

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

- 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*

<u>Study</u>	<u>Country</u>	<u>Disaggregation level</u>	<u>CO2 price</u>	<u>Denominator</u>	<u>Process emissions</u>	<u>Electricity</u>
Carbon Trust (2004)	UK	2-3 digit SIC	EUR 20/ t CO2	GVA	yes	yes
Morgenstern et al. (2004)	USA	4 digit SIC (USA)	US\$ 1/ t	Total cost	no	yes
WRI (2004)	USA	2 digit SIC (USA)	-	Final sales value	yes	no
Hourcade et al (2008)	UK	4 digit SIC	EUR 20/t CO2	GVA	yes	yes
Graichen et al. (2008)	Germany	4 digit NACE	EUR 20/t CO2	GVA	yes	yes
de Bruyn et al. (2008)	Netherlands	2-4 digit SIC	EUR 20/t CO2	Total cost	yes	yes
CITI (2008)	Australia	Company (ASX100)	A\$ 20/t CO2	Market Capitalisation	yes	no
Commission Services (2008)	EU-27	8 digit (partly aggregated) PRODCOM	EUR 30/t CO2	Product price	yes	yes

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:**

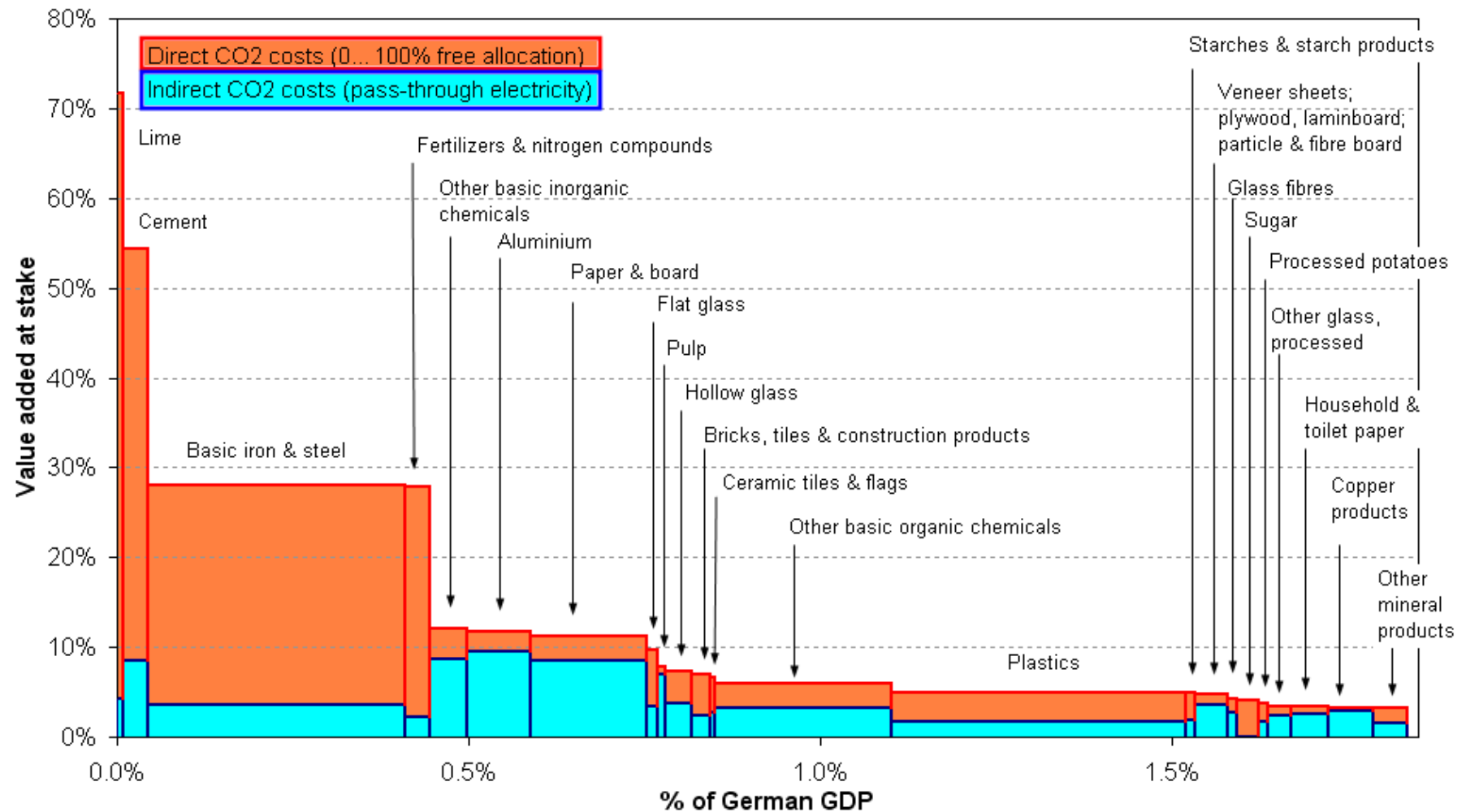
Electricity * estimated pass-through of CO₂ purchased costs to electricity prices

