Globalization and Environment

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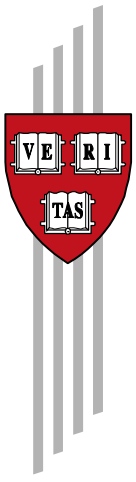

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Abstract

Economic globalization impacts the environment and sustainable development in a wide variety of ways and through a multitude of channels. The purpose of this paper is (a) to identify the key links between globalization and environment; (b) to identify the major issues addressed in multilateral economic agreements in trade and finance that affect environmental sustainability; and (c) to review priority policy issues affecting the environment in multilateral economic agreements and environment, thus identifying incentives implicit in trade and investment policy measures that affect environmental sustainability. The author categorizes these issues under the primary areas of globalization: trade liberalization, investment and finance, and technology diffusion, the latter including intellectual property rights.

In the case of the trade-environment interface, the paper examines the impact of both elements, and the causal relationship between them. It also pays special attention to multilateral environmental agreements and their potential effects on trade. An integrative section on the effects of globalization and environmental policy and performance leads to domestic and international priority policy issues and recommendations.

The author concludes that globalization brings with it potentially large benefits as well as risks. The challenge is to manage the process of globalization in such a way that it promotes environmental sustainability and equitable human development. In short, the more integrated environmental and trade policies are, the more sustainable economic growth will be and the more globalization can be harnessed for the benefit of the environment.

Keywords: Environment, Globalization, International Trade

JEL Classification Codes: F18, O13

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Globalization and Environment

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Globalization has been the defining trend in the closing decade of the 20th century and the dawn of new millenium heralding a new era of interaction among nations, economies and people. Globalization is an on-going process of global integration that encompasses (i) economic integration through trade, investment and capital flows; (ii) political interaction; (iii) information and information technology and (iv) culture. While all dimensions of globalization affect the natural environment and through it human development, for the purposes of tracing the main lines between globalization and environment we will focus on the economic dimensions of trade, investment and capital flows. An unprecedented flow of capital, technology, goods and services crosses national borders daily. Nearly 20 billion US dollars in capital flows around the world each day.

Economic globalization impacts the environment and sustainable development in a variety of ways and through a multitude of channels. Globalization contributes to economic growth and thereby affects the environment in many of the same ways that economic growth does: adversely in some stages of development, favorably at others. Globalization accelerates structural change, thereby altering the industrial structure of countries and hence resource use and pollution levels. Globalization diffuses capital and technology; depending on their environmental characteristics relative to existing capital and technology, the environment may improve or deteriorate. Globalization transmits and magnifies market failures and policy distortions that may spread and exacerbate environmental damage; it may also generate pressures for reform as policies heretofore thought of as purely domestic attract international interest. While it improves the prospects for economic growth worldwide and increases overall global output, globalization could conceivably reduce economic prospects in individual countries, sectors and industries; such marginalization of economies and people may result in poverty-induced resource depletion and environmental degradation.

Globalization diffuses world product standards and, to the extent that environmental standards are higher in the dominant consumer markets, it may create a trend toward rising standards globally; on the other hand, concerns over the possible loss of competitiveness due to "unfair practices" or lax standards may lead to a "race to the bottom." Economic globalization changes the government-market interface; it constraints governments and enhances the role of the market in economic, social and environmental outcomes; on the other hand, it creates new imperatives for states to co-operate both in managing the global commons and in coordinating domestic environmental policies.

The purpose of this paper is to (a) identify the key links between globalization and environment; (b) identify major issues included in multilateral economic agreements in trade, finance, investments and intellectual property rights that affect environmental sustainability; and (c) review priority policy issues affecting multilateral economic agreements and environment, to analyze incentives implicit in trade and investment policy measures that affect environmental sustainability.

Since this a vast area to cover, we have divided it into the main dimensions of economic globalization: trade liberalization, investment and finance and technology diffusion and intellectual property rights. In the case of the trade-environment interface, we consider both the impact of trade on the environment and of the environment on trade. An integrative section on the effects of globalization on the environmental policy and performance leads to domestic and international priority policy issues and recommendations.

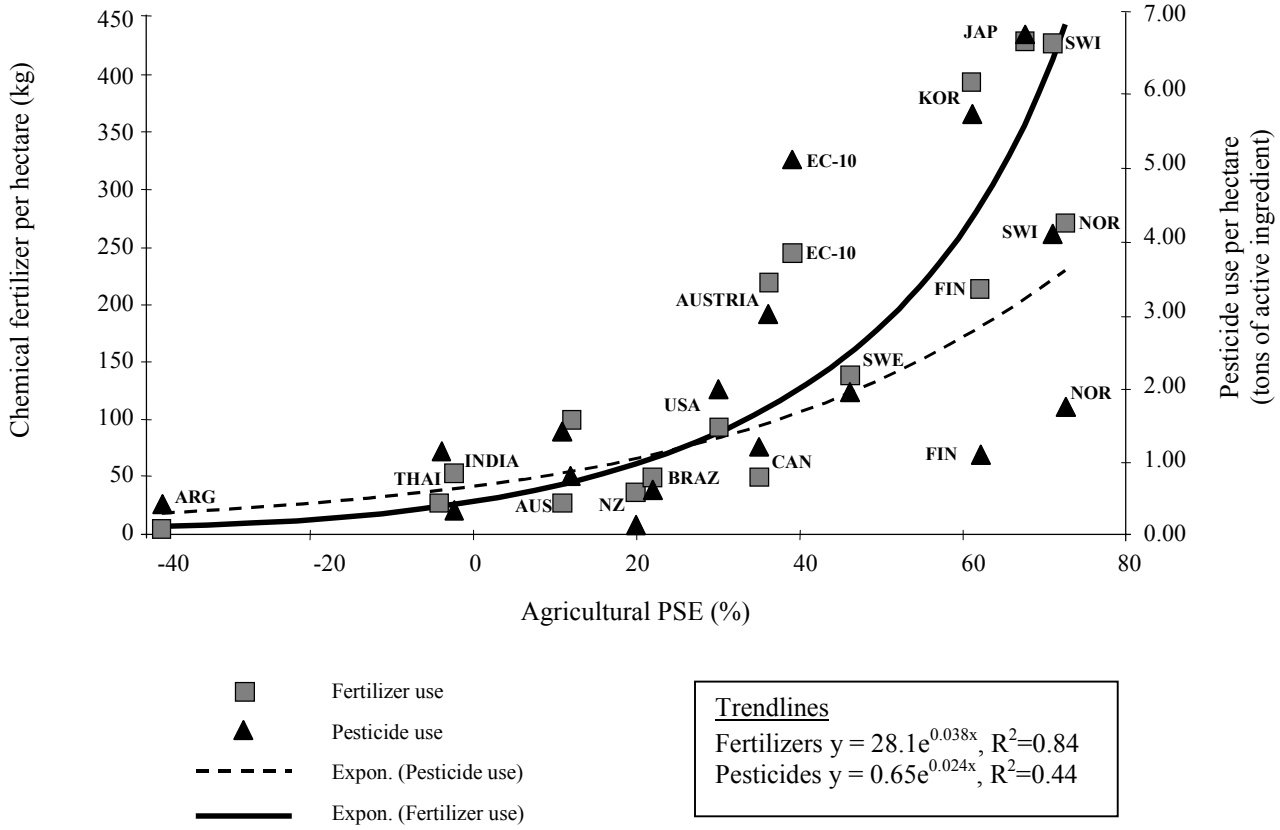
Trade and Environment

Trade liberalization and its outcome, freer trade, are both drivers and manifestations of globalization. They are also major channels through which globalization impacts the natural environment and affects environmental quality. World trade has grown faster than world output indicating a growing trade-intensity of the global economy. While global output grew at an average annual rate of 4% during 1950-94, the world merchandise trade grew at an average annual rate of over 6% during the same period. As a result, over the 45 year period, world merchandise trade grew by 14 times compared to only 5.5 times for the world merchandise output. The trade intensity of the global economy increased further during 1990-1995 (WTO 1995).

Trade theory has demonstrated that free trade maximizes the efficiency of resource allocation by channeling economic activities to least-cost producers; it thus produces a given level of output at the least cost. If natural and environmental resources are efficiently priced (i.e. all relevant social costs are accounted for), the global output resulting from free trade is also produced at the least environmental cost. Free trade maximizes social welfare. For example, countries with high levels of agricultural protection use more than ten times as much chemical fertilizers and pesticides per hectare as countries with low level protection (see Figure 1). In this case, trade liberalization would reduce the use of agrochemicals and hence environmental degradation in protectionist countries significantly and increase it marginally in low protection countries resulting in overall gains in environmental protection and sustainability. If, however, there are market failures (such as unpriced or underpriced resources or unaccounted for externalities), or policy failures (such as environmentally-harmful subsidies) that are not removed, resources are misallocated to start with and removal of barriers to trade may exacerbate this misallocation. Under such conditions, freer trade would not maximize social welfare. There would still be efficiency gains (positive effects) but there would also be welfare losses as wasteful resource depletion and environmental degradation are exacerbated (negative effects). The net effect on social welfare would depend on the relative magnitude of the positive and negative effects.

There are few studies attempting to estimate and compare the efficiency gains from trade liberalization with the costs of increased environmental degradation or needed additional environmental protection measures. Repetto (1993) attempted such a comparison and concluded that there is no *a priori* case for giving trade policy a priority over environmental policy. Efficiency gains from trade liberalization were estimated to range from 1 - 2 percent of GDP to 3 - 4 percent for economies with severe economic distortions. Environmental control costs and residual environmental damage costs, on the other hand, range from 1 - 2 percent of GDP to 3 - 5 percent of GDP in countries with lax environmental policies.

Figure 1: Relationship between agricultural producer subsidy equivalent (PSE) for 1979-89 and the use of chemical fertilizers and pesticides per hectare of cropland*



Source: Anderson (1992b, Figure 1) and World Resources Institute (1990, Table 18.2), in Anderon and Strutt (1994).

Box 1. Trade-related Environmental Effects

1. **Scale effects** — negative effects, when increased trade leads to more pollution without compensating product, technology or policy developments; positive effects, when increased trade induces better environmental protection through economic growth and policy development that stimulates product composition and technology shifts that cause less pollution per unit of output.
2. **Structural effects** — changes in the patterns of economic activity or micro-economic production, consumption, investment, or geographic effects from increased trade that either exert positive environmental effects, (e.g. reducing production of crops that rely on chemical intensive methods, in favor of more extensive agriculture), or cause negative consequences (e.g. encouraging the drainage of wetlands to satisfy new trade demands).
3. **Income effects** — positive effects increased willingness to pay with increased personal incomes brought about by growth-induced trade; also increased budgetary resources allocated to environmental protection both in absolute and relative terms.
4. **Product effects** — either positive effects, from increased trade in goods that are environmentally-beneficial, e.g. biodegradable containers, or negative effects, from more trade in environmentally-damaging products, e.g. hazardous wastes.
5. **Technology effects** — either positive effects from reducing pollution per unit of product, e.g., precision farming that reduces excess fertilizer use, or negative effects from the spread of "dirty" technologies, e.g., highly toxic and persistent pesticides, through trade channels.
6. **Regulatory effects** — either through improved environmental policies, in response to economic growth from enhanced trade or through measures included in the trade agreement, or the relaxation of existing environmental policies, because of specific trade pressures or restrictions on environmental policy by trade agreements.

Source: OECD, 1994 for 1 - 2 and 4 - 6; author for 3.

To better understand how globalization-induced free trade impacts the environment, it is necessary to examine the channels through which such impacts are transmitted. There are six such channels: (a) scale of economic activity; (b) income growth; (c) changes in structure of economic activity; (d) product composition; (e) technology diffusion; and (f) trade-induced regulations. (See Box 1 for a summary of these effects).

Scale effects

To the extent that trade liberalization stimulates economic growth, both the scale of economic activity and incomes increase. A larger volume of economic activity would certainly raise the aggregate level of natural resource use and environmental pollution unless improved resource efficiency and structural change reduce resource use and pollution intensity per unit of output more than proportionally. For given structure and resource use efficiency, the scale effects on the environment of trade liberalization are unambiguously negative. Negative scale effects are more pronounced where there are market failures such as ill defined property rights, unpriced ecosystems, uninternalized externalities and underprovided public goods. Policy failures such as energy subsidies or forced industrialization further exacerbate the scale effects of trade liberalization.

