

ASSESSMENT OF CUMULATIVE COST IMPACT FOR THE STEEL AND THE ALUMINIUM INDUSTRY

FINAL REPORT ALUMINIUM

CONTRACTOR

Centre for European Policy Studies

Prof. Dr. Andrea Renda (Project Coordinator)

Prof. Dr. Jacques Pelkmans

Prof. Christian Egenhofer

Andrei Marcu

Dr. Lorna Schrefler

Dr. Giacomo Luchetta

Dr. Felice Simonelli

Dr. Fabio Genoese

Dr. Diego Valiante

Federica Mustilli

Lorenzo Colantoni

Federico Infelise

Wijnand Stoefs

Jonas Teusch

Jacopo Timini

Julian Wieczorkiewicz

PARTNER

Economisti Associati

Roberto Zavatta

Enrico Giannotti

Giulia Maria Stecchi

Done in Brussels, 31 October 2013

SPECIFIC CONTRACT

No. SI2.648823 30-CE-0558235/00-06

IMPLEMENTING THE FRAMEWORK CONTRACT

No ENTR/2008/006 LOT 4

DISCLAIMER

The information and views set out in this Study are those of the authors and do not necessarily reflect the official opinion of the Commission. The Commission does not guarantee the accuracy of the data included in this Study. Neither the Commission nor any person acting on the Commission's behalf may be held responsible for the use which may be made of the information contained therein.

ASSESSMENT OF CUMULATIVE COST IMPACT FOR THE ALUMINIUM INDUSTRY

KEY FINDINGS

This Study contains an assessment of the cumulative costs of EU legislation on the European aluminium industry, as well as an evaluation of how these costs affect the competitiveness of this industry from an international standpoint. Cumulative costs are compared to production costs and current margins of the European primary aluminium industry, as well as to the production costs of international primary aluminium producers. The analysis draws on a sample of 11 primary aluminium plants, representing 60% of the total EU27 primary aluminium production in 2012.

The cumulative cost assessment for primary aluminium production is based on three different scenarios that take into account the uncertainty surrounding some of the elements used in the calculations. Specifically, i) the **intermediate scenario**, assumes that the pass-on rate in electricity prices of the EU Emissions Trading System (ETS) is 0.8 and uses the average of the lower and upper bounds for the attribution of environmental costs to EU legislation; ii) the **lower bound scenario**, assumes a 0.6 pass-on rate for ETS and 50% of environmental costs due to EU rules; and iii) an **upper bound scenario**, built on a pass-on rate of 1 for ETS and 80% of environmental costs due to EU rules.

- For the entire sample, cumulative regulatory costs range from 114 €/tonne to 149 €/tonne, with an intermediate estimate of 132 €/tonne. In the intermediate scenario, ETS indirect costs represent about 45% of total costs, followed by costs due to EU energy policies (about 41%) and environmental costs (about 13%).

To improve the accuracy of the analysis, **two subsamples of plants were identified**. The first (hereinafter subsample 1) includes plants that are procuring electricity via old long term contracts or through self-generation. The second (subsample 2) includes plants that procure electricity on the market.

- **The difference between subsamples is substantial.** Regulatory costs for plants in subsample 1 amount to some 20 €/tonne in the lower bound scenario and 27 €/tonne in the upper bound, with an intermediate estimate of 24 €/tonne. Environmental regulation is responsible for the largest share (72%) of total costs in the intermediate scenario for plants included in subsample 1. As old long-term contracts and self-generation shielded these plants from ETS indirect costs, expenses to comply with energy policy regulation are the second cost item in order of magnitude (23%).
- In subsample 2, cumulative regulatory costs range from 179 €/tonne to 228 €/tonne, with a value for the intermediate scenario equivalent to 203 €/tonne. For plants procuring electricity in the market, costs linked to energy policies account for about 47% of total costs, ETS for 45%, and environmental outlays for about 8%.

