Peterson Institute for International Economics

Policy Brief

NUMBER PB13-10

APRIL 2013

Four Changes to Trade Rules to Facilitate Climate Change Action

Aaditya Mattoo and Arvind Subramanian

Aaditya Mattoo *works with the Development Economics Research Group, World Bank. Email: amattoo@worldbank.org.* **Arvind Subramanian** *is an economist at the Peterson Institute for International Economics. Email: asubramanian@piie.com.*

Note: We are grateful to Nancy Birdsall, Chad Bown, Kim Elliott, Steven Fries, Gary Clyde Hufbauer, Dieter Helm, Veena Jha, Lawrence Macdonald, Petros Mavroidis, Yilmaz Muslum, Vikram Nehru, Bill Nordhaus, Ludovine Tamiotti, and participants at the conference on The Multilateral Trading System in the 21st Century organized by the George Washington University for helpful discussions. The views expressed in the paper should not be attributed to the World Bank, its Board, or Executive Directors.

INTRODUCTION

The history of discussions on trade and climate change, going back to the famous tuna dolphin case between Mexico and the United States two decades ago, is mostly a record of tensions. The objectives of trade and climate change are mostly seen as being in opposition.

The research on the links between trade rules and climate change action has mostly been concerned with how far climate change action is constrained by current trade rules pertaining, for example, to border tax adjustments (Horn and Mavroidis 2011), subsidies (Green 2006), and exports of natural gas (Levi 2012 and Hufbauer, Bagnall, and Muir 2013).

In *Greenprint: A New Approach to Cooperation on Climate Change*, we argued that only radical technological progress can reconcile climate change goals with the development and energy aspirations of humanity (Mattoo and Subramanian, 2012). Generating technological progress requires deploying the full range of policy instruments—to raise the price of carbon and to provide incentives for research and development of green technologies. Some of these policy instruments affect international trade and are therefore covered by the rules of the WTO. In this paper, we ask how trade policy and trade rules can facilitate action on climate change.

The tension between trade and climate change has arisen in part because of the assumption that climate change action (e.g., carbon price increases) can be taken as a given. The question that many papers adopt is, given this assumption, what is best from a trade perspective. But our approach and proposals are predicated on the current reality that action on climate change is proving fiendishly difficult. The relevant question then is: can trade rules be designed or changed to facilitate—in any way, direct and indirect, economic and political—climate change action without unduly damaging trade?

One feature that is worth noting is that WTO rules are designed primarily to discipline mercantilism—i.e., the inclination of nations to promote exports and to restrict imports.[1] In principle, WTO rules should not constrain first-best policies to address climate change. Thus, carbon taxes (or cap-and-trade) are incontrovertibly WTO compatible because they are domestic in nature and trade-neutral. Similarly, WTO rules do not constrain subsidies for clean energy such as feed-in-tariffs, now commonly used in several countries. Because their benefits are economy-wide, they would be considered non-specific and hence fall in the category of permissible subsidies (Mavroidis 2007, Hufbauer et al. 2009).

However, in the real world, where politics and interest groups have an important role in shaping policy, WTO rules can end up constraining policy choices to address climate change. The challenge going forward is to design rules for a world that is, in Avinash Dixit's words "second best, at best."

Normally, we would argue that where political economy considerations lead to mercantilism, rules should help governments resist pressures so that outcomes are tilted toward first-

1. In recent years, negotiators at the WTO have focused on liberalizing trade in environmental goods and services, a worthwhile, but so far elusive, goal.

best policy choices. In the case of climate change, the stakes involved are exceptionally large—planetary survival—and first-best choices, such as carbon taxes, are proving elusive. Hence, it may be necessary to harness mercantilism to steer policy choices in favor of action on climate change. That is the animating spirit and unifying logic behind the clarification of or changes in WTO rules that we propose below.

We consider four areas: subsidization of green goods and technologies; border tax adjustments (BTAs) related to carbon content; restrictions on the export of fossil fuels, especially natural gas; and intellectual property protection of new technologies and products related to climate change. In each case, we suggest a better balance can be struck between the need to restrain mercantilist tendencies and to allow scope for environmentally friendly policies. We conclude by showing how these changes could promote international cooperation on climate change.

