Final workshop
Tackling Leakage in a World of Unequal Carbon Prices

Carbon pricing effects on cost structures and trade flows of energy intensive industries

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1. Introduction
2. Quantification of carbon pricing effects
3. Quantification of exposure to international competition
4. Analysis of cost structure
5. Trade flow analysis
1. Introduction (1/2)

- EU Emissions Trading Scheme (ETS)
  - Reflection of GHG emissions related costs
    → Direct and indirect costs
  - Partial implementation of climate policy
    → Potential distortions in competitiveness
    → Carbon leakage
1. Introduction (2/2)

- Which sectors are affected?
  a) Increases in direct or indirect costs
  b) Ability for pass-through of additional costs
  c) High exposure to international competition
  d) Possibilities to reduce emissions or electricity consumption
  e) Profit margins as potential indicator of long-run investment and/or relocation decisions
  f) Effect of energy and climate policy outside the EU
<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Disaggregation level</th>
<th>CO2 price</th>
<th>Denominator</th>
<th>Process emissions</th>
<th>Electricity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Trust (2004)</td>
<td>UK</td>
<td>2-3 digit SIC</td>
<td>EUR 20/ t CO2</td>
<td>GVA</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Morgenstern et al. (2004)</td>
<td>USA</td>
<td>4 digit SIC (USA)</td>
<td>US$ 1/ t CO2</td>
<td>Total cost</td>
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<td>yes</td>
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<td>WRI (2004)</td>
<td>USA</td>
<td>2 digit SIC (USA)</td>
<td>-</td>
<td>Final sales value</td>
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<td>no</td>
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<tr>
<td>Hourcade et al (2008)</td>
<td>UK</td>
<td>4 digit SIC</td>
<td>EUR 20/t CO2</td>
<td>GVA</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Graichen et al. (2008)</td>
<td>Germany</td>
<td>4 digit NACE</td>
<td>EUR 20/t CO2</td>
<td>GVA</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>de Bruyn et al. (2008)</td>
<td>Netherlands</td>
<td>2-4 digit SIC</td>
<td>EUR 20/t CO2</td>
<td>Total cost</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>CITI (2008)</td>
<td>Australia</td>
<td>Company (ASX100)</td>
<td>A$ 20/t CO2</td>
<td>Market Capitalisation</td>
<td>yes</td>
<td>no</td>
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<tr>
<td>Commission Services (2008)</td>
<td>EU-27</td>
<td>8 digit (partly aggregated) PRODCOM</td>
<td>EUR 30/t CO2</td>
<td>Product price</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>
2. Quantification of carbon pricing effects

Concept of ‘value at stake’
Sum of potential direct and indirect costs in relation to gross value added (GVA)
- Indirect costs:
  Electricity * estimated pass-through of CO2 purchased costs to electricity prices
- Direct costs:
  emission intensity of production
    → energy em.: fuel input * em.factors
    → process em.: based on data from the GHG inventory
Note: 20 EUR/t CO2, 19.3 EUR/MWh pass-through in electricity
Source: based on Graichen et al. (2008), updated for 2006
Price increase assumption: CO₂ = €20/t CO₂; Electricity = €10/MWh

Source: Hourcade et al. (2008)
CO2-cost in relation to total cost

Note: 20 EUR/t CO2, 14 EUR/MWh pass-through in electricity
Source: de Bruyn et al. (2008)
3. Quantification of exposure to international competition

