

CHAPTER 43

ENVIRONMENTAL ISSUES

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I. Introduction

What role does the World Trade Organization play in efforts to safeguard the environment? What role *should* it play? Environmental groups and green-leaning governments have come to view the WTO, with its large membership and its relative success in achieving a rules-based international regime, as the prime candidate for international arbiter on environmental issues. However, many proponents of expanded global trade, and especially policy makers in developing countries, are skeptical about an expanded role for the WTO in maintaining environmental standards. They fear that WTO-approved trade sanctions may be used to enforce adherence to environmental norms not necessarily shared by or appropriate for all nations, and that environmental protection may in practice translate into a fresh justification for old-fashioned protectionism.

Although the word “environment” itself appears nowhere in the original articles of the General Agreement on Tariffs on Trade, Article XX allows broad exceptions for environmental policies that would otherwise constitute violations of GATT principles:

[N]othing in this Agreement shall be construed to prevent the adoption or enforcement by any contracting party of measures . . . necessary to protect human, animal or plant life or health . . . [or] . . . relating to the conservation of exhaustible natural resources. . . .

But Article XX also specifies that application of such measures must not constitute “a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail, or a disguised restriction on international trade. . . .”¹ Much of the recent controversy over the WTO’s appropriate role in achieving environmental objectives centers on application of Article XX, and thus at least implicitly on the weight that should be given to efficiency gains from expanding international trade relative to health and welfare benefits from raising environmental quality. This trade-off lies at the very heart of the controversy. Seen from the perspective of the WTO’s intended role as champion of open international markets, Article XX offers potential green cover for protectionist-inspired national policies.² Yet environmentalists regard the scope of Article XX as unduly narrow, preserving only very limited and circumscribed national sovereignty with respect to environmental initiatives.

This chapter begins by laying out the set of linkages and policy issues now collectively termed “trade and environment,” and then examines the role of the GATT and WTO in these areas (Part II). Part III focuses on relevant innovations made in the Uruguay Round. Part IV reviews recent economic analysis and empirical findings on the trade-environment nexus. The remainder of the chapter discusses the most important “unfinished business” in this area (Part V) as well as some policy conclusions (Part VI).

¹ As detailed in Part III of this chapter, the Uruguay Round negotiations supplemented Article XX by providing similar exemptions for policies affecting trade in services and in new agreements on agriculture, product standards, intellectual property rights, and subsidies.

² Writing from the perspective of international economics, we use *protection* (protectionist/protectionism) in reference to policy measures intended to shield domestic producers from foreign competition. Such policies create benefits for the shielded sector but usually inflict a net loss on the country as a whole. Thus, international economists almost always favor less protection, and this is also the main goal of the GATT/WTO system. But environmentalists want *more* protection—of the environment. As has been observed, this difference in the use of language can itself be a source of confusion in the trade-environment area: “the word ‘protection’ warms the hearts of environmentalists but sends chills down the spines of free traders.” DANIEL C. ESTY, GREENING THE GATT: TRADE, ENVIRONMENT, AND THE FUTURE 36 (1994).

II. Background

In the 1990s, heightened public interest in environmental issues led to a rapid “greening” of regional and multilateral negotiations on trade. Although environmental and conservation lobbies in the United States and most other advanced countries had begun to mobilize at least two decades earlier, their agenda until the 1990s was largely domestic. For the United States, the shift in focus toward trade issues started with the North American Free Trade Agreement (“NAFTA”) and the *Tuna-Dolphin* case³ in the GATT, discussed below.⁴

International economic theory has traditionally been constructed around a single policy objective: maximization of national welfare. In practice, this almost always means maximization of national income as conventionally measured, i.e., without any attempt to include the estimated cost of environmental damage or benefit of environmental cleanup. Trade is accordingly viewed as beneficial largely to the extent that it raises national income. Environmental issues, along with such other politically salient considerations as income distribution and national defense, are seen as only tangentially related to trade. Until the mid-1990s, few texts on international economics even raised the possibility that trade might have significant environment effects or that trade policies might be used to achieve environmental objectives.⁵ In his influential treatment of the “scientific” tariff, Harry Johnson refers collectively to these other considerations as *non-economic* objectives of protection, i.e., objectives apart from maximization of national income.⁶ Bhagwati and Srinivasan demonstrate that trade policy is rarely if ever the most efficient way—the one entailing least sacrifice of national income—to achieve such goals. Trade policy is thus regarded as a “second-best” means to achieve environmental objectives.⁷ A study prepared for the 1999 Seattle WTO ministerial reiterates this conclusion: “Trade barriers are poor environmental policies.”⁸ In practice, however, it has become increasingly difficult to justify exclusion of environmental issues from negotiations on trade.⁹

For the United States, the environmental side-agreement appended to the North American Free Trade Agreement in 1992 set the precedent for linking environmental safeguards to trade liberalization. At the international level, given the absence of a

³ Report of the GATT Panel (unadopted), *United States—Restrictions on Imports of Tuna*, BISD 39 S/155 (1991).

⁴ I.M. Destler and Peter J. Balint, *THE NEW POLITICS OF AMERICAN TRADE: TRADE, LABOR, AND THE ENVIRONMENT*, Chapter 3 (1999).

⁵ More recently, however, authors have been making up for lost time. The first edition of Charles Kindleberger’s classic textbook (Charles P. Kindleberger, *INTERNATIONAL ECONOMICS* (1953)) omits any mention of environmental concerns; a recent update (Thomas A. Pugel and Peter H. Lindert, *INTERNATIONAL ECONOMICS* (2000)) includes an entire chapter on the subject.

⁶ Harry G. Johnson, *The Cost of Protection and the Scientific Tariff*, 68(4) *JOURNAL OF POLITICAL ECONOMY* 327 (1960).

⁷ Jagdish N. Bhagwati and T. N. Srinivasan, *Domestic Distortions, Tariffs, and the Theory of the Optimum Subsidy*, 71(1) *JOURNAL OF POLITICAL ECONOMY* 44 (1963).

⁸ Håkan Nordström and Scott Vaughan, *TRADE AND ENVIRONMENT* 3 (1999).

⁹ Labor and environmental concerns often appear in tandem as twin threats posed by globalization. Although the International Labor Organization could in principle be the lead forum for labor issues, no comparable general-purpose organization exists in the area of environment. Individual environmental issues ranging from the ozone layer to wildlife have given rise to over two hundred free-standing multilateral environmental agreements, with signatories ranging from a handful to one hundred or more in number.

parallel organization dedicated to environmental protection,¹⁰ the WTO, with its inclusive membership and built-in mechanism for dispute resolution on trade matters, has emerged as an obvious candidate for resolving disputes on environmental issues as well.

Potential conflict between trade expansion and environmental protection became the stuff of headlines in November 1999, when environmental activists and other opponents of globalization combined forces to disrupt the WTO ministerial meeting in Seattle. Subsequent lobbying efforts, together with some rulings perceived as anti-environment emanating from WTO panels, helped to keep the trade-environment issue constantly before the public. Environmental issues have thus gained some legitimacy as an element of global trade diplomacy. Indeed, it has become almost essential from the standpoint of political viability for any new trade agreement to include environmental safeguards. Likewise, environmental non-governmental organizations (“NGOs”) have gained official standing in the WTO and other international forums.¹¹

Yet many economists and trade officials remain unconvinced of the benefits from systematic linkage of environmental and trade issues or from opening trade negotiations to NGO participation. So far there is no international consensus on environmental goals or on the value to be placed on achieving any specific goal. Some analysts even reject the whole notion of a trade-off, arguing that, especially in the longer run, the goals of trade expansion and environmental protection are largely complementary; the higher per-capita incomes brought about by expanded trade raise both the ability and the willingness to make environmental investments.¹² The free-trade-oriented *Economist* makes this case in an editorial, “Why Greens Should Love Trade” (October 9, 1999), timed to appear a few weeks before the Seattle WTO ministerial. Yet most participants in the debate acknowledge that pollution abatement and similar policies do typically entail a trade-off, the terms of which will necessarily vary across countries because of diversity in ecological conditions, per-capita income, and even social conditions.¹³

Thus, differences in income, climate, population density, preferences, and other relevant conditions are an obvious source of tension in any effort to protect global commons (oceans, ozone layer, biodiversity). However, even in the cases where economic activity has little or no effect outside a single country’s borders, nations seeking to maintain the highest environmental standards have strong motives to induce or even require other

¹⁰ Some important environmental issues involve global commons and cannot be treated adequately without broad international cooperation. See Esty, *supra* note 2, and Daniel C. Esty, *Greening World Trade*, in THE WORLD TRADING SYSTEM: CHALLENGES AHEAD (Jeffrey J. Schott ed. 1996) on the case for a Global Environmental Organization and John Whalley and Ben Zissimos, *An Internalisation-based World Environmental Organisation*, 25(5) THE WORLD ECONOMY 619 (2002) on an internalization-based World Environmental Organization. In Part VI of this chapter we consider obstacles a global environmental organization would face.

¹¹ Sylvia Ostry, *The WTO After Seattle*, paper prepared for presentation at the AMERICAN ECONOMIC ASSOCIATION ANNUAL MEETING (January 2001).

¹² A few economists, notably Michael Porter, adhere to the even more optimistic position that stringent environmental policies can actually promote economic growth and international competitiveness by stimulating innovation (Michael E. Porter and Claas van der Linde, *Toward a New Conception of the Environment-Competitiveness Relationship*, 9(4) JOURNAL OF ECONOMIC PERSPECTIVES 97 (1995)). Other empirical researchers remain unconvinced, however. Brian Copeland and M. Scott Taylor, in *Trade, Growth and the Environment*, 42(1) JOURNAL OF ECONOMIC LITERATURE (2004), speculate that the occasional positive relationship between trade competitiveness and pollution abatement expenditures merely reflects that both variables are endogenous.

¹³ Moreover, ex-post remediation of the kind that has been carried out in most of the industrialized countries is likely to be far costlier than preventive action. Thus, global efficiency could well be served by measures to encourage early environmental cleanup in developing countries, an issue to which we return in Part V.

nations to do likewise. U.S. measures to protect dolphins in extraterritorial waters are sometimes justified in terms of “psychological spillovers,” conveying the idea that U.S. residents can indeed be harmed by events occurring entirely outside their borders. Esty defends trade policy in aid of extraterritorial environmental goals on the ground that “trade, like any realm of human endeavor, cannot exist without baseline rules, defined by community standards and values.”¹⁴ As precedent he cites nineteenth-century British qualms about trade with slave-holding American states. Another justification for international action concerns environmental damage in countries without representative democracy. In such cases, there is less basis for assuming that national standards reflect the preferences of domestic residents.

A final obstacle to international consensus on measures to protect the environment is the lack of a well-developed understanding of many key issues at the trade-environment interface. The underlying environmental science itself remains incomplete in some highly contentious areas, notably global warming.¹⁵ Likewise, economic theory and empirical evidence concerning the trade-environment link can so far offer only limited guidance for policy making.¹⁶ Meanwhile, the trade-environment agenda continues to be broadened to include complex new concerns such as bioengineering, where scientific investigation is only in its infancy.

A. Environmental Issues in the GATT and the WTO

Notwithstanding the extraordinary publicity surrounding the Seattle demonstrations, the proposition that environmental concerns should be addressed internationally along with trade policies was far from new in 1999. “Trade and environment” issues first came to prominence almost three decades earlier. In 1971 the GATT established a Group on Environmental Measures and International Trade, intended as “a standby machinery which would be ready to act, at the request of a contracting party, when the need arose.”¹⁷ The United Nations Conference on the Human Environment, held in Stockholm in 1972, highlighted the possibility that strong environmental policies could undermine the international competitiveness of a country’s industries. While the danger that competitiveness concerns might promote a “race to the bottom” or at least discourage adoption of stronger environmental protection—“regulatory chill”—remains a core issue today, the trade and environment agenda has broadened over the years. In addition to the traditional and still pressing concerns of air and water pollution, negotiations may now include such topics

¹⁴ Daniel C. Esty, *Bridging the Trade-Environment Divide*, 15(3) JOURNAL OF ECONOMIC PERSPECTIVES 123 (2001).

¹⁵ Article 5:7 of the Uruguay Round Agreement on Sanitary and Phytosanitary Measures requires a scientific basis for national product standards but also recognizes a “precautionary principle” where relevant scientific research evidence is considered insufficient. However, there is disagreement among members as to the legal status of the precautionary principle. While some, notably the European Union, would like to see the principle strengthened, others are concerned that precaution might be over-used in order to implement otherwise unjustifiable protection.

¹⁶ Copeland and Taylor, *supra* note 12.