- These results highlight **the role of electricity as a crucial input for the competitiveness of the EU primary aluminium industry**. Old long-term contracts and self-generation by carbon free power sources shielded plants included in subsample 1 from ETS indirect costs and transmission costs. Moreover, purchasing electricity at low price considerably reduced their costs and improved their margins. Nonetheless, as soon as long-term contracts will expire, figures are likely to get closer to those of subsample 2.
- After a moderate reduction in 2003, **production costs grew steadily between 2003 and 2008**. The decline experienced in 2009 was followed by a new upward trend. While **in 2006 margins reached an all-time high, 2009 and 2012 were low points**.
- **The costs generated by EU rules represented on average 8% - and never more than 10% - of total production costs** over the entire period (2002-2012). Regulatory costs were in the area of 16% in 2006 (an exceptionally good year) to 39% of Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA) and even higher than this margin in times of crisis (2009 and 2012).
- The impact on price-cost margin was more significant, not only when considering the losses registered in 2009 and 2012, but also in profitable years. **Cumulative costs represented about 23% of profits in 2006** (the most profitable year) **and 242% in 2011** (the year with the lowest positive profit value) and were constantly higher than this margin from 2008 onward.
- EU primary aluminium plants incur very large business costs of production, followed by those installed in the US, China, and Australasia. While selected EU plants included in subsample 2 are estimated to be the highest cost producers globally, smelters in subsample 1 have a significant competitive advantage. Only Middle Eastern and Asian plants are currently more cost-efficient than subsample 1.
- The analysis of **cost differentials with the least cost producers** (primary aluminium smelters in the Middle-East) shows that **EU regulatory costs represented about one third of this competitive gap in 2012** (and one fifth for smelters included in subsample 1).
- EU regulatory costs are only one of the drivers behind the challenges currently faced by primary aluminium producers. Other factors, including the implementation of rules at the national level, have a direct impact on industry competitiveness of the industry.
- EU regulatory costs reduced the profitability of the EU primary aluminium industry not only in time of crisis, when the impact of any cost item is amplified, but also in the boom years, when they still represent a rather high share of industry margins. However, as this Study focuses only on the cost side of EU rules, the benefits of operating in the EU, such as proximity to high-added value customers should be borne in mind when reading our findings.

ASSESSMENT OF CUMULATIVE COST IMPACT FOR THE ALUMINIUM INDUSTRY

EXECUTIVE SUMMARY

A. Aims and scope of the Study

This Study contains an assessment of the cumulative costs of EU legislation on the European aluminium industry, as well as an evaluation of how these costs affect the competitiveness of this industry from an international standpoint. Cumulative costs are compared to production costs and current margins of the European aluminium industry, as well as to the production costs of international aluminium competitors located in i) Africa; ii) Asia; iii) Australasia; iv) Canada; v) China; vi) the Commonwealth of Independent States (CIS); vii) European Union; viii) Iceland; ix) Latin America; x) Middle East; xi) Norway; and xii) the United States.

This Study, however, is not an assessment of both the costs and the benefits generated by the relevant EU legislation. As a result, it contains no evaluation of the efficiency, consistency and proportionality of the rules analyzed. Our research question – as resulting from the terms of reference given to us by the European Commission, DG ENTR – is limited to an assessment the cost generated for the aluminium industry by the relevant legislation. As such, our Study differs noticeably from a full-fledged “fitness check”, which aims at evaluating the efficiency, effectiveness, burdensomeness and coherence of a *corpus* of EU legislation in a given policy domain (not a single economic sector). In particular, an assessment of the appropriateness, effectiveness and efficiency of the relevant legislation falls outside of the scope of this Study.

The following types of regulatory costs are considered to be relevant for the scope of the Study:

1. **Administrative costs:** costs incurred by firms due to the legal obligation to provide information to public authorities and third parties, as measured with the EU Standard Cost Model;
2. **Compliance costs:** costs incurred by a firm as a direct consequence of the need to comply with a legal act;
3. **Indirect costs:** costs of regulation which have an impact on aluminium producers not as direct addressees, but as counterparts of direct addressees.

This Study estimates, in particular, the cumulative costs generated by the following areas of legislation on the European aluminium industry: i) general policies; ii) the commodity

markets regulation; iii) legislation related to climate change; iv) competition policy; v) energy policy; vi) environmental legislation; vii) trade policy; viii) product regulation and life-cycle assessment (LCA).

In terms of industry coverage, the Study focuses on firms falling within class 24.42 of the NACEv2 classification. More specifically, we have focused our analysis on primary aluminium production; secondary aluminium production (both remelting and refining); and a selection of downstream activities (rolling and extrusion). The following entities are excluded: upstream, alumina production; and downstream, the companies that transform intermediate and semi-finished aluminium products into finished manufactures. Focusing on this class allows the Study to treat similar entities, thereby increasing the degree of accuracy of the findings.

The analysis is based on a sample of 11 primary aluminium plants out of the 16 plants that were still active in the EU27 at the end of 2012. The selected sample represents about 60% of total EU primary production at the end of 2012. For secondary aluminium production (recycling) we selected 20 plants, representing about 80% of EU production. Finally, for downstream operations, our sample covers 15 plants (both rolling mills and extruders), corresponding to roughly 60% of EU output. The response rate for secondary and downstream sections of the value chain was lower than for primary production. Hence, while all collected and verifiable information for the different segments of the value chain is reported in the relevant Sections, the cumulative cost assessment could only be completed for primary aluminium production.