GREEN SUBSIDIES

Consider certain episodes from last year. In late 2012, the United States sanctioned not only the use of anti-dumping duties from 18 to 250 percent against Chinese exports of solar panels on the grounds that Chinese manufacturers were "dumping" (selling below cost) solar panels, but also imposed anti-subsidy or countervailing duties of around 15 percent in response to state support for solar panels. Moreover, in the US Presidential debates, Mitt Romney put President Obama on the defensive by trying to tar him with the "failed industrial policy" brush in relation to government support for clean energy and Solyndra.

The European Union has also launched two investigations against Chinese solar panel exports, alleging dumping in one and subsidization in the other. Rulings in these cases are expected soon.[2] These examples illustrate how international rules and ideology (which underlie the former) could come in the way of efforts to tackle climate change.

As mentioned above, under current WTO rules, economy-wide subsidies for clean energy would be permissible because they are not specific to an industry. However, any form of export subsidies including those involving clean energy and/or green technologies is prohibited (see Part II of the WTO Agreement on Subsides and Countervailing Measures (SCM) and Pauwelyn 2009). Domestic subsidies for specific industries for the development and production of green products are not prohibited but actionable by partner countries if the latter believe that their domestic production or exports are adversely affected (See Part III of the WTO's SCM Agreement and Green 2006).

Partner countries can take two types of actions: Where they are affected in third markets, they can contest the subsidies through the WTO dispute settlement mechanism, asking for them to be curtailed or removed; and where they are affected in their own markets they can, in addition, impose countervailing duties on products benefitting from such subsidies, subject to a number of conditions, including demonstration of injury to a domestic industry (see part V of the WTO's SCM Agreement). Until 2000, some environmental subsidies were deemed non-actionable but that exemption has not been renewed. Thus, under the current regime, such subsidies are potentially in the actionable category.

On the face of it, these rules are an example of how trade negotiations can produce disciplines that are good for global welfare. In principle, any benefits of subsidies—such as enhancing the competitiveness of domestic producers—are outweighed by their costs to the granting government. Nevertheless, politically influential producer groups (think agriculture and aircraft makers) can sometimes extract subsidies from a government, which can in turn provoke retaliatory subsidies from other governments and lead to a wasteful subsidy war. WTO rules which prohibit export subsidies and render production subsidies actionable are meant to prevent precisely such a non-cooperative outcome.

In relation to climate change, however, these rules curtail three important benefits of subsidies. First of all, any subsidy that promotes clean energy and green products at home confers a benefit also to partner countries. If China generates less CO_2, that is partly a benefit for the United States. So the calculus of costs and benefits gets altered because of the global spillovers from such subsidies.[3]

Second, a country also makes available cheaper green products and technologies to other countries, and that encourages their use. If these products generate positive environmental spillovers, then they are likely to be underused at normal market prices, and subsidies can take us closer to the social optimum. Retailers and solar installation companies in the United States, which benefited from cheap Chinese solar panels, argued vehemently, but in vain, against curtailing competition from China. European action may cause the solar energy market to shrink, studies suggest. Any increase in domestic production and employment due to higher prices of

2. See http://www.bloomberg.com/news/2013-03-05/eu-to-register-chinese-solar-panels-highlighting-tariff-threat.html.

3. The spillover argument can, in principle, be made about other subsidies that generate global spillovers. The argument at hand rests to some degree on the special and large danger of global warming. There is a possibility that carve-outs for clean energy and green products will be emulated.

Chinese products would be outweighed by decreases suffered by upstream and downstream firms.

Third, there is an arguably bigger political economy benefit. Prospects for climate change action in the United States in the form of a carbon tax or cap-and-trade do not seem bright. President Obama's acknowledgement of climate change as a priority in his State of the Union Speech is unlikely to be matched by bold action because of the lack of bipartisan support in Congress. This state of affairs reflects a combination of factors—climate change denial, the strength of the carbon energy industries, and weak economic prospects. Thus,

Trade rules should penalize global environmental "bads" (by permitting border taxes on less clean imports), promote global environmental goods and technologies (by relaxing the constraints on the use of production and export subsidies and strengthening IPR protection), and avoid penalizing global environmental "goods" (by eliminating the export restrictions on natural gas).

the United States is unable or unwilling either to raise the price of carbon or to subsidize cleaner fuels and technologies. One development may galvanize action in the United States: the threat that green technology leadership will be captured by China. In other words, the United States needs a Sputnik moment of collective alarm at the loss of US economic and technological ascendancy.

