

Composition and drivers of energy prices and costs in energy intensive industries

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CEPS, Brussels 26 February 2014

Agenda

- About the study
- Key research areas
- Methodology
- Caveats
- Some key findings
- Cross-sectoral analysis
- Ammonia (chemicals)
- Chlorine (chemicals)
- Flat glass
- Bricks and roof tiles (ceramics)
- Wall and floor tiles (ceramics)
- Steel
- Aluminium

About the study

- **Objective**

Analysis of the composition and drivers of energy prices and costs in energy intensive industries

- **Sectors covered**

- Bricks and roof tiles (ceramics)
- Wall and floor tiles (ceramics)
- Ammonia (chemicals)
- Chlorine (chemicals)
- Flat glass

↔ 5 studies, 15 CEPS researchers involved, 24 Jul – 31 Oct 2013

- Separate studies for aluminium (cumulative cost assessments) and steel –

Analysis

1. Overview of energy prices development (2010-2012)
 - Absolute price level
 - Structure of the bill (energy component, grid fees, RES levies and other non-recoverable taxes)
2. Energy intensity/efficiency
3. Impact of energy costs on production costs and other key performance indicators (where data available)
4. Comparison with non-EU production sites (where data available)
5. Indirect ETS costs

Methodology

- Data collection based on questionnaires filled in by producers
 - 78 received, 65 were used either in the Sector Reports or in the cross-sectoral analysis
 - 24 further questionnaires from the aluminium and steel sectors were used in the cross-sectoral analysis
- Data validation
 - Plausibility checks
 - Electricity and natural gas bills (when available)
 - Data sources from third parties
- Strict compliance with confidentiality
 - Anonymised, aggregated and/or indexed data presentation
↔ no data can be attributed to any specific plant
- Criteria for establishing the samples: geographical, plant capacity, technology & size (SMEs and large companies)

Caveats

1. Industry self-reporting & sample choice & representativeness
2. Not all revenue streams may be reported (e.g. waste energy, demand responses payments etc.)
3. Validation
4. Margins
5. Period chosen: 2010-2012
6. Timeline

Some key findings

- Bigger than expected differences across member states
- Differences according to consumption level
- Separate drivers for gas and electricity
- Power prices are driven by RES costs (fees & levies) but often/sometimes compensated for by exemptions and
.... mitigated by overcapacity and renewables merit order effect
- Impact on margins not clear across sectors
- Some trends but devil is (often) in detail

Some key findings (cont'd)

Aluminum and steel

- Cumulative cost of **EU** regulation not excessive but energy policy matters
 - Aluminium: depending on power supply contracts.
(Power price is key!)
 - Steel: when margins are low any cost increase hurts
(Margins are key!)




Composition and drivers of energy prices and costs in energy intensive industries: Cross-sectoral analysis

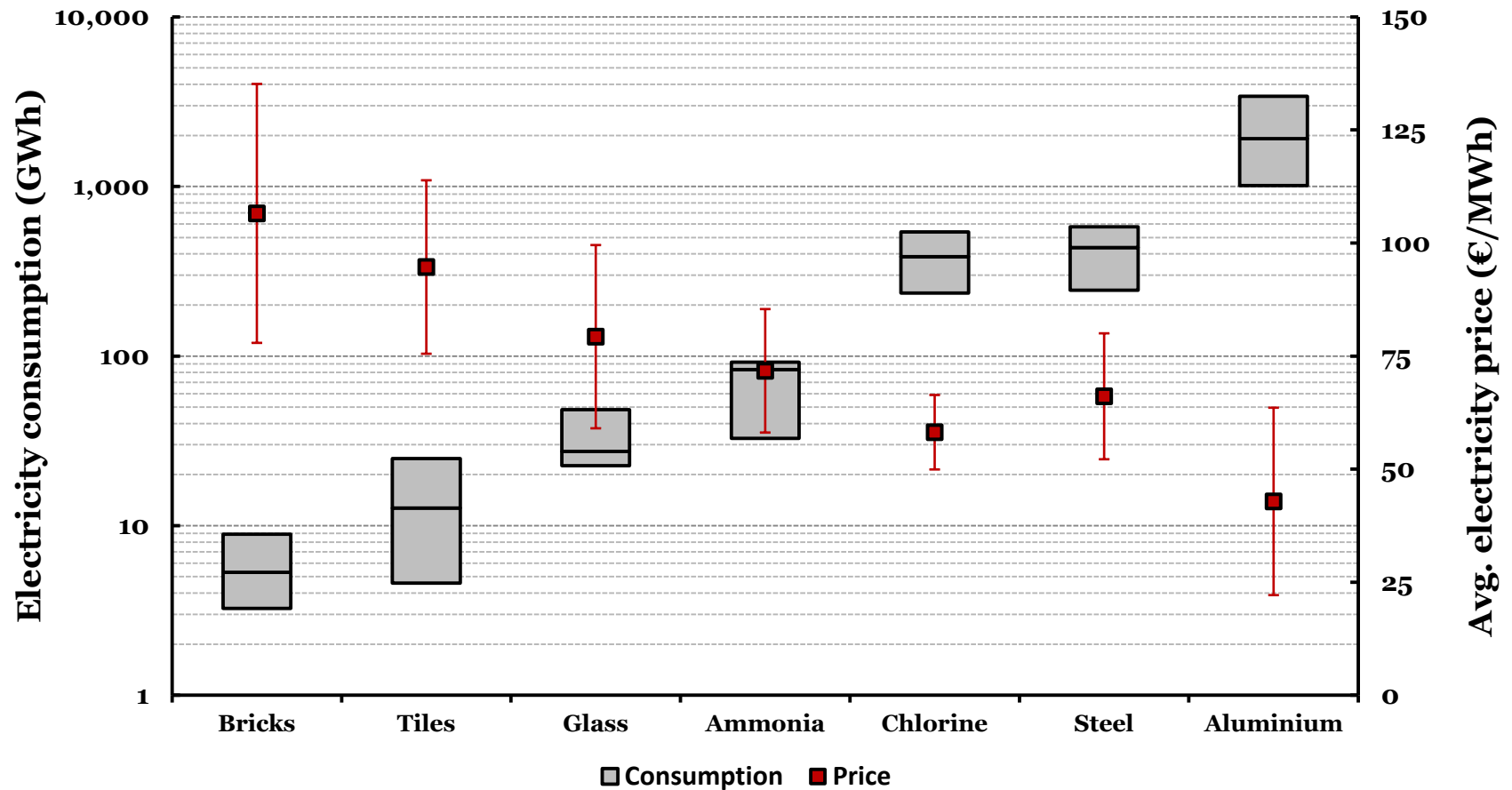
Dr. Fabio Genoese

CEPS, Brussels 26 February 2014

Cross-sectoral analysis

- Sector reports reflect general regional trends but what about the situation in member states?
 cross-sectoral analysis
- Data from all plants in all sectors used
- For four member states (DE, IT, ES, PL) sufficiently large number of questionnaires to allow country-specific analysis
- Focus on electricity

Electricity consumption and price variations grouped by sector (89 facilities)



Sector comparison

Observations:

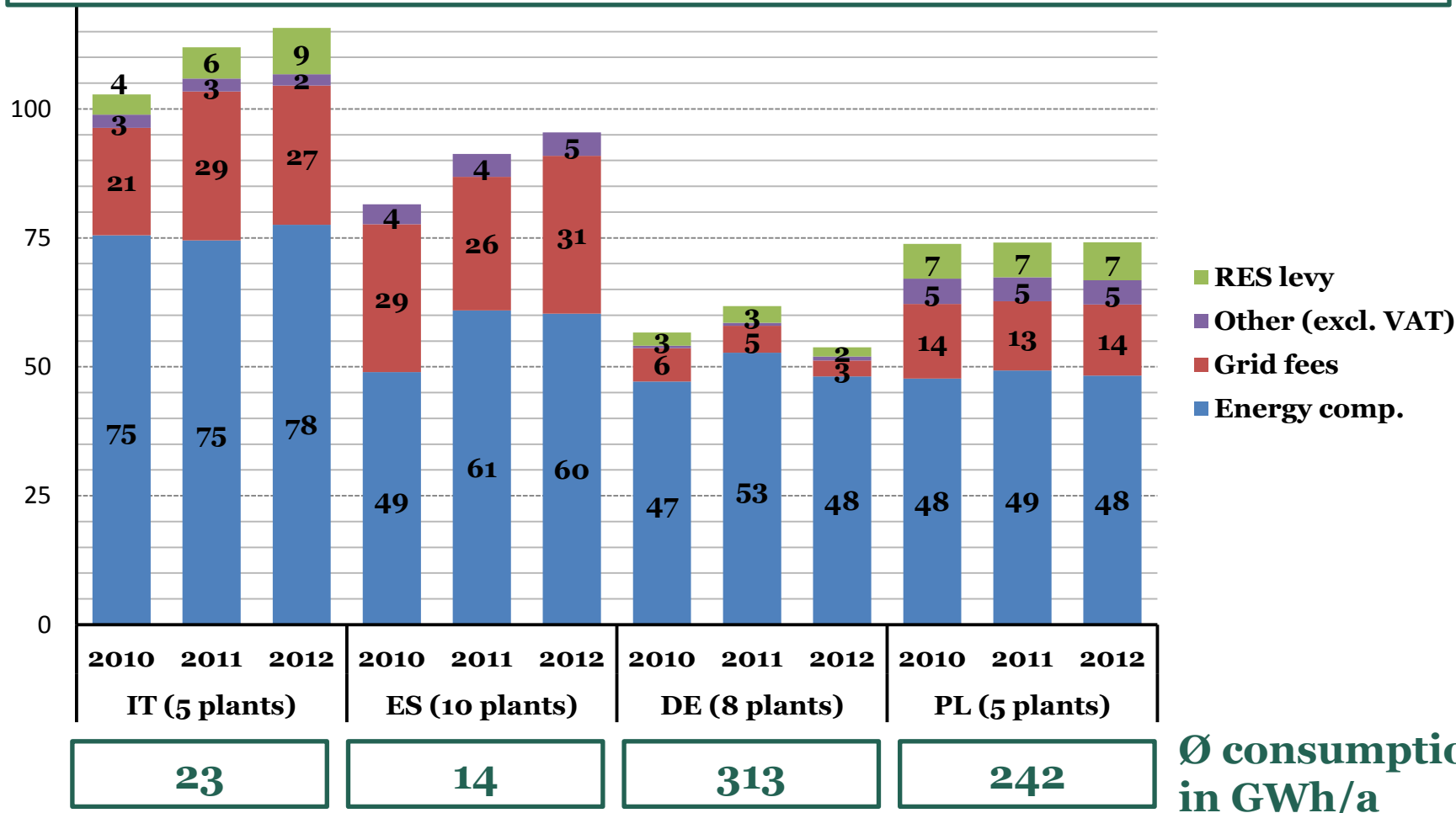
- Increasing consumption levels are accompanied by decreasing power prices
- Ø consumption: ~360 times higher in Aluminium than in Ceramics
- Ø price: ~43 €/MWh (Aluminium) vs. ~64 €/MWh Ceramics

Possible reasons:

- More favourable supply contracts (e.g. long-term contracts that had been negotiated when the level of prices was lower)
 - Discounts for large-scale consumers
 - Different level of levies and taxes (incl. exemptions for large-scale consumers)
- ⇔ National analysis of cost structure required
(sufficient number of questionnaires for 4 member states)

Structure of electricity costs in Italy, Spain, Germany and Poland in absolute terms (€/MWh)

Included: exemptions from levies/taxes



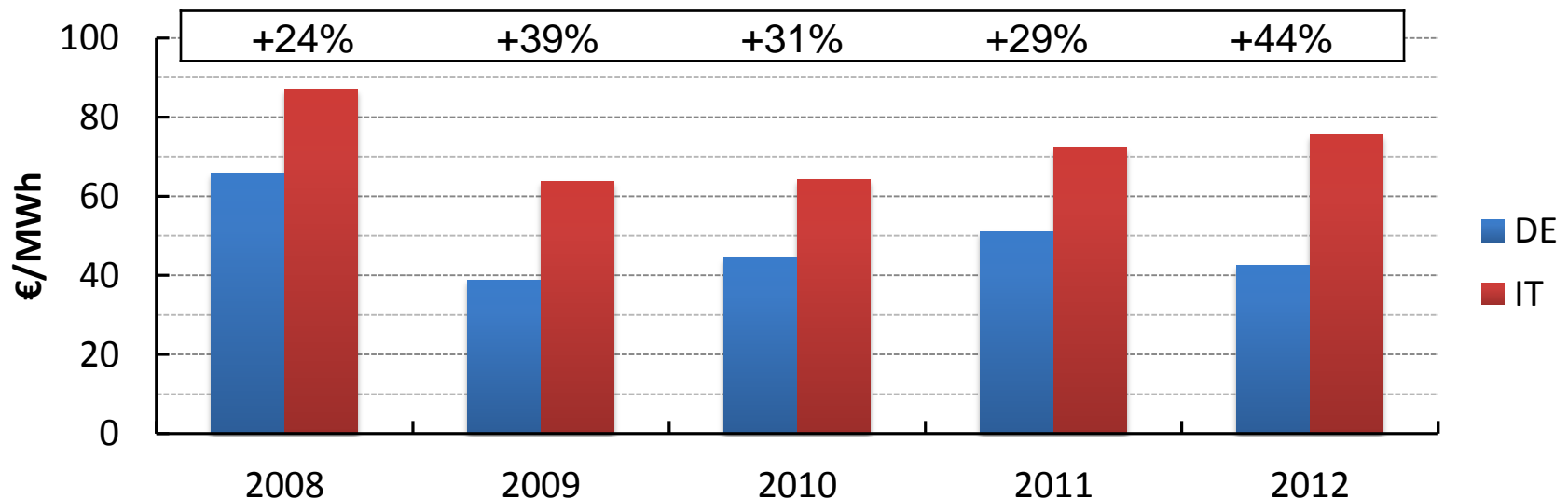
Ø consumption
in GWh/a

Key messages of the cross-sectoral analysis

#1: Internal Energy Market is not complete

- Significant differences – even in the energy component.
- Energy component: linked to wholesale market prices

Wholesale electricity market prices: Germany vs. Italy



Key messages of the cross-sectoral analysis

**#2: Internal Wholesale
Energy Market
≠
Internal Energy Market**

- Market coupling only affects wholesale market prices
- Increasing importance to look at all cost components





Composition and drivers of energy prices and costs in energy intensive industries: The case of the chemical industry

Vasileios Rizos

CEPS, Brussels 26 February 2014

Ammonia

- EU-27 ammonia production is spread over 17 different member states and 42 production plants
- Sample includes 10 plants from 10 different member states
 - Sample represents about 27% of the total EU-27 capacity
- Data aggregated together per three major EU geographical regions (Southern Europe, Western Northern Europe & Eastern Europe)