- **Direct costs:**

emission intensity of production

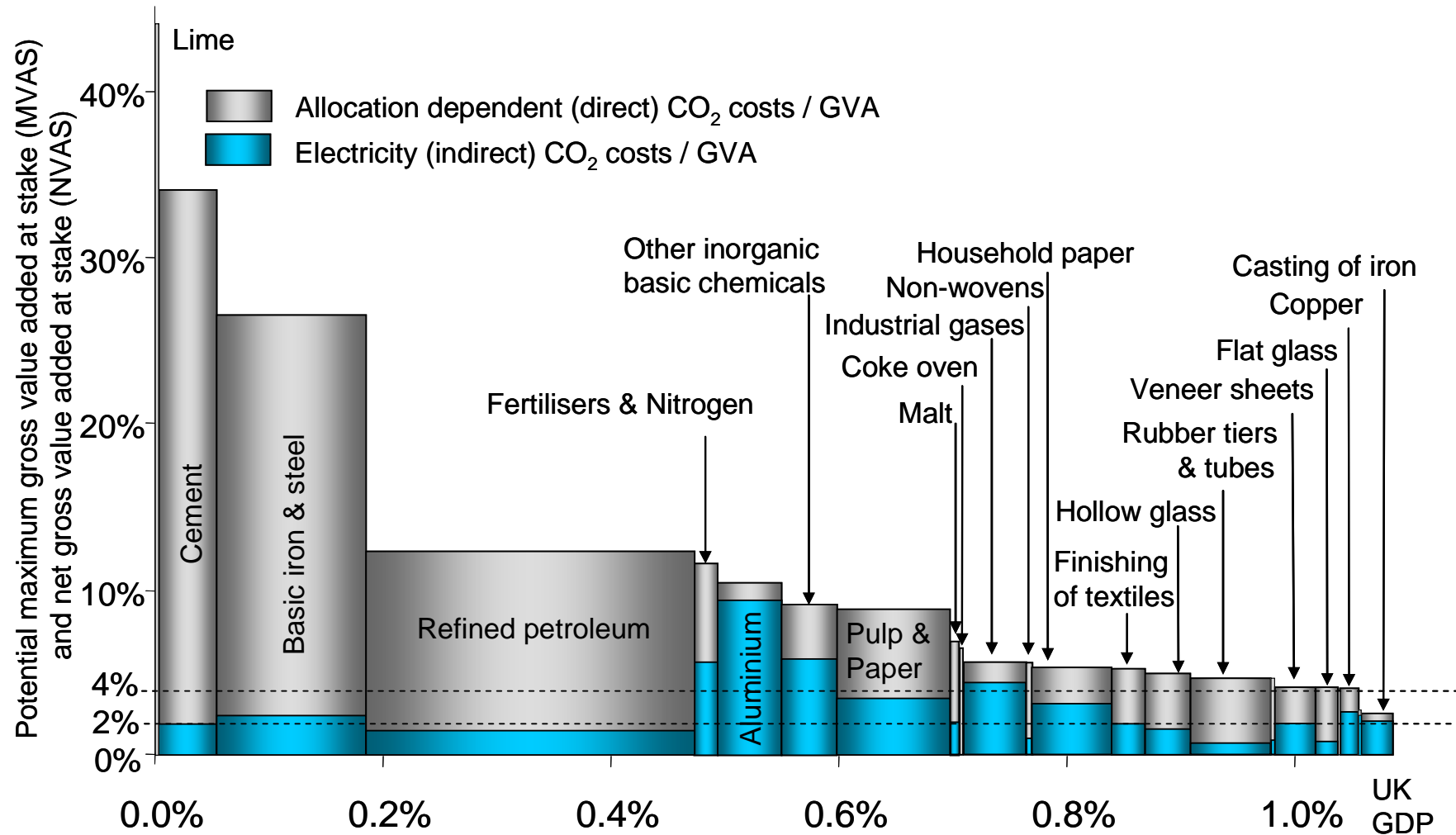
→ energy em.: fuel input * em.factors

→ process em.: based on data from the GHG inventory



Note: 20 EUR/t CO₂, 19.3 EUR/MWh pass-through in electricity

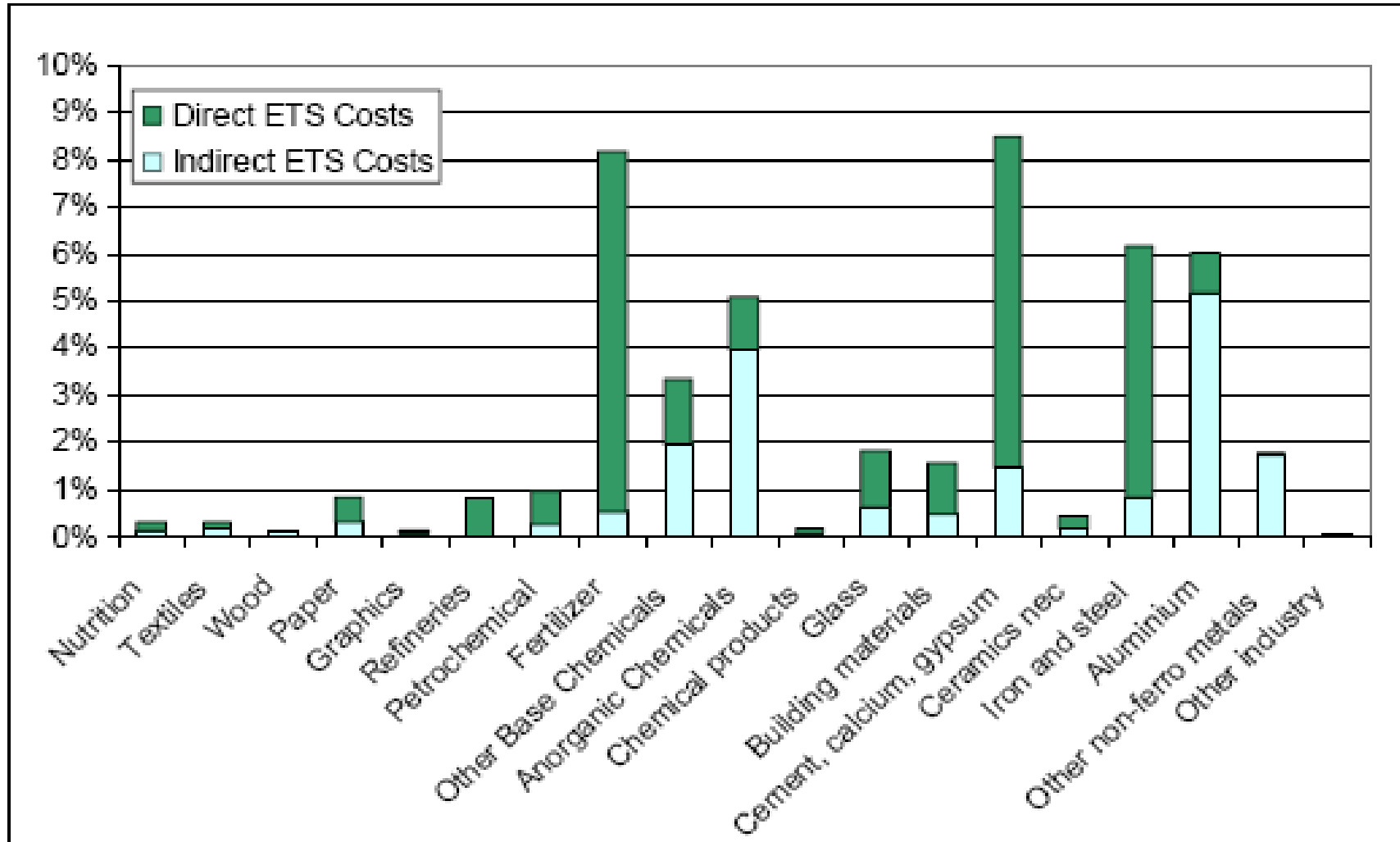
Source: based on Graichen et al. (2008), updated for 2006



Price increase assumption: CO₂ = €20/t CO₂, Electricity = €10/MWh

Source: Hourcade et al. (2008)

