

Environmental Goods: Where Do the Dynamic Trade Opportunities for Developing Countries Lie?

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Summary:

In order to provide an appreciation of the implications of trade liberalisation for environmental goods, this study reviews current and projected patterns of world trade in these goods. The following main results are found:

- Data indicate that developing countries have significant export strength and potential, not only in environmentally preferable products, but in many manufactured and chemical goods used in the provision of environmental services as well. Although they possess positive trade balances only in the former class of goods, their exports of the latter class are growing rapidly. Appropriately designed, trade liberalisation could allow some developing countries to significantly expand their production and export of such **dynamic environmental goods** and thus promote increased industrial diversification of their economies. For many others, trade liberalisation of environmentally preferable industrial and consumer goods may provide immediate gains needed to support rural economies and facilitate the integration of their small and medium sized enterprises into global supply chains.
- To provide gains for all countries – each with a unique production and export profile – the scope and spectrum of environmental goods targeted for liberalisation must be wide and selective. It must be wide in order to include goods of export interest to a varied set of developing countries. And it must also be selective in order to permit developing countries to exclude from liberalisation those goods for which they have strong production and export interests, and which continue to require some tariff protection, while liberalising others in which they have clear import interests. At the global level, **selective liberalisation** may be more economically efficient than a common list approach because of its ability to exploit countries' diverse production and export specialisations.
- There is considerable **export complementarity** between developing country regions for environmental goods. Their export profiles are sufficiently dissimilar so that export competition under liberalisation may be less intense than naively anticipated. This suggests that liberalised trade in environmental goods can provide win-win results for all developing country regions, quite simply because one region's exports are another region's imports and vice-versa. Although liberalisation limited to South-South trade can provide immediate gains, many dynamic gains can only be realized through increased trade with developed countries through global liberalisation.

The balance of data of this study suggests that trade liberalisation of environmental goods can provide significant gains to developing countries and that it should be pursued. To capture dynamic gains, it is advisable that developing countries confidently pursue WTO negotiations with the *provisos* that an eventual WTO list of environmental goods be broad and contain a sufficient variety of goods to ensure all developing countries can achieve immediate export gains, and that liberalisation be selective permitting each country to choose from the WTO list a limited 'best-fit' subset of goods for its tariff reduction commitments. Certainly, as an integral part of all WTO agreements, special and differential treatment provisions will also need to be carefully elaborated to ensure that any eventual agreement provides developing countries with flexibility in selecting goods for liberalisation, and sufficient safeguards to protect key national industries if liberalisation delivers adverse results.

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Defining environmental goods

There are two broad classes of environmental goods under discussion in WTO negotiations. Specifically, as presented in Figure 1, these two classes of environmental goods (EGs) are:

Class A EGs, which include manufactured goods and chemicals used directly in the provision of environmental services. Class A EGs include goods, and systems comprised thereof, used to provide an environmental service such as wastewater treatment, solid waste management, air pollution control, etc. These goods, which include a wide variety of basic industrial products such as valves, filters, pumps and compressors, can be specifically employed for environmental purposes.

Class B EGs, which include industrial and consumer goods not primarily used for environmental purposes but whose production, end-use and/or disposal have positive environmental characteristics relative to similar substitute goods. Class B EGs include items such as chlorine-free paper, energy-efficient office machines, clean production and energy technologies, natural fibre clothing, packaging or floor covering materials. Such goods, sometimes referred to as environmentally preferable products (EPPs), have inherent environmentally superior qualities compared to substitute goods (UNCTAD, 1995). However, Class B EGs are fundamentally different from Class A EGs because they are not necessarily used for environmental purposes. Rather, they are consumed by industry and consumers, producing a positive, or reduced negative environmental impact relative to identical use of a substitute good whenever, and for whatever purposes, they are consumed.

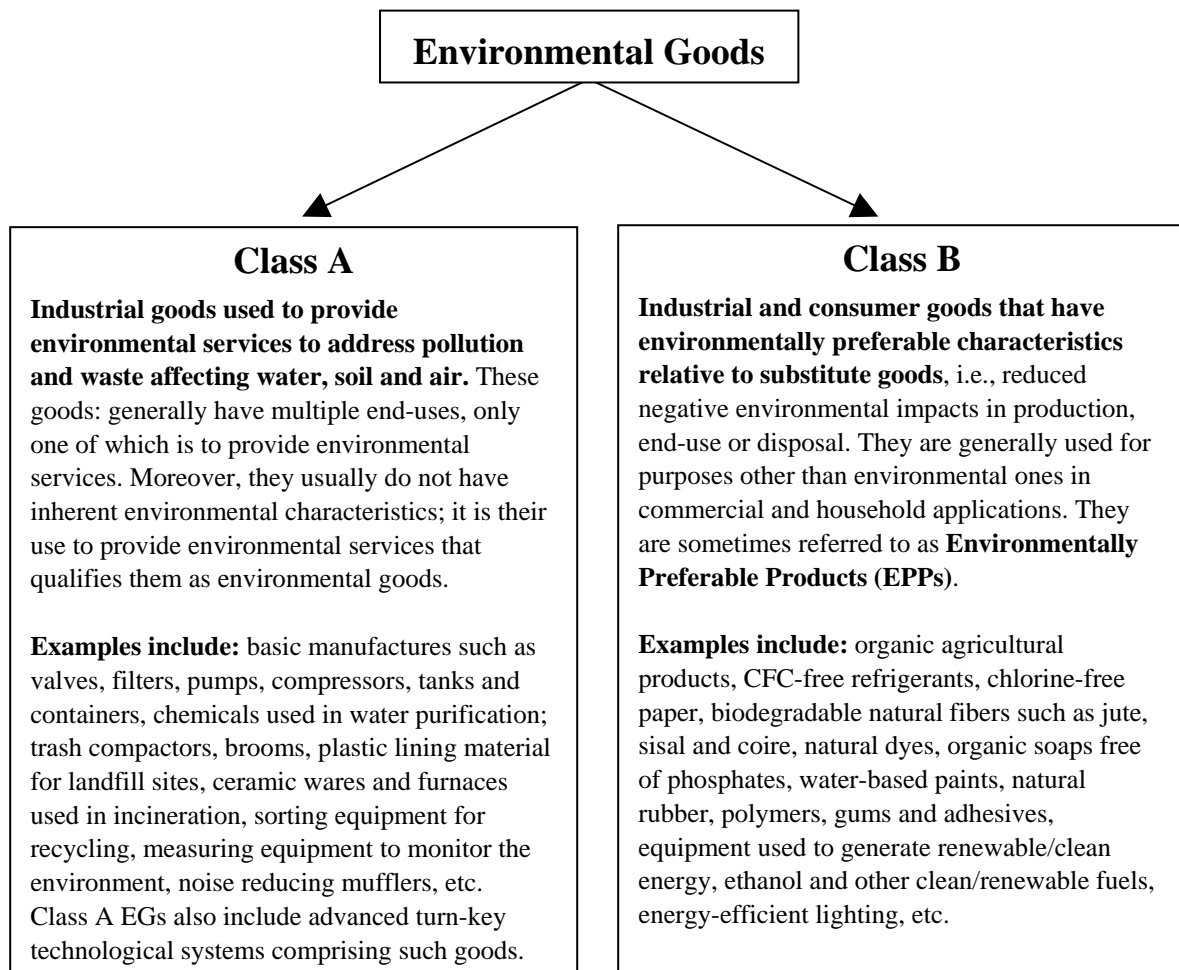


Figure 1: Criteria to identify broad classes of environmental goods and examples of goods meeting these criteria.

Environmental goods lists discussed and proposed in WTO negotiations

To date, products included in lists of environmental goods introduced in negotiations have mostly been limited to Class A environmental goods used to provide environmental services (pollution prevention, reduction, control, remediation and monitoring). In addition, some proposed goods represent Class B environmental goods including energy-efficient and renewable heat/power generation technologies; and a variety of energy-efficient consumer goods.

Many developed countries have proposed EG lists in negotiations which parallel the OECD and APEC lists (WTO, 2002). These lists comprise mostly capital equipment and their manufactured components, and chemicals, used for environmental services. The OECD classifies the environmental sector as the set of “firms producing goods and services capable of *measuring, preventing, limiting or correcting environmental damage such as pollution of water, air soil as well as waste and noise-related problems*” (OECD, 1996). The OECD list includes goods spanning 132 6-digit Harmonized Commodity Description and Coding System (HS) codes. Of these, 25 are minerals and chemicals used in water and waste treatment, and in renewable energy systems, and 97 are manufactures that serve as components of the systems and infrastructure used to provide environmental services. Also included in the OECD list are some Class B EGs in the form of environmentally sound technologies or *clean technologies* such as cleaner/resource efficient production and power generation systems. The APEC list of environmental goods spans 104 HS codes. In contrast to the OECD list, it excludes minerals and chemicals, while including a more extensive set of goods needed for environmental monitoring and assessment. The two lists have 54 goods in common at the HS 6-digit level.