China and other countries are today being straitjacketed by the subsidies-are-bad ideology. The global battle against climate change is thus being fought with a depleted arsenal (see, for example, Acemoglu et al. 2012). Countries that have the financial means to do so should be allowed to deploy industrial policy to promote clean energy and green technologies. What the world needs is unbridled competition or even a race initiated by a change in global trade rules to facilitate large scale support for the development and production of the currently under-supplied green goods. The United States would be forced to respond. Fiscal weakness might prevent the grant of retaliatory subsidies by the United States. But that might force the United States into the best possible reaction: increasing the price of carbon as a way of re-gaining the technological edge on climate change.

This logic applies also to export subsidies. They may also confer environmental benefits, but they are likely to inflict greater damage on partner countries in terms of trade displacement and are blatantly mercantilist instruments. It may be harder to agree on greater permissiveness vis-à-vis such instruments and their use may generate a stronger political backlash in importing countries.

In light of the above, we would propose altering current rules in the following manner. Production subsidies for specific green products and technologies should be permissible. Partner countries should not be able to take action unilaterally or through WTO dispute settlement against them.[4] Export subsidies related to green products and technologies should not be prohibited. However, since they carry greater risks of mercantilist abuse, they should be regulated more strictly than production subsidies. That is, depending on certain thresholds—in terms of the magnitude of subsidies and the damage to partner country trade—which could be specified in the future, they should be actionable either through multilateral dispute settlement or through countervailing action. In the language of current WTO subsidy rules, we would be shifting the treatment of subsidies one notch in the degree of greater permissiveness: Specific green subsidies that are currently actionable would be permitted; and current export subsidies that are prohibited would be made actionable.[5]

We would not change existing rules for subsidies contingent upon the use of domestic over imported goods. Local-content promoting subsidies have been implemented in China, India, and Canada and several countries, and contested by the United States and others (in fact China stopped providing such subsidies to its solar power companies in response to trade action by the United States).[6][7] These subsidies do not have the environmental benefits of other subsidies because they merely induce the substitution of more costly domestic inputs for cheaper foreign alternatives, and therefore do not

4. This proposal would have the effect of disallowing countervailing and anti-dumping actions for climate-related production subsidies.

5. So, for example, the current panoply of rules governing countervailing and anti-dumping action against production subsidies—including de minimis provisions, injury tests, thresholds—could be carried over to such action against climate-related export subsidies.

6. "The U.S. Trade Representative's Office responded by filing a complaint in December, 2011, with the WTO saying China violated rules of the Geneva-based trade arbiter. China's Special Fund for Wind Power Manufacturing required recipients of aid to use Chinese-made parts and amounted to a prohibited subsidy, the U.S. said. Before the WTO acted on the complaint, China made it moot by ending that aid in June, according to the U.S." (http://www.bloomberg.com/news/2011-09-23/blame-china-chorus-grows-as-solyndra-fails-amid-cheap-imports.html)

7. The case involving Canada was brought to the WTO by the European Union and related to the domestic content requirements in the feed-in tariff program of the province of Ontario. See Hufbauer et al. (forthcoming) for a discussion of the proliferation of local content requirements.

further—they may even hinder attaining—environmental objectives.

We can speculate on how WTO law might view trade interventions to address global spillovers such as those from granting production and export subsidies for green goods which have a beggar-thy-neighbor aspect but which help address the problem of climate change. In the famous shrimp-turtle case the WTO Appellate Body declared legitimate a US import ban on shrimp caught using a production process that was harmful to an endangered species of turtles.[8]

By allowing a ban based on the process of production and not the product itself, the WTO acknowledged that members were permitted, under some conditions, to take trade measures to protect the global public good even when the damaging action was taking place outside the territory of the member.[9] If negative interventions such as bans can be justified in this manner, surely it would make sense also to legitimize or be more permissive toward positive actions such as production and export subsidies when they serve to protect the global environment by encouraging more climate-friendly production and consumption outside a member's territory.