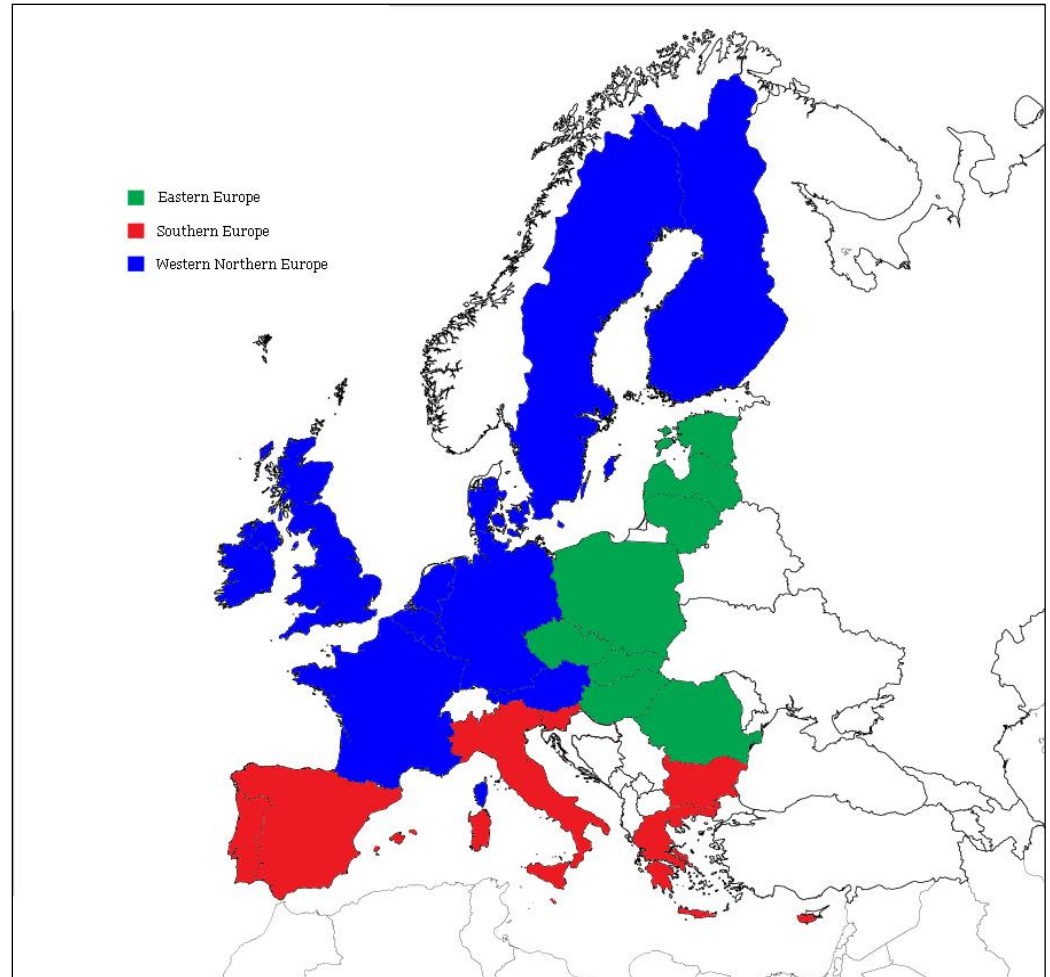
Ammonia

Data aggregated and allotted to three major regions:

Southern Europe:
12% of EU capacity



Western Northern Europe:
65% of EU capacity

Eastern Europe:
23% of EU capacity



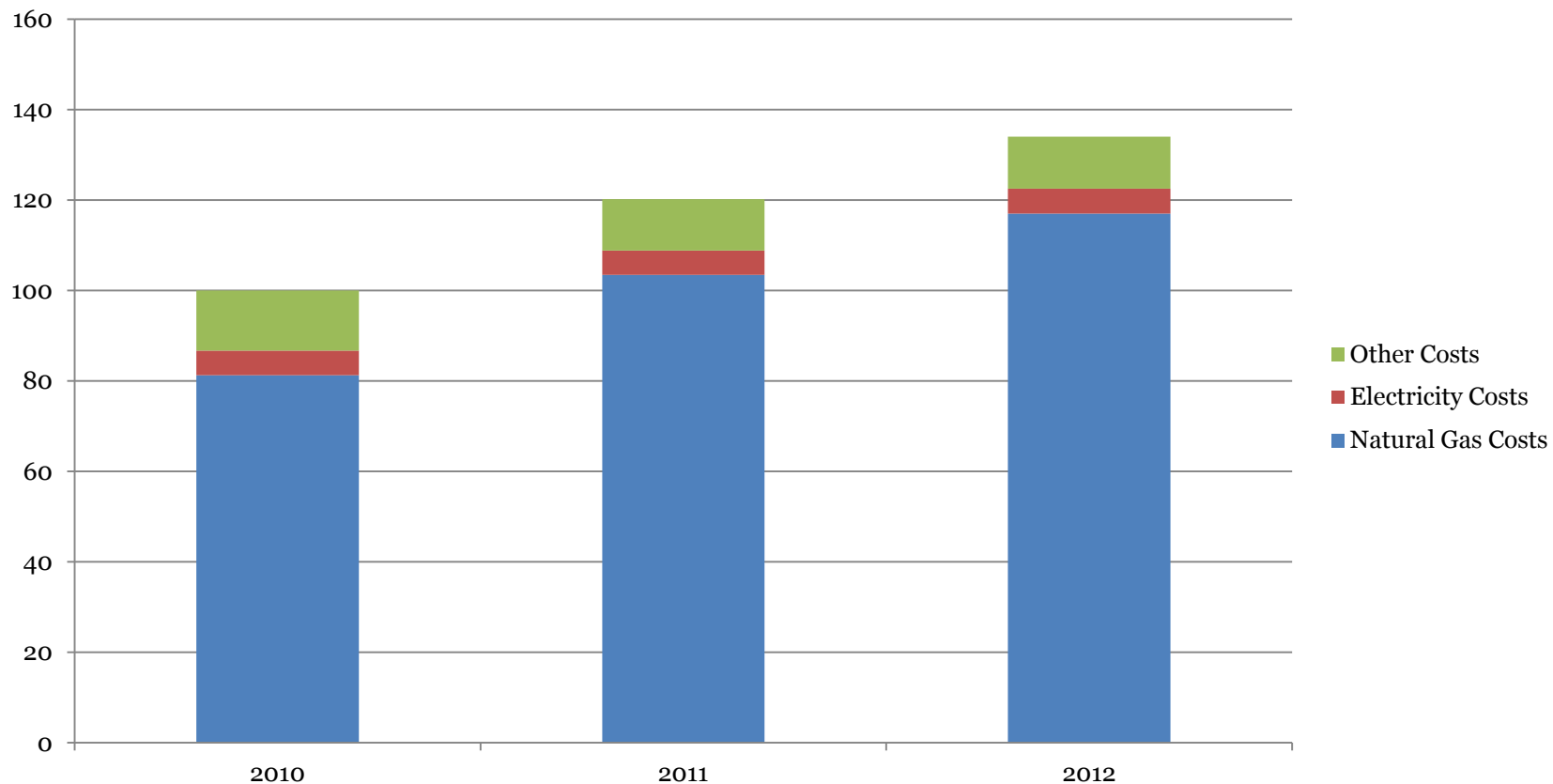
Ammonia

Energy sources

- **Natural gas**  90-94% of total energy costs
- **Electricity**  4-8% of total energy costs
- Focus on natural gas

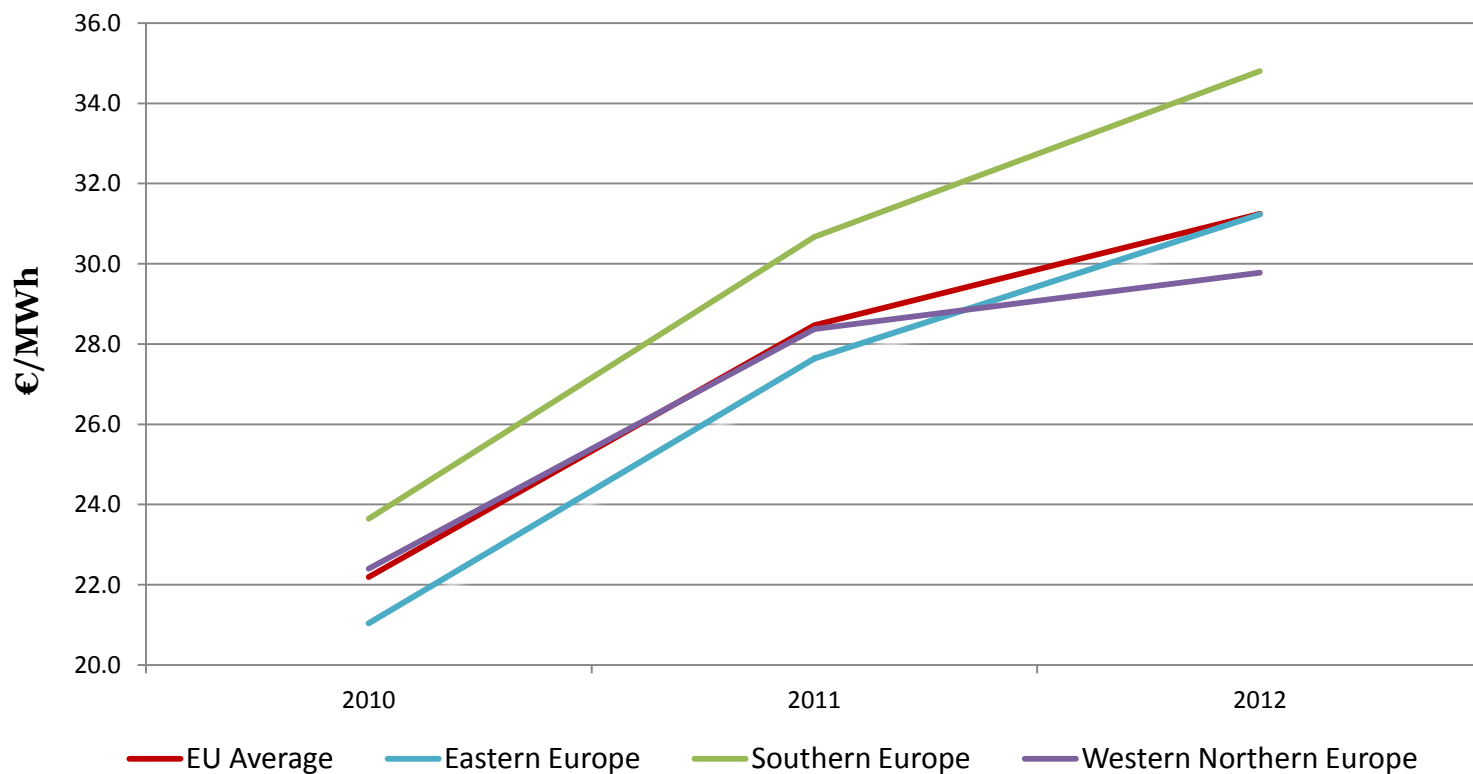
Ammonia

Total production costs of sampled EU ammonia producers (indexed)



Ammonia

Natural gas prices paid by sampled EU ammonia producers (€/MWh)



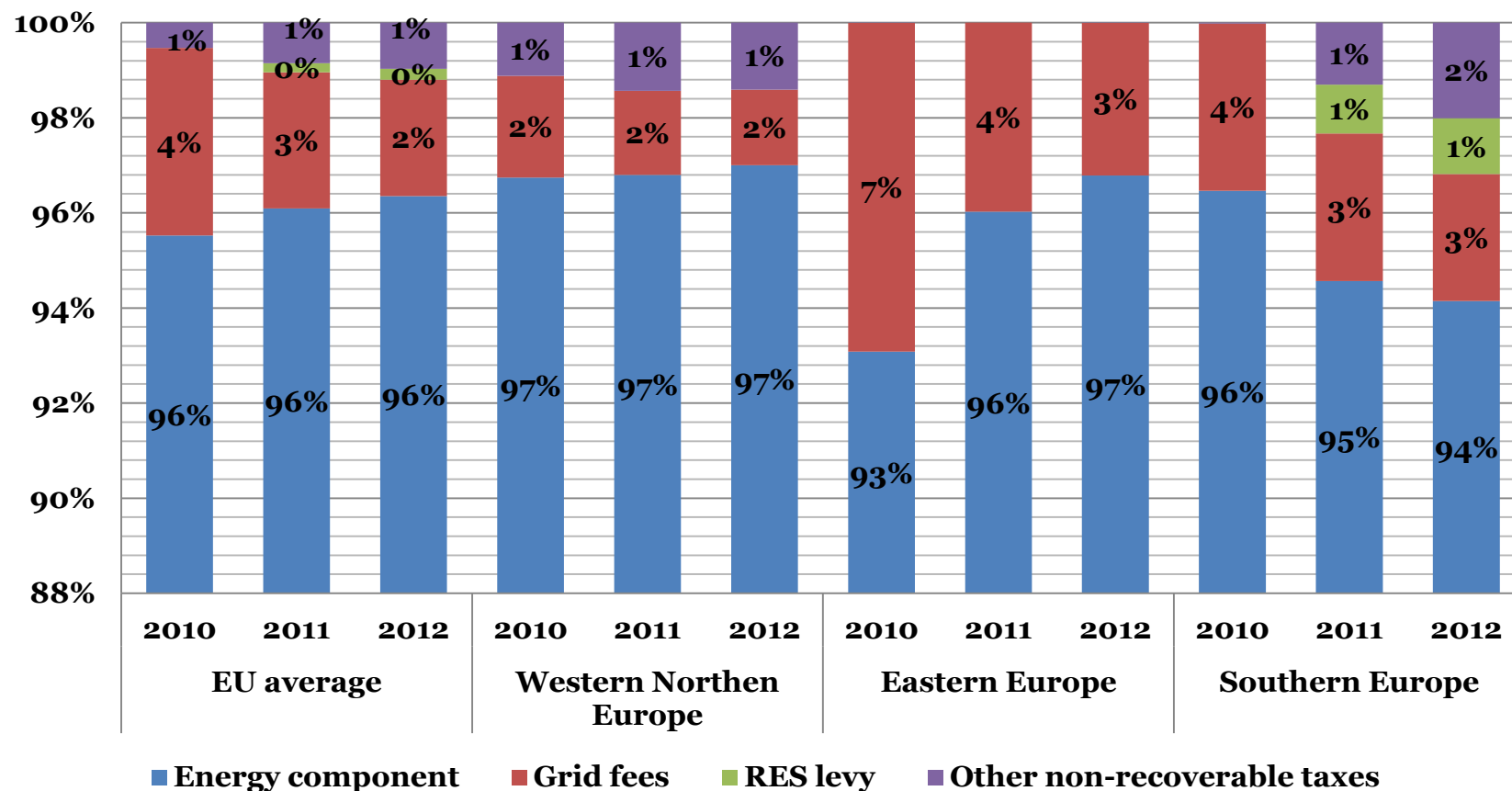
Ammonia

Descriptive statistics for natural gas prices paid by sampled EU ammonia producers, (€/MWh)

	2010	2011	2012
EU (average)	22.2	28.5	31.2
Eastern Europe (average)	21	27.6	31.2
Southern Europe (average)	23.6	30.7	34.8
Western Northern Europe (average)	22.4	28.4	29.8

Ammonia

Components of the natural gas bill paid by sampled EU ammonia producers (in %)



Chlorine

- EU production is spread across 19 different member states and 72 production plants
- Sample includes 9 plants and represents about 12% of the total EU-27 capacity
- Three major regions used for data aggregation: Southern Western Europe, Central Northern Europe and Southern Eastern Europe

