessed an increasing trend of signing bilateral FTAs within the region or with countries outside the region. Compared with other regional trade governance mechanisms, such as ASEAN and the Asia-Pacific Economic Cooperation, East Asia's bilateral FTAs impose more concrete legal obligations on parties in terms of trade liberalization. Such a general observation aside, however, little scholarly discussion has taken place about the embracing of environment norms through FTAs. Although a few studies examine the prevalence of environmental provisions in Asian trade agreements (Monteiro, 2016; Yanai, 2014), no clear-cut explanation has been provided for why East Asian countries do or do not connect trade to the environment in their FTAs. The environmental aspects of these FTAs are therefore worthy of discussion.

To varying degrees, East Asian countries have individually responded to the challenges of linking the environment to trade through their participation in FTAs. In rejecting the view that East Asian countries have adhered to a collective script that favors weaker and ill-defined environmental areas of cooperation, there have been a variety of preferences for environmental issues as exhibited by 15 East Asian economies in the language and stipulations of their respective FTAs.

This study strives to answer two questions that are critical to understanding the trade–environment linkage in East Asia. First, which countries have adopted an aggressive stance toward addressing environmental issues in trade, and which countries have responded sluggishly? Second, what are the factors for variance in the outcomes within the region? Having these questions in mind, this study compares a total of 85 bilateral FTAs that have been completed by 15 East Asian economies as of June 30, 2018.[8]

Linkage Mechanisms

Why do countries promote and accept the linkage between otherwise separate issues at the expense of increasing complexity? All other things being equal, issue linkage can help establish new areas for mutual advantage or broaden areas of agreement by connecting distinctive issues. The environment is one of these issue areas often addressed through linkage tactics. Compared with issue-specific negotiation, a linkage approach can be useful when available information and knowledge or actor preferences change dynamically. Negotiators may expand the scope of issues to reduce the uncertainty inherent in such a dynamic situation (Aggarwal, 1998, 2013; Sebenius, 1983). Under certain conditions with increasing returns to scope, interissue negotiations can offer efficient solutions "even though the knowledge base is itself changing and far from conclusive" (Haas, 1980, p. 371).

Three forms of linkages are most frequently discussed, and there are unique negotiation processes and outcomes associated with each.

First, tactical linkages take place when introducing agendas that are "not connected by any intellectual coherence at all" (Haas, 1980, p. 372). Tactical linkages are therefore "driven by an actor's ability to offer sufficient resources—either threats or rewards—to induce others to accept something in which they have no real interest" (Haas, 2003, p. 256). If linkages are positively induced, they can diminish conflict; however, in most cases, they create incisive conflict in domestic discussion as well as during negotiation. Thus, unstable institutions or agreements are likely to emerge (Aggarwal, 1998). Tactical linkage is closely related to the coercion mechanism in the policy diffusion literature (Simmons & Elkins, 2004).

Second, substantive linkage may be achieved by connecting otherwise different issues "based on consensual knowledge linked to an agreed social goal." For Ernst Haas (1980), knowledge becomes useful when it becomes "consensual" (p. 368) at a given time among interested actors to guide public policy goals. In a similar vein, Peter Haas (1999) notes that consensual knowledge is formed by "epistemic communities" (p. 2), which refer to a network of knowledge-based professionals and experts. Substantive linkage between two or more issues is thus likely to establish a stable issue area. This outcome results from negotiations, whereby the linker country convinces its partner country that "the issues are logically packaged" (Aggarwal, 1998, p. 16; 2013, p. 98). Substantive linkage is closely related to the policy diffusion mechanism of "learning" (Simmons & Elkins, 2004, p. 175).

Third, fragmented linkage is formed to maintain a coalition for certain social goals even though "elements of consensual knowledge are unevenly distributed among the coalition partners" (Haas, 1980, p. 371). Fragmented linkage has an intellectual basis for the linkage of two issues, but policy makers in one country do not perceive that they are substantively connected. There are two cases to be considered. If a stronger country suggests an issue linkage, decision-makers in a weaker country will have to treat the two issues together, even though they do not perceive them as such, in order not to be excluded from the coalition led by the stronger country.[9] Although rare, if a weaker country suggests an issue linkage but a stronger country does not perceive it as such, the stronger country might still be induced to collaboration for fear of reputational costs.[10] Therefore, it would be a temporary solution to externality problems. Some of the linkages may move to substantive linkages when causal understanding changes (Aggarwal, 1998).

As discussed earlier, a dominant neoclassical view maintains that international trade can increase positive environmental effects. Even if international trade has a negative impact on the environment because it expands consumption and the exploitation of natural resources, trade policies are increasingly seen as the method of cooperation needed to mitigate transnational environmental problems

Table 1. Types of Issue Linkages and the Basis for Persuasion.

Linkage types	Stronger country *i*'s view of connections	Weaker country *j*'s view of connections	Basis for persuasion	Outcomes
Substantive linkage	Connected	Connected	Knowledge	Stable issue area
Fragmented linkage	Connected	Unconnected	Fear of exclusion/ competition for rewards	Temporary solution to externalities
	Unconnected	Connected	Reputational costs	Unstable issue area
Tactical linkage	Unconnected	Unconnected	Power	Potentially unstable issue area

Source. Adapted from Aggarwal (1998).

(Anderson & Blackhurst, 1992, p. 5). It is also found that trade with environmentally well-regulated countries is likely to promote stringent environmental performance in other countries, particularly in the developing world (Gamso, 2017). Although there is no conclusive knowledge about the trade–environment nexus, one can reasonably deduce that there are at least some elements of consensual knowledge among the trading states that trade and the environment are connected. The tactical linkage that takes place "without any intellectual coherence at all" (Haas, 1980, p. 372) can thus be excluded from this study.

In contrast to previous studies that assume a stronger country plays a dominant role in linking trade to the environment (Jinnah, 2011), this study posits that both strong and weak countries can link the environment to trade. This study also assumes that decision-makers' perceptions, either positive or negative, leads to their linking strategy and behavior but is subject to change according to knowledge. Table 1 summarizes the linkage types and possible outcomes as a result of persuasion during trade negotiations.

Estimation Model

Dependent Variable

There are different typologies and measures to gauge environmental provisions in FTAs (George, 2014; Monteiro, 2016; Morin et al., 2017). Among others, this study focuses on two main aspects: *strength* and *scope*.[11]

The first index is the *strength* of environmental provisions. STRENGTH is evaluated using a 4-point scale ranging from 0 to 3. STRENGTH 0 signifies

the absence of GATT Article 20 in the agreement. STRENGTH 1 signifies the inclusion of GATT Article 20 in the agreement. STRENGTH 2 refers to the existence of a Dispute Settlement Mechanism (DSM) that *tacitly* enforces environmental provisions. Any chapter on environmental issues must not be included in the terms of exclusion for the general DSM stipulated in the agreement. STRENGTH 3 refers to the existence of a DSM that *explicitly* enforces environmental provisions covered under the agreement.