BORDER TAX ADJUSTMENTS

With notable exceptions, countries around the world have shown great reluctance to raise directly the domestic price of carbon. Countries that are inclined to raise carbon prices may favor additional border taxes, for two reasons: to offset the competitiveness disadvantage to their firms, and to prevent the "leakage" of carbon emissions in the form of increased production in countries with lower carbon prices. Other countries are wary of border taxes because of the "slippery slope" problem, i.e., once allowed, they could serve protectionist goals.

As table 1 shows, there is a range of actions/approaches that have been proposed, which vary in terms of their trade and environmental friendliness and also in the manner and extent to which they address underlying political economy problems. At one end, there is the recent Australian carbon tax that was implemented unilaterally whose key feature is that the tax is *not* applied on imports. Instead, the government removes some of the carbon tax burden on domestic firms in the energy-intensive and trade-exposed sectors over time (Moore 2013). This tax can thus be seen as very trade-friendly because it is not imposed on imported goods. By the same token, it exposes domestic industry to greater competition from imports from countries that do not impose similar carbon taxes as Australia.

At the other end of the spectrum are border tax adjustments imposed on imports based on the carbon embodied in them. In the climate change bill introduced in the US Senate by Senators Boxer and Sanders in February 2013, there was a provision for a "carbon equivalency fee" on imports of carbon pollution-intensive goods.[10] In the European Union, no clear policy initiatives have so far been taken in relation to border tax adjustments except in relation to carbon taxes on domestic and foreign airlines. But in the past, then French President Nicolas Sarkozy, among others, called for countries in the European Union to adopt carbon taxes and to impose adjustments at the border for these taxes.[11]

Can border taxes be designed in a way that addresses these conflicting concerns?

From a trade perspective, border tax adjustments applied symmetrically to imports and exports essentially transform production-based taxes into consumption-based taxes (Grossman 1982). Such adjustments do not alter the incentives within a country to produce exports or importables. From an environmental perspective, border tax adjustments are aimed at ensuring that the emissions reductions achieved within a country through a tax are not totally offset by the increase in emissions that occurs in partner countries by virtue of expanded trade.

What would be the status of different forms of BTAs under existing trade rules? WTO law and jurisprudence are evolving and not completely clear on what types of actions would be legitimate (see Hufbauer et al. 2009; Pauwelyn 2009, Bhagwati and Mavroidis 2007, UNEP and WTO 2009, and Horn and Mavroidis 2011, among others for a thoughtful examination of the legal implications of possible trade actions). The WTO issue on border tax adjustments relates to the basic national treatment principle in Article III of GATT (1994). This article clearly permits the imposition on imports

8. The United States actually lost the proceedings and the ban was declared inconsistent with the GATT 1994 because it was discriminatory against other nations. It subsequently eliminated the discriminatory application of the ban which was then validated by the WTO's Appellate Body.

9. The WTO described the ruling in these terms: "In its report, the Appellate Body made clear that under WTO rules, countries have the right to take trade action to protect the environment (in particular, human, animal, or plant life and health) and endangered species and exhaustible resources). The WTO does not have to "allow" them this right.

It also said measures to protect sea turtles would be legitimate under GATT Article 20 (i.e., XX) which deals with various exceptions to the WTO's trade rules, provided certain criteria such as non-discrimination were met." (http://www.wto.org/english/tratop_e/envir_e/edis08_e.htm).

10. At the time of this writing, details of the Waxman-Whitehouse-Blumenauer-Schatz bill are unclear but some form of border tax adjustments based on the carbon embodied in imports seems likely to be included.

11. The carbon safeguard mechanism would allow actions to be taken against imports under carefully circumscribed conditions analogous to contingent protection actions (Moore 2013).

