www.oeko.de

Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

# The EU Emissions Trading Scheme Ex-post cost-efficiency & Distributional effects

Dr. Johanna Cludius

Berlin, 12/12/2017

ETS Study Tour Chile

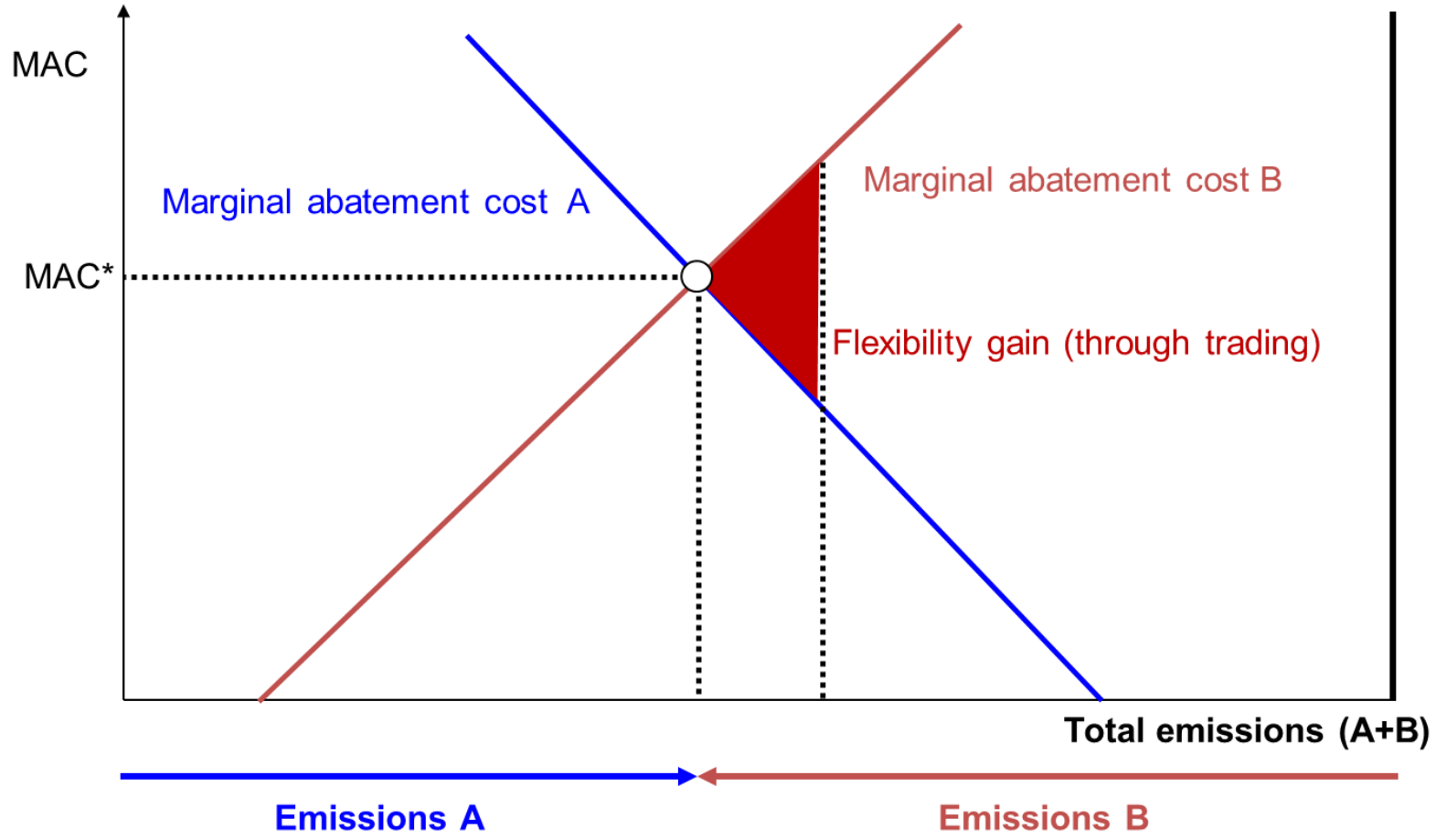



# Agenda

1 Ex-post assessment of cost-efficiency of the EU ETS compared to an alternative policy

2 Distributional effects of the EU ETS on industry, participating firms & at the household level

# Cost-efficiency of emissions trading in theory






Source: Based on Öko-Institut et al. (2014) Kosteneffizienz des Handels mit Emissionszertifikaten (EU-ETS) in der 2. Handelsperiode, Evaluierung und Weiterentwicklung des EU-Emissionshandels (EU-ETS-5)

# Estimation approach

- Compare abatement cost of two different scenarios: EU ETS vs. alternative policy (non-market based)
- Important: Both approaches lead to same level of emission reduction
- Different scenarios estimated in order to generate robust results; scenarios differ in
  - Sector detail
  - Time period considered
  - Method to estimate emission reduction attributable to the EU ETS