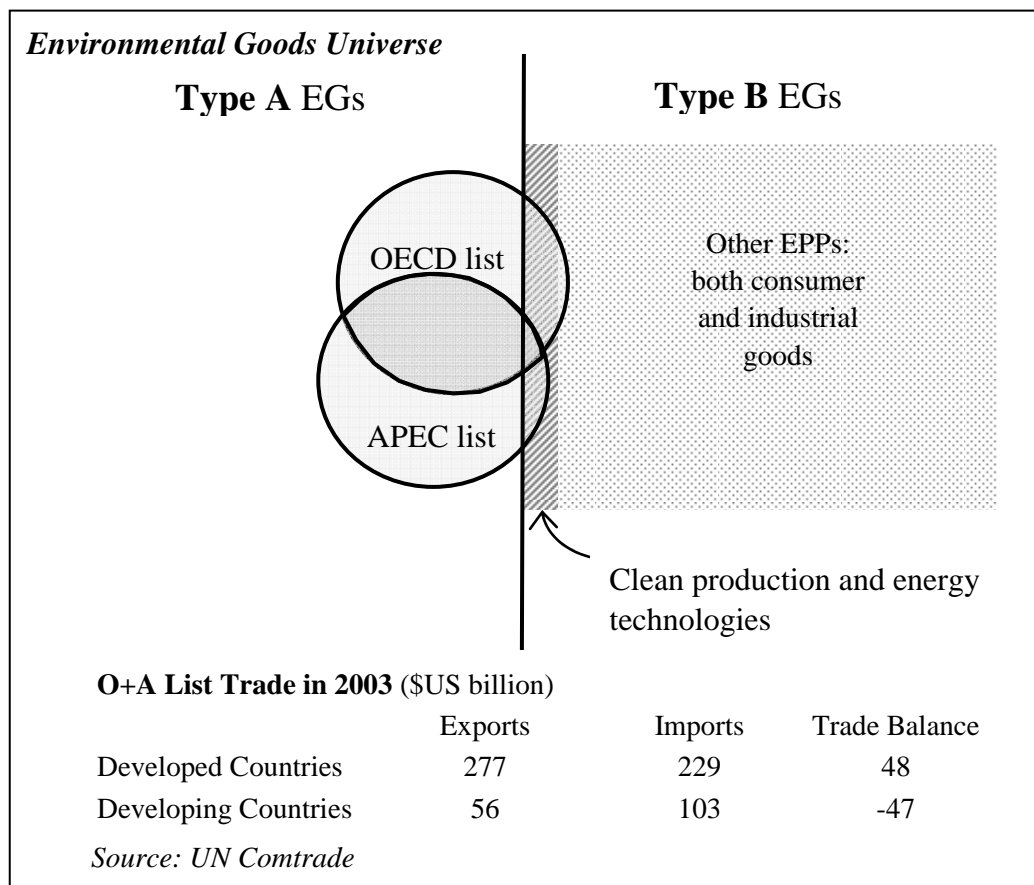


Figure 2: Mapping of the OECD and APEC lists of environmental goods. Class A EGs dominate both lists which define goods that share a common set of environmental functions. In 2003, developed countries were net exporters of the combined OECD and APEC lists of goods (O+A-list) and developing countries net importers.

As shown in Figure 2, the OECD and APEC lists of environmental goods comprise mostly Class A EGs, and are of considerable export interest to developed countries, the main producers of listed goods, while developing countries are net importers. The figure also shows that while the OECD and APEC lists do include some Class B EGs, these are predominantly clean/resource efficient production and energy technologies. They include only a few industrial/consumer EPPs such as fluorescent lamps, water based paints and recycled paper.

Recently, developing countries have begun the process of preparing their own lists of environmental goods. Many developing countries, and some developed countries, have identified Class B environmental goods or *Environmentally Preferable Products* (EPPs) as potential candidates for tariff reduction in WTO negotiations. In addition to energy-efficient and renewable energy technologies, such goods include many raw and processed natural resource based commodities consumed as food, health and cosmetic products, clothing, furniture, home products and building materials, all of which are of considerable export interest to developing countries. Because EPPs primarily comprise consumer goods and industrial inputs needed for their production, the rationale for their classification as environmental goods differ from those previously proposed based on their use in the provision of environmental services. They are, however, similar to energy-efficiency goods, which are themselves EPPs, and their use is associated with absolute or relative (i.e., compared to a substitute good) benefits for the atmosphere, climate, ecosystems and conservation of non-renewable fossil fuel resources.

UNCTAD has defined EPPs as the set of goods possessing inherent environmentally superior qualities compared substitute goods used in identical applications (UNCTAD, 1995). These qualities may be evident in at least one stage of the product lifecycle; i.e., during an EPP's production, end-use or disposal. As mentioned above, based on similar criteria, the OECD and APEC lists include several clean production and energy technology EPPs which generate reduced levels of pollution relative to conventional alternatives during the product's use. But in addition to these capital goods, UNCTAD has identified a wide-range of consumption goods whose end-use and disposal have reduced environmental impacts relative to the use and disposal of conventional alternatives. These latter goods, supplied to industrial and consumer markets, could be included in a negotiated WTO list of environmental goods further to proposal and adoption by members.

WTO rules do not currently permit members to differentiate among 'like products' based solely on differences in the way they are produced; i.e., according to their process and production methods (PPMs). Members may, therefore, decide to limit consideration of EPPs as environmental goods to those which exhibit superior environmental qualities during their end-use and disposal only. At the same time, however, members could negotiate an exception to like-products treatment for PPM-based EPPs, while clearly limiting product differentiation to production-based environmental qualities. Agreement would have to be attained on what products and associated production methods would qualify for special border treatment.

Superior environmental qualities of PPM-based EPPs cannot be discerned by the importing country based on a physical examination of such products at the border. Therefore, unless the provision of special treatment for PPM-based EPPs could be granted based on suppliers' declarations of conformity (SDOCs; which are successfully used under the WTO TBT Agreement to promote compliance with national and international standards), the application of preferential treatment may require costly and complex certification procedures. For many PPM-based EPPs, the administrative and financial costs of PPM certification borne by producers and exporters may exceed financial gains resulting from preferential tariff treatment except for products where applied tariffs in the importing country are very high. Certain organic agricultural goods may represent such an exception since current applied tariff levels for certain agricultural products remain extremely high in world markets.

It must be emphasized that although WTO members may not distinguish between like-products, consumers increasingly do, and this trend has already fueled a greatly increased market share for EPPs

in world markets wherein import demand is sufficiently high to permit importers and upstream exporters and producers to secure premium prices for PPM-based EPPs.

More generally, considering the effects of tariff reductions on all categories of EPPs, certain outcomes can be expected. Any reductions in tariffs applied to EPPs would lower product cost structures upstream from the consumer, and thereby, in competitive final markets ultimately reduce the cost of EPPs for end-use consumers. This would suggest that any reduction of tariffs on PPM-based EPPs would benefit consumers with lower prices which would in turn stimulate additional consumer demand through increased purchases by current consumers as well as through consumer-switching from less price-differentiated lower cost alternatives. This could result, *ceteris paribus*, in expanded exports from producing countries, and contribute to an erosion of lower-cost incentives for producers of non-EPP alternative products, ultimately prompting the latter to shift their production to EPP variants. Certainly, over time, such scenarios would suggest that the international trading system could stimulate a shift to more sustainable production and lowered consumption-related pollution by encouraging trade liberalisation in EPPs. At the same time, if the latter include products of export interest for developing countries, EG trade liberalisation could also provide the increase in market access needed for some developing countries – that have limited production and export of Class A EGs – to capture gains from an eventual WTO agreement to liberalise trade in environmental goods.

Environmental good trade patterns and levels of tariff protection

In this study, environmental goods trade patterns and levels of tariff protection were derived using nationally reported data on trade in goods that is readily available for most countries. For each of the two groups of environmental goods outlined above (i.e., Class A and Class B EGs), trade flows magnitudes were derived using national trade flow data reported to the United Nations using the 1996 6-digit HS system. Trade flow data were derived from the United Nations' Comtrade database (Comtrade, 2003). In addition, national tariff data were compiled from the TRAINS component of the World Bank/UNCTAD World Integrated Trade Solution (WITS) application (World Bank, 2001) in order to assess the magnitude and significance of protection influencing current trade patterns. Taken together, these data provide an indication of potential trade gains and losses for individual, and groups of, countries under EG trade liberalisation for Class A and Class B EGs.

In the analysis presented in the remainder of this paper, Class A EGs are simulated by the combined set of goods on the OECD and APEC lists: referred to here as the **O+A list** (with goods common to both lists included only once). Class B EGs are simulated by a set of EPPs defined by UNCTAD in a recent paper (UNCTAD, 2005) as a core set of EPPs; referred to here as the **EPP-Core** list. Moreover, all country classifications and groups are as classified by the UNCTAD Handbook of Statistics, 2004: U-DdC = Developed Countries, U-DgC = Developing Countries, U-DgAFR = Developing Africa, U-DgASO = Developing Asia and Oceania, U-DgLAC = Developing Latin America and the Caribbean, U-CET = Countries with Economies in Transition in Eastern Europe and Central Asia.

A general feature of trade in Class A EGs is that developed countries possess a significant trade surplus, and developing countries a large trade deficit, for these goods. For the Class B EGs developing countries as a group show a modest trade surplus. These features are evident in Figures 3 and 4.