The cost structures are a fundamental pillar of our analysis: our estimate of the magnitude of cumulative costs is indeed reported both in absolute terms and as a percentage on current operating expenditures and annualised capital expenditures. In addition, estimating these representative cost structures is an essential step for our international comparison of the competitiveness of EU and non-EU aluminium producers.

B. Comparison of Cost Structures

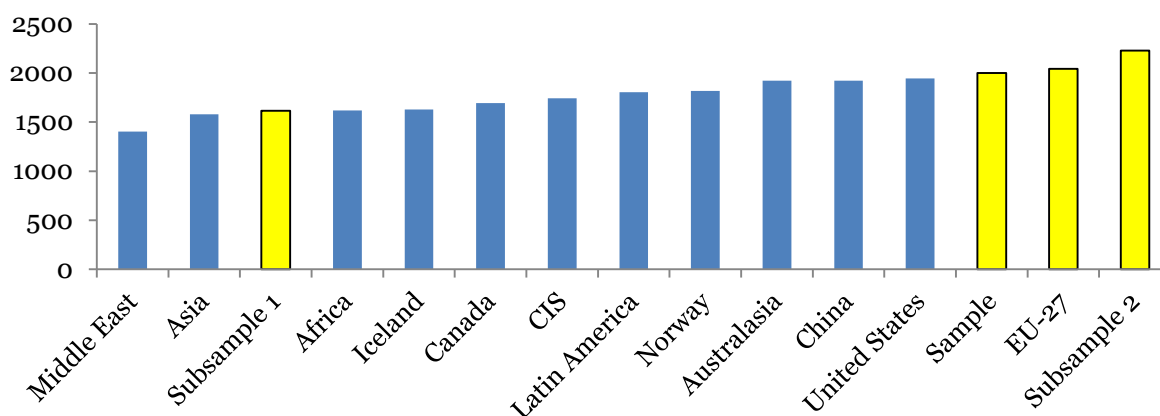
This section compares the costs for primary aluminium production on a worldwide basis, and assesses the current competitiveness of EU producers *vis-à-vis* other international players, based on CRU Primary Aluminium Smelting Cost Service platform. To improve the accuracy of the analysis, **two subsamples of plants** are identified in the Study. The first (hereinafter subsample 1) includes plants that are procuring electricity via old long term contracts or through self-generation. The second (subsample 2) includes plants that procure electricity on the market.

On average, EU smelters incur very large business costs of production (2,041\$), followed by those installed in the US (1,944\$), China (1,923\$) and Australasia (1922\$). While selected EU plants included in subsample 2 are estimated to be the highest cost producers, bearing business costs equal to 2,229\$ per tonne, smelters comprised in subsample 1

(1,615\$) have a significant competitive advantage. Only Middle Eastern (1,402\$) and Asian (1,582\$) plants are currently more cost-efficient.

Primary aluminium installations located in the Middle East play the role of least cost producers also when including in the analysis overheads and capital costs, incurring total costs equal to 1,880\$ per tonne of final product. Middle Eastern companies are followed by Icelandic plants (1,982\$) and selected EU smelters in subsample 1 (1,992\$). On average, the highest economic costs are incurred by Australasian producers (2,383\$) and are similar to those paid by EU27 aluminium producers (2,318\$). EU smelters comprised in subsample 2 (2,462\$) are the least competitive installations. Plants located in Norway, CIS, China, the US, and Latin America face comparable per-tonne costs ranging between 2,157\$ and 2,207\$.

Figure A: Business costs per tonne of aluminium (\$ 2012)



C. Assessment of Cumulative Costs

Estimated cumulative costs are presented *in terms of cost per unit of output* (€/tonne of aluminium). In order to provide an indication of the relative importance of the impact of EU legislation on the aluminium industry, regulatory costs per unit of output were compared with key performance indicators, such as price-cost margin and Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA). To reflect the uncertainty linked to the origin (i.e. national or EU) of costs generated by Environmental Policies as well as the ongoing debate surrounding the price of CO₂ permits passed on through electricity prices, three scenarios were developed. Specifically, i) an **intermediate scenario**, assuming that the pass-on rate for ETS equals 0.8 and using the average of the lower and upper bounds for environmental costs; ii) a **lower bound scenario** assuming a 0.6 pass-on rate for ETS and 50% of environmental costs due to EU rules; and iii) an **upper bound scenario**, built on a 1 pass-on rate for ETS and 80% of environmental costs due to EU rules. As explained above, the analysis distinguishes between plants currently procuring electricity via long term contracts or self-generation (subsample 1) and those purchasing this input on the market (subsample 2).