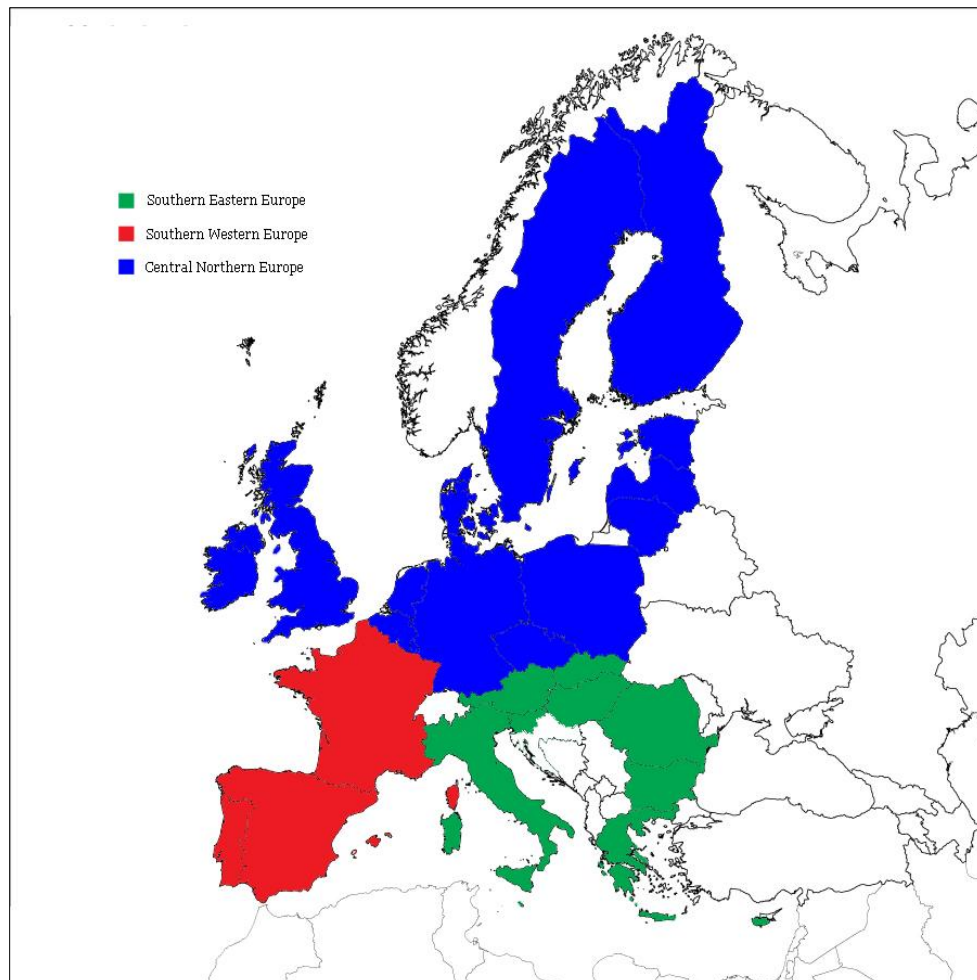
Chlorine

Data aggregated and allotted to three major regions:

Southern Western Europe:
19% of EU capacity (3 plants)


Central Northern Europe:
70% of EU capacity (6 plants)

Southern Eastern Europe:
11% of EU capacity



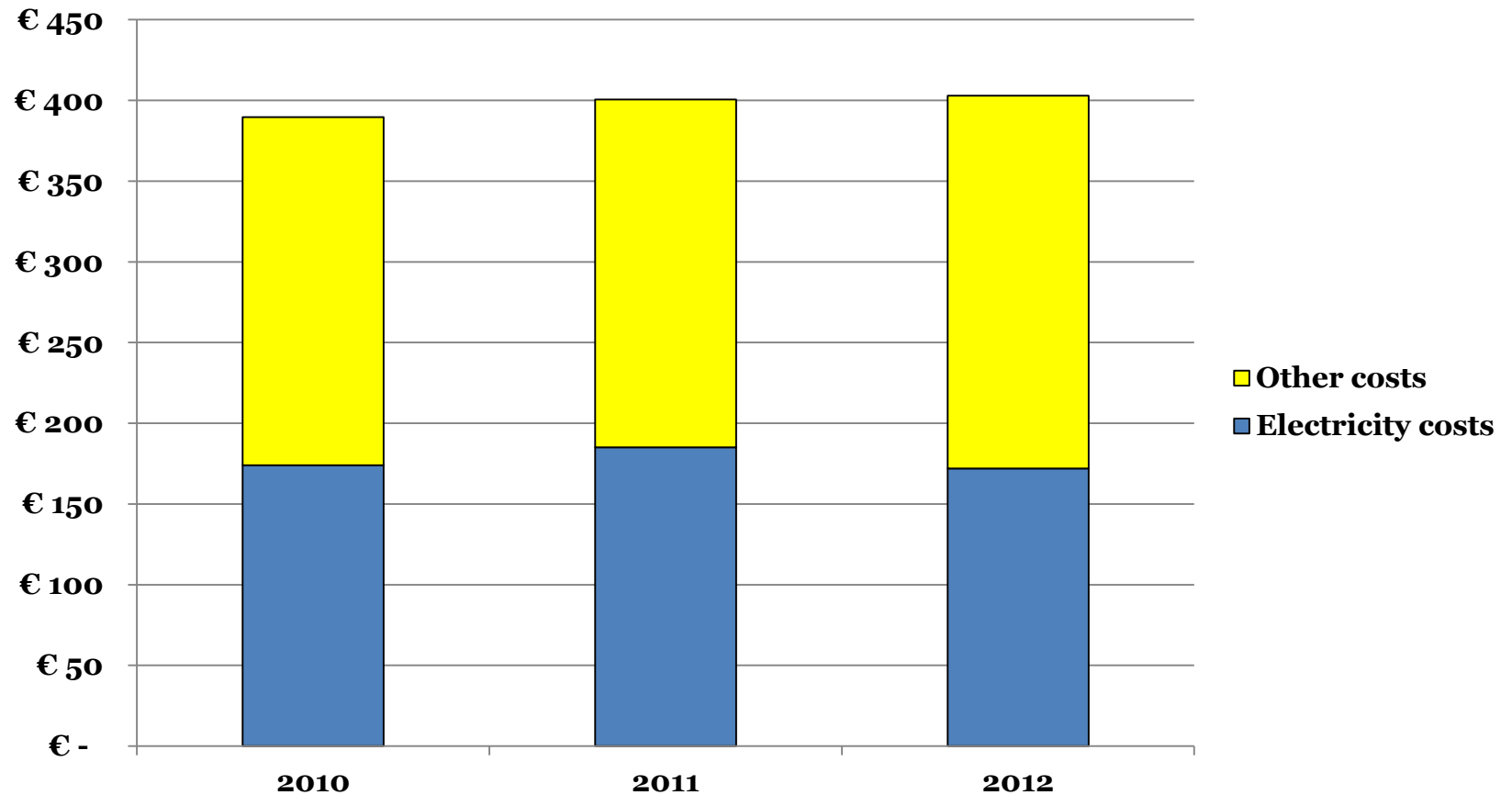
Chlorine

Energy sources

- **Electricity**  91% of total energy costs
- Focus on electricity

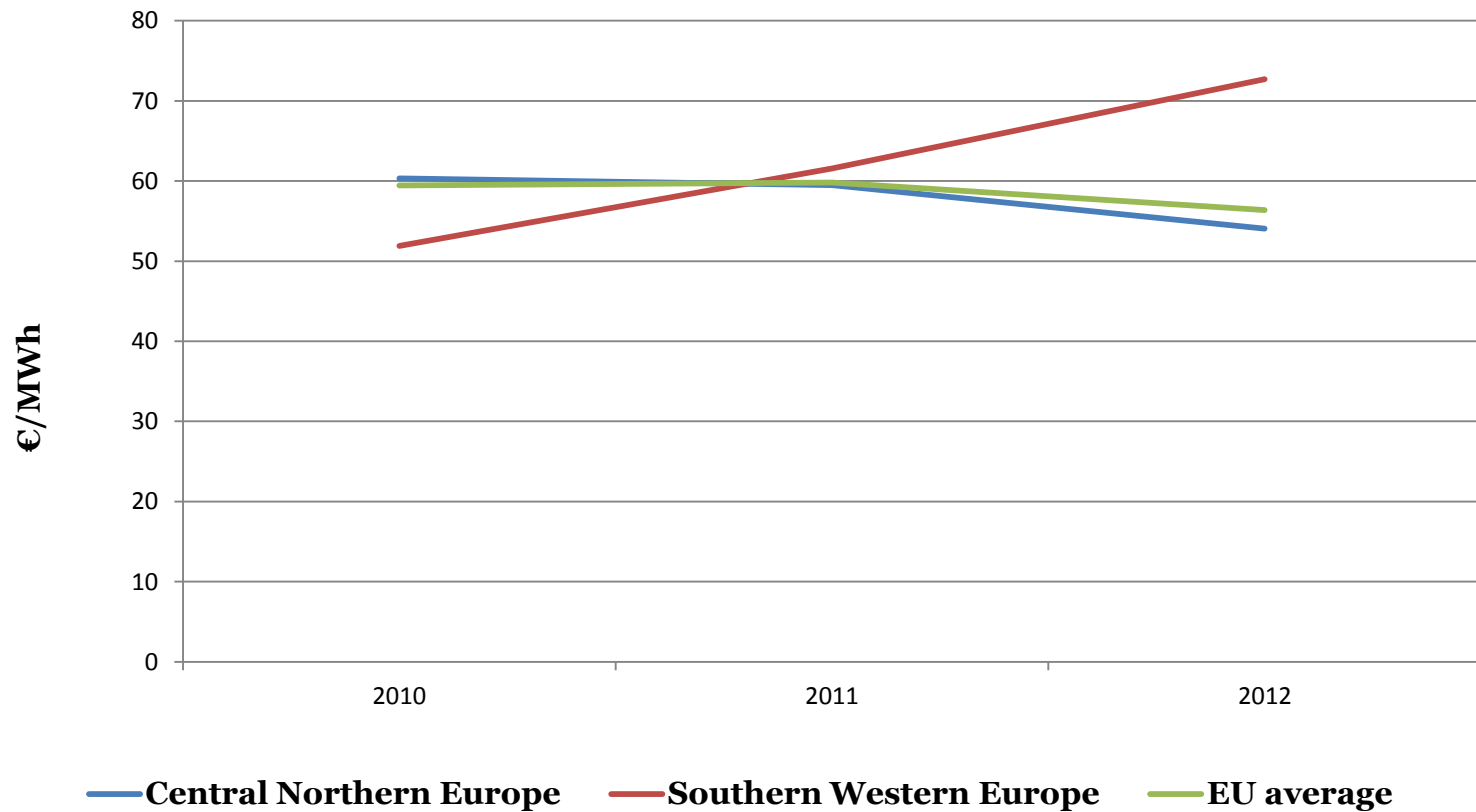
Chlorine

Total production costs of sampled EU chlorine producers (€/tonne)



Chlorine

Electricity prices paid by sampled EU chlorine producers (€/MWh)



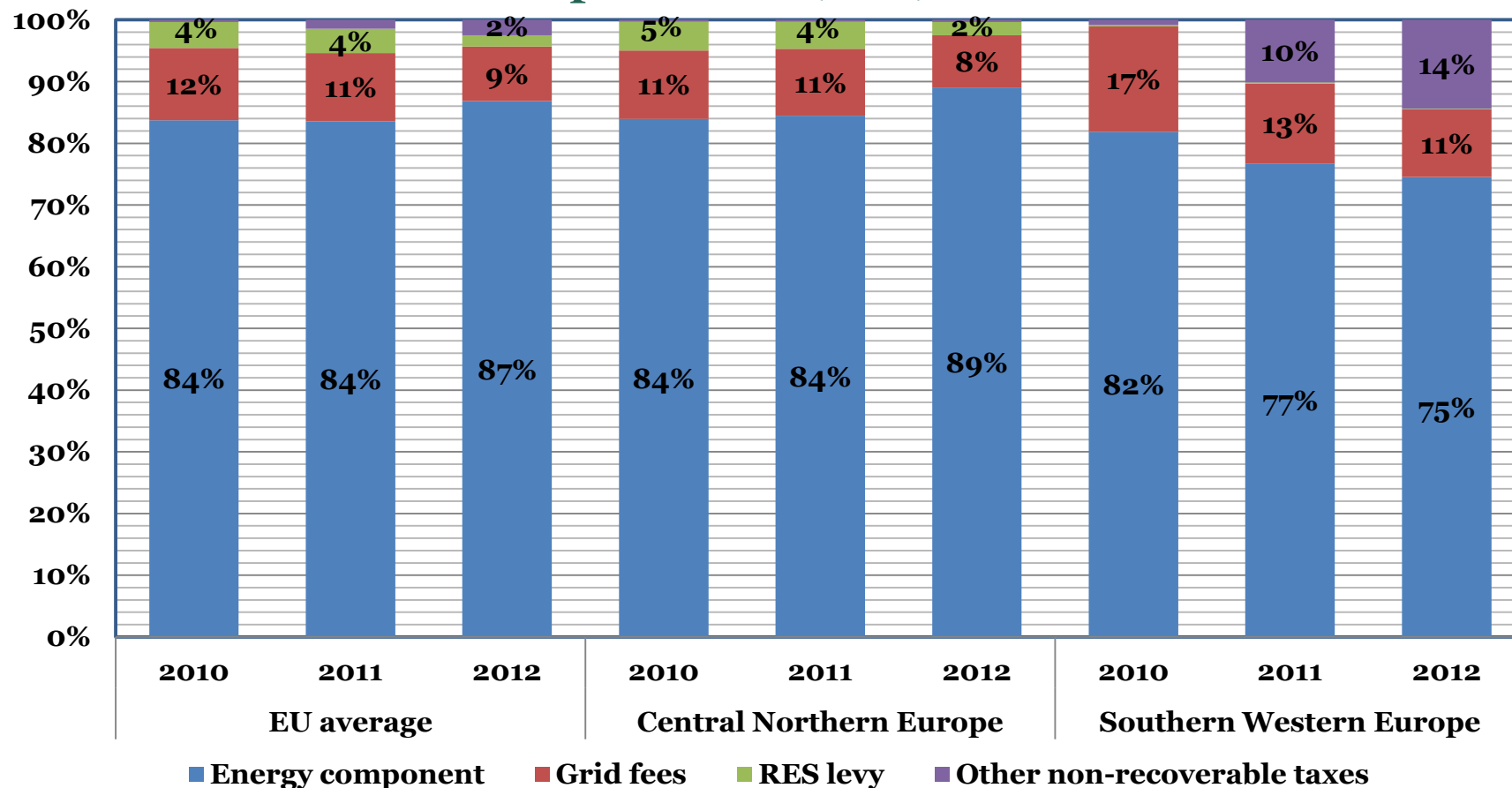
Chlorine

Descriptive statistics for electricity prices paid by sampled EU chlorine producers, (€/MWh)

	2010	2011	2012
EU (average)	59.4	59.8	56.4
Southern Western Europe (average)	51.9	61.5	72.7
Central Northern Europe (average)	60.3	59.5	54.1