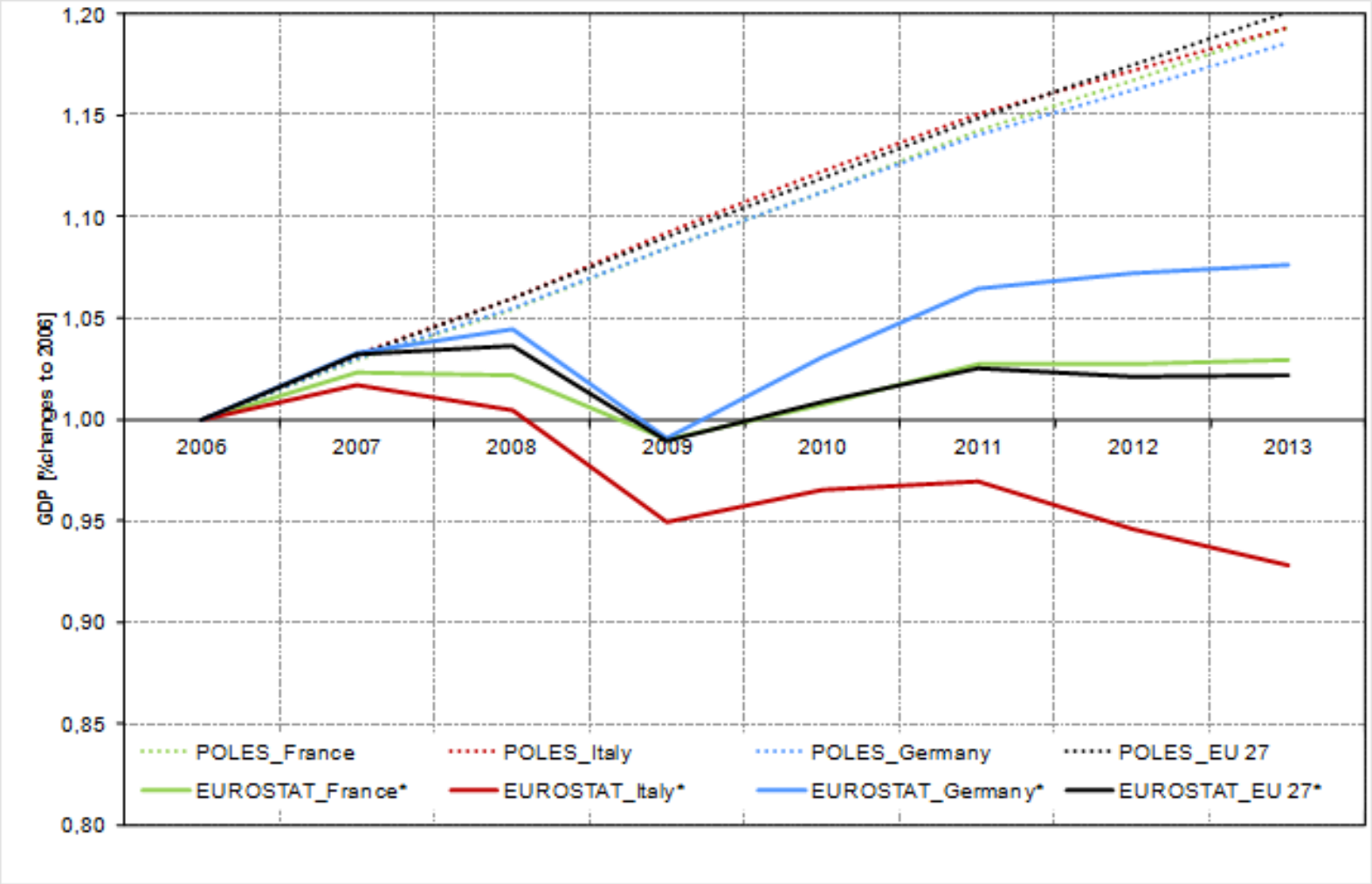
# Input to the analysis

- Emission reductions that can be attributed to the EU ETS
- Alternative policy scenario: Based on level of free allocation during the second trading period
- Level of analysis “aggregation level”
  - Always differentiated by each ETS country (i.e. trade between countries)
  - Approach 1: Electricity vs. industry (i.e. trade between two sectors in each country)
  - Approach 2: Electricity vs. individual industry sectors (steel, non-metallic minerals, other transformation (including the refineries) and other industry)
- Abatement cost curves taken from POLES (energy system model)
- Temporal dimension: 2008-12 and 2008 (single year only)

# Emission reductions due to the EU ETS

- Large body of literature on this topic, which estimates quite a wide range of reductions due to the EU ETS
- Not trivial to distinguish effect of the EU ETS, as other factors also influence CO2 emissions:
  - Economic development (2009-10 crisis)
  - Deployment of renewable energy
  - (Autonomous) improvements in energy intensity
  - Other policy instruments
  - Fuel prices and fuel mix
  - Structural changes in the economy (e.g. off-shoring of emissions)
  - Climatic factors (Heating and cooling degree days)

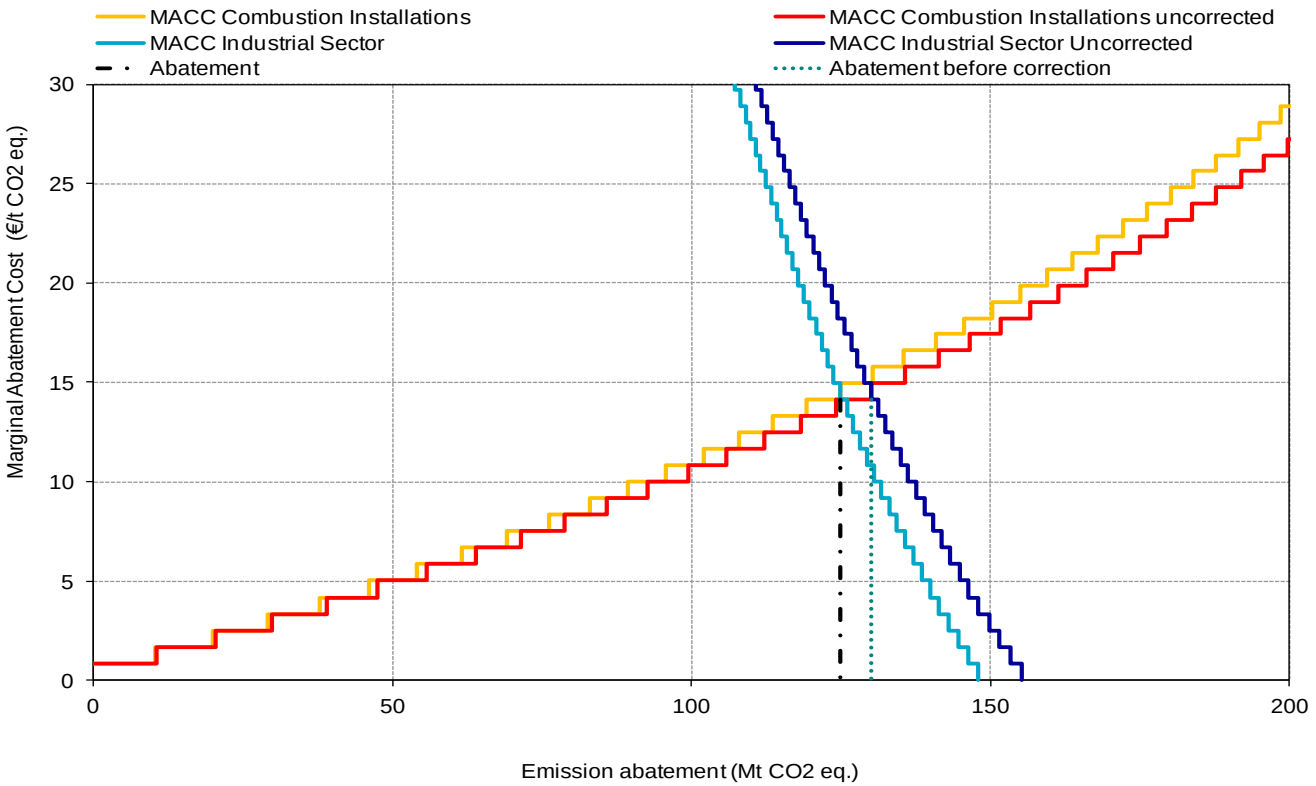
# Example: Economic development
# Expected vs. actual development






Source: Öko-Institut and Fraunhofer ISI (2017) Efficiency and effectiveness of the EU ETS – extended analyses (EU-ETS 6) / Untersuchung der klimapolitischen Wirksamkeit des Emissionshandels – erweiterte Analysen (EU-ETS 6); Report for UBA/DEHSt

