The European Emissions Trading Scheme

A Model to Follow or One to Avoid?

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Outline

- Introduction
- Initial allocation
- Carbon leakage
- Intertemporal and interregional flexibility
- Economic costs
- Firm-level evidence on Carbon Management
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Introduction

- Need for mitigation efforts due to the dangers of climate change
- Emission reductions via three channels
  1. Emissions Trading (European Emissions Trading Scheme)
  2. Investments in emission reduction activities outside EU (flexible mechanisms)
  3. Further measures for sectors not covered by the EU ETS (emissions reduction from new cars, increasing use of renewable energy, etc.)
- EU ETS is Europe’s most important instrument against climate change
- It is the largest and most ambitious ETS to date covering almost half of European CO2 emissions
- EU green house gas (GHG) emission reductions goal: 20% below 1990 levels by 2020 (“Climate and Energy Package”, 2009)
The Way to Emissions Trading in Europe – Overview

**International events**

- 1992
  - Kyoto Protocol (KP) signed
- 1994
  - EU ratifies KP
- 1997
  - KP comes into force
- 1998
  - Beginning of first KP period
- 2002
  - End of first KP period
- 2005
  - Beginning of first EU ETS phase
- 2008
  - Beginning of second phase
- 2012
  - Beginning of third phase
- 2013
  - European 3x20 goals
- 2020
  - European 3x20 goals

**European events**

- 1992
  - European CO2 tax proposal
- 1997
  - European tax proposal withdrawn
- 1998
  - EU burden-sharing agreement
- 2005
  - Beginning of first EU ETS phase
- 2013
  - Beginning of third phase

Source: Mission Climat of Caisse des Dépôts, 2008
EU “Climate and Energy Package”

Goal: Implementing the targets by 2020

- Published on Jan. 23, 2008 and amended and approved by the Council and European Parliament End of 2009

- Main legislative components
  - Amending Emissions Trading Scheme (ETS)
  - Specifying Targets for sectors outside the ETS
  - General Frame for Promoting renewables
  - Guidelines for subsidy schemes
  - CCS
Reducing CO₂ Emissions

Directive & Decision: Implementing the CO₂ targets

- Specifying the non-ETS targets (Decision)
  - Division of EU wide emission budget (14% versus 2005) between ETS and non-ETS sectors (based on efficiency)
  - Specifying non-ETS targets for individual member states vs 2005 Implemented by other instruments (standards, taxes, ...)

- Amending the ETS (Directive)
  - Defining overall ETS cap, allocation mechanism

- International dimension
  - Carbon – „external affairs“ (use of flex-mex)
  - Special provisions in case of international agreement (30 %)

<table>
<thead>
<tr>
<th></th>
<th>2020 Targets in % vs. BaU in</th>
<th>1990</th>
<th>2005</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETS</td>
<td>-24.9</td>
<td>-21.0</td>
<td>-27.6</td>
<td></td>
</tr>
<tr>
<td>non-ETS</td>
<td>-10.0</td>
<td>-10.2</td>
<td>-15.3</td>
<td></td>
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</table>
First Phases ETS (Phase I: 05–07, Phase II: 08-12)

- **sectoral coverage:** power plus energy intensive industry (IS, PP, NMM)
- **initial CO₂ allowance allocation:** allocated for free by member states
Energy Package (Phase III: 2013-2020)

- **extented sectoral coverage**: aviation, petrochemicals, ammonia and the aluminium sector (covers 60% of GHG in EU)
- **initial CO₂ allowance allocation**: auctioning as principle

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- **purchase allowances from government**
- **trade allowances for payments**

Auctioning and tighter emission caps lead to higher electricity prices (ZEW estimate for EU Commission: 39 €/tCO₂, +15% electricity prices)
Energy Package (Phase III: 2013-2020)

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- **Initial CO₂ allowance allocation**: auctioning as principle

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**Diagram**

- **Purchase allowances from government**
- **Trade allowances for payments**

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- **Initial CO₂ allowance allocation**: auctioning as principle
  - Purchase allowances from government
  - Trade allowances for payments
  - Auctioning and tighter emission caps lead to higher electricity prices (ZEW estimate for EU Commission: 39 €/tCO₂, +15% electricity prices)
  - ETS easier to introduce with free allocation (windfall profits)
  - Extended over time (GHGs and sectors)
National Allocation Plans (NAP)

