Chapter 10

NTM and other Trade Measures for the Environment in ASEAN

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CHAPTER 10

Trade Measures of Environment in ASEAN[*]

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1. Introduction

Environmentalists hold that the trade-induced depletion of natural resources and the pollution-haven effects of dirty industries migrating to low-stringency regulatory countries amply demonstrate that trade and the preservation of the environment are at odds. Trade economists recognise that the world trade regime must be made compatible with environmental objectives, but hold at the same time that an open world trading system with low barriers to trade in Environmental Goods (EGs) and Environmental Services (ESs) is needed to create a triple win: for the preservation of environment, for trade, and for developing countries. For lower-income countries, benefits would accrue through lower costs for environmental technologies and technological transfer. For higher-income developing countries, benefits would accrue through more secure access to the large Organisation for Economic Co-operation and Development (OECD) markets.[1]

Environmental issues entered trade negotiations as the text of the Preamble to the Agreement establishing the World Trade Organization (WTO) in 1994, which stated that the WTO would have as an objective to promote sustainable development and the protection of the environment (WTO, 1994). Environmental issues were then introduced formally in the launch of the Doha Round in 2001. Pursuant to Article 31, WTO members were asked to negotiate on the reduction, or, as appropriate, the elimination of tariff and non-tariff Barriers (NTBs) on Environmental Goods (EGs) and Environmental Services (ESs).

Multilateral negotiations under the Doha Round have gone nowhere and the plurilateral negotiations under the Environmental Goods Agreement (EGA) involving 17 WTO members launched in 2014 are also stuck. The lack of progress is on a much-reduced agenda only considering the reduction of tariffs on EGs (negotiations on ESs and NTBs were taken off the agenda). To paraphrase the title of Esty's (1994) book, 'Greening the GATT' – and his warnings of the difficulties ahead – dealing with the trade-environment-climate nexus has proved enormously difficult and it has been widely recognised that the regimes are on a collision course (Brainard and Sorkin, 2009).

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[1] The technological transfer mechanism is an important pillar of the Paris Agreement. Coninck and Bhasin (2015) review the difficulties in implementing the UNFCCC Technology Mechanism to promote technology development and transfer to developing countries, a condition imposed by developing countries at the 2011 United Nations Climate Change Conference (COP17) in Durban to continue negotiations on climate change.

Yet urgency is with us: preserving our environment is the centrepiece in the Sustainable Development Goals (SDG) menu, now the focal point for the planetary engagement to promote global welfare. The environment features directly in Goal 15 'Life on land' with nine targets and in Goal 13 on climate change and adaptation, which is brief on means to reduce Green House Gases (GHGs) because of the ongoing negotiations that lead to the Paris Agreement in December 2015.[2] The main link between the SDGs and trade policy is in Goal 17, which stresses the importance of a universal rules-based, open, non-discriminatory and equitable multilateral system under the WTO.

The lack of progress at the multilateral/plurilateral levels raises the question of what has happened at the national and regional levels. This chapter takes stock of government-issued trade measures that deal with environmental objectives focussing on the Southeast Asian Countries which is combined in the Association of Southeast Asian Nations (ASEAN).[3] If the objective is to focus on NTM measures applied to EGs, it is also necessary to cover tariffs and ESs for several reasons. First, to date, the negotiation agenda on trade measures for EGs and ESs have dealt exclusively with reduction in tariff barriers. Second, it is those negotiations that have lead (through a drawn out negotiation process) to the current lists of EGs. Third, EGs entering environment-related activities usually embody ESs. Last, the welfare interpretation of tariff measures is more clear-cut than for NTM measures where TBTs play an important role in identifying EGs.

This exercise is interesting for ASEAN countries individually to see where they stand and also at the regional level where the 'ASEAN way' bottom-up approach to consensus building might help make progress on this divisive agenda. However, this exercise faces the difficulty of identifying environment-related activities where many environmental projects (especially in developing countries) involve trade in EGs alongside trade in ESs. For example, moving towards renewable forms of energy may involve purchasing a wind turbine along with engineering and monitoring services to insure its functioning. This means that dealing with the trade policy commitments necessary to help meet environmental objectives calls for examining measures that affect trade in both goods and in services. This is why in discussions of trade in environmental goods, it is becoming customary to refer to the market for Environmental Goods and Services – EGS (Sauvage, 2014).

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[2] Goal 13 is 'Take urgent action to combat climate change and its impacts' and Goal 15 is 'Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss'.

[3] Private-sector standards and regulations are not covered here. Monteiro (2016) maps the range of environment-related provisions in RTAs notified to the WTO. His Figure 1 documents the sharp rise in environmental-related issues since the early 2000s such as environmental governance that go beyond the current WTO negotiation mandate that only deal with Article XX exceptions (and preamble). George (2014) documents trends in environment-related provisions in recent RTAs.

The chapter is exploratory, looking for differences in patterns of trade policy measures across broad categories of goods, distinguishing EGs from non-EGs. Section 2 provides a background on the difficulties encountered in reaching an agreement on boundaries that distinguish EGs and ESs from other goods and other services. Section 3 presents tariffs and NTMs for different lists of EGs and indicators of commitments in ESs for individual ASEAN members and for comparators. Section 4 reports on estimates of the effects of NTMs on the intensity of bilateral trade. Section 5 concludes with a discussion of prospects for making progress at the ASEAN level.

2. Challenges in Identifying Environmental Goods and Services: A Fool's Errand?

Identifying EGs and ESs to which to apply environmentally favourable trade policies has proved elusive. [4] First, there is a legal void in EGs and ESs reflecting power relations in the world trading system. There are no provisions in the WTO legal system related specifically to EGs and ESs except for the application of the most-favoured nation clause and a general interdiction of quantitative restrictions so there is no agreed upon definition of what is an 'environmental good' or an 'environmental service'. In effect, WTO members are free to carry out any environmental policy they wish so long as these policies do not undo the market access they have granted under the General Agreement on Tariffs and Trade (GATT). The result is a 'negative contract' with respect to the environment. Making the trading system compatible with the environmental objectives of the SDGs would call for a 'positive contract' in which countries would agree to trade rules that are favourable to the environment.[5] Moreover, negotiations on removing barriers to trade in goods take place in the GATT and negotiations for Services take place in the General Agreement on Trade in Services (GATS). Second, are the inherent technical difficulties in defining EGs and ESs described below.

2.1. Selecting Environmental Goods

During the Doha Round countries were invited to suggest approaches to reduce protection in 'Environmental Goods' and to suggest approaches that help define a 'universe' of 'Environmental Goods' subject to tariff reductions. Three broad approaches were proposed. The 'request and offer' approach where countries exchange market access bilaterally which is then extended to others on a most-favoured nation basis was proposed by Brazil. Some developing countries perceived this approach as a shield from a formula-based approach. However, tariffs were not sufficiently high amongst the major producers of EGs for reductions to generate significant gains for both sides. The 'integrated project' approach proposed by Argentina and India would select specific projects, which would solve the multiple end-use

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[4] The title is inspired by Moore's (2011) discussion of the difficulties in obtaining the necessary convergence in interests to apply border adjustment taxes to prevent carbon leakage between countries pursuing GHG emission reductions at different speeds.
[5] Mavroidis and Melo (2015) discuss needed changes and the legal obstacles that these changes would face under the present rules as e.g. for fuel subsidies and labelling.

problem identified on the left-hand side of Figure 10.1a. No international agreement would then be necessary, but the enhanced market access would be temporary, leaving exporters of EGs under uncertainty.

Finally, under the 'list approach', WTO members would negotiate on a list of products that would receive total or partial tariff reduction. Thirteen countries participated leading to seven lists of HS-6 level products after consolidation of submissions by nine members into a combined list. From ASEAN, Singapore proposed a list of six products and Thailand was the only developing country submitting a list of 17 products. [6] These submissions were collected under an umbrella list that combined 411 unique product submissions (the so-called 'WTO list'). On the WTO list, not a single product appeared on all six lists, and more than two-thirds of the products appeared only on one list. For a 'core' list of 26 products proposed by Australia, Colombia, Hong Kong and Norway, submitters – who were asked to choose their selection from a list of 6 EG categories (Air pollution control; renewable energy; environmental energy; carbon capture and storage; water management/water treatment; other) – displayed little agreement (see Balineau and Melo, 2013: Table 10.1). Yet, the Davos announcement launching the EGA negotiations on a reduction in tariffs also started from a list of 54 goods over which APEC members had agreed to reduce tariffs to 5 percent or less by end 2015. In 2017, 17 countries were participating in the EGA negotiations with no agreement yet on a list of goods, in spite of very little on the negotiation table because of the low level of tariffs amongst most participants.

Figure 10.1a summarises the technical difficulties faced in defining EGs. On the left hand side are Goods for Environmental Management (GEM) that have multiple end-uses. GEM products are mostly industrial, often involved in end-of-pipe activities like waste water treatment and solid-waste management, both of which have strong complementarities with ESs. High-income countries have a comparative advantage in these products. Amendments in the Harmonized System (HS) classification along with product classification based on efficiency Standards would help identification.

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[6] Perhaps this submission was elicited by the then chairman, Manuel A.J. Teehankee, of the Committee on Trade and the Environment in Special Session (CTESS), where the deliberations were taking place.

On the right-hand side are the Environmentally Preferable Products (EPPs). These include agricultural and natural resource-based goods in which developing countries have a comparative advantage. Identification of 'environmentally friendly' products is difficult (e.g. attribute disclosure through labelling and third-party certification, life cycle analysis that may call for distinctions according to Processes and Production Methods and likely to be challenged (e.g. interpretation of 'like products' at the WTO). Here government mandated regulatory standards for trade in endangered species and sensitive products, and Voluntary Sustainability Standards for traded commodities like palm oil, timber, and soy are helpful identifiers. Of these identifiers, regulatory standards are reported in the Multi-Agency Support Team (MAST) database but not the proliferation of privately generated VSS. These standards that are important for many EPPs are not covered here. [7] Identification and design of corrective measures are particularly difficult for EPPs as the role of trade in preserving natural resources is controversial, especially in the weak governance environment typical in resource abundant countries (Fischer, 2010). Exploring the NTMs that have been taken to protect the biological diversity in ASEAN, and how it compares with measures elsewhere is important, but beyond the scope of this exploratory investigation.