# Effect of correcting for other factors and estimated emission abatement due to the EU ETS

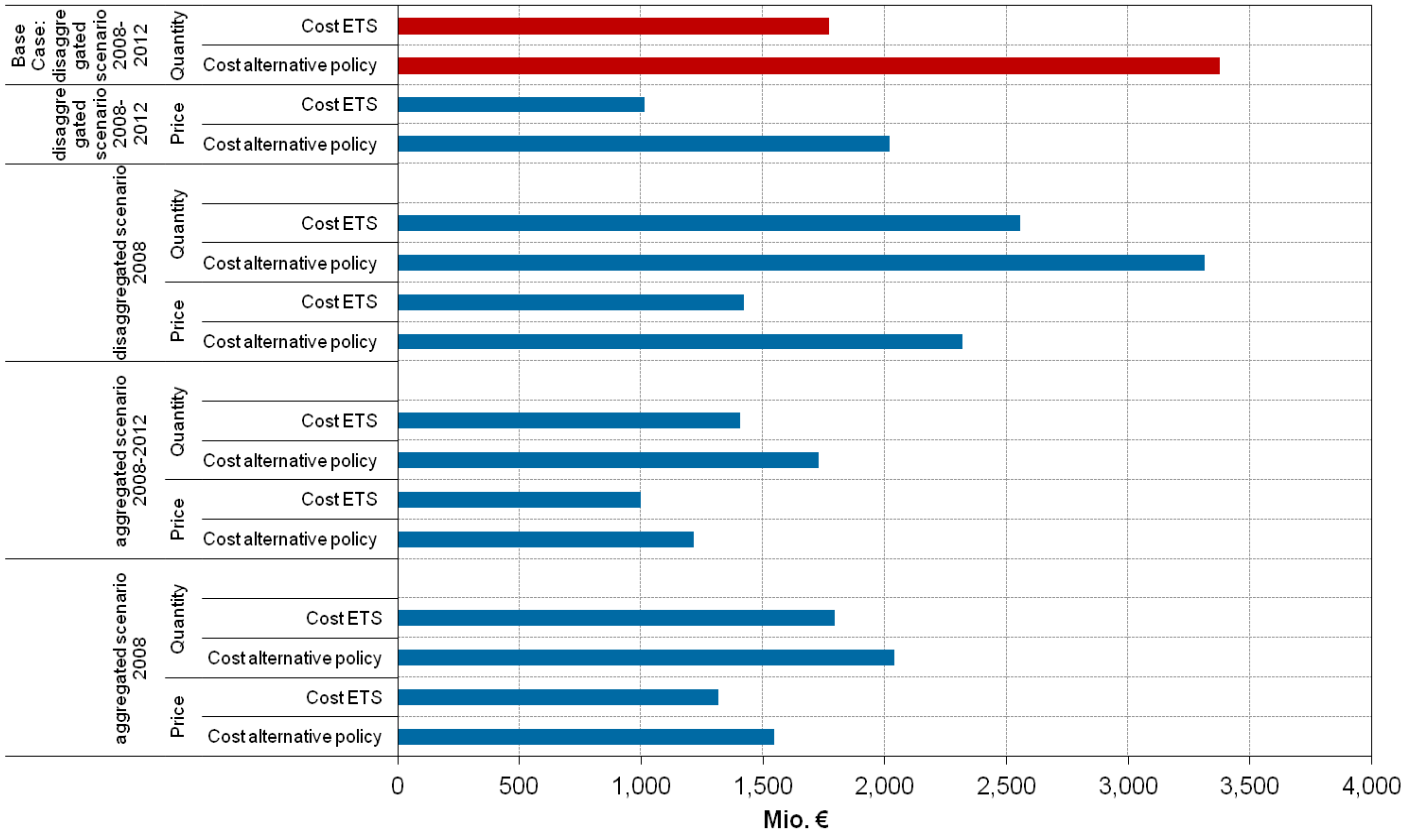



- If we do not correct for other factors, too much of the abatement is attributed to the EU ETS
- Estimated abatement due to EU ETS: 148 Mt per year during 2008-2012 compared to baseline



Source: Öko-Institut and Fraunhofer ISI (2017)Efficiency and effectiveness of the EU ETS – extended analyses (EU-ETS 6) / Untersuchung der klimapolitischen Wirksamkeit des Emissionshandels – erweiterte Analysen (EU-ETS 6); Report for UBA/DEHSt

# Abatement cost estimated for different scenarios EU ETS vs. alternative policy

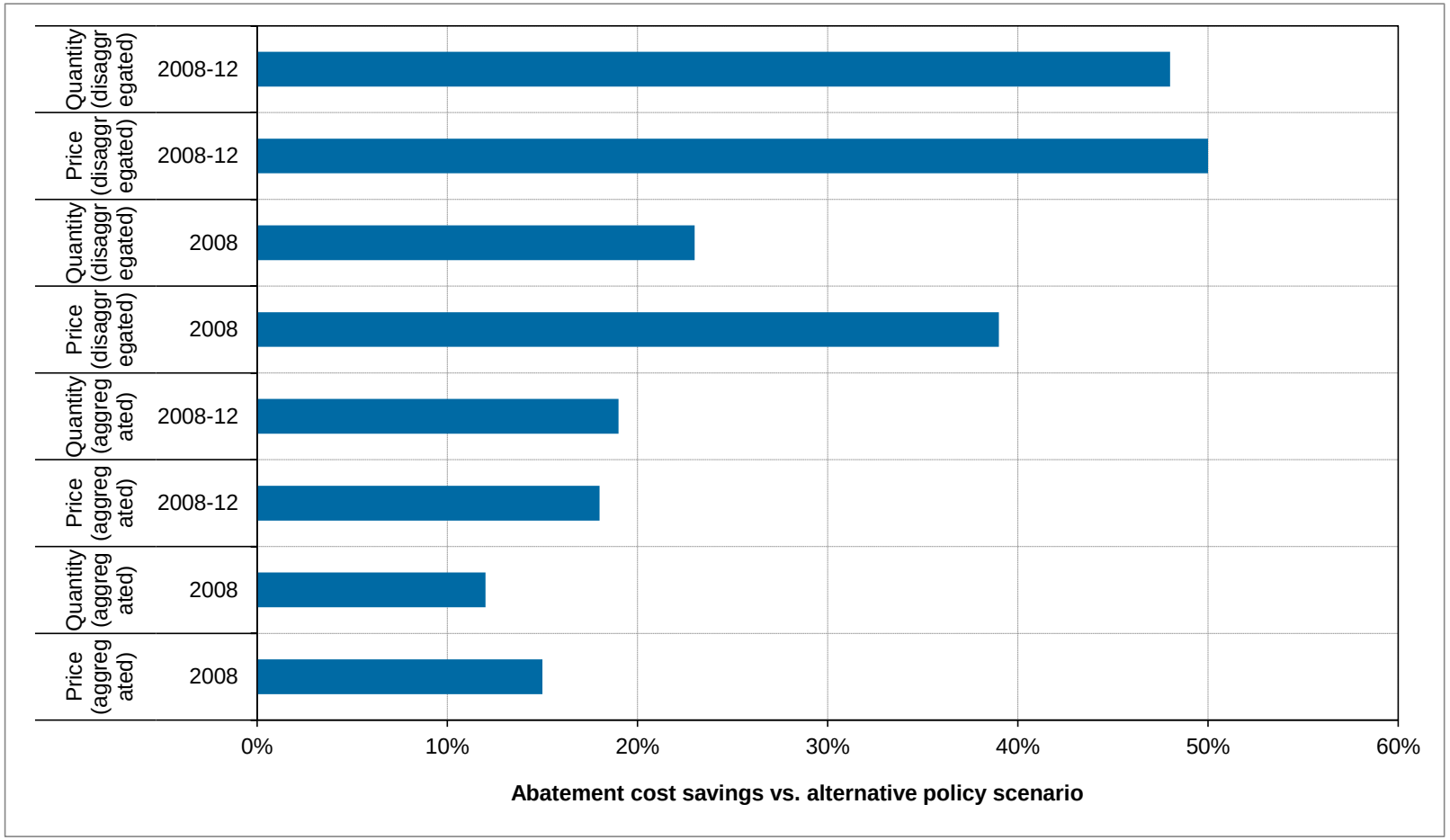



- Estimated cost savings range from about 200 Mio € to 900 Mio €



Source: Öko-Institut and Fraunhofer ISI (2017)Efficiency and effectiveness of the EU ETS – extended analyses (EU-ETS 6) / Untersuchung der klimapolitischen Wirksamkeit des Emissionshandels – erweiterte Analysen (EU-ETS 6); Report for UBA/DEHSt

# Ex-post cost-efficiency (%) of the EU-ETS compared to alternative scenario




- Translating this into % savings leads to estimated cost savings due to the EU ETS of between 12 and 50%