¹⁷ Nordström and Vaughan, *supra* note 8. The first activation came nearly twenty years later, just prior to the Uruguay Round, at the request of the countries from the European Free Trade Area. The main environmental issue raised in the intervening years related to trade of domestically prohibited goods. Such goods included pharmaceuticals and pesticides whose sale in the exporting country’s domestic market was no longer permitted due to health or environmental concerns, as well as radioactive or other hazardous waste materials.

as depletion of natural resources, use of hormones to promote cattle growth,¹⁸ reduction of biodiversity, and genetic modification of plants and animals. Moreover, these newer aspects of the trade-environment interface have become increasingly contentious, despite—or perhaps because of—the lack of a firm scientific basis for collective action.

Environmental issues had moved into the mainstream of the GATT by April 1994, when ministers from more than one hundred countries met in Marrakesh to conclude the Uruguay Round of multilateral trade negotiations. Negotiators agreed to establish a Committee on Trade and Environment within the new WTO. Moreover, the preamble to the agreement establishing the WTO describes its mandate as “expanding the production and trade in goods and services, while allowing for the optimal use of the world’s resources in accordance with the objective of sustainable development . . . in a manner consistent with respective needs and concerns at different levels of economic development.”

B. The Content of “Trade and Environment”

Recent conflicts between free traders and environmentalists¹⁹ reflect several types of linkages and associated issues at the interface between trade and environment policies. From the environmentalist perspective, there are at least four distinct concerns. The first is that expansion of trade may produce environmental damage, either directly, if new export opportunities encourage polluting industries to expand their operations and/or increase pollution associated with transport of goods, or indirectly, as conventional gains from trade raise national incomes and consumption. A related second concern is that some countries will use weaker environmental protection as a way of increasing their international competitiveness. A third issue is that individual countries seeking to maintain high environmental standards may be restrained by GATT/WTO rules from using trade policy for this purpose. Finally, GATT/WTO rules may inhibit international cooperation to reduce environmental threats by restricting the use of trade sanctions to enforce multilateral environmental agreements.

For their part, free traders fear that a coalition of environmentalists and protectionists could reverse decades of progress toward open international markets. Such a coalition could block poor nations from pursuing economic development via export expansion. From the perspective of those who wish to promote trade, there are at least two distinct concerns. First, WTO-sanctioned trade barriers designed to achieve environmental goals may become instruments of “eco-imperialism,” permitting richer and greener countries to force their own preferred norms on countries with lower incomes and different priorities. Second, allowing trade restrictions in aid of environmental goals provides yet another loophole for garden-variety protectionism. The active participation of U.S. labor unions in anti-WTO protests on environmental grounds adds weight to this concern.

Of these diverse issues, the first (possible environmental damage resulting from expansion of trade) relates directly to the WTO’s central objective of achieving and maintaining open global trade, and thus poses a key question in the trade-environment debate: Could trade expansion cause enough environmental damage to offset completely the resulting

¹⁸ European Union restrictions on imports of beef raised using hormones have already given rise to a WTO trade dispute. See Report of the Appellate Body, *European Communities—Measures Concerning Meat and Meat Products (Hormones)*, WT/DS26/AB/R and WT/DS48/AB/R (1998).

¹⁹ Following Esty, *supra* note 2, at 3, we simplify the exposition by using these terms to describe the two sides in the ongoing debate. We thus largely ignore differences in goals within each camp and also that many participants in each camp agree at least in principle on the need to balance environmental and narrowly economic objectives.

gains in national incomes? The other issues are linked to current or potential WTO rules specifying environmental exceptions to basic WTO principles. Below we discuss each area in turn. In Part III of this chapter, we highlight relevant changes in GATT/WTO rules negotiated in the Uruguay Round, while in Part IV we look more closely at recent contributions to economic theory and supporting empirical evidence.

1. *Trade as a Threat to Environmental Quality*

Many environmentalists view expanded trade (globalization) as a threat to environmental quality. The threat is perceived to arise through one or both of two channels. The first and more direct channel is the effect of trade expansion on the composition of output in each country.²⁰ Specifically, freer trade may increase the ability of dirty industries to expand where environmental regulation—or enforcement of environmental standards—is relatively weak. This relocation of dirty production to less-regulated sites is presumed to increase pollution²¹ in exporting countries and worldwide.²² As discussed in Part IV of this chapter, the relevance of this channel depends on the assumption that environmental regulation is an important component of total production cost, i.e., that countries with the lowest environmental standards are therefore likely to have comparative advantage in dirty industries. To the extent that increased trade means that goods travel longer distances to markets, pollution associated with transport may also rise.

A second and less direct channel through which globalization itself may affect the environment arises through the usually favorable net impact of expanded trade on economic growth and per-capita income. If environmental externalities such as pollution are roughly proportional to output, higher output necessarily translates into higher total pollution.²³ However, other effects work in the opposite direction. First, the social demand for clean air and water tends to rise with per-capita income. In economic terminology, environmental quality has a high income-elasticity; it is a “superior” good. As nations grow more prosperous, their leaders tend to adopt stronger environmental policies.²⁴ Moreover, globalization improves nations’ access to advanced technologies to implement these policies. Both of these changes are expected to have a favorable impact on technique, i.e., to reduce environmental damage per unit of output. Finally, growth

²⁰ As further discussed in Part IV of this chapter, the environmental impact of growth or trade can be partitioned conceptually into three distinct components: effects on the *composition* of output (relatively less or more production by dirty industries), on the *technique* of production (relatively less or more environmental damage per unit of output produced), and on the overall *scale* of production (a proportional increase in associated damage).

²¹ For expository concreteness, environmental damage is discussed here and in much of what follows as pollution that results from production. Part V of this chapter briefly discusses other types of environmental damage.

²² The effect of expanded trade on the environment depends critically on the particular form of pollution controls as well as whether a particular location has high or low standards. When pollution is regulated entirely by quantity restrictions such as emissions permits, and this quantity limit remains unchanged, expansion of dirty industries will result in an increased value of permits, and thus in cost to producers per unit of emissions; total environmental damage will not rise (Copeland and Taylor, *supra* note 12).

²³ Use of power and associated emissions are considered to be roughly proportional to output. On the other hand, poverty can itself contribute to some types of environmental deterioration, such as deforestation and water pollution.

²⁴ The process is far from automatic, however, and clearly depends on the form of the political system. Steve Charnovitz, *World Trade and the Environment: A Review of the New WTO Report* (2000), available at <<http://www.gets.org/pages/steve.charnovitz.cfm>> (accessed 29 July 2002), argues that the link is stronger in democratic societies. The environmental record in Eastern Europe and the Soviet Union in the decades prior to transition offers indirect evidence.

usually changes the composition as well as the scale of economic activity. Because the proportion of income spent on services tends to rise with per-capita income, the resulting change in the composition of output would be expected to reduce environmental damage per unit of aggregate output even if each individual good and service continued to be produced with unchanged technique. The observed net effect of all these changes,²⁵ termed the environmental Kuznets curve (“EKC”), often shows total pollution (of a specific type) rising with income at low per-capita income levels but then falling as income rises further. Theoretical and empirical analysis of the relationship between growth and environmental quality is reviewed below in Part IV.

2. *Environmental Policies as a Determinant of International Competitiveness*

National environmental policies typically affect production costs. Although the size of the effect is subject to debate, differences in national environmental policies or in the vigor of enforcement efforts at least potentially constitute one determinant of comparative advantage. Absent differences in technology or relative factor abundance, low-standard countries would have comparative advantage in dirty industries. Environmentalists accordingly fear that lower-income countries will become “pollution havens” due to their willingness to put economic growth ahead of environmental safeguards. A separate but related concern is that nations will compete for global markets and foreign direct investment by reducing environmental standards (race to the bottom) or will be reluctant to raise standards unilaterally due to competitiveness concerns (regulatory chill).

Although both situations reflect the potential role of environmental standards as a source of comparative advantage, the two differ in their implications for efficiency and welfare. Trade based on differences in preferred standards, i.e., the existence of pollution havens, does not necessarily imply economic inefficiency.²⁶ In contrast, competition for markets through strategic lowering of standards may result in a “prisoners’ dilemma” situation. In such a case, although every country might prefer a high-standard regime to a low-standard regime, without international cooperation each country expects to gain from choosing a low standard (in the language of game theory, choosing a low standard represents a dominant strategy for each player in a non-cooperative game). The result without cooperation is a global low standard rather than the high standard all nations would prefer. In this case—but not where differences in standards reflect differences in national preferences—international coordination of standards could raise global efficiency.

Available data, mainly for the United States, show that the *average* cost associated with meeting environmental regulations constitutes a small fraction of total production cost, suggesting that concerns about the role of low environmental standards as a determinant of production location may be overstated.²⁷ Yet average costs do not tell the whole story. Because compliance costs are much higher for certain “dirty” industries, the possibility remains that differences in environmental policies could have a significant effect on trade and FDI in at least a few sectors where abatement costs are especially high.

Many environmentalists, along with their protectionist anti-globalization allies, favor a policy remedy for competing imports that appear to be driven by significant differences

²⁵ These are respectively the *scale*, *technique*, and *composition* effects of growth on environmental damage as defined in footnote 20, *supra*.

²⁶ Copeland and Taylor, *supra* note 12. Even in the absence of trade, a country might prefer a low standard. In this case, the concern is clearly not international competitiveness but, rather, that the cost of compliance with a higher standard is perceived to exceed the benefit.

²⁷ Nordström and Vaughan, *supra*, note 8, at 36–38.

in environmental standards—what they term *environmental dumping* or *eco-dumping*. In the context of the WTO, the remedy could take the form of required harmonization of environmental standards across countries,²⁸ possibly encouraged or reinforced by allowing high-standard nations to apply anti-dumping and/or countervailing duties to imports whose low cost is due in part to weak environmental protection.²⁹ Free traders, familiar with the widespread abuse of conventional anti-dumping duties, strongly oppose introducing a major new device that is likely to be captured by protectionist forces.

3. GATT/WTO Restraints on National Environmental Protection

While some countries may opt for lower standards for reasons of income, tastes, or geography, others may reduce, or fail to raise, environmental safeguards in order to enhance trade competitiveness. In either case, any effect on trade is due to a *difference* in standards across countries; if two countries were to simultaneously impose equivalent increases or decreases, the effect on comparative advantage would be minimal.³⁰ However, if one country desires a higher standard while a second does not, required upward harmonization in effect forces the second country to bear part of the cost of achieving the first country's target. Thus, one element in the debate on harmonization of environmental standards is essentially about who should bear the economic cost of achieving higher national standards.³¹ Developing countries with lower per-capita incomes are understandably suspicious that rich countries favoring high environmental standards may seek to shift part of the cost onto their lower-standard trading partners. The "polluter pays" principle, integral to domestic market-based solutions to environmental spillovers, is likely to be problematic among sovereign nations with very different levels of per-capita income, i.e., with significant differences in willingness and *ability* to pay. A central problem for the international community is to find efficient means of improving global environmental performance without inflicting unacceptable costs on poorer nations in the process.³² We return to this issue in Part V of this chapter.

A closely linked issue is the WTO position on national policies to achieve environmental goals. As noted above, the use of trade policy to achieve environmental objectives is, in economic terminology, almost always second-best. At least in theory, there is a more direct policy that can achieve the same objective at lower cost in terms of foregone national income. For example, suppose that logging in a particular area causes destruction of species habitat (a *negative externality*, in economic terminology). To reduce environmental damage to the socially optimal level, the government could levy a tax on

²⁸ Jagdish N. Bhagwati and T.N. Srinivasan, *Trade and the Environment: Does Environmental Diversity Detract from the Case for Free Trade?* in FAIR TRADE AND HARMONIZATION—VOLUME 1: ECONOMIC ANALYSIS 161 (Jagdish N. Bhagwati and Robert Hudec eds. 1996), argue that such harmonization is seldom optimal from the perspective of global welfare.

²⁹ Environmental groups such as the Sierra Club intervened in the most recent battle between the United States and Canada in the longstanding conflict over Canada's alleged low stumpage fees for loggers operating on government-owned land. However, environmental concerns were not at the heart of the legal case. Indeed, these concerns were not even discussed in the U.S. Commerce Department's final decision in 2002, which resulted in the imposition of a substantial countervailing duty. For details, see *Certain Softwood Lumber Products From Canada*, 67 FR 15545 (April 2, 2002). Canada subsequently appealed the U.S. decision to the WTO and to a NAFTA panel.

³⁰ Even with identical standards and enforcement, industries in the two countries could experience differences in compliance costs for a variety of reasons, such as differences in geography, technology, or cost of capital.

³¹ Here we are concerned with purely local environmental issues. In this case the only "spillover" across borders is in costs associated with compliance. As discussed in Part IV, the situation is more complex with transboundary effects.

³² Bhagwati and Srinivasan, *supra* note 28, at 199.

logs (from a specific source) equal to the dollar value of the negative external effect, i.e., equal to the *additional* cost to the rest of society that logging companies would otherwise disregard in their business decisions. The tax “internalizes the externality,” causing loggers to choose on the basis of social rather than private cost of logging. Alternatively, the government could impose quantitative limits on logging in the relevant area (e.g., using transferable logging permits that in equilibrium would increase loggers’ cost per log by the same dollar amount as the tax). These policies are both first-best in that they address the problem at its source. In principle they are equivalent, although in practice one is likely to be preferable in terms of cost of implementation and enforcement or political acceptability.