In sum, mercantilist behaviour pervaded the negotiations on the submission of EG lists in the Doha and EGA negotiations. Products in the submitters' lists included those with high Revealed Comparative Advantage index values and systematically excluded products with tariff peaks.[8] Developing countries did not submit lists, preferring other approaches. This is apparent in the comparison of frequency of sanitary and phytosanitary (SPS) measures in the EG lists compared with those for all products in Table 10.1 (further down): whereas SPS measures (Chapter A of MAST) occupy 41 percent of NTMS for all HS-6 goods, they cover less than 1 percent on all EG lists. One has to conclude that that the EG lists do not represent the perception of EGs by developing countries, a major caveat to keep in mind when interpreting the comparisons below.

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[7] Andrew (2017) discusses in detail the limitations that trade puts in implementing SDG 15 and the two approaches (regulatory and Voluntary) to deal with trade in natural resources. He noted that the OECD has catalogued 514 Environmental labelling and information schemes. Fischer and Lyon (2015) discuss the competition over labelling between industry and NGOs (fierce for logging activities) concluding that, amongst the several possible outcomes, a convergence across schemes is quite likely.

[8] Balineau and Melo (2013) show that this selection process was not random (i.e. EG lists submitted had a greater share of products with an RCA>1 and fewer products with tariff peaks than if they had been selected randomly).
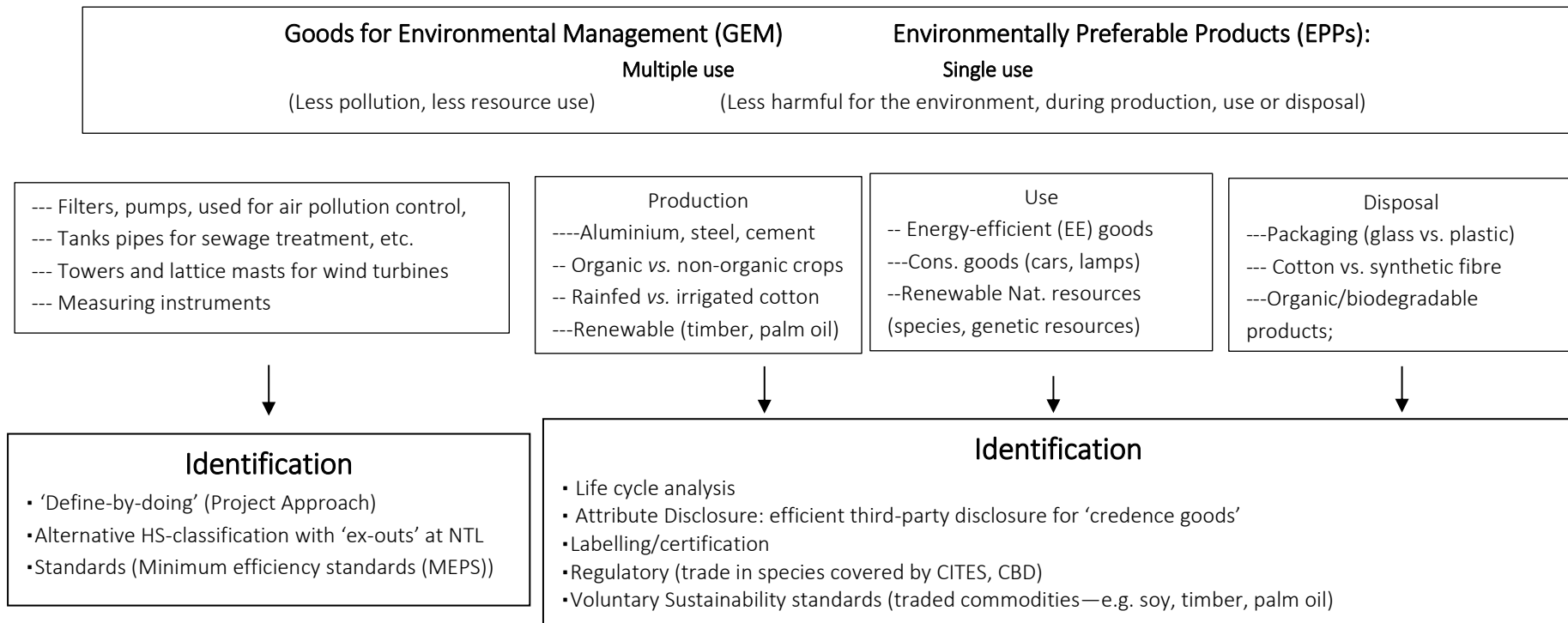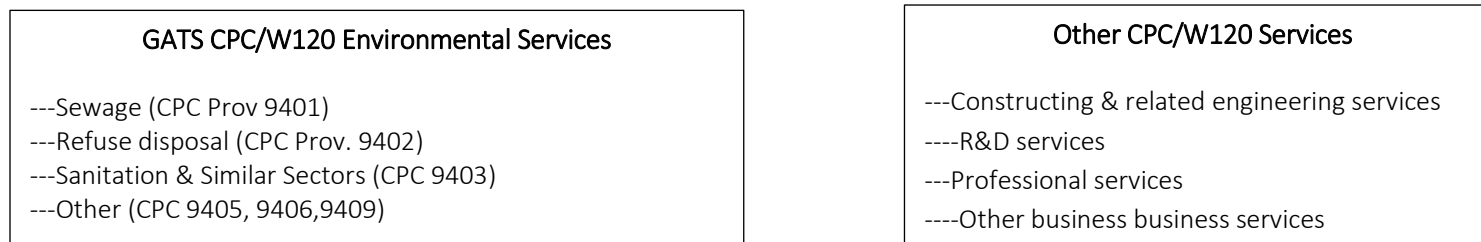
Figure 10.1a: Identifying Environmental Good (EGs)

Goods for Environmental Management (GEM)	Environmentally Preferable Products (EPPs):
Multiple use	Single use
(Less pollution, less resource use)	(Less harmful for the environment, during production, use or disposal)

[GEM box]
--- Filters, pumps, used for air pollution control,
--- Tanks pipes for sewage treatment, etc.
--- Towers and lattice masts for wind turbines
--- Measuring instruments

Production
----Aluminium, steel, cement
-- Organic *vs.* non-organic crops
-- Rainfed *vs.* irrigated cotton
---Renewable (timber, palm oil)

Use
-- Energy-efficient (EE) goods
---Cons. goods (cars, lamps)
--Renewable Nat. resources
(species, genetic resources)

Disposal
---Packaging (glass vs. plastic)
--- Cotton vs. synthetic fibre
---Organic/biodegradable
products;

Identification
▪ 'Define-by-doing' (Project Approach)
▪Alternative HS-classification with 'ex-outs' at NTL
▪Standards (Minimum efficiency standards (MEPS))

Identification
▪ Life cycle analysis
▪ Attribute Disclosure: efficient third-party disclosure for 'credence goods'
▪Labelling/certification
▪Regulatory (trade in species covered by CITES, CBD)
▪Voluntary Sustainability standards (traded commodities—e.g. soy, timber, palm oil)

Figure 10.1b: Identifying Environmental Services (ESs)

GATS CPC/W120 Environmental Services

---Sewage (CPC Prov 9401)
---Refuse disposal (CPC Prov. 9402)
---Sanitation & Similar Sectors (CPC 9403)
---Other (CPC 9405, 9406,9409)

Other CPC/W120 Services

---Constructing & related engineering services
----R&D services
---Professional services
----Other business business services

Source: Authors' compilation, based on Balineau and Melo (2011) and Steenblik and Geloso Grosso (2011).

2.2 Recognising the Scope of Services for Environment-related Activities

Figure 10.1b lists Services deemed the most important for trade in EGs with those classified as ESs on the left-hand side and a selection of other important Services relevant for environment-related projects on the right-hand side.[10] The classification is exclusive (i.e. single-purpose) so that no category in this list of sectors can appear twice, i.e. as another Service. As shown on the left-hand side of Figure 10.1b, only four sub-categories have been classified as ESs. As discussed by Steenblik and Geloso Grosso (2011) and others, this classification is outdated, exclusive, and too narrow as it concentrated on end-of-pipe public services focussing on waste management and pollution control. Crucially, the classification fails to recognise the increasing 'servicification' of manufacturing, that is, it fails to take into account that many operators integrate the supply of ESs with imports of EGs so that the customer would not demand the good without the accompanying services. The right-hand side of Figure 10.1b displays some other Services deemed crucial in the execution of environmental projects (section 3.3 reports an ordinal index of environmental services liberalisation based on the two lists in Figure 10.1b).

Figure 10.2: Environmental Goods have Higher Complexity
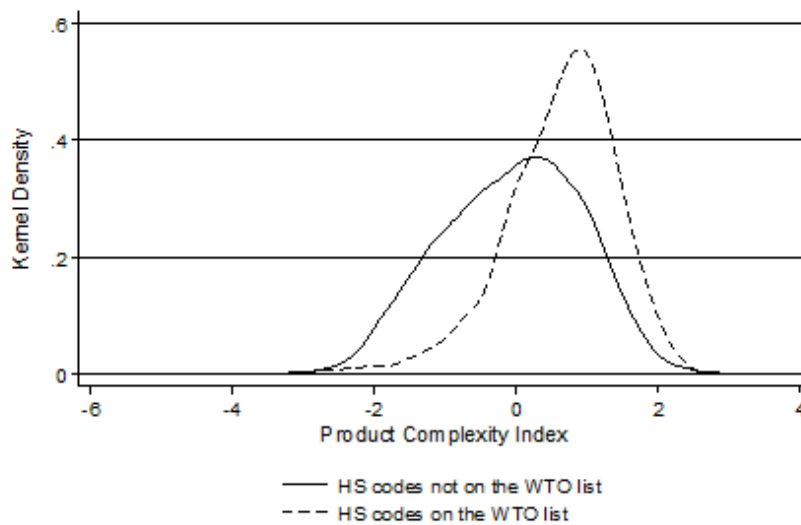
HS = Harmonized System; WTO = World trade Organization.
Notes: Environmental products are from the WTO combined list (411 products). Kernel density is a non-parametric method for smoothing probably density functions.
Source: Authors' calculations, based on the data obtained from Atlas of Economic complexity available at http://atlas.media.mit.edu/en/

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[10] Drawn up in 1990 for GATS negotiations of the Uruguay Round, the list resulted in 155 sectors. This list is used in the current negotiations for a Trade in Service Agreement (TiSA) aiming to open up markets and improve rules governing trade in services.

