



CLIMATE CHANGE, TRADE AND COMPETITIVENESS
IS A COLLISION INEVITABLE?

OPTIONS FOR ADDRESSING THE LEAKAGE/COMPETITIVENESS ISSUE IN CLIMATE CHANGE POLICY PROPOSALS

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ABSTRACT:

We are likely increasingly to see efforts to minimize leakage of carbon to non-participants and to address concerns on behalf of the competitiveness of carbon-intensive industry. Environmentalists on one side and free traders on the other side fear that border measures such as tariffs or permit-requirements against imports of carbon-intensive products will conflict with the WTO. There need not necessarily be a conflict, if the measures are designed sensibly. There are precedents (the turtle case and the Montreal Protocol) that could justify such border measures so as to avoid undermining the Kyoto Protocol or its successors. But to avoid running afoul of the WTO, and deservedly so, border measures should follow principles such as the following:

- Measures should follow guidelines multilaterally-agreed by countries participating in the emission targets of the Kyoto Protocol and/or its successors, against countries that are not doing so, rather than being applied unilaterally or by non-participants.
- Measures to address leakage to non-members can take the form of either tariffs or permit-requirements on carbon-intensive imports; they should not take the form of subsidies to domestic sectors that are considered to have been put at a competitive disadvantage.
- Independent panels of experts, not politicians, should be responsible for judgments as to findings of fact -- what countries are complying or not, what industries are involved and what is their carbon content, what countries are entitled to respond with border measures, or the nature of the response.

¹ The author would like to acknowledge useful input from Joe Aldy, Thomas Brewer, Steve Charnovitz, Jos Delbeke, Juan Delgado, and Gary Sampson.

- Import penalties should target fossil fuels and a half dozen or so of the most energy-intensive major industries -- aluminum, cement, steel, paper, glass, and perhaps iron and chemicals -- rather than penalizing industries that are further removed from the carbon-intensive activity, such as firms that use inputs produced in an energy-intensive process.
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I – INTRODUCTION

Of all the daunting obstacles faced by the effort to combat global climate change, the problem of leakage is perhaps the easiest to underestimate. Assume that a core of rich countries is able to agree for the remainder of the century on a path of targets for emissions of greenhouse gases (GHGs), following the lead of Kyoto, or to agree on other measures to cut back on emissions, and that the path is aggressive enough at face value to go some ways to achieving the GHG concentration goals that the environmental scientists say are necessary. Even under the Business as Usual scenario -- that is, the path along which technical experts forecast that countries' emissions would increase in the absence of a climate change agreement -- most of the emissions growth is expected to come from China and other developing countries. If they are not included in a system of binding commitments, global emissions will continue their rapid growth. But the problem of leakage is worse than it may appear. Leakage means that emissions in the non-participating countries would actually rise above where they would otherwise be, thus working to undo the environmental benefits of the rich countries' measures. Furthermore, not wanting to lose "competitiveness" and pay economic costs for minor environmental benefits, the rich countries would almost certainly lose heart and the entire effort would unravel. Thus it is essential to find ways to address concerns about competitiveness and leakage.

II - DEVELOPING COUNTRIES, LEAKAGE, AND COMPETITIVENESS

We need developing countries inside the program, for several reasons.²

The developing countries will be the source of the big increases in emissions in coming years according to the Business-as-Usual path (BAU). China, India, and other developing countries will represent up to two-thirds of global carbon dioxide emissions over the course of this century, vastly exceeding the OECD's expected contribution of roughly

² An additional reason we need developing countries in is to give the United States and other industrialized countries the opportunity to buy relatively low-cost emissions abatement from developing countries, which is crucial to keep low the economic cost of achieving any given goal in terms of concentrations. This would increase the probability that industrialized countries comply with the system of international emissions commitments. Elaboration is available from Aldy and Frankel (2004), Frankel (2005a, 2007), Scidman and Lewis (2008) and many other sources.

one-quarter of global emissions. Without the participation of major developing countries, emissions abatement by industrialized countries will not do much to mitigate global climate change

If a quantitative international regime is implemented without the developing countries, their emissions are likely to rise even faster than the BAU path, due to the problem of leakage. Leakage of emissions could come about through several (interrelated) channels. First, output of energy-intensive industries could relocate from countries with emissions commitments to countries without. This could happen either if firms in these sectors relocate their plants to unregulated countries, or if firms in these sectors shrink in the regulated countries while their competitors in the unregulated countries expand. A particularly alarming danger is that a plant in a poor unregulated country might use dirty technologies and so emit more than the plant producing the same output would have in the high-standard rich regulated country, so that aggregate world emissions actually go up rather than down!