Income effects

The gains from trade and trade-induced economic growth result in substantial income increases which impact the environment in a variety of ways. First, higher incomes result in both higher levels of consumption and associated environmental externalities, and in higher willingness to pay for environmental improvement, and associated increases in both private and public environmental expenditures. There is considerable empirical evidence that environmental quality is income elastic, in the sense that increases in income result in more than proportionate increases in environmental expenditures. Second, economic growth makes more resources available for environmental protection, and raises environmental quality in a country's list of priorities, prompting governments to increase environmental expenditures both in absolute terms and as a percentage of GDP. This is true of virtually all the newly industrializing countries (from China and South Korea to Mexico and Brazil). The reverse is also true, when income growth slows down (as after the recent Asian financial crisis), environmental expenditures tend to fall more than proportionally.

Third, to the extent that trade and growth benefits are widely distributed, trade liberalization may help reduce the pressures placed by poverty on the environment through the encroachment of natural resources. If, on the other hand, poor people (either rural or urban) are further marginalized by global competition without access to technology, capital and other means to compete, encroachment and degradation of natural resources (forest, pastures, fisheries, public lands) are likely to intensify. Trade liberalization may actually reinforce the vicious circle between poverty and environmental degradation, especially when open access resources, heretofore poor people's last resort source of livelihood, are now being exploited for exports. Ironically, economic collapse may not reduce the pressure on natural resources, if impoverished urban dwellers return to the rural areas reclaiming their traditional sources of livelihood as indeed happened in Thailand and Indonesia following the recent financial crisis. Finally, economic growth may result in reform of environmental policies and enactment of new laws and regulations and new institutions to enforce them.

Studies of the relationship between income levels and environmental degradation, not controlling for scale and structural change effects, found an inverted U-shape relationship, especially for localized effects. (Grossman and Krueger, 1995, Panayotou 1997a). At low-income levels (early stages of development), income growth is associated with higher levels of environmental degradation until a turning point is reached (between US$5,000-10,000) beyond which further income increases result in environmental improvement. This finding came to be known as the Environmental Kuznets Curve, tends to suggest that environmental degradation is a "growing up" problem to be overcome through rapid economic growth rather than through targeted environmental policies. To the extent that free trade speeds up economic growth and raises per capita incomes, any restrictions on trade or diversions of resources away from export-led growth slow down the transition to a positive income-environment relationship.

This is clearly a misinterpretation of an empirical relationship that is devoid of policy significance in its reduced form. First, it ignores the role of market and policy failures in determining the level of environmental damage cost per additional unit of GDP, and the scope for policy reform to reduce it. Second, it ignores threshold effects and the risk of irreversible environmental damages were environmental degradation to cross such thresholds before reaching

the turning point. Third, current income levels of developing countries are nowhere close to the turning point, hence environment-intensive production would continue for a long time, resulting in significant and possibly irreversible environmental damage.

Policy formulation calls for a more analytical and disaggregated approach to the income-environment relationship. Once such attempt (Panayotou 1997a) decomposed the income-environment relationship into: (a) a scale effect which was found to be unambiguously negative; (b) a pure income effect which was found to be unambiguously positive, and a composition or structural change effect which was found to be negative at earlier stages of development (shift from agriculture into industry) and positive at later stages of development (shift from industry to services). The speed of income growth was also found to matter, resulting in somewhat higher levels of environmental degradation per unit of GDP. However, it was also found that effective policy intervention is a potent means to reducing the environmental cost of growth at all stages of economic development. Thus, while some deterioration of environmental quality is inevitable along a country's development path up to the turning point, policy interventions to remove distortions and mitigate market failures can reduce the environmental cost of growth and hence of trade and keep it at reversible levels below critical ecological thresholds.

Structural or Composition Effects

Globalization in general and freer trade in particular result in a shift in industrial structure more in line with a country's comparative advantage. In the absence of market and policy failures, the composition of output under free trade would be better suited to a country's environmental resource endowment than under austerity. Controlling for scale effects and for stage of development, trade liberalization tends to make the structure of the economy less pollution-intensive to speed up the transition from resource extraction and processing to light manufacturing and eventually services. Since most developing countries are more richly endowed in low-cost labor than any other factor of production, trade liberalization tends to shift labor-intensive activities to developing countries. Indeed, Hettige, Lucas and Wheeler (1992) found that toxic intensity increased more rapidly in inward-looking developing countries, while outward-oriented, high-growth developing countries had a slowly increasing or declining toxic intensity of manufacturing. They found that highly protected economies had experienced rapid growth in capital-intensive smokestack sectors, while more open economies had experienced high growth in less pollution-intensive, more labor-intensive activities.

Developing countries may also have significant national resource endowments and income-constrained demand for environmental quality. The extent to which trade liberalization would contribute to sustainable development, under these conditions, depends critically on whether environmental assets are properly valued, and these values are somehow been taken into account by world markets. Otherwise, trade liberalization may result in structural shifts towards increased specialization in unsustainable activities. A recent study by Strutt and Anderson (1998), however, found that, even under business as usual scenario (i.e., no change in resource pricing or environmental regulation), implementation of the Uruguay Round trade reforms would have a positive impact on natural resource in developing countries and most other regimes of the world except for Western Europe where resource policies are well developed and can cope with any increase in resource exploitation (see Table 1).

Product and Technology Effects

Liberalized trade facilitates the diffusion of products, technologies and processes across borders. The environmental impacts of this diffusion depends on the characteristics of the products and technologies that are being diffused. The trade in products that are patently harmful to the environment such as toxic chemicals, hazardous waste, endangered species and disease bearing pests is strictly regulated or prohibited by international conventions. A very important channel through which globalization impacts the environment is the trade in environmentally preferred "producer" and "consumer" goods. The global market for environmental goods and services is around $300 billion annually and is expected to grow rapidly (OECD 1996). Trade liberalization expands the potential market for both more efficient capital equipment and "cleaner" production technologies on the production side and "greener" products, such as organic foods, low-emission vehicles and recyclables, on the consumption side.

While other dimensions of globalization, such as investment, intellectual property rights and economic integration have technology implications that impact the environment, three-quarters of all technology transfer arise from trade flows (OECD 1995), especially the trade in machinery and equipment, which amounts to almost 40 percent of total global trade (UN 1996). These trade flows result in diffusion of more efficient (and one hopes cleaner) technologies: almost 80 percent of the global trade in machinery and equipment comes from developed countries and about a third is imported by developing countries (UN 1996). Technology diffusion also takes place through the trade in services such as engineering and consulting services and technology licensing.

Table 1. Percentage changes in resource-sector output levels in various regions of the world following Uruguay Round trade reform (including China), 2010

	Indonesia	Other APEC developing economies	Other developing & transition economies	APEC high-income economies	Other high-income economies (W. Europe)	Total World
Paddy rice	-0.3	2.9	-1.3	-1.0	-3.1	0.48
Non-grain crops	-4.6	4.3	-0.4	2.0	-2.9	0.59
Livestock	0.1	-1.4	-1.6	0.9	1.2	-0.06
Forestry	-1.1	-0.7	-0.1	-0.0	1.9	-0.03
Fisheries	-0.7	-7.4	0.1	-0.4	5.1	-0.21
Coal	-7.1	-0.6	0.2	-0.3	1.0	-0.03
Oil	-3.3	-2.9	0.2	0.1	0.4	-0.04
Gas	-3.4	-1.4	0.1	0.5	0.1	0.06
Other minerals	-5.2	-5.0	-1.4	-1.4	1.9	-0.39

Source: Strutt and Anderson (1998)

Liberalized trade contributes not only to technology diffusion and transfer but also to technological progress through economies of scale, enhanced incentives to innovate and less duplication of research and development efforts due to fewer protectionist barriers (Grossman and Helpman 1995).

Does the trade-induced generation and diffusion of technology benefits or harms the environment? The technology-environment relationship is a complex one consisting of both demand and supply factors and policy effects. On the demand side, pressures by regulators, customers, shareholders and the community drive firms to demand technology with environmental characteristics such as "cleaner" production technology and pollution-abatement equipment. While regulatory and community pressures usually aim at process characteristics, customers pressure is directed towards product characteristics. Studies of firm behavior in developed countries tend to find regulatory pressure as the most potent driver of environmentally-preferred technologies (e.g. Henriques and Sadorsky,1996) while studies of firm behavior in developing countries tend to find community pressures as the most important determinant of firms' environmental behavior (Pargal and Wheeler, 1995; Panayotou *et al* 1997). On the supply side, environment-related technological change is driven by abatement costs and the ability of innovating firms to benefit from environmental damage mitigation (which in turn depends on the regulatory regime) and to appropriate the benefits from innovation with wider applications (which in turn depends on the intellectual property right regime). According to Johnstone (1997), in addition to these factors the level of industrial research and development is likely to be an important factor in the supply of environment-relevant technological innovations. Indeed, Nentjes and Wiersma (1987) found that the most active industries in environment related R&D were the chemicals, petroleum and machinery and vehicles.

Finally, environmental policy plays a key role in both the technological innovation. Clarity, predictability and stability of environmental policy are critical for the necessary investments to take place. Equally important is the flexibility of the policy instruments to allow firms to seek the least-cost methods of compliance, to take advantage of costs differentials in pollution abatement and to benefit from continuous innovation. In this regard, market-based instruments such as pollution taxes and tradable permits have significant advantage over command and control regulations. The case has also been made for a mixed system of pollution taxes to internalize the negative environmental externality of pollution *and* technological innovation subsidies to encourage the positive technological innovation externality (Johnstone 1997).

Regulatory effects

The regulatory effects of trade liberalization on the environment arise from (a) improved environmental policies, standards and enforcement in response to economic growth from enhanced trade; (b) environmental measures included in trade agreements; and (c) relaxation of existing environmental policies due to specific trade pressures or restrictions on environmental policies by trade agreements.

With regard to the first effect above, World Bank research based on data from 145 countries has found a positive association between economic growth and environmental

regulation and security of property rights. With regard to the second effect, NAFTA demonstrates how trade liberalization can serve as a catalyst for improvements in both the level and the enforcement of environmental regulations. Trade agreements in general may promote harmonization of environmental standards and influence policies towards environmental subsidies and environment-related fiscal and trade measures. While the multilateral trading system encourages the use of international standards, and allows for higher levels of environmental protection, there is a widespread fear that trade liberalization and the resulting strife for competitiveness would "drag down" environmental standards in a race towards the bottom. There is no evidence that this has happened thus far.

Empirical evidence

There are many analytical studies of the effects of trade liberalization on the environment (e.g. Bhagwati and Srinivasan 1997) but few empirical studies. A recent OECD (Sprenger, 1997) study has simply indicated the likely direction of the various impacts. The scale of economic activity has, as one would expect, unambiguously detrimental effects on the environment while technology and income have beneficial effects (see Table 2). Since these effects are in opposite direction and the remaining impacts (structural and product effects) are ambiguous, it is not possible to determine the net effect of trade on the environment in the absence of quantitative assessment of these impacts.

One attempt to quantify the effects of trade liberalization on the environment is a recent study by Strutt and Anderson (1998) on Indonesia. Using a modified version of the global general equilibrium model (GGE) known as GTAP they project the world economy to 2010 and 2020 with and without trade reforms. The effects of trade liberalization on the Indonesian environment (air and water pollution) are traced through a special environmental module attached to the Indonesian part of the GTAP. They, then, identify the effects on key air and water quality indicators of changes in the level and consumption of output and in production technology arising from (a) full global implementation of Uruguay Round commitments by 2010 and (b) additional move to MFN free trade by APEC countries by 2020. Without the trade reforms, the aggregate activity (scale) effects of economic growth on pollution are, as expected, positive and the technology effect negative; the intersectoral composition (or structural effects are mixed but mostly positive (see Table 3). The scale effects dominate. The implementation of the Uruguay Round trade reforms result in intersectoral composition (structural change) effects that dominate the scale effect, and result in reduction in pollution levels except for suspended solids (see Table 4). The authors conclude for Indonesia that "trade policy reforms slated for the next two decades in many cases would improve the environment (at least with respect to air and water pollution) and reduce the depletion of natural resources, and in the worst cases add only slightly to environmental degradation and resource depletion even without toughening the enforcement of environmental regulations or adding new ones. The economic gains from the trade reforms and the scope for adopting well-targeted environmental and resource policies to reduce any serious damage are such that the social welfare almost certainly is going to be improved substantially by these liberalizations" (Strut and Anderson 1998, p. 13-14).