Trade policy offers another way to reduce the damage from logging. Assuming that the country is a log exporter, an export tax or equivalent export quota would lower the net price received by domestic loggers and thus reduce domestic logging, just as with the logging tax or permit requirement. However, an export tax would also lower the price paid by domestic purchasers, thus encouraging inefficiently *high* domestic use of logs in construction or manufacturing.³³ For this reason, the trade approach is considered a second-best means of reducing environmental damage from logging. Like the optimal policy, the second-best policy reduces the negative externality from domestic logging. But at the same time it introduces a new inefficiency from excessive domestic use. Only precise measurement can show whether the net effect on social welfare is positive rather than negative—overall welfare may fall even when the reduced logging and associated reduction in environmental damage is taken into account. The same effects, and the same ambiguity regarding the overall effect on welfare, would occur if trade were restricted by importers rather than exporters.

A special case arises when the relevant activity occurs in an exporting country that is unwilling and/or unable to implement the first-best policy.³⁴ In this case, other countries may act to reduce the damage (e.g., destruction of fragile rain forest and associated loss of biodiversity) by limiting their own imports of the logs and products made from them, or by requiring eco-labeling to allow consumers to choose goods whose production is less environmentally damaging. In 2001, Brazil banned virtually all mahogany exports after finding that the most of the wood was being harvested illegally on public and Indian land.³⁵ Brazil claimed that trade restrictions were necessary to reduce profits from illegal logging and thus preserve the Amazon rainforest.

An example of second-best policy carried out by importing countries is the collective action taken since the 1960s by members of the Conference on International Trade in Endangered Species (“CITES”).³⁶ Here the first-best policy would be to restrict killing and/or sale of endangered species. However, this policy can only be applied in the exporting countries, which have largely been unable to enforce such restrictions. CITES members have therefore adopted the second-best approach of prohibiting imports of endangered species.

Article XX of the GATT clearly allows second-best policies to achieve environmental objectives even though they restrict trade, but two high-profile cases have underscored

³³ In the longer run, second-best export restrictions on wood and wood products also create an incentive for conversion of forested lands to more profitable uses, usually agriculture (Esty, *supra* note 2, at 189).

³⁴ Charnovitz, *supra* note 24.

³⁵ Jonathan Karp and Miriam Jordan, *U.S. Ports Hold On to Brazilian Mahogany*, THE WALL STREET JOURNAL (March 29, 2002).

³⁶ For details on membership and structure of CITES, see <<http://www.cites.org/index.html>> (accessed 15 July 2002).

important GATT/WTO limits on their application. The *Tuna-Dolphin* case arose over the incidental drowning of dolphins—large marine mammals—in fishing for tuna with purse-seine nets. Beginning in 1972, the United States applied a number of non-trade-policy measures, including dolphin-safe net requirements for U.S. ships and all ships in U.S. waters, voluntary labeling of dolphin-safe tuna, and government pressure on major U.S. canners to eschew purchases of dolphin-unsafe tuna. Although these measures had already reduced estimated mortality from about 130,000 dolphins in 1986 to just 25,000 by 1991,³⁷ the United States nonetheless imposed a ban on tuna imports from Mexico and four other countries. Mexico's immediate protest to the GATT was ultimately upheld, mainly over the principle that imports cannot be restricted solely on the basis of exporters' process and production methods ("PPMs").³⁸

Ignoring its exact legal basis, environmentalists cite the decision as evidence that GATT/WTO rules and their application are inherently anti-environment.³⁹ Still, the logic of the *Tuna-Dolphin* decision implies limits on the ability of one country to restrict trade as a means to influence the environmental standards of other countries.⁴⁰ To those who see trade mainly as a potential lever for achieving environmental or other types of non-economic objectives rather than as a means to raise allocative efficiency and national incomes, the outcome was surely a disappointment. Activists subsequently began to target the PPM issue, arguing that exclusion of goods based on PPMs is not inconsistent with GATT principles, as is usually claimed.

The *Shrimp-Turtle* case⁴¹ presents issues similar to those in *Tuna-Dolphin*, but with one critical difference: the sea turtles trapped by shrimp fishers are an endangered species. A U.S. prohibition on shrimp imports from countries without adequate (in the eyes of U.S. authorities) sea turtle safeguards was successfully contested in the WTO by four Asian countries. The WTO's Appellate Body ("AB") upheld the initial ruling in 1998 but on much narrower grounds.⁴² While the panel decision held that import bans of this type could not be justified, the AB found fault only with U.S. administrative procedures rather than with the import restriction itself. In particular, the four countries that initiated the case were subject to far harsher treatment than certain other countries. The United States won a final appeal in 2001 after changing the way the law was implemented. Changes included U.S. efforts to open international negotiations on protection of the endangered sea turtles, financial assistance for developing countries involved in the negotiations, and technical assistance and training in the installation and use turtle-safe nets for interested governments.⁴³ The rulings in this case thus confirmed that conservation measures can

³⁷ Pugel and Lindert, *supra* note 5, at 250.

³⁸ C. Ford Runge, *FREER TRADE, PROTECTED ENVIRONMENT*, 72–73 (1994). Dolphins are not an endangered species, distinguishing this case from the *Shrimp-Turtle* case, discussed below. Subsequent agreements among the interested parties reduced dolphin mortality to about 2000 per year after 1998, but controversy continues about the effects of stress experienced by dolphin in tuna-fishing areas. A 2001 report from the U.S. National Oceanic and Atmospheric Administration ("NOAA") describes ongoing research on dolphin populations <http://www.nmfs.noaa.gov/prot_res/PR2/Tuna_Dolphin/chase-recapture.html> (accessed July 15, 2002).

³⁹ Michael M. Weinstein and Steve Charnovitz, *The Greening of the WTO*, 80(6) *FOREIGN AFFAIRS* 148 (2001) conjecture that although the environmental movement has achieved most of its initial goals regarding the WTO, "the need to keep their supporters energized makes some groups loath to say so."

⁴⁰ To be more precise, an importing nation cannot do this without compensating affected exporters.

⁴¹ *United States—Import Prohibition of Certain Shrimp and Shrimp Products*, WT/DS58/R (1998).

⁴² Weinstein and Charnovitz, *supra* note 39, at 152.

⁴³ United States Trade Representative, *USTR on WTO Decision Supporting U.S. on Shrimp-Turtle Law*, October 22, 2001, <<http://usinfo.state.gov/wto/01102201.htm>> (accessed 1 January 2002).

be consistent with WTO agreements but must be administered fairly, i.e., in a way that does not constitute disguised protection for favored producers. The final resolution of the dispute also set an interesting precedent for international burden-sharing: the United States assumed much of the cost of implementing its preferred environmental standard through cash transfers and technical assistance to the developing country producers.

4. *GATT/WTO Conflicts with Multilateral Environmental Agreements*

Although environmental regulation is largely implemented at the national and sub-national level, economies and ecosystems are highly interdependent. Some major environmental goals, ranging from maintaining biodiversity to protecting the ozone layer, are appropriately viewed as global commons. For these goals, actions taken by any one country, and particularly by smaller countries, create diffuse global benefits enjoyed mainly by those *outside* the country. As a result, nations choosing individually on the basis of benefits to their own citizens tend to do too little; environmental protection is undersupplied from the global perspective.⁴⁴ An effective approach to regional (e.g., Rhine water quality) or global (biodiversity, ozone layer, global warming) commons issues thus requires international cooperation.

A kind of intellectual benchmark for such cooperation is the action that would be undertaken by a hypothetical inclusive and effective organization, variously termed a “Global Environmental Organization” or “World Environmental Organization.” Such an organization would be capable of formulating and enforcing appropriate policies that internalize all environmental externalities, i.e., capable of ensuring that all economic decisions in every country reflect *global* social costs and benefits. However, no such organization is even on the horizon. Instead, the most salient environmental issues have been tackled by narrowly defined agreements and treaties.

Of more than two hundred such multilateral environmental agreements (“MEAs”), almost all are extremely specific in their objectives, far from inclusive in membership, and reliant on voluntary compliance alone. Only six have more than fifty parties.⁴⁵ The WTO has identified about twenty MEAs with trade provisions or implications.⁴⁶ So far no trade dispute has arisen from conflict between MEA operations and WTO principles. However, environmentalists seek blanket WTO authorization to use trade sanctions as a means of enforcing compliance by members of an MEA and/or in preventing nonmembers from undermining an agreement’s effectiveness. To what extent is such use sanctioned under Article XX? Without further advance clarification, this scope will be delineated over time as enforcement actions give rise to trade disputes and their resolution within the WTO. But multilateral agreements typically require years to reach operational status, and ambiguity concerning the relationship between MEAs and the WTO increases the difficulty of achieving the international agreements required to tackle global environmental problems. Nonetheless, free traders in the WTO are unlikely to give environmentalists *carte blanche* with regard to the use of trade sanctions as a means of enforcing MEAs.

5. *Trade Sanctions and Eco-Imperialism*

Achieving higher environmental standards at the local or national level typically entails higher production costs and thus some sacrifice of national income as conventionally

⁴⁴ Economists view the situation as an example of the prisoners’ dilemma as described above. Only if all affected nations commit credibly in advance can the socially preferable outcome be achieved.

⁴⁵ William Krist, *Multilateral Environmental Agreements and the World Trade Organization*, WOODROW WILSON CENTER (March 2001) <<http://wwics.si.edu/tef/stoconfpap.htm>> (accessed 9 August 2001).

⁴⁶ <http://www.wto.org/english/thewto_e/whatis_e/tif_e/bey4_e.htm> (accessed 29 July 2002).

measured. For a country that trades with the rest of the world, higher production costs can also mean a loss of international competitiveness in affected industries to countries that have not matched the higher standards implemented at home. Any resulting increase in imports allows a high-standard country to consume goods whose production is environmentally damaging while incurring only part or sometimes even none of the associated damage. The domestic import-competing industry will typically suffer lower output and profits, however. Competition from less-controlled producers abroad may thus be regarded as “unfair.” Injured parties may seek—and may succeed in obtaining—restrictions on imports whose lower cost is due partly to the lower environmental standards of the exporting nation.

Because of differences across countries in incomes, tastes, and environmental conditions, individual nations are unlikely to adopt identical standards with regard to environmental protection. Developing countries in particular are concerned that richer trading partners may seek to impose their preferred standards on all exporters. Like conventional dumping, eco-dumping typically benefits the importing country as a whole but creates losses for importing-competing producers. The *Tuna-Dolphin* and *Shrimp-Turtle* cases discussed above are both instances in which the United States sought, with some success, to impose its own environmental priorities on producers in developing nations.

6. Environmental Concerns as Green Cover for Protectionism

Even when free traders share the same concerns as environmentalists, they remain suspicious—often with some reason—that highlighted environmental objectives simply provide a convenient excuse for old-fashioned protectionism. U.S. fishing fleets as well as would-be dolphin protectors favored the U.S. ban on imports of dolphin-unsafe tuna. In the protests that disrupted the 1999 WTO ministerial meeting in Seattle, environmental NGOs worked in tandem with the same U.S. labor unions that have perennially favored import restrictions. But international economists have been slow to recognize that, for better or for worse, environmental issues are likely to remain a WTO concern. While international economists rightly point out that trade policy is almost never a first-best way to achieve environmental goals, the same is true for virtually *all* uses of trade policy. Moreover, safeguarding the environment may well be a worthier non-economic objective from a social perspective than delaying the demise of an uncompetitive senescent industry.

Free traders also emphasize that economic growth depends on trade and investment. If environmentalists succeed in slowing down or reversing the process of globalization, there is a price to be paid in terms of lower growth and less-efficient use of resources. Many free traders point to the generally favorable association between higher incomes and increased attention to environmental concerns. However, it is important to remember that this process is far from automatic. Although poverty demonstrably contributes to certain types of environmental degradation, increased wealth by itself cannot ensure reductions in harmful practices.

III. The Uruguay Round Agreements

A significant advance in the Uruguay Round was to initiate negotiations on specific areas of concern in the trade-environment nexus. Until the Uruguay Round negotiations, Article XX of GATT (1947) had provided the sole basis for exceptions to trade policy obligations on grounds concerning environmental objectives. Although panel rulings in formal trade disputes such as *Tuna-Dolphin* had established bounds for permissible environmental exceptions to a country’s trade policy obligations within the GATT framework,

Article XX itself was the only element of the pre-Uruguay Round GATT treatment of environmental issues that had actually emerged from international negotiations.

