

The impact of carbon pricing on industrial competitiveness

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3. Can we model market share impacts?
4. Better understanding the process chain..

Part 1

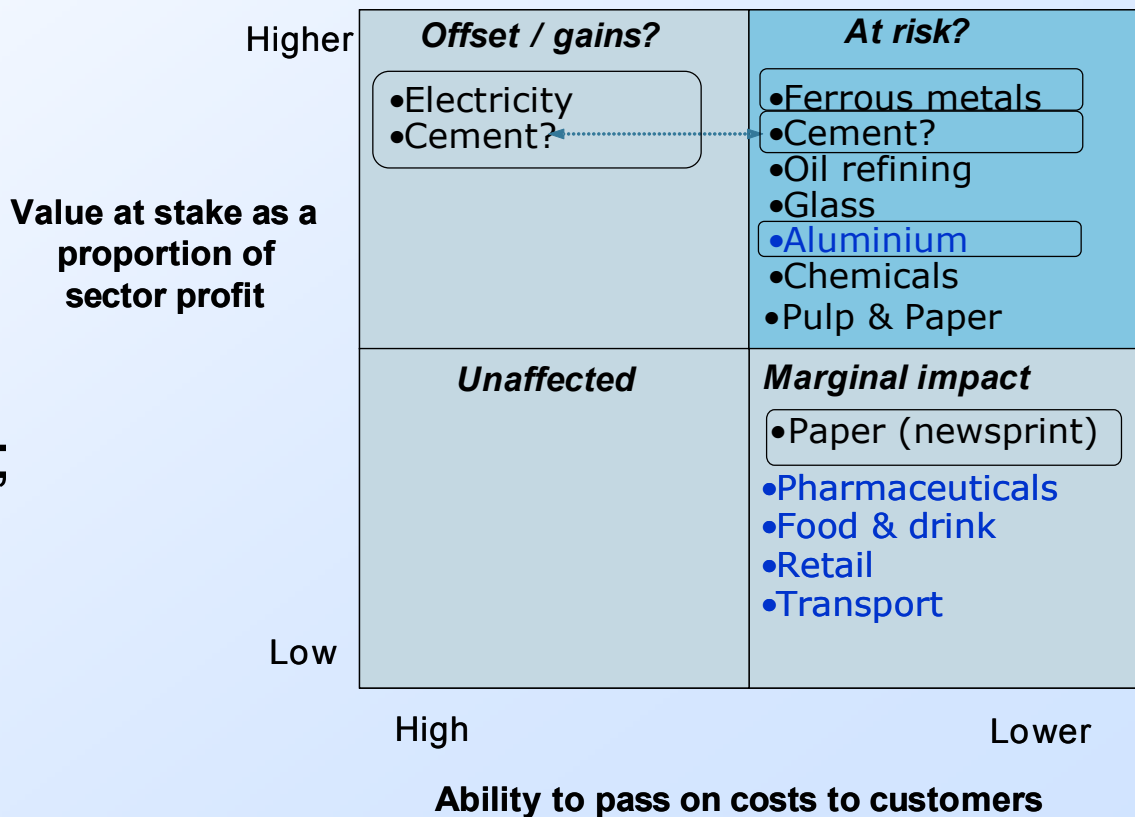
Basic analytics

A sector's cost is potentially impacted by ETS via 3 channels:

1. Cost of the emissions
2. Costs of abatement
3. Increased electricity prices

In turn there are 3 key determinants of competitiveness exposure

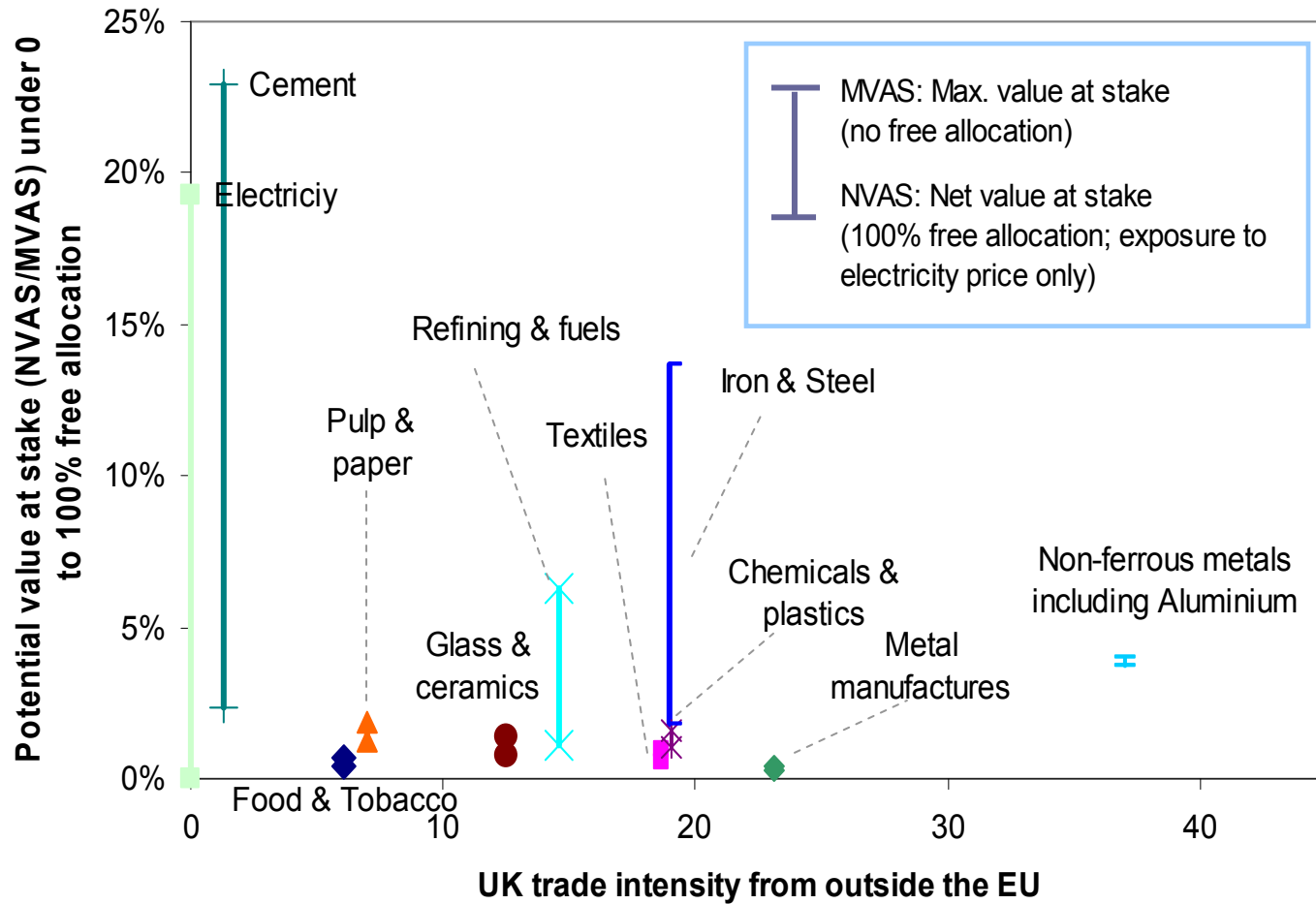
1. Energy intensity of production;
2. Ability to pass through cost increases to prices;
3. Abatement opportunities



Part 2

Who is affected?

Using 4 digit (SIC 92) representation of the sectors...



Vertical range gives insights on:

- Marginal cost increase (top end of bar)
- Impact of electricity price pass through

Combined with horizontal axis gives insights on:

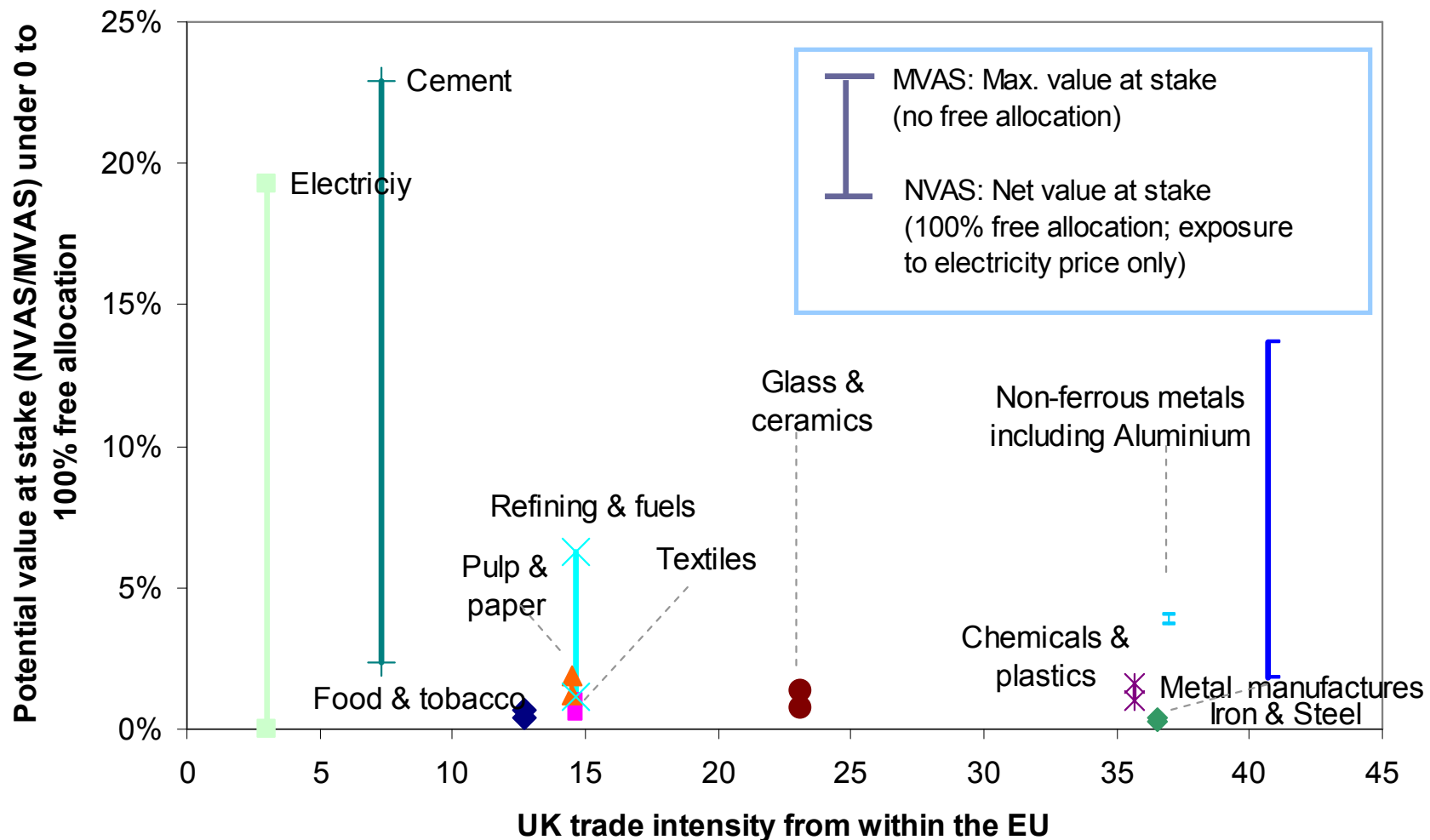
- Scope of auctioning
- dynamics of impacts

