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Abstract
The climate-trade nexus gains increasing attention as governments are taking great efforts to forge a post-2012 climate change regime to succeed the Kyoto Protocol. This raises the issues of the scope of trade-related measures and of when and how they could be used. This paper discusses how far trade-related measures should be incorporated in that context. Drawing on an analogy to the Montreal Protocol and comparing developing country's climate mitigation and adaptation needs with the funding available, the paper argues that such measures should initially be applied only among Annex I or II countries. To discipline the use of unilateral trade measures at the international level, the paper emphasizes a need to define comparable climate efforts. Moreover, the Lieberman-Warner bill in the U.S. Senate - taken as a proxy for future U.S. climate legislation - is assessed, and found to be neither effective nor likely to be WTO-consistent. The paper is concluded by arguing that, in order to encourage developing countries to do more to combat climate change, developed countries should focus on carrots. Sticks can be incorporated, but only if they are credible and realistic and serve as a useful supplement to push developing countries to take actions or adopt policies and measures earlier than would otherwise have been the case.

JEL classification: F18; Q48; Q54; Q56; Q58

Keywords: Post-2012 climate negotiations; Trade-related measures; Lieberman-Warner bill; WTO; Montreal Protocol; Developing countries; United States

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I. Introduction

There is a growing consensus that climate change has the potential to seriously damage our natural environment and affect the global economy and thus represents the world's most pressing long-term threat to future prosperity and security. With greenhouse gas emissions embodied in virtually all products produced and traded in every conceivable economic sector, effectively addressing climate change will require a fundamental transformation of our economy and the ways energy is produced and used. This will certainly have a bearing on world trade because it will affect the costs of production of traded products and therefore their competitive positions in the world market. This climate-trade nexus has become the focus of an academic debate (e.g., Bhagwati and Mavroidis, 2007; Charnovitz, 2003; Hufbauer, Charnovitz and Kim, 2009; Ismer and Neuhoff, 2007; The World Bank, 2007; Zhang, 1998, 2004 and 2007a; Zhang and Assunção, 2004), and gains increasing attention as governments are taking great efforts to forge a post-2012 climate change regime to succeed the Kyoto Protocol. To level the carbon playing field, such a regime, if effective, will imperatively include the use of trade-related policy tools. The core element of that is trade-related measures in a post-2012 climate change regime. This raises the issues of the scope of such measures and of when and how they could be used.

To examine this issue, this paper first looks at the lesson learned from other multinational environmental agreements, such as the Montreal Protocol in which such trade provisions have been included to see what guidance can be provided. Next, the paper examines whether the condition can be met, provided that a post-2012 climate regime is to incorporate trade provisions as the Montreal Protocol does. The paper also interprets the findings of the WTO panels on the Thai cigarette dispute the Shrimp-Turtle dispute to infer future WTO panel's stance on the use trade provisions being justified under the environmental exceptions of GATT Article XX. On these basis, the paper argues that while it is unlikely for developing country parties to agree to the inclusion of trade-related measures in a post-2012 climate regime, trade-related measures should, at the very least, be contemplated for a set of industrialized countries (Annex I or II countries) as part of the evolving climate regime. It should be specified how these measures will apply to non-complying parties within this group and when and how unilateral trade measures can be used against countries outside the group. To that end, the paper emphasizes that there is a clear need to define comparable efforts towards climate mitigation and adaptation to discipline the use of unilateral trade measures at the international level, because some industrialized countries, if not all, are considering the term "comparable" as the standard by which to assess the efforts made by their trading partners in order to decide on whether to impose unilateral trade measures on them. Finally, the paper argues that the Lieberman-Warner type of border adjustment provision, in its current form, is likely to face a WTO-consistency and methodological challenges. It holds out more sticks than carrots to developing countries. In order to encourage developing countries to do more to combat climate change, developed countries should clearly focus on carrots. Although sticks can be incorporated, it is argued that they should be credible and realistic and serve as a useful supplement to push developing countries to take actions or adopt policies and measures earlier than would otherwise have been the case. The paper concludes that at a time when the world community is starting to

negotiate a post-2012 climate regime, unrealistic border adjustment measures as exemplified in the Lieberman-Warner bill are counterproductive to help to reach such an agreement on comparable climate actions in the post-2012 climate negotiations.

2. Trade measures in the Montreal Protocol

The Montreal Protocol on Substances that Deplete the Ozone Layer (MP) was signed in 1987 and has since been amended and strengthened in a number of aspects. The MP uses trade measures as one enforcement mechanism among several policy instruments in achieving its aim of protecting the ozone layer. Parties to the treaty are required to ban trading with non-parties in ozone-depleting substances (ODS), such as CFCs, in products containing them, such as refrigerators, and potentially, in products made with but not containing CFCs, such as electronic components. The last provision has not yet been implemented primarily because of problems of detection, and also because of the small volumes of CFCs involved. These trade measures have been gradually extended to all the categories of ozone-depleting substances covered by the MP. Moreover, the MP has included the provision that exempts non-parties from trade measures if they are determined by the parties to be in compliance with the phase-out schedules. So, the offsetting trade measures are based on legitimate environmental objective and not merely on formal membership of an international agreement (Brack, 1996; Zhang, 1998).

More importantly, these trade measures are accompanied with finance and technology transfer mechanisms. Under the MP, the Multilateral Fund for the Implementation of the Montreal Protocol was established in 1990 to meet the incremental costs of developing country parties (the so-called Article 5 countries) in complying with the MP requirements. Since its operation in 1991, the Multilateral Fund has received contributions totaling over US$ 2.3 billion from 49 industrialized countries and supported about 5,700 projects and activities in 146 developing countries. The implementation of these projects will result in the phase-out of the consumption of more than 249,577 ODP tonnes and the production of about 174,206 tonnes of ozone depleting substances. As a result, developing countries are no worse off as parties than they are as non-parties. The MP is now 20-year old with 191 Parties. It has achieved 95% of its objective of phasing out the ODS and put the ozone layer on a path to recovery.[1] Accompanied with this effective financial mechanism, the first of its kind from an international treaty, the MP trade measures have in fact hardly ever been used, because almost every country is now a party to the treaty.

3. Funding from the Climate Convention and its financial mechanism

The lesson from the MP suggests that the funding level of finance mechanism is crucial if a post-2012 climate regime is to incorporate trade provisions as the Montreal Protocol does. The Kyoto Protocol (KP) establishes a clean development mechanism (CDM). It serves as a channel to provide finance and technology transfer to developing countries. The CDM has, in part, been successful. The global number of CDM projects registered

[1] See the Multilateral Fund web site at: http://www.multilateralfund.org (accessed on August 29, 2008).

and in the pipeline totals over 4600 - well above what was envisioned by countries when they negotiated, designed and launched the mechanism (Zhang, 2009b). The CDM market increased from 563 million tons of certified emission reductions (CERs) and €3.9 billion in 2006 to 947 million tons of CERs and €12 billion in 2007. The astonishing increase in value terms is due mainly to dramatic growth in the secondary market with about 300 million CERs traded over the course of 2007 (Point Carbon, 2008). While the CDM has emerged as a financing mechanism to mitigate greenhouse gas emissions as the implementation of CDM projects has progressed, it still does not work to full potential scale (IETA, 2008; Paulsson, 2009; Zhang, 2008a). To that end, change needs to take place both at national and international levels. At the national level, for those developing countries that have not truly benefited from the CDM, they need to put in place clear institutional structures, streamlined and transparent CDM procedures and sound governance of clearer lines of responsibility and functions to facilitate the smooth implementation of CDM projects in their countries. At the international level, post-Kyoto climate negotiations need to reform the CDM to overcome its current structural limitations and to make it accommodate those players and types of small projects that have been left out to date. When taken together and combined, they will help to expand the number and geographical reach of the CDM, thus spreading its benefits to more countries (Zhang, 2008a). Nevertheless, markets cannot deliver miracles. Market instruments like CDM, as useful as it may be, must therefore be complemented with traditional fund solutions that provide a stable source of funding.