Table 2. "Most Likely" impacts of trade liberalization on employment and environment in OECD (home) countries

Globalization-related activity	Anticipated economic effects	Anticipated *employment* effects	Anticipated pollution/resource use effects . . .	
			. . . at home	. . . on transboundary transport
International Trade				
• Scale effects	Change in the volume of exports and imports; increase in cross-border transport	(+,-)	(+)	(+)
• Structural effects	Change in the composition of exports and imports; increase in cross-border transport	(+,-)	(+,-)	(+,-)
• Product effects	Change in the composition of exports and imports; increase in cross-border transport	(+,-)	(+,-)	(+,-)
• Technology effects	Change in the composition of exports and imports; increase in cross-border transport	(+,-)	(-)	(-)

Source: Sprenger, Rolf-Ulrich "Globalization, Employment and Environment" OECD Proceedings, OECD Paris 1997.

Table 3. Decomposition of Changes in pollution as a consequence of economic growth and structural changes, Indonesia, 1992-2010 and 2010-2020

(a) 1992-2010	Total pollution change[a]		Aggregate activity effect	Intersectoral composition effect	Technology effect
Carbon (kt)	65,346	[134]	104,607	10,149	-49,409
Sulphur (kt)	799	[132]	1,302	214	-716
Nitrogen (kt)	7,427	[162]	1,897	392	-862
Water in (bm^3)[b]	-12	[-4]	685	-388	-309
Water out (bm^3)[b]	0.8	[126]	1.3	0.7	-1
BOD (kt)	81	[52]	337	176	-433
COD (kt)	341	[64]	1,149	726	-1,534
DS (kt)	-17	[-46]	79	-47	-48
SS (kt)	105	[23]	1,002	638	-1,532

(b) 2010-2020	Total pollution change[b]		Aggregate activity	Intersectoral composition	Technology effect
Carbon (kt)	63,982	[56]	107,244	16,904	-60,166
Sulphur (kt)	707	[50]	1,323	276	-893
Nitrogen (kt)	1,495	[65]	2,165	366	-1,035
Water in (bm^3)[b]	-109	[-36]	296	-167	-236
Water out (bm^3)[b]	0.4	[29]	1.3	1.0	-2
BOD (kt)	-13	[-5]	223	146	-382
COD (kt)	2	[-0]	822	587	-1,412
DS (kt)	-13	[-65]	19	-12	-19.5
SS (kt)	-211	[-37]	545	474	-1,231

[a]Percentages changes from base case are shown in square parentheses.
[b]This does not include the change in household water use.

Source: A. Strutt and K. Anderson, "Will Trade Liberalization Harm the Environment? The Case of Indonesia to 2020." Seminar Paper 98-04 Center for International Economic Studies, University of Adelaide, May 1998.

Table 4: Decomposition of pollution effects from Uruguay Round trade reform (including in China), Indonesia, 2010 (% change from 2010 baseline level shown in curved parentheses, % of the 1992-2010 absolute change is in square parentheses).

	Total change	Aggregate activity	Intersectoral composition
Carbon (kt)	-733	1,585	-2,318
	(-0.6)	(1.4)	(-2.0)
	[-1.1]	[2.4]	[-3.5]
Sulphur (kt)	-8	20	-27
	(-0.6)	(1.4)	(-1.9)
	[-1.0]	[2.4]	[-3.4]
Nitrogen (kt)	-22	32	-54
	(-1.0)	(1.4)	(-2.3)
	[1.5]	[2.2]	[3.8]
Water in $(bm^3)^b$	-0.8	4	5-
	(-0.3)	(1.4)	(1.6)
	[-7]	[35]	[-42]
Water out $(bm^3)^b$	0.01	0.02	-0.01
	(0.6)	(1.4)	(-0.8)
	[1.1]	[2.4]	[-1.3]
BOD (kt)	-2.0	3	-5
	(-0.9)	(1.4)	(-2.3)
	[-2.5]	[4.1]	[-6.6]
COD (kt)	-6.5	12	-19
	(-0.7)	(1.4)	(-2.1)
	[-1.9]	[3.6]	[-5.5]
DS (kt)	-0.5	0.3	-0.3
	(-0.3)	(1.4)	(-1.7)
	[-0.3]	[1.6]	[-2.0]
SS (kt)	5.3	8	-3
	(0.9)	(1.4)	(-0.5)
	[5.0]	[7.6]	[-2.5]

Source: Strutt and Anderson (1998)

The commonly used Strut and Anderson approach of using a side environmental module, rather than a fully integrated emissions-damage-abatement feedback system, has been criticized by Smith and Espinosa (1996). The latter using a new GGE model for the European Union that incorporates local and transboundary externalities illustrates how environmental and trade policies become intertwined. The model is extended to include three air pollutants (PM, NOx, SOx) and their health effects on influences on household preferences. They then evaluate the welfare implications of a 50 percent reciprocal reduction of non-tariff barriers for durables traded between UK and each of its EU trading partners, combined with a 25 percent increase in emission rates reflecting the entry of marginal plants in response to trade liberalization. When the effects of emissions on morbidity, and of morbidity on labor endowments and threshold demand for services are ignored, the balance of trade to GDP ratio is positive. When the income and substitution effects of health damages from pollution are considered (including mortality) the welfare implication of the 50 percent reduction in non-tariff barriers (as measured by the ratio of balance of trade to GDP) turns negative (see Table 5). Ignoring the air-pollution induced effects on morbidity results in 12 percent overstatement of the gains relative to GDP. Thus when the gains from trade are considered, trade liberalization enhances social welfare, if the accompanying increase in air pollution and its health effects are considered, there may be net welfare loss, depending on the magnitude of increase, the sector affected and the nature of environmental impacts.

Allowing for the environmental impacts of emissions and their feedbacks to the economy via revaluation of endowments or changes in rents and substitutions for other marketed goods, result also in larger increase in emissions. As shown in section B of Table 5, in the absence of exogenously specified increase in emissions, trade liberalization (50 percent reduction in non-tariff barriers) result in 3 times higher increase in particulates and an increase rather than a reduction in NOx and SOx. It is also of interest that Germany, a UK trading partner, enjoys smaller welfare gains from trade when the impact of the increased output on emissions and the transboundary effects of emissions from the UK on Germany are considered (see Table 5).

Is there a Case for Trade Measures to Protect the Environment?[1]

As GATT has gone beyond tariffs, quotas and other border instruments to be concerned with internal policies and measures such as standards, production subsidies, and intellectual property rights, environmental concerns and policies began to be projected beyond national borders even when no transboundary or global impacts are involved. Whether the underlying motivation is to counter "unfair trade" practices, to disguise protectionism or to advance a genuine environmental concern, trade contraction, rather than trade expansion has come to be viewed as the way to go. For example, Subramanian (1992) reports that "of the 48 bills on environmental matters introduced in the 101st Congress in the United States, 33 included provisions affecting international trade of which 31 took the form of restrictive trade measures. " (p. 135).

[1] It draws heavily on Subramanian (1992).

Table 5. Welfare implications and environmental effects of trade liberalization (50 percent reduction in non-tariff barriers for durables)

	Market effects only (no environmental effects)	Non-market environmental effects and feedbacks added
I. United Kingdom		
A. Welfare change		
1. Balance of Trade/GDP (%) (excluding mortality)	0.198	0.177
2. Balance of Trade/GDP (%) (including mortality)	0.198	-0.166
B. Environmental effects		
% Emission particulates	0.161	6.693
NOx	-0.111	2.064
SOx	-0.098	2.406
% Health effects		
Morbidity	--	1.647
Mortality	--	6.693
II. Germany		
A. Welfare change		
1. Balance of Trade/GDP (%) (excluding mortality)	0.013	0.012
2. Balance of Trade/GDP (%) (including mortality)	0.013	0.007

Source: K. Smith and J.A. Espinosa "Environmental and Trade Policies: Some Methodological Lessons" Environment and Development Economics (1996): 19-40, 1996.

Trade measures may take the form of either direct trade interventions or supporting trade provisions. Direct trade interventions usually aim at the environmental externality, e.g. US import ban on dolphin-unsafe Mexican Tuna (bilateral) or trade ban on endangered species under CITES Convention or trade restrictions on hazardous wastes under the Basel Convention (multilateral).

Direct trade interventions may also aim at compensating for environment-related loss of competitiveness. One such example is the Boren Proposal (Senator Boren's proposed pollution Deterrence Act of 1991) for automatic levying of countervailing duties on imports from countries with low environmental standards. Also, GATT's border tax adjustment rules allow the use of trade measures to offset taxes imposed on environmental grounds. Supporting trade provisions are trade measures aiming to assist the enforcement of a related action or provision. For example, Denmark banned the imports of soft drinks bottled in non-reusable containers to enforce a domestic consumption ban. The Montreal Protocol restricts trade of CFC-related products with non-signatories to enforce the production and consumption obligations on the signatories.

Trade measures may also be used as rewards and punishments for inducing a change in environmental behavior, participation in an international environmental agreements or compliance with its provisions. They may take the form of sanctions as in the case of the Pelly Amendment which authorizes trade measures against unrelated products for failing to observe US tuna fishing methods. Sanctions have also been threatened against countries to force them to raise or lower their standards. For example, the US has threatened withdrawal of concessions to EU to force it to lower its hormone standards on beef products. Finally trade inducements may take the form of incentives as in the case of NAFTA, whereby Mexico is provided with increased market access in exchange for raising its environmental standards, in general, and for reducing transborder pollution, in particular.

Are all the above uses of trade measures in the name of the environment (summarized in Table 6) justified or do they constitute disguised protectionism at worst, or inefficient instruments at best? Subramanian (1992) analyzed the use of trade measures for the environment and reached the following conclusions: First, with regards to domestic environmental problems, the use of trade measures aims to negate a source of comparative advantage which is legitimately "conferred by differences in environmental endowments, pollution assimilation capacities, or social preferences regarding environmental outcomes" (Subramanian 1992, p. 151). Therefore the intent of trade measures in relation to domestic environmental problems is largely protectionist.

Second, with regard to transboundary environmental problems trade measures are inefficient and often inequitable instruments for correcting market failures. Assignment of property rights, creation of markets and production or consumption interventions are superior to trade interventions. Trade restrictions imply unilateral allocation of property rights which may also be unfair to poor countries and counterproductive for environmental outcomes if income and environmental quality are positively related.

Third, trade measures have, however, a useful role to play in securing participation in compliance with multilateral environmental agreements. The threatened use of trade sanctions may be sufficient to alter the behavior of would-be free riders. In general, the use of trade restrictive measures for environmental purposes is generally more legitimate when it is multilateral and aims at enlisting participation and compliance for addressing global environmental problems. Appendix Table A.1 lists selected Multilateral Trade Agreements with possible trade effects or trade measures aiming to protect the environment (e.g. CITES) or to secure compliance (e.g. Montreal Protocol).

Table 6. Interactions Between Trade and Environment

Type of measure	*Features*	*Transborder*	*Domestic*
1. *Direct Trade Interventions*			
(a) Unilateral	Aimed to impact directly on the substantive problem; either the loss in competitiveness or the environmental externality; restrictive action will have penalizing effects (incidental or otherwise) on actions creating the pollution.	(a) US import ban on Mexican Tuna, EC's threatened ban against exports of tropical timber and against fur products produced from animals caught in leghold traps.	(a) Countervailing duty against products produced under alleged 'low standards' (e.g. Boren Initiative). Export subsidies for pollution equipment.
(b) Multilateral		(b) Trade ban on Ivory and on several other endangered species under the CITES Convention. Trade restrictions in Basel Convention on Hazardous Wastes.	(b) Proposals in the Uruguay Round to exempt certain kinds of production subsidies for pollution abatement from countervailing action. Multilaterally sanctioned use of trade measures to offset production taxes imposed on environmental grounds as the Superfund Panel Case.
2. *Supporting Trade Provisions*			
(a) Unilateral	Intended to enforce *other* actions or interventions, which address the substantive problem or externality; action by its nature will be in the related area and could have incidental penalizing effects.	(a) Circle of Poison Act intended to stop exports of harmful pesticides on the grounds that they may be used in products which are reimported; import ban to enforce domestic consumption ban or domestic standards (e.g. Danish beer bottles case).	
(b) Multilateral		(b) Trade restrictions against non-signatories of Montreal Protocol. National actions that are sanctioned multilaterally.	