2005-2012

Decentralized Allocation

Member states NAPs
- covered installations
- grandfathering (which emitters receive how many allowances)
- auction share
- new entrants reserves & closure treatment

Approval / Amendments by European Commission

Implications
Sum of national caps determines EU-wide cap
Over-allocation in phase I

2013-2020

Centralized Allocation

Allocation based on harmonized rules

Gradually rising share of allowances auctioned (e.g. full auctioning for power sector from 2013 onwards)

Implications
EU-wide cap directly determined by Commission
NAPs no longer required

Incentive for overallocation reduced by centralized allocation
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## Grandfathering and Auctioning

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<td>No</td>
<td>Yes. Concern about competitiveness and carbon leakage</td>
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<td><strong>Revenues and “double dividend”</strong></td>
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<td>Yes. Revenues can be used to cut (distorting) taxes or earmark for special purpose (climate change mitigation, green technologies)</td>
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<td>High rent seeking activities (windfall profits due to cost pass through in many sectors)</td>
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<td>Often considered unfair plus concerns about windfall profits</td>
<td>Yes</td>
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<td><strong>Transnational competition within the EU ETS</strong></td>
<td>Possibly competition distortion due to non-uniform grandfathering</td>
<td>Emitters are treated equally</td>
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<td><strong>Strategic behaviour</strong></td>
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Transnational Competition distortion within the EU ETS

Distribution of Allowances (Selected Sectors) 2008

Decentralized allocation does not only provide problems with cap, but also competition distortions in sectors

Source: Cooper (2010)
Closures and New Entrants

- Auctioning: Existing emitters, firms entering the ETS (*new entrants*), and firms that shut down (*closures*) are all treated equally

- Grandfathering requires a separate treatment

Closures

- *What happens to assigned allowances after firms close?*

  - Trade off between fairness and efficiency – withdrawal of permits after closure …
    - … appears fair
    - … but gives firms an incentive to pursue production → distortion of firm behaviour (inefficient)

  - In the EU ETS member states withdraw permits after closure (withdrawal usually occurs in the following year or – in some countries – in the subsequent phase)
Closures and New Entrants

New Entrants

- Issuance of additional permits to new entrants would raise cap and undermine environmental effectiveness of the scheme but …

- … no issuance would advantage incumbents and hamper new firms (barrier to market entry)
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Competitiveness concerns and leakage

- The EU ETS puts a price on CO2 for domestic installations which adds to other production costs
- Firms outside the EU ETS do not face these additional costs
- Possible consequences:
  - Loss of competitiveness if cost can not pass on prices due to market conditions like demand elasticities etc. (may lead to less local supply and higher unemployment)
  - Relocation of domestic industry outside Europe → Emission reductions cause higher emissions elsewhere (carbon leakage)
  - Note: Carbon leakage can also occur when reduced demand for energy lowers prices and thus raises consumption outside Europe

→ Unilateral climate action may cause competitiveness issues and make ET ineffective
Competitiveness Impacts

- measures of potential exposure level of industries or sectors to eu ets (hourcade, 2007):

  - What are energy intensive industries? What is the CO2 intensity of production?

  - What are the cost implications of climate policies. What are opportunities to abate carbon?

  - To what extent is cost pass-through possible? What is the ability to pass cost increases through prices. What are the market conditions; competitiveness situation (cost evolution, demand elasticity …) etc.