The second index is the *scope* of environmental issues attached to FTAs. SCOPE is also evaluated using a 4-point scale ranging from 0 to 3. SCOPE 0 signifies the absence of any environmental measures of minimal substance. Minimal substance refers to any language evoking environmental cooperation between parties to the agreement. SCOPE 1 signifies the inclusion of generic measures related to environmental cooperation and sustainable development. Any articles designating the environment as one of the fields of cooperation between the two parties will meet the threshold requirement for a SCOPE score of 1. SCOPE 2 signifies the inclusion of environmental measures related to general industries and sectors, while SCOPE is coded 3 if environmental measures related to specific industries and sectors are articulated.

Table 2 combines the coding results to illustrate the varying degrees of preferences for the trade–environment nexus. It is notable that 15 FTAs can be identified as containing a strong or very strong *and* a moderately or specifically defined trade–environment nexus.

Figure 1 illustrates the average preferences of 15 East Asian economies for the trade–environment nexus. It shows that each country's preferences for *strength* and *scope* are positively correlated. South Korea shows the strongest and most specifically defined preferences, and China shows the weakest and the least specifically defined preferences.

Linkage Hypotheses and Independent Variables

This study hypothesizes the relationship between the outcome of trade–environment linkage and persuasion mechanisms as follows:

H1: Substantive Linkage (consensual knowledge): If both parties perceive the trade–environment linkage as legitimate, their bilateral FTA will stipulate strong and/or specific trade–environment provisions.

H2: Fragmented Linkage 1 (fear of exclusion): If a weaker party does not perceive the trade–environment linkage as legitimate but a stronger party perceives it as such, their bilateral FTA will stipulate strong and/or specific trade–environment provisions.

H3: Fragmented Linkage 2 (reputational costs): If a stronger party does not perceive the trade–environment linkage as legitimate but a weaker party does perceive

Table 2. Strength and Scope of the Trade–Environment Nexus in East Asia's FTAs (85 Total).

Scope					
0 = None	3	Korea–ASEAN[1]	Malaysia–Turkey[4]	Korea–India[10]	Korea–EU[17]
1 = Generic		China–Singapore[2]	China–Peru[5]	Korea–Canada[11]	Korea–USA[18]
2 = Moderate		Taiwan–New Zealand[3]	Vietnam–EAEU[6]	Korea–New Zealand[12]	Korea–Colombia[19]
3 = Specific			Hong Kong–EFTA[7]	Korea–Australia[13]	Singapore–USA[20]
			Malaysia–Chile[8]	Japan–Switzerland[14]	Hong Kong–New Zealand[21]
			Korea–Singapore[9]	Singapore–EU[15]	
				Philippines–EFTA[16]	
	2		Korea–EFTA[22]	Japan–Indonesia[30]	
			Korea–China[23]	Taiwan–Nicaragua[31]	
			Japan–Brunei[24]	Hong Kong–Chile[32]	
			Japan–Mexico[25]		
			China–Costa Rica[26]		
			China–Switzerland[27]		
			Singapore–Costa Rica[28]		
			Korea–Central America[29]		
	1	Thailand–Peru[33]	Korea–Vietnam[34]	Korea–Turkey[67]	Korea–Peru[72]
			Japan–ASEAN[35]	Korea–Chile[68]	
			Japan–Vietnam[36]	Japan–Chile[69]	
			Japan–Peru[37]	Taiwan–Guatemala[70]	
			Japan–Thailand[38]	Taiwan–Panama[71]	
			Japan–Malaysia[39]		
			Japan–India[40]		
			Japan–Philippines[41]		
			Japan–Mongolia[42]		
			Japan–Australia[43]		
			China–ASEAN[44]		
			China–Chile[45]		
			China–New Zealand[46]		
			China–Iceland[47]		
			China–Australia[48]		

(continued)

Table 2. Continued

		ASEAN–AUS/NZL[49]		
		ASEAN–India[50]		
		Malaysia–Australia[51]		
		Malaysia–India[52]		
		Malaysia–New Zealand[53]		
		Malaysia–Pakistan[54]		
		Singapore–Australia[55]		
		Singapore–EFTA[56]		
		Singapore–India[57]		
		Singapore–New Zealand[58]		
		Singapore–Panama[59]		
		Singapore–Peru[60]		
		Taiwan–El Salvador–Honduras[61]		
		Thailand–Australia[62]		
		Thailand–Chile[63]		
		Thailand–New Zealand[64]		
		China–Georgia[65]		
		Singapore–Sri Lanka[66]		
0	China–Macao[73]	Japan–Singapore[80]		
	China–Pakistan[74]	Vietnam–Chile[81]		
	China–Hong Kong[75]	Singapore–Gulf Cooperation Council[82]		
	China–Thailand[76]	Singapore–Taiwan[83]		
	China–Taiwan[77]	ASEAN–Hong Kong[84]		
	Indonesia–Pakistan[78]	Singapore–Turkey[85]		
	Laos–Thailand[79]			
	0	1	2	3

Strength: 0 = None; 1 = GATT Article 20; 2 = DSM (tacit); 3 = DSM (explicit).

Note. FTAs = free trade agreements; ASEAN = Association of Southeast Asian Nations; EAEU = Eurasian Economic Union; EFTA = European Free Trade Association; EU = European Union; DSM = Dispute Settlement Mechanism.

Appendix A presents a summary of key environmental provisions of each FTA.

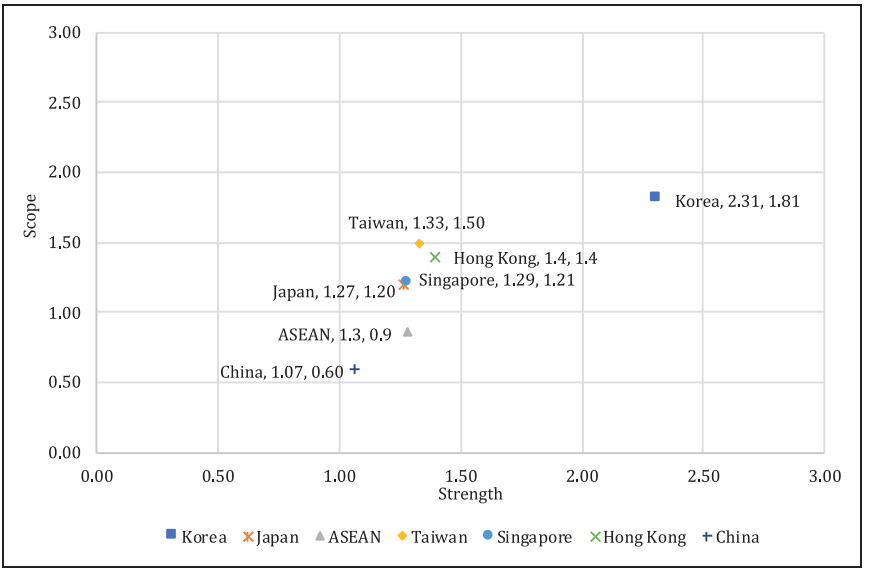

Figure 1. East Asian economies' preferences for the trade–environment nexus.

it as such, the stronger party might still be induced to a bilateral FTA stipulating strong and/or specific trade–environment provisions in order not to assume reputational risks as a coalition leader.