Another channel of leakage runs via world energy prices. If participating countries succeed in cutting back consumption of the high-carbon fossil fuels, coal and oil, demand will fall and the prices of these fuels will fall on world markets (other things equal). This is equally true if the initial policy is a carbon tax that raises the price to rich-country consumers as if it comes via other measures. Non-participating countries would naturally respond to declines in world oil and coal prices by increasing consumption. Conversely, demand for clean natural gas would increase in the rich countries, driving up the world price of LNG, and reducing reliance on it in non-participating countries.

Estimates vary regarding the damage in tons of increased emissions from developing countries for every ton abated in an industrialized country. But an authoritative survey concludes “Leakage rates in the range 5 to 20 per cent are common.”³

Even more salient politically than leakage is the related issue of competitiveness: American industries that are particularly intensive in energy or otherwise GHG-generating activities will be at a competitive disadvantage to firms in the same industries operating in

³ International Panel on Climate Change (2001), Chapter 8.3.2.3, pp. 536-544 .

non-regulated countries.⁴ Such sectors as aluminum, cement, glass, paper and steel will point to real costs in terms of lost output, profits, and employment. They understandably will seek protection and are likely to get it.

III - POSSIBLE APPLICATION OF TRADE BARRIERS BY THE UNITED STATES

Of twelve market-based climate change bills introduced in the 110th Congress, almost half called for some border adjustment: either a tax to be applied to fossil fuel imports (unobjectionable, *provided* the same tax is applied to domestic production of the same fossil fuels; distortionary and WTO-illegal otherwise) or a requirement that energy-intensive imports surrender permits corresponding to the carbon emissions embodied in them.⁵ The Bingaman-Specter “Low Carbon Economy Act” of 2007 would provide “If other countries are deemed to be making inadequate efforts [in reducing global GHG emissions], starting in 2020 the President could require importers from such countries to submit special emission allowances (from a separate reserve pool) to cover the carbon content of certain products.” Similarly the Lieberman-Warner bill requires the president to determine what countries have taken comparable action to limit GHG emissions; for imports of covered goods from covered countries, starting in 2020, the importer must buy international reserve allowances.⁶ These requirements are equivalent to a tax on the covered imports. The presidential candidates in the US election campaign apparently support some version of these bills, including import measures in the name of safeguarding competitiveness vis-à-vis developing countries.

In addition, a different law that has already been passed and gone into effect poses similar issues: The Energy Independence & Security Act 2007 “limits US government procurement of alternative fuel to those from which the lifecycle greenhouse gas emissions are equal to or less than those from conventional fuel from conventional petroleum

⁴ It is not meaningful to talk about an adverse effect on the competitiveness of the American economy in the aggregate. Those sectors low in carbon-intensity would in theory *benefit* from an increase in taxation of carbon relative to everything else. This theoretical point is admittedly not very intuitive. Far more likely to resonate publicly is the example that producers of renewable energy, and of the equipment that they use, would benefit.

⁵ Source: Resources for the Future.

⁶ S. 2191: America's Climate Security Act of 2007. Sections 6005-6006.

sources.”⁷ Canada’s oil sands are vulnerable. Since Canada has ratified the Kyoto Protocol and the US has not, the legality of this measure seems questionable.

IV - POSSIBLE APPLICATION OF TRADE BARRIERS BY THE EU

It is possible that many in Washington don’t realize that the US is likely to be the victim of legal sanctions before it is the wielder of them. In Europe firms have already entered the first Kyoto budget period of binding emission limits, competitiveness concerns are well-advanced, and the non-participating United States is an obvious target of resentment.⁸

After the United States failed to ratify, European parliamentarians proposed a “Kyoto carbon tax” against imports from the United States.⁹ The European Commission had to make a decision on the issue in January 2008, when the European Union determined its emission targets for the post-Kyoto period. In preparation for this decision, French President Sarkozy warned:

“...if large economies of the world do not engage in binding commitments to reduce emissions, European industry will have incentives to relocate to such countries...The introduction of a parallel mechanism for border compensation against imports from countries that refuse to commit to binding reductions therefore appears essential, whether in the form of a tax adjustment or an obligation to buy permits by importers. This mechanism is in any case necessary in order to induce those countries to agree on such a commitment.”¹⁰

The envisioned mechanism sounds similar to that in the Bingaman-Specter and Lieberman-Warner bills, with the difference that it could go into effect soon, since Europe is already limiting emissions whereas the US is not.