Chlorine

Components of the electricity bill paid by sampled EU chlorine producers (in %)





Composition and drivers of energy prices and costs in energy intensive industries: the case of the flat glass industry

Susanna Roth

CEPS, Brussels 26 February 2014

Flat glass

- **Float** glass dominates flat glass production (95% of EU total production). The sample only includes float glass producers.
- EU-27 float glass production is spread over 12 member states. 46 plants are operating in the EU.
- Sample includes 10 plants from 8 member states
- The sample represents about 19% of European capacity
- Data aggregated together per three major EU geographical regions (Southern Europe, Western Europe & Eastern Europe)

Flat glass

Data aggregated and allotted to three major regions:

Western Europe:

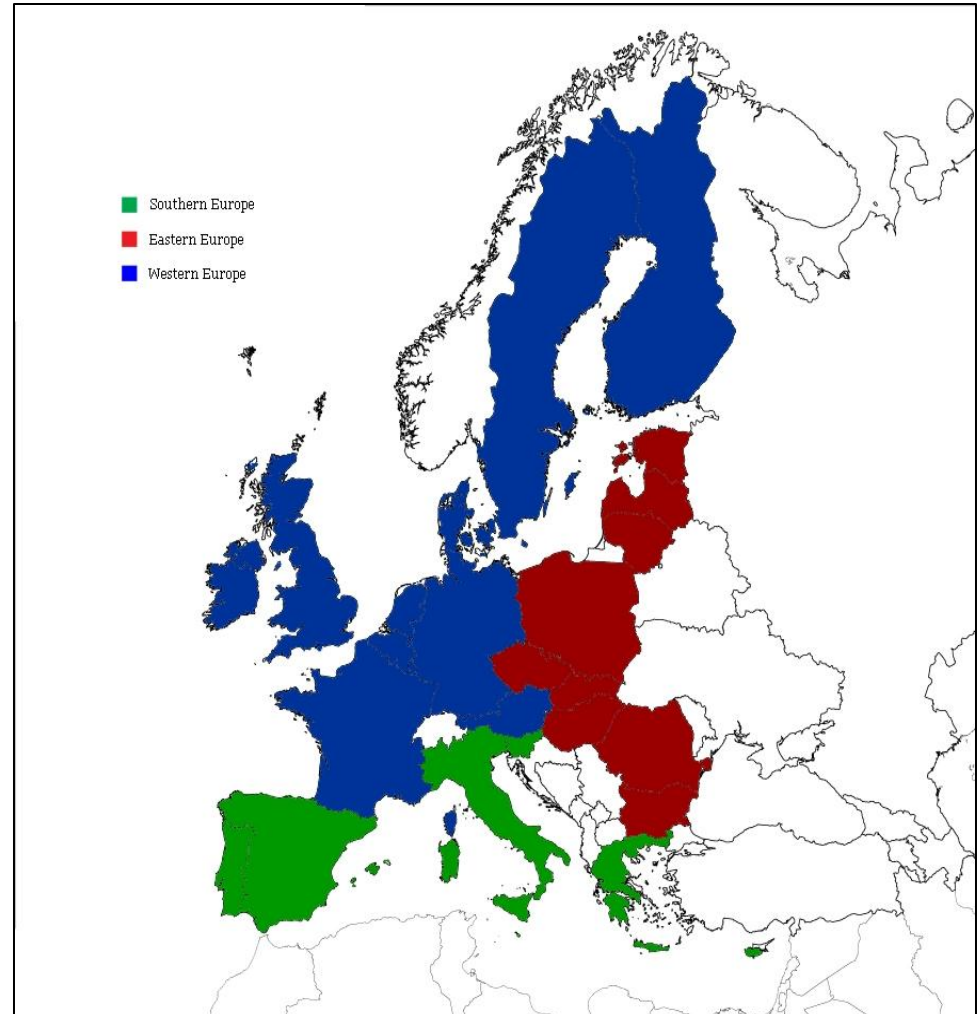
54% of EU float glass plants (6 plants in sample)

Eastern Europe:

24% of EU float glass plants (2 plants in sample)

Southern Europe:

22% of EU float glass plants (2 plants in sample)



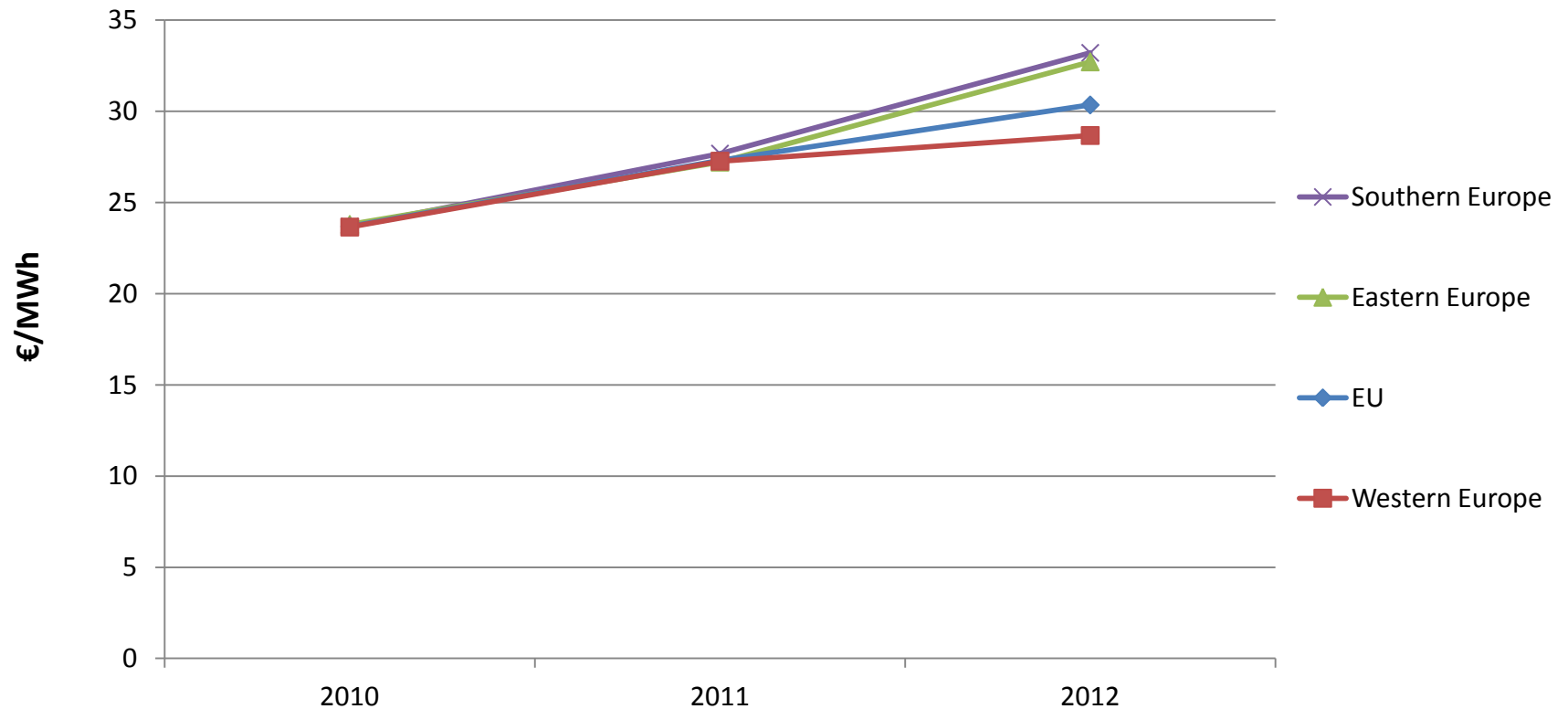
Flat glass

Energy sources:

- Energy costs has on average a share of 37% of total production cost
- **Natural gas** accounts for the majority of energy costs (71%)
- Fuel oil accounts for about 14%
- Electricity accounts for about 15%

Flat glass

**Natural gas prices paid by sampled EU float glass producers
(€/MWh)**



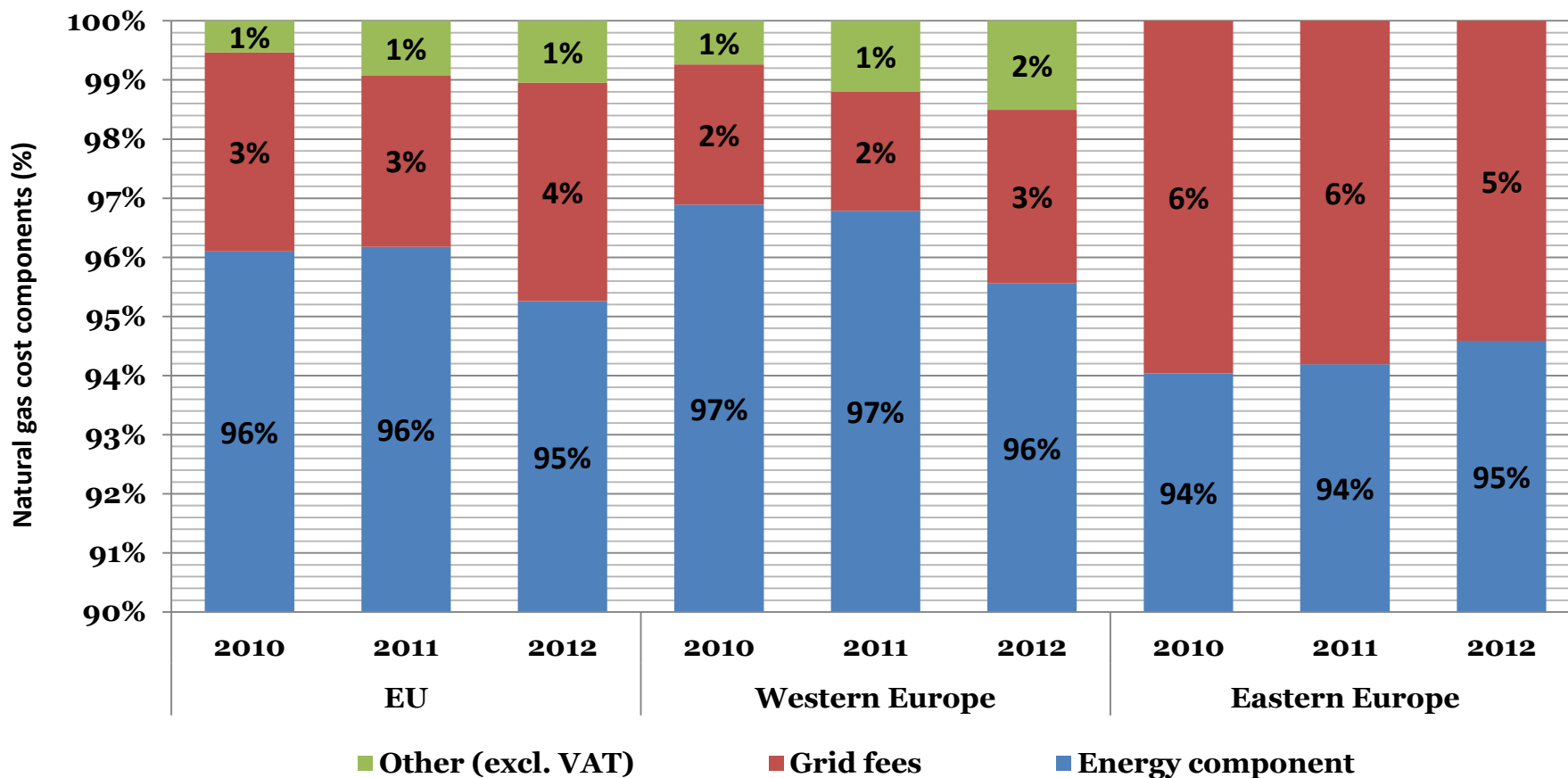
Flat glass

Descriptive statistics for natural gas prices paid by sampled EU float glass producers, (€/MWh)

	2010	2011	2012
EU (average)	23.7	27.3	30.3
Eastern Europe (average)	23.8	27.2	32.7
Southern Europe (average)	23.7	27.7	33.2
Western Northern Europe (average)	23.6	27.3	28.7

Flat glass

Components of the natural gas bill paid by sampled EU float glass producers (in %)





Composition and drivers of energy prices and costs in energy intensive industries: The case of the ceramic industry

Julian Wieczorkiewicz

CEPS, Brussels 26 February 2014

The ceramic industry

Two sub-sectors:

1. Bricks and roof tiles = “bricks”
 2. Wall and floor tiles = “ceramic tiles”
- Bricks → energy = 30-35% of total production costs
 - **Natural gas** has a share of **73-75%** of total energy costs
 - Electricity has a share of 25-27% of total energy costs
 - Ceramic tiles → energy = 17-29% of total production costs
 - **Natural gas** has a share of **66-70%** of total energy costs
 - Electricity has a share of 30-34% of total energy costs

The two sub-sectors are heavily populated by SMEs!

Bricks and roof tiles

Data aggregated and allotted to three major regions:

→ 13 plants

Northern Europe:

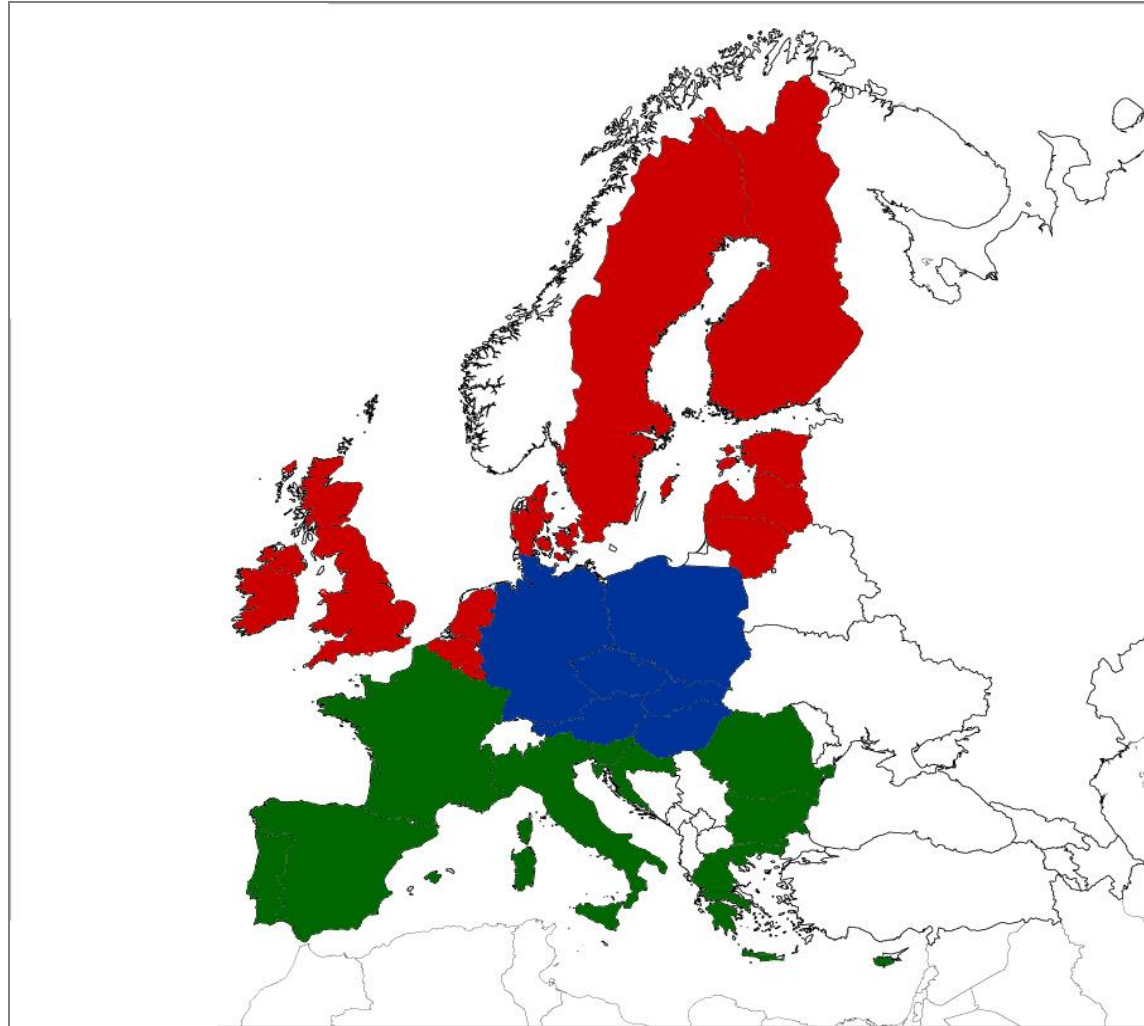
38% of EU production
(5 plants)