- Use of grandfathering instead of auctioning of EUA’s justified by arguing that auctioning would negatively affect balance sheets ⇔ only valid under inability of pass-through of costs generated by the scheme (hepburn et al., 2006)
Measures against Loss of Competitiveness considered

- *What can be done to mitigate negative competitiveness effects on EU industry?*

1) Global climate change agreement

2) Sectoral approaches

3) Reduce impact of ETS on certain industries
   - a) Grandfathering
   - b) Financial compensation by other means than grandfathering

4) Equalization of CO2 costs for imports and exports
   - a) Border Tax Adjustment (BTA)
   - b) Integrated Emissions Trading (IET)
EU ETS: Third Phase (2013 – 2020)

- **Determination of (sub-)sectors** to be exposed to a significant risk of carbon leakage (Commission’s decision of 24 December 2009)
- **Determination of benchmarks**, to be adopted by 31 December 2010

  - Competitive situation, and thus the risk of carbon leakage may change in case there is an international climate change agreement (Article 10b: report by EC until June 30, 2010)

Leakage exposed sectors following Article 10a of the revised directive
- dir. + indir. cost/gross VA (5%) and trade intensity \((E+M)/(TO+M)\) (10%)
  or
- one of these criteria above 30%
Proxy for competitive pressure: Energy costs

Assumption: €20/tCO2 and €19/mwh price pass through in electricity

Source: Oeko Institu (2008)
Proxy for competitive pressure

Maximal value at stake vs. Trade Intensity nonEU

Source: Oeko Institu (2008)
Consequences of the Commission decision

<table>
<thead>
<tr>
<th>MtCO2</th>
<th>&gt; 5% Costs/GVA und &gt; 10% Trade intensity</th>
<th>&gt; 30% Costs/GVA or Trade intensity</th>
<th>Rest of manufacturing industry in ETS</th>
</tr>
</thead>
<tbody>
<tr>
<td>700</td>
<td>di265 Manufacture of cement, lime and plaster</td>
<td>dg246 Manufacture of other chemical products</td>
<td>147</td>
</tr>
<tr>
<td></td>
<td>dj271 Manufacture of basic iron and steel and of ferro-alloys</td>
<td>dg244 Manufacture of pharmaceuticals, medicinal chemicals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>df231 Manufacture of coke oven products</td>
<td>db172 Textile weaving</td>
<td></td>
</tr>
<tr>
<td></td>
<td>df232 Manufacture of refined petroleum products</td>
<td>dc191 Tanning and dressing of leather</td>
<td></td>
</tr>
<tr>
<td></td>
<td>de211 Manufacture of pulp, paper and paperboard</td>
<td>dg242 Manufacture of pesticides and other agro-chemicals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dg241 Manufacture of basic chemicals</td>
<td>di262 Manufacture of non-refractory ceramic goods</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dj274 Manufacture of basic precious and non-ferrous metals</td>
<td></td>
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</tr>
</tbody>
</table>
Empirical evidence (Oberndorfer/Löschel/Alexeeva-Talebi)

- Empirical evidence:
  - diesel and gasoline: parts of the carbon costs have been passed on to consumers by their producers and/or retailers
  - glass industry - hollow glass / container glass: prices/revenues can be explained by own dynamics rather than input prices, pass-through seems difficult
  - ceramic industry – ceramic goods, ceramic bricks: pass-through of (at least of parts of) gas price shocks is possible
  - chemical industry – ldpe, an: pass-through of energy prices seems possible at European market, AN: asymmetric pass-through

Too broad list of exempted sectors due to heavy lobbying
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Price Development on the EU OTC Carbon Market

Figure taken from Ellerman and Buchner (2008)

Temporal flexibility important to stabilize permit prices and early investments

Political and market uncertainties (GDP, TC, weather, ff prices) important
Advantages of Banking and Borrowing

1. Reduced price volatility
   
   Example: Over-allocation in Phase II
   
   - with banking prices have not dropped to zero in Phase II → higher prices in Phase II → lower reduction requirement in Phase III → lower prices → banking can avoid extreme prices

2. Banking can give firms an incentive for early abatement
   
   - Early abatement is sensible when MAC are relatively low today
   - This may potentially coincide with early investments in low-carbon technologies – this would also lower future abatement costs

3. but: Negative spill-over effects if flaws in the design of trading periods

   Example: Over-allocation in Phase II undermines price signal → reduced incentives in Phase III for investments in low-emitting technologies
JI/CDM and other offsets in Phase I and II