Upper end of range: zero free allocation

Lower end of range: 100% free allocation

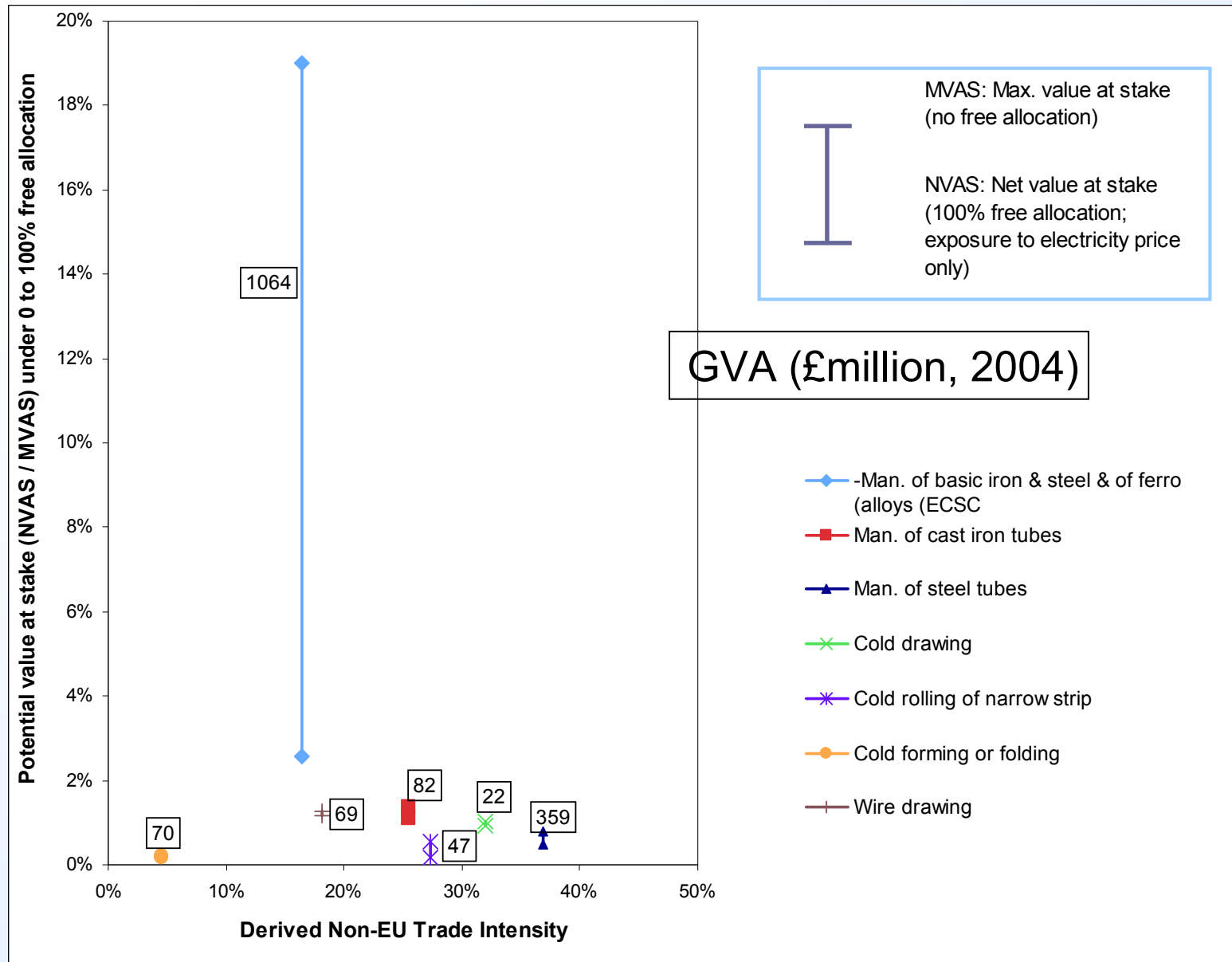
Assumptions: CO2 price=€15/tCO2; Pass through in electricity = €10/mwh

Setting against the *trade intensity from other EU countries* gives insight into the potential degree of concern about differential allocation between Member States.

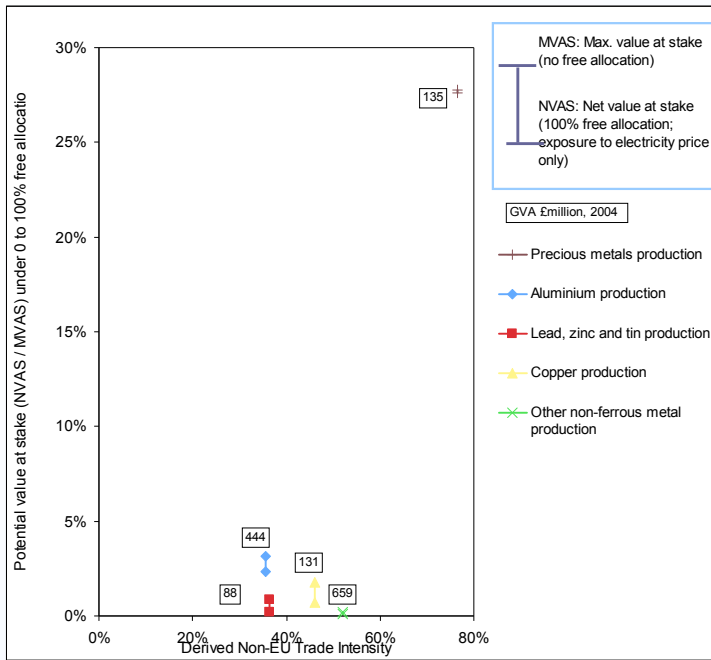


Upper end of range: zero free allocation ; Lower end of range: 100% free allocation
 Assumptions: CO2 price=€15/tCO2; Pass through in electricity = €10/mwh

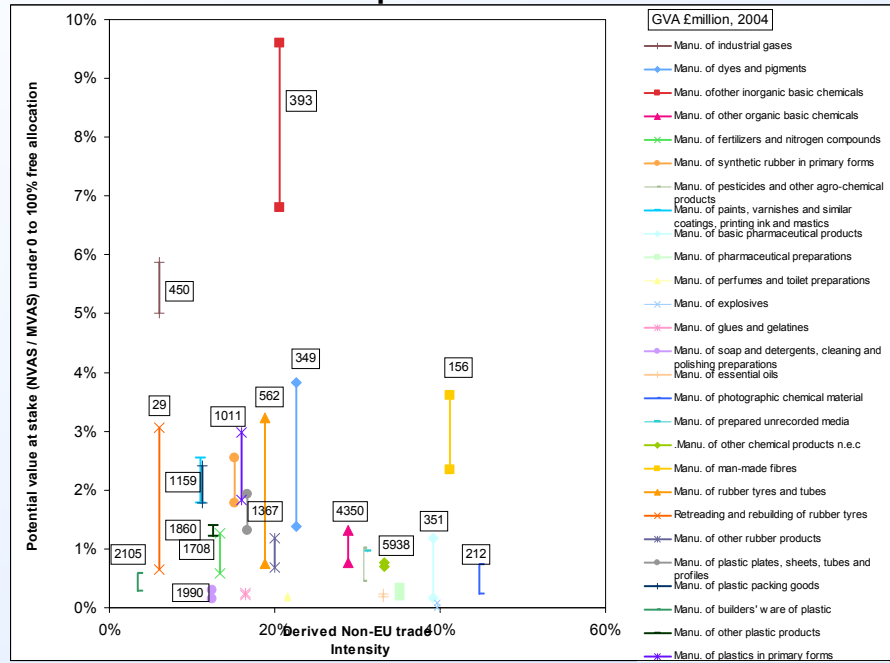
Moving from a 3 digit to a 4 digit (SIC 92) representation of the sector e.g. break-down of Iron & Steel sector (non-EU trade)