CO₂-cost in relation to total cost



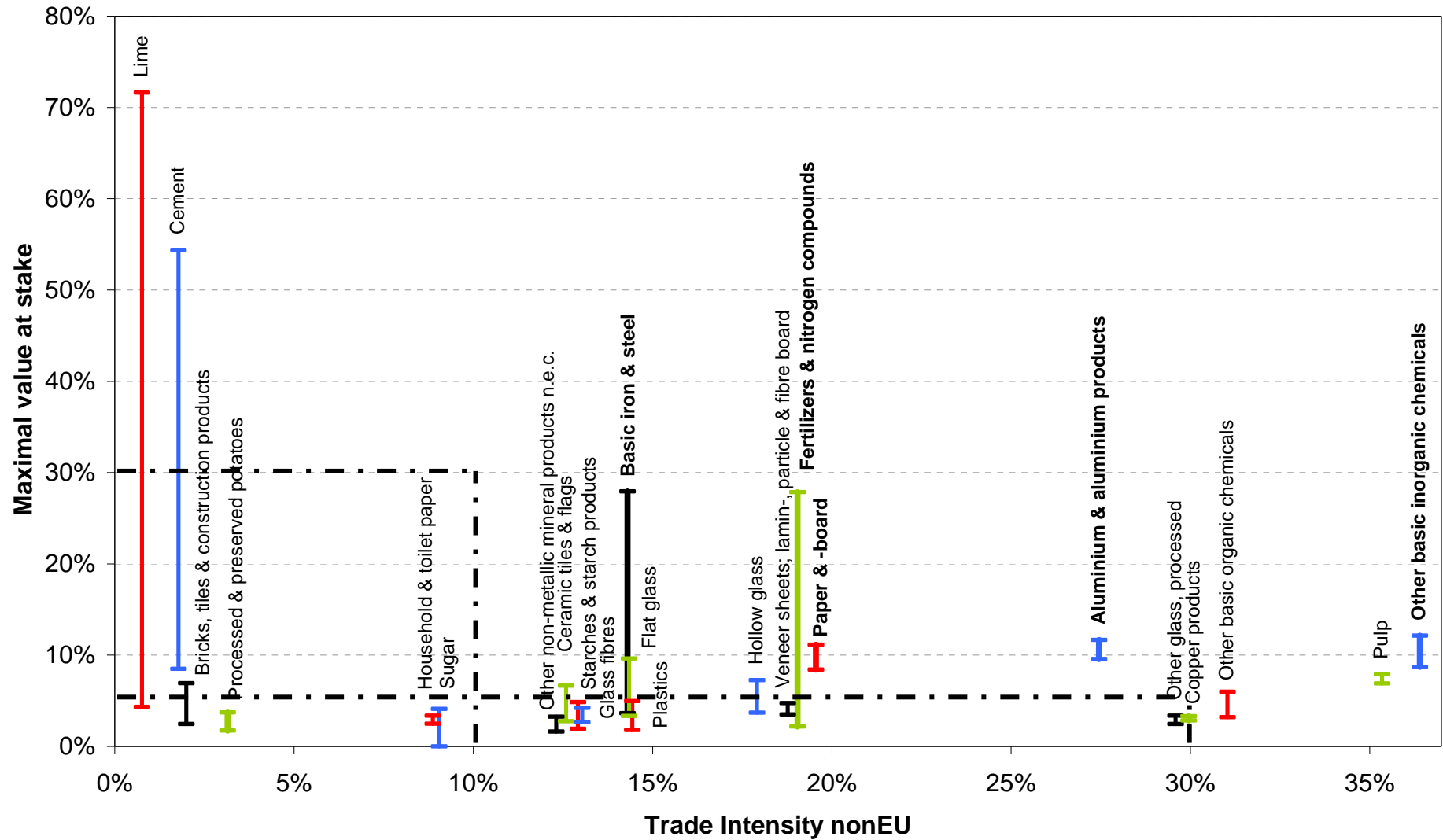
Note: 20 EUR/t CO₂, 14 EUR/MWh pass-through in electricity

Source: de Bruyn et al. (2008)

3. Quantification of exposure to international competition

Concept of trade intensity

$$\textit{TradeIntensity} = \frac{\textit{Exports}_{\textit{regional}} + \textit{imports}_{\textit{regional}}}{\textit{turnover} + \textit{imports}_{\textit{total}}}$$



Note: 20 EUR/t CO₂, 19.3 EUR/MWh pass-through in electricity

Source: Graichen et al. (2008), modified & updated for 2006

Sectors in Germany (I)	Option I (5%;10%)	Option II (30%)
Fertilizers & nitrogen compounds	MVAS, TI	
Basic iron & steel	MVAS, TI	
Aluminium & aluminium products	MVAS, TI	
Paper & -board	MVAS, TI	
Other basic inorganic chemicals	MVAS, TI	
Starches & starch products	MVAS, TI	
Flat glass	MVAS, TI	
Pulp	MVAS, TI	TI
Other basic organic chemicals	MVAS, TI	
Ceramic tiles & flags	MVAS, TI	
Hollow glass	MVAS, TI	

Sectors in Germany (II)	Option I (5%;10%)	Option II (30%)
Cement		MVAS
Lime		MVAS
Dyes & pigments		TI
Refractory ceramic goods		TI
Other chemical products n.e.c.		TI
Basic pharmaceutical products		TI
Electronic valves, tubes & other components		TI
Abrasive products		TI
Technical ceramic wares		TI
Aircraft & spacecraft		TI

Conclusions (A)