- Linking directive amending the ETS-Directive wrt JI/CDM (2004): no limits of the use of JI/CDM under ETS but asks MS to respect ‘supplementarity’ obligations under the Marrakesh Accords (significant); define an installation-specific limit in NAPs

- Phase II (2008–2012): strict limits in the third guidance 2006 on the use of JI/CDM credits during the second trading period after the collapse of the price of the European Union Allowance (EUA)
  - overall amount of JI/CDM for MS: 50% of reduction effort (max emissions-target in 1990, 2004, 2010)
  - rules for fixing limits in covered sectors: government purchases subtracted from ceiling
  - minimal percentage for ETS installations: 10% of allowances allocated to each installation (EU-12 allowed to increase)
  → aggregate limit 13% of ETS cap vs. 6% reduction vs 2005
**JI/CDM and other offsets in Phase III**

**Non-ETS:**
- member states can use project based credits from projects registered before 2012, but delivering abatement after 2013; limited to 3% of 2005 emissions per year
- transfer of unused part of this limit to another MS

**ETS:**
- full carry over of unused allowances from Phase II to Phase III (Commission estimates: 1/3 of required abatement 2013-2020)
- if registered before 2012, but abatement delivered after 2012
- project-based permits from other LDC countries (vulnerability)
- Bilateral agreements
- JI only with Kyoto II

**PACE calculations**
- NETS 1%, ETS 0%: ETS price 37 EUR/tCO2, CDM 1 bn EUR
- NETS 3%, ETS 25%: ETS price 22 EUR/tCO2, CDM 13 bn EUR

*Very little JI projects, CDM limits not used up (information problem, uncertainty)*
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Cost of emission abatement

- *Compliance cost* as a yardstick for broader policy acceptance
- *Excess cost* as an indicator for the need for “better regulation”

Determinants of economic adjustment costs:

- **Business-as-usual (BaU) economic development:**
  - Effective reduction requirements implied by abatement pledges
  - Benchmark structure for economic adjustment

- **Technologies and preferences:**
  - Ease of carbon substitution (“curvature” of MAC curves) through fuel switching, energy efficiency improvements or output/scale effects

- **International spillover and feedback effects:**
  - Terms-of-trade changes (“competitiveness”)
  - Emission leakage and border measures (unilateral action)

- **Initial market distortions and imperfections:**
  - Scope for 2nd-best effects (e.g. labor market double dividend)

- **Policy implementation**
  - Market-based versus command-and-control
  - Overlapping regulation (e.g. green quota on top of black quota)
Costs: The Critical Role of Baseline Projections

EU nominal abatement requirement w.r.t. 2005:
730 Mt CO₂

EU effective abatement requirement w.r.t. 2005:
1157 Mt CO₂

N.B. Marginal abatement cost (MAC) curves are sketched for the 2020 BaU (with 2005 MAC curve assumed to be identical)

Changes in baselines have major impacts on economic costs

Source: Böhringer/Löschel/Moslener/Rutherford (2009)
Excess Cost of Emission Market Regulation: Segmentation

Segmentation increases economic costs

Source: Böhringer/Löschel/Moslener/Rutherford (2009)
Excess Cost of Green Quota on Top of Black Quota

Abatement options:
- Installing renewables (Green)
- Fossil fuel reduction via demand reduction, fuel switching or higher energy efficiency (Black)
Core Results: Marginal Abatement Cost

- Segmentation induces deviation between non-ETS and ETS CO$_2$ price
- Binding RPS depresses CO$_2$ value

Marginal abatement costs moderate in ETS sectors
Core Results: Inframarginal Abatement Cost

- Substantial excess cost due to emission market segmentation
- Small (or even negative!) cost of additional RPS in our 2nd best setting

Economic costs seem moderate, too
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KfW/ZEW CO2 Barometer 2010: Carbon management

- Survey of 841 German companies (not installations) engaged in the EU ETS
- 121 (14.4%) firms responded – accounting for 25% of installations and 41% of emissions

- Emission levels by firms (left) and installations (middle) do not differ distinctly – but large installations (41%) account for almost all emissions (98%) (right)
Abatement – Measures and Technologies 2005-2010