The main explanatory variable of this study is *knowledge*, which is drawn from the linkage literature. It enters the estimation model with two different but related terms: salience and asymmetry. *Knowledge salience* is directly related to the substantive linkage hypothesis and captures the level of shared knowledge. *Knowledge asymmetry* is designed to portray how the knowledge variable works if it is unevenly distributed between a pair of trading partners.[12]

There is no consensus on how best to measure knowledge because there are a number of different channels. Ideally, to test the linkage hypothesis, one would examine how the knowledge about the nexus between trade and the environment in a given country is persuaded by the knowledge of its trading partners. However, this approach poses empirical difficulties because one cannot find systematic data on decision-maker perceptions. Analysts thus employ international environmental treaty commitments (Knill, 2005) or climate change perceptions (Howe, Markowitz, Lee, Ko, & Leiserowitz, 2013) as proxies for knowledge.

This study uses the "climate change perceived as a threat" index by the 2007–2008 Gallup World Poll to measure the level of knowledge about the trade–environment nexus. This survey was conducted for 500 to 2,000 randomly selected respondents from 128 countries. Telephone or face-to-face interviews were used (Howe et al., 2013; Knight, 2016). To measure each country's public perception of climate change, survey respondents were asked the following question: How much do you know about global warming or climate change? For those who answered positively, an additional question was asked: How serious of a threat is global warming to you and your family?[13]

Because the unit of analysis in this study is the trade agreement, which is a dyadic relationship between two countries, the multiplication of each country's threat perception index ($\text{threat}_i \times \text{threat}_j$) is used as a measure of *knowledge salience*$_{ij}$. The higher the *salience* score is, the more likely a substantive trade–environment linkage is formed for a given pair of countries (Hypothesis 1).

Another hypothesis explaining the depth of trade–environment linkage is *knowledge asymmetry*. There are two cases in which asymmetry can lead to trade–environment linkages. First, only the stronger party perceives the trade–environment linkage as legitimate, but the weaker party agrees on stronger or more specific environmental provisions because of the fear of exclusion from a trade agreement (Hypothesis 2). Second, only the weaker party upholds the trade–environment linkage, but the stronger party settles on the environmental provisions that the weaker party suggests because of the potential reputational costs (Hypothesis 3).

To measure the asymmetry between the partner countries, two dummy variables are used: *knowledge asymmetry*$_{i>j}$ and *knowledge asymmetry*$_{j>i}$. If the threat perception index of the stronger party i falls within the upper reference limit (URL) and that of the weaker party j falls within the lower reference limit (LRL), the dummy variable *knowledge asymmetry*$_{i>j}$ is coded 1; otherwise, it is 0. If the threat perception index of the weaker party j falls within the URL and that of stronger party i falls within the LRL, the dummy variable *knowledge asymmetry*$_{j>i}$ is coded 1; otherwise, it is 0. Following Gelman (2008), this study uses two standard deviations from the mean of 128 countries' threat perception indexes as threshold levels for the URL and LRL, respectively. Figure 2 shows where each country is located on the URL–LRL continuum.

Control Variables

Several variables are included to control the effect of power relationship, gross domestic product (GDP) per capita, population, distance between partners, and the year in which an agreement was signed.

First, this study controls the power relationship between a pair of trading countries, although the tactical linkage based on the pure exercise of power

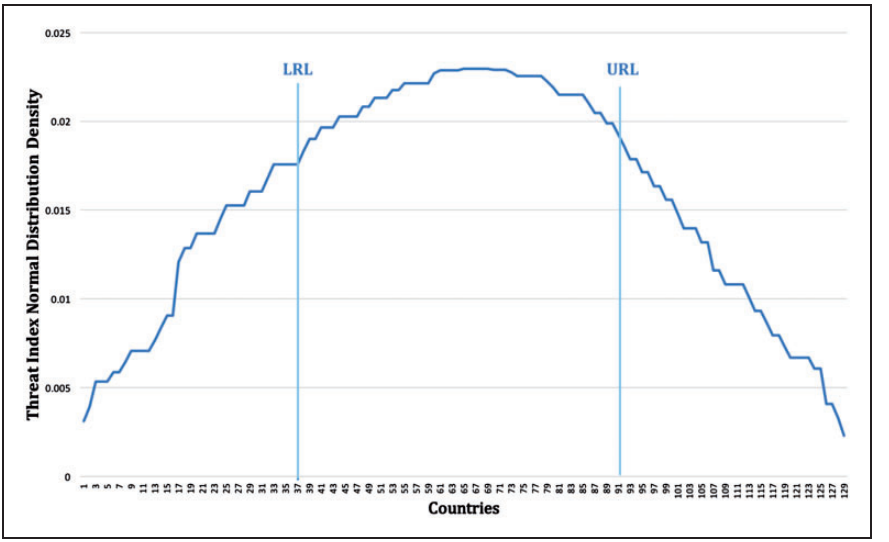

Figure 2. Distribution of threat perception index among 128 countries surveyed by the 2007–2008 Gallup World Poll.
Note. LRL = lower reference limit; URL = upper reference limit.

is excluded from the estimation model. The power variable enters the estimation model twice: (a) It is tacitly included in the model to define the *knowledge asymmetry* variable, and (b) it is explicitly included in the model to define the *trade asymmetry* variable. Ideally, the degree to which the two countries are unequally dependent on each other can be taken into account by measuring the asymmetry of trade dependence as the difference in the trade dependence scores ($trade\ asymmetry_{ij} = trade\ dependence_i - trade\ dependence_j$). The degree to which trade asymmetry affects the trade–environment nexus, if at all, is controlled using this measure.

Second, to control the effect of domestic economic characteristics, the logged multiplication of the GDP per capita of partner countries—$\ln(GDP\ per\ capita_i \times GDP\ per\ capita_j)$—is included in the estimation model. Other things being equal, a pair of rich countries are more likely to adopt stringent or specific environmental provisions and thus prevent environmental degradation (Aklin, 2015; Bergstrand, 1985).