But when trade liberalisation is being considered for environmental goods, it is equally significant to examine the coverage and extent of tariff protection affecting trade in these goods. In developed countries, tariff protection on both Class A and Class B EGs is remarkably low. For developed countries, as shown in Figure 5, trade-weighted average applied tariff rates range from nuisance levels of less than 1 percent ad-valorem for Class A EGs, to under 2 percent for Class B EGs. Average rates applied by developing countries are an order of magnitude higher than developed country values. As illustrated in Figure 6, average developing country rates are 9 percent for the Class A EGs, and climb to over 18 percent for Class B EGs.

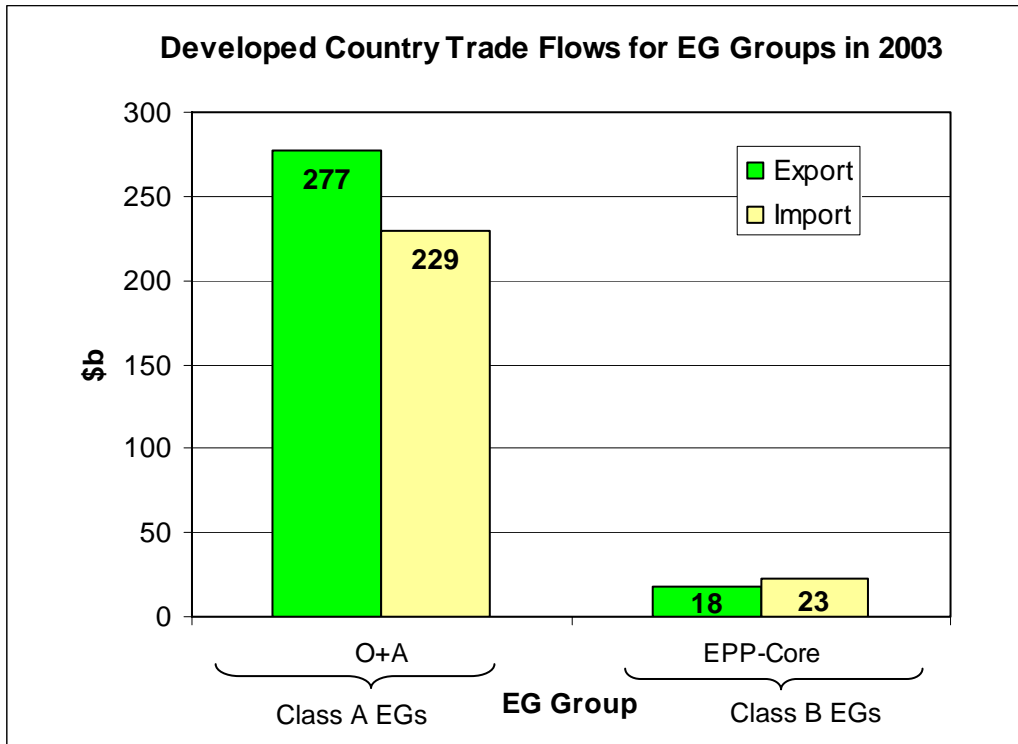


Figure 3: Developed country trade flows in EGs by EG Group in 2003 (trade with World).

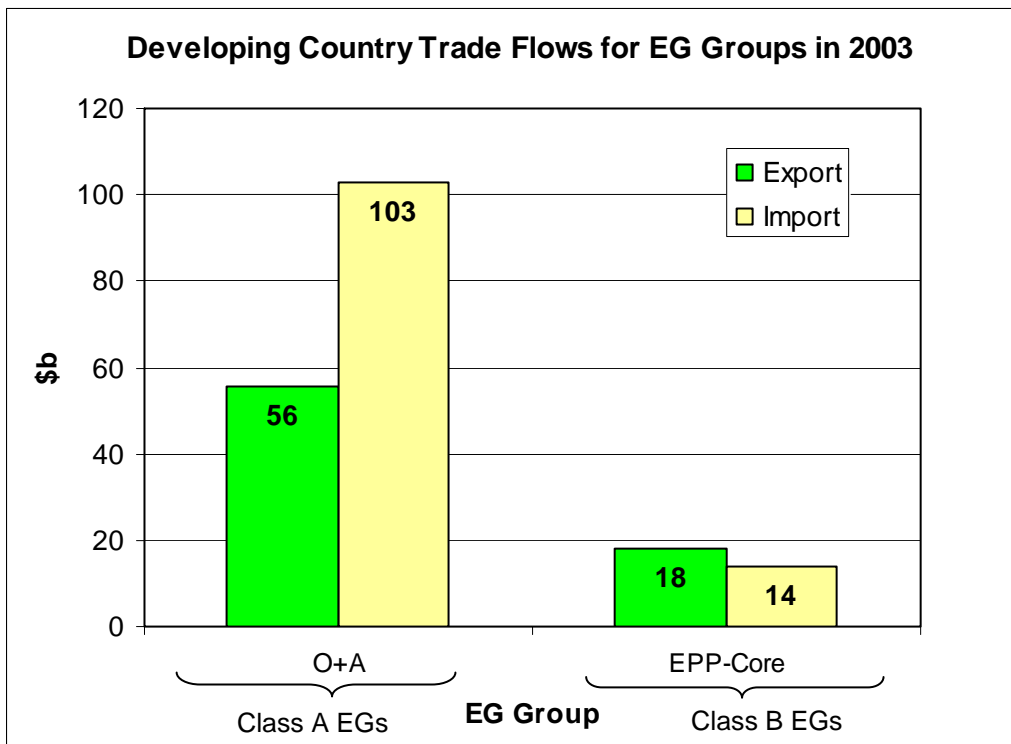


Figure 4: Developing country trade flows in EGs by EG Group in 2003 (trade with World).

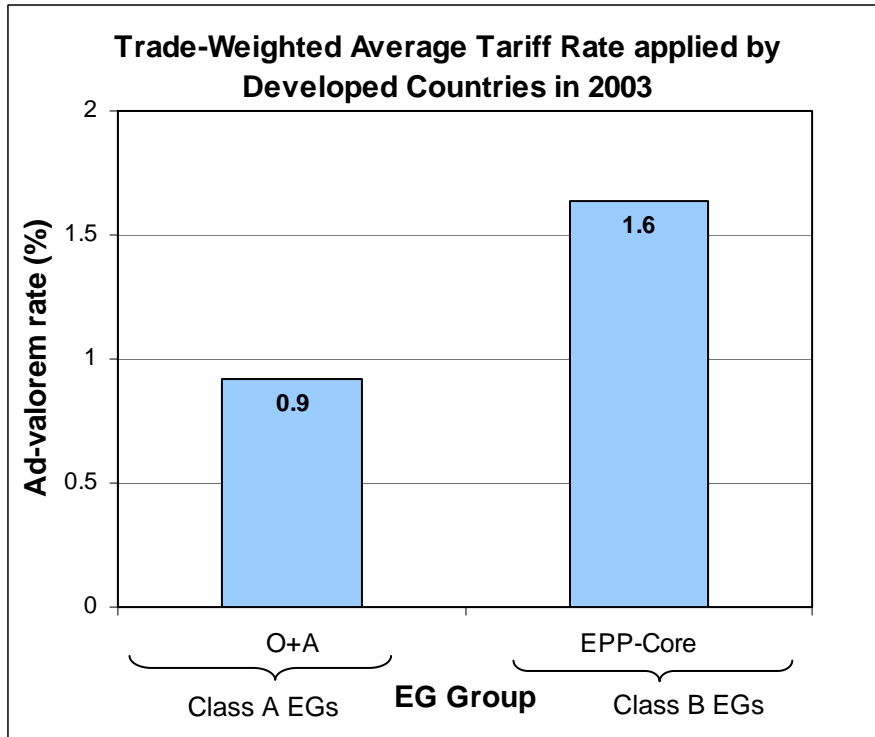


Figure 5: Tariff rates applied by developed countries on EGs in 2003 (partner is World).

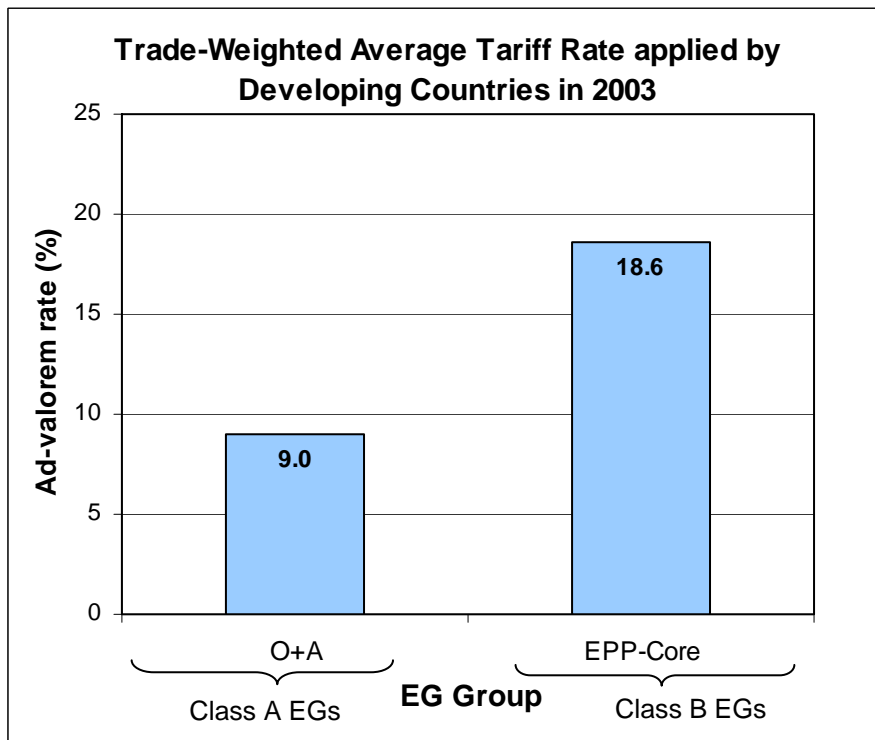


Figure 6: Tariff rates applied by developing countries on EGs in 2003 (partner is World).