EGs and ESs are complements and, for many multiple-use products, technologically sophisticated. This is confirmed by several measures of technological complexity including the continuous economic complexity measure developed by Hidalgo and Hausmann (2009), which allows comparisons of goods in different classifications. The normalised density function for this indicator is shown in Figure 10.2 for EGs and non-EGs using the WTO list (products are classified from least to most complex).[11] The distribution for EGs is to the right, an indication that the selection process resulting in the EG lists led to a selection of goods that are more complex. This result, which also holds for the other EG lists, reflects three aspects. First, EGs are mostly intermediate goods in the production process. Second, EGs embody a high degree of 'servicification'. And, perhaps most importantly, the EG lists do not include EGs with relatively little transformation like EPPs in which developing countries have a comparative advantage.

2.3 Case Study on Identifying EGs and ESs to Promote Energy efficiency

Energy efficiency (EE), long considered the 'low-hanging fruit' in mitigation efforts dealing with climate change, illustrates well the identification difficulties discussed here. On the EG side, EE gains can be achieved by TBTs – minimum energy performance standards (MEPS), comparative labels – and complementary trade liberalisation. On the ES side, gains can be obtained by engineering and EE audits that lead to an improvement in the functioning of the 'energy system' (more efficient motors and drives could save 10 percent of global energy consumption). [12]

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[11] The starting point is that a country's production potential resides in its non-tradable 'capabilities' (regulations, property rights, infrastructure) based on product characteristics. The identifying assumption is that a country's capabilities can be approximated by an outcome-based measure captured by the network of a country's exports. A country produces economically complex products if the bundle is only exported by a few countries that export a large number of these products. Klotz et al. (2016) critique this outcome-based measure. At the same time, they also showed that this continuous measure is closely associated with other discrete product categories of technological complexity devised by the OECD, WTO, UNCTAD, and the BEC.

[12] According to the Intergovernmental Panel on Climate Change (IPPC), improvements in energy efficiency are estimated to account for 38 percent of the CO_2 emissions reductions necessary to reach the +20 C target set at the Paris Agreement.

In his discussion of difficulties facing the identification of EGs for tariff and NTM liberalisation, Sugathan (2015) mentions that one must include both energy-efficient and energy-saving related goods that he classifies in five groups, the easiest (tier 1) being those, like light-emitting diodes (LEDs, HS- 854140) that are already identified in the HS-6 code. Next come those that can be categorised as 'ex-outs' like solar water heaters (HS- 841919), then those that have multiple end-use like monitoring and control equipment such as switchboard and control panels (HS-8543710-20).[13] The most problematic EGs to classify (tier 5 products) are the energy efficient products that are not physically distinguishable as relevant to EE, but which perform in a more energy-efficient manner than identical products with the same end use. Such products would be identifiable only on the basis of labeling or if accompanied by (preferably third-party) certification declaring that they conform to a specific MEPS.

WTO members may lower their applied tariffs on any products that meet a certain MEPS. However, such minimum thresholds could vary from country to country. One option that could be considered is to bind import tariffs at zero for the highest efficiency classes of products whenever they emerge and for which international standards exist by creating a special 'ex-out' category under the relevant HS6-digit product sub-heading. Good candidates in this regard are energy efficient motors for which efficiency classes have already been drawn up by the International Electrotechnical Commission. [14]

Many countries apply MEPS based on these IEC standards. The advantage of keeping import tariffs at zero for the highest efficiency motors (regardless of the tariff levels for less efficient motors) is that it would lower the market price and encourage diffusion of a technology that can have a direct impact on energy consumption and thereby GHG emission levels in the manufacturing sector. Another option for Tier 5 products would be to apply zero duty for energy efficient products as long as the product meets the domestic MEPS of the importing country, even if it does not meet the requirements of an international standard or if a commonly accepted international standard does not exist. However, because of the overall low level of applied tariffs in EGs (see below), the scope for efficiency gains are likely to be low even after contemplating a move from applied to bound tariff rates.

3. Trade-related Measures for EGs and ESs in ASEAN: A Comparative Perspective

We start with a brief description of the tariff landscape, as tariffs are simplest to interpret and have been the subject of negotiations, then move on to NTMs and proxy measures for ESs. The same graphical presentation is used to compare tariff measures and indicators of NTMs.

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[13] Spare parts relevant for the efficient functioning of EE goods even though they may have other uses than EE contexts would also fall under that group. Planned amendments to the HS (to be implemented in 2017) include the creation of separate HS-6 digit sub-headings for (a) LED lamps and (b) hybrid, plug-in hybrid and all-electric vehicles.

[14] An ISO-classified product category is recognised by the GATT (see Mavroidis and Melo 2015).

In each figure, for each country (or each country grouping), the average for the selected EG category is represented on the vertical axis against the corresponding average for the non-EG group on the horizontal axis. This choice of labelling means that all points below (above) the 45° line means that the country's trade policy measure is, on average, lower (higher) for EGs than for non-EGs. These measures are reported for each ASEAN member (where available), the average for the ASEAN group and for the EGA group. Averages are also reported for the three World Bank country groupings to which ASEAN members belong: Lower Middle Income countries (LMICs), Upper Middle Income countries (UMICs) and ASEAN. At times comparisons are carried out with two restricted 'core' lists drawn the OECD's Combined List of 248 Environmental Goods (CLEG). For these two restricted lists (Core CLEG of 11 products and core CLEG+ of 40 products), OECD staff have been able to ascertain that 2/3 (for the Core CLEG) and 1/3 (for the Core CLEG+) of all trade in these products is related to the environment (Sauvage 2014, Annex 1 gives the list of all OECD lists and the corresponding HS-8 code).

3.1 A Comparison of Applied Tariffs for EGs across countries groups of countries

Figure 10.3 compares average tariff rates for EGs and non-EGs for the WTO list (the corresponding values for the WTO and for the core CLEG+ lists are given in Table 10.1). On average, ASEAN members apply a tariff of about 5 percent for EGs and about 7 percent for non-EGs. On average, EGs are less taxed than non-environmental goods. Amongst ASEAN members, with the exception of Cambodia, Brunei Darussalam, and Lao PDR that are on the 45° line, all ASEAN countries lay below the 45° line. The figure also displays three patterns. First, the ranking of average tariff by income category group follows the per capita income ranking – lowest for HICs, highest for LMICs – and for each group the average tariff on EGs is lower than for non-EGs. Since the share of intermediates in EGs is higher than in non-EGs, one would expect that the desire to protect final goods in an industrialisation strategy and the counter-lobbying activities of downstream sectors would account for the lower average protection of EGs relative to non-EGs. It could also be because countries take the environment seriously but this is unlikely from an examination of the pattern tariff changes across these two categories of goods over the last 20 years.[15] Second, the greater disparity in tariff rates for LMIC and UMIC groups (relative to the High-Income Group (HIC) group) carries over to the comparisons for the EG and non-EG averages.[16] Third, there is little difference in patterns between the two lists.

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[15] Balineau and Melo (2013) do not detect any differences in rates of (applied) tariff reductions between EGs and non-EGs groups over the period 1997–2011 across countries.
[16] For the LMIC group the average tariff for EGs is (6 percent) and for non-EGs (9.5 percent).

Also, as expected, trade-weighted average values are closer to the origin (see Figure 10.A1 in Appendix). Not controlling for other determinants of import volumes, import volumes for more highly taxed products are lower so that using a trade-weighted average lowers the weight on high tariff products, resulting in lower averages. Overall, the move toward the origin is stronger for the non-EGs than for the EGs, suggesting a higher price elasticity for non-EGs. This is consistent with the evidence highlighted above about the complexity of the EG and the general observation that many EGs are intermediates which are less responsive to price. A higher proportion of countries and aggregates are now above the 45° line. On a trade-weighted basis, the Philippines, Cambodia, and Lao PDR have higher tariffs on EGs than on non-EG.[17] Finally, should the ASEAN contemplate removing tariffs on EGs, they would want to choose a list more representative of EGs in ASEAN than the WTO list. If the WTO list (or the OECD core CLEG list) were to be chosen as a starting point for negotiations, the average tariff would be about twice as high for the ASEAN group as for the EGA group. Greater gains might be expected from a successful negotiation. Also, one would expect greater frictions during the negotiations.