Source: Based on Öko-Institut and Fraunhofer ISI (2017)Efficiency and effectiveness of the EU ETS – extended analyses (EU-ETS 6) / Untersuchung der klimapolitischen Wirksamkeit des Emissionshandels – erweiterte Analysen (EU-ETS 6); Report for UBA/DEHSt

# Ex-post cost-efficiency of the EU ETS

## Summary

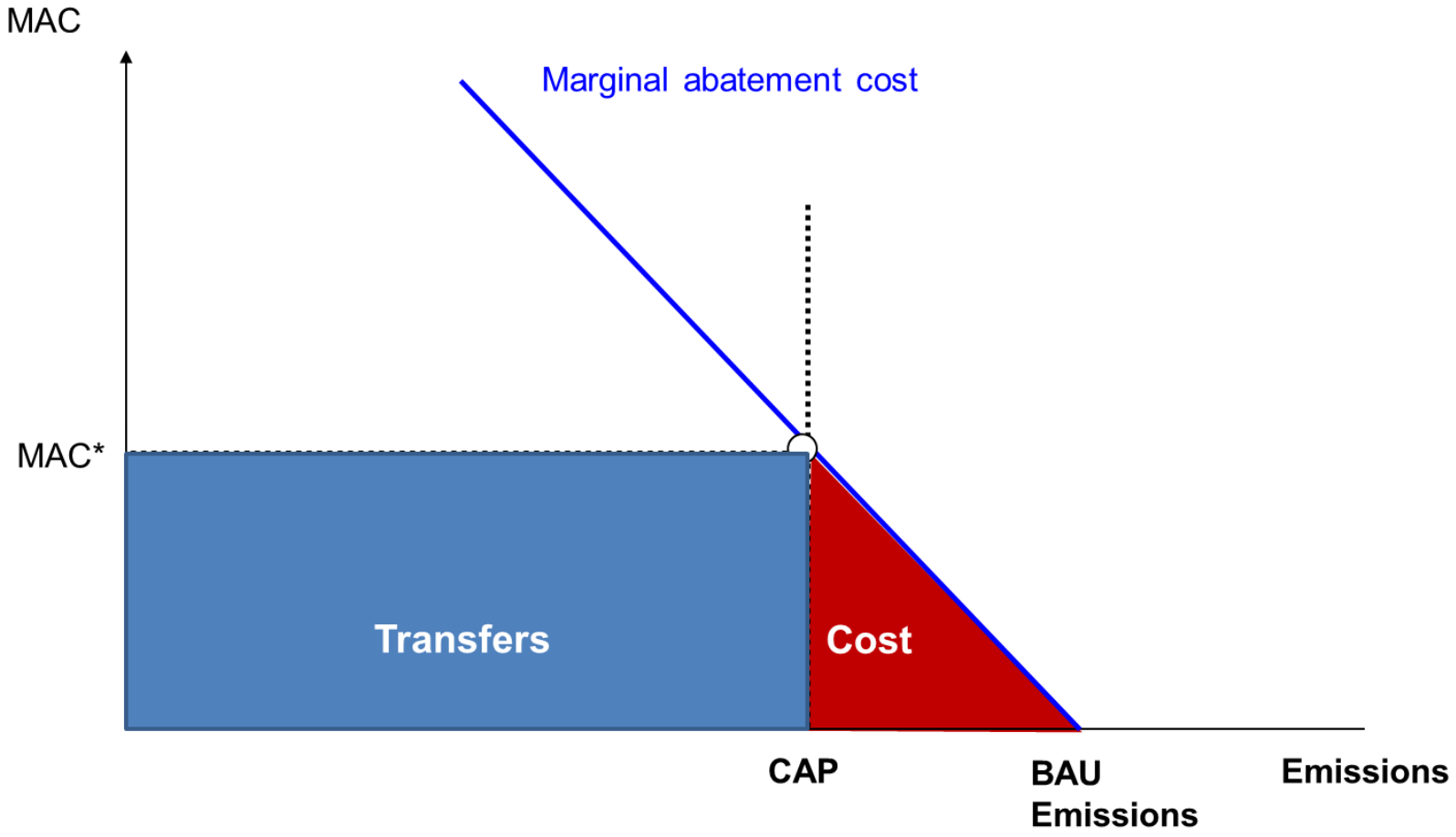
- All approaches indicate cost saving of the EU ETS vs. an alternative policy scenario (that provides less flexibility)
- Cost savings range from 12% to 50%
- Critical reflection of method
  - Assumptions very important and have the potential to drive results (esp. on abatement costs, emissions reduced by EU ETS, alternative policy)
  - Not all potential alternative policies considered (only less flexible ones)
  - Focus on abatement costs, but further costs (e.g. administrative) exist; but also benefits, which are not considered here (climate, environmental, health)

# Agenda

1 Ex-post assessment of cost-efficiency of the EU ETS compared to an alternative policy

2 Distributional effects of the EU ETS on industry, participating firms & at the household level

# Abatement costs and transfers of emissions trading in theory






Source: Based on Öko-Institut et al. (2014) Kosteneffizienz des Handels mit Emissionszertifikaten (EU-ETS) in der 2. Handelsperiode, Evaluierung und Weiterentwicklung des EU-Emissionshandels (EU-ETS-5)

# Distributional effects

## Preliminary considerations

- Who bears costs and reaps benefits? Is wealth transferred from some stakeholders to others?
- Some costs and benefits easy to measure, e.g. direct price increases
- Others hard to measure (in financial units), e.g. loss in biodiversity, health (cf. EC JRC 2017)
- Sometimes hard to define a boundary until which costs and benefits should be measured (“flow-on effects”)

- Distirubtion of (financial) costs and benefits discussed against the backdrop of EU ETS being an important tool to mitigate dangerous climate change (as the ultimate benefit)

# Distributional effects of climate policy

## Already featured in the 70‘s!

*“Obviously, the distributive side of externalities policy is of interest in and of itself in a world in which inequality and poverty have assumed high priority among social issues. In addition, without adequate consideration of this aspect of the matter, we may not be able to design policies that can obtain the support they require for adoption. Thus, by ignoring the redistributive effects of an environmental policy, we may either unintentionally harm certain groups in society or, alternatively, undermine the program politically”*

(Baumol and Oates 1975, p.191f).

# Distributional effects

## Why are they important?

- Acceptance of emissions trading scheme by all stakeholders
- Social cohesion in society
- Political feasibility of legislating an emissions trading scheme or changes to it

From the publishers of ENDS Report | ENDS Compliance Manager

ENDS Europe

Europe's environmental news and information service

News & Comment Document Watch Environmental Jobs

Climate Energy Waste & Resources Chemicals Pollution Nature Products

News

**Industry to fight as CO2 costs seen hitting €35/t by 2024**

Industry lobbyists vowed on Tuesday to fight the reforms of the EU emissions trading scheme, as a new report suggested these would boost prices to €35 per tonne by 2024

Source: http://www.endseurope.com/article/49190/industry-to-fight-as-co2-costs-seen-hitting-35t-by-2024, published 9 May 2017

# Distributional effects

## What levels and issues to explore?

**Industry globally**
- ETS vs. non-ETS countries
- Carbon leakage provisions
- Cost pass-through

**Industry / Firms EU level**
- ETS vs. non-ETS sectors
- Differences between Member States (e.g. in free allocation)
- Market performance

**Firms vs. Households**
- Free allocation vs. auctioning
- Cost pass-through

**Households**
- Vulnerable groups
- Use of auctioning revenue
- Interaction with other policies
- Social security system

# Industry at the global level

## Carbon leakage

- Was there evidence of carbon leakage in the EU ETS so far?
  - Ongoing projects for DEHSt: Majority of ex-post literature finds no effect of EU ETS on production, trade, etc. Minority of studies finds either positive or negative effects
  - The European Commission's Carbon Leakage Evidence project concludes "no evidence for any carbon leakage" during the first two trading periods
  - Relatively moderate carbon prices and a high level of free allocation likely contributed to this
  - What about "investment leakage"? Harder to investigate..
    - On the one hand, high demand in emerging economies, potentially lower energy and regulatory cost
    - On the other hand, political stability in the EU, sunk cost of existing facilities, speciality products,…
- It is true, however, that some EU industry is facing difficult times, the question is: Is the EU ETS to blame for this?