Table 6. Interactions Between Trade and Environment, cont'd

Type of measure	*Features*	*Transborder*	*Domestic*
Trade Inducements			
3A. *Sanctions:*			
(a) Unilateral	Actions intended to change environmental behavior and taken in *unrelated* areas; hence substitutable in principle by equivalent actions, e.g. financial sanctions for trade sanctions and technology transfer for trade incentives. Often sanctions will only be threatened and, if credible and effective, need not be taken.	(a) Pelly Amendment to US Fisherman's Protective Act of 1967 and Packward-Magnuson Amendment to the US Fisherman's Protective Act of 1967 under which imports of fish products in general can be restricted or prohibited. (e.g. Recent US action against Japan for policies endangering the sea turtle.)	(a) Use of trade restrictions to *raise* pollution standards abroad; use of trade restrictions to *lower* standards, e.g. threatened US actions in Beef Hormone case.
(b) Multilateral		(b) None so far.	
3B. *Incentives*			
(a) Unilateral			
(b) Multilateral		(b) US-Mexican NAFTA negotiations for of market access in return for reduced transborder pollution.	(b) US-Mexico NAFTA negotiations for provision of market access in return for higher standards

Source: Subramanian, A. "Trade Measures for Environment: A Nearly Empty Box?" The World Economy, January 1992, Vol. 15. No. 1.

Environment and Trade

Do environmental regulations act as barriers to trade? Do multilateral trade rules permit restrictions of trade for environmental purposes?

Globalization in general and trade liberalization in particular has accorded previously purely domestic policies international importance. Included among such policies are competition policy, intellectual property rights and environmental policy. Furthermore, the reduction of tariff barriers has heightened the relative importance of non-tariff barriers as potential constraints on trade. At the same time, protectionist forces having lost the use of tariff barriers are inclined to focus their attention on non-tariff barriers. Environmental concerns, because of their emotive nature are a prime candidate. This in turn has raised concerns that some environmental measures might be disguised protectionism? Sorting out legitimate environmental policy from disguised protectionism is not easy. For example, some environmental regulations such a tax on imported large cars or a subsidy for pollution abatement afford protection to domestic producers and reduce imports.

Multilateral trade rules make a fundamental distinction between (a) products standards and (b) process and production methods (PPM's). The two are treated very differently: national requirements on product standards and product-related PPM's are allowed, on non-product related PPM's they are not. We examine these in turn.

Product Standards

Multilateral trade rules permit national requirements for products to meet certain environmental, safety, and health standards provided that they are transparent and non-discriminatory between domestic and foreign sources. Taxes and charges for environmental or other resources are permitted to be imposed on important products and to except exports as an application of the principle of national sovereignty. Border adjustments are permitted: the consumption of a product that can cause environmental damage may be taxed provided that the tax is applied in a transparent and non-discriminatory manner. Packaging and recycling requirements are more controversial as they are part of a domestic-focused waste reduction policy that can impose higher costs on importers; as such it is acting as a non-trade barrier to trade. The trade effects of this policy can be mitigated by giving advanced notice to allow foreign suppliers to adjust.

Given their direct impacts on trade, product standards are prime candidates for harmonization. Two agreements of the WTP system, the Agreement on Technical Barriers to Trade and the Agreement on Application of Sanitary and Phytosanitary Measure encourage harmonization of product standards and where possible, adherence to international standards.

Process and Production Methods[2]

How natural resources are extracted or products are produced can have significant environmental impacts which countries attempt to control through harvesting restrictions, emission controls and specified production techniques. Extending such production-methods-

[2] Based on Adams (1997).

based standards (or taxes and charges) to imported products raise trade issues and conflict with the principle of national sovereignty: one country attempts to enforce a particular production method (that does not affect the final product) on another country.

If the method of production affects the characteristic of the imported product, border tax adjustments are allowed under WTO rules, i.e. product-related PPM's are treated in the same way as product standards. Charges or standards on non-product related PPM's (i.e. on production methods that do not affect the product characteristics) violate the principle that "like products" must be accorded "like treatment," and are prohibited by WTO rules. Border tax adjustments or countervailing duties for non-product related PPM's are not allowed, i.e. the prices of imported products cannot be adjusted for the extra cost incurred by the domestic industry operating under such requirements.

Thus, differences in domestic environmental policies are seen as part of the many variations that constitute a country's comparative advantage and do not justify compensating levies or export rebates to offset price differences. Where transboundary and global environmental issues are concerned harmonization of non-product PPM requirements may be necessary, at least on a consensual basis, as in the context of regional or multilateral agreement. An interesting issue currently under consideration is the potential for using border tax adjustments in combination with domestic process taxes to reduce greenhouse gases (Adams 1997).

In conclusion, unlike "product standards," "methods standards" are not candidates for harmonization; it would be both more difficult to do so and less beneficial. While some convergence is to be expected over time, production methods and solutions to local environmental problems are best tailored to local conditions. Yet the globalization of environmental concerns such as tropical deforestation and biodiversity loss pits the emerging product life-cycle perspective whereby consumers want to know the overall environmental characteristics of the products they buy against conventional notions of national sovereignty and of products as their physical characteristics (Adams 1997).

Does Environmental Policy Influence the Pattern of Trade?

Since differences in environmental policies and standards and their enforcement is translated into production cost differences, it is a legitimate concern that such differences may alter the pattern of trade. There is substantial evidence, however, that differences in environmental standards and environmental control costs have had very limited effect on trade patterns. The main reason is that environmental control costs are a very small fraction of production costs. Any comparative advantage created by lax environmental standards is overwhelmed by other sources of comparative advantage such as differences in resource endowments, technologies, human and physical capital, infrastructure and the macroeconomic policy environment. For example, Walter (1973) found that environmental control costs (ECC) amounted, on average, to 1.75% of the total value of US exports and 1.52% of US imports. Robison (1988) estimates the average EEC as a share of total exports as 0.37% in 1973 and 0.72% in 1982 and finds that a doubling in EEC sots has negligible impacts on output and trade; the trade balance is reduced by only 0.67%. Low (1992) has found that the traditionally lenient

environmental standards in Mexico did not result in specialization in dirty industries. Grossman and Krueger (1993) found that pollution abatement costs in the US have not affected US imports from Mexico. If this is the case with Mexico and the US, which share a long common border, have a large volume of trade, and have substantially different environmental standards, it is unlikely that environmental regulations have a significant impact on net exports in other cases either.

Another test of the relationship between environmental regulations and competitiveness is whether an increasing share of trade in pollution-intensive products comes from developing countries, which on the whole have more relaxed environmental laws (or more lax enforcement). While the share in world trade of pollution-intensive products from North America fell from 21 to 14 percent and that of Southeast Asia rose from 3 to 8 percent during 1965-1988 (Low and Yeats 1992), these trends are more indicative of increased demand for pollution-intensive products in newly industrializing countries than any shift of pollution-intensive production to developing countries.

Capital Flows, Foreign Investment and Environment

Capital flows in general, and direct foreign investment in particular, are major channels through which globalization impacts the environment. Foreign investment is a major vehicle of economic integration, technology diffusion and trade expansion. Globally, capital flows are larger than trade flows. Nearly 20 billion US dollars a day or 7 billion dollars a year cross national borders. Private capital flows to developing countries in 1996 were six times the official development assistance (ODA), accounting for 86 percent of the total capital flows to these countries (World Bank 1997). Unlike ODA, which has been steadily falling, private capital flows have been rising steadily right up to the recent financial crisis. Private capital flows are driven by the opportunity to earn a commercial return. These opportunities have increased considerably in the past decade as an increasing number of countries assume a greater market orientation and began to privatize state enterprises and to welcome foreign investment.

However, private capital flows, being motivated by market opportunities rather than capital needs or developing priorities, tend to be concentrated in a dozen or so emerging economies and to avoid poor countries with high risk and undeveloped institutions and poor infrastructure. Moreover, private capital flows are not usually guided by sustainability considerations and are indeed very volatile and sensitive to changing market conditions. Furthermore, there is little information available about their environmental and social impacts.

Of the nearly 280 billion US dollars of private capital flows to developing countries, 45 percent were accounted by foreign direct investment, 33 percent by debt finance and 19 percent by portfolio equity investments. Foreign direct investment (FDI) goes mostly into manufacturing plants, mining development, power stations, telecommunications, port development, airport and road construction, water supply, and sanitation, all of which have environmental and natural resource use implications. As such, FDI has the most direct and pronounced links to and effects on the environment and sustainable development. It is also a primary vehicle of technology transfer. Portfolio equity investments have only indirect links to the environment through their effect on the

value of companies that they are directed to. If they build up the value of companies with high environmental performance, they have positive impacts; if instead, they put pressure for short-term profitability, they create disincentive for environmental performance. Debt financing or commercial lending to private companies gives the lender a stake in the borrower's financial performance, which may be affected by environmental risks. This is not usually the case with investors in government bonds since the governments' solvency is usually unrelated to its environmental performance (Gentry et al 1996).

Private capital flows are highly concentrated (Table 7). Developing countries received only about a quarter of global FDI and portfolio flows, and within the developing world, twelve countries in Asia, Latin America and Eastern Europe received 80 percent of the total flows to developing countries; sub-Saharan Africa, arguably the region with the greatest need for capital infusion, received only 2 percent of these flows. At the other extreme, China receives more than half of all FDI that goes to Asia and a third of the global capital flows to developing countries.

What does the rapid growth of private flows mean for sustainable development? First, private capital flows are not a substitute for ODA, since poor countries that need them most attract the least. Moreover, private investment is not automatically channeled to sustainable development activities. To the contrary, the social and environmental areas traditionally have been among the activities least attracted to foreign investors, partly because of government regulations that limited foreign (and even domestic) private sector involvement. Moreover, without enforcement of environmental regulations and freedom to charge user fees or raise tariffs to cover costs (including an acceptable reform to capital), these sectors are not attractive to private capital.

However, during the past five to seven years, a number of positive changes, such as deregulation, privatization, and financial innovation have increased the availability and attractiveness of these sectors to both domestic and foreign private capital. The development of innovative financing strategies such as build-own-transfer (BOT), build-own-operate (BOO), and build-own-lease (BOL), etc. have made it possible for the private sector to enter into infrastructure development, while the increased use of competitive bidding, coupled with environmental performance bonds or bank guarantees has improved the efficiency and environmental performance of FDI and hence its contributions to sustainable development. The past five years have witnessed a strong trend toward privatization of state-owned enterprises and public utilities, concessions to private developers of infrastructure inducing power generation, transportation, water supply and sanitation, and waste treatment, among others. The privatization of electric utilities in Argentina and concessions to private developers for public transport and waste management in Thailand and for water and sanitation in the Philippines are cases in point. Indeed, there is a clear trend in the 1990s of FDI shifting from resource extractive industries to environmental services that are generally more environmentally benign.

Table 7. Leading host economies for FDI, 1985-1995 (based on cumulative inflows)

Rank	Country	FDI billion $
1	United States	477.5
2	United Kingdom	199.6
3	France	138.0
4	China	130.2
5	Spain	90.9
6	Belgium-Luxembourg	72.4
7	Netherlands	68.1
8	Australia	62.6
9	Canada	60.9
10	Mexico	44.1
11	Singapore	40.8
12	Sweden	37.7
13	Italy	36.3
14	Malaysia	30.7
15	Germany	25.9
16	Switzerland	25.2
17	Argentina	23.5
18	Brazil	20.3
19	Hong Kong	17.9
20	Denmark	15.7

Source: As cited in WTO, 1996

The net effect of FDI and portfolio investment on the environment and sustainable development is difficult to determine in the absence of data and quantitative models. On the one hand, FDI provides risk capital that contributes to economic growth, employment (see Table 9) and poverty alleviation; it also creates positive externalities in terms of increased competition, improved management skills, and access to greener markets and cleaner technologies.

On the other hand, fears have been expressed that foreign direct investment gravitates toward countries with lower environmental standards or lax enforcement ("pollution haven" hypothesis). Alternatively, capital mobility results in lower environmental standards as governments compete with each other to attract scarce investment by lowering environmental standards below efficient levels ("race to the bottom" hypothesis).

