Climate Change and Carbon Leakage

The problem and a proposal

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europa-uni.de/recap15/
Overview

1. The problem
2. Trade and Carbon leakage in a standard trade model
3. the proposal
Climate Change is going to transform the world into a different place.

Impacts of Climate Change, depending on the warming compared to pre-industrial times. From the Stern-Review:

How is this done?

(Stern, 2007, fig. 13-4, p. 294)
Getting an idea ("estimate") of the impacts of global warming:

1. How much more CO\textsubscript{2} than in pre-industrial times (1750-1850) do we have in the atmosphere. Often: How much more than 280 parts per million (PPM), assuming that the CO\textsubscript{2}-stock is in an equilibrium.
2. Then estimate the impact on the global average temperature.
3. And then try to get an idea about the consequences.
4. of course all this is questionable! (a simplification of a very complex system)

Global negotiations about Climate Change: Within the UN-Framework Convention on Climate Change (UNFCCC):

- Aimed at stabilizing atmospheric concentration of Greenhouse Gases to avoid "dangerous anthropogenic interference" with the climate system (Art. 2)
- principle of common but differentiated responsibilities (Art. 3) (circumstances, fairness principles etc. matter)
- 195 Parties to the Convention (almost universal)
- 1995: Kyoto Protocol (emission reduction targets for developed countries)
- 2009: (COP15-Copenhagen): agreement to limit temperature increases to 2°
so, we agreed to limit global warming to $2^\circ$ and limit emissions of greenhouse gases accordingly

private provision of a global public good by UNFCCC members → in a non-cooperative setting, this doesn’t work

promises compared to what is necessary:
• So far, the principle of common but differentiated responsibility means that developing countries argue for their right to develop, developing countries argue for more emission reduction in return for money.

• “Adding-Up Problem” (Mattoo and Subramanian, 2013a,b): CO2 is a stock that accumulates. To avoid too much global warming, the world needs to respect a “carbon budget” of around 750 gigatons between now and 2050.

• The flow of emissions that is caused by developing countries is already exceeding the emissions by developed countries:
Introduction
emissions of developed vs. developing counties

Annual CO₂-emissions (gigatons), 1965-2035

taken from Mattoo and Subramanian, 2013a, p. 13, based on Wheeler and Ummel, 2007

... and this will soon also be true for accumulated emissions ....
The principle of common but differentiated responsibility in Kyoto meant that, essentially, developed countries had to reduce emissions.

Is that a useful strategy?

In a world where developed and developing countries trade, reducing the production of carbon-intensive goods doesn’t mean they are not produced elsewhere (relocation of production).

“Carbon Leakage”:

- increase in emissions in countries without emission reduction
- reduction of emissions in countries that reduce emissions

CGE-studies find leakage rates between 0 and 130%. In general, empirical evidence about the relocation-effects of environmental policy is very mixed (“pollution haven” literature)
Mechanisms behind carbon leakage:

- Lower energy prices in the world market due to less demand from countries that reduce emissions
- Relocation of production
- Changed comparative advantage (clean vs. dirty production)
- Different input mix, for example labor vs. energy

A problem with that definition (from IPCC, 2007): Higher emissions in the developing world can occur for other reasons than climate policy in the developed world

Recently, another definition became prominent: “weak” carbon leakage

CO$_2$-emissions embodied in imports from countries that do not try to mitigate emissions (Kyoto: non-Annex B, developing world) to countries that try to mitigate emissions (Kyoto: Annex B countries) (Peters and Hertwich, 2008)
Recent evidence on Kyoto and carbon leakage: Aichele and Felbermayr, 2012

- Emission reductions agreed in the Kyoto protocol led to higher imports of CO$_2$ from countries that did not agree to reduce emissions (8%)

- Kyoto had (probably) no significant effect on world-wide emissions

- A general problem in the current setup of climate change negotiations is that unilateralism doesn’t work and all the efforts that have been made turn out to be insufficient

- In the policy debate: A shift to adaptation (providing local public goods) instead of mitigation (to the disadvantage of developing countries)

- One general theme of our RECAP15-project: How to ensure that unilateralism works.
Overview

1. The problem

2. Trade and Carbon leakage in a standard trade model

3. the proposal
Trade and Carbon leakage in a standard trade model I

- What follows is based on a joint paper (in german, sorry): Becker et al., 2013
- Starting point: harmonized international climate policy with consistent CO$_2$-pricing is unrealistic
- Unilateral action ineffective and harming the competitiveness of those countries with ambitious climate change policies
- current solution: Exclude energy-intensive industries (....)
- The solution we (not only we) are proposing: Border Adjustments (BA)
- A BA means that importers have to pay a tariff that matches an emission tax that applies to home firms (leveling the playing field)
- Our analysis:
1. Economics: Understanding the impact of an CO$_2$-tax, combined with border adjustment, on trade, competitiveness, carbon leakage and global CO$_2$-emissions

2. Law: Discussing the compatibility of border adjustments with WTO-regulations and WTO-case law (skipped)

3. Policy: Suggestion of border adjustment that are consistent with WTO-rules. Discuss the impact on developing countries
model: setup I