Table 1 The Amount of Pledges and Contributions from the Multilateral Financial Mechanisms under the Framework Convention and its Kyoto Protocol

Sources	Amount (million US$)
Special Climate Change Fund	106.57 (pledged)
Least Developed Countries Fund	172.44 (pledged)
Adaptation Fund	80-300 per year (estimated)
Global Environment Facility Trust Fund (allocated to climate change focal area)	950 (targeted for 2006-2010)

Sources: Global Environment Facility (2008a); UNFCCC (2007).

Can the funds established within the climate regime deliver as the Multilateral Fund under the MP did? The Special Climate Change Fund and the Least Developed Countries Fund are established under the United Nations Framework Convention on Climate Change (UNFCCC). As of October 2, 2008, the total pledged for these two funds (cumulatively, not per year) is US$279 million (Table 1). The only fund under the KP is the Adaptation Fund. The level of its funding depends on the quantity of CERs issued and their prices. Assuming annual sales of 300-450 million tons of CERs and a market price of US$24 per ton of CERs, the Adaptation Fund would receive US$80-300 million per year for the period 2008-2012 (UNFCCC, 2007). The Global Environment Facility (GEF) as an entity operating the financial mechanism of the UNFCCC has targeted the

amount of US$950 from its fourth replenishment at climate change projects over the period 2006-2010. Combined together, the pledges and contributions from all these three funds and the GEF Trust Fund are well below US$1 billion a year.

By contrast, according to the Stern Review (Stern, 2007), the incremental costs of low carbon investments in developing countries are likely to be at least US$20-30 billion a year. This is a very conservative estimate. The UNFCCC (2007) Secretariat puts the investment estimates for climate change adaptation in developing countries in the range of US$28-67 billion a year. On mitigation, the UNFCCC (2007) Secretariat estimates the investment of US$76 billion needed in developing countries a year.[2] So, developing countries will need the investment of at least US$100 billion in climate change mitigation and adaptation. However, the contributions from all these three funds and the GEF Trust Fund only amount to less than one percent of the anticipated needs from developing countries. This suggests that the ratio of the combined pledged funding from the funds to the required investment at 1:100.

Table 2 GEF Trust Fund Allocations and Co-financing in the Climate Change Focal Area

GEF Phase	GEF Grant (million US$)	Co-financing (million US$
Pilot phase (1991-1994)	284.80	2402.89
GEF 1 (1994-1998)	510.36	2322.10
GEF 2 (1998-2002)	681.07	3403.40
GEF 3 (2002-2006)	877.72	4810.56
GEF 4 (2006-2010)	950.00 (targeted)	
2007	76.35	1651.82
2008	138.45	1119.46
2009	88.26	514.04
Total	2657.01	16224.28

Source: Global Environment Facility (2008b).

The value of a single multilateral fund lies in its ability to leverage contributions from a range of other donors. Can these funds leverage co-financing from other sources to close this financing gap? Let us look at the recent record of leverage of multilateral funding. Since 1990, the World Bank Group commitments to renewable energy and efficiency have exceeded US$10 billion, with each dollar leveraging another three dollars from other private and public sources (Cundy, 2006). The GEF as an entity operating the financial mechanism of the UNFCCC, since its inception in 1991, has provided $8.26

[2] The estimates vary. The World Bank (2006) estimates the incremental, upfront capital costs of US$30 billion per year to decarbonize the power sector in developing countries alone.

billion in grants and generated over $33.7 billion in co-financing from other sources to support over 2,200 projects that produce global environmental benefits in 165 developing countries and countries with economies in transition.[3] As indicated in Table 2, in the focal area of climate change, as at November 2008, the GEF has allocated since its inception a total of US$2.66 billion from the GEF Trust Fund. This GEF funding has leveraged a co-financing in excess of US$16.22 billion. This suggests that the GEF enjoys an average leverage ratio of 4.1 in the all six focal areas and 6.1 in the climate change focal area, meaning that each dollar of the GEF grant leverages US$4.1-6.1 from other sources. Assuming the leverage ratio of 6 and the minimum requirement of US$100 billion per year, then the current commitments are only able to bring the total finance value to US$7 billion and leave the financing gap of US$93 billion per year. To close this gap, we need to increase the multilateral funding and enhance its leverage ability. Assuming the leverage ratio of 10, which has not experienced over the long time horizon for multibillion public funding, and the minimum requirement of US$100 billion per year, then the multilateral funding needs to be increased to US$10 billion per year to meet developing country needs for climate change mitigation and adaptation.

If the funding available under the financial mechanism of the UNFCCC remains at its current level and continues to rely mainly on voluntary contributions, it will not be sufficient to address the future financial flows estimated to be needed for climate change mitigation and adaptation in developing countries. If a success of the Montreal Protocol could be considered as some kind of predictor for a post-2012 climate regime, the combined pledged funding and contribution from the funds under the UNFCCC and the GEF and estimated funding from the fund under its KP are nowhere near to make trade measures work effectively, not to mention whether they can be incorporated in a post-2012 climate regime in the first place.

4. The findings of WTO Thai cigarette dispute and the Shrimp-Turtle dispute

Before the contracting parties employ trade measures to fulfill health/environmental concerns, WTO case laws suggest that, in order for these measures to be justified under the environmental exceptions of GATT Article XX, the contracting parties should explore whether there are any alternatives to trade provisions that could be reasonably expected to fulfill the same function but are not inconsistent or less inconsistent with the relevant WTO provisions or a good-faith effort has been made to reach an agreement among the parties concerned.