On theoretical grounds, Bhagwati and Srinivasan (1997) argued that capital mobility does not lead to a "race for the bottom" if the economy is competitive and distortion free and there are no constraints on the use of tax instruments. Capital mobility does not enter a government's benefit-cost analysis calculus in choosing environmental standards if the first-best instrument of a tax or user fee is available and can be set equal to the cost that a firm's operations impose on the

country. This cost includes the cost of providing public goods and services to the firm as well as the use of the environment for waste disposal (environmental cost). Weaker environmental standards may attract additional (foreign) investment but this will neither benefit nor harm the country since firms subject to an optimal (Pigovian) tax fully and efficiently compensate the country for any environmental cost associated with their investment (Bhagwati and Srinivasan, 1997). But of course, economies are neither fully competitive nor undistorted. The authors show that even monopoly power in capital and product markets does not destroy this benchmark efficiency; as long as the government can use tax instruments to exploit its market power, it is free to set its environmental policy efficiently. It is only when governments fail to tax capital efficiently that environmental policy becomes distorted; if governments overtax capital they may have an incentive to lower environmental standards to attract capital.

Is there evidence that lax environmental standards actually attract more foreign investment? Repeated tests of the "pollution haven" hypothesis failed to find evidence of a systematic tendency of manufacturing plants to be located in countries with lax environmental standards. In choosing how much to invest and where, firms take into account many factors in addition to environmental regulations, such as size of the local market, the quality of the labor force, the available infrastructure, ability to repatriate profits, political stability, and the risk of expropriation. In this context, evidence indicates that the stringency or laxity of environmental regulations is insignificant as a determinant of location decisions. Indeed, Wheeler and Mody (1992) found that multinational firms base their investment decisions primarily on labor costs and market access, while corporate tax rates and, by extension, environmental control costs play little or no role. In a World Economic Forum survey in 1997, 3,000 business executives from 53 countries were asked to rank environmental regulations and 26 non-environmental factors, ranging from government tax and investment policies to the quality of the workforce and infrastructure as to their role in their investment location decisions. The stringency of environmental regulations ranked 22nd. Figure 2 slows the importance attached to environmental regulations compared to 11 of the non-environmental factions. (A complete list of factors affecting industrial locations is given in Figure 3.) Thus executives who actually make investment location decisions report that environmental regulations do not figure significantly in those decisions. Similar results have been obtained by many surveys of the importance of environmental regulation in plant location decisions in the United States (see Table 8).

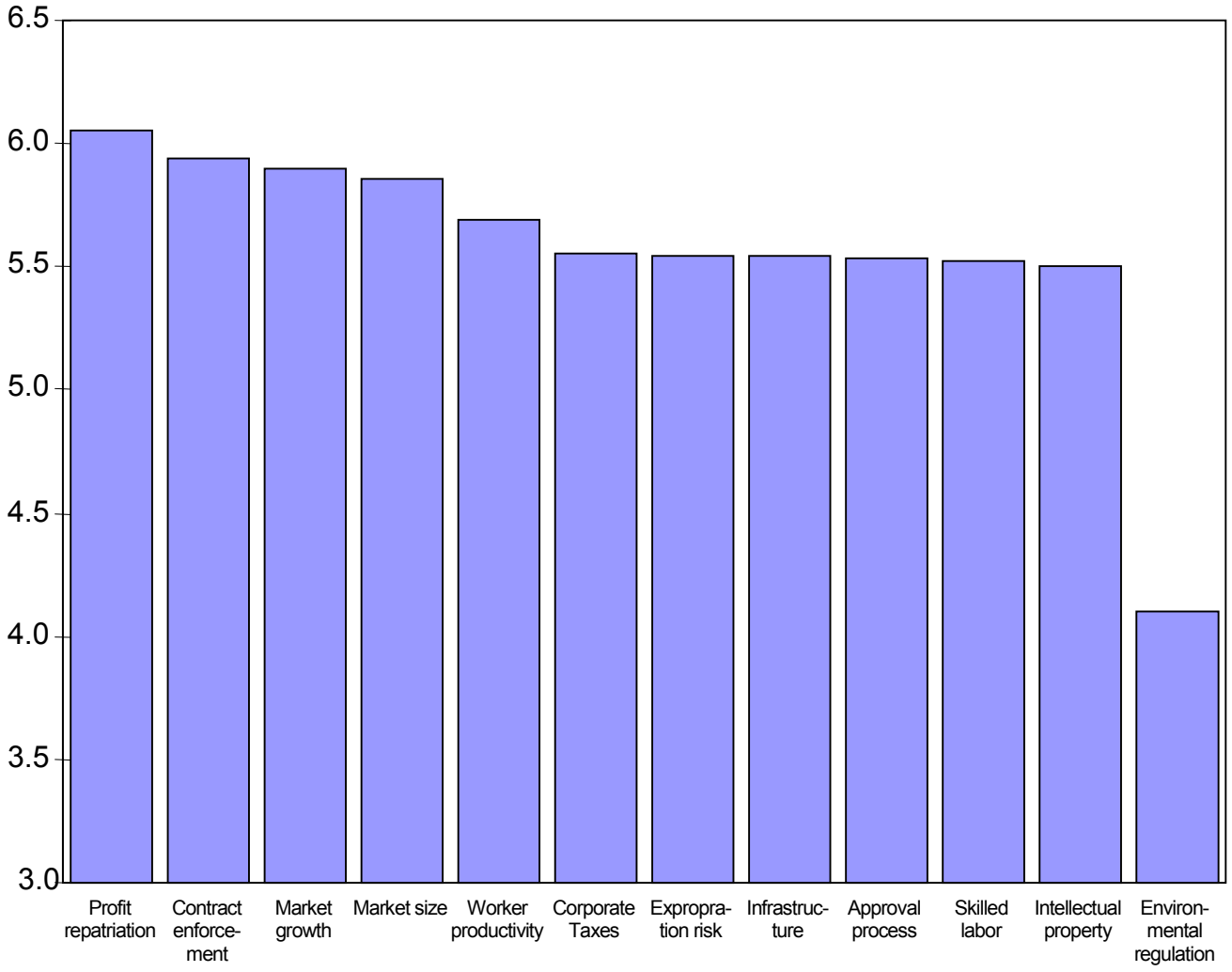
The results of these surveys are corroborated by *ex post* analysis of foreign direct investment in pollution-intensive industry. If environmental regulations affect FDI location decisions, we would expect foreign direct investment in pollution-intensive sectors to account for a larger share of foreign direct investment *from* countries with stringent environmental regulations today than it did in the 1960s or 1970s. Repetto (1995) showed that the reverse is true. He concluded that, to the extent that “greener” countries seem to be exporting their “dirty” industries, they are predominantly sending them to each other, not to developing countries with weaker regulations. In 1995, only 5 percent of US direct investment in developing countries was in pollution-intensive sectors, compared to 24 percent in developed countries with equally stringent (compared to the US) environmental regulations.

Table 8: Surveys of the Importance of Environmental Regulations to Plant Location in the United States

Survey	Sample	Result
Epping (1986)	Survey of manufacturers (late 1970s) that located facilities 1958-1977	"Favorable pollution laws" ranked 43rd to 47th, out of 54 location factors presented.
Fortune (1977)	*Fortune*'s 1977 survey of 1,000 largest U.S. corporations	11% ranked state or local environmental regulations among top 5 factors
Schmenner (1982)	Sample of Dun & Backstreet data for new *Fortune* 500 branch plants opening 1972-1978	Environmental concerns not among the top 6 items mentioned
Wintner (1982)	Conference Board survey of 68 urban manufacturing firms	29 (43%) mentioned environmental and pollution control regulations as a factor in location choice
Stafford (1985)	Interviews and questionnaire responses of 162 branch plants built in the late 1970s and early 1980s	"Environmental regulations re not a major factor," but more important than in 1970. When only self-described "less clean" plants were examined, environmental regulations were "of mid-level importance."
Alexander Grant (various years)	Surveys of industry associations	Environmental compliance costs given an average weight of below 4%, though growing slightly over time.
Lyne (1990)	*Site Selection* magazine's 1990 survey of corporate real estate executives	Asked to pick 3 of 12 factors affecting location choice, 42% of executives selected "state clean air legislation."

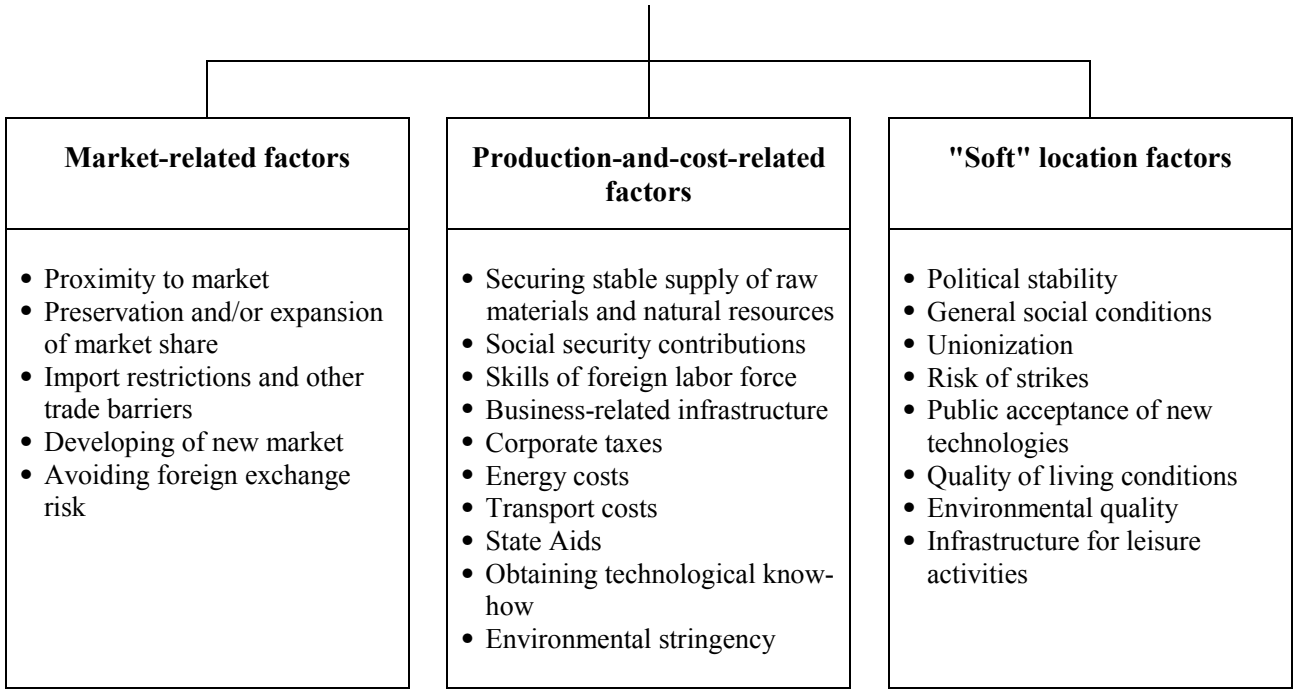
Source: Levinson (1997)

Figure 2: Comparative Impact on Industrial Location Decisions



Source: Executive Survey, World Economic Forum (1997) in Panayotou and Vincent (1997).

Figure 3: Industrial Location Factors



Source: Sprenger, 1997.

To the contrary, there is a growing evidence that foreign-owned firms or joint ventures tend to be cleaner than local firms (in general and state owned enterprises in particular) for at least five reasons: (a) the usually higher environmental standards of the developed countries are embedded in the technology of the overseas subsidiary (it is too costly to design different production processes for each location and regulatory regime); (b) they export to environmentally sensitive markets; (c) a degree of control is exercised by parent firms that do not want their image to be tarnished by environmentally irresponsible overseas operations; (d) in case of environmental accidents, they may still be subject to liability claims; and (e) pollution-intensive industries happened to be among the least footloose industries. Furthermore, foreign investors exhibit a strong preference for a stable and predictable policy environment, which requires clear, transparent and consistently enforced environmental regulations approaching international standards. Having invested in the cleaner technology of the advanced countries, multinational firms have an incentive to lobby for higher environmental standards to raise the costs of their domestic rivals. Thus the cleaner technology of the multinational firms constitutes another argument for the liberalization of capital controls and encouragement of capital flow.

Despite the likely positive influence of FDI on a country's environmental policy, the environmental performance of FDI cannot be taken for granted; it should be continuously monitored, as should that of domestic firms. FDI that is made in the absence of effective environmental policy, like any other type of investment, can result in environmental degradation, especially if the FDI flows are so large as to overwhelm the regulatory capacity of usually weak environmental authorities. As seen in Table 9, FDI inflows are "most likely" to add to pollution and resource use even as they increase employment (and hence curtail resource encroachment) and reduce pollution arising from transboundary transport.