- **Comparable studies show similar results**

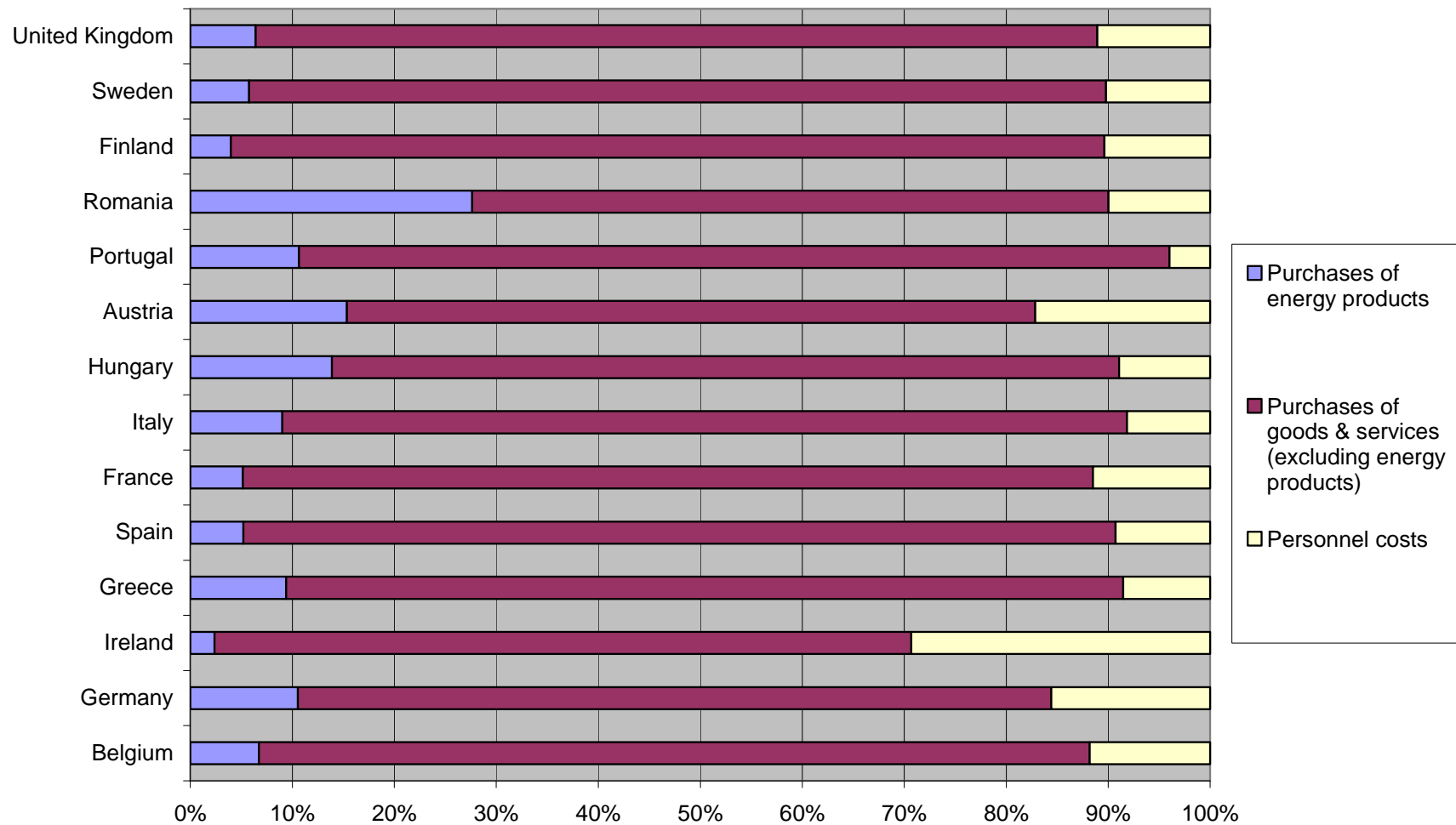
- **A small number of sectors may be exposed to distortions in competitiveness due to both high value at stake and high trade intensity**