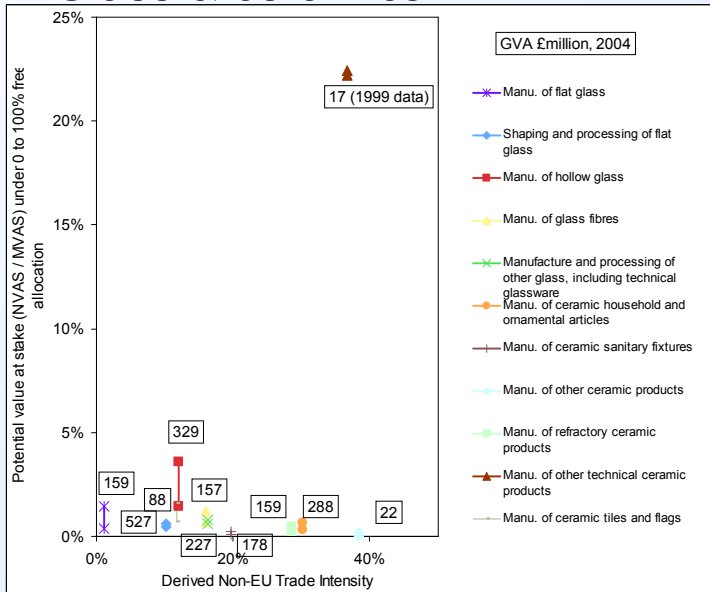
Non-ferrous metals



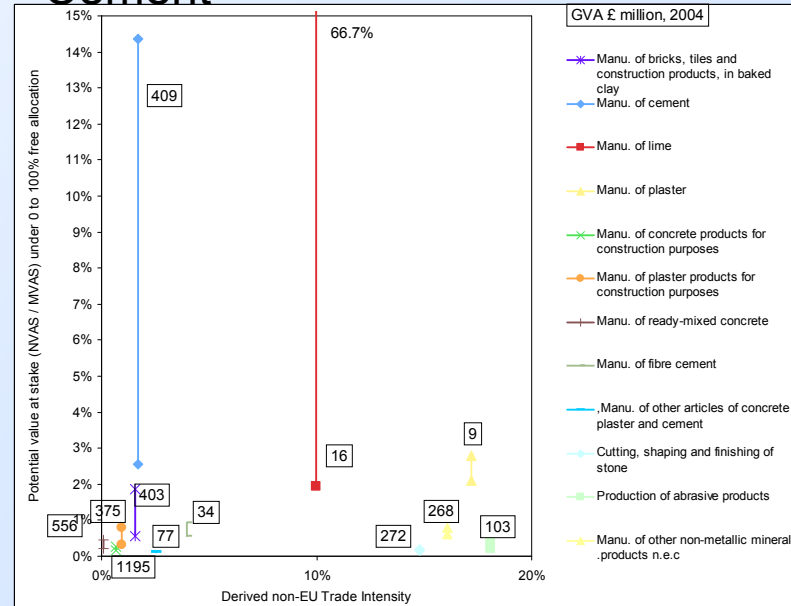
Chemicals & plastic



Glass & ceramics



Cement



Conclusion 1.

The analysis at 4-digit level identifies 2 groups of potentially exposed sub-sectors, with some overlap:

A) Indirectly exposed (electricity intensive production):

Top 5: production of precious metals; manufacture of industrial gases; other inorganic basic chemicals; other technical ceramic products; household and sanitary goods;

B) Potentially directly exposed (carbon intensive production)

Top 5: manufacturing of lime; production of precious metals; other technical ceramic products; basic iron & steel; manufacturing of cement.

➔ *significant impact of ETS on competitiveness concentrates on a far smaller fraction of industrial activities than suggested by aggregate figures.*

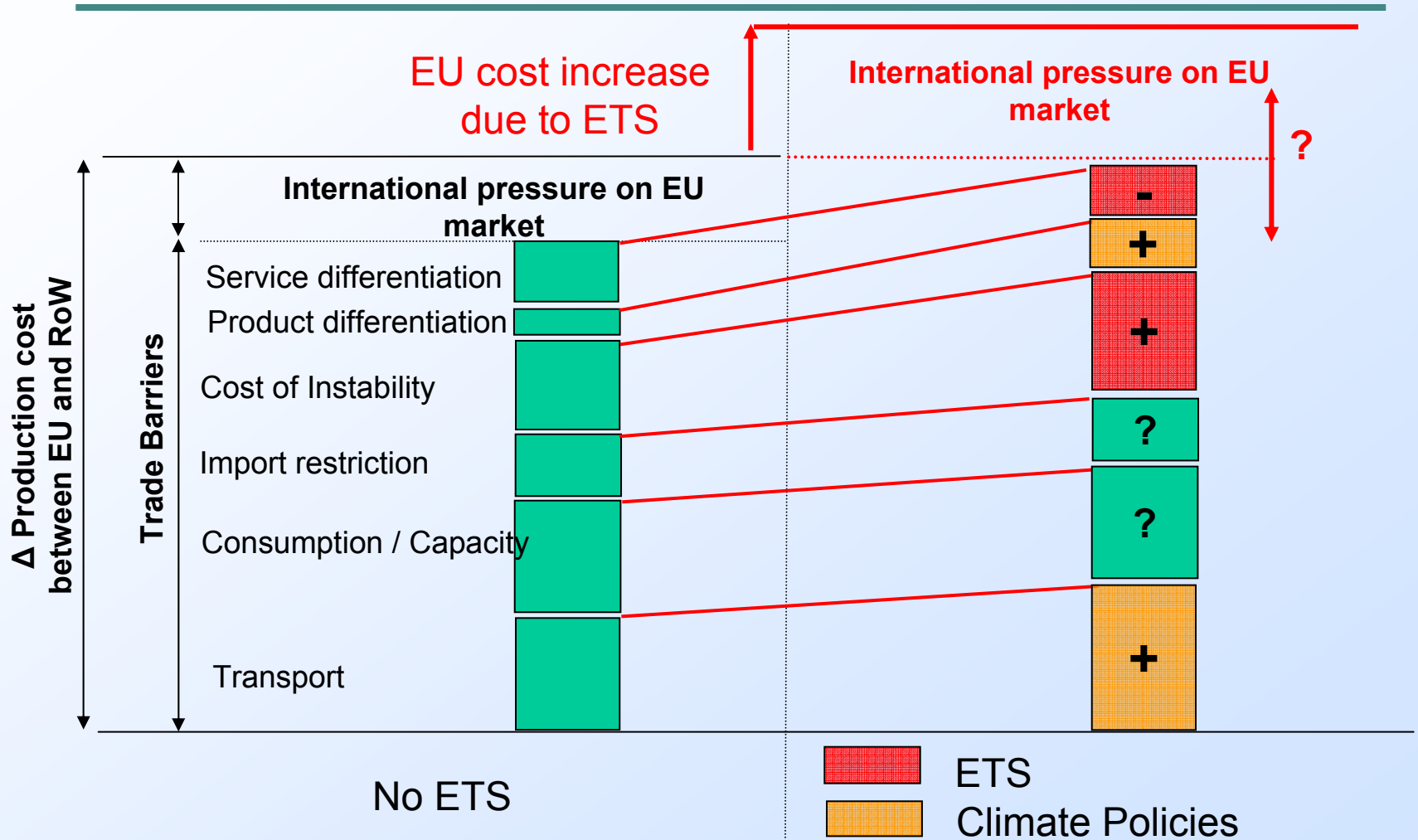
Conclusion 2.

- Overall, 20 out of 92 sub-sectors fall under either/both:
A) >1.5% electricity impacts at €15/t CO₂;
B) > 3% Maximum potential NVAS
(i.e.CO₂ price of €50/t CO₂, would therefore correspond to exposure of 5% and 10% respectively.)
- For the UK, the combined Gross Value Added of the top 20 potentially exposed is small (around 1% of total UK GVA).
- *low overall impact on total GVA of economy → implies low political obstacles towards finding international solutions to address competitiveness concerns for these sectors*

Part 3

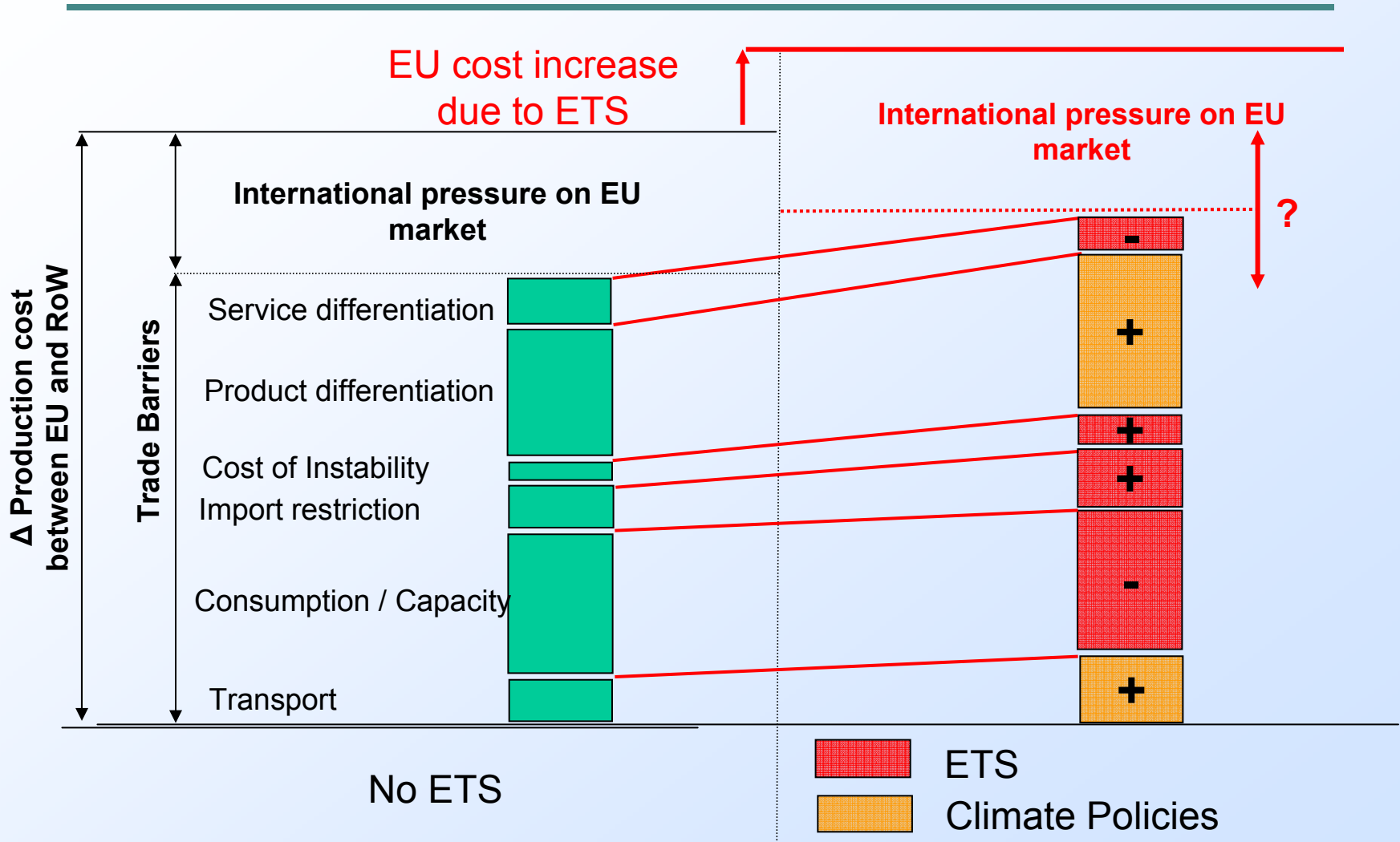
**Can we model EU ETS impacts on
market share?**