Table 1 Possible border tax adjustments

← Pro-Trade		Pro-environment (substantive+political economy) →	
Australian carbon tax	Carbon safeguard mechanism[1]	Carbon embodied in domestic production[2]	Carbon embodied in imports (various US legislative proposals)
	Export taxes levied on carbon-intensive exports		

1. Moore, Michael. O. 2013. Embedding Climate Change Mitigation Efforts in the Multilateral Trading System. Paper presented at the George Washington University Conference on the multilateral trading system.
2. Mattoo, Aaditya, Arvind Subramanian, Dominique van der Mensbrugghe, and Jianwu He. 2013. Trade Effects of Alternative Carbon Border-Tax Schemes. Forthcoming in the Review of World Economics.

of domestic indirect taxes provided the taxes on imports are no higher than the taxes levied on like domestic products.

Under the GATT panel ruling in the Superfund case, indirect taxes levied on domestic inputs could also be imposed on imports provided these inputs were embodied in the final product (see UNEP and WTO 2009). However, there is no WTO jurisprudence on whether such adjustments are permissible for inputs (such as energy) that are used in production but are not themselves incorporated in the final product. Even if border tax adjustment is permitted on inputs that are consumed but not incorporated in the final product, it is not clear whether it should be based on the carbon content of domestic production or foreign production.[12] The ruling in the Superfund case suggested that the border tax adjustment could be based on the amount of input embedded in the import, so there is a presumption in favor of the latter interpretation.

We show in *Greenprint* that BTAs based on carbon content in imports would have drastic trade consequences.[13] There is also a serious practical problem with BTAs based on inputs that are consumed in the process of producing the output. Implementing carbon taxes based on the direct and indirect carbon content in imports would require data not only on production methods in all source countries but also information on the origin of each input. Different imports from one country could have different carbon content depending on where the inputs used in production were sourced: US imports of car A from Malaysia that used steel from, say, Brazil would face a different kind of border tax adjustment than car B also from Malaysia that used steel from China. In a world of internationally fragmented production, establishing the precise carbon content of any particular product would be nearly impossible. These daunting informational requirements could allow considerable scope for rent-seeking behavior as firms try to manipulate information to influence the taxes imposed on particular goods from particular countries.

These considerations suggest that a possible compromise between no border tax adjustments (as in the case of the Australian carbon tax), which is best from a trade perspective, and adjustment based on carbon content of imports (as in various US legislative proposals), which is attractive from an environmental perspective, could be adjustment based on the carbon content in domestic production. Countries could accept this principle as a pragmatic and negotiated compromise between not just trade and environmental concerns, but also between the interests of different countries.[14]

The case for such adjustment is strengthened by our finding that unilateral emission reductions by industrial countries lead primarily to a loss in industrial competitiveness rather than to significant "leakage" of emissions. Adjustment based on carbon content in domestic production addresses competitiveness concerns in industrial countries without inflicting undue pain on developing countries.

An alternative to import taxes would be for the exporting country to impose taxes on exports, which could be designed to have the same environmental consequences as the import-based border taxes. The big difference would be that the tax revenues would be collected by the exporting countries rather than the importing countries. Such taxes could in principle be implemented unilaterally without the need for any change in trade rules. But international cooperation, in the form of coordination and information-sharing between importing and exporting countries (but also more broadly in the form of clarifying existing rules) would help walk the narrow path

12. If taxes on consumed inputs cannot be subject to border tax adjustment, then it would seem that neither taxes based on the carbon content of domestic production nor those based on the carbon content embodied in imports can be the basis for border adjustments. Of course, both bases for applying border taxes could be justified by the environmental exceptions provisions of Article XX (GATT 1994), but that avenue itself is untested and uncertain. If indirect taxes on inputs such as carbon/energy that are consumed in production can be subject to border tax adjustment—which is far from clear—then it would seem that the presumption would be that these taxes would be based on the carbon content embodied in imports. This interpretation is suggested by the GATT dispute settlement panel's ruling in the Superfund case and indeed, it would be consistent with viewing border tax adjustments as environmental measures aimed at taxing the consumption of the offending input.