⁷ Section 526. Source: *FT*, Mar. 10, 2008.

⁸ Bierman and Brohm (2005) and Government of Sweden (2004).

⁹ “Green barricade: Trade faces a new test as carbon taxes go global,” Alan Beattie, *FT*, Jan 24, 2008.

¹⁰ Letter to EU Commission President Jose Manuel Barroso, January 2008.

In the event, the EU Commission included instead the following provision in its Directive:

“Energy-intensive industries which are determined to be exposed to significant risk of carbon leakage could receive a higher amount of free allocation or an effective carbon equalization system could be introduced with a view to putting EU and non-EU producers on a comparable footing. Such a system could apply to importers of goods requirements similar to those applicable to installations within the EU, by requiring the surrender of allowances.”¹¹

The second of the two options, “carbon equalization” sounds consistent with what is appropriate (and with the sort of measures suggested by Sarkozy, and spelled out in detail in the US bills). The first option, however, is badly designed. It would help European industries that are carbon-intensive and therefore vulnerable to competition from non-members by giving them a larger quantity of free emission permits. According to simple microeconomic theory, this would do nothing to address leakage. Because carbon-intensive production is cheaper in non-participating countries, the European firms in theory would simply sell the permits they receive and pocket the money, with the carbon-intensive production still moving from Europe to the non-participants. Admittedly in practice there might be some effects, for example, an infusion of liquidity might keep in operation a firm that otherwise would go bankrupt. But overall, there would probably be almost as much leakage as if there had been no policy response at all. Presumably the purpose behind this option is not to minimize leakage, for which it would be the wrong remedy, nor even to punish non-participating countries, but simply to buy off domestic interests so that they will not oppose action on climate change politically.

V - WOULD TRADE CONTROLS OR SANCTIONS BE COMPATIBLE WITH THE WTO?

Would measures that are directed against CO₂ emissions in other countries, as embodied in electricity or in goods produced with it, be acceptable under international law? Not many years ago, most international experts would have said that import barriers against carbon-

¹¹ Source: Paragraph 13, Directive of the European Parliament & of the Council amending Directive 2003/87/EC so as to improve and extend the EU greenhouse gas emissions allowance trading system; Brussels, Jan. 2008.

intensive goods, whether tariffs or quantitative restrictions, would necessarily violate international agreements. Under the General Agreement on Tariffs and Trade (GATT), although countries could use import barriers to protect themselves against environmental damage that would otherwise occur within their own borders, they could not use import barriers in efforts to affect how goods are produced in foreign countries, so-called Processes and Production Methods (PPMs). A notorious example was the GATT ruling against US barriers to imports of tuna from dolphin-unfriendly Mexican fishermen. But things have changed.

The WTO (World Trade Organization) came into existence, succeeding the GATT, at roughly the same time as the Kyoto Protocol. The drafters of each treaty showed more consideration for the other than do the rank and file among environmentalists and free traders, respectively. The WTO regime is more respectful of the environment than was its predecessor. Article XX allows exceptions to Articles I and III for purposes of health and conservation. The Preamble to the 1995 Marrakech Agreement establishing the WTO seeks “to protect and preserve the environment;” and the 2001 Doha Communiqué that sought to start a new round of negotiations declares: “the aims of ... open and non-discriminatory trading system, and acting for the protection of the environment ... must be mutually supportive.” The Kyoto Protocol text is equally solicitous of the trade regime. It says that the Parties should “strive to implement policies and measures...to minimize adverse effects...on international trade...” The UNFCCC features similar language.

GHG emissions are PPMs. Is this an obstacle to the application measures against them at the border? I don’t see why it has to be. Two precedents can be cited: sea turtles and stratospheric ozone.