The Uruguay Round Agreements (“URAs”) did *not* include an explicit “Agreement on Trade and the Environment” to centralize all linkages between international trade and issues relating to the environment. Negotiators took a much more diffuse approach, introducing references to the environment and environmental exceptions to trade policy obligations into many of the newly codified areas. The resulting agreements on technical barriers to trade, sanitary and phytosanitary measures, trade-related intellectual property rights, subsidies and countervailing measures, agriculture, and services all contain specific language that underscores the interaction between trade and environmental objectives. And, while the URAs do not include an agreement on trade and the environment, a WTO directive established a Committee on Trade and Environment to identify, monitor, and assess issues relating to trade and the environment as they arise.

Even with the development of the new areas under the URAs, Article XX of GATT 1947 remains the key underlying component linking trade and the environment within the WTO system. However, the URAs are important because they add new possibilities for countries seeking to defend trade-restricting actions on environmental grounds.⁴⁷ Below we examine the newly codified areas in the URAs as they relate to the environment and identify the economic incentives created by the terms of the new agreements.

A. Standards

The Agreements on Technical Barriers to Trade (“TBTs”) and Sanitary and Phytosanitary (“SPS”) Measures are complementary codes focusing on product standards and food safety. The TBT Agreement is a modified version of a stand-alone Standards Code negotiated during the 1973–79 Tokyo Round; the SPS agreement introduces standards for food safety as well as regulations to promote human, animal, and plant health and safety. These agreements allow countries to adopt explicit product standards that are consistent with underlying WTO principles. In particular, standards must not be designed so as to discriminate between domestic products and imports (a violation of the national-treatment clause of Article III) or between imports from different sources (a violation of the MFN clause of Article I). For example, Article 5:1 of the SPS agreement may allow trade restrictions for environmental purposes in some circumstances. Such restrictions must be based on an appropriate assessment of “risks to human, animal or plant life or health, taking into account risk assessment techniques developed by the relevant international organizations.” Restrictions must also be transparent and non-discriminatory in their application.

The initial obscurity of the TBT and SPS agreements evaporated with several high-profile disputes over product standards. While the agreements have been interpreted as allowing for the establishment of standards based on a product’s *end-use* or *quality* or *content*, an important unresolved question is whether the WTO also permits standards based on *production method*. This issue is one common thread linking recent cases such as *Tuna-Dolphin*, *Shrimp-Turtle*, and *Beef Hormones*; in each case production method served as the justification for a ban on imports.

⁴⁷ Matthew Stilwell argues, in the context of GMO labeling, that the implied criteria for exceptions in the various agreements may differ in subtle ways. See *Center for Environmental Law, Protecting GMO Labeling from a WTO Challenge*, (2001), available at <<http://www.cid.harvard.edu/cidtrade/issues/biotechnologypaper.html>> (accessed 19 April 2003).

A central question in each of these standards disputes is whether a country may impose its own national production standard on goods that it consumes but that are produced elsewhere. In the *Tuna-Dolphin* case, the justification for the standard was a concern for the humane treatment of marine mammals; in the *Shrimp-Turtle* case, the standard was intended to bolster conservation efforts on behalf of an endangered species; in the *Beef Hormone* case, the basis was the “precautionary principle” and the lack of persuasive evidence that non-hormone-treated beef and hormone-treated beef have the same end-use effect on humans. The permissibility of such standards within the WTO framework is also likely to become a pivotal issue in the new and highly contentious area of genetically modified organisms (“GMOs”).

The first economic concern regarding any product standard relates to the reason that a trade-restricting measure is being imposed. As WTO rules rest on the underlying principle of liberal and non-discriminatory trade, an initial consideration is whether the standard constitutes a genuine response to a perceived threat to health or safety, rather than a disguised effort to protect domestic producers from competing imports or to discriminate between foreign producers. The TBT and SPS agreements specify the use of internationally accepted standards,⁴⁸ and thus rely on information provided by international standard-setting bodies. Since the WTO defers to these standard-setting bodies as “experts” in the relevant areas, their transparency and organization becomes an important factor in determining the outcome of actual cases.

A further concern is the effect of standards on production efficiency and the gains from trade. International harmonization of product standards may reduce costs of compliance for a firm serving more than one national market. Agreement on a common standard can lead to efficiency gains via network externalities. However, mandatory harmonization of *production* standards across countries could significantly reduce one of the primary sources of gains from trade, i.e., the gains arising from differences in production conditions across countries and resulting specialization based on comparative advantage.

B. Intellectual Property

Another substantive Uruguay Round agreement that includes an explicit environmental exception is the Agreement on Trade-Related Aspects of Intellectual Property Rights (“TRIPS”). This agreement seeks to strengthen the rules protecting patents, trademarks, copyrights, and trade secrets. One link between intellectual property and the environment is contained in Article 27 of TRIPS, which permits governments to refuse to issue patents “that threaten human, animal or plant life or health, or risk serious damage to the environment.”

C. Subsidies

One goal in the Uruguay Round was to limit the use of subsidies in many areas of international trade, thus shifting countries away from government-supported production and towards market-based reforms. While the effort to control subsidies and countervailing

⁴⁸ For example, the Preamble of the SPS agreement states that its aim is to “further the use of harmonized sanitary and phytosanitary measures between Members, on the basis of international standards and guidelines and recommendations developed by the relevant international organizations, including the Codex Alimentarius Commission, the International Office of Epizootics, and the relevant international and regional organizations operating within the framework of the International Plant Protection Convention. . . .”

duties was not new to the GATT/WTO system,⁴⁹ the URAs clarified the rules on permissible and impermissible subsidies.⁵⁰ Notably, the Agreement on Subsidies and Countervailing Measures (“SCM”) and the Agreement on Agriculture (“AoA”) include explicit exceptions for subsidies with environmental objectives. The SCM temporarily allowed for subsidies that helped firms adapt to new environmental laws, as long as those subsidies were less than twenty per cent of the firms’ actual compliance costs.⁵¹ Similarly, the AoA specifically exempts environmental programs from mandated cuts in subsidies.⁵²

Perhaps as important as the introduction of these exceptions for subsidies with environmental objectives is the increased discipline the WTO system imposes on non-environmental subsidies. Environmental problems are often caused or aggravated by government subsidies, especially subsidies to natural-resource-based industries such as agriculture, fishing, and logging. Farm subsidies and price supports, combined with restrictions on land under cultivation, create incentives for overuse of chemicals to increase crop yields. Likewise, government support of excess capacity in fishing fleets has exacerbated the conservation problems of the world’s fisheries. WTO limits on subsidies thus have the potential to reduce environmental damage along with inefficient high-cost production.

D. Services

Article XIV of the General Agreement on Trade in Services (“GATS”) contains exceptions analogous to those in Article XX(b) of GATT (1947) covering trade in goods.

IV. Economic Theory and Empirical Evidence

As the liberalization of world trade has become an important concern for the environmental movement, more economists have turned their attention to modeling and estimating the effects of trade and trade policy on the environment. An early examination of many trade-environment issues from an economic perspective⁵³ arose from a 1991 workshop organized for the GATT Secretariat. Surveys of more recent literature include Nordström and Vaughan⁵⁴ and Copeland and Taylor.⁵⁵ Here we summarize briefly some important theoretical results concerning the trade-environment nexus, as well as relevant empirical findings. Our review focuses on two fundamental questions: How does international trade affect the environment? What is the appropriate role for a trade agreement such as the WTO with respect to environmental concerns?

⁴⁹ Articles VI and XVI of GATT (1947) deal respectively with countervailing duties and export subsidies. The stand-alone Subsidies Code negotiated in the Tokyo Round also addresses these issues.

⁵⁰ See Chapters 16 and 41 in this book.

⁵¹ Article 8.2 (c) of the Agreement on Subsidies and Countervailing Measures specifies the conditions under which environmental subsidies are “non-actionable.” However, the initial exemption was for a five-year period subject to renewal (SCM Article 31). It has not been renewed so that the exemption no longer applies.

⁵² Annex 2: 12(a) of the Agreement on Agriculture indicates which types of subsidies are exempted from the reduction commitment.

⁵³ Kym Anderson and Richard Blackhurst, *THE GREENING OF WORLD TRADE ISSUES* (1992).

⁵⁴ Nordström and Vaughan, *supra* note 8.

⁵⁵ Copeland and Taylor, *supra* note 12.

A. *Environmental Externalities and Economic Policy*

From the economic perspective, most environmental issues arise from *externalities*, i.e., effects of consumption or production that fall on others. Activities creating air or water pollution thus entail *negative* externalities, while environmental cleanup generates *positive* externalities. The key consideration is the extent to which a consumer or producer's actions and decisions affect others not directly involved. This criterion may be interpreted narrowly, i.e., whether physical effects extend beyond the agent's private property, or more broadly, to include even psychological externalities. In the international context, a further distinction is made between external effects that occur entirely within a single country's borders and "transboundary" effects that spill over to other countries.

Existence of a negative externality implies that the *private* cost of an activity (the cost borne by the consumer or producer who causes the externality) is below its *social* cost. In the absence of corrective government action, market-determined consumption and production of polluting goods will usually be too high from the social point of view because decisions are based on private rather than social costs.⁵⁶ Likewise, the level of any activity with a positive externality will tend to be too low. Such situations are called *market failures* because the "invisible hand" is unlikely to achieve a socially desirable resource allocation.⁵⁷

From the economic viewpoint, the socially optimal level of pollution or other environmental damage is not zero unless the damage can be eliminated at no cost. In general, the socially optimal level depends on the social cost in terms of foregone economic output of a further reduction, i.e., the *opportunity cost* of abatement. The level of pollution (or pollution abatement) is socially optimal when the social cost in foregone output of a further reduction just balances the social benefits resulting from that reduction. The use of cost-benefit analysis in designing environmental policies is intended to achieve this kind of balance. However, this approach is far from straightforward in practice, as its implementation requires decision makers to place a dollar value on such intangible benefits as cleaner air or greater biodiversity. Moreover, effects usually extend far into the future and must therefore be discounted accordingly.

Policies to improve environmental outcomes are of two basic types: market-based instruments and direct controls. Appropriately designed taxes attempt to *internalize the externality* and thus ensure that decision makers choose actions based on their full social cost, not the private cost alone. But because of the difficulties entailed in measuring costs and benefits, such policies are unlikely to achieve this goal exactly. Rather than trying to fine-tune the market response, policy makers may opt instead for an approach that limits quantity directly, as with emissions permits,⁵⁸ or requires the use of a particular abatement technology. But regardless of which approach is chosen, policy makers are

⁵⁶ When property rights are fully defined and enforced, and costs of transactions among interested parties sufficiently low, private action alone may be sufficient to assure an efficient outcome (Ronald Coase, *The Problem of Social Costs*, 3 JOURNAL OF LAW AND ECONOMICS 1 (1960)). In such an outcome, the polluter may agree to compensate those affected, but it is also possible that those affected will pay the polluter to abate the pollution.

⁵⁷ Policies to address environmental spillovers are used when voluntary action, including Coasian private contracts between the parties responsible for the externality and all those affected by it, is considered insufficient to achieve a satisfactory outcome.

⁵⁸ If such permits may be bought or sold freely, their market value will approximate the tax rate required to achieve the same reduction in emissions. However, the fiscal implications will differ unless permits are distributed via competitive auction.

likely to give less consideration to costs or benefits experienced beyond the boundaries of the relevant jurisdiction, while globally efficient outcomes require such transboundary effects to be given equal weight. A reasonable assumption is that internalization via policy is incomplete: policy measures do not fully internalize environmental externalities (social cost remains above private cost), and that the remaining gap is larger in the case of transboundary effects.

Given this starting point, how do trade and economic growth (which may result from trade or other causes) affect environmental conditions and environmental policies? To better explore the complex relationships, recent analysis has relied on a conceptual partition of the environmental impacts of trade or economic growth into three distinct components: effects on the *composition* of output (relatively less or more production by dirty industries), on the *technique* of production (relatively less or more environmental damage per unit of output produced), and on the overall *scale* of production (a proportional increase in associated damage).

B. Economic Growth and the Environment

Conceptually, economic growth is likely to increase environmental damage via the scale effect, but this negative impact of growth may be more than offset by favorable composition and technique effects. Grossman and Krueger⁵⁹ were among the first to demonstrate empirically that economic growth does not necessarily imply accompanying deterioration of the environment. Using cross-country data, they estimate the reduced-form relationship between GDP and various measures of national pollutants, such as urban air pollution, oxygen levels in river basins, fecal contamination of river basins, and heavy metal contamination of river basins. Decomposing the overall impact of national income into the scale, technique, and composition effects, they conclude that while higher GDP is related to higher pollution in the very poorest countries, beyond a certain GDP threshold (around \$8000 in 1985 U.S. dollars), further increases in GDP are typically associated with an improvement in environmental quality. This is the U-shaped relationship between national income and pollution subsequently labeled the environmental Kuznets curve.⁶⁰

A substantial literature has explored the robustness of the empirical evidence for a U-shaped income-pollution relationship. An important recent contribution is Harbaugh, Levinson, and Wilson.⁶¹ With access to a richer data set and through the use of alternative econometric techniques and additional covariates in the estimation, the authors call into question the finding of a robust U-shaped relationship between a group of important air pollutants and national income. They also conclude that the available empirical evidence does not support broad claims either for an unequivocally positive or an unequivocally negative effect of economic growth on the environment.