13. This research draws on Mattoo et al. (2013).

14. Some rent-seeking even under the "carbon content in domestic production" standard could occur but this would be considerably less than under the alternative.

between carbon tax avoidance (if the exporting country undertaxes) and double taxation of carbon (if the importing country taxes what has already been taxed).[15]

EXPORT RESTRICTIONS ON FOSSIL FUELS

The overall environmental impact of the natural gas revolution is unclear: in the short run it is positive by facilitating the switch away from more carbon-intensive fuels such as coal and oil. But it can also slow the development of cleaner fuels such a renewables. What concerns us here are restrictions on the exports of natural gas, most recently in the United States. Current US law makes approval of exports to markets with which the United States has free trade agreements essentially automatic, but requires extensive review and subsequent approval for exports to others.[16]

The US action is hardly unprecedented. Fossil fuel producing countries, most notably members of Organization of the Petroleum Exporting Countries (OPEC), have often chosen to limit their production and/or exports. The goal could be to conserve exhaustible natural resources, to exploit market power, or in the case of restrictions on exports, to lower the price of fuel for domestic consumers and producers.

What do existing WTO rules say about restrictions on the production or export of fossil fuels? The application of GATT/WTO disciplines to energy products has a long and fuzzy history (Selivanova 2007) because the major energy exporters were not initially WTO members. After the 1970s oil price shocks, the United States was in the forefront of efforts to apply trade rules to energy products.[17] Essentially the WTO prohibits export quotas (Article XI) but not production quotas, such as those implemented under OPEC.

The prohibition on export quotas allows for exceptions. First of all, countries can impose restrictions temporarily in order to relieve critical shortage of products essential to the exporting country (Article XI.2).[18] This exception cannot of course be invoked for longer term restrictions on a product such as natural gas whose abundance is being celebrated. A general exceptions provision permits countries to take action (such as export quotas) to conserve exhaustible natural resources but "if such measures are made effective in conjunction with restrictions on domestic production or consumption" (Article XX (g)). Levi (2012) writes: "U.S. policy would be the opposite: it would be made in conjunction with efforts to encourage both domestic production and consumption of natural gas."

The WTO cannot prevent individual countries from making decisions about the exploitation of fossil fuels. For example, a country may justifiably curtail production. But restrictions on exports per se are harder to justify. They distort international markets without producing any clear environmental benefits. In the US case, the reluctance to allow gas exports has at least implicitly, if not explicitly, an industrial policy motive—to confer a competitive advantage to the US manufacturing sector.[19]

If greater use of natural gas is on balance globally desirable because it is cleaner than substitutes such as oil and coal (as Helm (2012) argues in his recent book), then restrictions on exports might be deleterious for global energy emissions. If the environmental benefits of unrestricted gas are not so clear, the export ban on natural gas should be disallowed on traditional trade grounds. This is then an example where WTO rules need to be tougher on mercantilist practices for the sake of the environment.[20]

15. Note that in table 1 export taxes were not placed at either end but below the other proposals. The reason is that the trade-off between trade and environmental objectives that export taxes strike will depend on their magnitude and their scope (e.g., whether they are levied on all goods or just energy-intensive ones).

16. See e.g., Levi (2012). Under US federal law, the Department of Energy has to find such exports to be consistent with the "national interest" before they can occur, though the term has not been clearly defined. Hufbauer, Bagnall, and Muir (2013) contains an excellent discussion of the issues and comes to the same conclusion.

17. The United States has called for action against OPEC for its anticompetitive practices and illegal export quotas on oil, which ultimately lead to higher gas prices in the United States. Senator Frank R. Lautenberg (D-NJ) introduced legislation which would require the United States Trade Representative to initiate consultations with countries that are members of both OPEC and the World Trade Organization (WTO).

18. The WTO also permits commodity agreements between countries which are designed to stabilize prices (Article XX (h)).

19. Michael Levi has written in the *New York Times*: "A decision to constrain natural-gas exports could have dangerous reverberations for American trade. For example, the United States has filed with the World Trade Organization a challenge to Chinese restrictions on exports of so-called rare earth minerals, which are crucial for new technologies like wind turbines, missiles and smartphones. If Washington hypocritically limits gas exports, it might as well write the Chinese brief."("The Case for Natural Gas Exports," *New York Times*, August 15, 2012)

20. An additional complication from export restrictions is whether they can act as de facto subsidies to downstream industries using the restricted products as inputs. In the WTO dispute relating to the export restrictions on raw materials by China, there was a concern that the Chinese export restrictions implicitly subsidized downstream consumers. But the issue of whether export restrictions are de facto WTO-illegal was not clarified by that ruling (since China fell under the special conditions applied to its 2001 Accession Protocol where it apparently agreed not to restrict exports of those particular products). Nevertheless the link between export restrictions and subsidies is potentially important in the WTO.