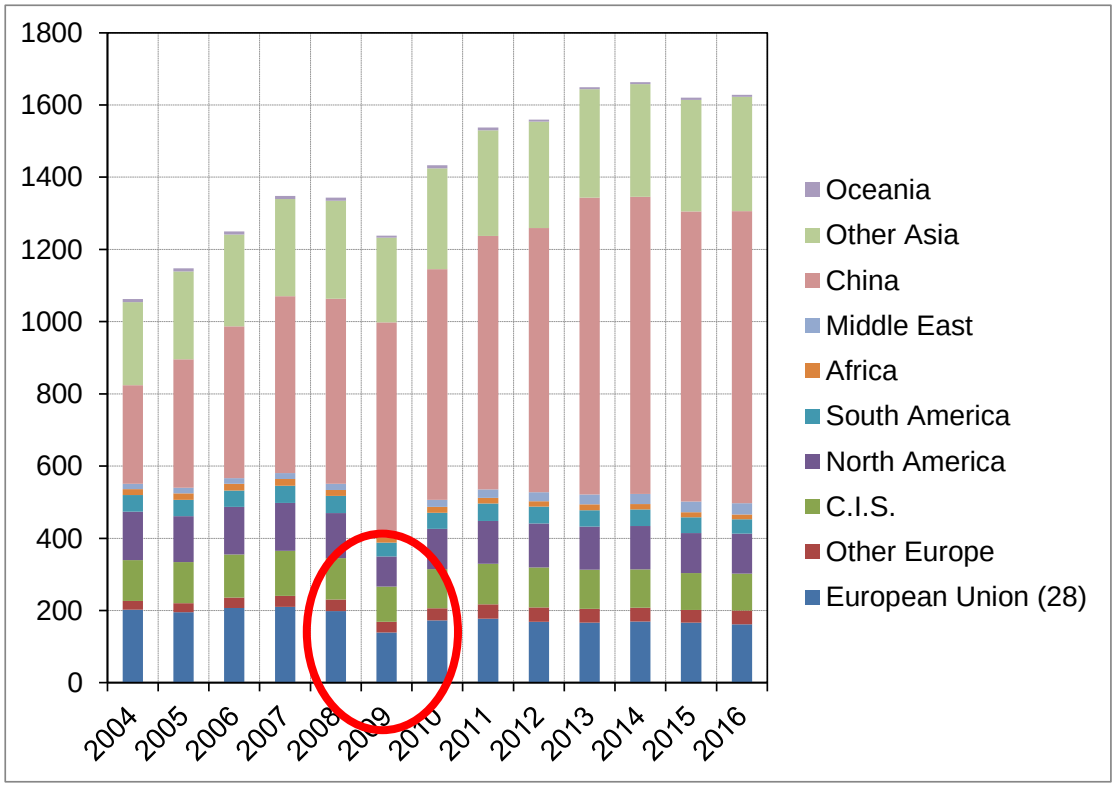
Source: Ecorys, Oeko-Institut, Cambridge Econometrics and TNO (2013) Carbon Leakage Evidence Project for the European Commission

# Example: Steel industry

## Global production and EU market share

- EU steel production has not returned to pre-crisis levels, whereas there have been capacity additions in other world regions
- Steel an important industry and employer in the EU

Source: https://en.wikipedia.org/wiki/Steel_mill




Crude steel production, by region, over time (million tons)



Source: Update of CE Delft and Oeko-Institut (2015) Ex-post investigation of cost pass-through in the EU ETS: An analysis for six sectors. Available at http://ec.europa.eu/clima/policies/ets/cap/allocation/docs/ex-post_investigation_of_cost_en.pdf

# Example: Steel industry

# Is the EU ETS to blame?

Source: https://en.wikipedia.org/wiki/Steel_mill

- The answer is: Probably not
- Free allocation and use of international credits means large German steel producers will not have to buy permits until the fourth trading period

| Sector / Company | 2008-2012 | 2013-2020 | 2008-2020 | | | |
|---|---|---|---|---|---|---|
| | Over-allocation | Estimated overallocation | Potential use of CER/ERU | Overallocation + potential use CER/ERU | | Purchase additional allowances |
| | M EUA | | | | % | year |
| **Iron and steel** | | | | | | |
| ThyssenKrupp | 19.6 | -10.3 | 26.6 | 35.8 | 113% | >2020 |
| Salzgitter | 11.8 | -18.2 | 13.3 | 6.9 | 105% | >2020 |
| ArcelorMittal | 12.3 | -20.2 | 11.7 | 3.7 | 103% | >2020 |

- Electricity producers pass through ETS costs. In Germany, steel producers are compensated for this (58 Mio € in 2015)
- Industry also exempt from cost of other climate policies (e.g. German renewable energy support scheme)



Sources: Update of Öko-Institut (2014). Die Zusatzgewinne ausgewählter deutscher Branchen und Un-ternehmen durch den EU-Emissionshandel: Untersuchung im Auftrag der Umweltstiftung WWF Deutschland
UBA/DEHSt (2017) Report on compensation measures for electricity price increases due to the EU ETS„SPK-Bericht 2015“

# Distributional effects

## What levels and issues to explore?

**Industry globally**

- ETS vs. non-ETS countries
- Carbon leakage provisions
- Cost pass-through

**Industry / Firms EU level**

- ETS vs. non-ETS sectors
- Differences between Member States (e.g. in free allocation)
- Market performance