The effects of lower tariffs on Class A EG trade

Many critics of trade liberalisation of environmental goods have argued that if it was in the interest of developing countries, they would lower applied tariffs unilaterally without any need of a multilateral agreement. In fact, a survey of the applied tariffs on Class A EGs shows that indeed some developing countries already have reduced tariffs on these goods relative to the higher tariff level applied by developing countries as a group on these goods. Using tariff data available for 80 developing countries from 1996 through 2003, and normalising these countries' trade flows by their 2000 GDP levels, significant trends are revealed. Of these countries, 21 have low (0-5 %), 19 moderate (5-10 %), and 40 high (10-30 %) trade-weighted average applied ad-valorem tariff rates on O+A goods.

Developing countries with lower applied tariffs import more Class A EGs on a relative per GDP basis than those with higher applied tariff levels (see Figure 7). This is expected, and indeed many developing countries fear an influx of EG imports resulting from trade liberalisation could destabilise domestic producers. However, on the other side of the trade equation, export data shows that developing countries with lower applied tariffs also export more Class A EGs on a relative per GDP basis than those with higher applied tariff levels (see Figure 8). The overall effect on trade appears positive for the group of developing countries with lower tariffs on these goods. Figure 9 shows their Class A EG export-to-import ratios are higher than those of their high tariff counterparts. Lower tariffs thus appear to be associated with more trade in these goods, not only increased imports, but enhanced exports as well (although a causal relation cannot be demonstrated here).

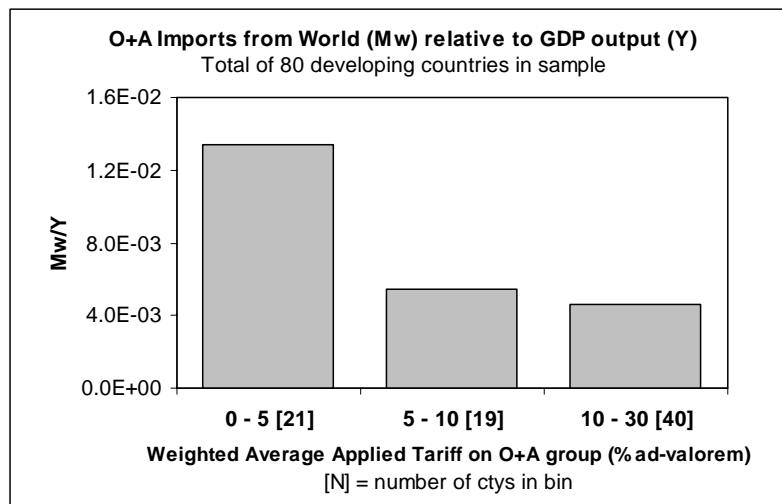


Figure 7: O+A imports by developing countries relative to tariff levels (partner is World).

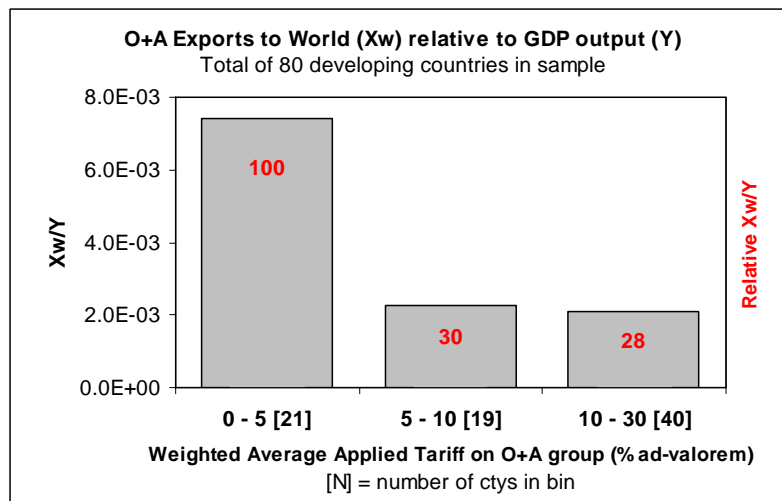


Figure 8: O+A exports by developing countries relative to tariff levels (partner is World).

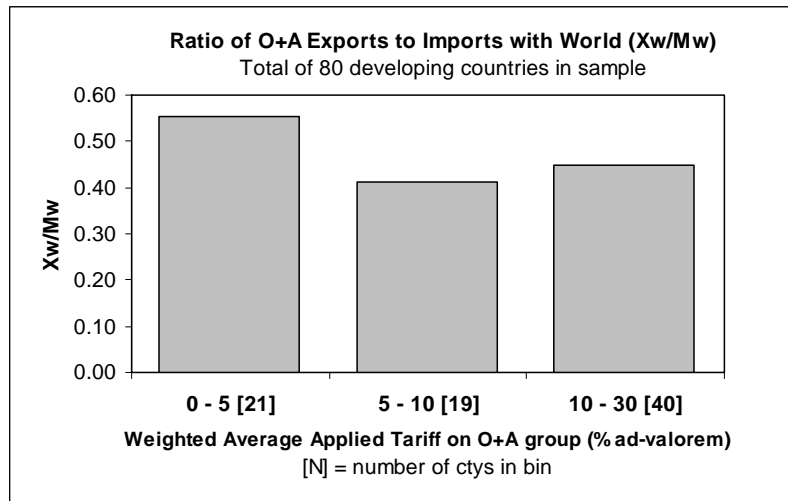


Figure 9: O+A export-to-import ratio of developing countries relative to tariff levels (partner is World).

Trade patterns for EGs

Class A EGs: O+A goods

Trade flows for developed and developing countries for the set of goods on the combined OECD and APEC lists (O+A list) from 1997 through 2003 are presented in Figure 10. Data indicate the size of the global export market for the O+A list is about 336 \$b (cf. Figure 11). Trade data show an overall negative, although improving, balance of trade for developing countries' trade in these goods with the rest of the world. For the aggregate set of all goods (at the 6 digit HS level) on the O+A list, developed countries were net exporters, and developing countries net importers, of environmental goods. However, underlying this situation are increases in developing country exports of environmental goods. As shown in Figure 10, developing country O+A exports doubled from 28 \$b to 56 \$b between 1997 and 2003, pointing to a dynamic export nature of these goods for developing countries. Over the same period, the ratio of developing country O+A exports-to-imports rose from 0.41 to 0.54, while there was a corresponding decline in this figure for developed countries from 1.34 to 1.21.

The regional breakdown of O+A trade shows significant disparities in trade between developed and developing regions. Figure 11 clearly shows the dominant role played by developed countries in global trade for the O+A goods. They account for over 80 percent of world exports and nearly 70 percent of world imports. Data in Figure 11 also indicate that among developing countries, trade in O+A goods is most significant for countries in Asia, which accounts for over 60 percent of all developing country trade in O+A goods. But to keep these figures in perspective, it should be noted that the region also accounts for over 60 percent of the developing world's population.

Finally, as mentioned above, tariffs applied by developing countries are significant for O+A goods. At over 9 percent ad-valorem, the trade weighted average applied tariff rate on O+A goods in developing countries roughly 10 times the developed country rate. Lowering the tariff rate applied by developing countries on O+A imports from other developing countries could encourage increased South-South trade.

Class B EGs: Goods on the EPP-Core list

Data compiled for regional trade of Class B EGs in Figure 12 indicate a significant trade surplus for developing countries as a group for the EPP-Core goods. However, when breaking this surplus down among the regional groups of developing countries (U-DgAFR, U-DgASO and U-DgLAC) both developing countries in Africa and the Americas show a slight trade deficit for Class B EGs goods.