Figure 10.3: Applied Tariffs: EGs vs. non-EGs (WTO list 411 products)
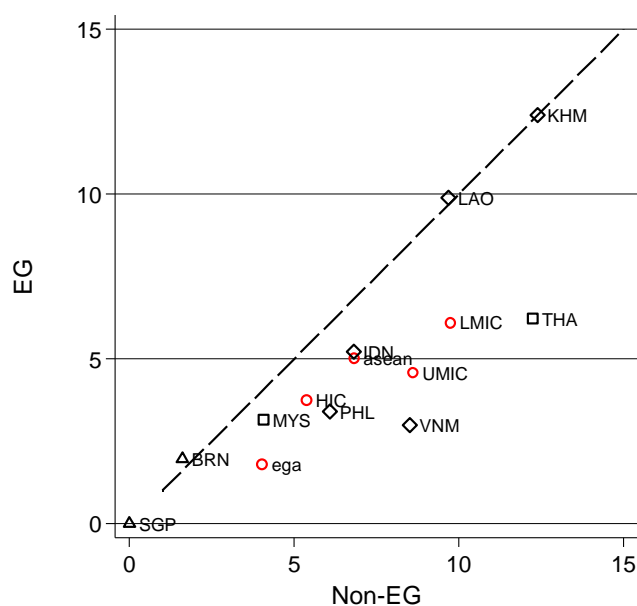
EG = Environmental Goods; WTO = World Trade Organization.
Note: Averages for groups are simple averages: LICs: Low-income group GNI p.c. (in 2015 $ atlas method <$1,025: LMIC (lower-middle income): 1,026 < GNI p.c. < 4,035; UMIC: 4,036 < GNI p.c. < 12,475; HIC GNI p.c. >12,475: EGA: Diamond (◊) LMIC (□) for UMIC and (Δ) for HIC.
Source: Author's calculations, based on COMTRADE and WTO data.

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[17] For countries with tariffs defined at the national tariff line level (HS-8 level or more), one should take into account aggregation to the HS6 level. For example, on average the 14 initial members of the EGA negotiations have 118 tariff lines on the EG list at the HS-6 level. (See Melo and Vijil, 2014).

3.2 The Landscape of Non-Tariff Measures

The selection process for EGs indicates goods that are technologically complex, an additional justification for information-revealing NTMs. If so, one might expect more NTMs for EGs than non-EGs. The same comparisons between EGs and non-EGs are now carried out mainly focussing on the principal MAST Chapter A (SPS), Chapter B (TBT) and Chapter P (export measures) using three indices:

The frequency index, F, gives the number of transactions covered by NTMs. It is defined as follows:

$$F_{ig} = \frac{\sum_{j=0}^{G} NTM_{ij} M_{ij}}{\sum_{j=0}^{G} M_{ij}}$$

(10.1)

where g indexes products groups (EG and non-EG), i indexes countries and G is the total number of goods in the category. NTM_{ij} is a dummy taking one when any NTM is applied to imports of good j. M_{ij} is a dummy indicating that product j is imported by country i.

The coverage index, C, gives the share of imports covered by NTMs:

$$C_{ig} = \frac{\sum_{j=0}^{G} NTM_{ij} V_{ij}}{\sum_{j=0}^{G} V_{ij}}$$

(10.2)

where V_{ij} is the value of imports of good j in country i. All other indices and variables remain the same as for the frequency index.

The pervasiveness index, P, measures the prevalence of NTMs by replacing the dummy variable in the frequency index by a count variable of NTMs affecting each HS-6 product:

$$P_{ig} = \frac{\sum_{j=0}^{G} \#NTM_{ij} M_{ij}}{\sum_{j=0}^{G} M_{ij}}$$

(10.3)

where $\#NTM_{ij}$ is the number of NTMs affecting product j in country i. All other indices and variables remain the same as above. Both frequency and coverage indices are constrained between 0 and 1, but not the pervasiveness index. A higher pervasiveness index value indicates that the country in question resorts more intensively to the use of that category of NTM.

Differences (or non-convergence) in regulatory frameworks for EGs is also important in assessing prospects for reform. Information on regulatory divergence is of particular relevance as, more than the regulation itself, it is often the diversity of regulations across jurisdictions that act as a barrier to trade.

Calculating standardised numbers of product-type NTMs combinations applied identically by any two countries provides a measure of regulatory divergence. Cadot et al. (2015) propose a measure of regulatory distance, RD, between country i and j is computed as:

$$RD_{ij} = \frac{1}{N}\sum_{k}\sum_{z}\left|NTM_{ik}^{z} - NTM_{jk}^{z}\right| \tag{10.4}$$

As before, NTM_{ik}^{z} takes the value 1 when the country imposes a NTM of type z on product k, and zero otherwise; and N denotes the number of observations where at least one of the two countries applies the NTM on a good on the EG list. In practical terms, regulatory distance indicates the percentage of NTMs-product combinations that are not equal across two countries. Because RD is normalised by the grand-total of product–NTM combinations (813 in our sample), the bilateral index values lie between zero and one.[18] The lower the value of the index, the more similar is the regulatory framework of two countries. In Figure 10.7 below, regulatory convergence is defined as $1 - RD$, so a higher value indicates a more similar regulatory structure.

Most products traded today are covered by one NTM measure or another. ASEAN is no exception as only four members do not have a full coverage ratio.[19] Table 10.1 gives the count and distribution of NTMs by MAST category at the ASEAN level for all goods and for three lists of EGs. Four patterns stand out. Over all products, SPS, TBT, and export measures account for 86 percent of the count. Second, whichever EG list is elected, the count on SPS measures is negligible, particularly so for the two OECD lists a reflection of the non-participation of developing countries in the submission of products for inclusion on EG lists. Third, the share of export measures (P) is higher for the WTO list than for the OECD lists. Fourth, there is very little difference in the MAST shares between the two OECD lists.

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[18] The index ranges from 0.002 between Côte d'Ivoire and Senegal and 0.563 between China and the US for the WO list of EG.

[19] Ing et al. (2016: Table 2.1) show that NTM coverage ratios (i.e. traded products covered by one NTM or another) in ASEAN are less than 100 percent (simple average in parentheses) in 2015 for the following members: Brunei Darussalam (65 percent), Indonesia (75 percent), Malaysia (71 percent) and Myanmar (42 percent).

Table 10.1 : NTMs by type in ASEAN: All Products and EGs

| Chapter	All products Count	%	WTO list Count	%	CLEG+ list Count	%	CLEG list Count	%
A	651,126	41.80	358	0.73	2	0.07	1	0.11
B	489,781	31.44	29,107	59.28	687	24.78	317	33.65
C	70,393	4.51	868	1.77	83	2.99	28	2.97
D	479	0.03	1	0.00	1	0.04	0	0
E	23,528	1.51	989	2.01	80	2.89	22	2.34
F	63,495	4.07	3,740	7.62	396	14.29	119	12.63
G	5,957	0.38	406	0.83	43	1.55	11	1.17
H	58,876	3.77	3,938	8.02	444	16.02	122	12.95
J	77	0.01	3	0.01	0	0	0	0
P	193,964	12.45	9,693	19.74	1,036	37.37	322	34.18
All	1,557,676	100	49,103	100	2,722	100	942	100

ASEAN = Association of Southeast Asian Nations; WTO = World Trade Organization; CLEG+ = Extended Core Combined List of Environmental Goods; CLEG = Core Combined List of Environmental Goods.
Notes: See text for definition of product lists. Count is for all measures at the HS6- level (5300+ products).
Source: Authors' calculations, based on ERIA–UNCTAD NTM database http://asean-itip.org

Figure 10.4 shows that the distribution of measures across countries is very sensitive to the choice of list. For the WTO list, the TBT measures are concentrated in Thailand while with the CLEG+ list the measures are more heavily concentrated on the Philippines. Because of these distributional differences in NTMs across lists, section 4 regressions are carried out with two lists: WTO and CLEG+. Except for the observation that SPS measures are under-represented across EG lists, no clear differences emerge between EGs and non-EGs when taking a count approach to comparing the distribution of measures.

Figure 10.4: Share of TBT (B) Measures in CLEG+ and WTO Lists
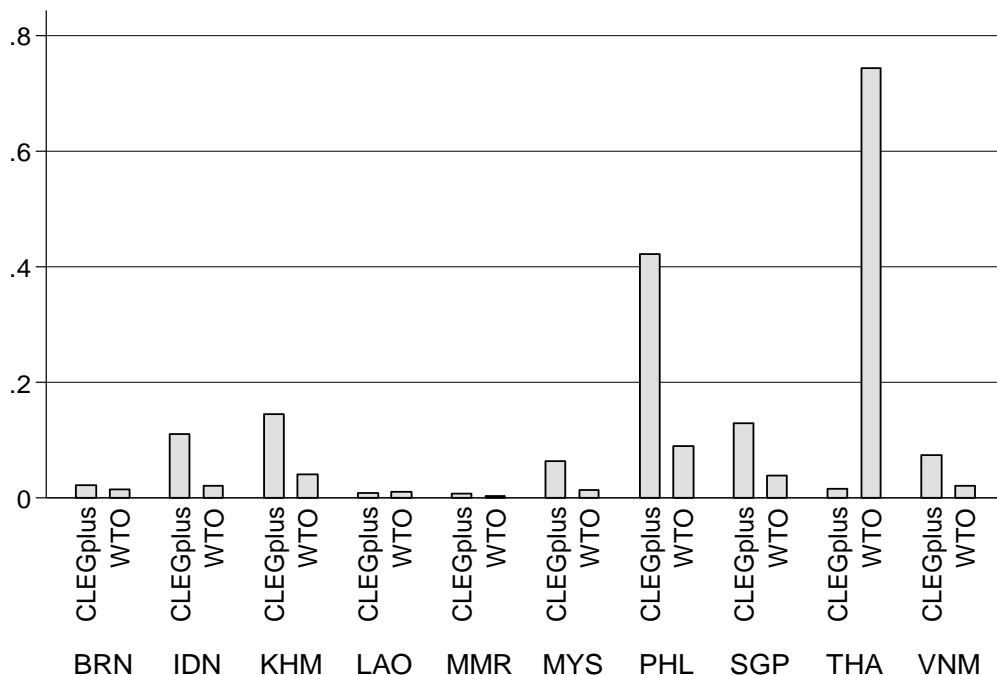
TBT = technical barriers to trade; CLEGplus = Extended Core Combined List of Environmental Goods; WTO = World Trade Organization.
Source: Authors' calculations, based on ERIA–UNCTAD NTM database http://asean-itip.org

Figure 10.5 compares the frequency (F), Coverage (C), and Pervasiveness (P) indices for NTMs presented in equations (10.1)–(10.3) for all the categories in the MAST classification except for export measures (P). As in Figure 10.3, index values for EGs (non-EGs) are reported on the vertical (horizontal) axis. Several patterns stand out. First, there is no EG specificity. With few exceptions, all values are bunched around the 45° line suggesting no specificity for EGs. Second, averages over the ASEAN and EGA negotiations groups are close, especially for the Frequency and coverage indices. As expected, the averages by income group show the highest frequency and coverage values for the HIC group though, somewhat surprisingly, the UMIC average is lower than the LMIC. Because of the relatively small sample size, one cannot exclude that these simple average values are dominated by outliers.