- partial equilibrium\(^1\) trade policy analysis, based on a traditional 2x2x2 model
- 2 countries: Home & Foreign
- 2 goods: CO\(_2\)-intensive and CO\(_2\)-extensive
- 2 factors: labor & energy
- technology implies that the use of energy causes CO\(_2\)-emissions
- climate policy at home is a CO\(_2\)-tax (could also be an Emissions trading scheme)
- no climate policy at all in Foreign
- Home internalizes production-externalities
- Foreign has an comparative advantage in the production of the energy-intensive good
Home is producing that good, too, but also imports it from Foreign.

partial equilibrium analysis of trade in the energy-intensive good. We distinguish two cases:

1. equal technologies in both countries
2. different technologies: imports of the energy-intensive good “contain” more CO\(_2\) than local production
3. the tax base both for the CO\(_2\)-tax and for the border-adjustment is CO\(_2\)-emission per good (“Carbon Footprint”)
4. A combination of a CO\(_2\)-tax and a border adjustment based on carbon footprints (of production) makes sure that all emissions are taxed similarly
   - equal technologies: border adjustment is equal to the CO\(_2\)-tax
   - different technologies: border adjustment is higher than the CO\(_2\)-tax

\(^1\) Jakob and Marschinski, 2013 argue that general equilibrium effects might be important when thinking about policy interventions into the trade with embodied carbon. We tend to disagree, but that is research that needs to be done.
model: unilateral policy without BA I

- local supply and demand, resulting export supply (Foreign) and import demand (home)
- free trade, no tax: price $P_1$, trade volume $Q_1$
- CO$_2$-tax: home producers less competitive, increased demand for imports

![Graph showing supply and demand curves for Home, World market, and Foreign market with CO$_2$ tax and market distortion (MD).]
model: unilateral policy without BA II

- reduced production at home ($S_2$), increased production in Foreign ($S_2^*$). Emissions change accordingly
- Carbon Leakage: $S_2^* - S_1^*$ (stronger comparative advantage for foreign)

![Graph showing the model of unilateral policy without BA II with diagrams for Home, World market, and Foreign showing price and quantity relationships.](image-url)
model: BA, equal technologies

- introducing a BA = imposing the CO$_2$-tax on imports, too: shift of the export supply curve
- compared with free trade: Foreign produces $S_1^*$
- no leakage, trade volume as before
model: BA, different technologies

- different technologies: BA > CO$_2$-tax
- trade volume shrinks to $Q_3$
- less production in foreign $S_3^*$
- leakage is more than compensated
what happens to the competitiveness of home and foreign depends on what you choose as a reference

For WTO-compatibility, this matters (....)

<table>
<thead>
<tr>
<th>Instrument</th>
<th>status quo</th>
<th>ToT home</th>
<th>ToT Foreign</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2-tax</td>
<td>free trade</td>
<td>(-)</td>
<td>(+)</td>
<td>equal technology: (+)</td>
</tr>
<tr>
<td>CO2-tax</td>
<td></td>
<td></td>
<td></td>
<td>different technology: (+ or -)</td>
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<tr>
<td>BA, equal technology</td>
<td>free trade</td>
<td>neutral</td>
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</tbody>
</table>
WTO law

- It matters (for lawyers) whether the CO$_2$-tax and the corresponding BA are introduced separately or as a package

- Two strategies to justify “climate-tariffs” within the WTO-system:
  1. Design a BA that is consistent with non-discrimination
  2. Claim an exception based on Art. XX GATT

- The introduction of a policy that is not changing the ToT is not against the spirit of the GATT. And we also argue in a legal analysis that a package can be seen as WTO-consistent, even without reliance on Art. XX GATT

- Even if the introduction of an BA is consistent with the WTO, it might be seen as unfair when designed as in our model. (taxing dirty technologies $\approx$ taxing poverty)
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strategy 1: BA based on the carbon footprint

- We suggest two different strategies to design a BA: Carbon footprint vs. Carbon Added Tax

- strategy 1: BA based on the carbon footprint
  - carbon leakage is eliminated
  - what is taxed is the consumption of “embedded” CO₂
  - the use of dirty technologies is punished
  - it no longer the decision of each nation individually how the local industry is regulated
  - a lot of potential for conflict! (And since a BA is hopefully only an intermediate step ...)
  - WTO-compatibility only based on Art. XX (WTO and WTO-panels need to decide the conflict between free trade and the environment in favor of the latter)
strategy 2: a neutral BA ala VAT

- assign prices to CO$_2$ at home (tax, emission trading,..)
- implement a BTA similar to the price on CO$_2$ at home
- For the sake of simplicity: A BA that is targeting the average firm in an industry (based on tariff classifications, for example)
- rebates for home exporters
- neutral in terms of competitiveness
- consumption of similar goods at home according to home-standards and -decisions about climate policy
- no double taxation (incentive to merge different emission trading systems)
- The use of a dirty technology in Foreign is NOT punished. National Sovereignty is untouched
- problems with WTO-rules? Unlikely ....
thanks