The GATT Thai cigarette dispute illustrates the former. Under Section 27 of the Tobacco Act of 1966, Thailand restricted imports of cigarettes and imposed a higher tax rate on imported cigarettes when they were allowed on the three occasions since 1966, namely in 1968-70, 1976 and 1980. After consultations with Thailand failed to lead to a solution, the U.S. requested in 1990 the Dispute Settlement Panel to rule on the Thai action on the grounds that it was inconsistent with Article XI:1 of the General Agreement; was not

[3] See "The About GEF" at the GEF web site at: http://www.thegef.org/interior.aspx?id=50 (accessed on November 14, 2008).

justified by the exception under Article XI:2(c), because cigarettes were not an agricultural or fisheries product in the meaning of Article XI:1; and was not justified under Article XX(b) because the restrictions were not necessary to protect human health, i.e. controlling the consumption of cigarettes did not require an import ban. The Dispute Settlement Panel ruled against Thailand. The Panel found that Thailand had acted inconsistently with Article XI:1 for having not granted import licenses over a long period of time. Recognizing that XI:2(c) allows exceptions for fisheries and agricultural products if the restrictions are necessary to enable governments to protect farmers and fishermen who, because of the perishability of their produce, often could not withhold excess supplies of the fresh product from the market, the Panel found that cigarettes were not "like" the fresh product as leaf tobacco and thus were not among the products eligible for import restrictions under Article XI:2(c). Moreover, the Panel acknowledged that Article XX(b) allowed contracting parties to give priority to human health over trade liberalization. The Panel held the view that the import restrictions imposed by Thailand could be considered to be "necessary" in terms of Article XX(b) only if there were no alternative measure consistent with the General Agreement, or less inconsistent with it, which Thailand could reasonably be expected to employ to achieve its health policy objectives. However, the Panel found the Thai import restriction measure not necessary because Thailand could reasonably be expected to take strict, non-discriminatory labelling and ingredient disclosure regulations and to ban all the direct and indirect advertising, promotion and sponsorship of cigarettes to ensure the quality and reduce the quantity of cigarettes sold in Thailand. These alternative measures are considered WTO-consistent to achieve the same health policy objectives as Thailand now pursues through an import ban on all cigarettes whatever their ingredients (GATT, 1990).

The WTO Appellate Body decisions on the Shrimp-Turtle dispute, which have been interpreted as implicitly permitting trade measures pursued through multilateral environmental agreements (MEAs), illustrate the latter. To address the decline of sea turtles around the world, in 1989 the U.S. Congress enacted Section 609 of Public Law 101-162 to authorize embargoes on shrimp harvested with commercial fishing technology harmful to sea turtles. The U.S. was challenged in the WTO by India, Malaysia, Pakistan and Thailand in October 1996, after embargoes were leveled against them. The four governments challenged this measure, asserting that the U.S. could not apply its laws to foreign process and production methods. A WTO Dispute Settlement Panel was established in April 1997 to hear the case. The Panel found that the U.S. failed to approach the complainant nations in serious multilateral negotiations before enforcing the U.S. law against those nations. The Panel held that the U.S. shrimp embargo was a class of measures of processes-and-production-methods type and had a serious threat to the multilateral trading system because it conditioned market access on the conservation policies of foreign countries. Thus, it cannot be justified under GATT Article XX. However, the WTO Appellate Body overruled the Panel's reasoning. The Appellate Body held that a WTO member requires from exporting countries compliance, or adoption of, certain policies prescribed by the importing country does not render the measure inconsistent with the WTO obligation. Although the Appellate Body still found that the U.S. shrimp embargo was not justified under GATT Article XX, the decision was not on ground that the U.S. sea turtle law itself was not inconsistent with GATT. Rather, the

ruling was on ground that the application of the law constituted "arbitrary and unjustifiable discrimination" between WTO members (WTO, 1998). The WTO Appellate Body pointed to a 1996 regional agreement reached at the U.S. initiation, namely the Inter-American Convention on Protection and Conservation of Sea Turtles, as evidence of the feasibility of such an approach (WTO, 1998; Berger, 1999). Here, the Appellate Body again advanced the standing of multilateral environmental treaties (Zhang, 2004; Zhang and Assunção, 2004). Thus, it follows that this trade dispute under the WTO may have been interpreted as a clear preference for actions taken pursuant to multilateral agreements and/or negotiated through international cooperative arrangements, such as the Kyoto Protocol and its successor. However, this interpretation should be with great caution, because there is no doctrine of *stare decisis* (namely, "to stand by things decided") in the WTO; the GATT/WTO panels are not bound by previous panel decisions (Zhang and Assunção, 2004).

Moreover, the WTO Shrimp-Turtle dispute settlement may have a bearing on the ongoing discussion on the "comparability" of climate actions in a post-2012 climate change regime. The Appellate Body found that when the U.S. shifted its standard from requiring measures essentially the same as the U.S. measures to "the adoption of a program *comparable* in effectiveness", this new standard would comply with the WTO disciplines. Some may view that this case opens the door for U.S. climate legislation that bases trade measures on an evaluation of the comparability of climate actions taken by other trading countries (Werksman and Houser, 2008). Comparable action can be interpreted as meaning action comparable in effect as the "*comparable* in effectiveness" in the Shrimp-Turtle dispute. It can also be interpreted as meaning "the comparability of efforts". The Bali Action Plan (BAP) adopts the latter interpretation, using the terms comparable as a means of ensuring that developed countries undertake commitments comparable to each other. But the BAP does not provide a clear definition. In the next section, we will discuss why there is a clear need to define comparable efforts towards climate mitigation and adaptation to discipline the use of unilateral trade measures at the international level.

5. What can be taken from the MP and the findings of WTO Appellate Body in the Shrimp-Turtle dispute?

The lesson from the MP suggests that trade measures can be incorporated in MEAs and work effectively in practice only if they are accompanied with effective financial and technology transfer mechanisms. However, just because the MP successfully uses trade measures to prompt broad participation and help compliance and enforcement does not necessarily mean that there is a potential for a post-2012 climate regime to do the same. So we need to be very careful in transplanting the MP experience into the UNFCCC context. Indeed, given that the scope of economic activities affected by a climate regime is several orders of magnitude larger than those covered by the MP, it is unlikely for industrialized countries to bear all the incremental costs of climate mitigation and adaptation in developing countries as they do in the MP case. Developing countries have well recognized this reality and are not expected for their costs to be fully borne by industrialized countries. However, if the combined pledged funding from the funds under the Climate Convention and its Kyoto Protocol and from its financial mechanism is

significantly far from the anticipated climate mitigation and adaptation needs from developing countries as it has been the case, it is safe to say that developing country parties are unlikely to agree to the inclusion of trade-related measures against them in a post-2012 climate regime in the first place.

However, as part of the evolving climate regime, trade-related measures should, at the very least, be contemplated for a set of industrialized countries (Annex I or II countries). It should be specified how these measures will apply to non-complying parties within this group and when and how unilateral trade measures can be used against countries outside the group. On the one hand, current articles on climate-trade linkages under the UNFCCC and its Kyoto Protocol are too general to hardly be of practical use. On the other hand, the BAP calls for "comparability of efforts" towards climate mitigation actions only among industrialized countries. However, lack of the clearly defined notion on what is comparable has led to diverse interpretations of the concept of comparability. Moreover, there is no equivalent language in the BAP to ensure that developing country actions, whatever might be agreed at Copenhagen, that must also be comparable to those of developed countries. So, some industrialized countries have extended the scope of its application beyond industrialized countries themselves, attempting to impose unilateral trade measures against other trading partners to address its competitiveness concerns. Such lack of the common understanding will lead one country to define whether other countries have made comparative efforts to its own. This can hardly be objective, and in turn leads one country to misuse unilateral trade measures against other trading partners to address its competitiveness concerns. Therefore, there is a clear need to define comparable efforts towards climate mitigation and adaptation to discipline the use of unilateral trade measures at the international level, taking into account differences in their national circumstances, such as current level of development, per capita GDP, current and historical emissions, emission intensity, and per capita emissions. If well defined, that will provide some reference to WTO panels in examining cases related to comparability issues.