Central Europe:

35% of EU production
(3 plants)

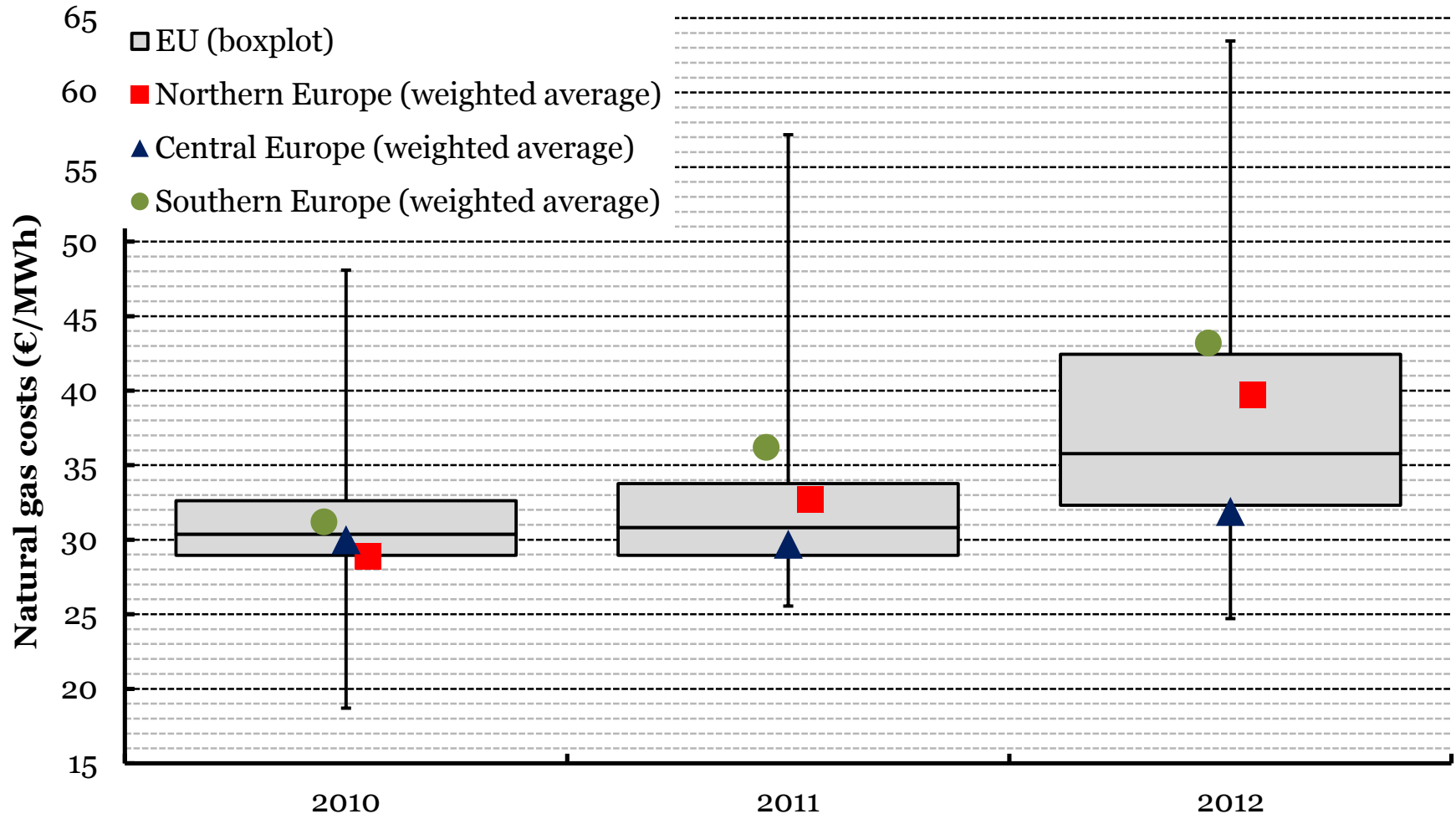
Southern Europe:

27% of EU production
(5 plants)



Bricks and roof tiles - Gas

Prices of natural gas paid by sampled producers (€/MWh)



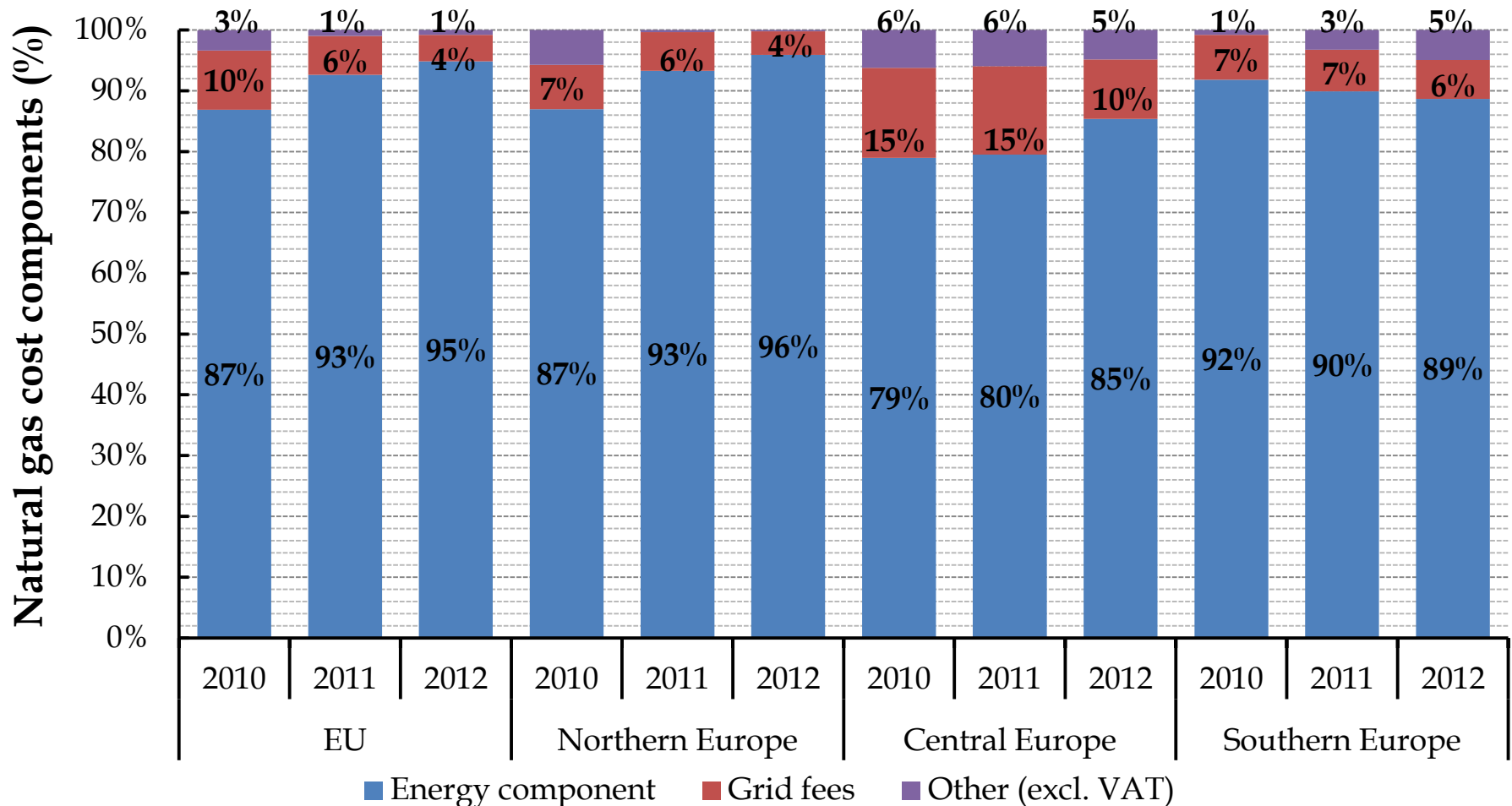
Bricks and roof tiles - Gas

**Descriptive statistics for natural gas prices paid by sampled producers
(€/MWh)**

	2010	2011	2012
EU (average)	30.4	33.2	39.5
Northern Europe (average)	28.9	32.7	39.7
Central Europe (average)	30.0	29.7	31.9
Southern Europe (average)	31.2	36.2	43.2

Bricks and roof tiles - Gas

Components of the natural gas bill paid by sampled producers (in %)



Wall and floor tiles

Data aggregated and allotted to three major regions:

→ 12 plants

Central & Northern Europe:

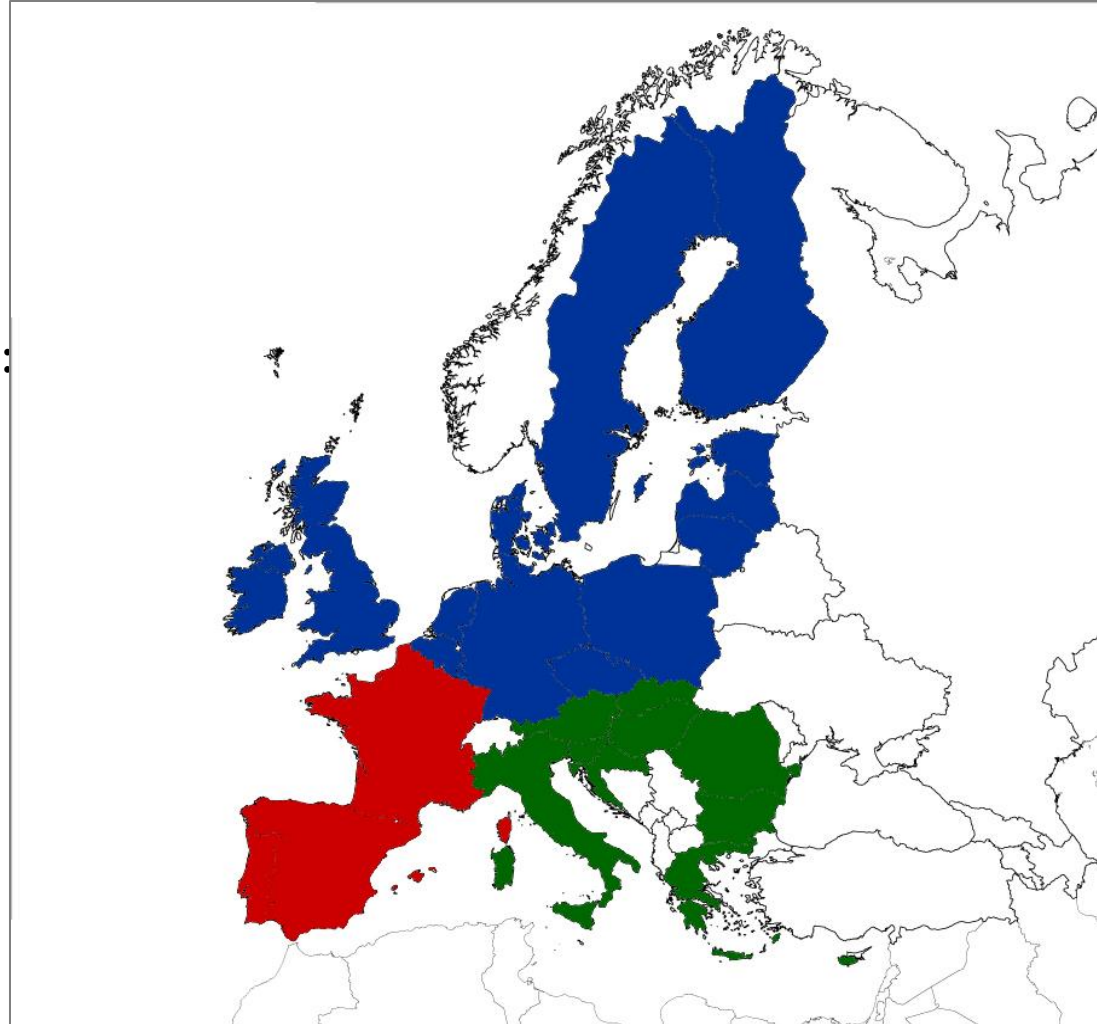
42% of EU production
(5 plants)

South-western Europe:

20% of EU production
(3 plants)