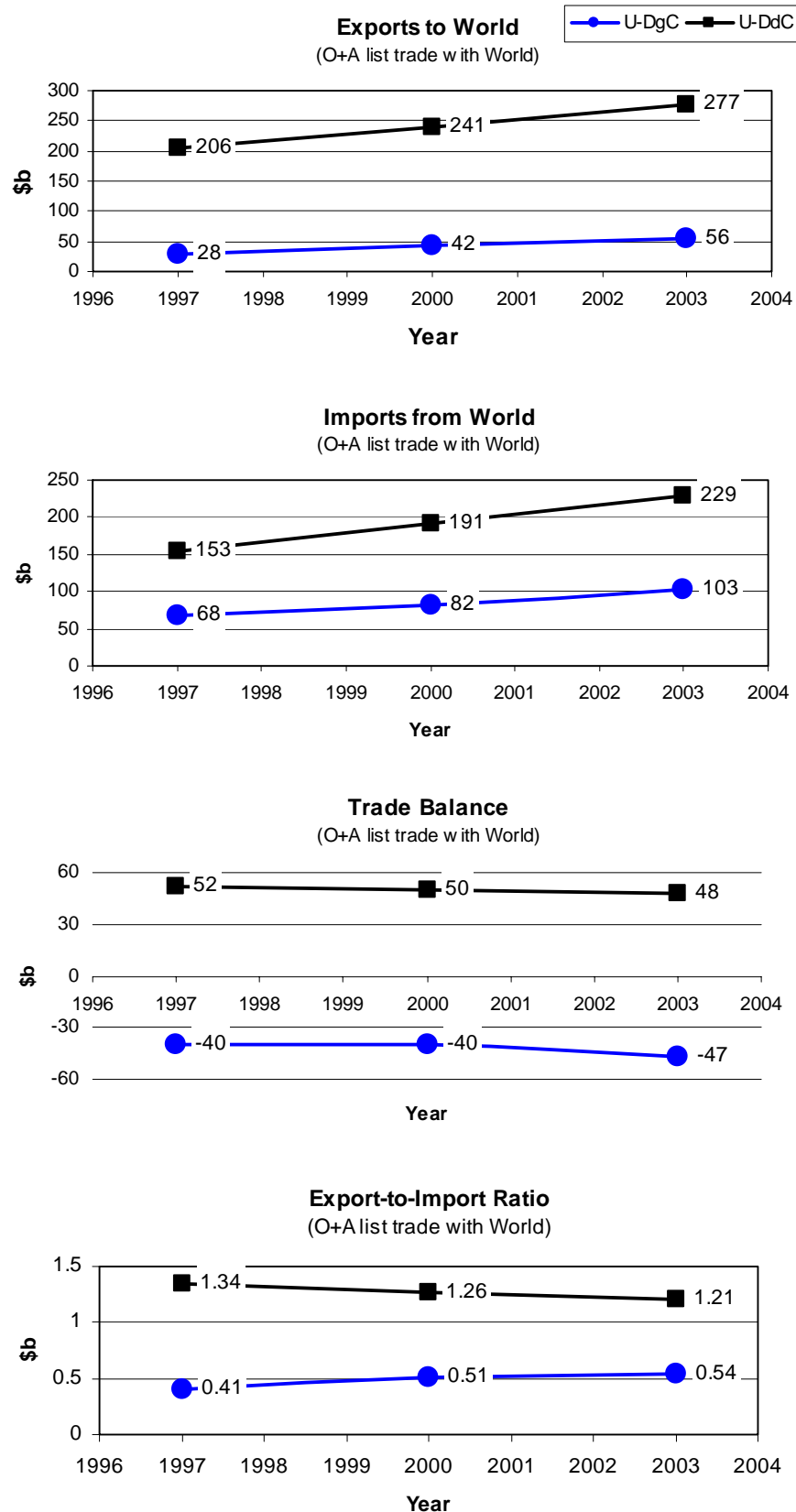
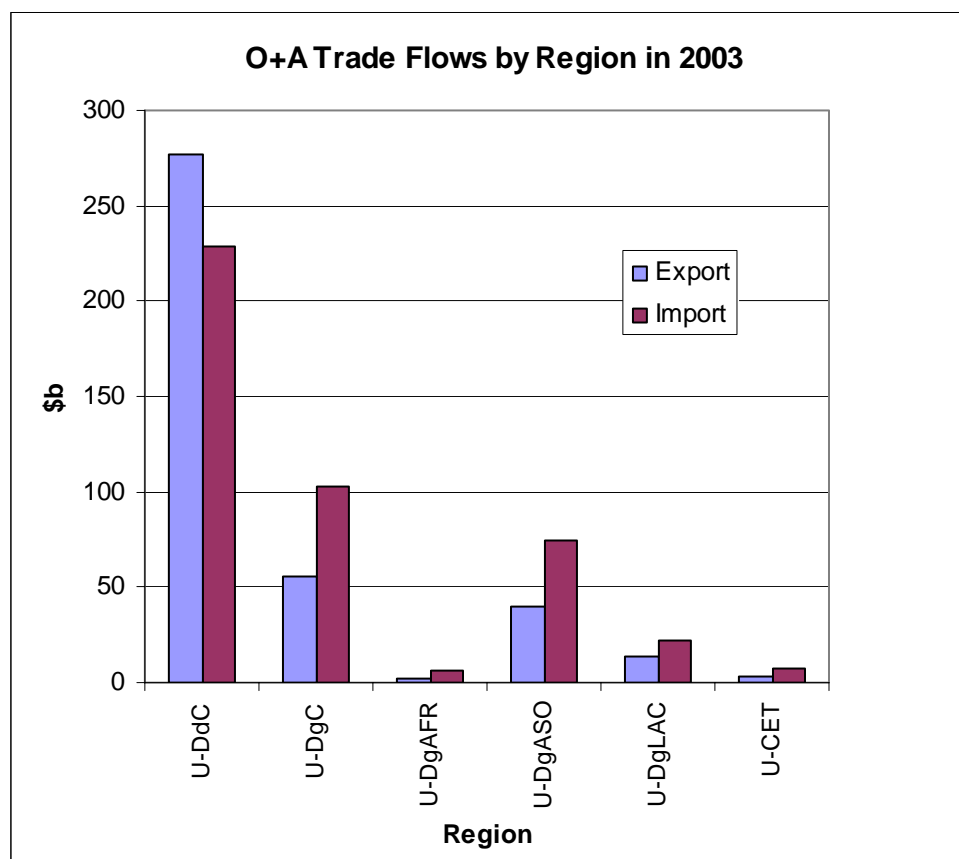


Figure 10: O+A trade time-series. Total exports, imports, trade balance, and export-to-import ratio for environmental goods on the O+A list for developed and developing countries. [U-DdC=Developed Countries, U-DgC = Developing Countries : as classified by the UNCTAD Handbook of Statistics, 2004].



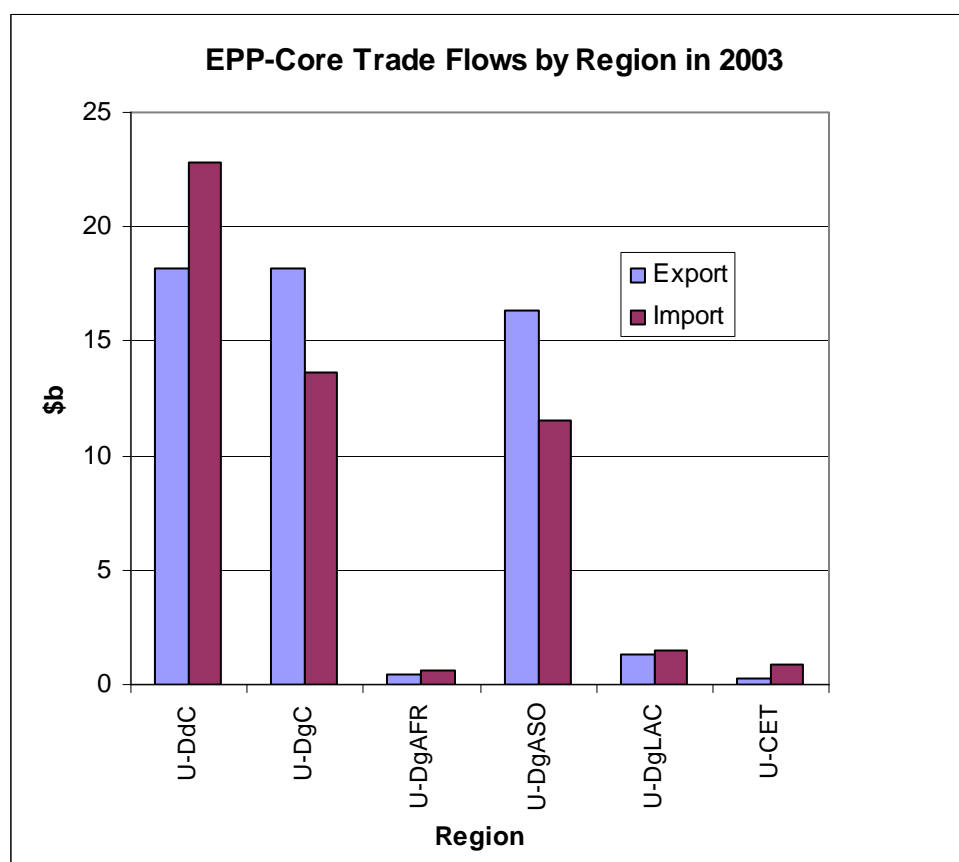
Year **2003**
 EG Group **O+A**
 Partner **World**
 Trade Value (\$ '000)

| Reporter | Export | Import | % World Exports | % World Imports |
|----------------|-------------|-------------|-----------------|-----------------|
| U-DdC | 276,969,359 | 229,077,867 | 83 | 68 |
| U-DgC | 55,771,083 | 102,891,441 | 17 | 30 |
| U-DgAFR | 2,329,656 | 6,205,263 | 1 | 2 |
| U-DgASO | 39,516,373 | 74,479,359 | 12 | 22 |
| U-DgLAC | 13,925,054 | 22,206,820 | 4 | 7 |
| U-CET | 2,957,103 | 7,351,977 | 1 | 2 |
| World | 335,697,545 | 339,321,285 | | |

Figure 11: Regional and sub-regional breakdown of O+A trade flows in 2003 (with World)

[All country classifications and groups are as classified by the UNCTAD Handbook of Statistics, 2004: U-DdC = Developed Countries, U-DgC = Developing Countries, U-DgAFR = Developing Africa, U-DgASO = Developing Asia and Oceania, U-DgLAC = Developing Latin America and the Caribbean, U-CET = Countries with Economies in Transition in Eastern Europe and Central Asia].