⁵⁹ Gene M. Grossman and Alan B. Krueger, *Environmental Impacts of a North American Free Trade Agreement*, in THE U.S.-MEXICO FREE TRADE AGREEMENT (Peter Garber ed. 1993); Gene M. Grossman and Alan B. Krueger, *Economic Growth and the Environment*, 110(2) QUARTERLY JOURNAL OF ECONOMICS 353 (1995).

⁶⁰ The name is based on its similarity to the U-shaped pattern for the relationship between economic growth and income inequality hypothesized by Simon Kuznets.

⁶¹ William T. Harbaugh, Arik Levinson, and David Molloy Wilson, *Reexamining the Empirical Evidence of the Environmental Kuznets Curve*, 84(3) REVIEW OF ECONOMICS AND STATISTICS 541 (2002). See James Andreoni and Arik Levinson, *The Simple Analytics of the Environmental Kuznets Curve*, 80(2) JOURNAL OF PUBLIC ECONOMICS 269, footnote 1 (2002) for a comprehensive list of papers in this literature.

Related theoretical work by Andreoni and Levinson⁶² shows that an EKC can be derived from optimizing behavior even in a model with a single consumer and thus no externalities and no possibility of market failure. The result depends on increasing returns in abatement of the pollution generated during production of the consumption good: proportional increases in both pollution and clean-up effort are associated with a more than proportional increase in pollution abatement. This assumption is plausible whenever abatement entails significant fixed costs.

With many consumers optimizing individually, the usual environmental externality is incorporated into the model. The U-shaped relationship now remains, but each individual consumes too much and abates too little, relative to the social optimum. Given the environmental externality and resulting market failure, public policy can raise social welfare by internalizing the externality. As Andreoni and Levinson emphasize, their results do not imply that economic growth alone will solve pollution problems, nor do they offer theoretical support for a *laissez-faire* approach to environmental problems. On the contrary, they show that although the pollution-income path may have an inverse-U shape even in the absence of environmental regulations, pollution will be inefficiently high at every income level.

C. Trade and the Environment

To assess how international trade affects the environment, it is useful to proceed in two steps. First we examine the impact of international trade on the environment when the environmental concern is local pollutants, i.e., where the source and the effect are in the same political jurisdiction. We then turn to the impact of trade on the environment in the presence of transboundary pollutants.

1. Trade's Impact with Local Pollutants

Copeland and Taylor⁶³ use a simple model of North-South trade that illustrates each of the possible channels through which trade can affect local pollution. They analyze the impact of trade on pollution when countries differ only in per-capita income (relative endowment of human capital); environmental standards are assumed to rise with income. North therefore applies higher environmental standards. Trade allows South to become a pollution haven, exporting pollution-intensive products to North. In this model, trade does raise pollution for South and for the world as a whole, but trade is nonetheless welfare-improving for both countries. Because environmental impacts are local and standards are adjusted endogenously to maximize national welfare, there is no market failure in this model, either with trade or without.

In terms of the standard decomposition, the *scale* effect implies that pollution will rise in both countries. However, the *technique* effect, here captured by the assumption that environmental standards rise with income, will lead to the adoption of cleaner production methods in both countries, thus reducing pollution per unit of output in each industry. The *composition* effect depends on the comparative advantage of the country. The composition effect reduces the average pollution intensity of production if the marginal industry that leaves the country due to specialization is dirtier than the average industry in the country. If the marginal industry is cleaner than the average national industry, then average pollution

⁶² Andreoni and Levinson, *supra* note 61.

⁶³ Brian Copeland and M. Scott Taylor, *North-South Trade and the Environment*, 109(3) QUARTERLY JOURNAL OF ECONOMICS 755(1994).

intensity will rise. Under the assumptions of the model, the composition effect must dominate as industries relocate in order to take advantage of differences in environmental standards. A larger initial North-South gap in per-capita income results in a larger increase in pollution worldwide due to trade.

Differences in environmental protection are the only source of comparative advantage in Copeland and Taylor,⁶⁴ so that South necessarily has a comparative advantage in dirty industries. In reality, however, many polluting industries are relatively capital intensive. Without significant differences in environmental standards, such industries would be expected to locate in capital-abundant, i.e., more developed, countries. To capture this second determinant of industry location, Antweiler, Copeland, and Taylor⁶⁵ include factor endowments as an additional source of comparative advantage. This theoretical framework introduces the possibility that capital-intensive industries may prefer to locate in the capital-abundant North, where capital is cheaper, even though environmental taxes there are higher due to higher incomes. The authors use this framework to disentangle two competing hypotheses: the pollution-haven hypothesis, i.e., that trade will allow dirty industries to relocate to low-income countries with relatively weak environmental standards, and the factor-endowments hypothesis, i.e., that trade will allow dirty capital-intensive industries to relocate to relatively capital-abundant higher-income countries despite higher environmental standards.

In the empirical part of the analysis, Antweiler *et al.* examine the impact of liberalized trade in manufactured goods on the environment, where “the environment” is measured by sulfur-dioxide (SO₂) emissions. Estimating the sizes of the scale, technique, and composition effects, the authors find that the composition effect is small, so that the factor-endowment motive for trade dominates the pollution-haven hypothesis. The net impact of the trade-induced scale and technique effects is a reduction in pollution from these sources. Overall, liberalized trade is found to be good for the environment: a one per cent increase in GDP created by trade liberalization is associated with a fall of nearly one per cent in pollution concentrations. These empirical results suggest that, at least for sulfur-dioxide emissions, the favorable technique effect associated with higher incomes due to expanded trade is much larger than the composition effect (international relocation of production) and the scale effect (higher production levels). However, there is no basis for concluding that the relative magnitudes of the three effects will be similar for other types of industrial pollution or that expanded trade will necessarily be associated with a net decrease in every type of pollution.

One important implication of these models is that trade *does* affect the environment, even when policy makers set optimal domestic environmental policies and adjust these policies as per-capita income rises. When the net impact is a *cleaner* environment, as found by Antweiler, *et al.*,⁶⁶ this outcome arises almost entirely through the technique effect: income gains induced by trade cause governments to respond with more-stringent environmental policies, which in turn create incentives for industry to adopt cleaner production techniques. A favorable net outcome therefore rests critically on the ability and willingness of policy makers to adjust environmental standards optimally as per-capita incomes rise.

⁶⁴ *Id.*

⁶⁵ Werner Antweiler, Brian R. Copeland, and M. Scott Taylor, *Is Free Trade Good for the Environment?* 91 (4) AMERICAN ECONOMIC REVIEW 877(2001).

⁶⁶ *Id.*

In addition to trade-induced increases in income that encourage adoption of stronger environmental policies, another potential benefit from trade arises through the spatial separation of “environmentally incompatible” industries such as “dirty” manufacturing and an environmentally sensitive sector such as agriculture or fishing.⁶⁷ By allowing incompatible industries to move farther away from each other, trade can reduce or eliminate some negative externalities that depress productivity in the other industry, thereby raising productivity overall.

2. *Trade's Impact with Transboundary Pollutants*

Although industrial pollution is often a national or local problem, some of the most controversial environmental issues involve transboundary pollutants. Without international coordination, policies designed to maximize *national* welfare are likely to under-correct for this type of externality. Trade may thus reduce efficiency and welfare once environmental consequences are taken into account. Where the number of countries affected is small, regional agreements may suffice to achieve the required coordination. Examples of such cases include acid rain along a shared border and pollution of a river that runs through two or more countries. But for the limiting case in which one country's actions affect all countries equally, global environmental quality can be considered a pure public good, subject to the usual incentive problems associated with the optimal provision of public goods. Without international coordination, each country will “spend” too little, from the global perspective, to reduce emissions that threaten the ozone layer or contribute to global warming. The case of *global* pollution differs importantly from the framework described above because the relocation of dirty industries to lower-income pollution havens can reduce environmental quality everywhere, not just in the new location. This transboundary effect can undercut the standard gains from trade.

Unterberdoerster⁶⁸ revisits the spatial separation of environmentally incompatible industries via trade in the case of pollution with transboundary effects. In this setting, specialization due to trade has repercussions for pollution in a partner country. The relative size of the transboundary component of pollution is key. Under some conditions, free trade may increase pollution and, over time, reduce environmental quality in both countries. In fact, trade can cause the world production possibility frontier to shift inward as transboundary pollution shrinks productivity in the partner country. However, this unfavorable outcome requires both that the emitting industry in one country is more polluting than its counterpart in the other country and that the ratio of transboundary to national pollution is sufficiently high.

Copeland and Taylor analyze the effects of trade among many countries when global environmental quality is a pure public good.⁶⁹ As in earlier work,⁷⁰ they focus on the role of environmental policy as a determinant of trade by assuming that differences in per-capita income (human capital endowments) and thus in environmental standards are the only source of comparative advantage. Each of many countries in the higher-income North and lower-income South maximizes national welfare with respect to a limit on its

⁶⁷ Brian Copeland and M. Scott Taylor, *Trade, Spatial Separation, and the Environment*, 47(1) JOURNAL OF INTERNATIONAL ECONOMICS 137 (1999).

⁶⁸ Olaf Unterberdoerster, *Trade and Transboundary Pollution: Spacial Separation Reconsidered*, 41(2) JOURNAL OF ENVIRONMENTAL ECONOMICS AND MANAGEMENT 269 (2001).

⁶⁹ Brian Copeland and M. Scott Taylor, *Trade and Transboundary Pollution*, 85(4) AMERICAN ECONOMIC REVIEW 755 (1995).

⁷⁰ Copeland and Taylor, *supra* note 63.

own total emissions; these limits are implemented through the sale of pollution permits. Even in this extreme case of transboundary pollution, poorer countries choose higher limits; in autarky, permits are thus cheaper in these countries.

Trade can then be interpreted as the indirect exchange of two factors of production: human capital and pollution permits. The effects of trade depend on the extent of differences in endowments of human capital between North and South. If differences are not too large, so that trade in goods equalizes factor prices, trade has no net impact on the environment. Although the autarky equilibrium is sub-optimal from a global perspective (too much consumption and too much pollution), trade does not exacerbate that inefficiency. However, if income differences are large and trade in goods alone does not equalize factor prices, the price of pollution permits will remain relatively lower in poorer countries. Trade then allows these countries to become pollution havens, and free trade has a negative impact on the global environment. However, both of these effects are moderated if pollution permits as well as goods can be traded internationally. And, not surprisingly, reductions in pollution by a coalition of countries or through North-South income transfers tied to pollution reduction can achieve Pareto improvements. These results reflect the underlying inefficiency from setting environmental policy at the national level when benefits are global.

3. Avenues for Further Research

Even given the substantial increase over the last decade in formal economic analysis of the impact of international trade on the environment, empirical results concerning the size (and perhaps even the sign) of the impact of trade on the environment should still be regarded as preliminary, and many more pollutants in addition to sulfur dioxide remain to be investigated. Although the initial results appear promising for proponents of liberal trade, they are not yet conclusive. Moreover, there has been little empirical work assessing the effects of trade on transboundary pollution. Finally, despite the attention to these issues in recent trade negotiations, there has been little theoretical or empirical work specifically assessing the environmental impact of liberalized agricultural trade and the reduction of state-sponsored subsidies on the environment, and in particular the effects on runoff, groundwater, and pollutants associated with chemical-intensive farming.⁷¹

D. Trade Agreements and the Environment

The literature reviewed in the previous sections addresses the environmental impact of increased trade, usually with a focus on the interaction between income levels and endogenous national environmental standards. A related line of research investigates implications of sensitive environmental issues for the role and design of *international trade agreements*. A key issue here is the extent to which current WTO rules curtail the ability of signatories to apply desired environmental safeguards at the national level.

1. Adequacy of WTO Rules to Accommodate Environmental Safeguards

Economists view trade agreements as a means for countries to achieve mutual gains either by coordinating behavior directly or by establishing rules of behavior that are likely to

⁷¹ Agricultural support programs often create incentives for adoption of chemical-intensive techniques that increase yield per acre. Thus, a potential benefit of reducing import restrictions, export incentives, and price supports is the reduction of some types of environmental damage.

increase global efficiency.⁷² An example of direct coordination is a trade agreement that enables relatively large countries—which have less incentive to remove trade barriers unilaterally because of associated terms-of-trade losses—to benefit from liberalization. Such a trade agreement helps large countries out of the prisoners' dilemma resulting from terms-of-trade effects. By compelling each country to give up sovereignty with respect to its trade policy, the trade agreement can make all trading partners' better off.