The true import of a 1998 WTO panel decision on the shrimp-turtle case was missed by almost everyone. The big significance was a path-breaking ruling that environmental measures can target, not only exported products (Article XX), but also partners’ Processes & Production Methods (PPMs) -- subject, as always, to non-discrimination (Articles I & III). The United States was in the end able to seek to protect turtles in the Indian Ocean, provided it did so without discrimination against Asian fishermen. Environmentalists failed

to notice or consolidate the PPM precedent, and to the contrary were misguidedly up in arms over this case.¹²

Another important precedent was the Montreal Protocol on stratospheric ozone depletion, which contained trade controls. The controls had two motivations¹³:

- (1) to encourage countries to join, and
- (2) if major countries had remained outside, the controls would have minimized leakage, the migration of production of banned substances to nonparticipating countries. In the event (1) worked, so (2) was not needed.

These two examples go a long way to establishing the legitimacy of trade measures against PPMs. Many trade experts, both economists and international lawyers, are not yet convinced¹⁴, let alone representatives of India and other developing countries. I personally have come to believe that the Kyoto Protocol could have followed the Montreal Protocol by incorporating well-designed trade controls aimed at non-participants. One aspect that strengthens the applicability of the precedent is that we are not talking about targeting practices in other countries that harm solely the local environment, where the country can make the case that this is nobody else's business. Depletion of stratospheric ozone depletion and endangerment of sea turtles are global externalities. (It helped that these are turtles that migrate globally.) So is climate change from GHG emissions. A ton of carbon emitted into the atmosphere hurts all residents of the planet.

In case there is any doubt that Article XX, which uses the phrase "health and conservation," applies to environmental concerns such as climate change, a third precedent is relevant. In 2007, a new WTO Appellate Body decision regarding Brazilian restrictions on imports of retreaded tires confirmed the applicability of Article XX(b): Rulings "accord considerable flexibility to WTO Member governments when they take trade-restrictive measures to protect life or health... [and] apply equally to issues related to trade and environmental protection...including measures taken to combat global warming."¹⁵

¹² For a full explanation of the legal issues, see Charnovitz (2003a). Also M. Weinstein, "Greens and Globalization: Declaring Defeat in the Face of Victory," *The New York Times*, 22 April, 2001; and Charnovitz and Weinstein (2001).

¹³ Brack (1996).

¹⁴ Some experts believe that even multilateral trade penalties against non-members might not be permissible under the WTO. See Sampson (2000), p.87.

¹⁵ Source: Brendan McGivern, 12 Dec., 2007.

VI - SOME PRINCIPLES FOR DESIGN OF LEGITIMATE PENALTIES ON CARBON-INTENSIVE IMPORTS

While the shrimp-turtle case and the Montreal Protocol help establish the principle that well-designed trade measures can legitimately target PPMs, at the same time they suggest principles that should help guide drafters as to what is good design.

First, the existence of a multilaterally negotiated international treaty such as the Kyoto Protocol conditions the legitimacy of trade controls. On the one hand, that leakage to non-members could negate the goal of the Protocol strengthens the case for (the right sort of) trade controls. It is stronger, for example, than in the shrimp-turtle case, which was a unilateral US measure. On the other hand, the case is weaker than it was for the Montreal Protocol. (Multilateral initiatives like the latter are on firmer ground than unilateral initiatives.) The Kyoto Protocol could have made explicit allowance for multilateral trade controls, and chose not to. The case would be especially weak for American measures if the US has still not ratified the Kyoto Protocol or a successor agreement. The Europeans have a relatively good case against the United States, until such time as the US ratifies. But the case would be stronger still if a future multilateral agreement, for example under the Framework Convention on Climate Change (UNFCCC), agreed on the legitimacy of trade controls and on guidelines for their design.

Second, there is the question of the sorts of goods or services to be made subject to penalty. It would certainly be legitimate to apply tariffs against coal itself, assuming domestic taxation of coal or a domestic system of tradable permits were in place. It is probably also legitimate when applied to the carbon content of electricity, though this requires acceptance of the PPM principle. The big question is the carbon/energy content of manufactures. Trade sanctions would probably not be legitimate when applied solely as punishment for free riding, against unrelated products of a non-member or, in a more extreme case, on clean inputs, e.g., a ban on US turbines used for low-carbon projects

(unless perhaps economy-wide sanctions were multilaterally agreed by UNFCCC members).¹⁶

Paradoxically, the need to keep out coal-generated electricity or aluminum from non-members of the Kyoto Protocol is greater than the need to keep out coal itself. The reason is that the Protocol already puts limits on within-country emissions. If one assumes the limits are enforced, then the world community has no particular interest in how the country goes about cutting its emissions. But if the country imports coal-generated electricity or aluminum from non-members, the emissions occur outside its borders and the environmental objective is undermined.