How will climate policies impact the RIP? Cement



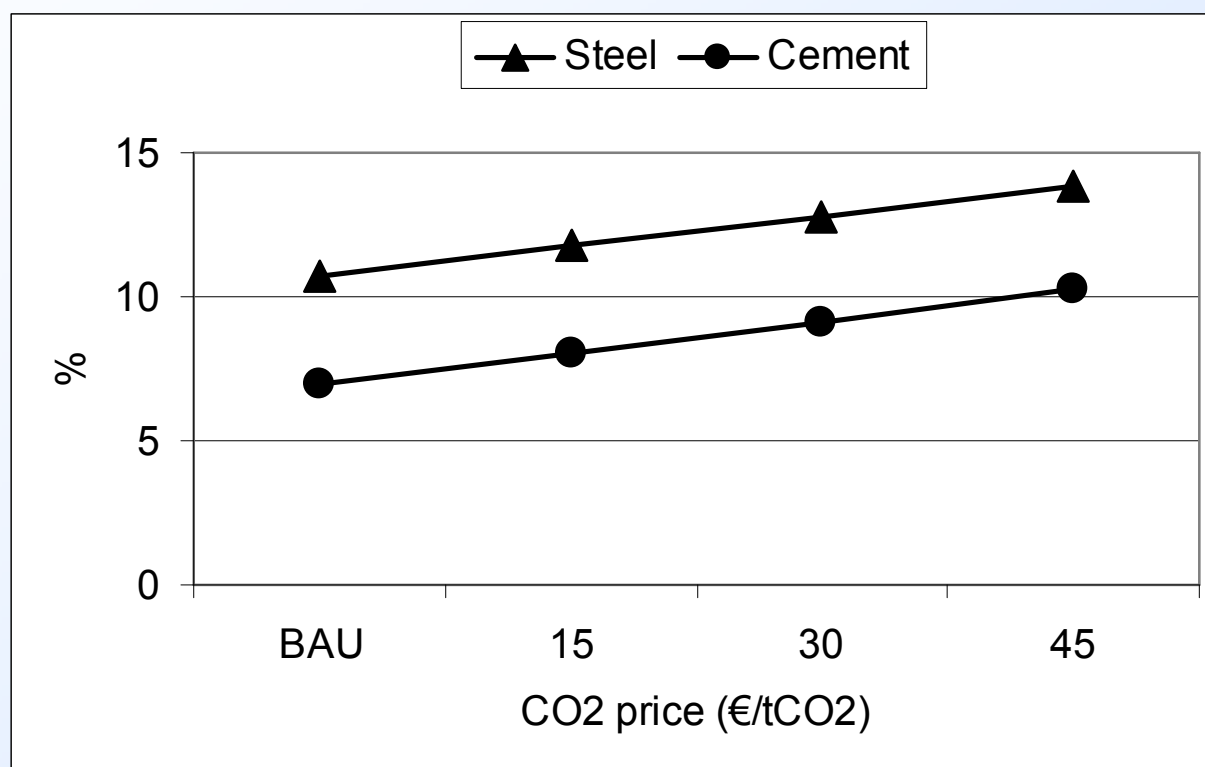
How will climate policies impact the RIP?

Steel



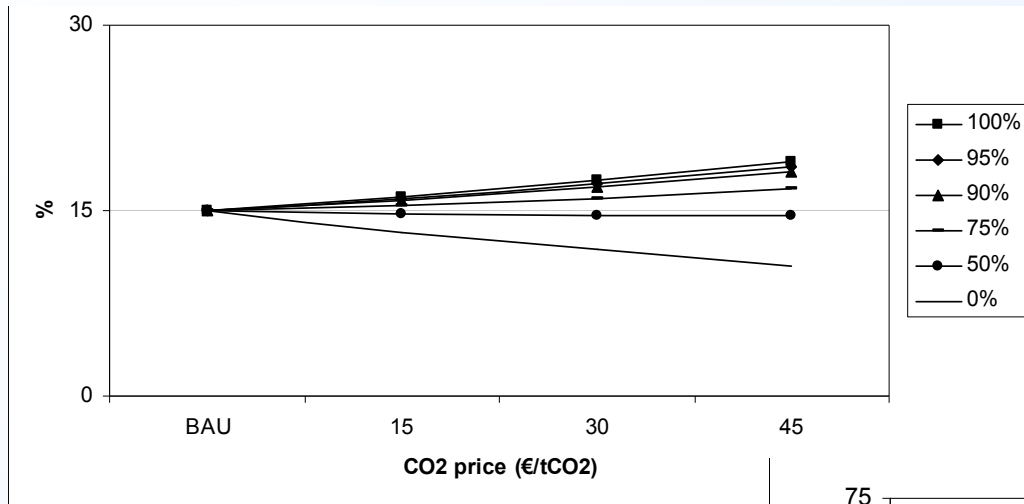
Central scenario

EU Import ratio



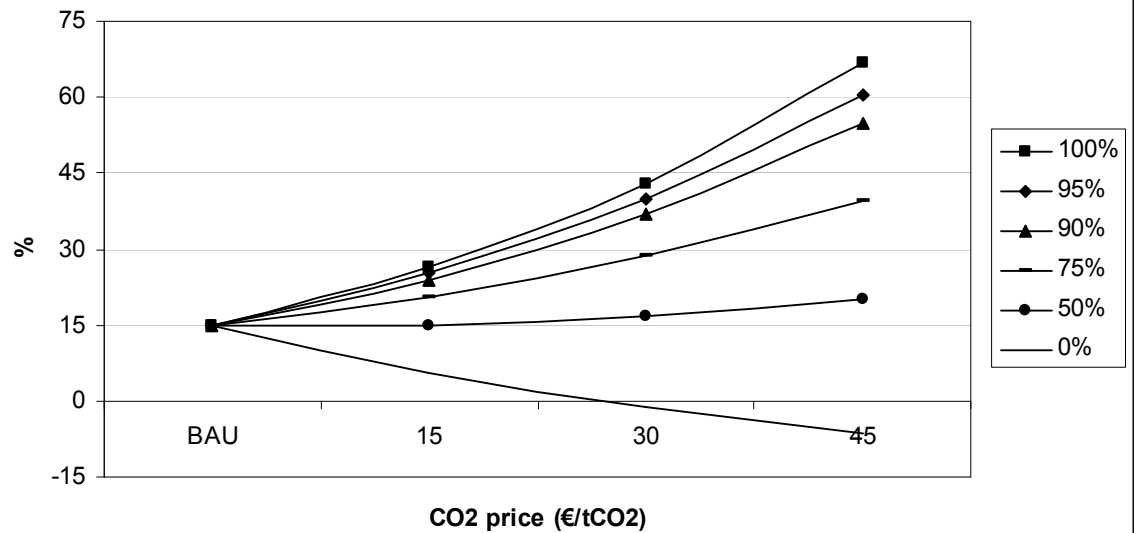
Central scenario

Gross Profit margin for various Rates of Free Allocation (RFA)