INTELLECTUAL PROPERTY RIGHTS PROTECTION FOR GREEN TECHNOLOGIES

The WTO's TRIPs agreement requires countries to provide patent protection for all fields of technologies (Article 27.1). TRIPs provisions would therefore apply to new technologies and products related to climate change as well. However, what TRIPs gives technology creators with one hand, it partially claws back with another hand, through fairly permissive compulsory licensing provisions. Countries can grant compulsory licenses (licenses granted without the authorization of the patent owner) without specifying the reasons, provided they fulfill certain conditions. Two important conditions are: providing due process and ensuring "adequate compensation" for the patent holder (Article 31 (h)).

Now, developing countries have been using compulsory licenses, especially in the area of pharmaceuticals, to dilute the patent right and lower prices of medicines in order to achieve health goals (Brazil and India being recent examples). Some of the rhetoric surrounding environmental technologies suggests that developing countries may favor weaker intellectual property rights to facilitate dissemination of such technologies.

If, however, these countries come to believe that (i) the stakes in preventing climate change are high for them (as we argue in our book, *Greenprint*); (ii) technology generation is key to preventing or mitigating the effects of climate change; and (iii) because they are large emitters of greenhouse gases and because their markets for green technologies are large, technology generation will be materially affected by the property rights protection that they provide, then their incentives for strengthening intellectual property rights (IPR) protection will be enhanced. In this case, rules on IPRs could be strengthened.

One way of doing this would be to tighten the compulsory license provisions at least for the large emerging market economies such as China, India, Brazil, Indonesia, Russia, and South Africa. One possibility, for example, would be to change Article 31 (h) of the TRIPs agreement to say that where compulsory licenses are granted for green technologies, the right holder shall be paid remuneration related to the fixed cost of inventing them (suitably apportioned across the large markets).[21] Another way could be to make stronger commitments to enforce IPR laws in relation to green technologies.

CONCLUSIONS AND INTERNATIONAL COOPERATION

In this note, we have argued that the WTO faces a challenge in curbing mercantilism while allowing space for environmentalist policy. We have provided four instances where changes in trade rules would promote climate change goals. All these changes have an underlying political economy logic and consistency. They would allow global environmental "bads" to be penalized (by permitting border taxes on less clean imports), global environmental goods and technologies to be promoted (by relaxing the constraints on the use of production and export subsidies and strengthening IPR protection), and prevent global environmental "goods" being penalized (by eliminating the export restrictions on natural gas).

These changes would be important in facilitating broader cooperation on climate change. In *Greenprint,* we proposed a bargain between industrial countries and the dynamic emerging economies that would kick-start the technology revolution that is imperative to address the climate change problem without sacrificing legitimate energy aspirations. The former would take early and consistent actions to raise the price of carbon. The latter would contribute in other ways including through trade-related actions.

The analysis above suggests that these trade actions/contributions by the dynamic emerging economies could take two forms. First, by permitting industrial countries to take BTAs—or by imposing export taxes on energy-intensive manufacturing goods themselves—they could facilitate the political economy of industrial countries raising carbon prices.[22] Energy-intensive industries in the United States and Europe would receive some protection against the loss of competitiveness and thus be less resistant to carbon price increases. Second, by strengthening IPR protection, they could contribute to the global effort at technology development.

From the perspective of the bargaining dynamic between China (and other countries such as India) on the one hand and the United States and European Union on the other, there is a nice give-and-take as shown in table 2.

China would have to agree to clarify existing rules to permit the United States to implement BTAs and to strengthen IPR protection. In turn, the United States and European Union would have to agree to change rules to allow China to subsidize green technologies and goods. And concessions by

21. Yet another possibility would be to disallow compulsory licenses altogether in relation to green technologies. But this would run counter to the spirit of the TRIPs agreement which does not limit the grounds on which compulsory licenses can be granted. It would also be overly restrictive and hence neither feasible nor desirable.