But it is hard to determine carbon content of manufactures. The best would be to stay with the five biggest-scale, most energy-intensive industries – probably aluminum, cement, steel, paper, and glass. Even here there are difficult questions. What if the energy used to smelt aluminum in another country is cleaner than in the importing country (Iceland's energy comes from hydro and geothermal) or dirtier (much of China's energy comes from coal)? How can one distinguish the marginal carbon content of the energy used for a particular aluminum shipment from the average carbon content of energy in the country of origin? These are questions that will have to be answered. But as soon as one goes beyond four or five big industries, it becomes too difficult for even a good-faith investigator to discern the effective carbon content, and it is also too liable to abuse. One would not want to levy tariffs against the car parts that are made with the metal that was produced in a carbon-intensive way, or against the automobiles that used those car parts (they could be low-mileage hybrids!) or against the products of the firms that bought the cars, etc.

VII - THE BIG DANGER

Just because a government measure is given an environmental label, does not necessarily mean that it is motivated primarily -- or even at all -- by bona fide environmental objectives. To see the point one has only to look at the massive mistake of American subsidies of bio-fuels (and protection against competing imports from Brazil). If each country on its own

¹⁶ Charnovitz (2003, page 156) emphasizes the distinction between trade controls, which fall on environmentally relevant sectors, versus trade sanctions, where the targeted products are arbitrary and unrelated to the non-compliant act (and are used multilaterally only by the WTO and UN security council).

imposes border adjustments for imports in whatever way suits national politics, they will be poorly targeted, discriminatory, and often disguisedly protectionist. When reading the language in the US Congressional bills or the EU decision, it is not hard to imagine that special interests could take over for protectionist purposes the process whereby each government decides whether other countries are doing their share, and what foreign competitors merit penalties.¹⁷ Thus the competitiveness provisions will indeed run afoul of the WTO, and they will deserve to.

It is important who makes the determinations regarding what countries are abiding by carbon-reduction commitments, who can retaliate against the non-compliers, what sectors are fair game, and what sort of barriers are appropriate. One policy conclusion is that these decisions should be delegated to independent panels of experts, rather than made by politicians.

The most important policy conclusion is that we need a multilateral regime to guide such measures. Ideally the regime would be negotiated along with a successor to the Kyoto Protocol that set targets for future periods and brought the United States and developing countries inside. But if that process takes too long, it might be useful in the shorter run for the US to enter negotiations with the EU to harmonize guidelines for border penalties, ideally in informal association with the secretariats of the UNFCCC and the WTO.¹⁸

VIII - WHY TAKE MULTILATERALISM SERIOUSLY?

“Why should WTO obligations be taken seriously?” some may ask. There are three possible answers, based on considerations of international citizenship, good policy, and real politik.

Regarding international citizenship, one question is whether the US wants to continue its drift in the general direction of international rogue country status, or rather to return to the highly successful post-war strategy of adherence to international law and full

¹⁷ The Congressional language imposing penalties on imports from countries that do not tax carbon was apparently influenced by the International Brotherhood of Electrical Workers, which regularly lobbies for protection of American workers from foreign competition. Alan Beattie, *FT*, Jan 24, 2008. Simultaneously, the European Trade Union Confederation urged the EU Commission to tax imports from countries refusing to reduce emissions. “Unions back carbon tax on big polluting nations,” AP and *Wall Street Journal*, Jan. 16, 2008.

¹⁸ Sampson (1999).

membership in -- indeed leadership of -- multilateral institutions. The latter course does not mean routinely subordinating American law, let alone American interests, to international law. There will be cases where the US wants to go its own way. But the effort on Climate Change should surely not be one of these cases. Among other reasons is that GHG emissions are inherently a global externality. No single country can address the problem on its own, due to the free rider problem. While there is a role for unilateral actions on climate change -- e.g., by the United States as part of a short-term effort to demonstrate seriousness of purpose and begin to catch up with the record of the Europeans -- in the long term multilateral action offers the only hope of addressing the problem. The multilateral institutions are already in place -- specifically the UNFCCC, its child the Kyoto Protocol, and the WTO -- and they were predominantly created by US leadership.