Note: Data for DgC are the sum of data for regions U-DgAFR, U-DgASO and U-DgLAC.



Year
EG Group
Partner
Trade Value (\$ '000)

2003
EPP-Core
World

| Reporter | Export | Import | % World Exports | % World Imports |
|----------------|------------|------------|-----------------|-----------------|
| U-DdC | 18,147,072 | 22,835,827 | 50 | 61 |
| U-DgC | 18,155,670 | 13,673,190 | 50 | 37 |
| U-DgAFR | 458,741 | 617,813 | 1 | 2 |
| U-DgASO | 16,375,059 | 11,536,494 | 45 | 31 |
| U-DgLAC | 1,321,870 | 1,518,883 | 4 | 4 |
| U-CET | 280,157 | 848,278 | 1 | 2 |
| World | 36,582,899 | 37,357,295 | | |

Figure 12: Regional and sub-regional breakdown of EPP-Core trade flows in 2003 (with World)

[All country classifications and groups are as classified by the UNCTAD Handbook of Statistics, 2004: U-DdC = Developed Countries, U-DgC = Developing Countries, U-DgAFR = Developing Africa, U-DgASO = Developing Asia and Oceania, U-DgLAC = Developing Latin America and the Caribbean, U-CET = Countries with Economies in Transition in Eastern Europe and Central Asia].

Note: Data for DgC are the sum of data for regions U-DgAFR, U-DgASO and U-DgLAC.

Dynamism in environmental goods exports of developing countries

The survey of environmental goods trade presented above indicates that developing countries are currently running substantial trade deficits in Class A EGs on the O+A list and, at the same time, for Class B EGs on EPP-Core list, data indicate a sizable trade surplus for developing countries as a group, but slight trade deficits for some developing country regions. For which environmental goods might trade liberalisation most improve the overall export performance of developing countries? To respond to this important question, one must look beyond static trade balances to trends in the overall export performance of developing countries in these goods.

When global trade expansion is examined, data show the annual average growth in the value of world merchandise exports in the last two decades has exceeded 8 percent. However, there have been considerable differences in the export growth rates from one product group to another, with some growing more than twice as fast as aggregate growth in world trade, most advancing at a rate comparable to growth in world trade, and other sectors exhibiting flat or declining exports. These facts suggest that when evaluating which environmental goods might be attractive candidates for trade liberalisation, developing countries should examine not only their current export levels and trade balances for these goods, but trends in the growth of their export levels and the size of the world export market as well.

Although developing countries have a trade deficit in Class A EGs, Table 1 shows that these goods rank among their more dynamic exports. Growing at annual rate of 12.5 percent and rising as a share of total exports from 2.5 to 2.8 percent between 1997 and 2003, Class A EG export growth by developing countries exceeded the 9.8 percent growth of world exports over this period. While exports are mainly towards the North, South-South trade is significant. In 2003, some 20 percent of the South's Class A EG import demand was met by exports from the South, while the same figure in 1997 was only 13 percent. Certainly, tariff reductions from currently high levels would stimulate increased South-South trade in these goods and contribute to narrowing the South's trade gap.

Class B EGs show little dynamism. Table 1 shows that the annual growth rate of developing country exports for Class B EGs between 1997 to 2003 was only 8.7 percent, lower than that of world exports, and significantly lower than the 12.5 percent growth rate for Class A EGs. In absolute terms, developing countries' total exports of Class B EGs rose from 13 \$b to only 18 \$b between 1997 and 2003, while their exports of Class A EGs more than doubled from 27 \$b to 56 \$b. These figures clearly indicate that Class A EGs offer developing countries as a group, far greater opportunities for income and employment generation than Class B EGs.

Dynamic rankings of developing countries' Class A and Class B EG exports to developed and developing countries are presented in Tables 2 and 3 respectively. They indicate that the environmental goods trade patterns of developing countries with developed and developing countries are somewhat different. In both cases, however, Class A EGs are more dynamic than Class B EGs, and EG exports to developed countries more dynamic than exports to other developing countries, potentially due to the high applied tariffs that persist in South-South EG trade.

Nevertheless, many LDCs and developing countries with small rural economies appear prominently in a ranking of Class B EG exports relative to GDP (see UNCTAD 2005). This observation, and the fact that many of these countries' exports are concentrated in natural resource based commodities, indicates that trade liberalisation of Class B EGs will be essential in providing them with immediate export gains.

| Reporter = U-DgC | | Partner = World | | |
|-------------------------------------|---------------------------------------|--|-------|---------------|
| EG Group | Annual growth rate of DgC exports (%) | Share of Total DgC Exports to World 1997 | 2003 | Increment (%) |
| O+A | 12.5 | 0.025 | 0.028 | 14.4 |
| EPP-Core | 8.7 | 0.022 | 0.020 | -6.1 |
| Total Goods Exports to World | 9.8 | | | |

Table 1: Dynamism of developing countries' EG group exports to the world. The calculated annual export growth rate is the compound annual growth rate (CAGR).

| Reporter = U-DgC | | Partner = U-DdC | | |
|-------------------------------------|---------------------------------------|--|-------|---------------|
| EG Group | Annual growth rate of DgC exports (%) | Share of Total DgC Exports to U-DdC 1997 | 2003 | Increment (%) |
| O+A | 14.9 | 0.024 | 0.030 | 27.9 |
| EPP-Core | 9.5 | 0.025 | 0.024 | -4.2 |
| Total Goods Exports to U-DdC | 10.3 | | | |

Table 2: Dynamism of developing countries' EG group exports to developed countries. The calculated annual export growth rate is the compound annual growth rate (CAGR).

| Reporter = U-DgC | | Partner = U-DgC | | |
|-------------------------------------|---------------------------------------|--|-------|---------------|
| EG Group | Annual growth rate of DgC exports (%) | Share of Total DgC Exports to U-DgC 1997 | 2003 | Increment (%) |
| O+A | 9.3 | 0.027 | 0.027 | -1.5 |
| EPP-Core | 8.1 | 0.018 | 0.016 | -7.6 |
| Total Goods Exports to U-DgC | 9.5 | | | |

Table 3: Dynamism of developing countries' EG group exports to developing countries. The calculated annual export growth rate is the compound annual growth rate (CAGR).

Complementarity in environmental goods export profiles of developing countries

For the Class A and Class B EGs examined here, regional country groups may have either similar or different production and export specialisations. For instance, one country region may have substantial exports of a subset S of goods within an EG list, but relatively limited exports in other listed goods, while a second country region may have limited exports of goods within subset S , but substantial exports in other products on the EG list. Accordingly, the export profiles of the two regions will differ. In such a case, the two regions will have low degree of export similarity for the EG list. On the other hand, two groups of countries may have similar production and export specialisations for an entire EG list, and as a result, a high degree of export similarity. Figure 13 illustrates these two contrasting possibilities.