**Firms vs. Households**

- Free allocation vs. auctioning
- Cost pass-through

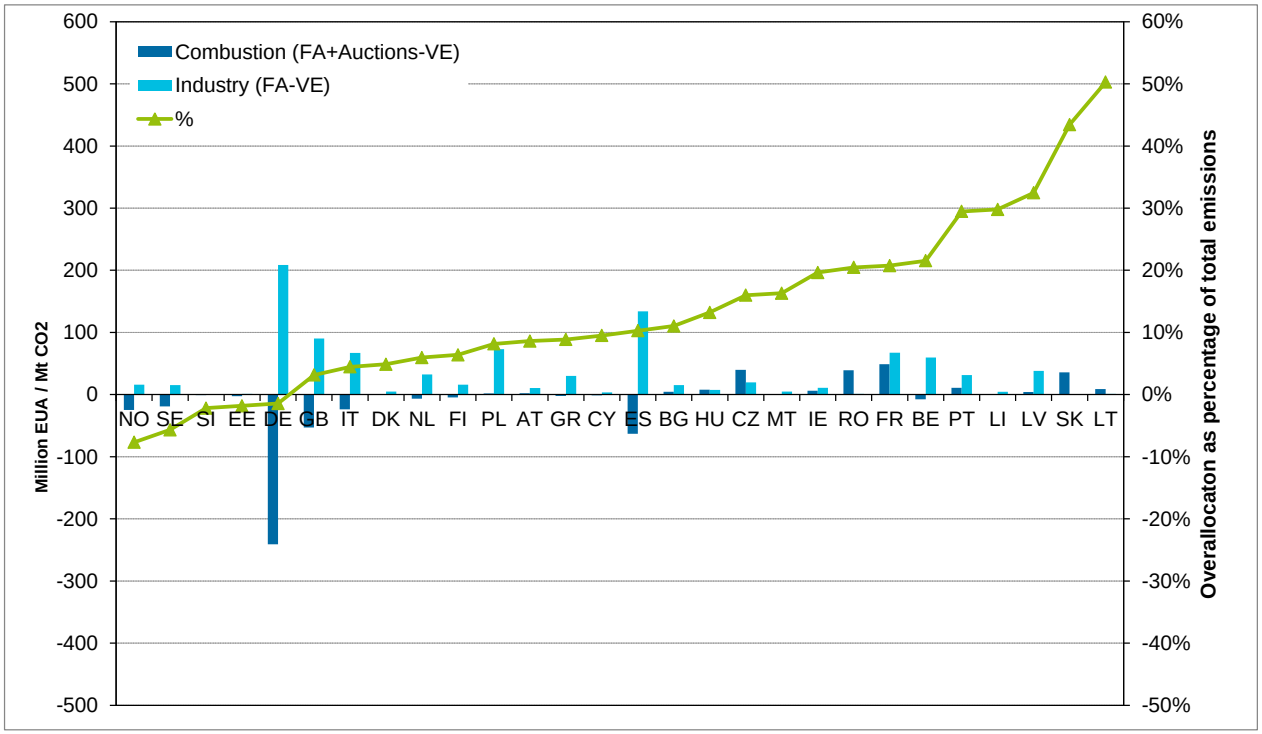
**Households**

- Vulnerable groups
- Use of auctioning revenue
- Interaction with other policies
- Social security system

# Industry EU level

## Allocation methods and other measures

- National Allocation Plans (NAPs) in first and second trading period of the EU ETS led to unequal treatment of installations and sectors in different countries




Cumulated free allocation vs verified emissions during the second trading period of the EU ETS

Auctioned amounts counted towards combustion sector

- From third trading period onwards: Harmonised allocation rules at the EU level
- Differences in other measures remain, e.g. compensation for ETS-induced rises in electricity prices



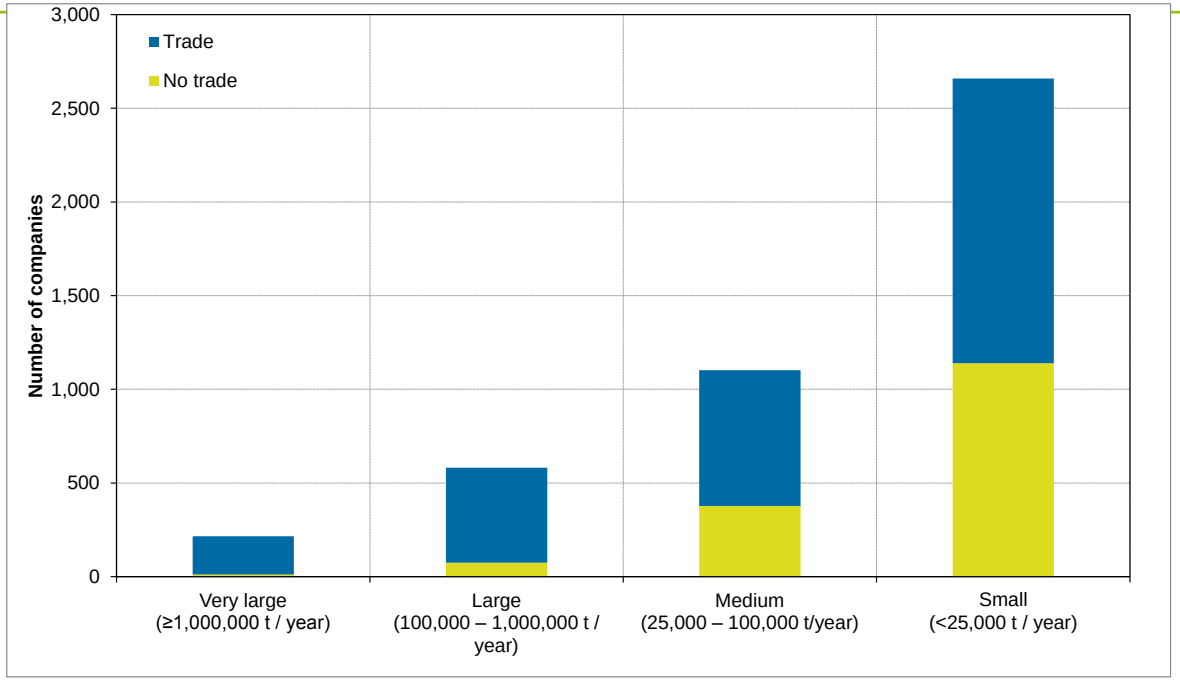
Source: Update on Cludius J. (2015). Distributional Effects of Energy and Climate Policy (Ph.D. Economics), UNSW Australia, http://handle.unsw.edu.au/1959.4/54911; EEA EU ETS Dataviewer

# Firms EU level

## Carbon market performance of firms

Not all ETS firms active on the market. Many small firms inactive.

(Shown here: Participation rate by size group for the first trading period of the EU ETS)




- Larger firms with trading experience more likely to realise gains from trading. Most important for gains on the market for EUAs, however, level of free allocation
- Trading support for small firms at start of the scheme may be beneficial both for efficiency of the scheme and distributional considerations
- But: Important to monitor who enters the market (i.e. checks and prequalification requirements of non-liable firms; cf. VAT fraud on EUA market)



Source: Based on Cludius J. (2015). Distributional Effects of Energy and Climate Policy (Ph.D. Economics), UNSW Australia, http://handle.unsw.edu.au/1959.4/54911

# Distributional effects

## What levels and issues to explore?

**Industry globally**

- ETS vs. non-ETS countries
- Carbon leakage provisions
- Cost pass-through

**Industry / Firms EU level**

- ETS vs. non-ETS sectors
- Differences between Member States (e.g. in free allocation)
- Market performance