Third, as inspired by the gravity model, this study assumes that the *strength* and *scope* of the trade–environment nexus is a positive function of the logged product of two trading partners' populations, $\ln(population_i \times population_j)$. Other things being equal, populous countries are more likely to adopt stringent or specific environmental provisions as they are more likely to feel threatened by climate change (Carrere, 2006).

Fourth, following the gravity logic, this study assumes that the *strength* and *scope* of environmental provisions in a given bilateral FTA are a negative function of the *distance* between a pair of countries as measured by the logged distance between the two capital cities, $\ln(\text{distance}_{ij})$.

Finally, the *year of signing* is controlled because more recently signed FTAs are more likely to include stronger or more specific environmental provisions due to the dissemination of knowledge over time.[14] Table 3 provides descriptive statistics for each variable.

Methods

The two dependent variables of this study are both measured on a nominal scale ranging from 0 to 3. As equal distances between the levels cannot be reasonably assumed for the ordinal dependent variables, we can use an OLOGIT model. However, a standard OLOGIT also has a limitation: It requires a parallel odds assumption, which can be met only when the effects of all the independent variables remain constant across all the dependent variables (Long & Freese, 2006). For example, the parallel odds assumption posits that the effect of consensual knowledge should be the same across all different levels of *strength* and *scope* of the trade–environment nexus. If this assumption is not met, OLOGIT may produce misleading results.

Alternately, GOLOGIT can estimate the impact of explanatory variables on the dependent ones more effectively by relaxing the parallel odds assumption and thus by allowing the differentiated effects of explanatory variables on the outcome variables. It is also known that GOLOGIT is more parsimonious than other alternative models when conventional OLOGIT cannot be used for the violation of the parallel odds assumption. It should be noted, however, that GOLOGIT may produce biased results as it posits that the effect of the independent variable on the dependent variable is cumulative over time (Williams, 2016).

This study uses both OLOGIT and GOLOGIT for three reasons.

First, the Brant test is commonly used to examine whether the OLOGIT parallel odds assumption holds, but the test cannot be conducted here because of the complex composition of explanatory variables that include binary, continuous, and logarithmically transformed variables.

Second, there is no compelling reason to believe that the effect is cumulative in the case of this study. For example, one cannot reasonably assume that consensual knowledge cumulatively affects the *strength* and *scope* of trade–environment linkages.

Third, model fit statistics, such as deviance chi-square, the Akaike information criterion (AIC), and McFadden's pseudo R^2, report mixed results, which suggests that they are not conclusive to prefer one method to the other.[15]

Table 3. Descriptive Statistics.[a,b]

	Variable	Obs	*M*	*SD*	Min	Max	1	2	3	4	5	6	7	8	9	10
1	Strength	85	1.20	0.74	0	3	1									
2	Scope	85	1.47	1.03	0	3	0.50	1								
3	Knowledge salience$_{ij}$	85	7.96	0.62	6.09	8.70	0.46	0.22	1							
4	Knowledge asymmetry$_{i>j}$	85	0.05	0.21	0	1	0.02	0.01	−0.03	1						
5	Knowledge asymmetry$_{j>i}$	85	0.13	0.34	0	1	−0.15	0.06	−0.38	−0.09	1					
6	Trade asymmetry$_{ij}$	85	−7.76	15.05	−115	−0.01	0.12	0.04	0.03	0.00	−0.04	1				
7	ln GDP per capita$_{ij}$	85	20.16	1.34	15.28	22.33	0.30	0.24	0.33	0.03	−0.03	−0.17	1			
8	ln population$_{ij}$	85	21.43	2.44	16.53	27.29	−0.16	−0.05	−0.44	0.04	0.30	−0.13	−0.53	1		
9	ln distance$_{ij}$	85	8.42	0.72	5.78	9.38	0.46	0.32	0.33	−0.15	−0.11	0.17	0.25	−0.27	1	
10	Year	85	2009	4.82	1991	2018	0.16	0.23	0.04	0.04	0.07	0.25	−0.20	0.10	0.12	1

Note. GDP = gross domestic product.

[a]All monetary variables are measured in current year U.S. dollars.

[b]Trade, GDP, and population statistics are obtained from the IMF World Economy database (International Monetary Fund, 2017).

Thus, this study presents both GOLOGIT and OLOGIT models to ensure a comprehensive analysis. To control potential heteroskedasticity, both models are estimated using robust standard errors clustered by trade agreements.

Estimation Results

Strength of Trade–Environment Linkages

The model fit statistics for *strength* is mixed. The deviance chi-square statistics indicates that GOLOGIT (110.204) is preferred to OLOGIT (125.813), and the AIC statistics shows that OLOGIT (147.813) is better than GOLOGIT (162.204). The McFadden's R^2 of the GOLOGIT model is 37.3%, which also suggests that GOLOGIT is preferred to OLOGIT (28.3%) in explaining the variance in the *strength* of trade–environment linkages. The coefficients are presented as odds ratios (ORs) to facilitate their interpretation.

As shown in Table 4, the estimation results find strong and consistent support for the consensual knowledge hypothesis of the *strength* model. As to the fragmented linkage hypotheses, the result of the fear of exclusion hypothesis is mixed, whereas the reputational costs hypothesis finds no statistically significant evidence. ORs are reported, focusing on the leverages of explanatory variables and the percentage-point change in odds by one standard deviation. The ORs are obtained by using the exponentiating coefficients (b_1) and ($\mathrm{OR} = e^{b_1}$). The OR is interpreted as follows: The odds that a dependent variable will fall into $n + 1$, versus one less than or equal to n, are the *odds* times greater for one unit of increase in the explanatory variable (Long & Freese, 2006).

The OLOGIT model shows that one unit increase in *knowledge salience* is expected to increase the odds of obtaining $strength = n + 1$ to 6.55 times greater than the odds of obtaining $strength \leq n$. The odds of having a level of *strength* one degree higher ($strength = n + 1$ instead of $strength = n$) are enhanced approximately by 219.2% with one standard deviation of increase. The result from GOLOGIT is also consistent with the OLOGIT result. It shows that for one unit change in *knowledge salience*, the odds of $strength = n + 1$ versus $strength \leq n$ are 5.51 times greater. Substantively, our finding indicates that a one = unit increase in consensual knowledge from its mean level enhances the likelihood of strong environmental provisions (e.g., from $strength = 1$ to $strength = 2$) by 16.8% on average.

These results indicate that if both FTA partners have substantive knowledge about the trade–environment nexus, they are more likely to stipulate strong environmental provisions in their FTAs. The positive result for Hypothesis 1 also indicates that at least in the short- to medium-term, a larger emphasis on environmental concerns and greater opportunities to promote convergence with trade issues would appear to be largely dependent on the consensual knowledge held by FTA partners.

Table 4. Strength of Trade–Environment Linkages.