Moreover, the basic designs and operations of these institutions happen to be relatively sensible, taking political realities as given. They are more sensible than most critics of the international institutions and their alleged violations of national sovereignty believe. This applies whether the critics are on the left or right, and whether their main concern is the environment or the economy.¹⁹ One can place very heavy weight on economic goals, and yet realize the desirability of addressing externalities, minimizing with leakage, dealing with competitiveness concerns, and so forth. One can place very heavy weight on environmental goals, and yet realize the virtues of market mechanisms, non-discrimination, reciprocity, addressing international externalities *cooperatively*, preventing special interests from hijacking environmental language for their own financial gain, and so forth.

The third reason why the US should be prepared to modify the sort of “international reserve allowances” language of the Lieberman-Warner bill, and moving in the direction of multilateral coordination of guidelines for such measures, comes from hard-headed self interest. Section 6006 of Lieberman-Warner does not envision these measures going into effect until 2020. This is as it should be, since any such bill must give the United States time to start playing the game before it can presume to punish other players for infractions. But the EU language could be translated into penalties against US products any day. It is in the American interest to have any border penalties governed by a sensible system of multilateral

¹⁹ I have addressed elsewhere other ways in which the climate regime (Kyoto) could come into conflict with the trade regime (WTO), and the more general questions of whether free trade and environmental protection need be in conflict. Frankel (2004, 2005a,b).

guidelines. The Europeans might welcome US participation in joint negotiations to agree on guidelines, as part of a process of negotiations over the Kyoto-successor regime. The argument is much stronger than the historical examples of US import barriers leading to subsequent emulation and retaliation that comes back to hit our exports (Smoot Hawley tariff in 1930, Anti-Dumping cases in the 1980s....) Here we have an opportunity to influence others' barriers against our goods more than ten years before we would be putting up barriers against theirs.

IX - CONCLUDING RECOMMENDATIONS

Both the economics and the law are complicated. The issues needed further study. Nevertheless, the central message of this paper is that border measures to address leakage need not necessarily violate the WTO or sensible trade principles, but that there is a very great danger in practice that they will.

I conclude with some subjective judgments as to principles that could guide a country's border measures if its goal were indeed to reduce leakage and avoid artificially tilting the playing field toward carbon-intensive imports of non-participating countries. I classify characteristics of possible border measures into three categories, which I will name by color (for lack of better labels):

- (1) the "White" category: those that seem to me reasonable and appropriate
- (2) the "Black" category: those that seem to me very dangerous, in that they are likely to become an excuse for protectionism
- (3) the "Grey" category: those that fall in between.

The White (appropriate) border measures could be either tariffs or (equivalently) a requirement for importers to surrender tradable permits. The principles include:

- Measures should follow some multilaterally-agreed set of guidelines among countries participating in the emission targets of the Kyoto Protocol and/or its successors.
- Judgments as to findings of fact -- what countries are complying or not, what industries are involved and what is their carbon content, what countries are entitled to respond with border measures, or the nature of the response -- should be made by independent panels of experts.

- Measures should only be applied by countries that are reducing their emissions in line with the Kyoto Protocol and/or its successors, against countries that are not, either due to refusal to join or to failure to comply.
- Import penalties should target fossil fuels, and five or six of the most energy-intensive major industries: aluminum, cement, steel, paper, glass, and perhaps iron and chemicals.

The Black (inappropriate) border measures include:

- Unilateral measures applied by countries that are not participating in the Kyoto Protocol or its successors.
- Judgments as to findings of fact that are made by politicians, vulnerable to political pressure from interest groups for special protection.
- Unilateral measures that seek to sanction an entire country, rather than targeting narrowly defined energy-intensive sectors.
- Import barriers against products that are further removed from the carbon-intensive activity, such as firms that use inputs that are produced in an energy-intensive process.
- Subsidies – whether in the form of money or extra permit allocations -- to domestic sectors that are considered to have been put at a competitive disadvantage.

The Gray (intermediate) measures include:

- Unilateral measures that are applied in the interim before there has been time for multilateral negotiation over a set of guidelines for border measures.