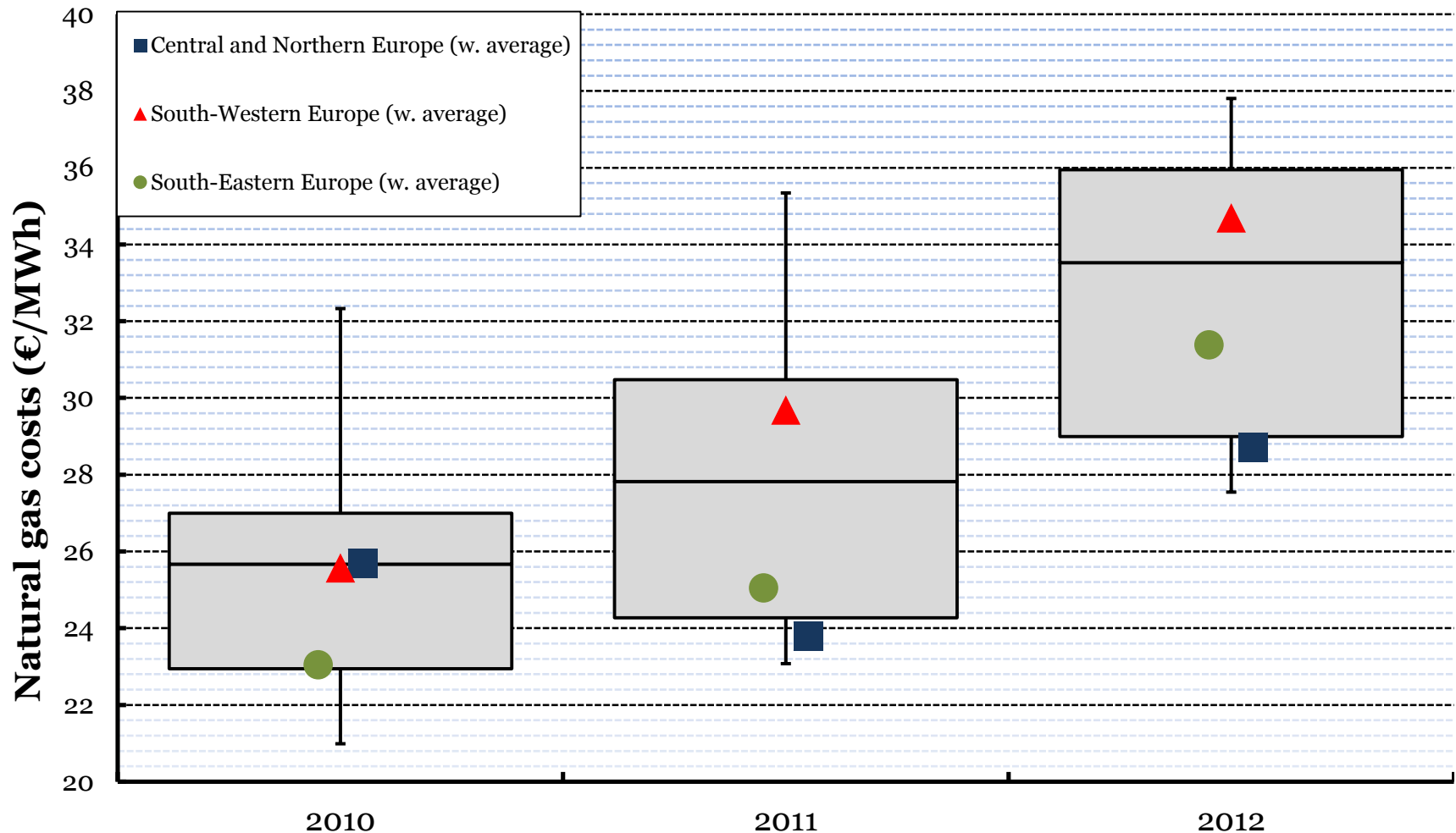
South-eastern Europe:

38% of EU production
(4 plants)



Wall and floor tiles - Gas

Prices of natural gas paid by sampled producers (€/MWh)



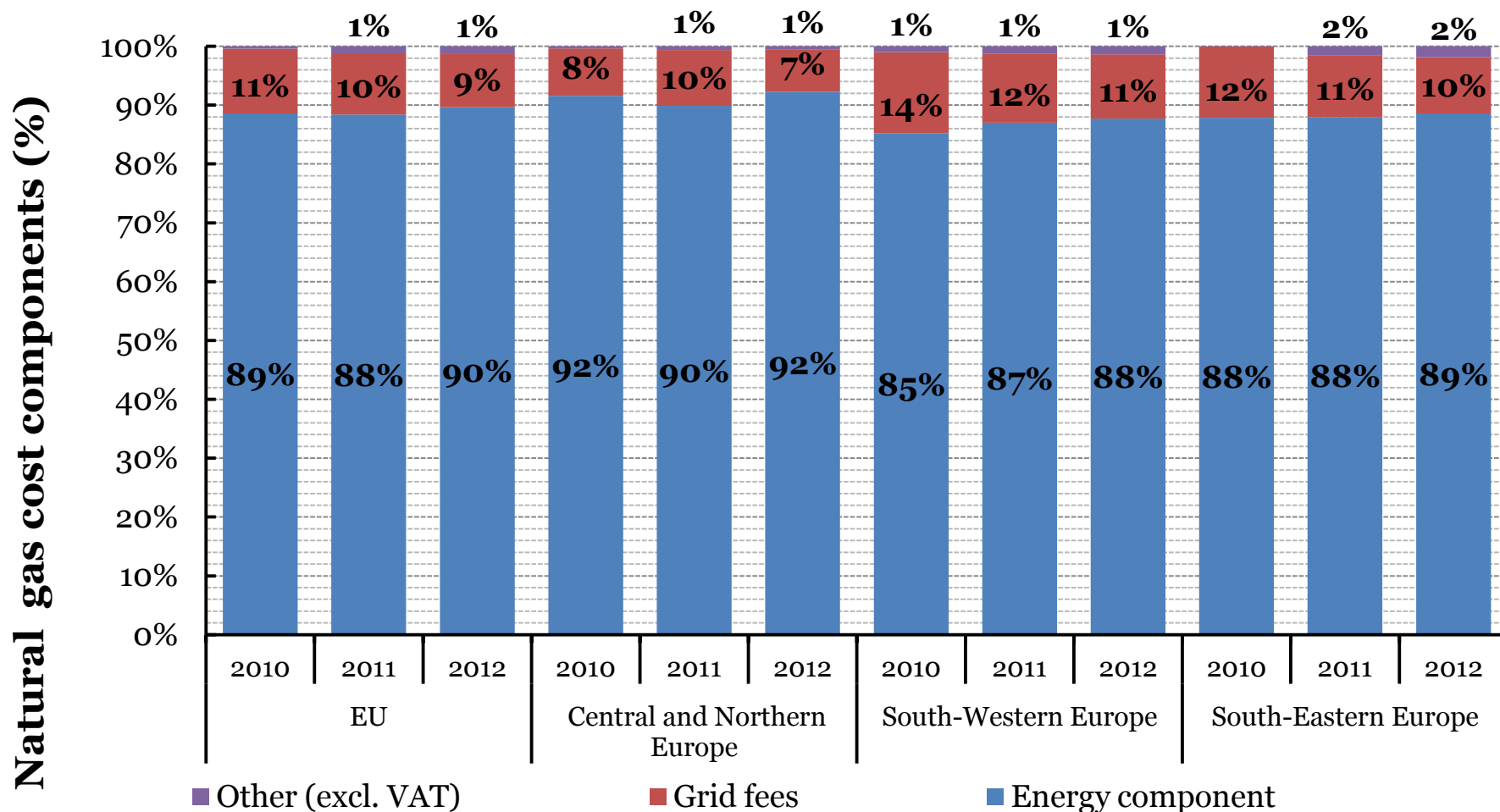
Wall and floor tiles - Gas

Descriptive statistics for natural gas prices paid by sampled producers (€/MWh)

	2010	2011	2012
EU (average)	25.0	26.2	31.7
Central and Northern Europe (average)	25.7	23.8	28.7
South-Western Europe (average)	25.6	29.7	34.7
South-Eastern Europe (average)	23.0	25.0	31.4

Wall and floor tiles - Gas

Components of the natural gas bill paid by sampled producers (in %)





The Steel Industry in the European Union: Composition and drivers of energy prices

Dr. Giacomo Luchetta

CEPS, Brussels 26 February 2014

Steel

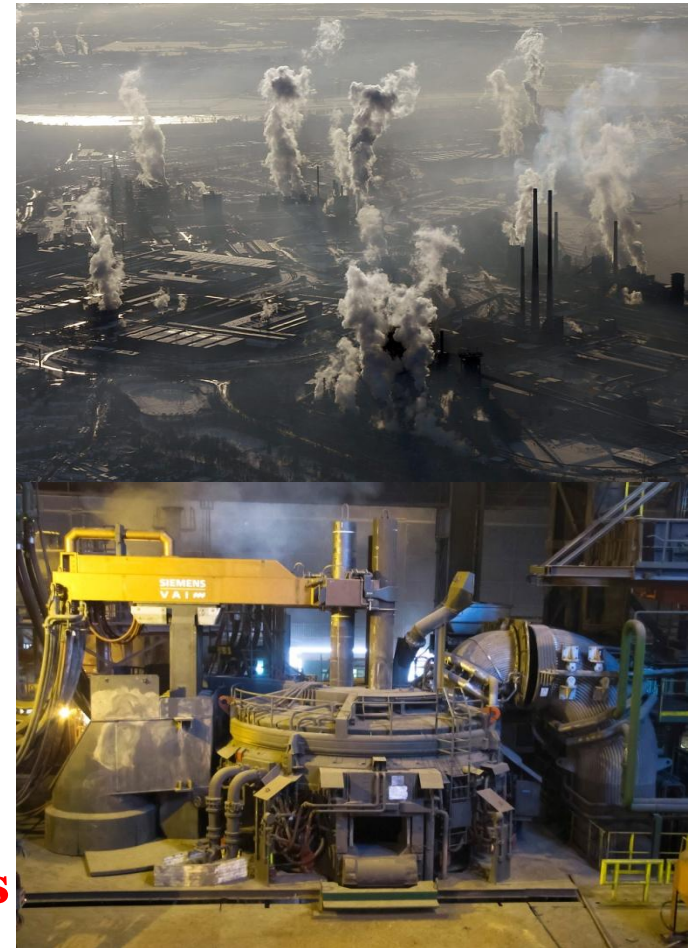
- Steel Production per EU area: NW 59%; CEE 15%; S 26%.
- Sample includes 17 plants from 9 different MSs ~15% of EU crude steel capacity
- Production technologies: **Blast Oxygen Furnace** (58%) and **Electric Arc Furnace** (42%)
- 4 BOF plants; 11 EAF plants; 2 rolling mills
- Plants owned by global players, regional champions, and niche specialists

Electricity costs

EAF 9% of total costs; BOF 4% of total costs

Natural gas costs

EAF 4% of total costs; BOF 1.5% of total costs



Steel

Data aggregated and allotted to three major regions:

Central Eastern Europe:

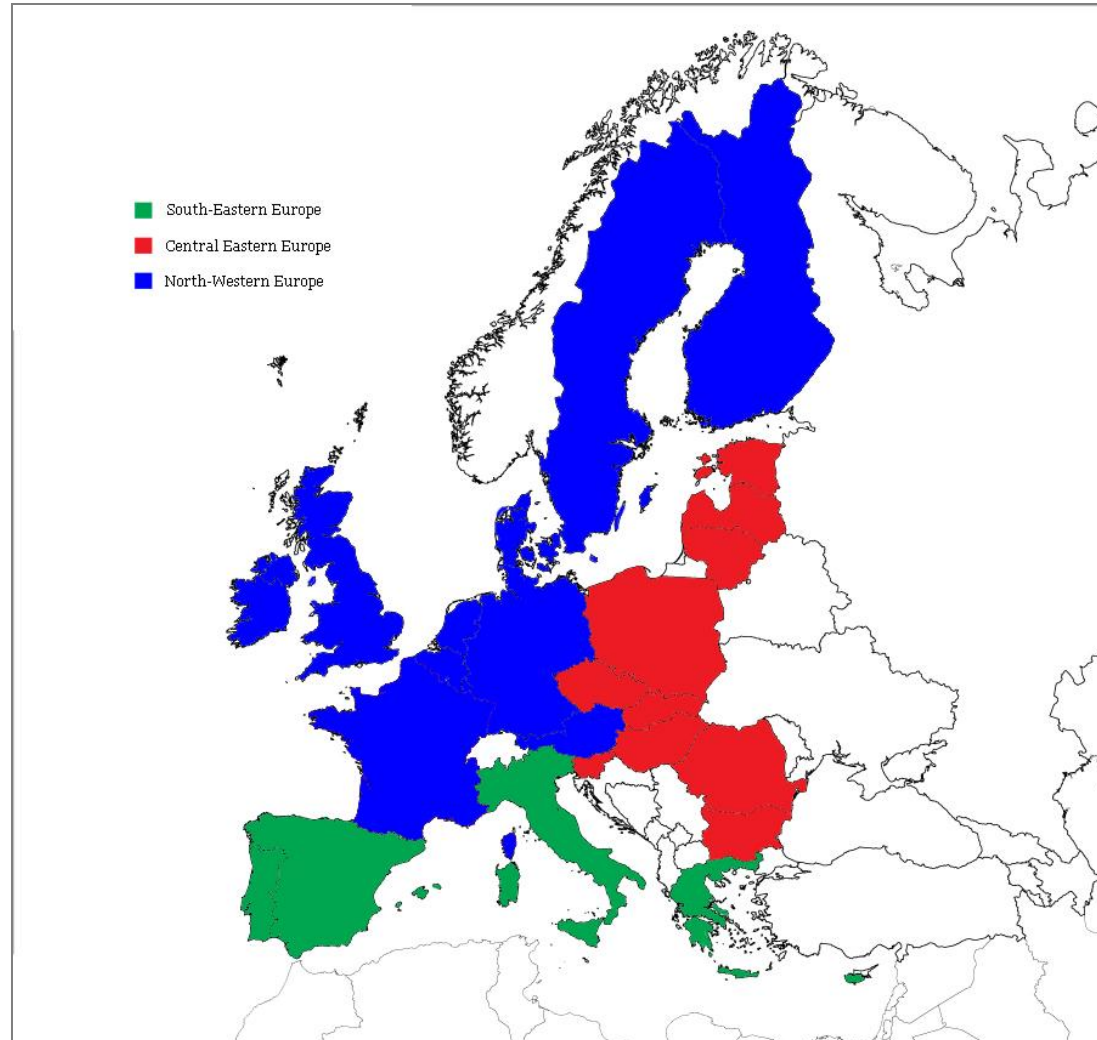
15% of EU crude steel production in 2012 (3 plants in sample)

North-Western Europe:

59% of EU crude steel production in 2012 (9 plants in sample)

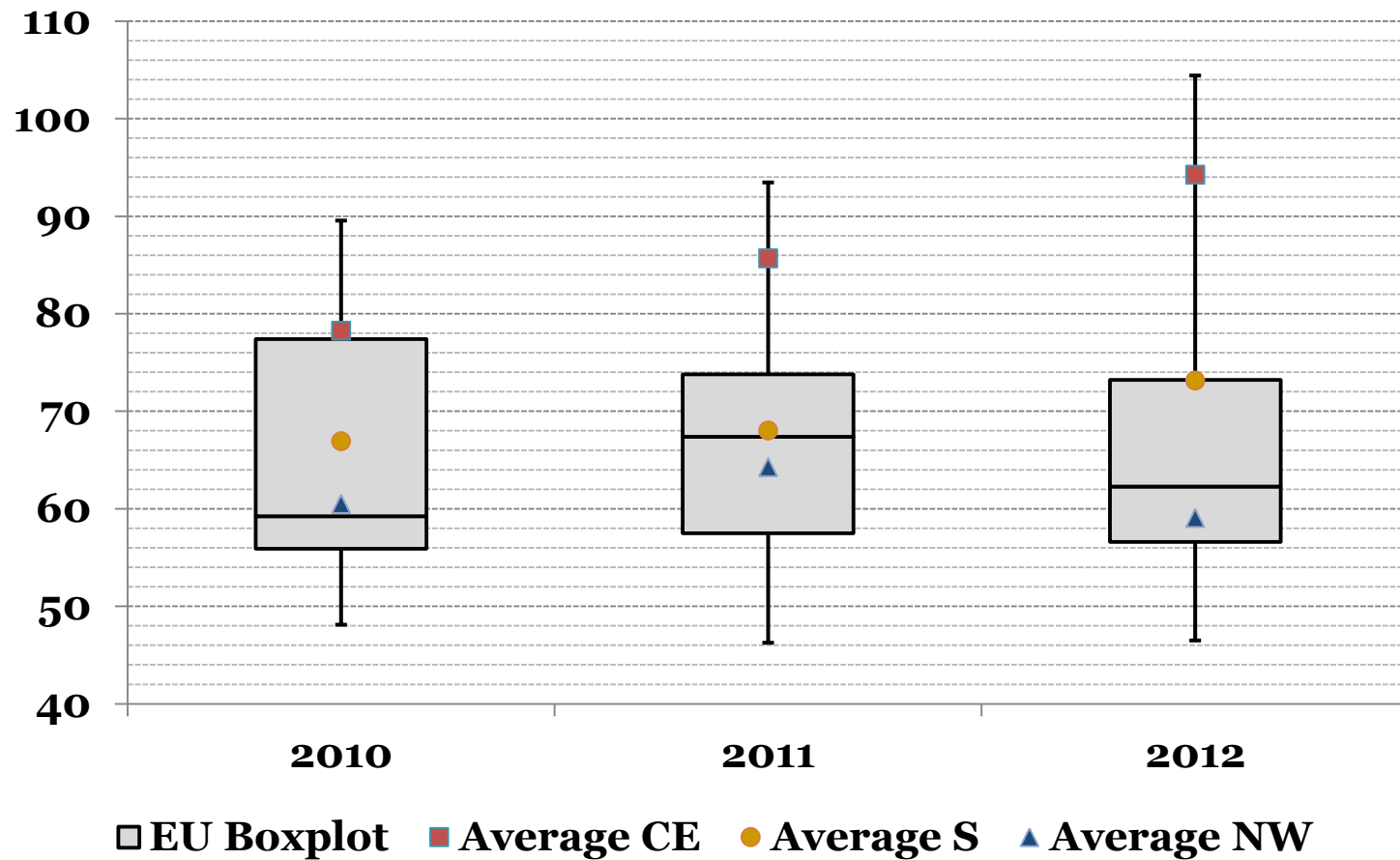
Southern Europe:

26% of EU crude steel production in 2012 (5 plants in sample)



Steel

Electricity prices paid by sampled EU steel producers, (€/MWh)



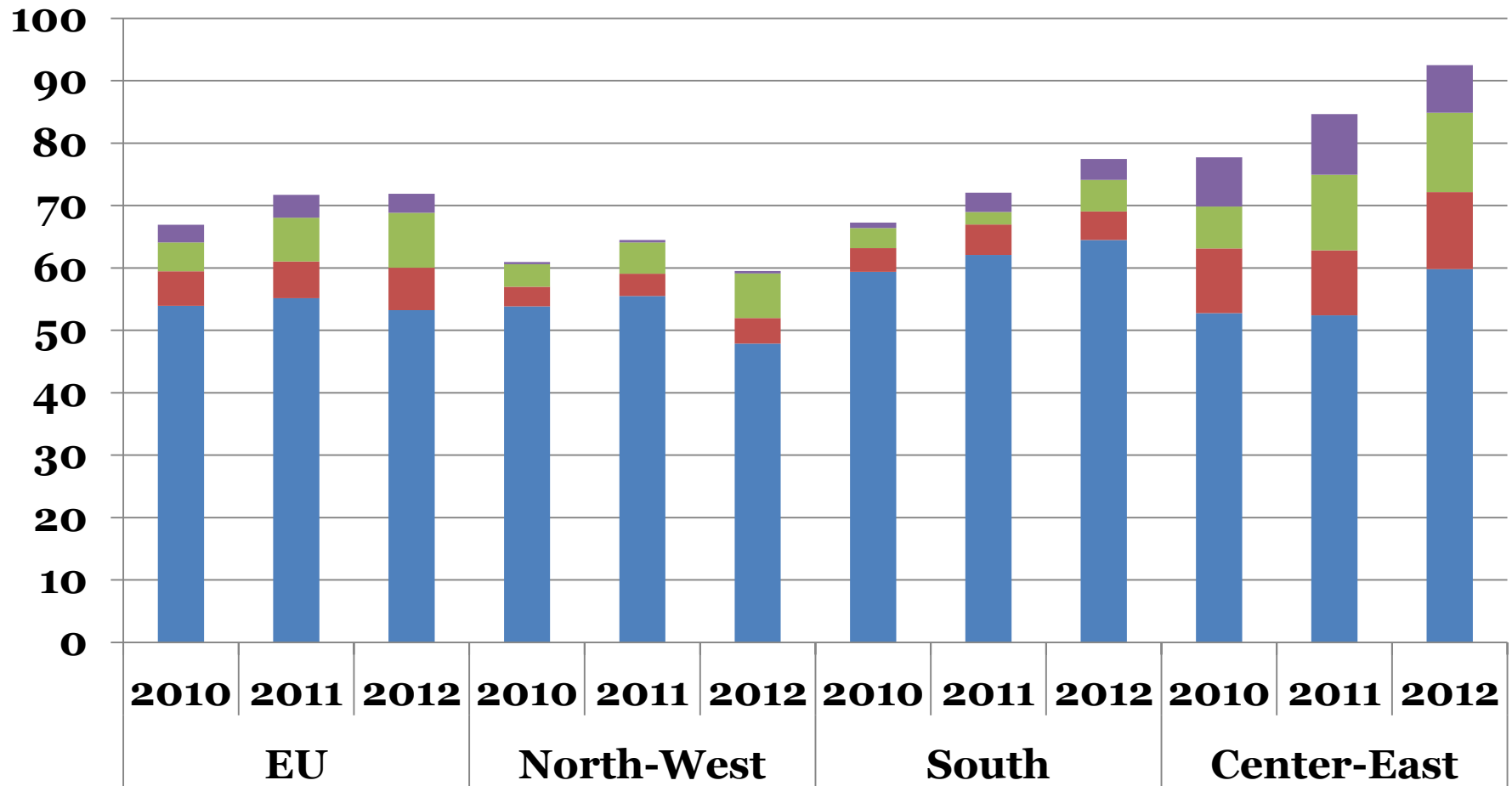
Steel

Descriptive statistics for electricity prices paid by sampled EU steel producers, (€/MWh)

	2010	2011	2012
EU (average)	66.8	71.2	71.4
Central and Eastern EU (average)	77.7	84.7	92.5
Southern EU (average)	67.7	68.8	74.2
North-Western EU (average)	60.7	64.3	59.4

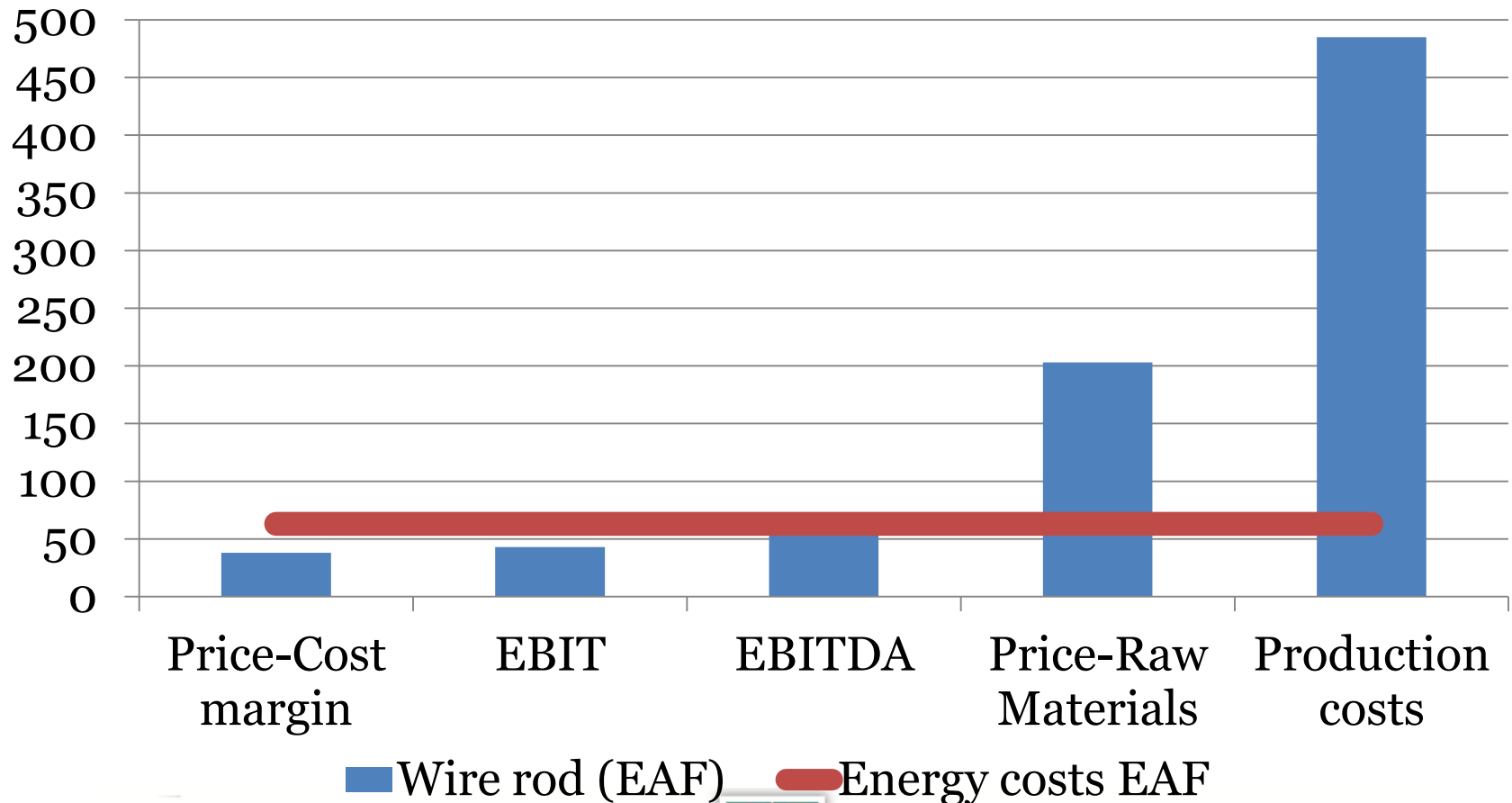
Steel

Components of the electricity bill paid by sampled EU steel producers



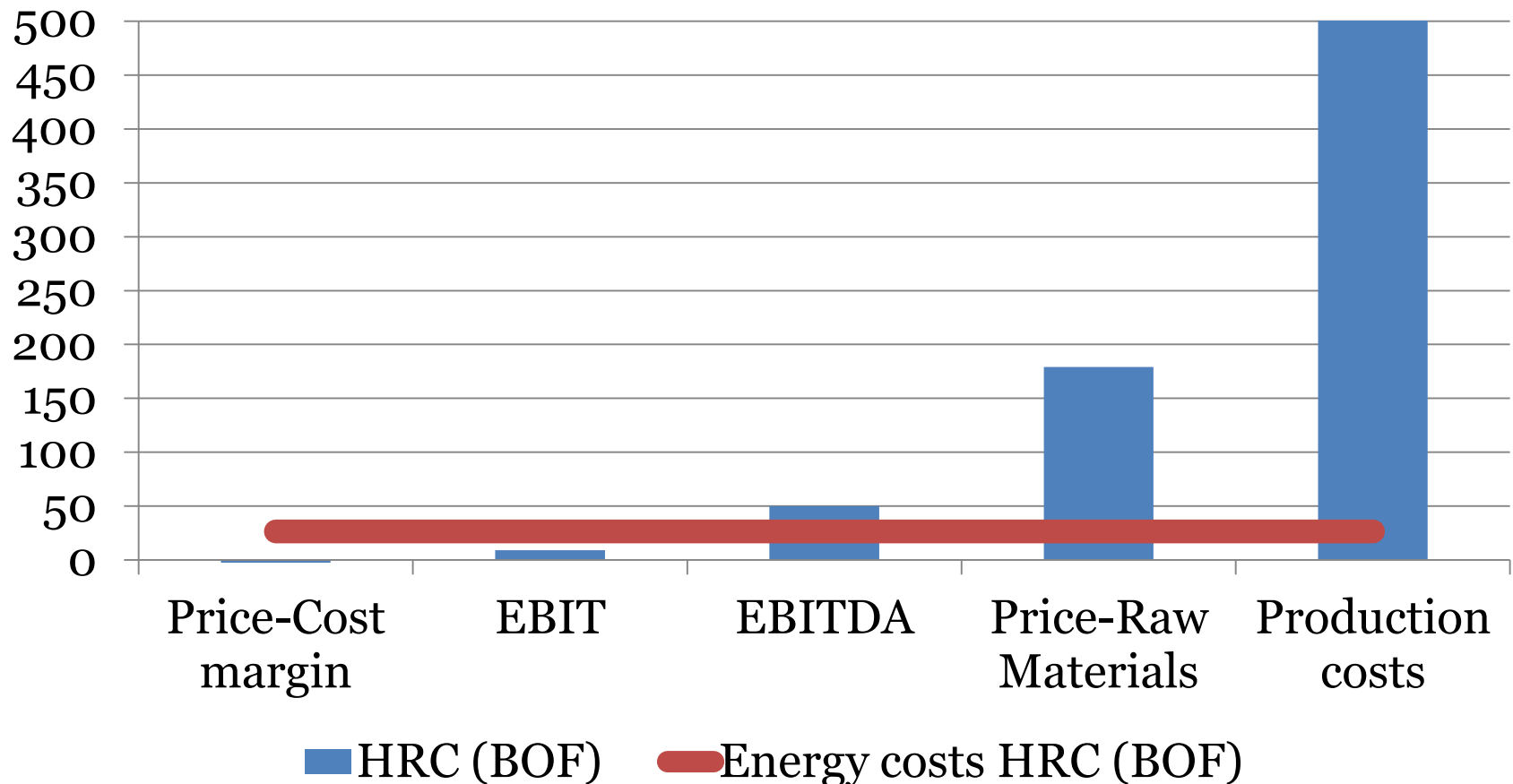
Steel

Energy Costs vs. Margin and Production Costs: EAF Wire Rods (€, 2012)



Steel

Energy Costs vs. Margin and Production Costs: BOF Hot Rolled Coils (€, 2012)





Assessment of cumulative cost impact for the aluminium industry

Dr. Lorna Schrefler

CEPS, Brussels 26 February 2014

Aluminium

- The Cumulated Cost Assessment (on 8 policy areas) covers primary & secondary aluminium production and a selection of downstream players in rolling and extrusion
- For energy: focus on **primary aluminium** only, with a sample of **11 plants** out of 16 currently operational in 10 EU MS, representing **60% of EU production** in 2012
- Sample can be divided in **two sub-samples**:
 - ✓ Plants procuring energy via old long-term contracts or through self-generation
 - ✓ Plants who purchase electricity on the market
- Three scenarios including different pass-on rates for ETS indirect costs

Results as regards energy and in particular the indirect cost of ETS in electricity prices differ markedly between the two subsamples

Aluminium

Cumulative regulatory costs for primary production range from **114 €/tonne to 149 €/tonne** (entire sample)