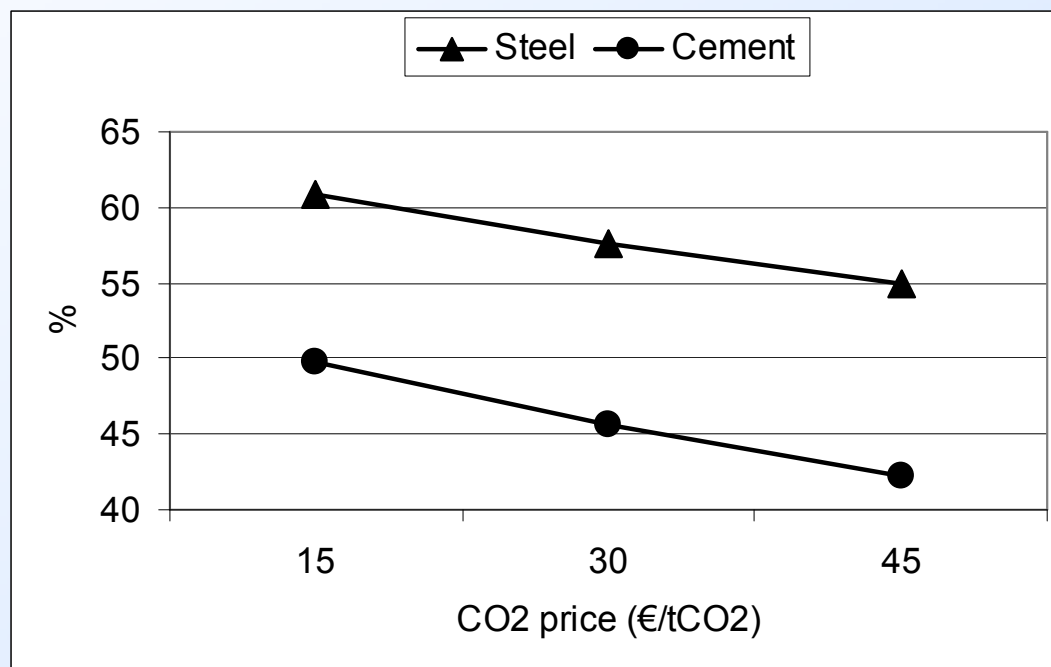
CEMENT

STEEL



Central scenario

Compensating Rate of Free Allocation



Conclusions

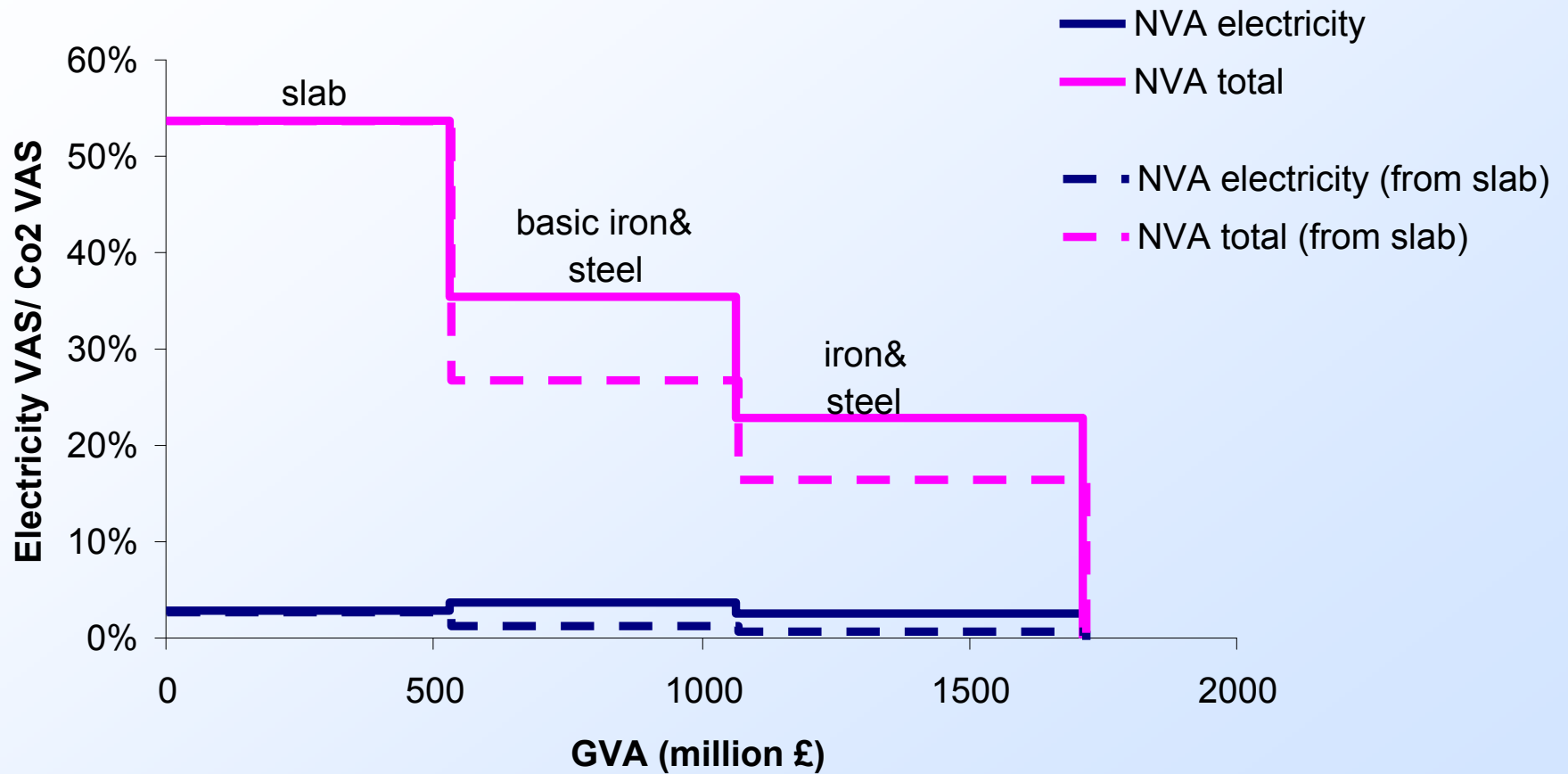
According to the econometric estimates of key parameters, and given their uncertainty:

- Market share losses are likely to remain modest
- Market share losses in the cement sector are of the same order of magnitude than in the steel sector, the high CO₂-intensity of the former offsetting its lower trade sensitivity
- The CRFA : it is all about the rate of cost pass through (PT)... Hence, huge uncertainty.
- A “wrong” CRFA has drastic impact on the cement sector’s profitability, much less for the steel sector
- Finally, what RFA? It is all about your risk aversion...

Part 4

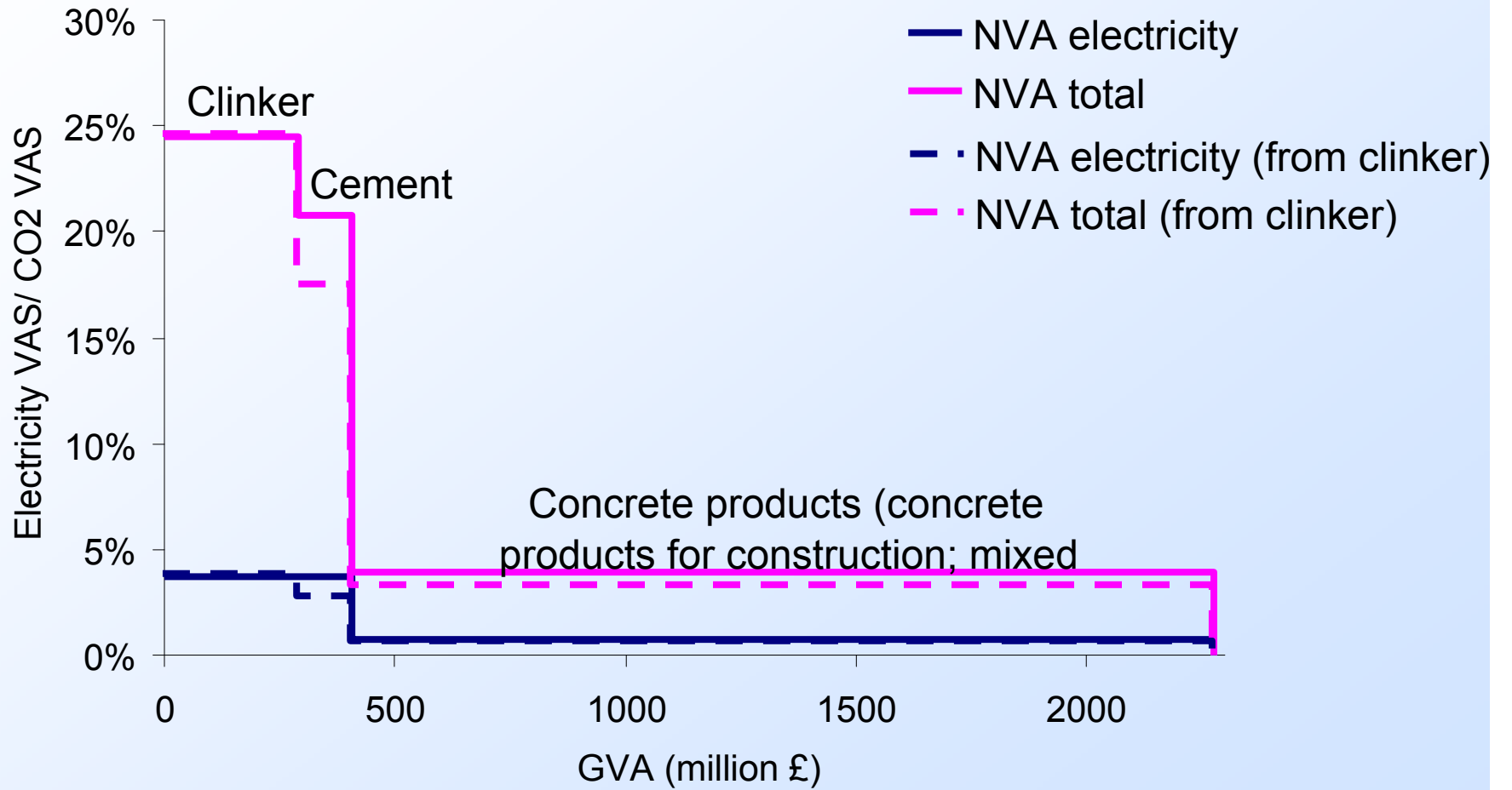
Towards better understanding the Production Chain:

Basic Oxygen Furnace production



Note – preliminary results – particularly GVA slab pure guess.
This has implications for VAS estimations for slab.