In conclusion, the overall net effects of a foreign direct investment on the environment and sustainability of host countries could be positive or negative. On the one hand, FDI generates employment, growth and wealth that makes larger investments in environmental protection possible, and it may even reduce pollution per unit of output through cleaner technology. On the other hand, it leads to increased industrial production and hence increased aggregate pollution levels (scale effect) as well as increased consumption of pollution goods such as electricity, fossil fuels for automobiles, etc.

Since developing countries need both more investment and more improvements of their environmental performance, it behooves them to design a clear, transparent, stable and consistently applied environmental regulatory system that can serve as an attraction for foreign investors who want to be able to predict their costs and returns and to be assured that these costs are stable and common to all competitors.

Table 9. "Most Likely" impacts of Foreign Direct Investment on employment and environment in OECD (home) countries

Globalization-related activity	Anticipated economic effects	Anticipated *employment* effects	Anticipated pollution /resource use effects . . .	
			. . . at home	. . . on transboundary transport
FDI outlaws				
• Plant closure/relocation	Reduction in local output; increase in imports of final products; increase in cross-border transport	(-)	(-)	(+)
• Export substitution	Reduction or change in the composition of output for export;	(-)	(-)	(+)
• Re-imports	Reduction in output; increase in imports of final products; increase in cross-border transport	(-)	(-)	(+)
• Complementary exports	Increase in output of intermediate goods or capital goods; increase in cross-border transport	(+)	(+)	(+)
• Increased competitiveness	Increase/no change in output; increase in cross border transport	(+,-)	(+,-)	(+,-)
FDI inflows				
• Mergers or acquisitions	Shift in output; reduction in imports and cross-border transport	(+,-)	(+,-)	(-)
• Greenfield investment	Increase in output; reductions in imports and cross-border transport	(+)	(+)	(-)
• Import substitution	Increase in output; reductions in imports and cross-border transport	(+)	(+)	(-)
• Substitution of domestic production	Shift in output	(0)	(+,-)	(+,-)
• Change in competitiveness	Increase/no change in output for export; increase/no change in cross-border transport	(+,0)	(+,0)	(+,0)

Source: Sprenger, Rolf-Ulrich "Globalization, Employment and Environment" OECD Proceedings, OECD Paris 1997.

In recognition of the growing importance of foreign direct investment, OECD has attempted to negotiate a multilateral agreement on investment (MAI) among its members and non-members willing and able to meet is obligations. (Argentina, Brazil, Chile, Hong Kong, and Slovak Republic joined the negotiations as observers.) MAI attempts to establish rules of investment and to create an inclusive investment climate, analogous to what has been negotiated and agreed upon for trade and services through GATT and GATS. The main objectives of a multilateral agreement on investment are to meet the foreign investors' need for (a) long-term stability of rules and procedures, (b) open markets and equal competitive opportunities with domestic investors, (c) protection of existing investments and (d) an international mechanism for settling disputes with national governments. OECD took the initiative of drafting MAI in recognition of (1) its major stake in investment rules, as it accounts for 85 percent of FDI outflows and 60 percent of inflows; (2) the common view of the benefits from free investment flows; and (3) its need for more comprehensive and effective rules. MAI was intended to include direct investments, portfolio investment, real estate investments and rights under contract. The main provisions of MAI were:

- Non-discrimination: foreign investors must be treated no less favorably than domestic investors (National Treatment) and all investors should be accorded the Most-Favored-Nation Treatment.
- Transparency of laws, regulations and procedures
- Free transfer of funds to and from the host country
- Expropriation only for public purpose and with full compensation
- Dispute resolution through binding arbitration.

General exceptions were allowed for national security, and integrity and stability of the financial system; temporary safeguards in response to balance of payments crisis; and country specific exceptions and regulations as negotiated among the parties. Exceptions for culture were also considered.

With regard to the environment, MAI allowed freedom to governments to implement policies to protect the environment as long as these policies are not more stringent for foreign investors than for domestic ones, and MAI parties do not lower their environmental standards to attract foreign investment. The NAFTA provisions against environmental measures that constitute disguised restrictions on trade and investment were in effect expanded to include all OECD countries under MAI.

MAI has been heavily criticized on a variety of fronts, from national sovereignty and cultural protection to public health and the environment. The environmental criticism included among others: (1) concerns that corporate challenges to environmental regulations will accelerate; (2) the intellectual property rights provisions giving patents full protection may conflict with provisions of the biodiversity convention; (3) while logging concessions are protected by MAI, acquiring land for preservation is not protected; and (4) governments are unduly constrained by provisions on rights from concessions, licenses, and permits in regulating corporations developing natural resources in their jurisdictions (Clarke 1998).

At the end, MAI did not receive the necessary support from key parties to come into effect. However, new efforts to negotiate a multinational agreement on investment are anticipated in coming years.

Globalization, Technology and Environment[3]

Economic globalization affects both the nature and the rate of technological innovation and diffusion through a variety of channels: (a) more liberalized international trade, (b) more liberalized capital flows and a more favorable investment climate, (c) improved institutional and communication links, and (d) increased protection of intellectual property rights.

As we have already seen, 75 percent of international technology transfer arises from trade flows and 18 percent from investment flows (OECD 1995). Technology transfer arises from the trade of both goods and services including licensing of particular technologies through arms-length transaction with foreign firms. Expanded trade also advances the rate of technological innovations by (a) enlarging the size of the market and generating economies of scale, (b) by realizing more monopoly profits from successful innovation and (c) by reducing dislocation of R&D efforts as protectionist barriers are removed. Capital flows, especially FDI, contribute to technological innovations and diffusion by (a) generating greater finance from capital exporting countries for financing investments in equipment, embodying more advanced technologies that are available in the host country, (b) by investing in R&D overseas, and (c) by generating technological spillover to national firms, through imitation, employment turnover, and by supplying multinationals demanding higher quality standards. For at least two reasons, the technology transfer by multinationals tends to be more advanced than what already exists in the host country: (a) 80 percent of FDI originates in countries that are primary sources of technological innovations such as the US, UK, Germany and Japan; (b) in order to overcome institutional, regulatory, cultural, and other hurdles in the host country, multinationals tend to apply advanced technology which, along with management, tend to be their most important competitive advantages (Grossman and Helpman 1995). It is estimated that 75 percent of industrial R&D is done by multinationals. Finally, the flow of technical expertise between countries encouraged by globalization results in international exchange of information which reduces the costs of developing new technologies. Archibugi and Michie (1995) report that 75 percent of patent applications in OECD countries come from outside OECD. However, again it is the middle-income and newly industrializing economies that have benefited most from the international flow of technology and knowledge. This creates a new source of inequality among developing countries as some converge technologically while others are left further behind.

Having established the link between globalization and technological innovation and transfer, there remains to establish the link between technological change on the one hand and environmental quality and resource use on the other. What has been the environmental intensity of technological change? Table 10 indicates that the material intensity of output in all regions of the world was reduced during the period 1970-1988. This includes most basic material inputs such as wood, metals, minerals, steel and raw agricultural materials: while world GDP during 1970-1991 increased by only 38 percent (Young and Sachs 1995) and CO_2 dioxide emissions

[3] This section draws heavily on Johnstone (1997).

(WRI 1996) per unit of GDP also declined. This decline, or course, is only in part due to technological change; and in part to structural change. Furthermore, the aggregate resource use and pollution levels continue to rise as the scale effect of global output growth outweighs the structural and technological change effects.

Table 10. Technological Innovation with Significant Environmental Impact

Innovation	Form of Change	Primary Investment	Secondary environmental effect	Primary motivation
Coal scrubbers	End-of-pipe	Reduced SO2 emissions	Increased energy use (-)	Environmental
Electric arc furnace	Process	Reduced energy consumption	Increased use of scrap (+/-)	Economic
HCFCs	Input substitution	Reduced ozone depletion		Environmental
Biodegradable packaging	Product change	Reduced waste accumulation	Reduced waste from plastics manufacturing (+)	Environmental
Thermomech. pulping	Process	Reduced waste water discharges	Increased energy use (-)	Economic
Low-solvent paint	Product change	Reduced smog		Environmental
Reverse osmosis purification	End-of-pipe	Reduced waste water discharges	Increased solid waste (-)	Environmental
Counter-current rinsing	Process	Reduced heavy metal waste	Reduced metal inputs (+)	Environmental/Economic

Source: Johnstone, N. "Globalization, Technology, and Environment" OECD, 1997

Is there a trend for technological innovations to be less environment-intensive or cleaner? Environmental intensity changes when there is a change in the product or the production process, when one input is substituted for another and when the technology is used more efficiently. There is no comprehensive analysis of recent technologies as to their environmental intensity. Table 11 presents a list of selected technological innovations with significant (positive) environmental impacts, which have been widely adopted in recent years and are spreading throughout the developing world. (For a discussion of the determinants of the environment-intensity of technology, see section on technology effects of trade liberalization.)

Table 11. Average annual rate of change in material-intensity of output, by region

	1970-1973	1974-1983	1984-1988
OECD (except USA			
Raw Agricultural Materials	-3.39	-3.88	0.42
Wood	-1.9	-1.4	-0.17
Metals & Minerals	-0.38	-2.22	-1.66
Steel	-3.87	-2.09	-3.6
NADCs			
Raw Agricultural Materials	-1.99	-2.01	2.58
Wood	-3.37	-0.96	-2.28
Metals & Minerals	12.48	2.82	1.14
Steel	-5.29	-3.39	-3.86
USA			
Raw Agricultural Materials	1.73	-3.86	4.08
Wood	-2.73	0.24	-1.07
Metals & Minerals	10.03	2.36	2.87
Steel	-5.12	-3.12	-2.63
Asia			
Raw Agricultural Materials	-3.26	-1.29	1.47
Wood	-3.79	-1.52	-3.18
Metals & Minerals	11.19	3.67	0.02
Steel	-5.45	-3.52	-4.79

NADCs = Non-Asian Developing Countries

Source: Hoffman and Zivkovic, 1992.

In conclusion, globalization in principle could improve the environmental characteristics of technology through (a) increased exposure to foreign markets from where cleaner technologies and more effective pollution abatement equipment than those available at home can be imported; (b) increased access to export markets that may be more environmentally demanding than local markets; (c) foreign investment that brings with it the technologies and practices of the home country with more stringent environmental standards than the host country; (d) increased diffusion of the fast-growing export-oriented environmental goods and services industry. However, empirical evidence on the quantitative effect of globalization-driven technological innovation and diffusion, especially on developing countries, is extremely limited.

Intellectual Property Rights

One of the Uruguay Round results that liberalized trade and created the WTO was the Agreement on Trade-Related Aspects of Intellectual Property Rights, Including Trade in Counterfeit Goods, known as the TRIPS Agreement, which came into force with WTO on

January 1, 1995. The TRIPS Agreement sets up the rules that WTO members must follow in establishing a system to protect intellectual property rights within their borders. Unlike other WTO rules that describe what countries may not do, TRIPS prescribes what countries must do. For example, it requires that any intellectual property rights granted to domestic innovators must also be granted to foreign innovators (*national treatment*) and no party should be favored over others (*non-discrimination*). Contravening the TRIPS Agreement may bring "cross-retaliation" through goods covered by other agreements. Developing country members and economies in transition have five years and less-developed countries ten years to set up the required laws and meet the standards set up in the TRIPS agreement. This is a challenge for countries that have no related legislation in place or have entire sectors developed based on imitations of innovations developed elsewhere (e.g. India's pharmaceutical industry).

It is certain that complying with TRIPS will impose significant social and financial costs on countries through higher prices (due to payment of royalties and industry concentration). For example, small-scale seed and pharmaceutical companies in India and other developing countries are likely to go out of business and prices will rise beyond the reach of many poor people.

TRIPS also is likely to have significant but not easily predictable effects on the environment. For example, concentration of the seed market in the hands of a few major producers who specialize in a few strains may result in loss of biodiversity and impoverishment of the genetic pool. The process of loss of thousands of land races that began with the Green Revolution would accelerate. A narrow genetic base and extensive monocultures will be more vulnerable to pests and blight epidemics.