Concept of trade intensity

\[
\text{TradeIntensity} = \frac{\text{Exports}_{\text{regional}} + \text{imports}_{\text{regional}}}{\text{turnover} + \text{imports}_{\text{total}}}
\]
Note: 20 EUR/t CO2, 19.3 EUR/MWh pass-through in electricity
Source: Graichen et al. (2008), modified & updated for 2006
<table>
<thead>
<tr>
<th>Sectors in Germany (I)</th>
<th>Option I (5%;10%)</th>
<th>Option II (30%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertilizers &amp; nitrogen compounds</td>
<td>MVAS, TI</td>
<td></td>
</tr>
<tr>
<td>Basic iron &amp; steel</td>
<td>MVAS, TI</td>
<td></td>
</tr>
<tr>
<td>Aluminium &amp; aluminium products</td>
<td>MVAS, TI</td>
<td></td>
</tr>
<tr>
<td>Paper &amp; -board</td>
<td>MVAS, TI</td>
<td></td>
</tr>
<tr>
<td>Other basic inorganic chemicals</td>
<td>MVAS, TI</td>
<td></td>
</tr>
<tr>
<td>Starches &amp; starch products</td>
<td>MVAS, TI</td>
<td></td>
</tr>
<tr>
<td>Flat glass</td>
<td>MVAS, TI</td>
<td></td>
</tr>
<tr>
<td>Pulp</td>
<td>MVAS, TI</td>
<td>TI</td>
</tr>
<tr>
<td>Other basic organic chemicals</td>
<td>MVAS, TI</td>
<td></td>
</tr>
<tr>
<td>Ceramic tiles &amp; flags</td>
<td>MVAS, TI</td>
<td></td>
</tr>
<tr>
<td>Hollow glass</td>
<td>MVAS, TI</td>
<td></td>
</tr>
<tr>
<td>Sectors in Germany (II)</td>
<td>Option I (5%, 10%)</td>
<td>Option II (30%)</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Cement</td>
<td></td>
<td>MVAS</td>
</tr>
<tr>
<td>Lime</td>
<td></td>
<td>MVAS</td>
</tr>
<tr>
<td>Dyes &amp; pigments</td>
<td></td>
<td>TI</td>
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<tr>
<td>Refractory ceramic goods</td>
<td></td>
<td>TI</td>
</tr>
<tr>
<td>Other chemical products n.e.c.</td>
<td></td>
<td>TI</td>
</tr>
<tr>
<td>Basic pharmaceutical products</td>
<td></td>
<td>TI</td>
</tr>
<tr>
<td>Electronic valves, tubes &amp; other components</td>
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<td>TI</td>
</tr>
<tr>
<td>Abrasive products</td>
<td></td>
<td>TI</td>
</tr>
<tr>
<td>Technical ceramic wares</td>
<td></td>
<td>TI</td>
</tr>
<tr>
<td>Aircraft &amp; spacecraft</td>
<td></td>
<td>TI</td>
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</tbody>
</table>
Conclusions (A)

- Comparable studies show similar results

→ A small number of sectors may be exposed to distortions in competitiveness due to both high value at stake and high trade intensity

→ Thresholds based on one of the two criterias only defines more sectors to be potentially exposed
Cost structure analysis

- Breakdown of operational costs analysed as proxy for labour and energy/CO2 intensity
- Many gaps in Eurostat data
- Values vary widely between MS
- No pattern visible (e.g. a MS with a high share of personnel costs in all sectors analysed)
Operational expenditure, basic iron & steel

United Kingdom
Sweden
Finland
Romania
Portugal
Austria
Hungary
Italy
France
Spain
Greece
Ireland
Germany
Belgium

Purchases of energy products
Purchases of goods & services (excluding energy products)
Personnel costs
Reasons for differences in breakdown of operational costs

- different recycling ratios & production processes
- different efficiencies of plants
- varying prices
- different product mix
- Degree of specialization
- use of outsourcing or employment agencies

† Limited value of analysis, preferably base analysis on physical units than on expenditure
4. Trade flow analysis

Basic iron & steel, top 10 non-EU trading partners of EU-27
Basic iron & steel, trade of EU-27 according to regions

- **Trade volume according to regions**
  - EU15: 66%
  - EU12: 26%
  - other (outside of EU27): 8%

- **Export according to regions (2007)**
  - EU15: 68%
  - EU12: 21%
  - other (outside of EU27): 11%

- **Import according to regions (2007)**
  - EU15: 66%
  - EU12: 26%
  - other (outside of EU27): 8%
Cement, top non-EU import partners of EU-27

Top nonEU trade partners, cement imports

- Turkey
- China (P.R.)
- Egypt
- USA
- Croatia
- Russia
- Thailand
### Ranking by trade volume of main trading partners of EU-27

<table>
<thead>
<tr>
<th></th>
<th>NACE</th>
<th>USA</th>
<th>Russia</th>
<th>China</th>
<th>Norway</th>
<th>Switzerland</th>
<th>Turkey</th>
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<tbody>
<tr>
<td>Aluminium</td>
<td>27.42</td>
<td>4</td>
<td>2</td>
<td>6</td>
<td>1</td>
<td>3</td>
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<tr>
<td>Basic iron &amp;</td>
<td>27.10</td>
<td>4</td>
<td>2</td>
<td>3</td>
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<td>6</td>
<td>1</td>
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<tr>
<td>steel and</td>
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<td>ferro-alloys</td>
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<td>Other basic</td>
<td>24.13</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>(7)</td>
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<td>Fertilizers &amp;</td>
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<td>Paper &amp; paperboard</td>
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<td>1</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>

Source: Mohr; Graichen; Schumacher (2009)
Aluminium, import and export volumes of main non-EU trading partners, 2007

![Bar chart showing import and export volumes in million EUR for various countries in 2007.](chart.png)
Conclusions (B)

- Shares of intra-/extra-EU trade have been rather stable (2003-2007)
- Import/export relation of non-EU partners: major change only in basic iron & steel (imports 2003: 44% to 2007: 57%)
- Main trading partners of the EU-27 are similar across the 5 sectors
- Six main trading partners in each sector account for half of non-EU trade
- ETS-partners (Norway, Iceland, Liechtenstein) have to be excluded from further analysis
Thank you!

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