Cement



Note – preliminary results – particularly electricity split clinker/cement pure guess

Part 5

Annex

4 digit analysis : new approach to defining trade intensity

For the 3 digit analysis, we define UK trade intensity from the EU as:

$$= \frac{\text{value of imports from EU} + \text{value of Exports to EU}}{\text{value of total UK market value}}$$

For market value we use total supply=total demand from Input Output tables

Due to data constraints at 4 digit level, in this analysis we use:

$$= \frac{\text{Value derived EU exports} + \text{Value derived EU imports}}{\text{annual turnover} + \text{val. total imports} - \text{val. total exports}}$$

Where we define:

$$\text{Value derived EU exports} = \text{Total exports at 4 digit} \times \frac{\text{Exports to EU 3 digit}}{\text{Total export 3 digit}}$$

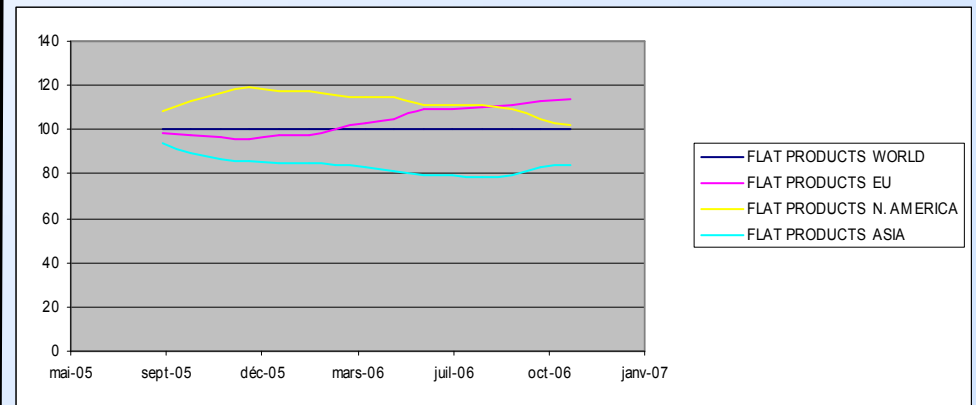
International pressure on the EU Steel sector

Long products

- Low value added products and differentiation (?)
 - High transportation cost for scrap steel
- Local market: EU Import ratio ~ 10%

Flat products

- High product differentiation
- Three Regional markets (Asia, North America and Europe) partially linked
- EU Import ratio remains modest (~10%)
- Price differences maintain



Is this situation sustainable?

A possible new scheme: slab production in low cost countries, product differentiation close to consumers

Modelling assumptions

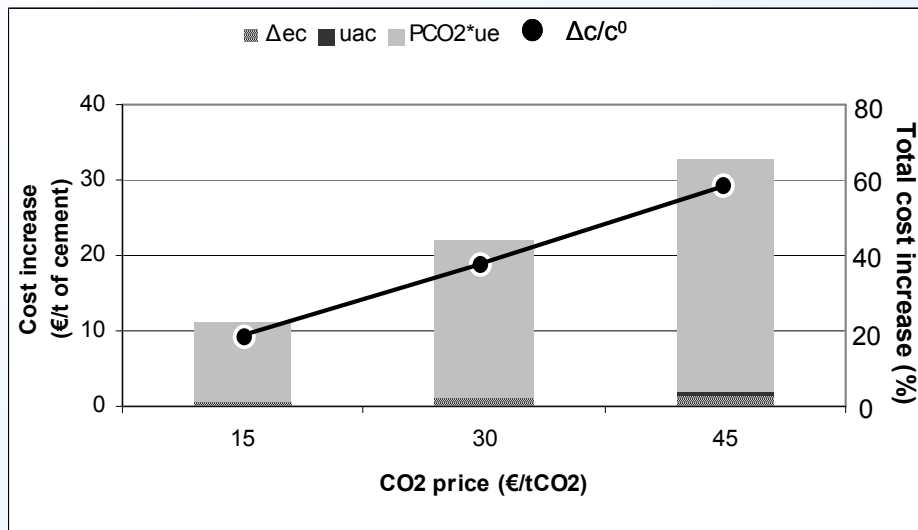
- Time Horizon: 2015
- Geographical aggregation : EU 27
- Products: flat and long steel products are aggregated
- For a given CO2 price, 3 elements in the cost increase due to the ETS:
 - Electricity cost increase (full pass-through in the electricity sector)
 - Abatement cost: depends on the **Marginal Abatement Cost Curve (MACC)**
 - Emission cost: free allowances (if any) are purely grandfathered
- Price increase: depends on the **Pass Through (PT)**
- Market share loss: depends on the **trade elasticity (σ)**
- Demand drop: depends on the **demand elasticity (ϵ)**

