Is carbon leakage still a relevant issue?

Some fragments of the economics of carbon leakage 2.0

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An example of relocation of production
voestalpine invests €550 m in Texas, US

- Direct reduction iron (DRI) plant
  Iron processing factory

- Break-through technology
  Relies on cheap gas
  in contrast to pure coke-based blast furnaces

- Why is this investment made in the US and not in the EU?
  Production costs about 20% lower than in EU
  mainly but not only due to cheap gas

This decision was hardly influenced by considerations
about future carbon prices
Compared to pre-2008 we are discussing carbon leakage now in a radically different environment

Consequently the economics of carbon leakage needs to move from stage 1.0 to stage 2.0
More facts than just the carbon price need to be considered
Fragmentation by size
85 % installations account for only 10 % emissions

Emissions vs. installations

- 75 % installations account for 5 % emissions
- 85 % installations account for 10 % emissions
Fragmentation by sectors
Only the power sector faced short positions

Power sector dominates
Accounts for 73% of emissions
Stringency of the market between Power and NonPower sectors

- Power sector was rather short
- NonPower sector was always long
- Differences between trading periods
**EU ETS Net Positions**

All sectors 2008-2012

- **Austria**: 7.2%
- **Belgium**: 15.3%
- **Bulgaria**: 27.5%
- **Cyprus**: 26.0%
- **Czech Republic**: 13.4%
- **Denmark**: 3.2%
- **Estonia**: -2.1%
- **Finland**: 6.4%
- **France**: 21.6%
- **Germany**: -11.0%
- **Greece**: 2.8%
- **Hungary**: 5.6%
- **Iceland**: 14.6%
- **Ireland**: 12.9%
- **Italy**: 4.4%
- **Latvia**: 37.9%
- **Liechtenstein**: 59.7%
- **Lithuania**: 25.3%
- **Luxembourg**: 27.9%
- **Malta**: 8.5%
- **Netherlands**: 5.6%
- **Norway**: -86.2%
- **Poland**: 3.4%
- **Portugal**: 18.3%
- **Romania**: 30.1%
- **Slovakia**: 33.2%
- **Slovenia**: 1.1%
- **Spain**: 9.5%
- **Sweden**: 13.6%
- **United Kingdom**: -4.0%
- **Total**: 4.7%

**Profile of country stringencies 2008 - 2012**

- **The overall market was long by about 5 %**

- **Country positions differ**

**Scale**
- $x \leq -50\%$
- $-50\% < x \leq -20\%$
- $-20\% < x \leq -5\%$
- $-5\% < x \leq 0\%$
- $0\% < x \leq 5\%$
- $5\% < x \leq 20\%$
- $20\% < x \leq 50\%$
- $50\% < x$
- not in EU ETS
- ETS but no data
Concepts

The economics of cap and trade needs to be reconsidered
Problem 1
Abatement costs are not a well defined concept

<table>
<thead>
<tr>
<th>Abatement options</th>
<th>Operating decisions</th>
<th>Investment decisions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>no investments</td>
<td>different levels of investments</td>
</tr>
<tr>
<td>Change of output</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change of energy efficiency</td>
<td></td>
<td></td>
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<tr>
<td>Change of energy mix</td>
<td></td>
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</tr>
</tbody>
</table>

- This is caused inter alia by the difference between integrated and add-on abatement technologies
Problem 2
The causality from the stringency of allowances to technological change is highly uncertain

- Carbon prices of a conceivable size have only a very limited impact on the choice of technologies
Problem 3
Uncertainty about abatement costs and impacts on technologies undermine the cost minimization argument

- There is high uncertainty about abatement costs
- Abatement costs vary
  - Interest rates
  - Capital depreciation rates
  - Energy prices
  - Cyclical fluctuations
- Abatement costs may not be unique at all
  - e.g. joint production structures
Scope

The issue of carbon leakage needs to be put into a broader perspective
The widening energy price gap
EU vs. US

Trends in energy price indexes
2005-2012

Gas price index
Industry
EU 35%  US -66%

Gas price index
Households
EU 45%  US 3%

Electricity price index
Industry
EU 38%  US -4%

Electricity price index
Households
EU 22%  US 8%
How relevant are energy costs?

Share of energy in % of production costs – selected sectors in Germany (2010)

- Cement, lime and plaster
- Clay building materials
- Basic iron and steel
- Pulp, paper and paperboard
- Glass
- Basic pharmaceuticals
- Non-ferrous metals (incl. aluminium)
- Wood and cork
- Average manufacturing
- Furniture
- Automotive
- Consumer electronics
Prices are only of limited relevance for technological innovation

- Cap & Trade
  - Price determined
  - Technologies
    - Non-price determined
    - Energy and emissions
  - Economic activity

Path Dependent
EU’s industry is losing ground in the global technology competition

National Science Board (2012): Science and Engineering Indicators

The technology gap of EU vs. US and China is widening
Linking carbon leakage to trade and industrial policy

- What determines the geography of trade?
  Factors for determining the location of production

- How valid is the Porter Hypothesis (1991)?
  Well-designed regulation could actually increase competitiveness

- What are the drivers of industrial innovation?
  Investigating the economics of innovation
Questions

Information that would help a better understanding of carbon leakage
Sample of a questionnaire

- **Cost structure**
  - user costs of capital (annuity of the investment costs)
  - operating costs (wages, materials, types of energy)

- Impact (in percent) of a carbon price of €10 on variable costs?

- Impact (in percent) of an increase of electricity price of €10 / MWh on variable costs?

- Are the current energy price gaps towards non-EU regions relevant for importing pre-materials or relocating production?
Propositions

Embedding carbon leakage into an innovation-driven industrial polity
Putting carbon leakage into a new perspective

- European industries have become now more vulnerable with respect to energy prices than to carbon prices.
- Europe is facing a widening technology gap both towards the US and Asia.
- Carbon leakage is now encompassed by the broader issues of competitiveness.
- A targeted innovation policy for improving competitiveness will substantially lower the threat of carbon leakage.
Thank you.

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