REFERENCES

- Aldy, Joseph, and Jeffrey Frankel, "Designing a Regime of Emission Commitments for Developing Countries that is Cost-Effective and Equitable," written for *G20 Leaders and Climate Change*, Council on Foreign Relations, Sept. 20-21, 2004.
- Aldy, Joseph, Scott Barrett, and Robert Stavins (2003), "Thirteen Plus One: A Comparison of Global Climate Architectures," *Climate Policy*, 3, no. 4, 373-97.
- Bierman, F., and R. Brohm "Implementing the Kyoto Protocol Without the United States: The Strategic Role of Energy Tax Adjustments at the Border," *Climate Policy* (2005, vol. 4, no. 3).
- Brack, D., 1996, *International Trade and the Montreal Protocol* (London: The Royal Institute of International Affairs and Earthscan Publications, Ltd.).
- Brewer, T.L. "The Trade Regime and the Climate Regime: Institutional Evolution and Adaptation," *Climate Policy* 3, no. 4 (2003): 329-341.
- Brewer, T.L. "Multinationals, the Environment and the WTO: Issues in the Environmental Goods and Services Industry and in Climate Change Mitigation," in S. Lundan, A. Rugman and A. Verbeke, eds., *Multinationals, the Environment and Global Competition* (Elsevier, 2004).
- Brewer, T.L. "The WTO and the Kyoto Protocol: Interaction Issues," *Climate Policy* vol. 4, no. 1 (Sept. 2004).
- Charnovitz, Steven, 2003a, "The Law of Environmental 'PPMs' in the WTO: Debunking the Myth of Illegality," *The Yale Journal of International Law* 27, no. 1 (Winter 2003): 59-110.
- Charnovitz, Steven, 2003b, "Trade and Climate: Potential Conflicts and Synergies," in *Beyond Kyoto: Advancing the International Effort Against Climate Change* (Pew Center on Global Climate Change, 2003), 141-167.
- Charnovitz, Steven, and Michael Weinstein, "The Greening of the WTO," *Foreign Affairs* 80, no. 6 (2001): 147-156.
- Cosbey, Aaron, Sergio Saba, and Lucas Assuncao, 2003, *Implications, Including for Development, of the Interface Between Environment and Trade Policies for Oil-Exporting Countries*, United Nations Secretariat, August. Chapter 4.1, "Options on Kyoto under WTO Rules."
- Frankel, Jeffrey, 2004, "Kyoto and Geneva: Linkage of the Climate Change Regime and the Trade Regime" for *Broadening Climate Discussion: The Linkage of Climate Change to Other Policy Areas*, FEEM/MIT conference, Venice, 2004. [KSG RWP04-042](#).
- Frankel, Jeffrey, 2005a, "You're Getting Warmer: The Most Feasible Path for Addressing Global Climate Change Does Run Through Kyoto," In *Trade and Environment: Theory*

and Policy in the Context of EU Enlargement and Transition Economies, edited John Maxwell and Rafael Reuveny (Edward Elgar Publishers, Ltd., UK), 2005; pp. 37-55.

Frankel, Jeffrey, 2005b, "Climate and Trade: Links Between the Kyoto Protocol and WTO," in *Environment*, vol. 47, no. 7, September 2005: 8-19.

Frankel, Jeffrey, 2005c, "The Environment and Globalization" in *Globalization: What's New* edited by Michael Weinstein, Council on Foreign Relations (Columbia University Press: New York), 2005, pp. 129-169. Reprinted in Economics of the Environment: Selected Readings, Fifth Edition, edited by R.Stavins (W.W.Norton: New York), 2005.

Frankel, Jeffrey, 2007, "Formulas for Quantitative Emission Targets," Chapter 2 in Architectures for Agreement: Addressing Global Climate Change in the Post Kyoto World, edited by Joe Aldy and Robert Stavins, Cambridge University Press, 2007, p. 32-56.

Frankel, Jeffrey, and Andrew Rose, "Is Trade Good or Bad for the Environment? Sorting out the Causality" *Review of Economics and Statistics*, 87, no. 1, 2005.

Government of Sweden, National Board of Trade [Kommerskollegium], *Climate and Trade Rules – harmony or conflict?* (2004).

International Panel on Climate Change (2001), *Third Assessment Report -- Climate Change 2001*, Working Group III.

Sampson, Gary P., *Trade, Environment, and the WTO: The Post-Seattle Agenda*, Overseas Development Council (Washington) and Johns Hopkins University Press (Baltimore), 2000, p.87.

Sampson, Gary "WTO Rules and Climate Change: The Need for Policy Coherence," in Bradnee Chambers. ed., *Global Climate Governance: A Report on the Inter-Linkages Between the Kyoto Protocol and Other Multilateral Regimes* (Tokyo: United Nations University, 1999).

Seidman, Laurence, and Kenneth Lewis, 2008, "Compensation and Contributions Under an International Carbon Treaty," University of Delaware, February.