**Firms vs. Households**

- Free allocation vs. auctioning
- Cost pass-through

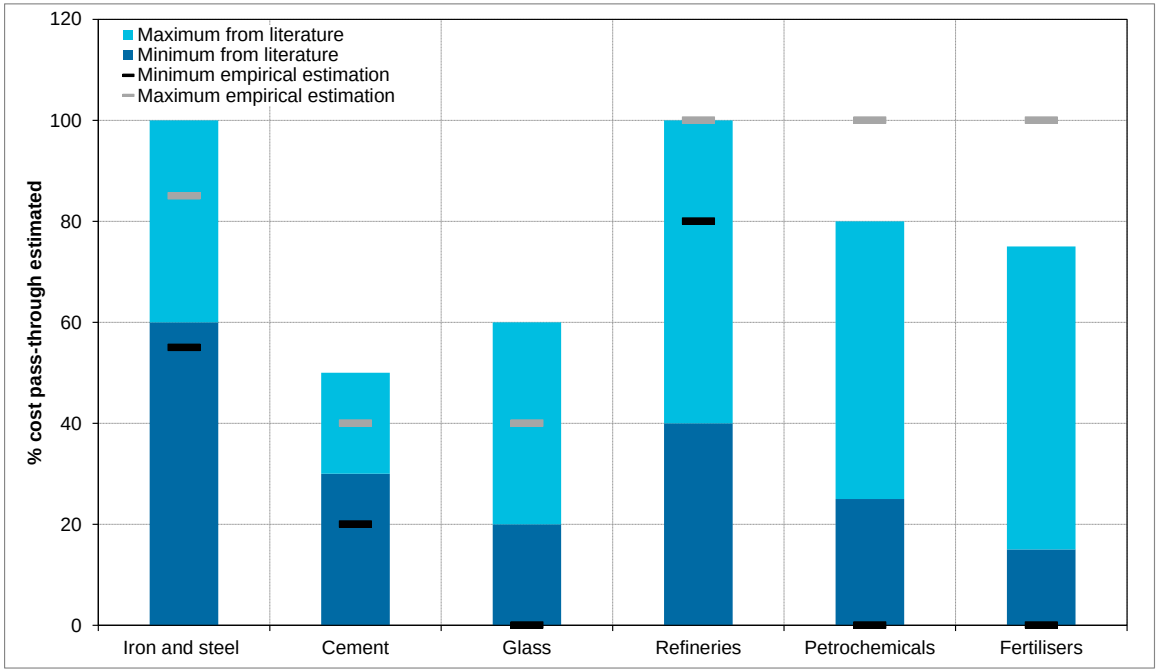
**Households**

- Vulnerable groups
- Use of auctioning revenue
- Interaction with other policies
- Social security system

# Firms vs. households

## Cost pass-through

- Agreement that cost pass-through is possible in electricity industry (close to 100% or even above, depending on tariff structures)
- Also industry sectors seem to have passed through opportunity costs of freely allocated allowances




Estimated cost pass-through rates for ETS industry sectors (minimum, maximum and estimates from literature)

- If allowances are allocated for free, this may lead to windfall profits at the expense of consumers



Source: CE Delft and Oeko-Institut (2015) Ex-post investigation of cost pass-through in the EU ETS: An analysis for six sectors. Available at http://ec.europa.eu/clima/policies/ets/cap/allocation/docs/ex-post_investigation_of_cost_en.pdf

# Distributional effects

## What levels and issues to explore?

**Industry globally**

- ETS vs. non-ETS countries
- Carbon leakage provisions
- Cost pass-through

**Industry / Firms EU level**

- ETS vs. non-ETS sectors
- Differences between Member States (e.g. in free allocation)
- Market performance

**Firms vs. Households**

- Free allocation vs. auctioning
- Cost pass-through

**Households**

- Vulnerable groups
- Use of auctioning revenue
- Interaction with other policies
- Social security system

Öko-Institut e.V.

# Households

## Incidence of the EU ETS / Revenue recycling

- If ETS costs are passed through to households, low income households relatively more affected
- Figure 1: Especially through electricity price increases (regressive), increase in the price of other goods (progressive)
- Figure 2: Revenue recycling can compensate (in particular lump-sum), of course only possible if auction revenues exist

**Figure 1**

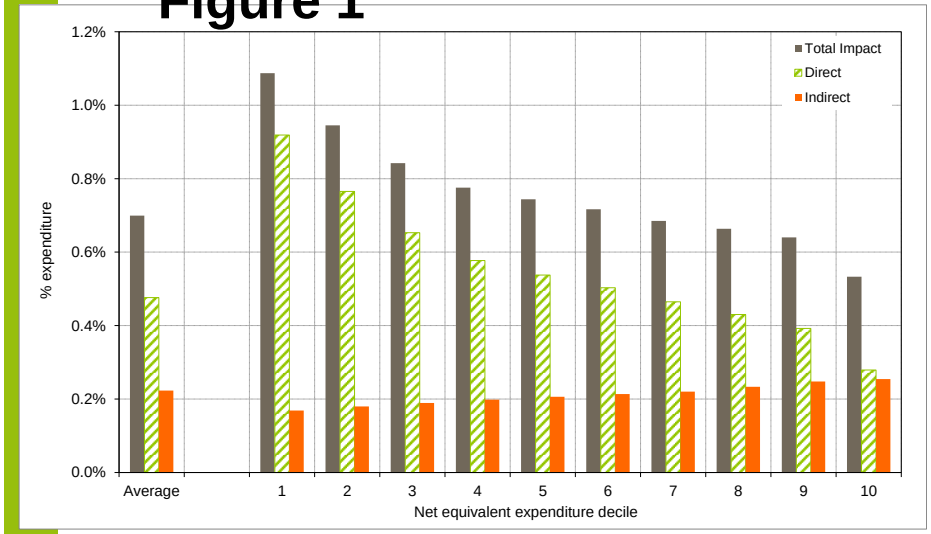
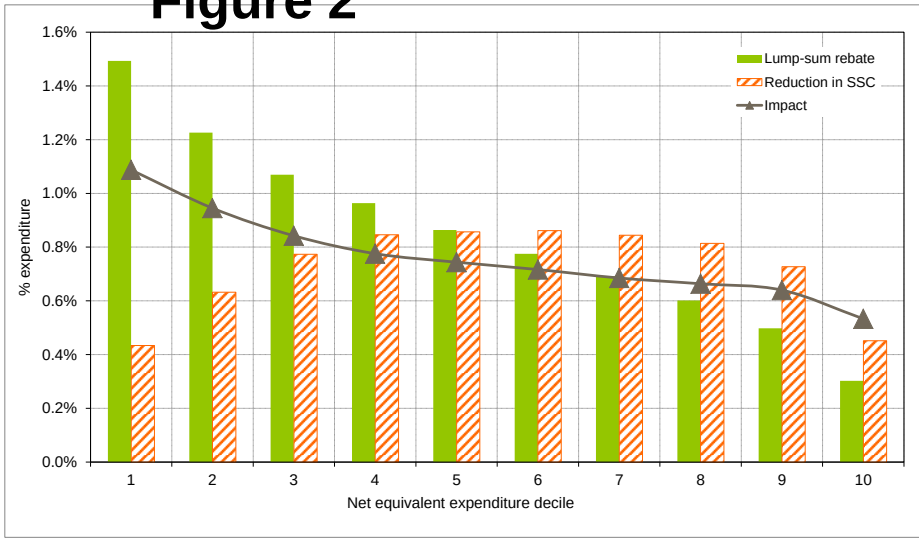