As a hypothetical example, assume that a country imposes unilateral trade measures against its trading partners on the comparability ground but does so without following the internationally agreed notion. Its trading partners might choose to challenge that country before WTO. A case like this is likely, given that both the top Chinese official in charge of climate issue and the Brazilian lead climate ambassador consider the WTO as the proper forum when developing countries are required to purchase allowances in the proposed U.S. cap-and-trade regime (Samuelsohn, 2007). If a case like this really happens before a WTO panel, that panel would likely look to the UNFCCC for guidance on an appropriate standard for the comparability of climate to assess whether that country has followed the international standard when determining comparability. Otherwise, that WTO panel will have no choice but to fall back on the aforementioned Shrimp-Turtle jurisprudence, and would be influenced by the fear of the political fall out from overturning U.S. unilateral trade measures in its domestic climate legislation. If the U.S. measures were allowed to stand, that would undermine the UNFCCC's legitimacy in setting and distributing climate commitments between its parties (Werksman and Houser, 2008).

6. How far can developing country commitments go in an immediate post-2012 climate regime?[4]

The U.S. commitments at Kyoto and diplomatic and public pressure on China had put great pressure on China to take on some kind of commitments. Under these circumstances and in anticipation that the U.S. would take on more stringent commitments subsequent to the first compliance period (namely, far below its 1990 level), I envisioned a decade ago the following six proposals that could be put on the table as China's plausible negotiation position, which is described in ascending order of stringency (Zhang, 2000).[5]

"First, China could regard its active participation in CDM as 'meaningful participation'.

Second, just as Article 3.2 of the Kyoto Protocol requires Annex I countries to 'have made demonstrable progress' in achieving their commitments by 2005, China could commit to demonstrable efforts towards slowing its greenhouse gas emissions growth at some point between the first commitment period and 2020. Securing the undefined 'demonstrable progress' regarding China's efforts is the best option that China should fight for at the international climate change negotiations subsequent to Buenos Aires.

Third, if the above commitment is not considered 'meaningful', China could make voluntary commitments to specific policies and measures to limit greenhouse gas emissions at some point between the first commitment period and 2020. Policies and measures might need to be developed to explicitly demonstrate whether or not China has made adequate efforts. Such policies and measures might include abolishing energy subsidies, improving the efficiency of energy use, promoting renewable energies, and increasing the R&D spending on developing environmentally sound coal technologies.

Fourth, China could make a voluntary commitment to total energy consumption or total greenhouse gas emissions per unit of GDP at some point around or beyond 2020. In my view, carbon intensity of the economy is preferred to energy intensity of the economy (i.e., total energy consumption per unit of GDP), because all the efforts towards shifting away from high-carbon energy are awarded by the former…

The fifth option would be for China to voluntarily commit to an emissions cap on a particular sector at some point around or beyond 2020. Taking on such a commitment, although already burdensome for China, could raise the concern about the carbon leakage from the sector to those sectors whose emissions are not capped.

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[4] This section draws heavily on Zhang (2000, 2008b and 2009a).

[5] Zhang (2000) was originally prepared for the United Nations Development Programme in 1998. When the draft of that paper was ready, the Washington DC-based Resources for the Future made a press release titled "Is China Taking Actions to Limit Its Greenhouse Gas Emissions?", September 15, 1998.

This leads to the final option that China could offer: a combination of a targeted carbon intensity level with an emissions cap on a particular sector at some point around or beyond 2020. This is the bottom line: China cannot afford to go beyond it until its per capita income catches up with the level of middle-developed countries."

At that time, it looked like China would be pressured to take on commitments at a much earlier date than what China wished. This situation changed once the U.S. withdrew from the Kyoto Protocol. A decade later, we see that the ideas of commitments based on carbon intensity and sectoral approaches, which were discussed in the academic literature ten years ago, are formally incorporated into the Bali roadmap. This roadmap, which was agreed to at the UNFCCC Conference of Parties meeting in December 2007, sets out the course for developing post-2012 commitments, with a clear deadline for conclusion by 2009. This is a very positive development, and clearly indicates the policy relevance of the once-sound-theoretical ideas. However, there is great doubt that developing countries will go beyond the aforementioned third option between 2013 and 2020 for several reasons.

First, given the very short timeframe to conclude the negotiations, in all likelihood, it would be impossible to reach the necessary agreement on the rules, countries and sectors covered and the levels of ambitions for developing countries, especially due to the amount of the data that would be required. As it has been indicated by the Asian-Pacific Economic Cooperation (APEC) Leaders Summit in September 2007, setting a carbon intensity target, even if it is not binding, is not that easy. Australia, the host country, proposed that all 21 APEC economies, regardless of whether they are developed and developing economies, agree to reduce energy intensity by at least 25% by 2030, but in the end the leaders only agreed to work towards achieving an *APEC-wide* (emphasis added) aspirational goal in energy intensity by at least 25% by 2030, relative to 2005 levels. This should not come as a surprise because energy use per unit of GDP, a key indicator of patterns of energy use, is still high in many developing Asian countries, and even increased in countries such as Brunei, the Philippines, Malaysia, South Korean and Thailand between 1990 and 2004. Indonesia and Pakistan consumed almost the same amount of energy per unit of GDP as they were in 1990 (Figure 1). Even the rate of energy efficiency improvement in IEA countries has been less than 1% per year since 1990 – much lower than in the previous decades.

Second, it is inconceivable that developing countries would ever go beyond the aforementioned third option between 2013 and 2020 without an effective financial mechanism. Market instruments like CDM, as useful as it may be, must be complemented with traditional fund solutions that provide a stable source of funding. However, the pledged funding from the funds under the Climate Convention and its Kyoto Protocol and from its financial mechanism are far from the anticipated needs from developing countries. Unless this funding situation changes significantly, which is most unlikely to happen, developing countries cannot afford to make commitments beyond the third option above-envisioned a decade ago.