**KEY
PARAMETERS**

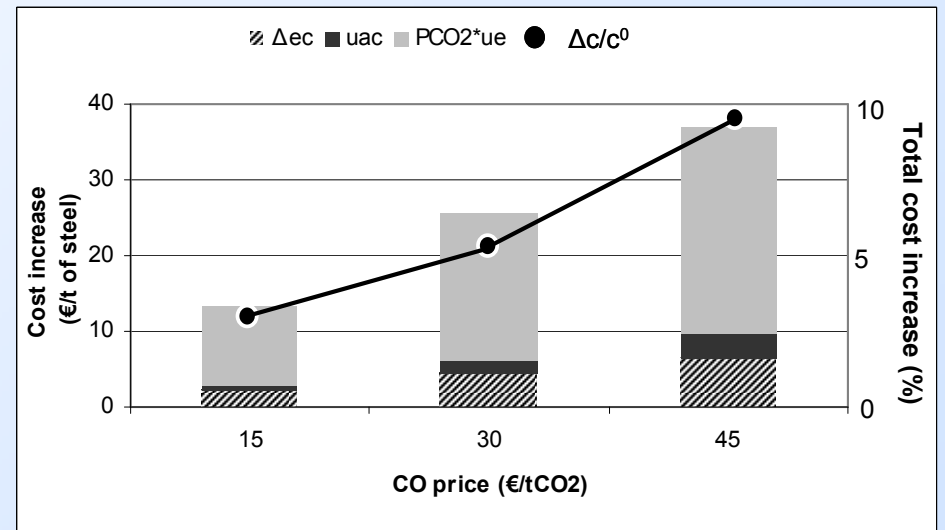
Central scenario

Values for key parameters = the range mean

Cost Impact



Cement

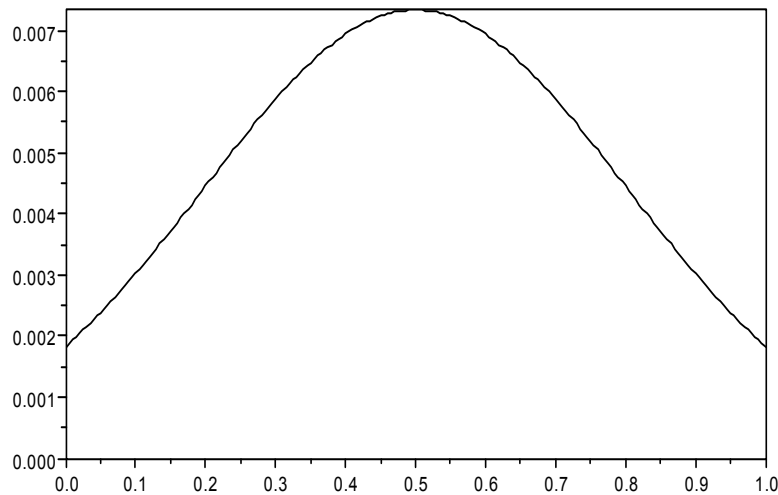


Steel

CAVEATS

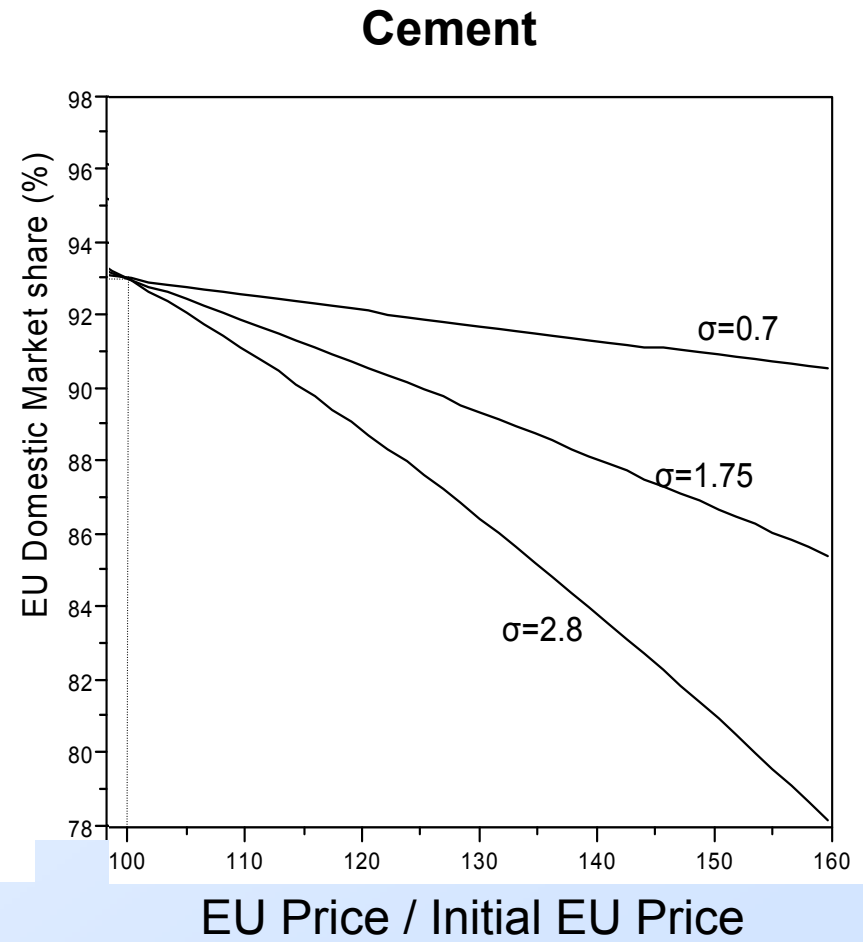
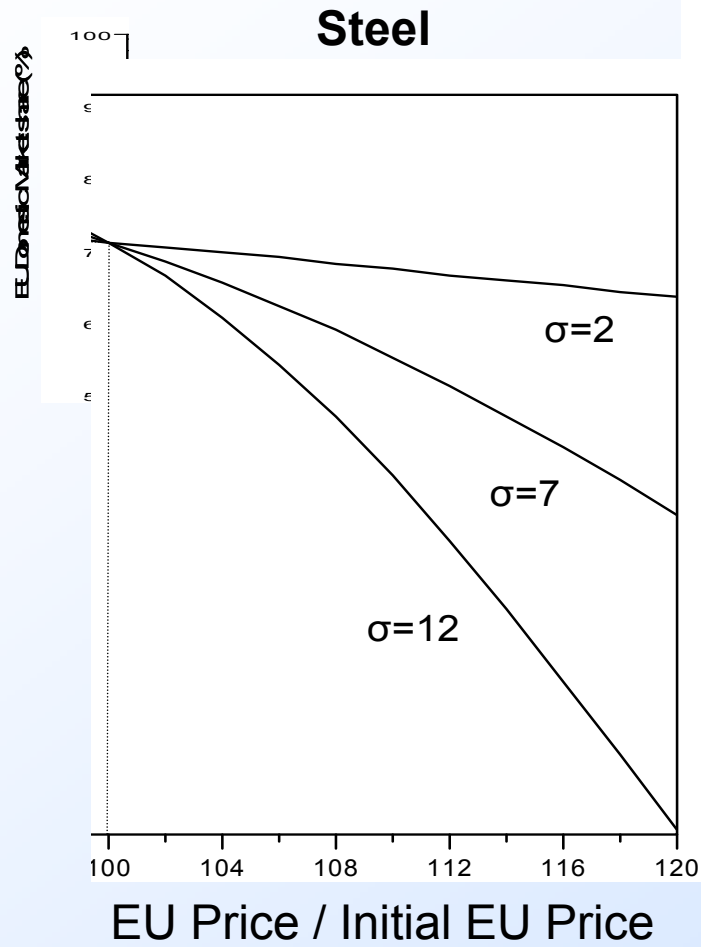
Caveat N° 1 : Uncertainty surrounding these parameters

→ For every parameter, we test a range of values (from economics literature) and define a density of probability



	Cement		Steel	
PT	0	full	0	full
Trade elasticity	0.5	2.8	2	12
Demand elasticity	0.2	1.5	0	1
MACC	PRIMES +/- 33%			

Uncertainty on the trade elasticity



Uncertainty on the pass through

A controversial issue...

Theoretical Literature enhances the paradoxical role of market power
→ Trade exposure is not the only PT determinant

Empirical literature:

- Ex-ante studies use a wide range of estimates
- Econometric works claim for significant PT:
 - Walker: PT of the CO₂ opportunity cost in 2005 from 10 to 40% in the cement sector
 - Literature on exchange rate → PT on export markets from 20 to 70% for these two sectors

CAVEATS

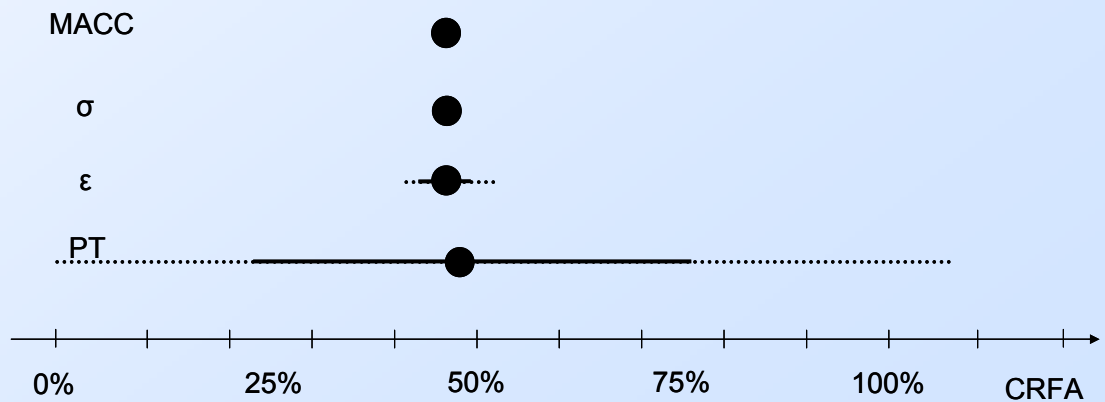
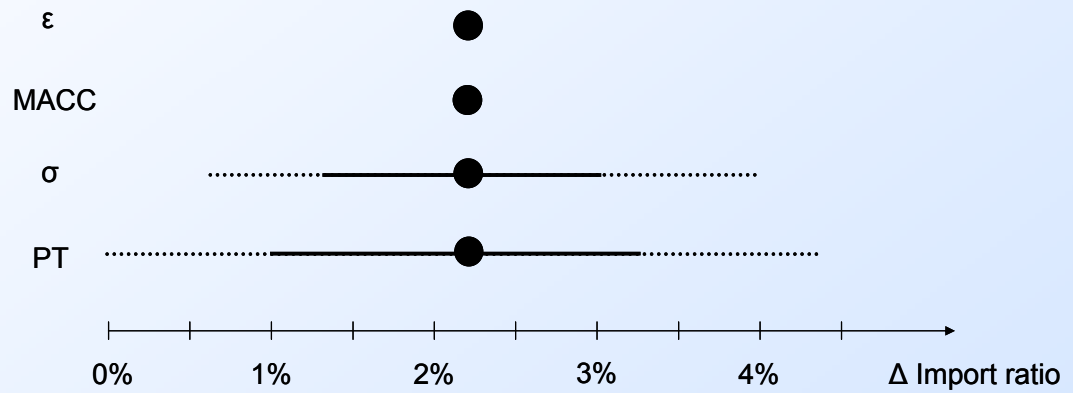
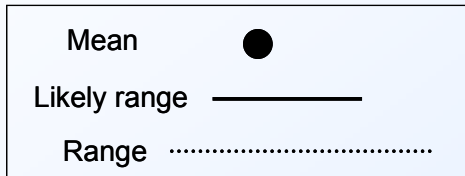
Problem N° 2 : reliability of econometric estimates

- Poor estimates availability for the EU
- Estimates based on *small* shocks
- Estimates based on past data, whereas the determinants of trade evolve (e.g. slab trade)
- No distinction between trade barriers (all mixed) whereas they will evolve differently over time
- Do not take into account the impact of climate policies on trade barriers

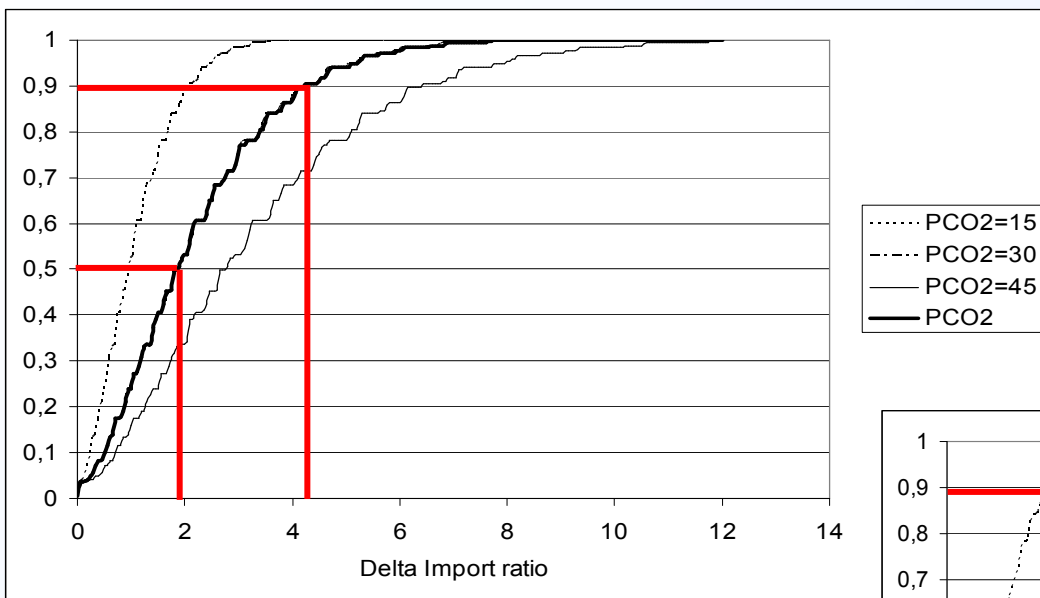
Nevertheless...