A related effect arises from the different treatment of formal and informal innovation. While varieties resulting from formal innovation resulting from scientific research by firms or individuals is protected under TRIPS, no protection is rendered to varieties produced informally by farmers by selecting the desired characteristics through traditional knowledge. This pits breeders' rights against farmers' rights and is criticized as unfair, especially since breeders and other formal innovators search for new crop traits and medicines by studying the products in use by traditional societies. As traditional medicines and land races developed over many generations do not fit the standard model of innovation, they are not protected by TRIPS, with the consequence that a steady flow of information from South to North worth billions goes uncompensated (Runnalls 1998).

Another concern relates not just to cultivated crops but to biodiversity in general. The release of new life forms, such as genetically modified plants, animals and microorganisms, protected by TRIPS, raises concerns relating to the ability of such "new life forms' to multiply, mutate and migrate. Genetically modified organisms (GMO), once they have been released into the environment, may multiply and spread widely, affecting existing species. Even harmless GMOs without side effects may eventually mutate and assume unintended qualities or migrate to other organisms through pollination or sexual reproduction. Because of these concerns, the TRIPS Agreement allows for exceptions to patenting animals and plants, but the fact that countries can choose to patent life forms is considered contrary to the Precautionary Principle which is fundamental to sustainable development. These threats to biodiversity are expected to

be addressed in the Biodiversity Protocol to the Convention on Biological Diversity now under negotiation.

Globalization and Environmental Policy and Performance

Economic globalization changes the "balance of power" between markets, national governments and international collective action. It enhances the influence of markets on economic, social, and environmental outcomes and reduces the degree of freedom and unilateral management capabilities of national governments, and it creates the necessity for states to cooperate both in the management of the global commons and the coordination of domestic policies (Zarsky 1997). Globalization creates market driven political pressures to gain or maintain competitiveness and this forces premature and not necessarily appropriate convergence of environmental policy. In the presence of diversity of environmental endowments, assimilative capacities and preferences efficient environmental management requires sensitivity to local ecological and social conditions. Diversity of conditions calls for a diversity of policies. Yet globalization leads to uniformity and inertia in environmental policy in the absence of collective action.

The main channel through which globalization influences environmental policy is through the cost of production. To the extent that environmental policy raises or is perceived to raise the cost of production, globalization-inspired concerns about gaining or maintaining competitiveness, mitigate against any change of policy, that might change the cost parameters unless competitors are subject to the same policy. The creates the inertia, pressures toward uniformity and a shift of power from national governments to market and global governance.

Zarsky (1997) advanced the hypothesis that globalization creates forces that: (a) lead to domestic environmental "policy paralysis" and (b) puts the market in the driver's seat with regard to environmental policy and performance. On the one hand, diverse or weaker environmental policies raise concerns among competitors that the country is somehow trying to subsidize exports to attract foreign investors at their expense. On the other hand, any attempt to raise environmental standards raise concerns among domestic producers about higher costs of production and loss of competitiveness and hence loss of market share and foreign investment to competitors. Between the concerns of domestic producers and those of foreign competitors, environmental policy makers have a very narrow room to maneuver. This room has narrowed further as profit margins became smaller and smaller under the competitive pressures of globalization. Even if the increase in production costs is negligible and temporary, the fear or threat of being priced out of the market or lose a hard-won export market or foreign investment leads to "policy paralysis" and a strong bias towards the status quo. But the status quo does not favor the environment, since "relative market prices and patterns of competitive advantage usually grow out of an institutional context in which environment is left out of the equation. The pressures of globalization mean that improvements in environmental performance will be slow. Given the large new demands on global ecosystems posed by rapid economic growth in developing countries, slow progress—even if steady—points toward a pessimistic assessment of the prospects for global sustainability" (Zarsky 1997, p. 32).

The pressures to maintain the status quo or make only small gradual changes in step with competitors is not a temporary phenomenon but one that gathers momentum over time: as the share of income denied from trade and foreign investment rises, the political pressures and lobbying not to disturb competitiveness intensify.

This "Zarsky hypothesis" leads to a number of testable predictions. First globalization generated pressures to maintain competitiveness keep governments and enterprises from taking any initiatives to improve their environmental performance, if they entail significant costs on domestic producers. Second, developing country product standards will be slowly pulled up towards those of large markets and PPMs towards those of main competitors. Third, the benchmark-setting developed country standards will improve only slowly and gradually out of fear of loss of competitiveness to slowly converging developing countries.

There has been no direct test of the Zarsky hypothesis and its predictions, Zarsky presents some indirect evidence that tends to support the hypothesis, at least in part:

- The proposed BTU tax in the US in 1993 was defeated on account of its perceived threat to US industry's international competitiveness despite the fact that (a) US energy prices are about one-half of those of the rest of OECD; (b) the estimated impact on even the energy intensive industries (aluminum, chemicals, fertilizers) was negligible (1-2 percent of the value of shipments); and (c) the economic and environmental benefits were assessed to be substantial in terms of deficit reduction, improved energy efficiency, decreased pollution and reduced dependence on foreign oil.
- The proposed EU-wide carbon/energy tax in the early 1990s was postponed indefinitely on the grounds that Japan, the US and other EU trading partners were not prepared to adopt similar measures. A similar greenhouse levy of on only $3 per ton of carbon was defeated in Australia in 1994 despite the exemption for transport fees and fossil fuel exports, and the estimated negligible impact on the other energy-intensive industries such as aluminum. The industry's contention that the perceived effects, however small, could drive investment away towards low-energy-cost countries carried the day.

- China, India, and many other developing and transitional economies which continue to subsidize fossil fuels and electricity to the order of 30-50 percent of the world prices are reluctant to remove these subsidies from fear of loss of competitiveness, despite the disappearance of the original rationale of these subsidies—the promotion of state-owned internal oriented industrial growth.

The implication of the Zarsky hypothesis is that nation-states face a prisoners dilemma with regard to environmental policy: pressures to compete for market and investments in a global economy compel them to pursue individual policies that result in lower pay-off than if they acted collectively. Cooperation and coordination of policy in internalizing environmental cost while recognizing the need for diversity would result in greater welfare for all countries. The absence of effective global governance or enforceable coordination condemns countries to a collectively suboptimal policy of premature and inefficient convergence to slowly improving environmental standards.

Yet there are counter-threads that tend to improve environmental performance even as environmental policy is caught in classic prisoners dilemma. Growing public environmental awareness and rapidly spreading information about industry's environmental performance, both spearheaded by the information technology, give rise to a global environmental ethic. Under pressure from communities, customer, shareholders and employees, industry self-regulation is advancing ahead of formal regulations. Furthermore, the pressures of competition compel firms to intensify their search for more efficient, resource-saving, waste-reducing technologies. Moreover, the cross-border flows of capital, commodities, people and ideas promote technological and managerial change—resources are better allocated, cleaner and more efficient technologies are disseminated and the environmental standards of worst performers are gradually pulled up. These trends are fully consistent with the Zarsky hypothesis that globalization makes markets, the drivers of environmental performance, at the same time as it tends to "paralyze" official environmental policy.

Managing the Process of Globalization to Protect the Environment and Enhance Sustainability

Countries and people have the potential to drive significant benefits from the globalization process but there is still the problem of realizing this potential. Too much attention has been paid to the economic benefits of globalization and not enough to the social and environmental implications. As a result, the promise and potential of globalization as a force of sustainable human development may not be realized. Furthermore, at the same time that globalization improves the prospects for economic growth worldwide, it may reduce the economic prospects in individual countries, sectors and communities. A variety of factors contribute to wide disparities both within nations and between nations:

- Lack of access to more efficient technologies
- Lack of access to capital
- Inadequate flexibility to respond to changes in market demand
- Inability to manage structural change
- Weak institutions and absence of effective safety nets.

To the extent that globalization marginalizes economies, sectors, and people, it results in poverty-induced resource depletion and environmental degradation, which lead to further human deprivation, disparity and dispowerment.

Globalization is likely to place significant stresses on the environment if perverse subsidies and other distortions are not removed and environmental costs fully internalized or if “social adjustment” policies are not in place to cushion economic dislocation and avert marginalization of the poor. Globalization, by driving a wedge between what is produced and what is consumed in any given locations, alters the distribution of environmental impacts and the costs of avoiding them within the current generation and between the current and future generations.

The environmental consequences of globalization differ from the economic effects both in time and space: (1) environmental impacts are more long-term, dynamic and cumulative and they are beset with uncertainty; we don’t really know what the long-term damages are; and (2)

environmental impacts involve both physical and non-physical spillovers that may or may not be transmitted through markets such as cross-border pollution, aesthetics, ethical or moral concerns of parties not involved in the transaction. Globalization generates international interest in what traditionally were considered purely domestic policies, since economic integration implies that trade and investment are now being affected by such policies. Globalization increasingly brings into conflict notions of national sovereignty over production processes with globally-oriented life-cycle perspectives, where consumers want to know the overall environmental impact of what they buy and consume.

In conclusion globalization brings with it potentially large benefits as well as risks. The challenge is to manage the process of globalization in such a way that it promotes environmental sustainability and equitable human development. The ability of nation-states to manage risks, inequalities and change is severely restricted by taxation constraints and the need to remain competitive. Hence, the traditional instruments of trade barriers and command and control regulations would not work because they would have unacceptably high costs in a globalized world and at the same time be less effective. To manage globalization in the interest of both people and the environment, it would be necessary to implement more efficient and innovative policies domestically and more effective global governance internationally.

National Policies

1. Accelerate democratization and institutional development to keep in pace with globalization
2. Increase accountability and transparency throughout the economy, and especially in the formulation and implementation of public policy
3. Channel more public investment to human capability formation
4. Preserve as much as possible of the autonomy of the state to exercise fiscal and monetary policies to achieve both macroeconomic stability and growth
5. Reform domestic policies that both distort trade and have negative environmental impacts (e.g. energy subsidies)
6. Correct existing market failures though efficient incentive systems (economic instruments) that internalize environmental costs, to avert their magnification by trade liberalization and economic integration.
7. Improve the effectiveness of environmental policy (benefit per dollar spent) through the involvement of businesses and local communities in monitoring and enforcement rather than relying on the state's limited budget and weak regulatory enforcement capacity. Instruments of empowerment include information disclosure in environmental performance of firms, and provision of training and other capacity building services to communities.
8. Institute social adjustment policies to cushion economic dislocation and avert the marginalization of the poor.

It must be recognized, however, that the autonomy of the state to act deliberately to protect the environment or to cushion the impact on the poor of structural or other changes brought about by globalization is limited by the need to compete in the global economy for capital, jobs and markets, on the one hand, and by the interest that competitors and trade partners take on the country's domestic environmental and social policies, on the other. Countries facing

financial crisis are further constrained by limitations imposed on their fiscal and monetary policy by creditors, the International Monetary Fund and the crisis itself.

International Policies

As we have seen, globalization constrains the state's unilateral management capacities and creates new imperatives for states to coordinate their domestic environmental policies as well as to cooperate in the management of the global commons. Without effective global governance (or effective multilateralism as Zarsky calls it) nation-states, subject to the pressures of globalization, drift towards a low-level environmental policy convergence that is insensitive to local ecological conditions and does not respect the diversity of preferences and priorities across and within nations. The challenge is to mobilize collective action among governments, firms and civil societies to overcome the gravity towards the sterile uniformity and inertia created by narrow competitiveness concerns and create a broader environmental policy framework, which will (a) recognize and allow for the diversity of environmental endowments and preferences; (b) raise the terms of environmental policy convergence; and (c) allow for continuous improvement in environmental performance. In such a framework policy coordination, harmonization and convergence would not be understood as homogenization or standardization of the objectives and instruments of environmental policy regardless of local circumstances, but a collective move towards sustainable development at different speeds depending on stage of development, environmental endowments, etc.

Unfortunately, the one international "body" entrusted with the responsibility of building a bridge between environmental and trade policy, WTO's Committee on Trade and Environment (CTE), did not focus on finding "a synergy between environment and trade as two equal policy objectives. Rather they have explored how to fit environmental concerns within the framework of existing trade regimes" (Ewing and Taresofsky, 1996). CTE saw its role as one of limiting unilateral state actions in the name of environmental protection in order to protect the trading system rather than one of a paradigm shift from a negative to a positive trade-environment relationship and a "collective responsibility to promote sustainable trade, investment and growth (Zarsky 1991). Rather than focusing on how trade rules can promote sustainable development CTE focussed narrowly on (a) whether there should be a "safe harbor" within WTO for trade-restricting measures included in multilateral environmental agreements (MEA); and (b) on whether eco-labelling schemes constitute non-tariff trade barriers. These issues are important as guidelines are urgently needed for both ecolabelling schemes and MEA negotiators but they cannot be resolved in isolation from other important issues in the interface of trade and environment and without an overarching framework of sustainable development in which both environment and trade are critically important and synergistic. As Zarsky (1997) put it, "first, the Organization [WTO] as a whole needs to affirm its commitment to a development agenda…Among other things, this would entail abandoning the idea that the primary goal of trade-environment diplomacy is to enhance the capacities of developed countries to restrict market access on environmental grounds (p. 41)."