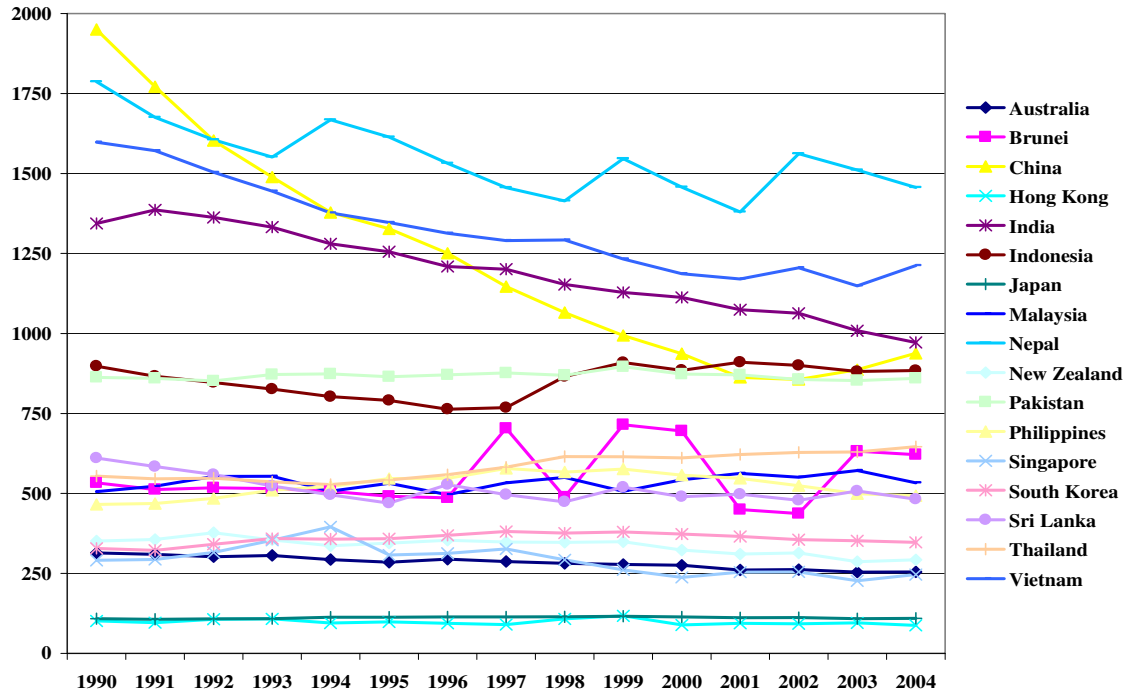

Figure 1. Energy use per unit of GDP in the selected Asia Pacific countries, 1990-2004 (Tons of oil equivalent/million 2000 US$).
Source: Zhang (2008a).

Third, the U.S. factor will continue to play a role in affecting developing country's willingness to take on commitments and the ambition of that commitments. The U.S. House of Representatives passed the American Clean Energy and Security Act of 2009 that would cut U.S. carbon emissions by 17% from 2005 levels by 2020 by a vote of 219-212 on June 26, 2009. The debate would now move to the U.S. Senate that is expected to write its own version of a climate change bill, but its fate is uncertain this year. Even if the Senate's bill had set the same emission target as the House's bill, U.S. greenhouse gas emissions in 2020 would be still above their 1990 level, given the fact that U.S. GHG emissions were 16.8% higher in 2005 than that in 1990 (EIA, 2007), and not all emission sources are capped under the Act. From a U.S. perspective, that emission reduction would appear quite ambitious and require serious actions and investment, but is still far short of a 7% reduction of the U.S. GHG emissions during the period 2008-2012 required by the Kyoto Protocol and 25-40% by 2020 suggested by the IPCC and demanded by developing countries. In anticipation that the U.S. would take on the more stringent commitments subsequent to the first compliance period (namely, far below its 1990 level), I envisioned a decade ago that developing countries may go beyond the aforementioned third option. However, the U.S. emissions in 2020 are at best kept at their 1990 level. This is far from the point where it is likely that developing country would do that.

7. Encouraging developing countries to do more: carrots, sticks or both?
Understandably, the U.S. and other industrialized countries would like to see developing countries, in particular large developing economies, go beyond that because of concerns about their own competitiveness and growing greenhouse gas emissions in developing countries. They are considering unilateral trade measures to "induce" developing countries to do so. WTO members have rights to do that because they are free to unilaterally decide what measures to take and under what conditions. But once they have made such a choice, then and only then the WTO rules apply. For example, a variety of measures have been put forward for the U.S. legislators to consider, falling into the three broad categories: border adjustment measures, performance standards and carbon market design (Subcommittee on Energy and Air Quality of the U.S. House of Representatives, 2008). To date, there is a considerable disagreement as to what measures would be most likely to pass muster under the WTO. Therefore, from the perspective of WTO consistency, industrialized countries need to focus on carrots, supported by sticks (e.g., border adjustment measures and similar trade-related measures, or conditions on access to carbon markets), as a means of encouraging developing countries to do more domestically than what are internationally agreed upon. The Montreal Protocol clearly demonstrates that an approach of a carrots (financial assistance and technology transfer) assisted with sticks (trade restrictions) approach works effectively in achieving its legitimate environmental objective.

However, measures as proposed in the Lieberman-Warner Climate Security Act of 2008 hold out more sticks than carrots to developing countries. A proposal by the International Brotherhood of Electrical Workers (IBEW) and American Electric Power (AEP) would have required importers to obtain emission allowances to cover the carbon content of certain products from countries that do not take climate actions comparable to that of the U.S. (Morris and Hill, 2007). The original version of the bill had already incorporated this mechanism, threatening to punish energy-intensive imports from developing countries by requiring importers to obtain emission allowance, but only if they had not taken comparable actions by 2020, eight years after the effective start date of a U.S. cap-and-trade regime begins. It was argued that the inclusion of trade provisions would give the U.S. additional diplomatic leverage to negotiate multilaterally and bilaterally with other countries on comparable climate actions. Should such negotiations not succeed, such trade provisions would provide a means of leveling the carbon playing field between American energy-intensive manufacturers and their competitors in countries not taking comparable climate actions. Not only would the bill have imposed an import allowance purchase requirement too quickly, it would have also dramatically expanded the scope of punishment: almost any manufactured product would potentially have qualified. If strictly implemented, such a provision would pose an insurmountable hurdle for developing countries (The Economist, 2008).

It should be emphasized that the aim of including trade provisions is to facilitate negotiations while keeping open the possibility of invoking trade measures as a last resort. The latest version of the Lieberman-Warner bill has brought the deadline forward to 2014

to gain business and union backing.[6] The inclusion of trade provisions might be considered the "price" of passage for any U.S. legislation capping its greenhouse gas emissions. Put another way, it is likely that no climate legislation can move through U.S. Congress without dealing with the issue of trade provisions. An important issue on the table is the length of the grace period to be granted to developing countries. While many factors need to be taken into consideration here (Haverkamp, 2008), further bringing forward the imposition of allowance requirements to imports is rather unrealistic, given the already very short grace period ending 2019 in its original version. It should be noticed that the Montreal Protocol on Substances that Deplete the Ozone Layer grants developing countries a grace period of 10 years (Zhang, 2000). Given that the scope of economic activities affected by a climate regime is several orders of magnitude larger than those covered by the Montreal Protocol, if legislation incorporates border adjustment measures (put the issue of their WTO consistency aside), in my view, they should not be invoked at least 10 years after mandatory U.S. emission targets take effect.

Moreover, unrealistically shortening the grace period granted before resorting to the trade provisions would increase uncertainty of whether the measure would withstand a challenge by U.S. trading partners before the WTO. As the ruling in the Shrimp-Turtle dispute indicates, for a trade measure to be considered WTO-consistent, a period of good-faith efforts to reach agreements among the countries concerned is needed before imposing such trade measures. Put another way, trade provisions should be preceded by major efforts to negotiate with partners within a reasonable timeframe. Furthermore, developing countries need reasonable time to develop and operate national climate policies and measures. Take the establishment of an emissions trading scheme as a case in point. Even for the U.S. SO_2 Allowance Trading Program, the entire process from the U.S. Environmental Protection Agency beginning to compile the data for its allocation database in 1989 to publishing its final allowance allocations in March 2003 took almost four years. For the first phase of the EU Emissions Trading Scheme, the entire process took almost two years from the EU publishing the Directive establishing a scheme for greenhouse gas emission allowance trading on 23 July 2003 to it approving the last national allocation plan for Greece on 20 June 2005. For developing countries with very weak environmental institutions and that do not have dependable data on emissions, fuel uses and outputs for installations, this allocation process is expected to take much longer than what experienced in the U.S. and the EU (Zhang, 2007b).