Figure 10.5: The Landscape of NTMs: Indices EGs. vs. non-EGs
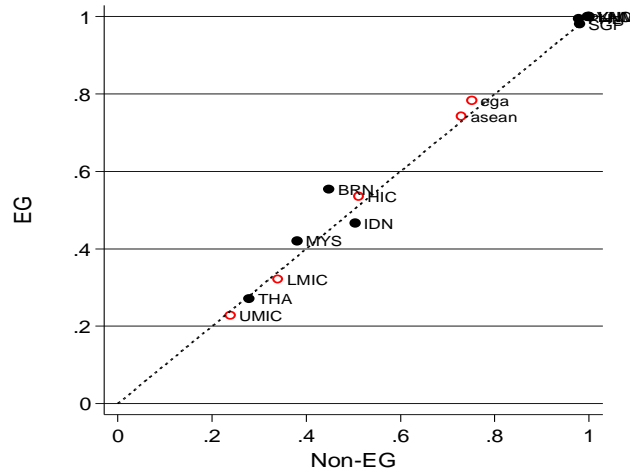### Figure 10.5a: Frequency indices
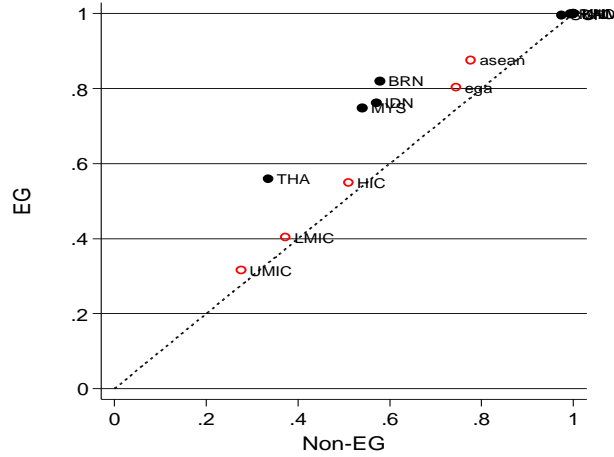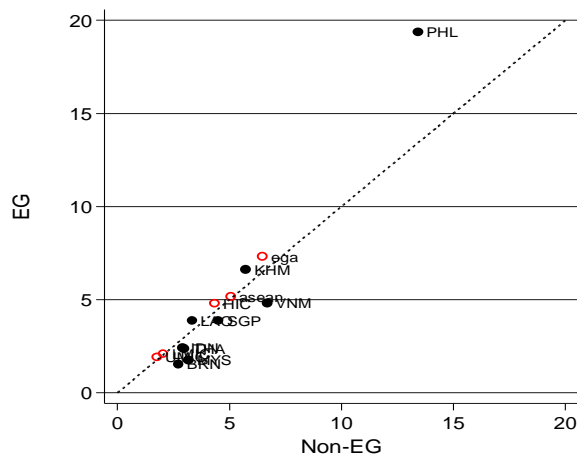

Figure 10.5b: Coverage indices

### Figure 10.5c: Pervasiveness indices

NTM = non-tariff measure; EG = Environmental Goods.
Notes: Average values for indices for all HS-6 products calculated over all MAST classification Chapters: WTO list.
Source: Authors' calculations, based on ERIA–UNCTAD NTM database http://asean-itip.org

Looking at patterns across ASEAN members, coverage ratios for EGs are higher than for non-EGs for Malaysia and Brunei Darussalam, perhaps an indication that NTMs are directed towards preserving the environment. The Philippines is clearly an outlier on the Pervasiveness scale and the 100 percent coverage ratios for six countries noted earlier is confirmed in the bunching of P and C values at unity.[20] Overall no clear country pattern of the intensity of regulation emerges from this first look at the data.

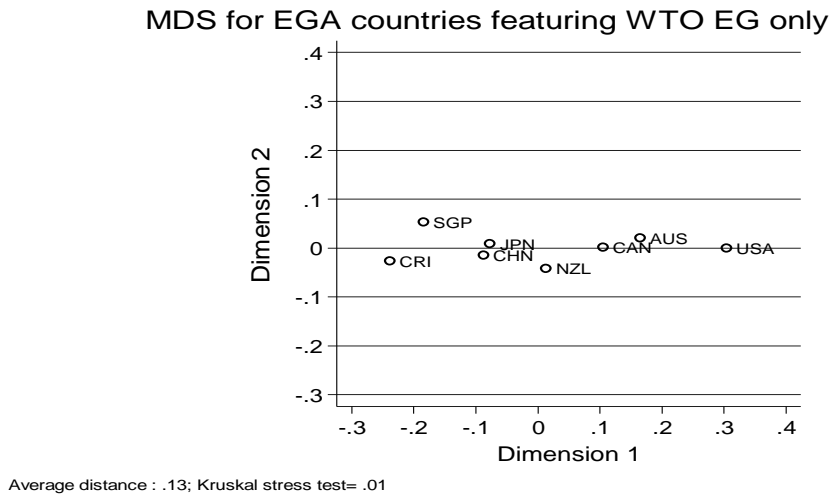**Figure 10.6a: Regulatory Distance in EGs for NTM on EGs ASEAN Group**
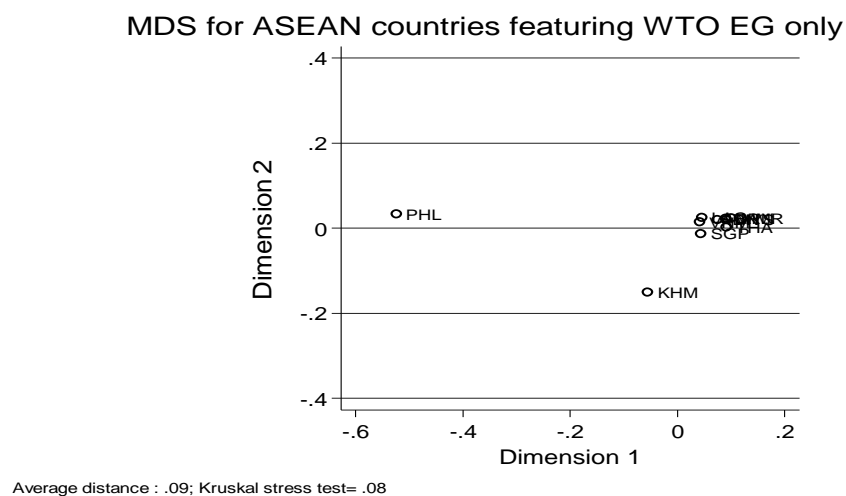
EG(s) = Environmental Good(s); NTM = non-tariff measures; ASEAN = Association of Southeast Asian Nations; MDS = Multidimensional Scaling; WTO = World trade Organization.
Source: Authors' calculations, based on ERIA–UNCTAD NTM database http://asean-itip.org

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[20] The Philippines uses the 8-digit ASEAN Harmonized Tariff Nomenclature with 9,820 tariff lines, all affected by NTMs. De Dios (2016, Table 9.1) reports that 37 agencies issue NTMs.

Figure 10.6b: Regulatory Distance in EGs for NTMs on EGs EGA group

MDS for EGA countries featuring WTO EG only

Average distance : .13; Kruskal stress test= .01

EG(s) = Environmental Good(s); NTM = non-tariff measure; ASEAN = Association of Southeast Asian Nations; MDS = Multidimensional Scaling; WTO = World Trade Organization.
Notes: Distance calculated for goods on the WTO list.
Source: Authors' calculations, based on ERIA–UNCTAD NTM database http://asean-itip.org

Trade and regulatory policies can be complementary, but achieving this complementarity can be difficult as policy choices are torn between the desire to reap economies of scale (wished by multinationals) and the endless appetite for greater product diversity (wished by consumers), which is possible thanks to the widespread technical progress of recent years. This tension is reflected in a trade-off between a push for regulatory harmonisation and a move towards mutual equivalence (or towards the weaker form of mutual recognition). Figures 10.6 and 10.7 plot rough measures of regulatory similarity for EGs across ASEAN and between individual ASEAN members and the United States (US) and the European Union (EU), two key partners for ASEAN members. These measures can be informative of the likely costs of harmonisation and diversity in consumer preferences.

Figure 10.6 uses multidimensional scaling (MDS) to reduce the dimensionality of regulatory distance in equation (10.4) across trading partners to a two-dimension plane[21] to estimate the regulatory distance of NTMs for EGs on the WTO list. Figure 10.6a reports those for ASEAN and Figure 10.6b those for the EGA. As discussed in Cadot et al. (2015) and Knebel and Peters (2017), a greater distance between two points suggests a more disparate regulatory landscape across countries for the selected products. In Figure 10.6a, the cluster shows that, with the exception of Cambodia and the Philippines, which lay far from the centre of mass of countries, ASEAN forms a relatively homogeneous group. In the spirit of Cadot et al., this plot can be used to flag 'problem areas' for further scrutiny.

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[21] With N countries bilateral comparisons would require an (N-1) plane. The formula for the two-dimensional plane and the formula for the Krusall index are given in the appendix of Cadot et al. (2015).

Then the figure suggests that the Philippines and Cambodia are likely to have a different regulatory structure as its pervasiveness index, markedly higher in the case of EGs on the WTO list, suggests a wider use of NTM than the rest of ASEAN on those products (or perhaps this indicates data quality issues in the reporting of NTMs).[22]

Figure 10.6b displays the same information for countries engaged in the EGA negotiations. We see that there is less regulatory convergence between EGA members than between ASEAN members as the average regulatory distance for EGs amongst ASEAN is 0.09 while it is 0.13 amongst EGA members.[23] On the assumption that the quality of data is approximately the same for EGA and ASEAN, ASEAN members may have less difficulty to engage reforms of environmental measures at the regional level.