22. If current WTO law and jurisprudence do not permit carbon border tax adjustments, especially those based on carbon embodied in imports, the clarification of rules to permit such adjustments would amount to a real concession by developing countries.

Table 2 Political economy of cooperation on trade rules

Changes	Concession by developing countries	Concession by industrial countries
Border tax adjustments (BTAs)	Clarify rules to allow BTAs	
Green subsidies		Change World Trade Organization (WTO) rules to allow production subsidies and make export subsidies actionable rather than prohibited
Exports of natural gas		US lifts restrictions
Intellectual property rights (IPRs)	Strengthen IPR protection for green technologies	

both rich and poor would serve to facilitate the global objective of kick-starting the technology revolution.

Thus, the proposed changes to trade rules in this paper not only have an underlying political economy logic, but also a balance of concessions between the major trading players which may help achieve international cooperation.

REFERENCES

Acemoglu, Daron, Philippe Aghion, Leonardo Bursztyn, and David Hemous. 2011. The Environment and Directed Technical Change. *American Economic Review* 102, no. 1: 131–166.

Bhagwati, Jagdish and Petros C. Mavroidis. 2007. Is Action Against US Exports for Failure to Sign the Kyoto Protocol WTO-legal? *World Trade Review* 6: 299–310.

Green, A. 2006. Trade rules and Climate Change Subsidies. *World Trade Review* 5, no. 3: 377–414.

Grossman, Gene, 1982, "Border Tax Adjustment," *Journal of International Economics*, vol. 10, no. 1, February 1980.

Helm, Dieter. 2012. *The Carbon Crunch: How We're Getting Climate Change Wrong—and How to Fix it*. New Haven and London: Yale University Press.

Horn, Henrik and Petros C. Mavroidis. 2011. To B(TA) or not to B(TA)? On the Legality and Desirability of Border Tax Adjustments from a Trade Perspective. *World Economy*.

Hufbauer, Gary Clyde, Jeffrey J. Schott, Martin Vieiro and Erika Wada. Forthcoming. *Local Content Requirements: A Global Problem*. PIIE Working Paper. Washington: Peterson Institute for International Economics.

Hufbauer, Gary Clyde, Allie E. Bagnall, and Julia Muir. 2013. *Liquefied Natural Gas Exports: An Opportunity for America.* PIIE Policy Brief 13-6. Washington: Peterson Institute for International Economics.

Hufbauer, Gary Clyde, Steve Charnovitz, and Jisun Kim. 2009. *Global Warming and the World Trading System*. Washington: Peterson Institute for International Economics.

Levi, Michael. 2012. *A Strategy for US Natural Gas Exports*. The Hamilton Project Discussion Paper 2012-04. Washington: Brookings.

Mattoo, Aaditya, Arvind Subramanian, Dominique van der Mensbrugghe, and Jianwu He. 2013. Trade Effects of Alternative Carbon Border-Tax Schemes. Forthcoming in the *Review of World Economics.*

Mattoo, Aaditya and Arvind Subramanian. 2012. *Greenprint: A New Approach to Cooperation on Climate Change*. Washington: Center for Global Development.

Mavroidis, Petros. 2007. *Trade in Goods*. Oxford and New York: Oxford University Press.

Moore, Michael. O. 2013. Embedding Climate Change Mitigation Efforts in the Multilateral Trading System. Paper presented at the George Washington University Conference on the multilateral trading system.

Pauwelyn, Joost. 2009. Testimony Before the Subcommittee on Trade of the House Committee on Ways and Means. March 24, 2009. Available at http://waysandmeans.house.gov/media/pdf/111/pauw.pdf (accessed on April 17, 2013).

Selivanova, Yulia. 2007. The WTO and Energy: WTO Rules and Agreements of Relevance to the Energy Sector. Geneva: International Centre for Trade and Sustainable Development.

UNEP and WTO (United Nations Environment Program and the World Trade Organization). 2009. Trade and Climate Change: A Report by the United Nations Environment Program and the World Trade Organization. Geneva.