Alternatively, a trade agreement may serve as a way for governments that lack commitment power with respect to the actions of their private sector to commit credibly to trade liberalization.⁷³ Given this frame of reference and that trade agreements generally require governments to give up sovereignty over their trade policies, must countries in a similar fashion cede control over their domestic policies in order to move toward global efficiency with regard to environmental concerns? Bagwell and Staiger address this question for the case of local pollutants and large countries—ones whose unchecked trade and domestic policy choices could generate negative terms-of-trade externalities for trading partners.⁷⁴ Perhaps surprisingly, they conclude that it is *not* necessary for countries to cede control over domestic environmental policy in order to achieve global efficiency.

In the case of local pollutants, the international transmission of environmental problems occurs only through the government's desire to manipulate its environmental policy to improve its trade prices and thus generate welfare gains for itself (with corresponding terms-of-trade losses for its trading partners). While one way to deal with this problem would be to negotiate directly over national environmental policies by bringing them into the WTO, this drastic measure is not required; current WTO rules are already adequate to handle most of the problem. With a minor reform that would actually give governments *more* sovereignty, the existing WTO framework could produce a globally efficient outcome.

The Bagwell-Staiger analysis has two elements, both of which focus on WTO rules regarding market-access commitments. First, consider the case in which a domestic industry with competitiveness concerns seeks import relief from its government. Because the country's tariff rates are bound under the WTO, the government cannot respond unilaterally by manipulating its trade policy. It has an incentive to relax its environmental standards as an alternative means to improve the competitiveness of the domestic industry, thereby imposing some costs on its trading partners through the induced change in the terms of trade. However, the WTO already has rules and procedures that address this problem. An affected exporting country can intercede with a *non-violation*⁷⁵ complaint

⁷² Kyle Bagwell and Robert W. Staiger, 89(1) *An Economic Theory of GATT*, AMERICAN ECONOMIC REVIEW 215 (1999).

⁷³ Robert W. Staiger and Guido Tabellini, *Discretionary Trade Policy and Excessive Protection*, 77(5) AMERICAN ECONOMIC REVIEW 823(1987).

⁷⁴ Kyle Bagwell and Robert W. Staiger, *Domestic Policies, National Sovereignty, and International Economic Institutions*, 116(2) QUARTERLY JOURNAL OF ECONOMICS 519 (2001); Kyle Bagwell and Robert W. Staiger, *The WTO as a Mechanism for Securing Market Access Property Rights: Implications for Global Labor and Environmental Issues*, 15(3) JOURNAL OF ECONOMIC PERSPECTIVES 69 (2001).

⁷⁵ A violation complaint alleges a trading partner's violation of one or more specific WTO rules. In contrast, a non-violation complaint may be brought to the WTO when a member undertakes an activity (here, lowering environmental standards) that violates no explicit WTO rule yet nullifies or impairs the market-access benefits expected by its trading partner. See Chapter 29 of this book; and Ernst-Ulrich Petersmann, *THE GATT/WTO DISPUTE SETTLEMENT SYSTEM: INTERNATIONAL LAW, INTERNATIONAL ORGANIZATIONS AND DISPUTE SETTLEMENT*, CHAPTER 4 (1997). In practice, very few non-violation complaints have been brought, and not all of these have been successful.

and initiate a trade dispute. The non-violation complaint would make the WTO-valid argument that, although the domestic policy action reducing the country's environmental standards did not violate any WTO rules, the action did affect the market-access commitments expected by the exporting country. Thus, enforcement of current WTO rules appears to be sufficient to deal with race-to-the-bottom concerns.

The second element of the Bagwell-Staiger analysis relates to the adequacy of current WTO rules to deal with concerns of regulatory chill—governments' hesitation to tighten domestic environmental policies if some of the benefits of those policies accrue to trading partners in the form of expanded market access. Bagwell and Staiger⁷⁶ suggest two possible means of addressing this issue, one of which involves giving governments more sovereignty than the WTO rules currently allow. One way for an international trade agreement like the WTO to address the regulatory-chill problem is to grant a government the right to raise its tariffs when it imposes a more-stringent domestic pollution policy, thus neutralizing the net market-access impact of the policy change. Although this approach conforms to the spirit of WTO practice, current rules prohibit members from raising their bound tariffs even if there is no net impact on their market-access commitments. Increasing a bound tariff could give rise to a *violation* complaint, even though the *net* effect of the two changes would be to leave the exporting country's market access unchanged.

Alternatively, the government raising its environmental standards could offer domestic producers a subsidy to offset the financial burden on environmentally regulated industries. Some subsidies of this type were explicitly authorized as non-actionable under the Uruguay Round Subsidies Agreement, although as noted above the exemption is no longer applicable.⁷⁷ However, for countries that would find it difficult to generate the tax revenue needed to implement subsidy policies, the tariff-increase approach may be more feasible. Because current WTO rules prohibit uncompensated tariff adjustments, this would require a minor reform of the rules.

2. *The WTO as a Self-Enforcing Agreement*

Given that the organization has no real enforcement power of its own, the WTO relies primarily on the retaliation threats of its members to sustain cooperative outcomes such as low tariffs and liberalized trade. The threat of retaliation—and of the possible breakdown of the agreement—restrains countries from cheating. But success in achieving and maintaining lower tariff barriers has led countries to use domestic policies as alternative means of achieving the same policy objectives, so that recent negotiations have increasingly focused on the trade impact of domestic policies, including environmental policies.⁷⁸ Article III of the GATT stipulates that no domestic policy should be applied in such a way as to “afford protection to domestic production.” Because explicit protection in the form of tariffs (up to the bound level) is allowed under the GATT rules, Article III embodies a preference for the use of tariffs rather than domestic policies.

Given that the WTO lacks a centralized means of enforcement and globally efficient outcomes are thus not attainable, an important question is how best to allocate the scarce

⁷⁶ Bagwell and Staiger, *supra* note 74.

⁷⁷ For a discussion, see Michael J. Trebilcock and Robert Howse, *THE REGULATION OF INTERNATIONAL TRADE* 196 (1999).

⁷⁸ Josh Ederington and Jenny Minier, *Is Environmental Policy a Secondary Trade Barrier? An Empirical Analysis*, 36(1) *CANADIAN JOURNAL OF ECONOMICS* 137 (2003), in an empirical analysis, find results consistent with U.S. use of environmental policy as a secondary means to protect import-competing industries. By modeling environmental policy as endogenous, Ederington and Minier also obtain larger estimated effects on trade than those reported by earlier researchers.

enforcement power arising from the self-interest of its members. Should it be used to achieve maximum cooperation on trade policies, maximum cooperation on domestic policies (including environmental measures), or some mix of the two? Ederington's theoretical analysis of international coordination of trade and domestic policies concludes that when enforcement power is limited, countries should cooperate fully over domestic policies, allowing each country to use these optimally to counter domestic distortions such as environmental externalities.⁷⁹ Trade policies should then be set so as to maintain the agreement's viability. In particular, this rules out the idea of an environmental "escape clause" allowing members to relax their environmental policies when faced with external shocks. Rather, adjustments necessary to sustain the agreement and to prevent countries from defecting should come through adjustments in trade policies only, as permitted under the WTO's Agreement on Safeguards.⁸⁰

Ederington's result is an application of the theory of economic distortions to trade policy.⁸¹ Here the assumed source of the inefficiency is trade. Specifically, sufficiently large surges in import volumes create a terms-of-trade motive for one country to defect from the agreement (the country's private benefit from defecting exceeds the social benefit, which is negative). Therefore, the efficient means of addressing the distortion is through a trade policy. Use of an environmental policy would be at most second best.

3. *Avenues for Further Research*

The theoretical literature on the role of trade agreements has so far addressed mainly issues relevant to localized pollution rather than global-commons concerns. One important open question is whether the WTO should be used to negotiate and/or enforce international environmental agreements. Bagwell and Staiger,⁸² in assessing the WTO's role as a mechanism for securing market-access property rights, see no basis for expecting that the success of the GATT/WTO in facilitating trade liberalization would carry over to negotiations on global-commons issues. However, their stance on the issue of enforcement is neutral: "At this early stage in the research literature, it is impossible to advance with confidence an answer to whether using WTO trade sanctions as an enforcement mechanism for global labor and environmental standards would end up benefiting either free trade, labor, or the environment." Threats of retaliation via trade policy might lead, *ceteris paribus*, to more international cooperation on environment—and, likewise, threats of retaliation via environmental policy might lead to more international cooperation on trade. However, it is also possible that issue linkage would result in more cooperation in one area and less in the other than if each were dealt with separately.

⁷⁹ Josh Ederington, *International Coordination of Trade and Domestic Policies*, 91(5) AMERICAN ECONOMIC REVIEW 1581 (2001).

⁸⁰ Kyle Bagwell and Robert W. Staiger, *A Theory of Managed Trade*, 80(4) AMERICAN ECONOMIC REVIEW 779 (1990), establish such a motive for including a safeguards clause in an international trade agreement. By allowing countries to increase protection temporarily when facing import surges (and thus strong terms-of-trade incentives to deviate from the cooperative agreement), a safeguards clause helps to maintain viability of the agreement.

⁸¹ Distortions are situations where private costs and/or benefits diverge from social costs and/or benefits. As noted above, these are cases where market failure is likely. A central conclusion from the literature on policy in the presence of distortions is that the best policy is one that addresses the distortion at its source. A "second-best" policy is the best choice available when the optimal policy is ruled out for political or budgetary reasons.

⁸² Kyle Bagwell and Robert W. Staiger, *The WTO as a Mechanism for Securing Market Access Property Rights: Implications for Global Labor and Environmental Issues*, 15(3) JOURNAL OF ECONOMIC PERSPECTIVES 69, 85 (2001).

V. Unfinished Business

Some new trade-environment disputes have already emerged during the short history of the WTO, while a number of others brought to the GATT prior to 1995 remain unresolved. This section examines several issues where WTO consideration is currently in progress or likely to begin soon. Perhaps it is not surprising that the most contentious of the current issues (beef hormones, genetically modified organisms, biodiversity) are newer concerns only loosely related to ongoing efforts with regard to air and water pollution. For the latter, decades of experience with policy making at the national level and efforts to establish international cooperative regimes have already borne some fruit: an improved scientific basis for policy formation as well as better performance. While the newer issues are analytically similar to traditional pollution concerns in that they also entail negative production or consumption externalities, policy making is hampered by lack of an adequate scientific base. This is partly because the issues are newer, but also because they usually involve the possibility that today's actions will have negative consequences far in the future. Design of an appropriate policy response, whether at the national or international level, hinges critically both on the accuracy with which future changes can be predicted and the choice of the discount rate used to compare costs and benefits accruing over time.⁸³

A. Process and Production Methods

One key issue sure to be raised under the WTO's Dispute Settlement Understanding is the WTO position on rules that distinguish among traded goods on the basis of process and production methods. Specifically, members seek to establish when it is permissible to limit imports from a trading partner based solely on that partner's PPM. In GATT/WTO terminology, to what extent can goods produced by different methods nonetheless be considered "like products"?

Restraint of trade on the basis of PPM was rejected by a GATT panel in the *Tuna-Dolphin* case, discussed above. The panel concluded that the primary goal of the U.S. ban on imports of dolphin-unsafe tuna was to pressure other countries to adopt U.S.-style regulations concerning protection of dolphins.⁸⁴ The panel also found that the United States had not exhausted means other than restriction of imports in its efforts to protect dolphins. In fact, subsequent to the panel ruling, nine countries including Mexico and the United States signed a multilateral agreement on protection of dolphins.⁸⁵

A U.S. restriction on imports of shrimp on the basis of PPM was likewise rejected by a WTO panel, as also discussed above. A subsequent ruling by the WTO Appellate Body following an appeal did not reverse the panel decision against the United States. However, the 1998 report of the Appellate Body affirmed the right of members to take actions necessary to protect the environment and also that measures to protect sea turtles

⁸³ All environmental issues have an intertemporal dimension, but it is notable that the greatest progress has been made in reducing emissions such as sulphur dioxide, whose negative effects can be seen or smelled today. Also, merely documenting longer-term effects, say of GMOs, necessarily requires a longer period of observation and analysis.

⁸⁴ This kind of forced harmonization offers two types of potential benefits for the United States. First, it reduces the number of dolphins killed outside U.S. waters by ensuring that all those wishing to serve the U.S. market adopt dolphin-safe methods in tuna fishing. In addition, it restores the initial competitiveness position of U.S. tuna fishers, and thus shifts part of the cost of the U.S. policy onto U.S. trading partners. Of course, any type of import restriction also imposes higher prices on domestic consumers.

⁸⁵ Trebilcock and Howse, *supra* note 77, at 406–410.

would be permitted under Article XX. The problem with the U.S. policy was in its implementation, which was found to discriminate among exporting countries—exporters in the western hemisphere received financial and technical assistance and were allowed more time to comply with the policy. Even though the Appellate Body did not rule in favor of the United States, the report can be seen as strengthening the use of Article XX as a basis for the unilateral application of trade measures in some circumstances. Specifically, trade measures to achieve environmental objectives could be used if efforts to achieve a multilateral solution have failed and the measures themselves are not discriminatory in their application.⁸⁶ Following improvements in implementation to eliminate discrimination among exporters, the U.S. policy prevailed in a WTO challenge with respect to implementation of the decision in 2001.