In the case of a WTO dispute, the question will arise whether there are any alternatives to trade provisions that could be reasonably expected to fulfill the same function but are not inconsistent or less inconsistent with the relevant WTO provisions. In the GATT Thai cigarette dispute, the Dispute Settlement Panel concluded that Thailand had legitimate concerns with health but it had measures available to it other than a trade ban that would be consistent with the General Agreement on Tariffs and Trade (e.g. bans on advertising) (GATT, 1990). Indeed, there are alternatives to resorting to trade provisions to protect the

[6] This is in line with the IBEW/AEP proposal, which requires U.S. importers to submit allowances to cover the emissions produced during the manufacturing of those goods two years after U.S. starts its trade-and-cap program (McBroom, 2008).

U.S. trade-sensitive, energy-intensive industries during a period when the U.S. is taking good-faith efforts to negotiate with trading partners on comparable actions. One way to address competitiveness concerns is to initially allocate free emission allowances to those sectors vulnerable to global competition, either totally or partially. Bovenberg and Goulder (2002) found that giving out about 13% of the allowances to fossil fuel suppliers freely instead of auctioning in an emissions trading scheme in the U.S. would be sufficient to prevent their profits with the emissions constraints from falling in comparison with those without the emissions constraints.

There is no disagreement that the allocation of permits to emissions sources is a politically contentious issue. Grandfathering, at least partially grandfathering, helps these well-organized, politically highly-mobilized industries or sectors to save considerable expenditures and thus increases the political acceptability of an emissions trading scheme, although it leads to a higher economic cost than a policy where the allowances are fully auctioned.[7] That explains why the sponsors of the American Clean Energy and Security Act of 2009 had to make a compromise amending it to auction only 15% of the emission permits instead of the initial proposal for auctioning all the emission permits in a proposed cap-and-trade regime in order for it to pass the U.S. House of Representatives Energy and Commerce Committee in May 2009. However, it should be pointed out that although grandfathering is thought of as giving implicit subsidies to these sectors, grandfathering is less trade-distorted than the exemptions from carbon taxes (Zhang, 1998 and 1999), which means that partially grandfathering is even less trade-distorted than the exemptions from carbon taxes. To understand their difference, it is important to bear in mind that grandfathering itself also implies an opportunity cost for firms receiving permits: what matters here is not how firms get your permits, but what firms can sell them for - that is what determines opportunity cost. Thus, even if permits are awarded gratis, firms will value them at their market price. Accordingly, the prices of energy will adjust to reflect the increased scarcity of fossil fuels. This means that regardless of whether emissions permits are given out freely or are auctioned by the government, the effects on energy prices are expected to be the same, although the initial ownership of emissions permits differs among different allocation methods. As a result, relative prices of products will not be distorted relative to their pre-existing levels and switching of demands towards products of those firms whose permits are awarded gratis (the so-called

[7] In a second-best setting with pre-existing distortionary taxes, if allowances are auctioned, the revenues generated can then be used to reduce pre-existing distortionary taxes, thus generating overall efficiency gains. Parry et al. (1999), for example, show that the costs of reducing U.S. carbon emissions by 10% in a second-best setting with pre-existing labor taxes are five times more costly under a grandfathered carbon permits case than under an auctioned case. This is because the policy where the permits are auctioned raises revenues for the government that can be used to reduce pre-existing distortionary taxes. By contrast, in the former case, no revenue-recycling effect occurs, since no revenues are raised for the government. However, the policy produces the same tax-interaction effect as under the latter case, which tends to reduce employment and investment and thus exacerbates the distortionary effects of pre-existing taxes (Zhang, 1999).

substitution effect) will not be induced by grandfathering. This makes grandfathering different from the exemptions from carbon taxes. In the latter case, there exist substitution effects (Zhang, 1998 and 1999). For example, the Commission of the European Communities (CEC) proposal for a mixed carbon and energy tax[8] provides for exemptions for the six energy-intensive industries (i.e., iron and steel, non-ferrous metals, chemicals, cement, glass, and pulp and paper) from coverage of the CEC tax on grounds of competitiveness. This not only reduces the effectiveness of the CEC tax in achieving its objective of reducing CO_2 emissions, but also makes the industries, which are exempt from paying the CEC tax, improve their competitive position in relation to those industries which are not. Therefore, there will be some switching of demand towards the products of these energy-intensive industries, which is precisely the reaction that such a tax should avoid (Zhang, 1997).

Moreover, to pass WTO scrutiny of trade provisions, the U.S. is likely to make reference to the health and environmental exceptions provided under GATT Article XX. This Article itself is the exceptions that authorize governments to employ otherwise GATT-illegal measures when such measures are necessary to deal with certain enumerated public policy problems. The GATT panel in Tuna/Dolphin II concluded that Article XX does not preclude governments from pursuing environmental concerns outside their national territory, but such extra-jurisdictional application of domestic laws would be permitted only if aimed *primarily* (emphasis added) at having a conservation or protection effect (GATT, 1994; Zhang, 1998). The capacity of the planet's atmosphere to absorb greenhouse gas emissions without adverse impacts is an 'exhaustible natural resource'. Thus, if countries take measures on their own including extra-jurisdictional application *primarily* to prevent the depletion of this 'exhaustible natural resource', such measures will have a good justification under GATT Article XX. Along this reasoning, if the main objective of trade provisions is to protect the environment by requiring other countries to take actions comparable to that of the U.S., then mandating importers to purchase allowances from the designated special international reserve allowance pool to cover the carbon emissions associated with the manufacture of that product is debatable. To increase the prospects for a successful WTO defense, I think that trade provisions can refer to the designated special international reserve allowance pool, but may not do without adding "or equivalent". This will allow importers to submit equivalent emission reduction units that are not necessarily allowances but are recognized by international treaties to cover the carbon contents of imported products.

Besides the issue of WTO consistency, there will be methodological challenges in implementing trade provisions, although such practical implementation issues are

[8] As part of its comprehensive strategy to control CO_2 emissions and increase energy efficiency, a carbon/energy tax has been proposed by the CEC. The CEC proposal is that member states introduce a carbon/energy tax of US$ 3 per barrel oil equivalent in 1993, rising in real terms by US$ 1 a year to US$ 10 per barrel in 2000. After the year 2000 the tax rate will remain at US$ 10 per barrel at 1993 prices. The tax rates are allocated across fuels, with 50% based on carbon content and 50% on energy content (Zhang, 1997).

secondary concerns. Identifying the appropriate carbon contents embodied in traded products will present formidable technical difficulties, given the wide range of technologies in use around the world and very different energy resource endowments and consumption patterns among countries. In the absence of any information regarding the carbon content of the products from exporting countries, importing countries, the U.S. in this case, could adopt either of the two approaches to overcoming information challenge in practical implementation. One is to prescribe the tax rates for the imported product based on U.S. domestically predominant method of production for a like product, which sets the average embedded carbon content of a particular product (Zhang, 1998; Zhang and Assunção, 2004). This practice is by no means without foundation. For example, the U.S. Secretary of the Treasury has adopted the approach in the tax on imported toxic chemicals under the Superfund Tax (GATT, 1987; Zhang, 1998). Alternative is to set the best available technology (BAT) as the reference technology level and then use the average embedded carbon content of a particular product produced with the BAT in applying BTA (Ismer and Neuhoff, 2007). To be more defensible, either of the approaches should allow foreign producers to challenge the carbon contents applied to their products to ensure that they will not pay for more than they have actually emitted.