	OLOGIT			GOLOGIT
	Odds ratio (Robust *SE*)	Odds % change[a]	Marginal effects (%)[b]	Odds ratio (Robust *SE*)
Knowledge salience$_{ij}$	6.55 (4.1)***	219.2	16.8	5.51 (5.01)*
Knowledge asymmetry$_{i>j}$	3.51 (3.41)	30.7	15.6	2.46E+06 (2.18E+06)***
Knowledge asymmetry$_{j>i}$	0.54 (0.49)	−19.0	−4.76	0.35 (0.28)
Trade asymmetry$_{ij}$	1.02 (0.02)	38.8	0.2	1.02 (0.02)
ln GDP per capita$_{ij}$	1.79 (0.44)**	118.4	5.23	1.79 (0.43)**
ln population$_{ij}$	1.33 (0.23)*	99.4	2.53	1.14 (0.20)
ln distance$_{ij}$	5.32 (2.67)***	231.2	15.1	3.16 (2.10)*
Year	1.09 (0.05)*	53.6	0.79	1.24 (0.11)**
Cut point 1	222.15 (101.34)			
Cut point 2	227.49 (101.35)			
Cut point 3	229.35 (101.36)			
Observations	85			85
Deviance chi-square	125.813			110.204
McFadden's pseudo R^2	0.283			0.373
AIC	147.813			162.204

Note. OLOGIT = ordered logistic regression; GOLOGIT = generalized ordered logistic regression; SE = standard error; AIC = Akaike information criterion.

[a]The odds % change shows the percentage change in the odds of dependent variable (strength) by one standard deviation change of each independent variable.

[b]The marginal effects indicate the average increase of the likelihood that the dependent variable (strength) falls into a one-degree higher category when the independent variable increases by one unit from its mean level.

*$p \leq .1$. **$p \leq .05$. ***$p \leq .01$.

In the meantime, the GOLOGIT analysis find that *knowledge asymmetry* in favor of a stronger country can have a statistically significant impact on the likelihood of strong environmental provisions. This result suggests that an environmentally conscious strong country can induce an environmentally less conscious weak country to make strong environmental concessions for fear of exclusion. The odds of a stronger trade–environmental provisions increase by 2.46×10^6 times when *knowledge asymmetry* takes on the value of 1.[16]

In contrast, the knowledge distribution in favor of a weaker party cannot affect the *strength* of the trade–environment nexus in their FTAs. There is no statistically significant evidence that a one-sided preference for the environment by a weaker party can lead to the adoption of strong environmental provisions by a stronger party for fear of reputational costs.

Statistical supports for control variables are mixed. The effect of *trade asymmetry* scores is statistically significant in neither OLOGIT nor GOLOGIT analysis, indicating that the distribution of power alone cannot affect the likelihood of strong environmental provisions. In support of the gravity model of international trade, the log-transformed multiplication of partner countries' GDP per capita is found to have a statistically significant impact on the likelihood of a stronger trade–environment nexus in both OLOGIT and GOLOGIT analyses (OR = 1.79). On average, a one unit increase in *GDP per capita* index from its mean level increases the likelihood of strong environmental provisions by 5.23%, indicating the wealthier partners are more likely to adopt stronger environmental provisions in their FTAs. The results of the population, the *distance* between FTA partners, and the year FTAs are signed are mixed. Only the OLOGIT estimation shows that greater *population density* is likely to cause strong environmental provisions (OR = 1.33). In contrast to a theoretical prediction, both models find that there is a positive causal relationship between *distance* and the *strength* of environmental provisions (OLOGIT OR = 5.32; GOLOGIT OR = 3.16), implying that East Asian countries' FTAs with non-Asian countries are more likely to include strong environmental provisions compared with intraregional FTAs. Last, the *year of signing* FTAs is positively linked to the *strength* of trade–environment linkages (OLOGIT OR = 1.09; GOLOGIT OR = 1.24), implying that more recently signed FTAs are more likely to contain stronger environmental arrangements.

Scope of Trade–Environment Linkages

The model fit statistics for *scope* generally prefer GOLOGIT model over OLOGIT model. The GOLOGIT (deviance chi-square = 147.766, AIC = 201.766, McFadden's $R^2 = 30.6\%$) fits better in estimating *scope* of trade–environment linkage than OLOGIT (deviance chi-square = 186.553, AIC = 208.553, McFadden's $R^2 = 12.3\%$).

As shown in Table 5, the estimation results find support for the consensual knowledge hypothesis of the *scope* model. The proportional OR of *knowledge salience* is 1.97 in OLOGIT and 3.54 in GOLOGIT. The odds of having a level of *scope* one degree higher (*scope* = $n + 1$ instead of *scope* = n) are enhanced by 51.9% with one standard deviation of increase in *knowledge salience* score. This finding also indicates that a one = unit increase in *knowledge salience* from its mean level enhances the likelihood of more specific environmental provisions (e.g., from *scope* = 1 to *scope* = 2) by 4.44%. Other things being equal, countries are thus more likely to stipulate specific environmental provisions in their FTA when they have substantive knowledge about the trade–environment nexus.

As to fragmented linkage hypotheses, the results are mixed. The fear of exclusion hypothesis is supported only by GOLOGIT ($OR = 6.15 \times 10^7$), while the reputational cost hypothesis is supported by neither OLOGIT nor GOLOGIT

Table 5. Scope of Trade–Environment Linkages.

	OLOGIT			GOLOGIT
	Odds ratio (Robust SE)	Odds % change[a]	Marginal effects (%)[b]	Odds ratio (Robust SE)
Knowledge salience$_{ij}$	1.97 (0.72)*	51.9	4.44	3.54 (2.25)**
Knowledge asymmetry$_{i>j}$	2.01 (1.34)	16.1	3.63	6.15E+07 (6.62E+07)***
Knowledge asymmetry$_{j>i}$	2.06 (1.53)	27.7	3.93	1.73 (1.94)
Trade asymmetry$_{ij}$	1.00 (0.01)	1.2	0.00	1.09 (0.06)
ln GDP per capita$_{ij}$	1.57 (0.38)*	82.9	2.95	0.83 (0.31)
ln population$_{ij}$	1.21 (0.12)*	54.6	1.16	1.15 (0.14)
ln distance$_{ij}$	2.66 (1.09)**	101.2	6.38	7.39 (8.10)*
Year	1.14 (0.07)**	87.8	0.85	0.97 (0.07)
Cut point 1	286.96 (123.96)			
Cut point 2	289.75 (124.13)			
Cut point 3	290.49 (124.18)			
Observations	85			85
Deviance chi-square	186.553			147.766
McFadden's pseudo R^2	0.123			0.306
AIC	208.553			201.766

Note. OLOGIT = ordered logistic regression; GOLOGIT = generalized ordered logistic regression; AIC = Akaike information criterion.