Sensitivity Analysis

CEMENT



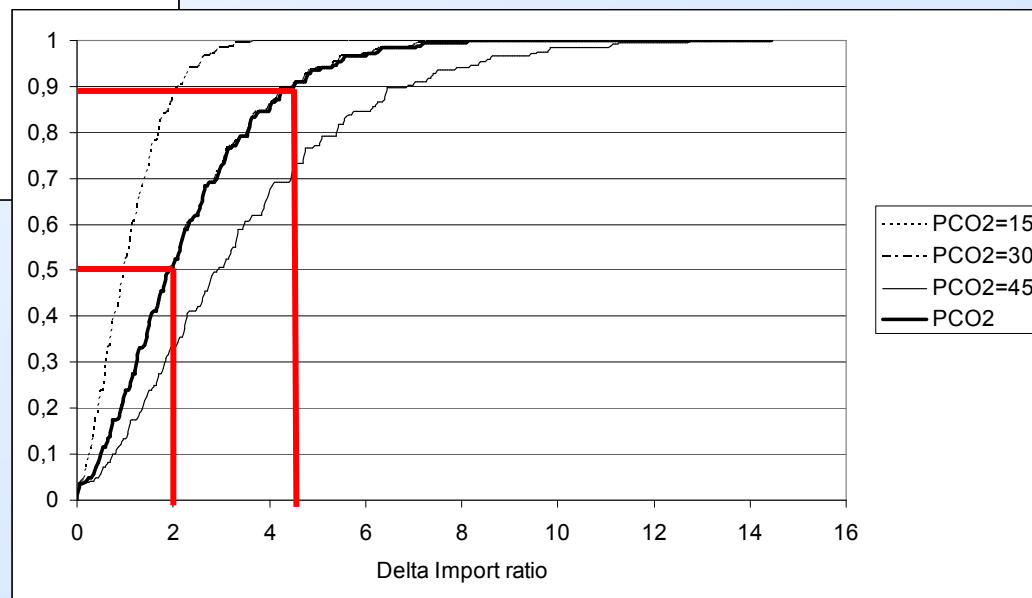
Multi-sensitivity Analysis



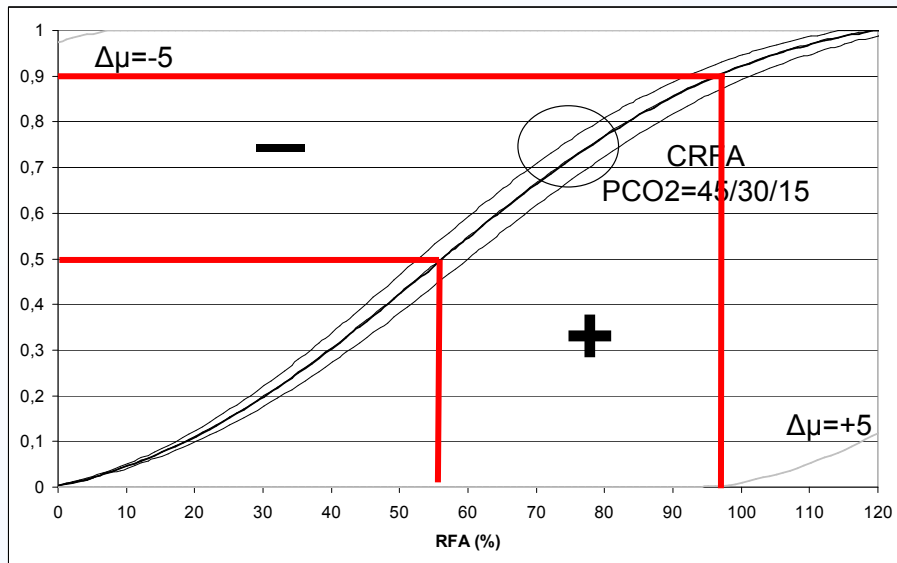
STEEL
Mean: -2%

Δ EU Import ratio *Repartition function*

CEMENT
Mean: -2%



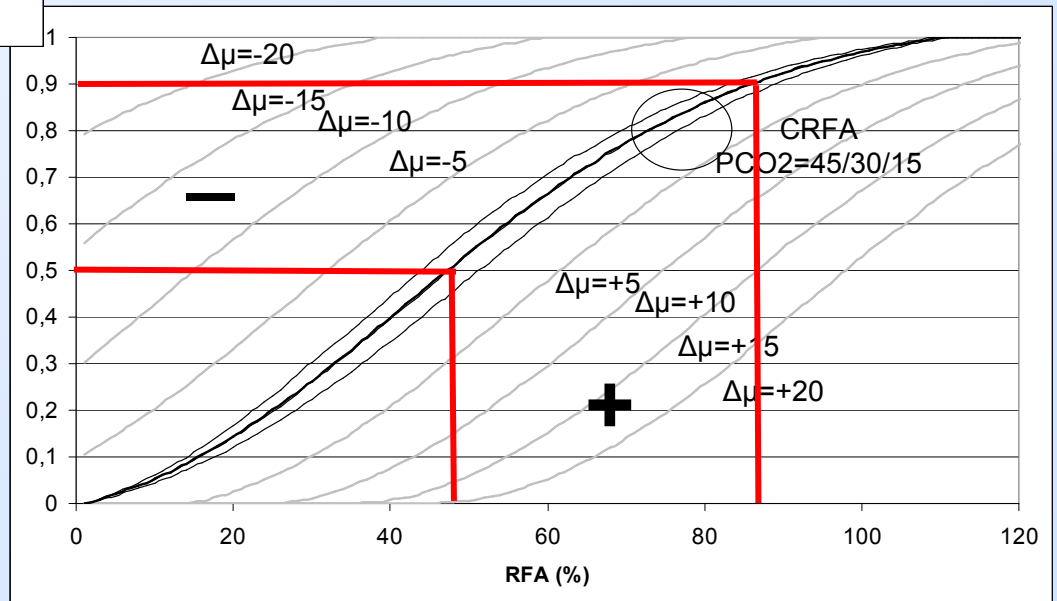
Multi-sensitivity Analysis



STEEL
Mean CRFA: ~60%

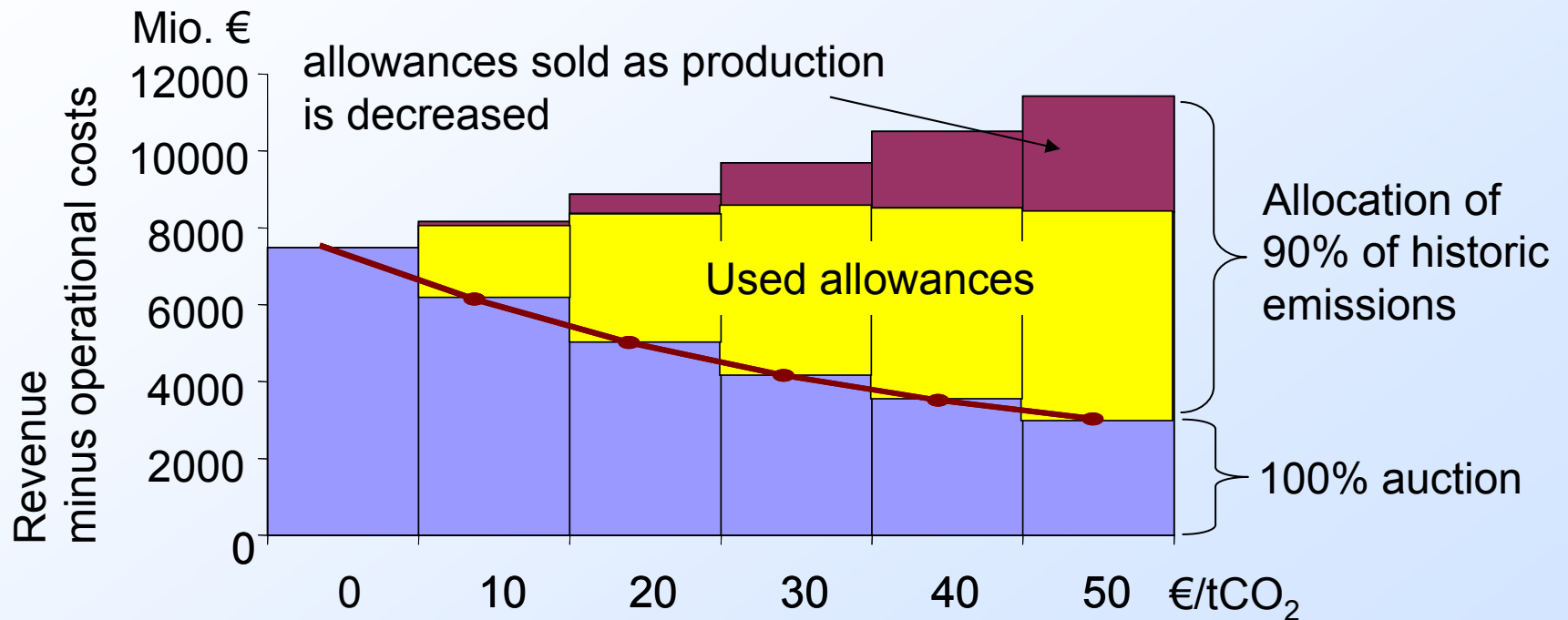
CRFA
Repartition function

CEMENT
Mean CRFA: ~50%



The current approach of free allocation shields profits, not the production of effected sectors

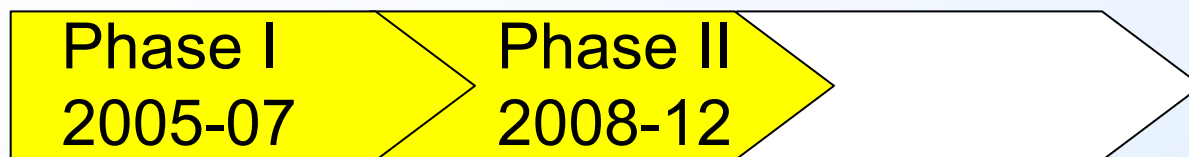
Example: Cournot model of the European cement sector



- energy intensive industry has usually high fixed costs
- relocating production is a strategic (long-term) decision
- competitiveness is affected by post 2012 perspective

Assumptions: For 20€/tCO₂, extended cost: +14€/t cement ~200km by road`

Robust solutions for post 2012 exist



Continued international cost differences effect energy intensive industry.

Global or sectoral agreements

Compensation of Exports/imports

Allocation proportional to output

	Efficient production	Environmental costs reflected in price	Fair competition
Global or sectoral agreements	✓	✓	✓
Compensation of Exports/imports	✓	✓	✓
Allocation proportional to output	✓		✓

We will find the best solution in an international dialogue.