8. Conclusions

Governments are taking great efforts to forge an agreement on comparable climate actions in the post-2012 climate negotiations. Aimed at leveling the carbon playing field, the inclusion of trade-related provisions is considered useful by some in both facilitating the adoption of such an agreement and effectively implementing it, once reached.

To gain some guidance on the scope of trade provisions in a post-2012 climate change regime, this paper first describes the Montreal Protocol in which such trade provisions have been included. The lesson from the Montreal Protocol suggests that trade measures can be incorporated in multilateral environmental agreements and work effectively in practice only if they are accompanied with effective finance and technology transfer mechanisms. This lesson, combined with the fact the combined pledged funding from the funds under the Climate Convention and its Kyoto Protocol and from its financial mechanism is far from the anticipated climate mitigation and adaptation needs of developing countries, suggests that developing country parties are unlikely to agree the inclusion of trade-related measures against them in a post-2012 climate regime.

In the meantime, the paper argues that trade-related measures should, at the very least, be contemplated for a set of industrialized countries (Annex I or II countries) as part of the evolving climate regime at least on two grounds. First, the Shrimp-Turtle dispute under the WTO may have been interpreted as a clear preference for actions taken pursuant to multilateral agreements and/or negotiated through international cooperative arrangements. Second, there is a clear need to define comparable efforts towards climate mitigation and adaptation to discipline the use of unilateral trade measures at the international level. The Bali Action Plan calls for “comparability of efforts” towards climate mitigation actions only among industrialized countries. However, some industrialized countries, if not all, are considering the term “comparable” as the standard by which to assess the efforts

made by all their trading partners in order to decide on whether to impose unilateral trade measures on them. This is not hypothetical. Rather, it is very real as the Lieberman-Warner bill in the U.S. Senate demonstrated. While that bill died on the floor of the Senate, this is by no means the end of the prospect for border adjustment type of unilateral trade measures provision, given that the inclusion of such trade provisions might be considered the "price" for passing any U.S. legislation capping its greenhouse gas emissions. In addition to methodological challenges in implementing the Lieberman-Warner type of border adjustment provision, the paper argues that that type of border adjustment provision is likely to face a WTO-consistency challenge. To increase the prospects for a successful WTO defense, there should be a period of good-faith efforts to reach agreements among the countries concerned before imposing such trade measures. Put another way, trade provisions should be preceded by major efforts to negotiate with partners within a reasonable timeframe. As the WTO panel's findings of the GATT Thai cigarette dispute indicate, the WTO consistency also requires considering alternatives to trade provisions that could be reasonably expected to fulfill the same function but are not inconsistent or less inconsistent with the relevant WTO provisions. Moreover, the paper suggests that trade provisions can refer to the designated special international reserve allowance pool, but may not do without adding "or equivalent". This will allow importers to submit equivalent emission reduction units that are recognized by international treaties to cover the carbon contents of imported products.

It should be emphasized that the Lieberman-Warner type of border adjustment provision holds out more sticks than carrots to developing countries. If the U.S. and other industrialized countries really want to persuade developing countries to do more to combat climate change, they should first reflect why developing countries are unwilling to and cannot afford to go beyond the aforementioned third option in the first place. That will require industrialized countries to seriously consider developing countries' legitimate demand that industrialized countries need to demonstrate that they have taken the lead in reducing their own greenhouse gas emissions, provide significant funding to support developing country's climate change mitigation and adaptation efforts and to transfer low- or zero-carbon emission technologies at an affordable price to developing countries. Industrialized countries need to provide positive incentives to encourage developing countries to do more. Carrots should serve as the main means. Sticks can be incorporated, but only if they are credible and realistic and serve as a useful supplement to push developing countries to take actions or adopt policies and measures earlier than would otherwise have been the case. At a time when the world community is starting to negotiate a post-2012 climate regime, unrealistic border adjustment measures as exemplified in the Lieberman-Warner bill are counterproductive to help to reach such an agreement on comparable climate actions in the post-2012 climate negotiations.

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References

Berger, J.R. (1999), Unilateral Trade Measures to Conserve the World's Living Resources: An Environmental Breakthrough for the GATT in the WTO Sea Turtle Case, *Columbia Journal of Environmental Law*, Vol. 24, pp. 355-411.

Bhagwati, J. and P.C. Mavroidis (2007), Is Action against US Exports for Failure to Sign Kyoto Protocol WTO-Legal?, *World Trade Review*, Vol. 6, No. 2, pp. 299-310.

Bovenberg, A.L. and L.H. Goulder (2002), Addressing Industry-Distributional Concerns in U.S. Climate Change Policy, Unpublished manuscript, Department of Economics, Stanford University.

Brack, D. (1996), *International Trade and the Montreal Protocol*, The Royal Institute of International Affairs and Earthscan, London.

Charnovitz, S. (2003), Trade and Climate: Potential Conflicts and Synergies, in Pew Center on Global Climate Change*, Beyond Kyoto – Advancing the International Effort Against Climate Change*, pp. 141-170.

Cundy, C. (2006), World Bank Raises Spending, Exceeds Target, on Renewables, *Environmental Finance,* Vol. 7, No. 10, September, p. 14.

EIA (2007), Emissions of Greenhouse Gases in the United States 2006, DOE/EIA-0573(2006), U.S. Energy Information Administration (EIA), Washington, DC, November, Available at: http://www.eia.doe.gov/oiaf/1605/ggrpt/pdf/0573(2006).pdf.

General Agreement on Tariffs and Trade (GATT, 1987), United States – Taxes on Petroleum and Certain Imported Substances, Report of the Panel, Adopted on June 17, L/6175, BISD 34S/136, Geneva, Available at: http://www.wto.org/english/res_e/booksp_e/analytic_index_e/introduction_01_e.htm.

General Agreement on Tariffs and Trade (GATT, 1990), Thailand – Restrictions on Importation of and Internal Taxes on Cigarettes, Report of the Panel, DS10/R, Adopted on November 7, BISD 37S/200, Geneva, Available at: http://www.wto.org/english/res_e/booksp_e/analytic_index_e/introduction_01_e.htm.

General Agreement on Tariffs and Trade (GATT, 1994), United States: Restrictions on the Imports of Tuna, Report of the Panel (not adopted), DS29/R, June 16, Geneva, Available at: http://www.wto.org/english/res_e/booksp_e/analytic_index_e/introduction_01_e.htm.