Other unresolved issues besides MEA's and ecolabelling, central to the trade-environment relationship are: (1) non-product-related process and production methods (PPMs) for which WTO rules have come increasingly in conflict with globally-oriented product life-

cycle perspectives; and (2) the gradual removal of domestic policies such as energy, chemical and water subsidies that both distort trade and damage the environment; and (3) internalization of environmental costs.

The latter two issues, while domestic in nature and unilaterally beneficial are politically unpalatable because of concerns about loss of competitiveness, not unlike the concerns that limited unilateral trade liberalization and necessitated several rounds of trade negotiations and coordinated action, which culminated with the Uruguay Round. What is needed is a "Green Round" to coordinate joint action on the elimination of environmentally damaging subsidies and internationalization of environmental costs (with due recognition of diversity among countries). The question is whether WTO is up to the task of convening such a "Green Round" and coordinating the implementation of multilateral agreements on resource subsidies and internalization of environmental costs. WTO has thus far provided no evidence that is either prepared to view the trade-environment-relationship in a broader development context, or willing to address it in a more holistic manner.

A "Global Environment Organization" as called by Esty (1994) may be necessary to fill the gap which in its absence is now partially filled by regional groupings such as NAFTA, APEC, OECD and other, which attempt policy coordination among their members. That such regional initiatives are not a substitute for effective global governance and multilateralism can be seen from the now defunct efforts of OECD to negotiate a Multilateral Agreement on Investment (MAI) among is members. First, its main motivation was to promote foreign investor interests by reducing political risk and ensuring "national treatment" rather than to encourage investment for good environmental management and sustainable development. Second, it was met with suspicion by developing countries which viewed it as a run around WTO to conclude an agreement without their participation which, in letter, would bind only OECD members but in effect would apply to them as well. This gave rise to calls for exceptions to MAI provisions to protect the environment and ultimately for a much broader sustainable development investment agreement. Belated offers by OECD negotiators to include a "pollution haven" clause and to append environmental guidelines for multinationals did not constitute substitutes for effective policy coordination.

Clearly, private capital flows into developing countries, especially emerging markets, will continue to grow rapidly into the foreseeable future. The challenge is to attract more foreign investment into the poorer countries and to direct it to sustainable development activities. In this regards, Official Development Assistance (ODA) has a critical role to play in leveraging private capital flows, both directly and through encouragement of better policies (including prudent macroeconomic policies and outward-oriented trade policies) in the recipient countries. Governments can ensure through regulations, incentives, and voluntary agreements that new investment is directed towards sustainable goals or, at a minimum, it does not jeopardize environmental, social and long-term development goals.

At the multilateral level, there has been a clear trend since the early 1990s to take into account more consistently the environmental and social effects of projects. This is true of both the Multilateral Investment Guarantee Agency (MIGA) which guarantees funds to governments and the private sector to reduce risks, and the International Finance Corporation (IFC) that

provides loans, equity and other financial instruments to private sector in development. In cooperation with national governments, international organizations should support the monitoring and the development of a database for tracking the environmental impacts of foreign capital flows on environmental quality and sustainability.

With regard to technology, globalization can play a key role in generating and diffusing resource-saving and cleaner production technologies to developing countries but, for this to happen, several policy concerns must be resolved. First, the fact that developed countries dominate the generation of technological innovations, means that some of these technologies and their environmental features are ill-suited to the factor endowments, and economic and environmental circumstances of developing countries. Second, developing countries may lack the capacity to successfully absorb technological innovations, including those that aim to mitigate negative environmental impacts. It is, therefore, important that developing countries themselves develop their own institutional framework and capacity for adoption and adaptation of foreign technologies as well as for domestic generation of innovations (Johnstone 1997). Some domestic and foreign technological capacities tend to be complimentary than substitutable, domestic capacity should be coupled with removal of domestic barriers to diffusion of foreign technology, such as import tariffs on capital equipment, local content requirements, or foreign exchange restrictions. Lack of protection of intellectual property rights is another barrier to diffusion, since foreign firms may be concerned that transferring or licensing a technology may result in their losing their market advantage. Developing countries should undertake to increase their own capacity to assimilate transferred technology by fostering research and development, and improving their skills in negotiation and management with the aim to strengthen their intellectual property rights.

International policies also have an important bearing on technology transfer. While MEAs such as the Montreal Protocol and the Basel Convention provide for transfer of best available, environmentally safe technologies to developing countries, care must be taken so that the transferred technology reflects the economic and environmental conditions of the recipient country rather than those of the donor (Johnstone 1997). For this to happen, it is necessary to develop cooperation between donors and recipient in R & D related to environmental technologies. Tropical environments and materials differ fundamentally from temperate ones in ways that affect the effectiveness and efficiency of environmental technologies designed for temperate environments.

Finally, there is scope for governments to ease the terms of access to some cleaner production technologies for developing countries as a form of development assistance. Technologies, such as newly developed vaccines or clean coal technologies which benefit diversity, the environment and human health, could be made freely available to developing countries. Developed countries can soften the impacts of TRIPs on developing countries by specifying very liberal terms of protection for environmental and clean production innovations involving public financing.

There is a need for an Amendment or Understanding among WTO members that the rights of informal innovators are also protected and for a broader interpretation of TRIPs to include patents for land races and other products of traditional knowledge in exchange for a

commitment by the developing countries to preserve these varieties. There are many innovative ideas including granting of special status, such as free or concessional access or royalty sharing, to source communities for commercial products "derived" from traditional knowledge or products in traditional use. The Convention on Biological Diversity already provides that the benefits from commercial use of genetic resources should be shared with the country of origin in a "fair and equitable way."

Finally, with regard to the risks posed to the biodiversity of flora and fauna, any patent protection afforded to the genetically modified organisms under TRIPs must incorporate the highest standards of protection according to the "precautionary principle," which is fundamental to sustainable development.

In conclusion, the more integrated environmental and trade policies are, the more sustainable economic growth will be and the more globalization can be harnessed for the benefit of the environment. At a rather modest level, this integration may take the form of institutionalization of environmental issues in future bilateral, multilateral and regional trade agreements. At a more ambitious level, new institutions of more effective and equitable global governance can be created to bring together governments, the private sector and civil society in a dialogue to achieve consensus for action in dealing with globalization-induced volatility, inequality and threats to environmental sustainability.

APPENDIX

Table A.1: Selected Multilateral Environmental Agreements with Possible Trade Impacts

Major Global Environmental Agreements with Major Trade Impacts

Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 29 December 1972

Convention on International Trade in Endangered Species, 3 March 1973

Vienna Convention for the Protection of the Ozone Layer, 22 March 1985

Montreal Protocol on Substances that Deplete the Ozone Layer, 16 September 1987

Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, 22 March 1989

United Nations Framework Convention on Climate Change, 9 May 1992

Convention on Biological Diversity, 5 June 1992

Global Commodity/ Environmental Agreements with Trade Impacts

Treaty for the Preservation and Protection of Fur Seals, 7 July 1911

ILO Convention (#13) concern-ing the Use of White Lead in Painting, 25 October 1921

FAO Agreement for the Establishment of the Indo-Pacific Fisheries Commission, 26 February 1948 (amended and super-seded 20 January 1961)

Washington International Convention for the North-West Atlantic Fisheries, 8 February 1949

Washington Convention for the Establishment of an Inter-American Tropical Tuna Commission, 31 May 1949

Paris International Convention for the Protection of Birds, 18 October 1950

FAO International Plant Protection Convention, 6 December 1951

Tokyo International Convention for the High Seas Fisheries of the North Pacific Ocean, 9 May 1952

Washington International Convention for the Regulation of Whaling and 1956 Protocol, 10 November 1948; Protocol, 4 May 1959

Convention on Fishing and Conservation of the Living Resources of the High Seas, 29 April 1958

London North-East Atlantic Fisheries Convention, 24 January 1959

Varna Convention concern-ing Fishing in the Black Sea (as amended 30 June 1965), 7 July 1959

Paris International Convention on the Protection of New Varie-ties of Plants, 2 December 1961

Rio de Janeiro International Convention for the Conservation of Atlantic Tunas, 14 May 1966

Phyto-sanitary Convention for Africa South of the Sahara, 13 September 1968

FAO Convention on the Conservation of the Living Resources of the South-East Atlantic, 23 October 1969

Canberra Convention on the Conservation of Antarctic Marine Living Resources, 20 May 1980

International Tropical Timber Agreement, 18 November 1983

Reykjavik Convention for the Conservation of Salmon in the North Atlantic Ocean

Pacific Islands Regional Fisheries Treaty, 2 April 1987

Convention for the Establish-ment of a Latin American Tuna Organization, 1989

Wellington Convention on the Prohibition of Driftnet Fishing in the South Pacific, 24 November 1989

Table A.1: Selected Multilateral Environmental Agreements with Possible Trade Impacts (cont'd)

Other Global Environmental Agreements

Paris International Convention for the Protection of Birds, 18 October 1950

International Convention for the Prevention of Pollution of the Sea by Oil, 12 May 1954

Brussels International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 29 November 1969

Brussels International Convention on Civil Liability for Oil Pollution Damage, 29 November 1969

Ramsar Convention on Wetlands of International Importance, Especially as Waterfowl Habitat, 2 February 1971

World Heritage

Bonn Convention on the Conservation of Migratory Species of Wild Animals, 23 June 1979 Convention on Desertification

Other Multilateral Environmental Agreements with Trade Impacts

European Convention for the Protection of Animals During International Transport, 13 December 1968

Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 29 December 1972

Convention on International Trade in Endangered Species, 3 March 1973

London International Convention for the Prevention of Pollution from Ships (MARPOL), 2 November 1973

European Convention for the Protection of Animals kept for Farming Purposes, 10 March 1976

Bonn Convention for the Protection of the Rhine River against Pollution by Chlorides, 3 December 1976

European Convention for the Protection of Animals for Slaughter, 10 May 1979

European Convention for the Protection of Animals Used for Experimental and Other Scientific Purposes, 18 March 1986

European Convention for the Protection of Pet Animals, 13 November 1987

Bamako Convention on the Ban of Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa, 30 January 1991

Other Multilateral Environmental Agreements

London Convention for the Protection of Wild Animals, Birds and Fish in Africa, 19 May 1900

Washington Convention on Nature Protection and Wildlife Preservation in the Western Hemisphere, 12 October 1940

Berne Convention on the International Commission for the Protection of the Rhine against Pollution, 29 April 1963

Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft (Oslo Convention), 15 February 1972

Helsinki Convention for the Protection of the Marine Environment of the Baltic Sea Area, 22 March 1974

Paris Convention for the Prevention of Marine Pollution from Land-Based Sources, 4 June 1974

Barcelona Convention for the Protection of the Mediterranean Sea against Pollution, 16 February 1976

Apia Convention on the Conservation of Nature in the South Pacific, 12 June 1976 Kuwait Regional

Convention for Co-opera-tion on the Protection of the Marine Environment from Pollution, 24 April 1978

ECE Convention on Long Range Transboundary Air Pollution, 13 November 1979

Abidjan Convention for Co-operation in the Protection and Development of the Marine and Coastal Environment of the West and Central African Region, 23 March 1981

Table A.1: Selected Multilateral Environmental Agreements with Possible Trade Impacts (cont'd)

Other Global Environmental Agreements (cont'd)

Lima Convention for the Protection of the Marine Environment and Coastal Area of the South-East Pacific, 12 November 1981

Jeddah Regional Convention for the Conservation of the Red Sea and Gulf of Aden Environment, 14 February 1982

Cartagena Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region, 24 March 1983

Nairobi Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region, 21 June 1985

Noumea Convention for the Protection of the Natural Resources and Environment of the South Pacific Region, 25 November 1986

Voluntary International Environmental Agreements with Trade Impacts

ISO 9,000

ISO 14,000

Source: von Moltke, Konrad. "International Environmental Management, Trade Regimes and Sustainability." Paper prepared for the International Institute for Sustainable Development Winnipeg, Manitoba, Canada, January 1996

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