- **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

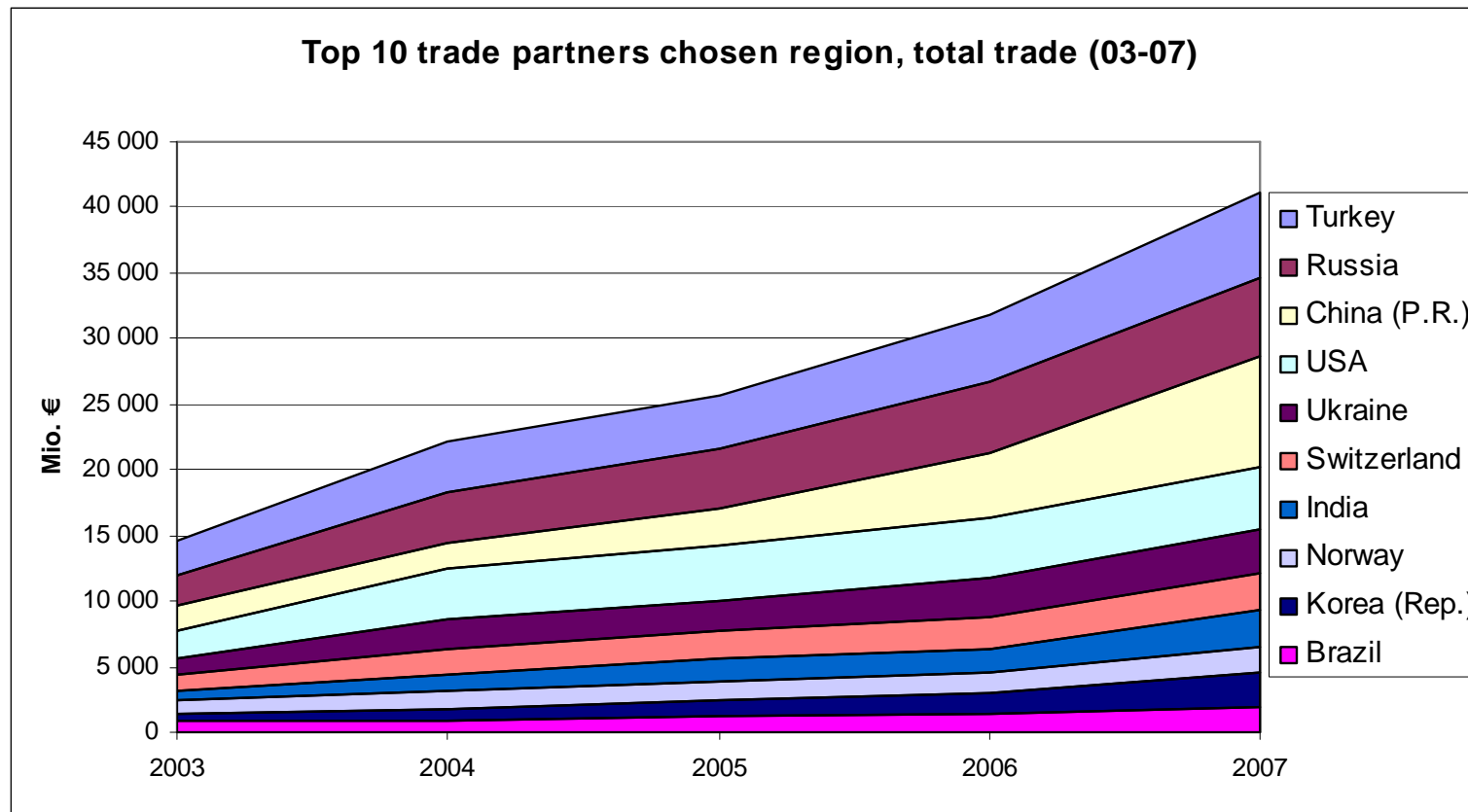


Reasons for differences in breakdown of operational costs

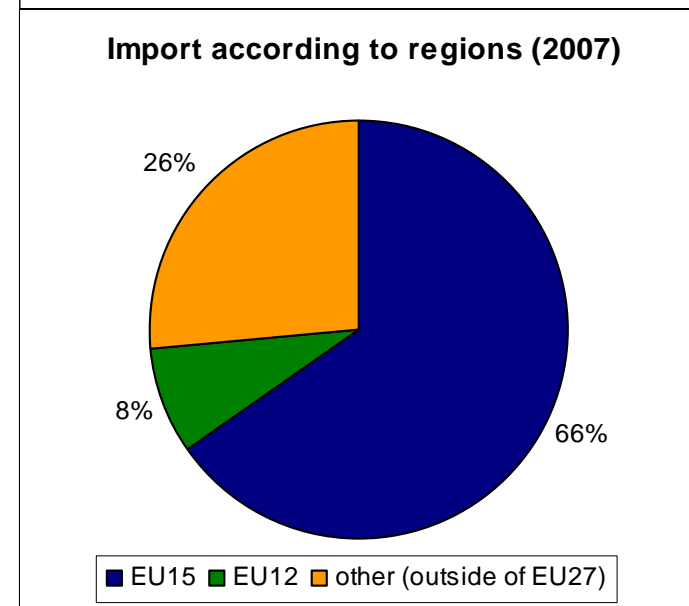
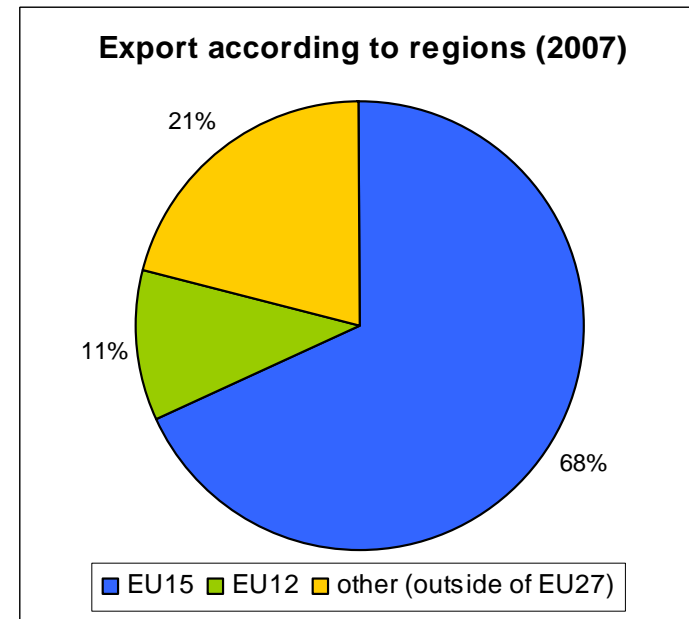
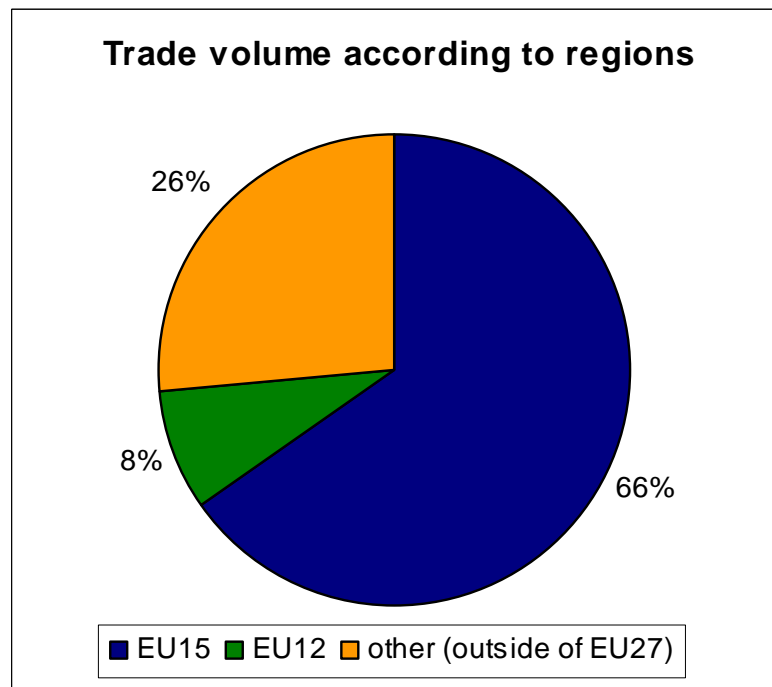
- **different recycling ratios & production processes**
 - **different efficiencies of plants**
 - **varying prices**
 - **different product mix**
 - **Degree of specialization**
 - **use of outsourcing or employment agencies**
- Limited value of analysis, preferably base analysis on physical units than on expenditure**