**Figure 2**



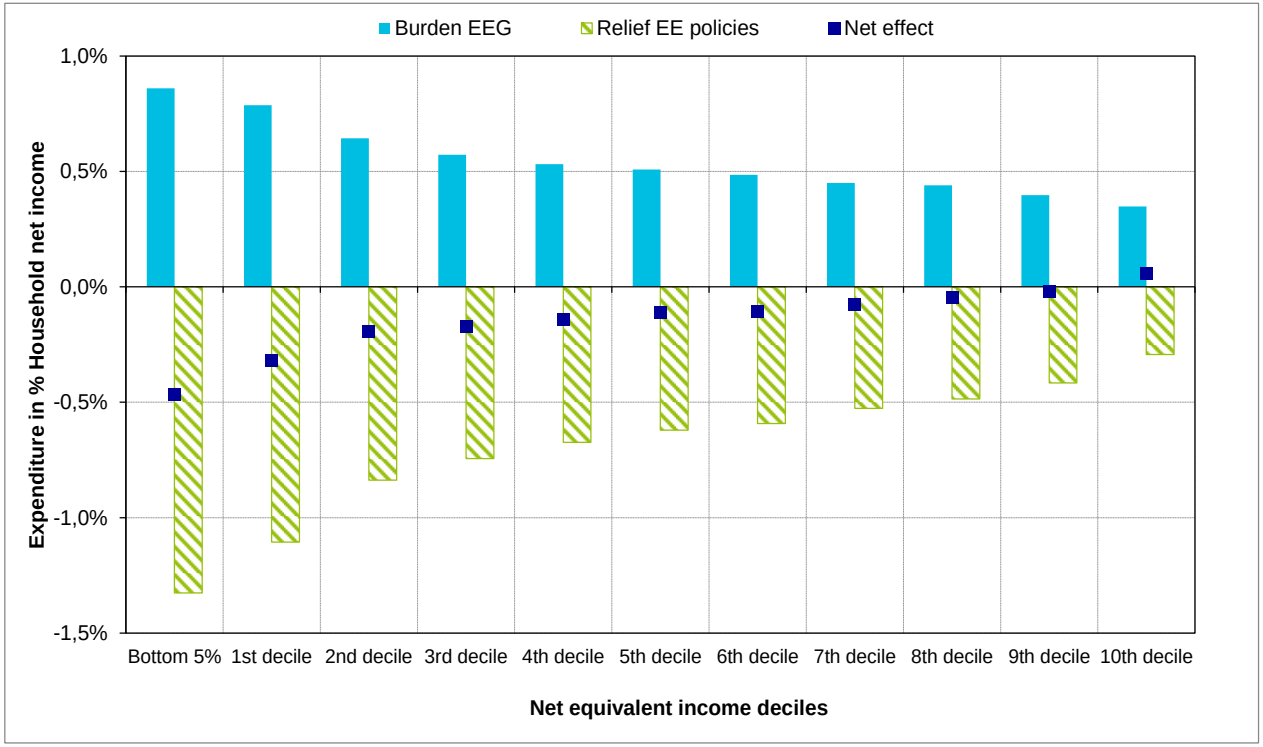



Source:Beznoska, M.; Cludius, J. & Steiner, V. (2012). The Incidence of the European Union Emissions Trading System and the Role of Revenue Recycling. DIW Discussion Papers, (1227)

# Households

## Positive impact of other climate policies

- Take into account potential positive interactions with other climate policies
- Main candidate here: Energy efficiency and saving policies
- Example: Renewable energy support cost vs. savings due to energy efficiency policies in Germany → in sum, they are progressive








Source:Research Data Centre (FDZ) of the Federal Statistical Office Germany and the Statistical Offices of the Laender: German Income and Expenditure Survey (EVS) 2008 (80 % scientific use file) extrapolated to 2014; own estimation and illustration Schumacher /Cludius/Förster (2016) – http://www.ieppec.org/wp-content/uploads/2016/05/Paper-Schumacher-1.pdf

# Distributional effects: A last note on political feasibility




Source: https://papundits.wordpress.com/2013/09/18/aussie-abbott-set-to-axe-the-carbon-tax-2/

# Distributional effects of the EU ETS

## Summary

- Important to take distributional effects into account
  - Acceptance of an emissions trading scheme in society
  - Strike a balance between ambitious scheme and political feasibility
- Distributional effects for Industry at the global level
  - Carbon leakage is a concern if no global carbon price exist
  - So far no evidence of carbon leakage (on a large scale); provisions seem to work or other factors prevent carbon leakage
  - Difficult times (e.g. for steel sector) not due to EU/DE climate policy
- Distributional effects for Industry at the EU level
  - Different treatment of industry in different Member States
    - Mainly in first and second trading period (free allocation, NAPs)
    - But some differences remain (e.g. compensation for electricity price increases)
  - Carbon market performance varies between firms in different countries, sectors and of different size and may lead to further dist. effects

# Distributional effects of the EU ETS

## Summary

- Distribution of costs and benefits between covered firms and households
  - Level of free allocation and carbon cost pass-through rates important
  - Share of free allocation is reduced in EU ETS, but still relatively generous for some industry sectors (Example: steel industry)
  - Electricity industry in the EU generally able to pass through carbon cost (except in countries with set tariffs)
  - Many industry sectors were also able to pass through costs (at least to some extent)
  - Generous free allocation and the possibility to pass through costs may lead to windfall profits

# Distributional effects of the EU ETS

## Summary

- Distributional effects at the household level
  - EU ETS likely regressive (affects low-income households relatively more than high-income households) – this is true for many climate policy instruments
  - Potential mitigation of this effect: Use of auctioning revenue, general social security provisions (In this context: Important to generate auction revenue)
  - Other energy and climate policies, especially targeted energy efficiency and energy saving policies, can reduce burden for vulnerable groups
- Example: Use of auctioning revenue in Germany
  - ETS auctioning revenue goes into a Fund (Energy and Climate Fund) which, amongst others, supports national programmes on energy efficiency in households (as part of the National Climate Initiative “NKI” and Action Program on Climate Protection “Aktionsprogramm Klimaschutz”)
  - This use of auctioning revenue can create win-win situations (climate protection and protection of vulnerable consumer groups)

Öko-Institut e.V.
Institut für angewandte Ökologie
Institute for Applied Ecology

# Thank you for your attention!

Do you have any questions?

# Research reports and publications cited

Beznoska, Cludius and Steiner (2012). The Incidence of the European Union Emissions Trading System and the Role of Revenue Recycling. DIW Discussion Papers, (1227)

CE Delft and Oeko-Institut (2015) Ex-post investigation of cost pass-through in the EU ETS: An analysis for six sectors. Available at http://ec.europa.eu/clima/policies/ets/cap/allocation/docs/ex-post_investigation_of_cost_en.pdf

Cludius (2015). Distributional Effects of Energy and Climate Policy (Ph.D. Economics), UNSW Australia, http://handle.unsw.edu.au/1959.4/54911

Forzieri, G.; Cescatti, A.; Batista e Silva Filipe & Feyen, L. (2017). Increasing risk over time of weather-related hazards to the European population: a data-driven prognostic study. Lancet Planetary Health, 1. EC JRC.

Ecorys, Oeko-Institut, Cambridge Econometrics and TNO (2013) Carbon Leakage Evidence Project for the European Commission

Öko-Institut et al. (2014) Kosteneffizienz des Handels mit Emissionszertifikaten (EU-ETS) in der 2. Handelsperiode, Evaluierung und Weiterentwicklung des EU-Emissionshandels (EU-ETS-5)

Öko-Institut and Fraunhofer ISI (2017)Efficiency and effectiveness of the EU ETS – extended analyses (EU-ETS 6) / Untersuchung der klimapolitischen Wirksamkeit des Emissionshandels – erweiterte Analysen (EU-ETS 6); Report for UBA/DEHSt

Öko-Institut (2014). Die Zusatzgewinne ausgewählter deutscher Branchen und Unternehmen durch den EU-Emissionshandel: Untersuchung im Auftrag der Umweltstiftung WWF Deutschland

Schumacher, Cludius and Förster (2016) Energy efficiency vs. renewable energy policies within the German Energiewende – What are the distributional implications for households? – http://www.ieppec.org/wp-content/uploads/2016/05/Paper-Schumacher-1.pdf

# Contact details

**Dr. Johanna Cludius**
Researcher, Energy & Climate Division

**Oeko-Institut**
Schicklerstr. 5-7
10179 Berlin
Germany

Telefon: +49 30 40 50 85 375
E-Mail: j.cludius@oeko.de