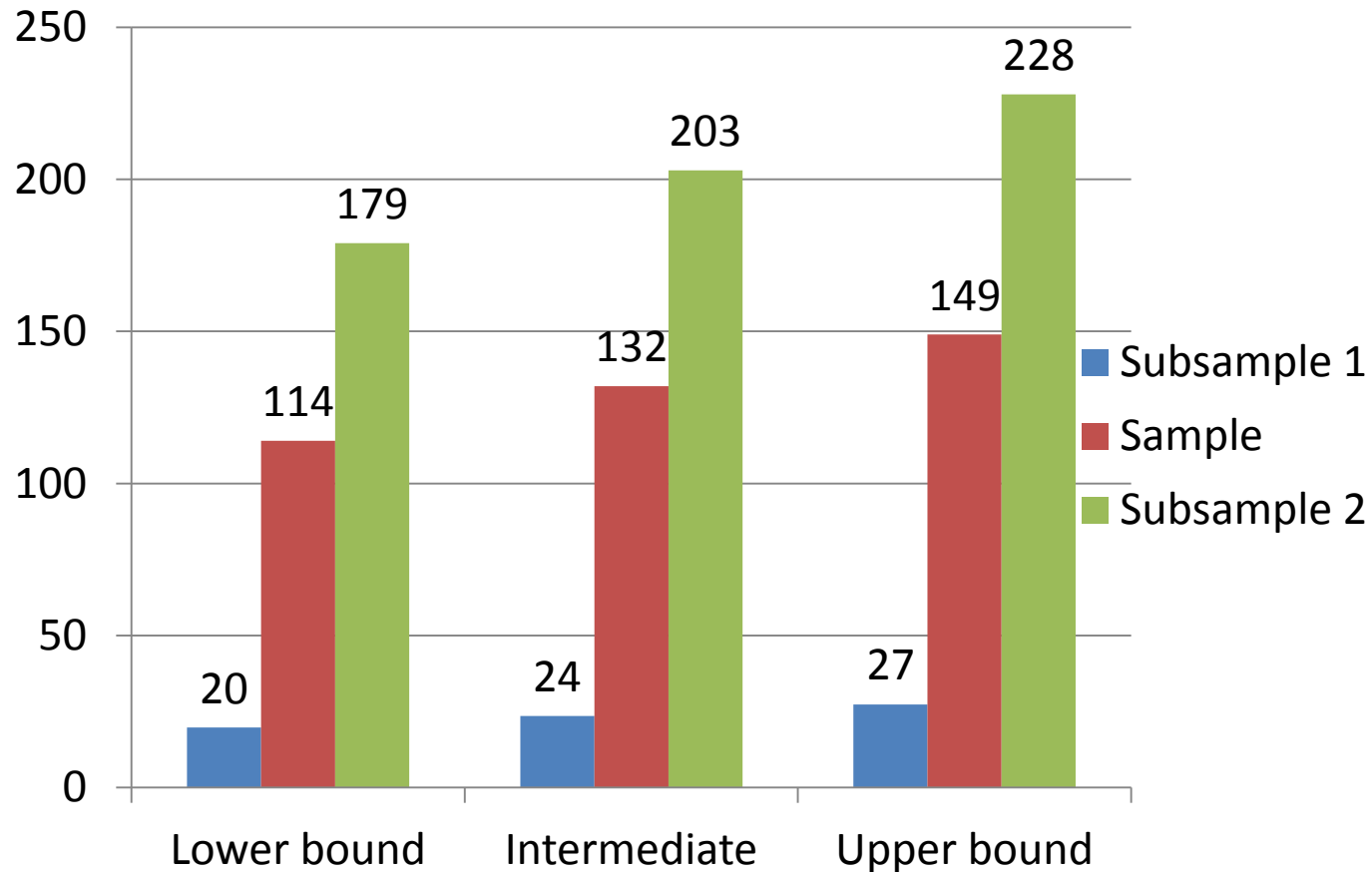
- 45% for ETS indirect costs
- 41% for energy policy
- 13% for environmental regulation

The difference between subsamples is substantial

- **20-27€/tonne** in subsample 1:
 - 23% for energy policy
- **179-228€/tonne** in subsample 2:
 - 47% for energy policy
 - 45% for ETS indirect costs

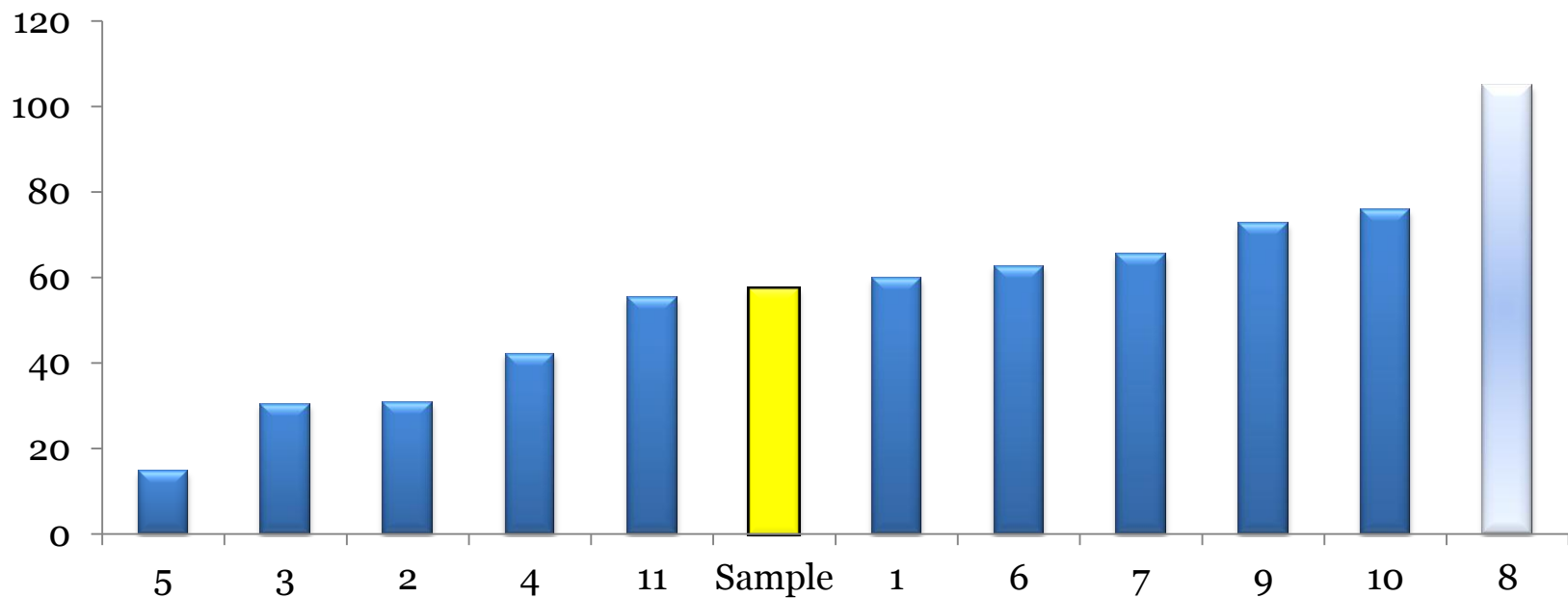
Aluminium

Cumulative Regulatory Costs - Comparison among scenarios (2012, €/tonne)



Aluminium

Prices of electricity for the sample aluminium smelters - 2012 (\$/MWh, delivered at plant)



Source: Interviews and CRU

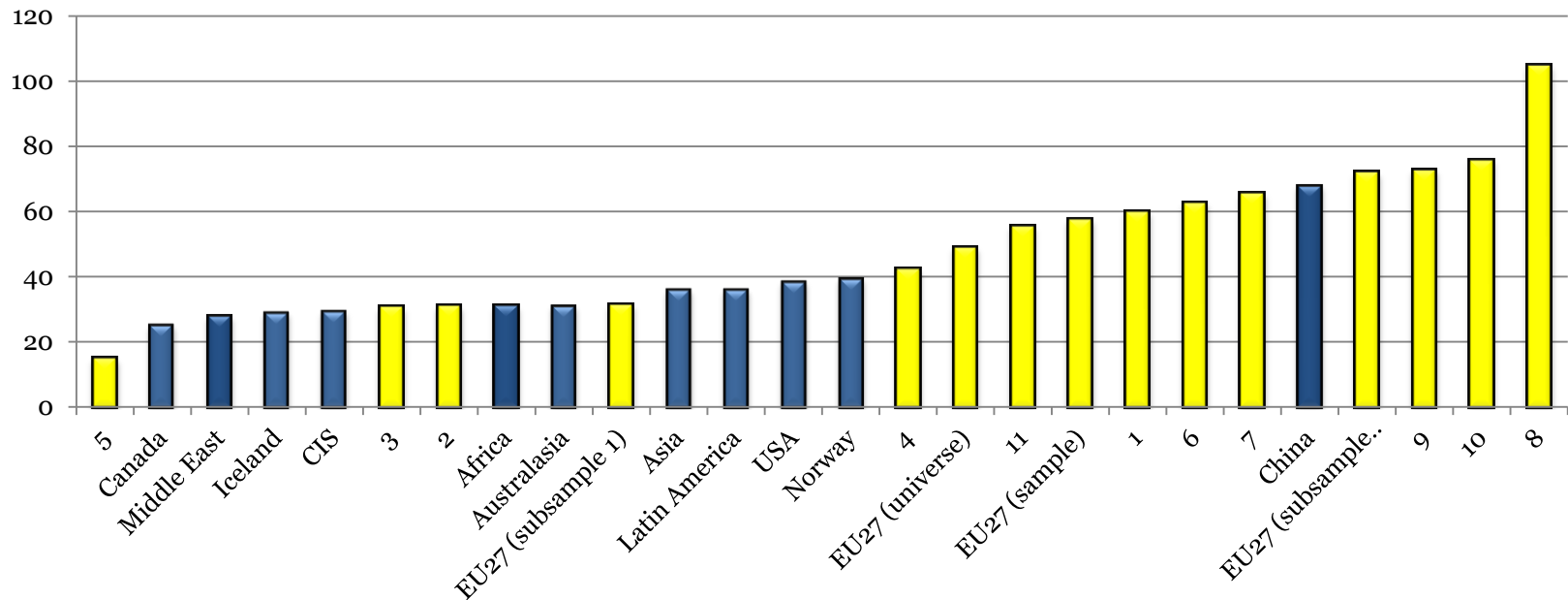
Aluminium

Breakdown of electricity prices paid by sampled producers (€/MWh)

	Sample			Subsample 1			Subsample 2		
	2010	2011	2012	2010	2011	2012	2010	2011	2012
Energy component	34.90	38.40	40.58	21.56	21.83	23.93	47.97	52.41	50.16
<i>RES Costs</i>	<i>0.39</i>	<i>1.51</i>	<i>2.19</i>	<i>0.16</i>	<i>0.18</i>	<i>0.37</i>	<i>0.61</i>	<i>2.74</i>	<i>2.89</i>
<i>Transmission Costs</i>	<i>2.10</i>	<i>1.81</i>	<i>1.40</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>3.13</i>	<i>2.63</i>	<i>2.17</i>
<i>Taxes</i>	<i>0.62</i>	<i>0.56</i>	<i>0.53</i>	<i>0.00</i>	<i>0.00</i>	<i>0.00</i>	<i>0.90</i>	<i>0.81</i>	<i>0.78</i>
Total	38.01	42.28	44.70	21.72	22.01	24.30	52.61	58.59	56.00

Aluminium

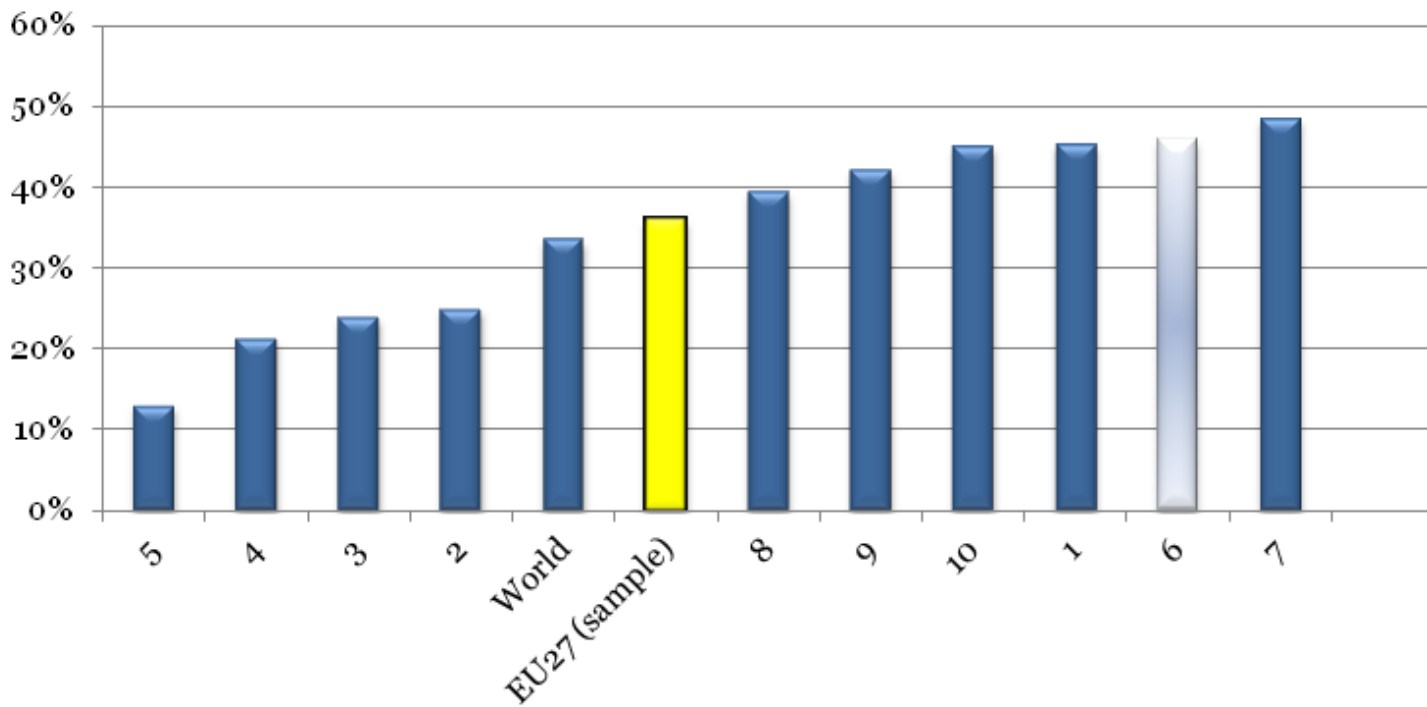
Prices of electricity for the aluminium smelters in different world areas - 2012 (\$/MWh, delivered at plant)



Source: Interviews and CRU

Aluminium

Share of electricity costs over total costs for aluminium smelters in different world areas - 2012



Source: Interviews and CRU

Availability of CEPS studies

- Studies on ceramics, flat glass and chemicals are available at:

http://ec.europa.eu/enterprise/newsroom/cf/itemdetail.cfm?item_id=7238&lang=en&title=Study-on-composition-and-drivers-of-energy-prices-and-costs-in-energy-intensive-industries

- Study on steel is available at: <http://www.ceps.be/book/steel-industry-european-union-composition-and-drivers-energy-prices-and-costs>

- Study on aluminium is available at: http://ec.europa.eu/enterprise/newsroom/cf/itemdetail.cfm?item_id=7124&lang=en&title=Final-report---Assessment-of-Cumulative-Cost-Impact-for-the-Aluminium-Industry

Time for questions