4. Trade flow analysis

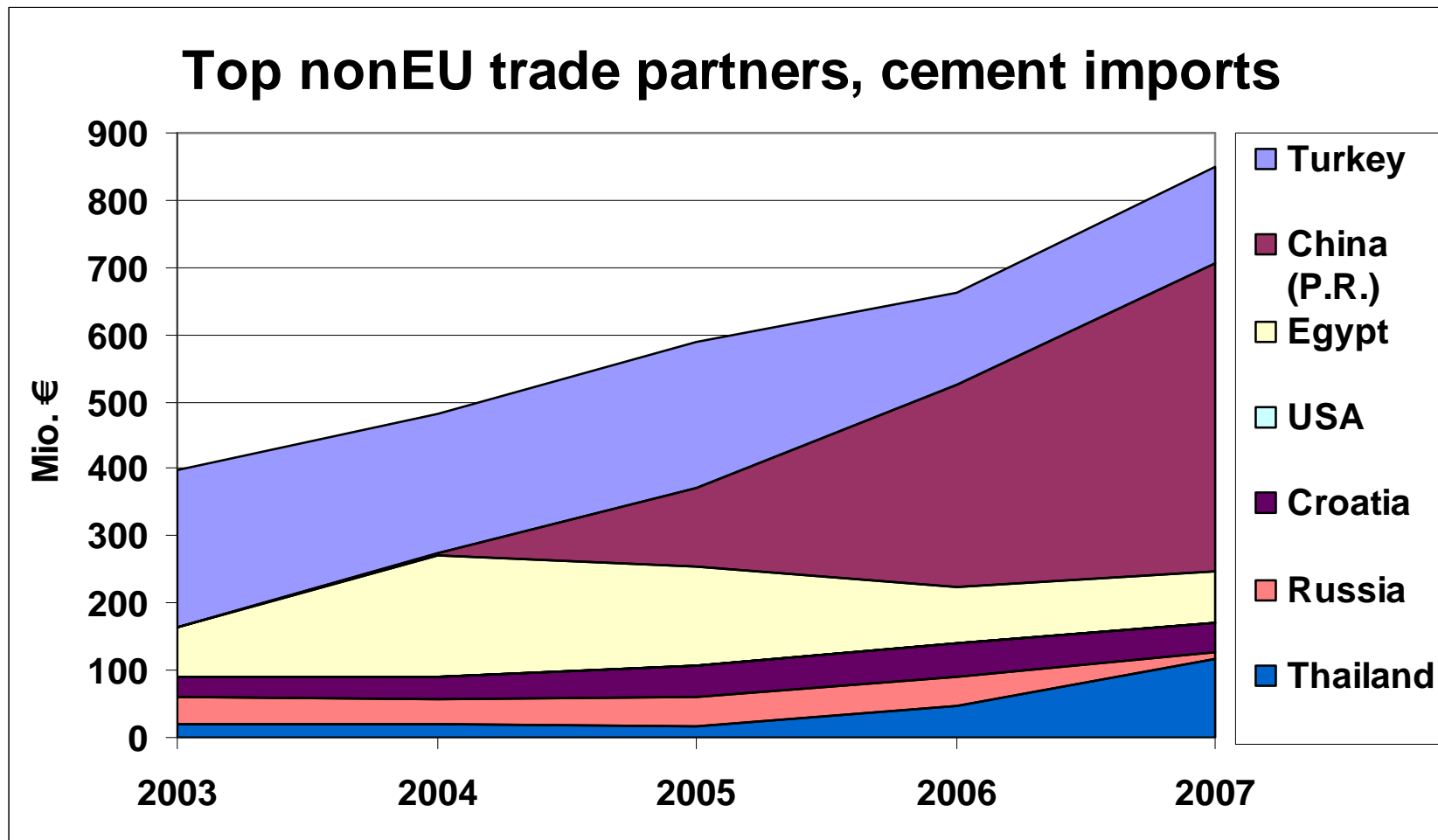
Basic iron & steel, top 10 non-EU trading partners of EU-27