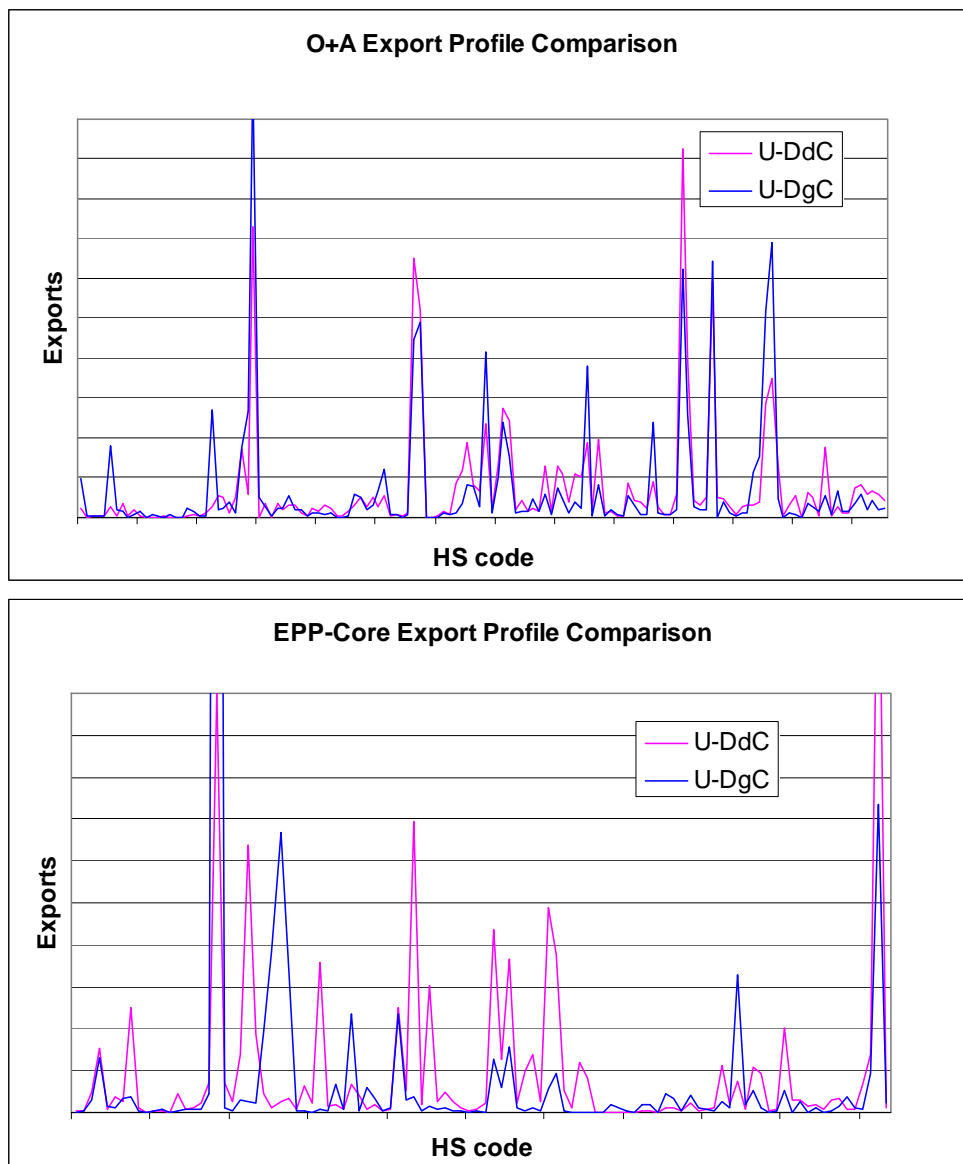


Figure 13: A comparison of the normalised export (to World) profiles of developed and developing countries for the O+A and EPP-Core EG lists. In the top graph, a high degree of export similarity between developed and developing countries is apparent for O+A exports. In the bottom graph, a low degree of export similarity between developed and developing countries is observed for EPP-Core exports. [Actual 2003 data].

The World Bank (Ng and Yeats, 2003) defines the export similarity index (ESI) as:

$$ESI_{jk}(G) = \sum_i [\min(X_{ij}, X_{ik})] \times 100$$

Where X_{ij} and X_{ik} are shares of exports of product i in region j 's and region k 's total exports of all products i belonging to the product group G . The summation is taken over all products i comprising the product group. The index provides a useful measure of how similar or different two regions' export profiles are. The ESI index varies between 0 and 100, with 0 indicating complete dissimilarity and 100 representing complete similarity of the two regions' export profiles for any group G of products.

ESIs have been calculated for the Class A and Class B EG groups examined in this study in order to gauge how much export competition actually exists between the exports of different regional country groups. For example, in the two comparisons of developed and developing country export profiles in Figure 13, the value of the ESI for O+A EG group exports is relatively high at 72, indicating significant export competition for many products in this EG group in world markets, while the ESI value for EPP-Core group exports is relatively low at 38, indicating a low level of export competition between developed and developing countries for products in the EPP-Core EG group. A tabular presentation of the ESIs between major country groupings for these EG groups is provided in Table 4.

From Table 4 it is evident that between developed and developing countries, export similarities are relatively higher for O+A than for EPP-Core goods. Assuming that import demand is elastic and that there is little product differentiation within the HS categories defining these goods, trade liberalisation in O+A goods would thus likely result in increased export competition between developed and developing country exporters for many of this O+A goods in markets where tariff reductions would be most significant, that is in developing country destination markets. On the other hand, for the EPP-Core goods, relatively little export competition is projected in world export markets as the ESIs for these goods are rather low. However, considerations of product differentiation within HS categories – which is present to a significant degree for many HS headings – would greatly alter these preliminary findings. In the presence of product differentiation, projected levels of export competition inferred here would be significantly reduced.

Table 4 also shows the ESIs for world exports of selected EG groups between the major developing country regions; namely Africa, Asia and Oceania, and Latin America and the Caribbean. These data show only moderate export similarity between countries in Asia and Oceania, and Latin America and the Caribbean for each of the EG groups examined. This indicates that there is a fair degree of complementarity between the export baskets of the two regions. When the export profiles of these two country groups are compared with those of Africa, very low values of export similarity are found for the O+A groups, however, for products comprising the EPP-Core group, ESIs are moderate to high.

An interesting finding from the ESI data is that for O+A exports, which are more dynamic than EPP-Core exports of developing countries to other developing countries (see Table 3), the inter-regional developing country ESIs are relatively low, and significantly lower than the ESI values for O+A trade between developed and developing countries. This observation indicates that EG trade liberalisation limited to trade between developing countries only may stimulate significant complementary export growth for each of the exporting developing country regions. South-South trade liberalisation schemes, such as Generalised System of Trade Preferences (GSTP) may thus provide developing countries with a particularly attractive option for EG trade liberalisation. However, it should be recalled that developing countries' O+A exports to developed countries are, at the current time, much more dynamic than their O+A exports to other developing countries. Global-scale liberalisation may need to be pursued to secure the capture these gains.

Export Similarity Indices (ESI) for Class A and Class B EG groups

| EG group: | O+A | | | | | | EG group: | EPP-Core | | | | | |
|-----------|-------|-------|---------|---------|---------|-------|-----------|----------|-------|---------|---------|---------|-------|
| Period: | 2003 | | | | | | Period: | 2003 | | | | | |
| | U-DdC | U-DgC | U-DgAFR | U-DgASO | U-DgLAC | U-CET | | U-DdC | U-DgC | U-DgAFR | U-DgASO | U-DgLAC | U-CET |
| U-DdC | 100 | 72 | 38 | 69 | 60 | 53 | U-DdC | 100 | 38 | 19 | 38 | 45 | 51 |
| U-DgC | 72 | 100 | 39 | 87 | 68 | 51 | U-DgC | 38 | 100 | 56 | 91 | 62 | 19 |
| U-DgAFR | 38 | 39 | 100 | 35 | 36 | 33 | U-DgAFR | 19 | 56 | 100 | 48 | 49 | 8 |
| U-DgASO | 69 | 87 | 35 | 100 | 56 | 46 | U-DgASO | 38 | 91 | 48 | 100 | 61 | 18 |
| U-DgLAC | 60 | 68 | 36 | 56 | 100 | 55 | U-DgLAC | 45 | 62 | 49 | 61 | 100 | 28 |
| U-CET | 53 | 51 | 33 | 46 | 55 | 100 | U-CET | 51 | 19 | 8 | 18 | 28 | 100 |

Table 4: Export Similarity Indices (ESI) for Class A and Class B EG groups. Each cross-table provides the inter-regional ESI for the respective EG groups. The ESIs between developed and developing countries are highlighted in green, while the ESIs between the different developing country regions are highlighted in yellow.

[All country classifications and groups are as classified by the UNCTAD Handbook of Statistics, 2004: U-DdC = Developed Countries, U-DgC = Developing Countries, U-DgAFR = Developing Africa, U-DgASO = Developing Asia and Oceania, U-DgLAC = Developing Latin America and the Caribbean, U-CET = Countries with Economies in Transition in Eastern Europe and Central Asia].

Modelling Global EG trade liberalisation

It is difficult to predict the outcome of global trade liberalisation of environmental goods. Both general and partial equilibrium models that may be used to estimate the impacts of tariff reductions require a specification of import demand, export supply and import substitution elasticities for each product and country participating in the liberalisation process. Moreover, such estimations are further complicated because production and export subsidies may be effective in various countries for some of these products which would affect estimates of the net welfare gains or losses of liberalisation. Nevertheless, it is possible to estimate the potential direction – i.e., positive or negative – of EG liberalisation if rough estimates of elasticities are used and subsidies are ignored. Here, based on such specifications, and the further assumption that such general analyses can be applied to aggregate EG product groups, the global partial equilibrium model (GSIM) developed by Francois and Hall was used to estimate the effects of tariff reductions on EG trade (Francois and Hall, 2003). In running the GSIM model, the following assumptions were made:

- Demand is price elastic in all regions and for all goods; a modest uniform value of demand elasticity of 1.1 was assumed (meaning that a 1 percent decrease in world price, due to tariff reductions, results an increase in demand of 1.1 percent).
- In response to increased demand, producer prices will rise; a relatively high value of supply elasticity of 1.5 was assumed for all regions and goods.
- Perfect substitutability between imports and domestically produced goods.
- *Ex ante* tariff rates for each region are the 2003 region-to-region trade weighted average EG group tariff rate, and the *ex post* rate was set to 50 percent of each region's *ex ante* trade weighted average rates (i.e., a 50 percent tariff reduction in each region).