Figure 10.7: Regulatory Convergence relative to European Union (EU) and United States (US)

Figure 10.7a: WTO List

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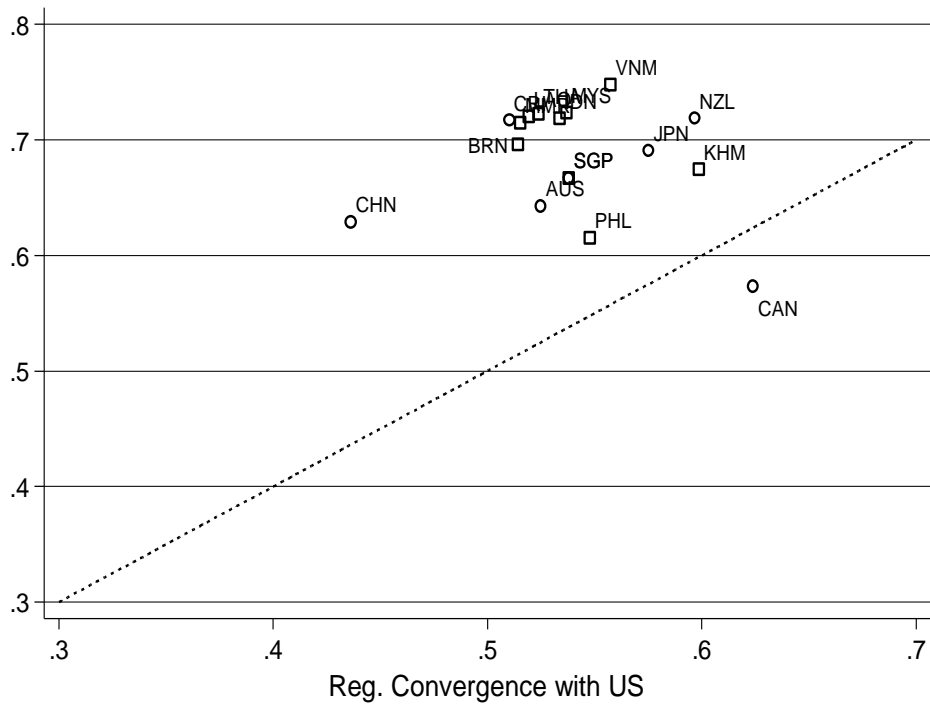
[22] Sotharith et al. (2016: 63) mention that official websites are only in Khmer language and are often outdated. De Dios (2016: Table 9.1) notes a long list of shortcomings in the inventory of the Philippines's NTMs (incomplete, validity), making it difficult to use these indices for comparisons across countries.
[23] The same pattern holds with the core and core CLEG+ list.

Figure 10.7b: CLEG+ List
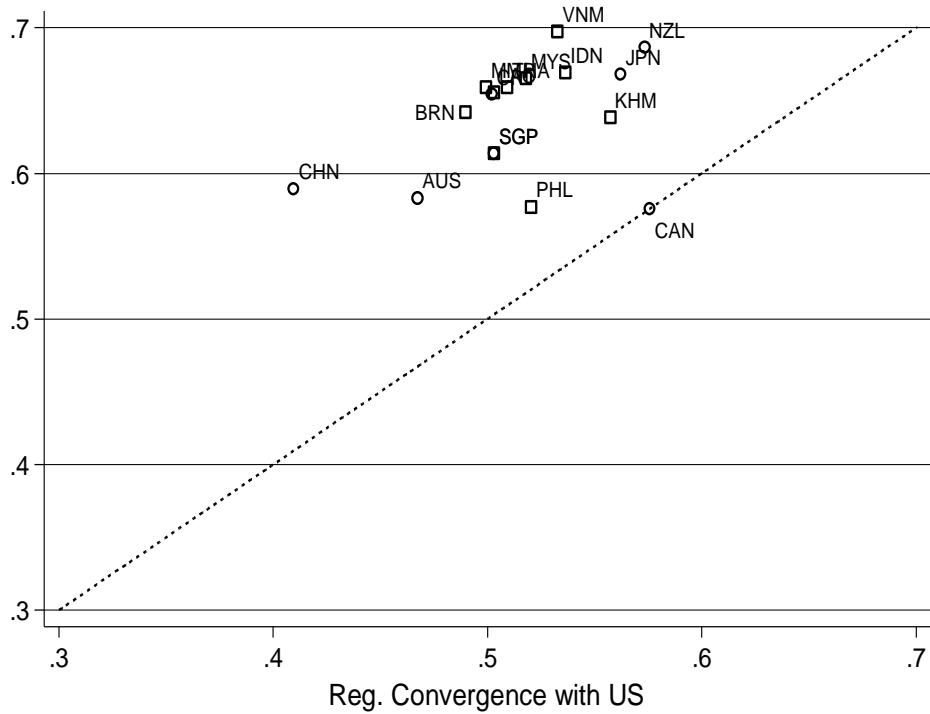
WTO : World Trade Organisation's list (411 products). CLEG+ : Extended Core Combined List of Environmental Goods (40 products)
Note: □ : Environmental Goods Agreement (EGA) participants; o : Association of Southeast Asian Nations (ASEAN) members.
A higher value indicates a closer regulatory environment.
Source: Authors' calculations, based on ERIA–UNCTAD NTM database http://asean-itip.org

Figure 10.7 displays regulatory convergence relative to the EU and the US for the WTO and CLEG+ lists of environmental goods. Except for Canada, all countries are closer to the EU than to the US. This pattern appears for both EGA and ASEAN and for both EG lists under scrutiny. This may indicate that the EU uses a wider range of NTM than the US, which may reflect the political economy of the choice of regulations in both environments. In the US, compromises are only made at the national level while in the EU compromises must be reached across all states. This may result in a larger number of regulations in the EU.

3.3 Indicators of Barriers to Trade in Environmental Services

Indicators of the restrictiveness of environmental regulations and of barriers to trade in ESs are highly desirable because of the complementarity of trade in EGs and ESs (who would purchase sewage or air-cleaning services absent an environmental regulation?).[24]

But the necessary information to cover the broad range of EGs is often not available and, when proxies are available, hard to interpret. First, most services are of a 'change effecting' nature as they change the conditions of the consuming units (e.g. remediation and clean-up of soil and water) and the policy barriers (mostly regulations) are opaque, behind the border as most services do not pass through customs for registration. Third, trade data are only available for few categories of services (up to 12 categories) and few countries (mostly OECD) to infer trade costs in services from observed trade patterns.[25]

These indicators of trade costs do not capture the level of detail in the Environmental Services listed in Figure 10.1b nor do they distinguish between Services intensive for trade in EGs from those intensive for trade in non-EGs. For EGs, the complementarities are mostly mode 3 commercial presence (establishing a subsidiary to provide environmental consulting and services locally) and mode 4 temporary presence of natural persons (experts in a particular environmental domain travel abroad for training or repair).[26]

Restrictions on the ability of firms to invest and operate in country as a foreign entity hinges on a wide range of restrictions (e.g. foreign equity limits, restrictions on legal form, complex visa procedures for work permits) that do not directly target ESs but that may be very costly for trade in EGs because of the complementarities between ESs and EGs.[27] Sauvage and Timiliotis (2017, pp.10–11) provide several examples of restrictions including some in ASEAN members. For the Philippines, the constitution limits foreign participation to 40 percent and Singapore reaffirmed its right during the TPP negotiations to adopt or maintain any measure affecting waste water management.

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[24] Sauvage (2014) shows a strong positive relation between a country's share of world export share of EGs in the power sector and air pollution control with a composite indicator of the overall restrictiveness of environmental policies and negative impact of tariffs on imports of EGs (controlling for regulatory stringency). These results are confirmed in case studies of municipal solid waste management and waste water treatment. Drawing on a list of 248 EGs of the OECD (the 'CLEG' list), Sauvage and Timiiliotis (2017) further assess a positive correlation of Revealed Comparative Advantage indices (RCAs) for this EG list with the OECD Services Trade Restrictiveness Index (STRI) for environmental policies available for 56 countries.

[25] Miroudot et al. (2013) and Anderson et al. (2015) calibrate a gravity model to trade in these broad categories of services. Both estimate that barriers to trade in services are a multiple of those derived for trade in goods using the same approach and that they have fallen unevenly over the last 15 years.

[26] The gravity estimates of trade costs mentioned above rely on balance of payments data that cover mode 1 (cross-border) and mode 2 (consumption abroad) services. The OECD STRI composite index capturing restriction to trade in Services is comprehensive, covering 22 services sectors for 44 countries but does not apply to core ESs (see Sauvage and Timiliotis, 2017, technical appendix).