Basic iron & steel, trade of EU-27 according to regions



Cement, top non-EU import partners of EU-27

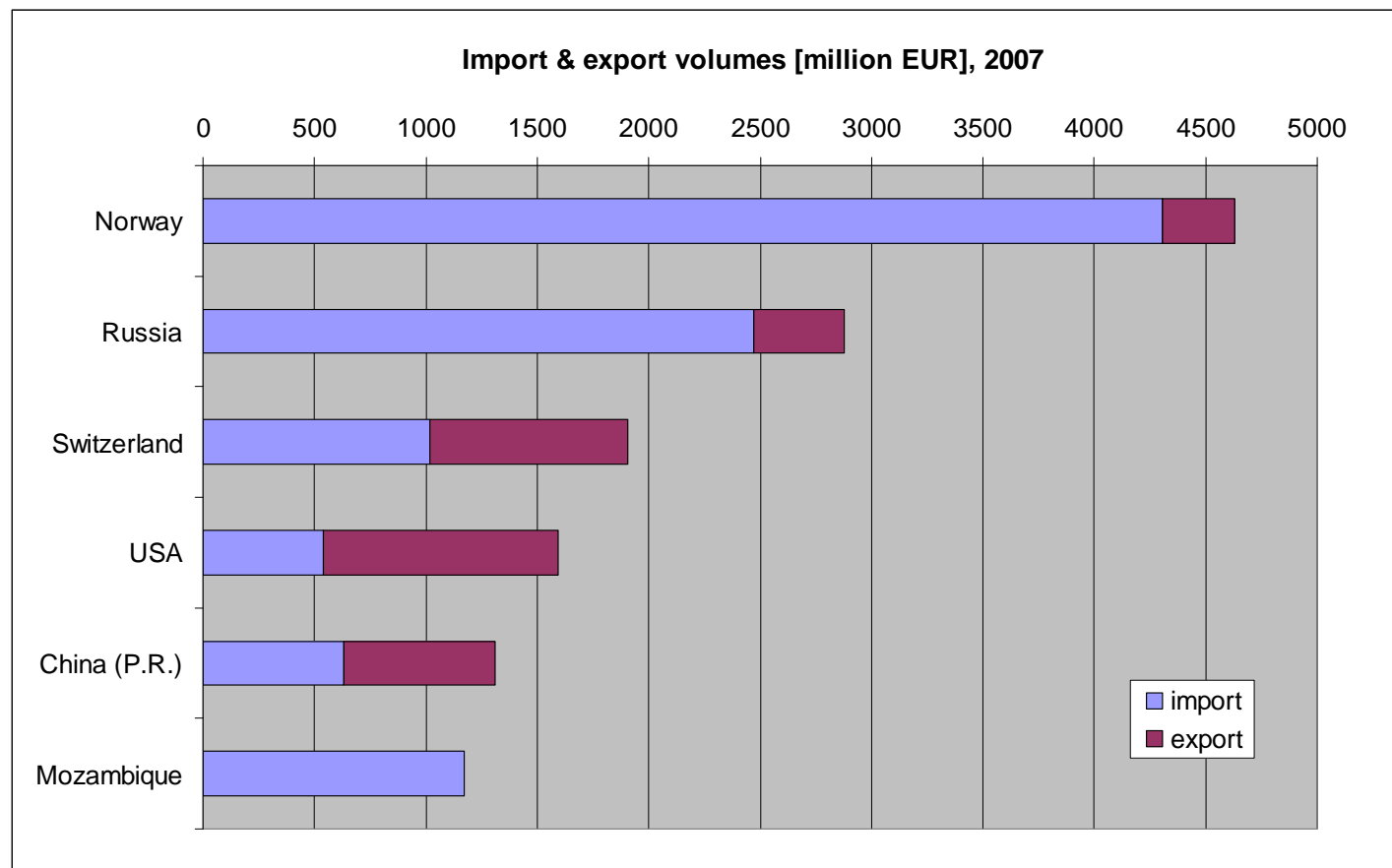


Ranking by trade volume of main trading partners of EU-27

	NACE	USA	Russia	China	Norway	Switzerland	Turkey
Aluminium	27.42	4	2	6	1	3	
Basic iron & steel and ferro-alloys	27.10	4	2	3		6	1
Other basic inorganic chemicals	24.13	1	4	2	3	(7)	
Fertilizers & nitrogen compounds	24.15	3	1		2		
Paper & paperboard	21.12	1	3	5	4	2	6

Source: Mohr; Graichen; Schumacher (2009)

Aluminium, import and export volumes of main non-EU trading partners, 2007



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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