Abatement Measures

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Small firms</th>
<th>Large firms</th>
<th>Small emitters</th>
<th>Large emitters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process optimization ranks first</td>
<td>63%</td>
<td>45%</td>
<td>76%</td>
<td>52%</td>
<td>72%</td>
</tr>
<tr>
<td>Investments in energy efficiency</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Decline in production</td>
<td></td>
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<td>Renewable energies</td>
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<tr>
<td>Fuel switch</td>
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<tr>
<td>Others</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
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</table>

- Large firms (> 250 employees) and large emitters are more likely to abate
- 37% of firms have not carried out abatement measures
- Process optimization ranks first
- Many measures do not include investments
Trading – Frequency

Stock exchange trading volume more than doubled within a year’s time

But almost half of firms did not trade in 2009

Annual trading wide-spread but more frequent trading activity plays a major role only for large emitters

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<th>Large emitters</th>
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<td>Trading more than once a year</td>
<td>18%</td>
<td>10%</td>
<td>24%</td>
</tr>
<tr>
<td>Trading once a year</td>
<td>33%</td>
<td>30%</td>
<td>36%</td>
</tr>
<tr>
<td>No trading since February 2009 (as of March 2010)</td>
<td>36%</td>
<td>60%</td>
<td>40%</td>
</tr>
<tr>
<td>Trading planned by February 2011</td>
<td>49%</td>
<td>30%</td>
<td>42%</td>
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Avoidance of speculative business frequently named among smaller firms – they often lack experience since emissions trading is not their core business.

Abstaining from trading reduces efficiency of the scheme.
Trading – Permit Price Expectations

- Price expectations (inflation-adjusted) for Phase III (2013-2020) have lowered slightly within a year’s time
- Firms expect higher prices than experts
- More stringent cap expected to raise prices
Information Level and Carbon Management

- Good information level of market and legal situation - but firms are not well informed about CDM and JI

- 65% have not yet assessed abatement possibilities

→ This undermines efficiency of the scheme
Carbon Management and Efficiency

Does heterogeneity in firm emissions hamper efficiency of the scheme?

Gini coefficient = 0.92

0: total equality
1: maximal inequality

Great disparity between large and small emitters
Empirical Evidence in the EU ETS

- Firm emission levels play a role in the EU ETS because small emitters (emissions < 25,000 tCO2 per year) typically ...
  - ... face higher ETS-related transaction costs
  - ... are less likely to carry out abatement measures
  - ... engage less often in trading activities ...

  ... than large emitters (emissions > 25,000 tCO2 per year)

- Small firms may challenge the scheme due to barriers to emissions trading
  → This undermines the efficiency of the scheme
Summary and Conclusions from Firm Survey

**Abatement**
- Investments as a measure to abate is becoming more and more important
- Most companies have not yet assessed internal abatement potentials

**Trading**
- Trading activities are most frequent among larger emitters
- Transaction costs as a barrier to trading especially for small firms
  → Carbon taxation for them may be more appropriate (opt-out)
- Access to CDM / JI remains difficult

**Carbon Management**
- Emissions trading not yet sufficiently incorporated in entrepreneurial cost and risk management
  → still room for efficiency improvement
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Benchmarks for Free Allocation

In leakage sectors determined by EU Commission

- benchmark for free allowances

- The amended EU ETS Directive (Article 10a) identifies the starting point on how to determine the benchmarks:

  “In defining the principles for setting ex-ante benchmarks in individual sectors or sub-sectors, the starting point shall be the average performance of the 10% most efficient installations in a sector or sub-sector in the Community in the years 2007-2008. The Commission shall consult the relevant stakeholders, including the sectors concerned.”

- Stay of play: 50 benchmarks under development for 19 sectors (January 2010) – additional 14 BMs in 7 annex I and 6 BM in non-annex I sectors under discussion
Next Steps for Benchmark Developments

- Update the estimations with results based on the benchmarking exercise!
  - Draft benchmark and allocation rules (by May 2010)
  - Draft sent to Member States (June/July 2010)
  - Vote in the CCC (July/September 2010)
  - 3-month scrutiny by the EP and the Council (September-December 2010)
  - Adoption by the Commission (December 2010)