[a]The odds % change shows the percentage change in the odds of dependent variable (*scope*) by one standard deviation change of each independent variable.

[b]The marginal effects indicate the average increase of the likelihood that the dependent variable (*scope*) falls into a one-degree higher category when the independent variable increases by one unit from its mean level.

*$p \leq .1$. **$p \leq .05$. ***$p \leq .01$.

analysis. The former result implies that the weaker party's fear of exclusion is likely to promote specifically defined environmental provisions. However, this interpretation should be taken with caution because the robust standard error of the estimator (6.62×10^7) is significantly higher than those of other explanatory variables.

The estimation results for control variables are also mixed. Neither OLOGIT nor GOLOGIT analysis finds that the power relationship between FTA partners as measured by the *trade asymmetry* scores has any statistically significant impact on the *scope* of trade–environment linkages. Meanwhile, the OLOGIT model finds evidence supporting the positive impact of partner countries' *income levels* (OR = 1.57), *populations* (OR = 1.21), *distance* (OR = 2.66), and *year of*

signing (OR = 1.14) on the likelihood of specific environmental provisions. The GOLOGIT model finds support only for the *distance* between partner countries (OR = 7.39). This result indicates that the East Asian countries tend to include specific environmental provisions when they negotiate FTAs with non-Asian countries.

Conclusions and Future Research

This study analyzed how East Asian countries have responded to the challenges that the trade–environment nexus presents. To assess such responses, this study focused on the approaches of 15 East Asian economies to the trade–environment nexuses within their bilateral FTAs. A total of 85 FTAs have thus been examined. In rejecting the view that East Asian countries have adhered to collective ideas that favor weaker and ill-defined environmental areas of cooperation related to trade, this study found that there are differences and variances that have been overlooked thus far.

Trade-dependent East Asian economies are facing the possibility that stronger environmental standards would not only undermine the price competitiveness of their products but would also be used as disguised barriers against them. In the WTO debate about the trade–environment nexus, many East Asian countries claim that raising environmental standards is often motivated by nonenvironmental concerns such as protecting domestic jobs and industries negatively affected by trade liberalization. However, the main response from East Asian countries to these challenges has not necessarily been to argue that the trade–environment nexus should not be included on their negotiation agenda. In fact, many of them have paid close attention to the trade–environment issue in multilateral contexts, such as the WTO and various MEAs, although their manifestation is rather subtle.

More dramatic shifts are found in East Asian countries' bilateral FTAs. FTAs impose more concrete legal obligations on parties in terms of trade liberalization. Those with environmental provisions have also greatly increased. South Korea shows the strongest and the most specifically defined preferences for the trade–environment nexus through FTAs. By contrast, China shows the weakest and the most generally defined preferences.

Then what causes some, if not all, countries to embrace stronger or more specific environmental provisions in their FTAs? The importance of main causal findings is threefold.

First, consensual knowledge plays a crucial role in linking trade to the environment. Trade–environment linkages are likely to be strong and specific when both parties share consensual knowledge about the significance of environmental issues.

Second, the distribution of power has a conditional effect on the ways in which trade and the environment are connected. The fear of exclusion

hypothesis on the *strength* and *scope* of trade–environment linkages is accepted by GOLOGIT estimation. Other things being equal, the asymmetric distribution of knowledge in favor of a stronger country can induce a weaker country to agree on stronger and more specific environmental provisions. By contrast, the reputational cost hypothesis on the *strength* and *scope* of linkages is accepted by neither model.

Third, and relatedly, the estimation result of the power relationship between FTA partners as measured by the trade asymmetry scores indicates that a greater power difference alone has little impact on the likelihood of strong or specific environmental provisions.

To conclude, the findings of this study offer a path for future research. It is one thing to adopt trade-related environment provisions, but it is quite another to implement them diligently. Will the trade–environment linkages found in East Asian FTAs be effectively implemented and thus induce countries to promote trade and the environment at the same time? If this question is empirically answered in future research, one can reasonably accept the claim that preferential trading agreements can significantly reduce the transaction costs related to aggregating the interests of a great number of actors into a common policy position while making it easier to monitor compliance with agreements.

Appendix A. A Summary of Environmental Provisions Related to STRENGTH and SCOPE

1. Building environmental industries, compressed natural gas technology, and institutions; GATT Article 20 omitted although spirit evoked in General Exceptions
2. Chinese regional development (Tianjin Eco-City project) for energy conservation
3. Greater regulation to manage the environment; voluntary market mechanism to achieve higher levels of environmental protection; civil aviation environmental cooperation; environmental cooperation on natural resources, climate change, soil and air pollution, management of wastewater, and depletion of ozone layer
4. Broadening environmental conducive services; environmental cooperation in areas of air quality, water management, waste management, marine and coastal ecological conservation; environmental impact assessment; GATT Article 20
5. Mining environmental issues; sustainable management of forestry; fishery cooperation; GATT Article 20
6. Environmental cooperation agreement for exchanging knowledge and experiences; upholding levels of environmental regulation; environmental education and training for public awareness; GATT Article 20; exclusion of DSM
7. Rights to regulate for encouraging high levels of environmental protection; Johannesburg plan for the implementation of the World Summit on Sustainable Development; promotion of environmental technologies, sustainable renewable energy, and ecolabel-led goods and services; GATT Article 20; exclusion of DSM

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8. Environmental cooperation in areas of air quality, water management, waste management, marine and coastal ecological conservation, and mining; GATT Article 20
9. Cooperation in compressed natural gas technologies and their applications to environmental protection; maintaining environmental measures; investment activity to be undertaken in a manner sensitive to environmental concerns; GATT Article 20
10. Manufacturing recycling standards, health, safety, and the environment; environmental standards vis-à-vis investment promotion; state–investor procedure with respect to environmental standards
11. Transparency procedure regarding environmental protection; being able to withdraw an automotive good from the market if there are urgent environmental risks; upholding levels of protection in the enforcement of environmental laws
12. Environmental measures on wastewater treatment, waste management, air pollution, soil environment conservation, groundwater, clean air, and waste control; environmental impact on fishery industries; Environmental Committee to oversee cooperative activities
13. Environmental measures on soil environment conservation, clean air conservation, toxic chemicals, waste control, and groundwater; enforcement of environment laws; Environmental Committee and consultation
14. Excludability of inventions necessary for the environment and plant and human life from patent; trade in environmental goods and services related to renewable energy and climate change goals; health, safety, and the environment vis-à-vis investment promotion; state–investor, state–state DSM nonspecific to the environment
15. Rights to regulate levels for environmental protection; UN Framework Convention on Climate Change (UNFCCC); environmental cooperation on goods, services, investment, and customs; complying with long-term conservation measures of the Food and Agriculture Organization
16. Not weakening or reducing the level of environmental protection; expert consultations or consultations within the Joint Committee regarding any matter under the Environment Chapter; attempting to arrive at a mutually acceptable solution; no recourse to arbitration under DS chapter; sustainable development; MEAs; Trade and Sustainable Development Chapter; forest-based products
17. Motor vehicles and parts, chemical assessment (safety); sustainable development and trade; UNFCCC; government consultation and expert panel via the Committee on Sustainable Development and Trade
18. Automobile environmental standards; endangered species; environmental law public awareness; environmental consultations and panel procedures
19. Environmental standards vis-à-vis investment promotion; trade and sustainable development; biological diversity; Council on Sustainable Development; climate change cooperation; biotechnology; environmental manufacturing technology; energy (oil and gas) and mineral cooperation on sustainable activities; procedural guarantee of tribunals related to environmental laws
20. Environmental regulations to prevent environmentally hazardous chemicals and materials; environmental laws to protect wild flora and fauna; public participation and consultation on environmental matters; judicial (e.g., litigation), quasi-judicial, or administrative