Global Environment Facility (2008a), Status Report on the Climate Change Funds October 2008 (Report from the Trustee), GEF/LDCF.SCCF.5/Inf.2, Washington, DC, November 7, Available at: http://www.thegef.org/uploadedFiles/Documents/LDCFSCCF_Council_Documents/LDCFSCCF5_November_2008/LDCF.SCCF.5.Inf.2%20Status%20Report%20on%20the%20Climate%20Change%20Funds.pdf.

Global Environment Facility (2008b), Work Program Submitted for GEF Council Approval, GEF/C.34/6, Washington, DC, October 14, Available at: http://www.thegef.org/uploadedFiles/Documents/Council_Documents__(PDF_DOC)/GEF_C34/C.34.6%20Work%20Program%20Cover%20Note(1).pdf.

Haverkamp, J. (2008), International Aspects of a Climate Change Cap and Trade Program, Testimony before the Committee on Finance, U.S. Senate, February 14, Available at: http://finance.senate.gov/hearings/testimony/2008test/021408jhtest.pdf.

Hufbauer, G.C., Charnovitz, S. and J. Kim (2009), *Global Warming and the World Trading System*, Peterson Institute for International Economics, Washington, DC.

International Emissions Trading Association (IETA, 2008), State of the CDM 2008: Facilitating a Smooth Transition into a Mature Environmental Financing Mechanism, Geneva, Available at: http://www.ieta.org/ieta/www/pages/getfile.php?docID=3111.

Ismer, R., and K. Neuhoff (2007), Border Tax Adjustment: A Feasible Way to Support Stringent Emission Trading, *European Journal of Law and Economics*, Vol. 24, No. 2, pp. 137-164.

McBroom, M. (2008), How the IBEW-UWM-Boilermakers-AEP International Proposal Operates within Climate Legislation, June 17, Available at: http://www.wita.org/index.php?tg=fileman&idx=viewfile&idf=189&id=4&gr=Y&path=&file=WITA-+Climate+Change+-+Overview+of+IBEW-AEP+Proposal+(June+17%2C+2008).pdf.

Morris, M.G. and E.D. Hill (2007), Trade is the Key to Climate Change, *The Energy Daily*, Vol. 35, No. 33, February 20.

Parry, Ian W.H., Williams III, R.C. and L.H. Goulder (1999), When Can Carbon Abatement Policies Increase Welfare? The Fundamental Role of Distorted Factor Markets, *Journal of Environmental Economics and Management*, Vol. 37, No. 1, pp. 52-84.

Paulsson, E. (2009), A Review of the CDM Literature: From Fine-tuning to Critical Scrutiny?, *International Environmental Agreements: Politics, Law and Economics,* Vol. 9, No. 1, pp. 63-80.

Point Carbon (2008), Carbon 2008: Post-2012 Is Now, Norway, March 11.

Samuelsohn, D. (2007), Trade Plan Opposed by China, Brazil and Mexico, *Greenwire,* September 26, Available at: http://www.earthportal.org/news/?p=507.

Stern, N. (2007), *Stern Review on the Economics of Climate Change*, Cambridge University Press, Available at: http://www.hm-treasury.gov.uk/independent_reviews/stern_review_economics_climate_change/sternreview_index.cfm.

Subcommittee on Energy and Air Quality of the U.S. House of Representatives (2008), Competitiveness Concerns/Engaging Developing Countries, Climate Change Legislation Design White Paper, Washington DC, January, Available at: http://energycommerce.house.gov/Climate_Change/White_Paper.competitiveness.013108.pdf.

The Economist (2008), Pollution Law: Trading Dirt, June 7, pp. 42-44.

The World Bank (2006), An Investment Framework for Clean Energy and Development: A Progress Report, Background Paper for the Development Committee Meeting on September 18, Washington DC.

The World Bank (2007), *International Trade and Climate Change: Economic, Legal and Institutional Perspectives*, Washington DC.

UNFCCC Secretariat (2007), Report on Analysis of Existing and Potential Investment and Financial Flows Relevant to the Development of an Effective and Appropriate International Response to the Climate Change, Dialogue Working Paper No. 8, Prepared for the Fourth Workshop under the Dialogue on Long-Term Cooperative Action to Address Climate Change by Enhancing Implementation of The Convention, August 27-29, Vienna, Available at: http://unfccc.int/files/cooperation_and_support/financial_mechanism/financial_mechanism_gef/application/pdf/dialogue_working_paper_8.pdf.

Werksman, J. and T. Houser (2008), Competitiveness, Leakage and Comparability: Disciplining the Use of Trade Measures under a Post-2012 Climate Agreement, Discussion Paper, World Resources Institute, December, Washington, DC.

World Trade Organization (WTO, 1998), United States – Import Prohibition of Certain Shrimp and Shrimp Products, Report of the Appellate Body, WT/DS58/AB/R, Geneva.

Zhang, Z.X. (1997), *The Economics of Energy Policy in China: Implications for Global Climate Change*, New Horizons in Environmental Economics Series, Edward Elgar.

Zhang, Z.X. (1998), Greenhouse Gas Emissions Trading and the World Trading System, *Journal of World Trade*, Vol. 32, No. 5, pp. 219-239.

Zhang, Z.X. (1999), Should the Rules of Allocating Emissions Permits be Harmonised?, *Ecological Economics*, Vol. 31, No. 1, pp. 11-18.

Zhang, Z.X. (2000), Can China Afford to Commit itself an Emissions Cap? An Economic and Political Analysis, *Energy Economics*, Vol. 22, No. 6, pp. 587-614.

Zhang, Z.X. (2004), Open Trade with the U.S. without Compromising Canada's Ability to Comply with its Kyoto Target, *Journal of World Trade,* Vol. 38, No. 1, pp. 155-182.

Zhang, Z.X. (2007a), Doing Trade and Climate Policy Together, in Najam, A., Halle, M. and R. Meléndez-Ortiz (Editors), *Trade and Environment: A Resource Book*, International Institute for Sustainable Development, Canada, and International Center for Trade and Sustainable Development, Geneva.

Zhang, Z.X. (2007b), Why Has China not Embraced a Global Cap-and-Trade Regime?, *Climate Policy*, Vol. 7, No. 2, pp. 166-170.

Zhang, Z.X. (2008a), Asian Energy and Environmental Policy: Promoting Growth While Preserving the Environment, *Energy Policy*, Vol. 36, No. 10, pp. 3905-3924.

Zhang, Z.X. (2008b), Is China a Christmas Tree to Hang Everybody's Complaints? Putting its Own Energy-Saving into Perspective, The Plenary Address at the 31st International Association for Energy Economics International Conference, Istanbul, Turkey, June 18, *Energy Economics,* forthcoming, Available at: doi:10.1016/S0140-9883(03)00042-2.

Zhang, Z.X. (2009a), How Far Can Developing Country Commitments Go in an Immediate Post-2012 Climate Regime?, *Energy Policy*, Vol. 37, No. 5, pp. 1753-1757.

Zhang, Z.X. (2009b), Improving the Rules on Carbon Projects, Science and Development Network, London, April 8, Available at: http://www.scidev.net/en/opinions/improving-the-rules-on-carbon-projects.html.

Zhang, Z.X. and L. Assunção (2004), Domestic Climate Policy and the WTO, *The World Economy*, Vol. 27, No. 3, pp. 359-386.