[27] Local-content requirements have been increasingly used as a pre-condition for accessing financial support in feed-in tariff programmes in at least 21 countries since 2009, leading to several WTO disputes (see Prag, 2017, Box 10.3)

Figure 10.8: GATS Score Commitments for Environmental Services and other (Environmental-related) Services

Wide Definition of Environmental Services*

Score (min=20; max=100)

■ Environmental services   ■ Other services
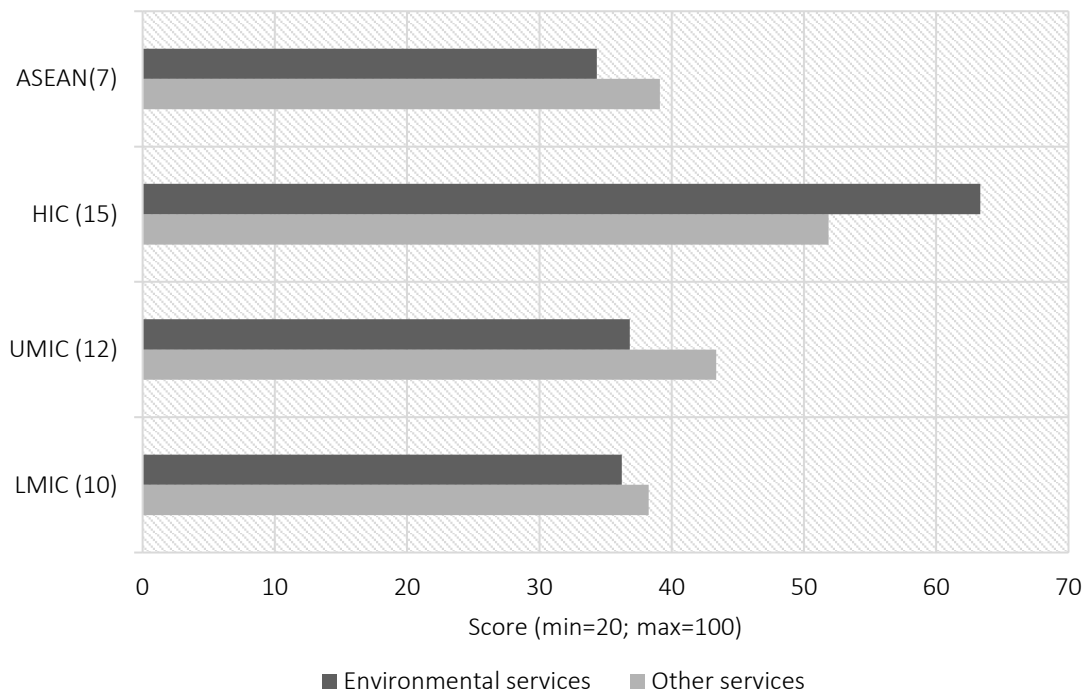
Notes: Number of countries in parenthesis. Scores based on the qualitative Environmental Services Liberalization (ESL) index in Melo and Vijil (2014, Annex 2). A higher score means greater market access, closer to national Treatment. The ESL index is inspired from Miroudot et al. (2010). See Melo and Vijil (2014, Annexes 1 and 2) for the derivation and choice of weights.
* The wide definition includes both those sectors identified on the left-hand and right-hand sides of Figure 10.1a. Similar patterns emerge with the narrow definition of ESs.
ASEAN sample includes Brunei Darussalam, Indonesia, Malaysia, Singapore, Thailand, Viet Nam and the Philippines
Source: Authors' calculations, based on Melo and Vijil (2016, Figure 1).

In the case of Indonesia, Presidential Regulation No. 39 places a 55 percent limit on the share of equity that can be detained in companies providing certain services in consulting and engineering with managers being locally licensed professionals. In Viet Nam, sewage services are often provided by public monopolies or are delegated to private operators with exclusive rights.

Some of these restrictions can be captured by an ordinal index coding these regulations that were reflected in commitments for market access and for national treatment that countries made at the GATS. The result is the Environmental Service Liberalization (ESL) index reported in Figure 10.8. ESL values compare the average commitment scores on ESs with those on non-ESs categories.[28]

Like bound tariffs, the values of these indexes are an inaccurate indicator of applied Services policies as countries often go beyond commitments at the GATS when formulating their regulation in Services activities. Three patterns stand out. First, scores are very close for both categories of ESs, an indication that commitments varied little across a broad range of Services (to save space, only the wide definition scores are reported). Second, as in the case of goods, GATS commitments have been the greatest for the HICs, the only group that made relatively greater commitments for ESs than for other Services. Finally, as a group, ASEAN has a very similar score with those for the LMIC and UMIC groups.

This review comparing trade measures for EGs and non-EGs reveal few clear patterns beyond the generally lower average applied tariffs for EGs than non-EGs for reasons noted above. ASEAN countries, like the corresponding averages for their respective income categories, display similar patterns for EGs and non-EGs. Similar remarks apply to comparisons indicators of barriers to trade in services.

4. Probing Environmental Goods Specificities in Trade Patterns

Increasing trade in EGs was – and continues to be – the objective of the negotiations described in the introduction. The political process and the technical difficulties in defining EGs cast doubts on the informational content of the lists. On the other hand, the comparisons of trade measures, NTMs and tariffs on the lists revealed few robust differences between EGs and non-EGs and across countries. The question then, is whether one can hope to detect any effect of these trade instruments on trade patterns. Estimates below address this issue.

4.1 Models and sample

We use a gravity model to check whether the impact of NTM is different for environmental goods. We estimate the following models:

$$\ln(imports_{odtp}) = NTM_{odtp} + \gamma_{otp} + \gamma_{dtp} + \gamma_{odp} + \mu_{odtp} \tag{10.5}$$
$$\ln(imports_{odtp}) = NTM_{odtp} + NTM_{odtp} * list_p + \gamma_{otp} + \gamma_{dtp} + \gamma_{odp} + \mu_{odtp} \tag{10.6}$$

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[28] The ESL is constructed from an observation rule applied to the commitments made under the GATS by Services sectors, sub-sectors and mode of supply. Commitments are either 'full' (no limitation), 'partial' (some limitations), or 'unbound' (no commitment) with partial commitments further differentiated and classified into various limitations related to market access and national treatment. Melo and Vijil (2014: Appendices 1 and 2) describe the typology and weights used in the ESL index, which is based on Miroudot et al. (2010).

$$\ln(imports_{odtp}) = NTM_{odtp} + NTM_{odtp} * ASEAN_d + \gamma_{otp} + \gamma_{dtp} + \gamma_{odp} + \quad (10.7)$$
$$\mu_{odtp}$$

where o indexes origin country, d destination country, t year, and p products at the 6-digit HS level. All three specifications have three sets of fixed effects: γ_{otp}, controls for omitted variables that influence product p in origin country, o, in time t like export taxes; γ_{dtp}, controls for omitted variables that influence product p in destination country, d, in time t like most-favoured nation; and γ_{odp} controls for time-invariant omitted variables that affect bilateral trade (distance, common language, bilateral tariffs, etc.). This set of dummy variables is necessary to obtain theory-consistent estimates.[29] Three dummy variables allow us to isolate any NTM or ASEAN specificity in the trade flows, having controlled on time-invariant bilateral product-specific omitted variables time-varying omitted variables in origin and destination countries. NTM_{odtp} a dummy indicating the presence of an NTM on the import of product p from origin country, o to destination country, d. Variable $list_p$ is a dummy indicating that product p is on one of two EG lists: The WTO list of 411 products and core CLEG+ list of 40 products for which the OECD has verified that at least 1/3 of trade is for environmental purposes. $ASEAN_d$ indicates that the destination country is a member of ASEAN. μ_{odtp} is an error term. The terms $NTM_{odtp} * list_p$, $NTM_{odtp} * ASEAN_d$ and represent interactions between the dummies presented above.

To be able to fully interpret the coefficients on these interactions, we would need to introduce in equations (10.5)–(10.7) the relevant dummies $list_p$ and $ASEAN_d$ without interaction. However, this is not possible because those dummies are collinear with the fixed effects required by the gravity specification. Our model is nevertheless sufficient for our purpose which is to highlight a possible significant difference between the impact of NTMs on EGs and on ASEAN countries from the corresponding impacts on non-EGs and non-ASEAN countries.

Estimation is over the entire NTM database. Two sets of estimates were carried out: yearly over the period 2010–2014 and every three years over the period 2004–2014 (3- or 5-year intervals are recommended for panel estimates of gravity models (Baier and Bergstand, 2007). Even though the NTM database which only refers to public sector NTMs gives the date of entry of new estimates, there is little information on the removal of existing NTMs so it is not possible to go beyond exploring a snapshot of NTMs at a specific date. In any case, both samples returned quasi-identical set of estimates so we only report results from the 2010–2014 sample in Table 10.2.

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[29] See Baldwin and Taglioni (2006) or Head and Mayer (2015).

4.2 Results

Table 10.2 reports the results from estimating equations (10.5-10.7). Column (1) introduces only the NTM dummy (results from estimating equation 10.5). Columns (2) and (3) add the interaction between NTMs and goods on the WTO list and core CLEG+ lists (results correspond to equation 10.6). Column (4) introduces the interaction between NTM and ASEAN countries (results correspond to equation 10.7). Two results stand out: on average, NTMs restrict bilateral trade but not differently for EGs than for non-EGs or for ASEAN countries as a group. The coefficient on the NTM dummy is statistically significant across all 4 regressions in Table 10.2 and is estimated to decrease bilateral imports by about 21 percent ($=e^{0.24}$ -1) on average when at least one NTM is imposed on the relation. However, this is an 'average treatment effect' so it aggregates trade-enhancing NTMs (e.g subsidies or information revealing labels that do not raise costs much) along with trade-deflecting NTMs (e.g. geographic prohibition or cost-raising conformity assessments).

Table 10.2: Bilateral Trade OLS Estimates

VARIABLES	(1) log(Imports)	(2) log(Imports)	(3) log(Imports)	(4) log(Imports)
NTM	-0.238***	-0.240***	-0.240***	-0.208***
	(0.0459)	(0.0473)	(0.0462)	(0.0596)
NTM & WTO		0.0265		
		(0.192)		
NTM & CLEG+			0.152	
			(0.409)	
NTM & ASEAN				-0.131
				(0.137)
Observations	19,681,751	19,681,751	19,681,751	19,202,942
R-squared	0.894	0.894	0.894	0.895
Importer-time-product FE :	yes	yes	yes	yes
Exporter-time-product FE :	yes	yes	yes	yes
Importer-exporter-product FE :	yes	yes	yes	yes

OLS = ordinary least squares; NTM = non-tariff measure; WTO = World Trade Organization; CLEG+ = Extended Core Combined List of Environmental Goods (40 products); ASEAN = Association of Southeast Asian Nations; FE = Fixed effect.
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' calculations, based on ERIA–UNCTAD NTM database http://asean-itip.org

Column (2) reports results with the WTO list dummy to see if the NTMs on the WTO list have a different impact on the volume of trade. The coefficient on NTM & WTO interaction is not significant, so we can reject the hypothesis that NTM produce different effects on average when applied to environmental goods on the WTO list. Column (3) reports the results with the much smaller CLEG+ OECD list. Column (3) also shows that the impact of NTMs on the 40 products of the CLEG+ is not statistically different. Column (4) introduces the results of ASEAN & NTM interaction which, again turns to be statistically insignificant. The magnitude of the coefficient on NTMs is slightly reduced from -0.238 to -0.208 but the sample is also slightly different as about 400,000 singleton observations were dropped from the sample. Finally,

robustness checks were carried out. Restricting the sample to MAST Chapter B (TBT) measures only, the most prevalent NTM category on EG lists yields similar results albeit with a stronger negative effect (see Table 10.A2).