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proceedings regarding environmental rights and damages for the enforcement of environmental laws
21. Environmental cooperation on sewage, disposal, noise, biodiversity, air, and sanitary issues; environmental DSM
22. Financial assistance to companies using environmental technology; environmental operation license required for sewage services, the disposal of waste, and services associated with toxins or radioactivity; retailing services for used cars and gaseous fuels subject to environmental pollution tests; GATT Article 20
23. Promotion of environmental goods and services; GATT Article 20; Committee on Environment and Trade to oversee the implementation of the Environment Chapter
24. Environmental impact of activities related to energy (technologies); environmental standards vis-à-vis promoting investment; not relaxing environmental measures; GATT Article 20; DSM not applied to the field of environmental cooperation
25. Clean Development Mechanism under the Kyoto Protocol and the UNFCCC; GATT Article 20
26. Agricultural cooperation to develop technologies for agriculture and livestock production of higher quality with a lower environmental impact; GATT Article 20
27. Johannesburg plan for the implementation of the World Summit on Sustainable Development 2002; Rio + 20; financial resources for environmental cooperation
28. Environmental cooperation including green markets, clean technology, and sustainable management; GATT Article 20; exclusion of DSM
29. Promoting sustainable development; investment and the environment; environmental cooperation including forestry and renewable energy sectors; GATT Article 20
30. Minimizing environmental impact of activities related to energy and mineral sources; GATT Article 20; state–investor procedure nonspecific to the environment
31. Facilitating technology development on waste management and biodiversity; providing effective sanctions for the violation of environmental damage
32. Environment Chapter; environmental cooperation; encouraging sound environmental policies and practices; pursuing a high level of environmental protection; MEAs; no disguised protectionist purposes; collaborative framework; institutional arrangements; consultations; Environmental Commission if consultations fail
33. Sanitary and phytosanitary (SPS) measures protecting human, animal, and plant life
34. SPS measures protecting human, animal, and plant life; GATT Article 20
35. Basic economic cooperation in energy and environmental fields; SPS measures (no ecological component); GATT Article 20
36. Basic principle of cooperation in environmental fields; GATT Article 20
37. Basic principle of cooperation in environmental fields; GATT Article 20
38. Environment standards vis-à-vis investment promotion; GATT Article 20
39. Environment standards vis-à-vis investment promotion; GATT Article 20
40. Environment standards vis-à-vis investment promotion; environmental protection; GATT Article 20
41. Conformance with importing party's safety and environmental standards of used vehicles; not relaxing each party's environmental measures; GATT Article 20; DSM not applied to the field of environmental cooperation

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42. Basic principle of cooperation in environmental fields; GATT Article 20
43. Basic principle of cooperation in environmental fields; GATT Article 20
44. Economic cooperation extended to the environment; GATT Article 20
45. Environmental cooperation agreement; SPS measures; GATT Article 20
46. Environmental cooperation agreement; GATT Article 20
47. Environmental cooperation agreement; GATT Article 20
48. Environmental cooperation agreement; GATT Article 20
49. Environmental cooperation agreement; GATT Article 20
50. Cooperation in the environmental sector; GATT Article 20
51. Environmental cooperation agreement; GATT Article 20
52. Environmental cooperation agreement; GATT Article 20
53. SPS measures protecting human, animal, and plant life; GATT Article 20
54. Basic principle of cooperation in environmental fields; GATT Article 20
55. SPS measures; GATT Article 20; prohibition of performance requirements including environmental measures
56. Sustainable development and the protection and preservation of the environment; GATT Article 20
57. SPS measures protecting human, animal, and plant life; GATT Article 20
58. SPS regulations and standards; GATT Article 20; preservation of regulatory authority to protect the environment
59. SPS measures protecting human, animal, and plant life; GATT Article 20
60. SPS measures protecting human, animal, and plant life; GATT Article 20
61. Environmental cooperation agreement; GATT Article 20
62. Environmental conservation agreement; GATT Article 20
63. Sustainable development; not relaxing existing environmental laws and regulations to encourage trade and investment; environmental cooperation; GATT Article 20
64. Technical regulations necessary for the protection of the environment; authority to take appropriate and timely measures for goods that pose an immediate risk to health, safety, or the environment; GATT Article 20
65. Environment and Trade Chapter; neither weakening nor reducing the protections afforded in its environmental laws, regulations, policies, and practices; consulting aiming to reach a mutually satisfactory solution; environmental cooperation; sustainable development; GATT Article 20
66. Environmental cooperation; GATT Article 20
67. UNFCCC; strengthening the development and enforcement of environmental laws and policies; not lowering environmental standards; Chapter on Trade and Sustainable Development; a committee or working groups to deal with any matter of mutual interest arising under this chapter, but not subject to DSM
68. SPS measures based on ecological conditions, environment standards vis-à-vis investment promotion; state–investor, state–state DS procedure including request for expert reports on scientific matters
69. Promoting sustainable development; environmental standards vis-à-vis investment promotion; SPS measures; state–investor procedure including request for expert reports on environmental matters

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70. Environmental protection and sustainable development; environmental measures to protection human, animal, or plant life or health; investment activity to be undertaken under each party's ecological or environmental laws; not relaxing environmental measures; state–investor DS procedure
71. Environmental protection, conservation, and sustainable development; protection of human, animal, and plant life; GATT Article 20; not reducing the level of safety or protection to the environment; notification of environmental measures to the other party; investment activity to be undertaken under each party's ecological or environmental laws; state–investor DS procedure
72. Environmental protection; biological diversity; energy efficiency technologies; climate change; mining and energy resources; prior notification of environmental protection measures; investment activity to be undertaken in a manner sensitive to environmental concerns; GATT Article 20; Environment Chapter; Environmental Affairs Council; environmental consultations to arrive at a mutually satisfactory resolution; environmental dispute not applicable to the general DSM
73. None mentioned
74. None mentioned
75. None mentioned
76. None mentioned
77. None mentioned
78. None mentioned
79. None mentioned
80. GATT Article 20
81. GATT Article 20
82. GATT Article 20
83. GATT Article 20
84. GATT Article 20
85. GATT Article 20

Note. GATT = General Agreement on Tariffs and Trade; DSM = Dispute Settlement Mechanism; MEA = multilateral environmental agreement.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the Ministry of Education and the National Research Foundation of the Republic of Korea (NRF-2017S1A3A2067636 to M. G. K.).