The disputes in the *Tuna-Dolphin* and *Shrimp-Turtle* cases both acknowledged environmental concerns. In each case the issue is not the stated goal of the policy but, rather, the trade-restricting method used to achieve it. However, some environmental goals are more controversial. In the *Beef Hormones* case, the European Union banned imports of U.S. beef from cattle treated with hormones, even though decades of scientific research indicate that such beef poses no risk to human health.⁸⁷ A WTO panel and the Appellate Body both concluded that the EU ban violated WTO provisions.⁸⁸ After the European Union failed to change its policy, the United States exercised its right under the WTO to impose retaliatory restrictions on imports from the European Union.⁸⁹

PPMs would also be a substantial issue in any case concerning trade restrictions of genetically modified organisms brought under the DSU. In recent decades, genetic engineering has produced new varieties of wheat, corn, and other crops, with higher yields and less vulnerability to common pests. By 2001, one hundred million acres worldwide had been planted with these new varieties, with the United States accounting for the lion's share.⁹⁰ As in the case of beef hormones, the weight of scientific evidence suggests that GMOs provide no significant risk to human health. Yet many consumers in Europe are reluctant to eat foods containing GMOs, and environmentalists have raised the concern that GM crops might crossbreed with wild plants to produce "super-weeds." EU regulatory authorities have thus placed a *de facto* moratorium on approval needed to market new products in the European Union. A number of countries have passed or are considering mandatory labeling of foods containing GMOs.⁹¹ While U.S. trade and agriculture officials have lodged protests in various forums, some North American farmers are already switching back to traditional varieties to ensure access to important

⁸⁶ The report gave further support to environmental groups in stating that WTO panels may accept "amicus briefs" (friends of the court submissions) from NGOs or other interested parties <http://www.wto.org/wto/english/tratop_e/envir_e/edis08_e.htm> (accessed 14 August 2001).

⁸⁷ Given that the WTO defers to the Codex Alimentarius Commission on matters of food safety, support from the Codex standard played a key element in the ruling against the European Union. While Trebilcock and Howse, *supra* note 77, at 152 point out that the Codex standard on hormones was adopted by a vote of 33 to 29 with seven abstentions, they also note that the Codex has been criticized for a "closed-door policy" and procedures that do not ensure an outcome based on the weight of scientific evidence.

⁸⁸ A further complication is evidence that some European farmers use hormones obtained illegally via a black market <<http://www.sciencenews.org/20020105/bob13.asp>> (accessed 29 July 2002).

⁸⁹ The EU offered additional concessions on non-hormone-treated beef as a settlement. However, the U.S. took an inflexible stance in the bargaining, either to underscore a principle or because it did not have sufficient amounts of non-hormone treated beef to benefit from accepting the EU offer.

⁹⁰ U.S. General Accounting Office, *International Trade: Concerns Over Biotechnology Challenge U.S. Agricultural Exports* 3, Report to the Ranking Minority Member, Committee on Finance, U.S. Senate (GAO-01-727, June 2001).

⁹¹ *Id.* at 6.

export markets. Ironically, concerns about the possible long-term risk of GMOs may mean increases in environmental damage from the additional chemicals normally required for commercial success with older varieties. Furthermore, the uncertainty regarding market access for GM crops is likely to affect planting decisions of developing countries in Africa that rely on the EU markets for their agricultural exports.

Because the issues at stake—such as when scientific evidence is adequate for use in determining policy and when the precautionary principle justifies restriction of imports—have become so controversial, it may be risky for the future of the WTO system to allow the parameters of acceptable trade restriction on the basis of PPM to be determined entirely by case law. Reliance on DSU case law may be politically palatable when the issues involved are benign and limited to trade. However, when the issues involved in the international debate include politically sensitive questions over the environment, science, trust of regulatory authorities, and even ethics, direct international negotiations over the issues will carry more weight politically than would third-party adjudication by a body like the DSU that is already viewed with substantial distrust and skepticism.

Another important concern raised by the PPM experience is the flexibility of the WTO, in its current form, to respond to the dynamic nature of environmental concerns, given that the scientific information required to make informed policy decisions is evolving as well. Many environmental issues that need to be addressed (global warming, deforestation, coral reefs, biodiversity, etc.) have uncertain future costs if left untreated. Yet addressing these environmental issues today entails certain costs in terms of foregone national income as resources are moved out of current production and into prevention of environmental degradation. These costs and benefits have a significantly larger intertemporal dimension than the costs and benefits of market access that the GATT/WTO system has successfully negotiated over its history. Progress in negotiating over the environment will require flexibility, long-term cooperation, and a consensus on both the underlying scientific base and the appropriate discount rate to be used when current costs weighed against future benefits.

There are at least two different concerns over the current structure of the WTO in handling these needs. Because the WTO itself does not have ongoing legislative powers, it is not amenable to flexible, ongoing discussions of the sort needed to respond to environmental concerns. Occasional negotiating rounds may not be adequate to address such potentially serious concerns. Furthermore, the WTO as currently structured has shown little ability to credibly match intertemporal gains and losses. As shown by its experiences with TRIPs, the Agreement on Textiles and Clothing, and other agreements with relatively long phase-in periods, intertemporal trading is difficult to sustain politically.

B. Internalization Versus Polluter Pays

As discussed in Part IV of this chapter, internalization of externalities is central to the market-based approach to achieving environmental goals. The goal of this internalization approach is to ensure that the optimizing decisions of individuals and firms reflect the full social cost or benefit from their actions. To the extent that the internalization is achieved via a system of taxes and subsidies or an equivalent system of marketable permits—polluters also bear, at least proximately,⁹² the cost of the choices they make: the polluter pays an extra amount equal to the value of the negative external effect, and the

⁹² As with any tax, ultimate incidence (the actual change in net price received or paid) depends on elasticities of producer supply and consumer demand.

abater likewise enjoys a cost reduction equal to the value of the positive external effect. However, even at the regional or national level, such policies may be modified to soften income-distribution effects deemed undesirable and/or politically unacceptable. In the United States, small businesses, though often among the worst polluters, are nonetheless exempted from most policies intended to protect the environment. Older autos, typically owned by those in lower income groups, are usually exempt from environmental regulations that apply to newer vehicles, although some communities have instead adopted incentives to remove these high-emissions vehicles from the road.

It is notable that burden-shifting approaches to internalization are often seen as necessary even within a single country or smaller area, where an elaborate system of taxes and payments is available to modify the distribution of income and consumption. In the global community, where differences between rich and poor are so much larger, there is no overall redistribution mechanism comparable to that applied within most individual countries, whether rich or poor. The international distribution of costs associated with protecting global commons therefore becomes an important consideration in policy design. In the highly improbable event that all can agree on the monetary equivalent of social costs and benefits, poorer countries with more immediate problems are likely to apply much higher discount rates to future benefits. Thus, even disregarding the very real uncertainty about future outcomes, the set of environmental objectives seen as worth pursuing from a social perspective will be nonetheless be smaller for poorer countries than for wealthy ones. For this reason, efforts to reach agreement on environmental objectives and on measures to achieve them will likely fail unless poorer countries are compensated for their participation—or threatened with possible consequences of their non-participation (e.g., trade sanctions or worse). In the *Shrimp-Turtle* case, the country most interested in the relevant environmental issue (the United States) eventually agreed to pay at least part of the cost entailed in addressing the underlying problem.⁹³ Outside the GATT/WTO system, debt-for-nature swaps are an example of international compensation used to achieve environmental objectives. In recent years, financial assistance from the World Bank has sometimes been conditional on implementation of environmental safeguards.

Unfortunately, the WTO system relies on voluntary exchanges of trade concessions and lacks an explicit compensation scheme to facilitate cross-country bargaining. Except for perhaps the most politically sensitive sectors in developed countries (agriculture, textiles, steel), tariff barriers have been negotiated to very low levels, making it increasingly difficult to find mutually acceptable trade concessions needed to strike bargains between countries over future trade, environmental or any similar issues. The current sole alternative to additional trade liberalization—compensation in the form of tariff retaliation—is both inefficient and a contributor to the perception that the GATT/WTO system is based on “power” relationships. We return to the idea of achieving more internalization of global externalities via international compensation in Part VI.

VI. Conclusions and Future Directions

Many environmentalists see the GATT/WTO system as a significant obstacle to progress on environmental issues. However, our review of recent high-profile cases finds that actual panel and Appellate Body decisions have had the effect of encouraging international

⁹³ Press release, United States Trade Representative, June 15, 2001 <<http://www.ustr.gov/releases/2001/06/01-40.pdf>> (accessed 7/22/02).

cooperation to achieve environmental goals. It is true that decisions in the *Tuna-Dolphin* and *Shrimp-Turtle* cases limited the ability of the United States to require trading partners to adopt U.S.-style environmental safeguards. These decisions discourage powerful countries with large markets from the use of unilateral trade restrictions to force adoption of a preferred environmental safeguard, rather than pursuing the same objective via negotiation among interested parties. In the *Shrimp-Turtle* case, the Appellate Body report explicitly reaffirmed that WTO rules do not prevent members from taking unilateral trade action to protect the environment if international cooperative efforts fail, but also that unilateral measures may not be applied in a way that discriminates between WTO members. The *Shrimp-Turtle* case is also significant as an example of negotiated compensation (in the form of U.S. technical and financial assistance) to defray the cost to lower-income countries of conforming to the U.S. standard of sea-turtle protection.⁹⁴

The primary goal of the GATT/WTO system is to expand global trade. While economists generally argue that more trade is likely to improve environmental conditions, environmentalists fear that the opposite will be true. Recent contributions to the economic analysis of the trade-environment nexus help to untangle the complex relationship between environmental standards and trade. One clear implication from this literature is that trade expansion *is* likely to affect the environment. Via the scale effect and perhaps also the composition effect, increased trade will—other things equal—lead to additional pollution and a dirtier environment. The upward adjustments in domestic and global environmental policies necessary to offset the scale effect from higher production activity are often a response to rising incomes, but this effect should not be regarded as automatic.

Along with most free traders, WTO officials tend either to minimize the importance of the link between trade and environment or to emphasize the evidence of a favorable net effect. Instead, WTO experts should alert national policy makers to the likely impact of liberalized trade on pollution and other environmental damage in the absence of stronger safeguards, and encourage members to use trade-induced increases in GDP partly to facilitate the upward adjustments in national standards needed to ensure that freer trade will also mean more environmental protection. Under current GATT rules, policy makers may be discouraged from making optimal adjustments in national standards because of their impact on trade competitiveness. However, our review of the literature indicates that a minor modification of current rules would allow individual nations to use trade policy to neutralize such competitive effects.

Although measures implemented at the national or sub-national level are sufficient to produce socially optimal outcomes with regard to localized environmental effects, optimizing solutions to some problems require international coordination. However, it is far from obvious that a global forum is best for tackling all or even most of these problems. Many examples of transboundary environmental impacts involve just a few countries, often only two. For these, direct negotiations, possibly entailing compensation or issue linkage, may be more productive than efforts coordinated by a global environmental organization.⁹⁵ Even for a “global” issue such as carbon-dioxide emissions, concerted

⁹⁴ Providing financial compensation to developing countries in return for action to safeguard global commons is central to the Whalley and Zissimos, *supra* note 10, proposal for a World Environmental Organization, which we discuss below.

⁹⁵ A possible danger is that new arrangements in which richer nations compensate poorer ones for improved environmental policies might result in foot-dragging on needed policy improvements or even threats of new environmentally damaging actions in the hope of extracting greater compensation from other nations.

action at the OECD level alone could achieve important benefits. Still, environmentalists and an increasing number of international economists see a role for a specialized international organization dedicated to safeguarding the global environment. Existing institutions, such as the United Nations Environmental Programme (“UNEP”) and the newer United Nations Commission on Sustainable Development, are largely advisory bodies with “narrow mandates, small budgets, and limited support.”⁹⁶ These coexist with hundreds of organizations and treaties that address specific environmental concerns ranging from climate change to coral reefs. But no current organization has the authority to coordinate ongoing efforts at the national level and to develop general principles to guide such efforts.

Esty⁹⁷ makes the case for a GATT-inspired Global Environmental Organization (“GEO”) that would centralize development and implementation of environmental standards and resolve environment-related disputes.⁹⁸ Interestingly, the first candidate for a basic principle to guide such a GEO is “universal acceptance of the polluter pays principle—forcing governments, industry, and individuals alike to bear the full costs of the environmental burdens they impose on society.”⁹⁹ Above we have discussed the problems likely to arise when the polluter-pays principle is applied in an international context. Without transfers to alleviate the financial burdens imposed when poor countries adopt the higher standards usually preferred by richer ones, such an approach is likely to increase North-South tensions without achieving much cooperation.