5. Concluding Remarks

Taking better care of our environment was an important mandate at the launch of the Doha Round in 2001 and since 2015 is now the centrepiece in the SDGs menu. Yet, in spite of very modest ambitions – reducing the already low tariffs on Environmental Goods (EGs) – little progress has been achieved. Developing countries did not participate in the Doha Round submissions of EGs lists so that the retained lists did not represent their interests. Negotiations on reducing barriers to trade in complementary ESs have been off the agenda even though, as aptly put by Sauvage and Timiliotis (2017), environmental services are to environmental equipment what software is to hardware for computer users. So far, there is no indication that countries are adopting regulations that make the preservation of the environment cheaper. An example is the widespread use of local content requirements in Renewable Energy markets.

Recognising that the EG lists do not represent the diversity of interests amongst ASEAN members, this paper's preliminary incursion on how ASEAN countries have unilaterally addressed this agenda suggests the following observations. On average, as a group, ASEAN members apply a tariff of 5 percent on EGs, which is lower than the 7 percent average for non-EGs. With the exception of Cambodia, Lao PDR, and the Philippines, ASEAN countries apply a lower average tariff on the EG list than on the non-EG list. Similar comparisons for indices of NTM prevalence illustrate the strong bias in all EG lists where SPS measures are virtually nil, a reflection that the political process leading to the various EG lists only included EGs in which high-income countries have a comparative advantage. Environmentally Preferable Products (EPPs) including mostly agricultural goods in which many ASEAN members have a comparative advantage do not figure in any of the EG lists discussed at the multilateral (and plurilateral) negotiations at the WTO. For the EG lists, frequency, coverage and pervasiveness indices are quite similar at the country level amongst members with no clear distinct pattern emerging relative to corresponding values in comparator groups. Interestingly, measures of the regulatory distance amongst ASEAN members are less than amongst the group of the 17 countries engaged in plurilateral EGA negotiations to reach zero-tariff trade in EGs.

Although there is little to exchange on the EGA negotiation table, there is hope that the results could be multilateralised at the WTO if 'critical mass' is reached (goods on the negotiation list should cover around 90 percent of world trade). Similar negotiations to eliminate tariffs on EGs for a more representative list of EGs of ASEAN membership could be envisaged though reaching critical mass would be unlikely whatever the selected EG list. ASEAN members may then prefer to negotiate outside the WTO. While dealing with tariff reductions would bring limited gain in terms of protection of the environment if Environmental Services are not also included, it might serve as a catalyst for initiatives further on. First, the effective number of participants would be only nine countries (Singapore has no tariffs), which would make it easier to agree on a list of EGs that would accommodate all negotiating parties. Second, the bottom-up 'ASEAN way' at regional cooperation has been active in environmental issues, with ministerial meetings on the environment held every 3 years. The organisational framework for managing environmental matters has been relatively successful for some regional public goods like biodiversity conservation, though not on transboundary pollution from burning biomass (Koh and Robinson, 2004) and sustainable logging (Angelsen, 2015).

A Mutual Recognition Agreement on Conformity Assessment for NTMs has been proposed as a deliverable for the EGA negotiations (Sugathan, 2016). Prospects are more favourable for ASEAN where regulatory distance appears to be less than for the EGA alongside a history of successful cooperation amongst members. Mutual equivalence, a weaker form of mutual recognition, where countries negotiate on whether their norms and regulations are 'different, but equivalent' helps build trust by giving greater leeway for countries (an existing equivalence agreement can be revoked by a country if it finds its partner's new regulation is not equivalent). The approach would be suitable for tackling the still widely different NTM measures across ASEAN members. As argued by Messerlin (2017), this approach does not generate the costs that harmonisation imposes. A national regulatory supervisory body à la Ing et al. (2016) could be proposed for this task, the objective of which would be to strike a balance between the desire for diversity associated with economies of scope and the desire for harmonisation associated with economies of scale.

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Appendix

Figure 10.A1 Applied Tariffs: EGs vs. non-EGs (trade weighted averages)

WTO list (411 products)
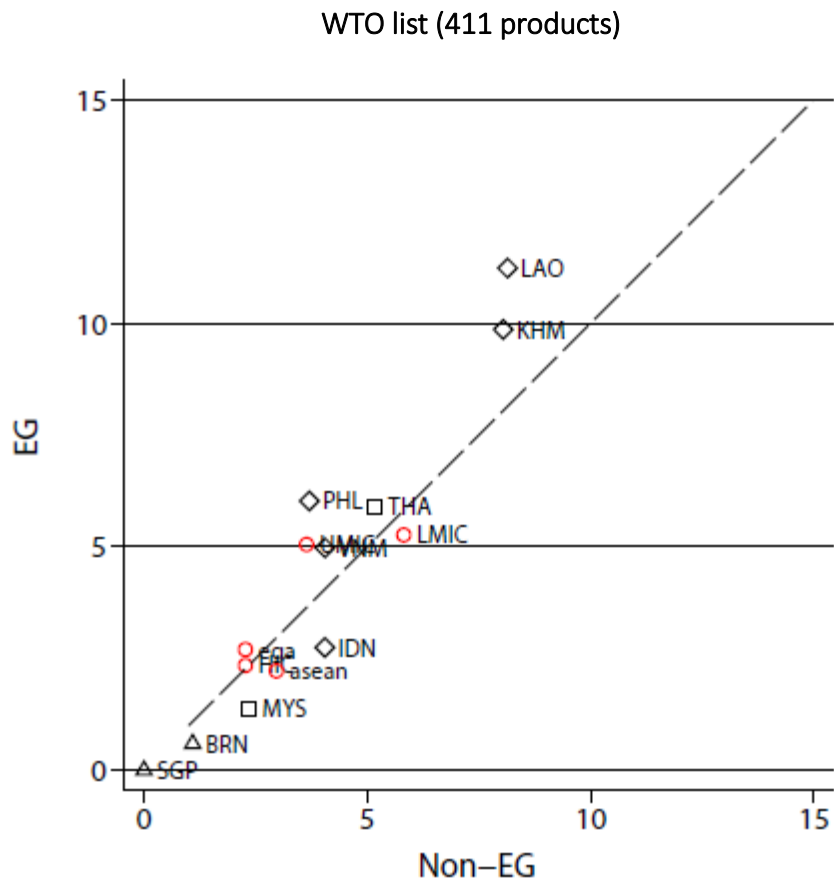
Notes: EGs= Environmental Goods; Averages for groups are simple averages: LICs: Low-income group GNI p.c. (in 2015 $ atlas method < $1,025: LMIC (lower-middle income): 1,026 < GNI p.c. < 4,035; UMIC: 4,036 < GNI p.c. < 12,475; HIC GNI p.c. > 12,475: EGA: Diamond (◊) LMIC (□) for UMIC and (Δ) for HIC Source: Author's calculations, based on COMTRADE and WTO data.

Table 10.A1 : Average Tariff: EGs versus non-EGs

	Trade Weighted Rate	Simple Average
ASEAN		
CLEG+		
Not in list :	1,83	2,83
In list:	2,72	3,23
WTO		
Not in list :	3,20	3,45
In list:	2,23	3,72
EGA		
CLEG+		
Not in list :	3,52	4,18
In list:	1,23	1,40
WTO		
Not in list :	4,56	5,01
In list:	2,70	1,87
High Income Countries (HIC)		
CLEG+		
Not in list :	3,11	4,25
In list:	1,30	2,00
WTO		
Not in list :	5,16	5,19
In list:	2,35	2,44
Low Income Countries (LIC)		
CLEG+		
Not in list :	1,90	2,96
In list:	8,12	7,05
WTO		
Not in list :	3,13	3,58
In list:	7,19	8,48
Middle Income Countries (MIC)		
CLEG+		
Not in list :	1,34	2,48
In list:	3,05	3,95
WTO		
Not in list :	2,38	3,02
In list:	5,12	4,81

EGs= Environmental Goods; ASEAN = Association of Southeast Asian Nations; CLEG+ = Extended Core Combined List of Environmental Goods; WTO = World Trade Organization's list; EGA =Environmental Goods Agreement.
Source: Authors' calculations, based on COMTRADE and ERIA–UNCTAD NTM databases.

Table 10.A2: Bilateral Trade OLS Estimates

VARIABLES	(1) log(Imports)	(2) log(Imports)	(3) log(Imports)	(4) log(Imports)
TBT	-0.667***	-0.634**	-0.646***	-0.838*
	(0.242)	(0.252)	(0.245)	(0.487)
TBT & WTO		-0.650		
		(0.729)		
TBT & CLEG+			-1.498	
			(0.922)	
TBT & ASEAN				0.186
				(0.552)
Observations	19,681,751	19,681,751	19,681,751	19,202,942
R-squared	0.894	0.894	0.894	0.895
Importer-time-product FE :	yes	yes	yes	yes
Exporter-time-product FE :	yes	yes	yes	yes
Importer-exporter-product FE :	yes	yes	yes	yes

OLS = ordinary least squares; TBT =technical barriers to trade; WTO =World Trade Organization's list; CLEG+ = Extended Core Combined List of Environmental Goods ; ASEAN = Association of Southeast Asian Nations; FE =Fixed effects.
Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1.
Source: Authors' calculations, based on COMTRADE and ERIA–UNCTAD NTM databases.