Notes

1. See the ADB database at https://aric.adb.org/fta (accessed June 30, 2018).

2. Such unintended environmental consequences are also known as environmental leakage, which refers to how efforts at reducing pollution in one country may lead to an increase in pollution elsewhere. For more details, see Ghertner and Fripp (2007).
3. GATT Article 20 stipulates,

> Subject to the requirement that such measures are not applied in a manner which would constitute a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade, nothing in this Agreement shall be construed to prevent the adoption or enforcement by any contracting party of measures . . . (b) necessary to protect human, animal or plant life or health . . . (g) relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption . . .

4. In addition to GATT Article 20 (General Exceptions) and similar provisions under the General Agreement on Trade in Services Article 14 and the Agreement on Trade-related Aspects of Intellectual Property Rights Article 27, some of the covered agreements under Annex I, including the Agreement on Sanitary and Phytosanitary Measures, the Agreement on Technical Barriers to Trade, and the Agreement on Agriculture recognize the right of WTO members to regulate trade to protect human, animal, and plant life or health, or the environment. Several GATT and WTO disputes have dealt with the application and interpretation of these provisions and agreements.
5. The WTO's neoclassical perspective is also clearly reflected in its mission statement:

> An important element of the WTO's contribution to sustainable development and protection of the environment comes in the form of furthering trade opening in goods and services to promote economic development, and by providing stable and predictable conditions that enhance the possibility of innovation. This promotes the efficient allocation of resources, economic growth and increased income levels that in turn provide additional possibilities for protecting the environment. (https://www.wto.org/english/tratop_e/envir_e/envt_intro_e.htm, accessed on June 30, 2018)

6. https://www.wto.org/english/tratop_e/envir_e/envt_intro_e.htm (accessed on June 30, 2018).
7. To put it differently, the preferential governance of environmental issues can have at least three advantages over MEAs: (a) it usually involves a small number of actors; (b) it facilitates issue linkage; and (c) it provides connections between national and global governance systems (Betsill, 2007, p. 14). Among others, the North American Free Trade Agreement galvanized earlier efforts to develop the trade–environment nexus (Aggarwal, 2013, p. 91).

8. Among 87 signed bilateral FTAs, the agreement between China and Maldives and the one between Indonesia and Chile are not included because the texts of agreements are not yet publicly available. Meanwhile, mega-FTAs such as Asia-Pacific Economic Cooperation and the Comprehensive and Progressive Agreement for Trans-Pacific Partnership are not included because the unit of analysis of this study is bilateral agreements. On the contrary, seemingly plurilateral agreements, for instance, between South Korea and the European Union and between ASEAN and Australia/New Zealand are considered as bilateral because they were in fact negotiated bilaterally based on either formal or informal coalitions.
9. This is similar to what the diffusion literature calls a competition mechanism. Competition is more decentralized than coercion, but it is also based on the power relationship to the extent that actors—particularly the weaker ones—are induced by the fear of exclusion (Bechtel & Tosun, 2009; Holzinger & Knill, 2008; Vogel, 1997).
10. In this case, issue linkage and policy diffusion are regarded as the result of a social construct or emulation. Although the weaker country alone regards the linkage as substantively connected, the stronger country may find that the linkage is a sign of its dignity as a coalition leader (Holzinger & Knill, 2008). However, it is also likely that "issue-linkage will not succeed if the states with a strong stake in the existing distribution of benefits, and the capability to control it, prefer to keep things as they are" (Haas, 1980, p. 371).
11. This approach is consistent with the Organisation for Economic Co-operation and Development (OECD)'s categorization of environmental provisions in regional trade agreements. The OECD considers the following as environmental provisions in regional trade agreements: (a) a reference in preamble; (b) general and specific exceptions based on GATT Article 20 or General Agreement on Trade in Services Article 14 for protection of human, animal and plant life; and (c) a commitment to uphold environmental law and not weaken it to attract trade or investment. At the same time, it considers the following provisions more substantive: (a) environmental cooperation, (b) public participation, (c) dispute settlement, (d) coverage of specific environmental issues, (e) specific provisions on MEAs, and (f) implementation mechanism (George, 2014, p. 7). In a similar vein, Monteiro (2016) identifies 62 different types of environmental-related provisions and categorizes them into 12 main types ranging from preamble language to dispute settlement procedures.
12. To formally define the *knowledge asymmetry* variables, this study assumes a power relationship between two trading partners. It can be most conveniently measured by a trade dependence score, defined as the share of dyadic trade flow (the sum of imports and exports) in GDP. Formally, $Trade\ Dependence_i = \frac{(Imports_{ij}+Exports_{ij})}{GDP_i} = \frac{Trade_{ij}}{GDP_i}$, where $Trade_{ij}$ denotes bilateral trade between countries i and j. Other things being equal, this study assumes that country i is stronger than country j if the former is less dependent on the latter for their bilateral trade as a share of GDP. As Hirschman's (1945/1980) classic work points out, interdependence tends to foster asymmetry as a result of dependence and inequality between trading partners. Power arises from asymmetric mutual dependence in an anarchic setting.
13. This study uses only the "threat perception" survey results. The awareness index is not used for two reasons: (a) the two variables are highly correlated (cc = 0.76) and

(b) the threat perception measure is more appropriate for this study as it takes into account how climate change is perceived as a direct and personal (''you and your family'') hazard and thus is more likely to lead to national policies linking trade to the environment. The threat perception scores range from 13% (Liberia) to 85% (Portugal). In the case of FTAs agreed between individual East Asian countries and regional associations such as ASEAN, the European Union, and the Eurasian Economic Union, the average of member countries' threat perceptions is used to measure each regional association's threat perception.

14. It should be noted that the data of this study are cross-sectional in nature and thus present a snapshot in the year in which each agreement was signed.
15. The bigger the deviance chi-square value is, the poorer the fit of the model is. The lower the AIC value is, the better the model fit is. The higher McFadden's pseudo R^2 is, the better the model fit is.
16. However, this interpretation should be taken with caution because the robust standard error of the same variable is significantly higher than those of other variables. It should also be noted that the explanatory power of fear of exclusion is not conclusive because the OLOGIT analysis does not yield any statistically significant findings.

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