There are the obvious modelling caveats. While the above assumptions are conservative, they are overly generalised for the purpose of making accurate estimates of *ex post* trade flows for a number of reasons. Both elasticities and tariffs may vary considerably by product and region. The level of tariff reduction achieved in an eventual EG liberalisation agreement is not known. And application of the model to aggregate EG groups, which assumes that consumption expansion proceeds in a uniform manner for all products in a given group, may give spurious results. Moreover, the model fails to capture the beneficial effects of trade complementarity mentioned above because only aggregate EG group trade is analysed. Nevertheless, despite these deficiencies, the basic direction of impacts for each region should not differ from those that could be attained from an accurate good-by-good application of the GSIM model. Keeping these caveats in mind, the GSIM model was used to estimate the direction of static *ex post* effects of tariff reductions on goods in the O+A and EPP-core EG groups for the following country groups: developed countries, developing countries in Africa, developing countries in Asia and Oceania, developing countries in Latin America and the Caribbean, and countries with economies in transition.

For the O+A EG group, GSIM results suggest an increase in production and exports for all regions, although these are most pronounced for developed countries, Asia, and countries with economies in transition (exports increase by 1 to 2 percent), and relatively small for Africa and Latin America and the Caribbean (where exports increase by less than 1 percent). Consumer surplus is positive for all regions due to lower goods prices (declining by 2 to 6 percent), except in developed countries where prices are predicted to rise slightly (by 0.1 percent). Tariff revenue loss is significant in all regions. The net welfare effect is positive in all regions except in Asia and in countries with economies in transition where increases of producer and consumer surpluses fall short of offsetting tariff revenue losses.

For the EPP-Core EG group, similar GSIM results suggest an increase in production and exports for all regions, although these are most pronounced for developed countries, Asia and Latin America and the Caribbean (exports increase by 2 to 3 percent), and relatively small for Africa and countries with economies in transition (export increases of less than 1 percent). Consumer surplus is positive for all regions due to lower goods prices (declining by 4 to 8 percent) except in developed countries where prices are predicted to rise slightly (by nearly 0.6 percent). Tariff revenue loss is significant in all regions. The net welfare effect is positive in developed countries and in all developing country regions, particularly Asia, however, it is slightly negative in countries with economies in transition where tariff revenue loss exceeds combined increases of producer and consumer surpluses.

Modelling South-South EG trade liberalisation only

The GSIM model was also run to investigate the effects of South-South EG trade liberalisation. In this case, tariffs on EGs were reduced by 50 percent in all developing countries for all EG imports from other developing countries, while developing country tariff rates on EG imports from developed countries and countries with economies in transition were maintained at current levels.

For the O+A EG group, GSIM results project an increase in production and exports for all developing country regions (exports increase by 1 to 3 percent), and marginal declines for developed countries and countries with economies in transition (where exports decrease by less than 0.5 percent). Trade diversion is significant; South-South exports increase and South-North exports decrease slightly. Asia emerges as the biggest gainer under this scenario, with imports of Asian goods displacing a significant share of developing country imports from developed countries. Consumer surplus is positive and significant for all developing country regions where goods prices fall by about 1 percent. Tariff revenue loss is significant in all developing country regions, especially in Africa where it just offsets gains in production, exports and lower consumer prices, resulting in a net welfare loss for the region. Developed countries also experience a significant net welfare loss under this scenario.

For the EPP-Core EG group, GSIM results project an increase in production and exports for all developing country regions (exports increase by 2 to 4 percent), and declines for developed countries and countries with economies in transition (where exports decrease by almost 1 percent). Again, trade diversion is observed – South-South exports increase and South-North exports decrease. As with South-South liberalisation of O+A trade, Asia emerges as the biggest gainer, with imports of Asian goods displacing a significant share of developing country imports of goods from developed countries. Consumer surplus is positive and significant for all developing country regions where goods prices fall by 2 to 4 percent. Again, tariff revenue loss is significant in all developing country regions, especially in Africa where it offsets gains in production, exports and lower consumer prices, resulting in a net welfare loss for the region. Again, as with South-South only liberalisation in O+A goods, developed countries also experience a significant net welfare loss.

In summary, the rough results obtained here do not point to a clear and best liberalisation option for developing countries as a group. Latin America and the Caribbean fare similarly well under both global and South-South scenarios. However, Asia fares better under a South-South scenario for trade liberalisation of O+A and EPP-Core goods, wherein its preferential access to Southern markets is not shared by developed countries and thus its exports rise substantially displacing those from the developed countries. On the other hand, Africa, with the major portion of its exports to developed countries, fares better under O+A and EPP-Core global liberalisation scenarios wherein these exports increase more significantly. This last observation demonstrates that although developed country tariffs on EGs are already extremely low, and tariff cuts resulting from liberalisation will necessarily be small, substantial increases in South-North exports can still result from such cuts because current South-North export volumes are large. It should be emphasised that the results derived here project only approximate static gains and losses. Developing countries can expect significant long-term dynamic gains that are more important than the static gains or losses noted above. Nevertheless, in view of the over-simplified analyses undertaken here, more detailed and accurate modelling efforts are needed if developing countries seek a clearer indication of which scenarios can be expected to yield the greatest benefits.

Conclusions and approaches to negotiations

The analyses of this study indicates that developing countries have significant export strength and potential, not only in Class B EGs (i.e., environmentally preferable products - EPPs), but in many Class A EGs used in the provision of environmental services as well. Although, as a group, they possess positive trade balances only for Class B EGs, their exports of Class A EGs are growing at extremely fast rates albeit from relatively small bases relative to developed countries. A focus on trade balances alone will thus fail to take into account many dynamic gains that can be augmented through trade liberalisation of many environmental goods for which developing countries currently exhibit trade deficits.

Appropriately designed, trade liberalisation could allow some developing countries to significantly expand their production and export of such 'dynamic' Class A environmental goods and thus promote increased industrial diversification of their economies. For many others with limited export potential in dynamic Class A EGs, trade liberalisation of Class B environmentally preferable industrial and consumer goods may provide gains needed to support rural economies, facilitate the integration of their small and medium sized enterprises into related global supply chains, and thereby increase employment and contribute to poverty reduction.

These considerations suggest that different developing countries need different approaches to EG trade liberalisation. The scope and spectrum of EGs targeted for liberalisation must be wide in order to generate immediate gains for all developing countries while providing for their continued export growth of many dynamic products. However, it must also be selective in order to permit developing countries to exclude from liberalisation those goods for which they have strong production and export

interests, and which continue to require some tariff protection, while liberalising others in which they have clear import interests.

Such a selective liberalisation process may be globally more economically efficient than a common list approach because of its ability to exploit countries' diverse production and export specialisations. Data on export similarity examined in this study show many areas of export complementarity between the world major regions, and certainly more complementarity may be present at the country to country level. Although countries compete with each other in their own and foreign markets, their export profiles are sufficiently dissimilar so that export competition under liberalisation may be less intense than naively anticipated. This indicates that liberalised trade in environmental goods can provide win-win results for all developing country regions, particularly under a selective liberalisation process which would allow each country to select unique and different goods for liberalisation. There is sufficient production and export specialisation in the world to ensure that all countries will inevitably find significant new export destinations in liberalised markets. But developing country tariffs remain prohibitively high, and therefore, to secure these gains, tariff reductions are essential to facilitate expanded South-South trade.

The balance of data of this study suggests that trade liberalisation of environmental goods can provide significant gains to developing countries and that it should be pursued. Although liberalisation limited to South-South trade can provide immediate static gains, many dynamic gains can only be realized through increased trade with developed countries through global liberalisation. Moreover, the argument that developed country tariffs are already low on many environmental goods should not imply that there are no gains to be realised from their reduction of tariffs from present levels. In view of the large volume of developed country imports from developing countries for many environmental goods, analyses indicate that even starting from currently low levels, reductions may induce substantial additional import demand for developing country exports

It is thus advisable that developing countries confidently pursue WTO negotiations with the *provisos* that an eventual WTO list of environmental goods be broad and contain a sufficient variety of goods to ensure all countries can achieve immediate export gains and that liberalisation be selective permitting each country to choose from the WTO list a 'best-fit' subset of goods for its tariff reduction commitments. Proposals for a dual list approach to liberalisation should be further developed to allow for this possibility.

Finally, as an integral part of all WTO agreements, special and differential treatment provisions will also need to be carefully elaborated to ensure that any eventual agreement provides developing countries with flexibility in selecting goods for liberalisation, and sufficient safeguards to protect national industries if liberalisation delivers adverse results. Such provisions may, for instance, allow developing countries' commitments to be more limited and subject to smaller tariff reductions than those of developed countries. They should also allow access to safeguard mechanisms if liberalisation delivers adverse results, and permit developing countries to provide subsidy support and other forms of government assistance to their domestic environmental goods industries. Finally, in connection with environmental services, performance requirements on investments in developing countries by foreign service providers should be permitted in order to provide preferences for domestically produced environmental goods used in foreign service providers' operations.

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