Whalley and Zissimos¹⁰⁰ address this problem directly in their proposal for a World Environmental Organization (“WEO”). The WEO would seek internalization of environmental externalities at the international level through Coasian¹⁰¹ bargaining (and trading) over environmental objectives. They favor a property-rights approach to clarifying and confronting the issue of global externalities and environmental protection. Because the “environmental assets” highly valued by citizens of developed countries are often owned by citizens of developing countries, an internalization-based WEO would entail the exchange of environmental protection commitments for direct cash transfers from developed countries.¹⁰² To avoid problems of time-inconsistency, the WEO would use an escrow account to administer these commitments.

Although the concept of explicit compensation for commitments to protect environmental assets is important, establishment of such a WEO would face formidable obstacles. One initial problem concerns acceptance of existing property rights. Some environmentalists question whether a unique global environmental asset such as the Amazon rainforest should be considered the property only of the countries that contain it. Even granting this, government ownership and control of such land is often contested (legally and/or de facto) by indigenous residents and other groups. Environmental bargains of

⁹⁶ Esty, *supra* note 2, at 78.

⁹⁷ *Id.* at 78–83.

⁹⁸ Although the proposal initially attracted little support from international economists, subsequent disruption of the Seattle ministerial and other WTO meetings underlined immediate practical benefits from shifting the locus of environmental debate into another body.

⁹⁹ Esty, *supra* note 2, at 80.

¹⁰⁰ Whalley and Zissimos, *supra* note 10.

¹⁰¹ Coase, *supra* note 56, argues that, under certain conditions, contracting among affected parties can establish a socially efficient allocation of resources in the presence of an externality. In such cases, no government action is needed to “internalize the externality.” Required conditions include well-defined property rights and low transactions costs.

¹⁰² They also argue that the agreement could be expanded to allow for the exchange of environmental protection commitments for trade concessions.

the kind proposed by Whalley and Zissimos cannot proceed without agreement on the initial allocation of the relevant property rights.

A separate problem is that, given their experiences with World Bank and International Monetary Fund conditionality, developing countries may be hesitant to participate in such an arrangement if they perceive it as being forced on them by developed countries. To the extent that environmental cash payments are seen as replacing other aid, what Whalley and Zissimos present as a carrot will look like just another stick. Furthermore, Newell¹⁰³ foresees strong opposition to the implication that protection of environmental assets is worth only as much to the global community as OECD countries are willing to pay. Finally, the very long time-span suggested by Whalley and Zissimos (twenty to forty years) between commitment and receipt of payment poses special problems. Are the governments representing today's poor amenable to measures that impose costs now and promise financial benefits that will be reaped only by future governments and citizens? Unless countries have a way to take financial commitments to the bank and turn them into cash today, the line of interested southern countries is likely to be a short one.¹⁰⁴ But to the extent that cash is delivered in advance of performance, the problem of time-inconsistency returns. Adherence to commitments could, of course, be monitored on an ongoing basis, but this approach is likely to be costly, intrusive, and controversial.

In the near term, given the absence of a GEO or a WEO, is there a consensus role for the WTO to play with respect to safeguarding the global environment—something that does not interfere with its primary trade-liberalization mandate? As we have suggested above, an important first step—and one closely related to the WTO's core mission—is to improve countries' understanding of trade-induced environmental changes and to emphasize the need to adjust domestic environmental policies accordingly. Economic research has shown that many aspects of globalization can affect both the level and the types of environmental damage experienced by any given country. One possible role for the WTO, perhaps in cooperation with an environmental organization such as UNEP, is in tracking the pattern of trade in specific pollution-intensive industries, identifying how industry production and trade are changing across countries, and thus keeping a special eye on the composition effect discussed in Part IV above.

Ultimately, favorable changes in production technique are what allow trade-induced economic growth to be accompanied by improvements in environmental quality, but these favorable changes do not occur automatically. Governments liberalizing trade may need assistance in determining when and how to adjust environmental policies in response to the resulting changes in production and the environment. The WTO can provide technical assistance on trade-related environmental concerns that would be similar in spirit to assistance offered to developing countries by the recently established Advisory Center on WTO Law to improve their understanding of their WTO rights and obligations.¹⁰⁵

Finally, what should the WTO *not* do, with respect to the trade-environment nexus? Members' increasingly resort to the use (and abuse) of WTO-legal antidumping and countervailing duties and safeguards measures means that trading countries now face substantial uncertainty as to whether their negotiated market access rights will actually

¹⁰³ Peter Newell, *A World Environment Organization: The Wrong Solution to the Wrong Problem*, 25(5) THE WORLD ECONOMY 659 (2002).

¹⁰⁴ Newell, *supra* note 103, at 664, points to the very modest results achieved through debt-for-nature swaps, which already offer deals somewhat parallel to what Whalley and Zissimos envision.

¹⁰⁵ Website. <<http://www.acwl.ch/>> (accessed 29 July 2002).

be realized. The WTO should not add to the problem of discretionary administered protection by allowing members to restrict trade for reasons of alleged eco-dumping.

BIBLIOGRAPHY

- Advisory Centre on WTO Law. 2002. Website. <<http://www.acwl.ch/>> (accessed 29 July 2002).
- Anderson, Kym, and Richard Blackhurst. 1992. *The Greening of World Trade Issues*. Ann Arbor: University of Michigan Press.
- Andreoni, James and Arik Levinson. 2001. "The Simple Analytics of the Environmental Kuznets Curve," *Journal of Public Economics*, 80(2): 269–286.
- Antweiler, Werner, Brian R. Copeland, and M. Scott Taylor. 2001. "Is Free Trade Good for the Environment?" *American Economic Review*, 91(4): 877–908.
- Bagwell, Kyle, and Robert W. Staiger. 1990. "A Theory of Managed Trade," *American Economic Review*, 80(4): 779–795.
- Bagwell, Kyle, and Robert W. Staiger. 1999. "An Economic Theory of GATT," *American Economic Review*, 89(1): 215–248.
- Bagwell, Kyle, and Robert W. Staiger. 2001a. "Domestic Policies, National Sovereignty, and International Economic Institutions," *Quarterly Journal of Economics*, 116(2): 519–62.
- Bagwell, Kyle and Robert W. Staiger. 2001b. "The WTO as a Mechanism for Securing Market Access Property Rights: Implications for Global Labor and Environmental Issues," *Journal of Economic Perspectives*, 15(3): 69–88.
- Bhagwati, Jagdish N., and T. N. Srinivasan. 1963. "Domestic Distortions, Tariffs, and the Theory of the Optimum Subsidy," *Journal of Political Economy*, 71(1), 44–50.
- Bhagwati, Jagdish N., and T. N. Srinivasan. 1996. "Trade and the Environment: Does Environmental Diversity Detract from the Case for Free Trade?" in Jagdish N. Bhagwati and Robert Hudec, eds., *Fair Trade and Harmonization—Volume 1: Economic Analysis*. Cambridge, MA: MIT Press, 161–221.
- Charnovitz, Steve. 2000. "World Trade and the Environment: A Review of the New WTO Report." <<http://www.gets.org/pages/steve.charnovitz.cfm>> (accessed 29 July 2002).
- Coase, Ronald. 1960. "The Problem of Social Costs," *Journal of Law and Economics* 3: 1–44.
- Copeland, Brian and M. Scott Taylor. 1994. "North-South Trade and the Environment," *Quarterly Journal of Economics*, 109(3): 755–87.
- Copeland, Brian and M. Scott Taylor. 1995. "Trade and Transboundary Pollution," *American Economic Review*, 85(4): 716–737
- Copeland, Brian and M. Scott Taylor. 1999. "Trade, Spatial Separation, and the Environment," *Journal of International Economics*, 47(1): 137–168.
- Copeland, Brian and M. Scott Taylor. 2004. "Trade, Growth and the Environment," *Journal of Economic Literature* 42(1): 7–71.
- Destler, I.M., and Peter J. Balint. 1999. *The New Politics of American Trade: Trade, Labor, and the Environment*. Policy Analyses in International Economics 58. Washington, D.C.: Institute for International Economics, October.
- Ederington, Josh. 2001. "International Coordination of Trade and Domestic Policies," *American Economic Review*, 91(5): 1580–1593.
- Ederington, Josh, and Jenny Minier. 2003. "Is Environmental Policy a Secondary Trade Barrier? An Empirical Analysis," *Canadian Journal of Economics*, 36(1): 137–154.
- Esty, Daniel C. 1994. *Greening the GATT: Trade, Environment, and the Future*. Washington, D.C.: Institute for International Economics, July.
- Esty, Daniel C. 1996. "Greening World Trade," in Jeffrey J. Schott, ed., *The World Trading System: Challenges Ahead*. Washington, D.C.: Institute for International Economics, December.
- Esty, Daniel C. 2001. "Bridging the Trade-Environment Divide," *Journal of Economic Perspectives*, 15(3): 113–130.
- GATT (1947). General Agreement on Tariffs and Trade 1947, as amended, including notes and supplementary provisions. Geneva: GATT.

- Grossman, Gene M. and Alan B. Krueger. 1993. "Environmental Impacts of a North American Free Trade Agreement," in Peter Garber, ed. *The U.S.—Mexico Free Trade Agreement*. Cambridge, MA: MIT Press.
- Grossman, Gene M. and Alan B. Krueger. 1995. "Economic Growth and the Environment," *Quarterly Journal of Economics*, 110(2): 353–377.
- Harbaugh, William T., Arik Levinson, and David Molloy Wilson. 2002. "Reexamining the Empirical Evidence of the Environmental Kuznets Curve," *Review of Economics and Statistics*, 84(3): 541–551.
- Johnson, Harry G. 1960. "The Cost of Protection and the Scientific Tariff," *Journal of Political Economy*, 68(4): 327–345.
- Karp, Jonathan, and Miriam Jordan. 2002. "U.S. Ports Hold On to Brazilian Mahogany," *The Wall Street Journal*, March 29.
- Kindleberger, Charles P. 1953. *International Economics*. Homewood, IL: Richard D. Irwin, Inc.
- Krist, William. 2001. "Multilateral Environmental Agreements and the World Trade Organization," discussion paper, Woodrow Wilson Center, March <<http://wwics.si.edu/tef/wtoconfpap.htm>> (accessed 9 August 2001).
- Newell, Peter. 2002. "A World Environment Organization: The Wrong Solution to the Wrong Problem." *The World Economy* 25 (5): 659–671.
- Nordström, Håkan, and Scott Vaughan. 1999. *Trade and Environment*. Special Studies 4. Geneva: World Trade Organization.
- Ostry, Sylvia. 2001. "The WTO After Seattle." Paper prepared for presentation at the American Economic Association annual meeting, New Orleans, January.
- Petersmann, Ernst-Ulrich. 1997. *The GATT/WTO Dispute Settlement System: International Law, International Organizations and Dispute Settlement*. London: Kluwer Law International.
- Porter, Michael E., and Claas van der Linde, "Toward a New Conception of the Environment-Competitiveness Relationship," *Journal of Economic Perspectives* 9(4): 97–118.
- Pugel, Thomas A., and Peter H. Lindert. 2000. *International Economics (eleventh edition)*. Boston: Irwin McGraw-Hill.
- Runge, C. Ford. 1994. *Freer Trade, Protected Environment*. New York: Council on Foreign Relations.
- Staiger, Robert W., and Guido Tabellini. 1987. "Discretionary Trade Policy and Excessive Protection," *American Economic Review*, 77(5): 823–37.
- Stilwell, Matthew. 2001. "Protecting GMO Labeling from a WTO Challenge." Center for International Environmental Law. <<http://www.cid.harvard.edu/cidtradeissues/biotechnologypaper.html>> (accessed 19 April 2003).
- Trebilcock, Michael J., and Robert Howse. 1999. *The Regulation of International Trade* (second edition). New York: Routledge.
- United States Trade Representative. October 22, 2001. "USTR on WTO Decision Supporting U.S. on Shrimp-Turtle Law." <<http://usinfo.state.gov/wto/01102201.htm>> (accessed 1 January 2002).
- Unteroberdoerster, Olaf. 2001. "Trade and Transboundary Pollution: Spacial Separation Reconsidered." *Journal of Environmental Economics and Management*, 41(2): 269–285.
- U.S. General Accounting Office. 2001. "International Trade: Concerns Over Biotechnology Challenge U.S. Agricultural Exports." Report to the Ranking Minority Member, Committee on Finance, U.S. Senate (GAO-01-727), June.
- Weinstein, Michael M., and Steve Charnovitz. 2001. "The Greening of the WTO," *Foreign Affairs*, 80(6): 147–156.
- Whalley, John and Ben Zissimos. 2002. "An Internalisation-based World Environmental Organization," *The World Economy*, 25(5): 619–642.