**Table A: Cumulative regulatory costs for EU primary aluminium production
Intermediate scenario (€/tonne)**

Policy area	Cost typology	Sample	Subsample 1	Subsample 2
<i>ETS (pass-on rate = 0.8)</i>	Indirect	59.99	0.00	90.50
	Sub-Total	59.99	0.00	90.50
<i>Energy</i>	Transmission	26.24	0.00	48.67
	RES	27.29	5.30	46.09
	Sub-Total	53.53	5.30	94.76
<i>Environment (average)</i>	Investment	3.70	3.70	3.70
	Direct Financial	1.70	1.70	1.70
	Operating	11.10	11.10	11.10
	Administrative	0.38	0.38	0.38
	Sub-Total	16.88	16.88	16.88
<i>Product</i>	Administrative – REACH	1.34	1.34	1.34
	Sub-Total	1.34	1.34	1.34
Total		131.73	23.52	203.47

**Table B: Cumulative regulatory costs for EU primary aluminium production
Lower bound scenario (€/tonne)**

Policy area	Cost typology	Sample	Subsample 1	Subsample 2
<i>ETS (pass-on rate = 0.6)</i>	Indirect	46.46	0.00	70.09
	Sub-Total	46.46	0.00	70.09
<i>Energy</i>	Transmission	26.24	0.00	48.67
	RES	27.29	5.30	46.09
	Sub-Total	53.53	5.30	94.76
<i>Environment (50% of costs due to EU)</i>	Direct Investment	2.85	2.85	2.85

<i>rules)</i>	Financial	1.30	1.30	1.30
	Operating	8.54	8.54	8.54
	Administrative	0.38	0.38	0.38
	Sub-Total	13.07	13.07	13.07
Product	Administrative – REACH	1.34	1.34	1.34
	Sub-Total	1.34	1.34	1.34
Total		114.40	19.71	179.26

**Table C: Cumulative regulatory costs for EU primary aluminium production
Upper bound scenario (€/tonne)**

Policy area	Cost typology	Sample	Subsample 1	Subsample 2	
ETS (pass-on rate = 1)	Indirect	73.53	0.00	110.92	
	Sub-Total	73.53	0.00	110.92	
Energy	Transmission	26.24	0.00	48.67	
	RES	27.29	5.30	46.09	
	Sub-Total	53.53	5.30	94.76	
Environment (80% of costs due to EU rules)	Investment	4.55	4.55	4.55	
	Direct	Financial	2.09	2.09	2.09
		Operating	13.66	13.66	13.66
	Administrative	0.38	0.38	0.38	
	Sub-Total	20.68	20.68	20.68	
Product	Administrative – REACH	1.34	1.34	1.34	
	Sub-Total	1.34	1.34	1.34	
Total		149.07	27.32	227.70	

As shown in the tables above, the cumulative regulatory costs range from 114 €/tonne to 149 €/tonne, with an intermediate estimate of 132 €/tonne. In the intermediate scenario,

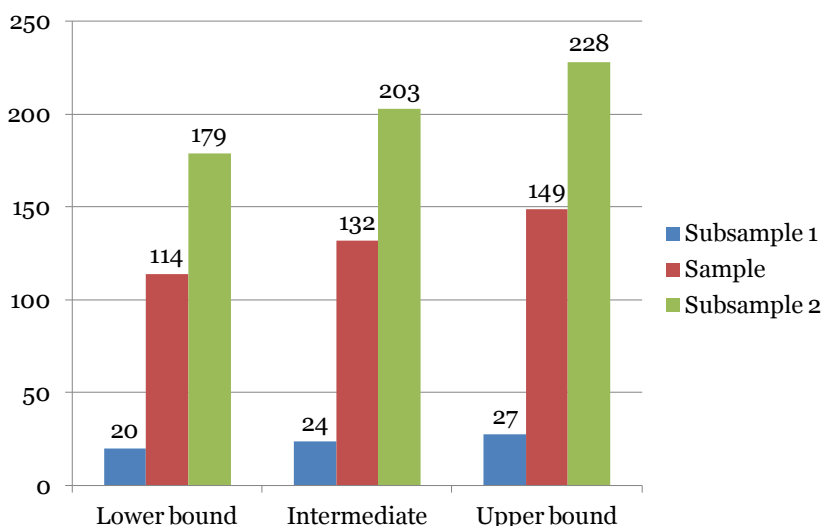
ETS indirect costs represent about 45% of total costs, followed by costs due to EU energy policies (about 41%) and environmental costs (about 13%).

The difference between subsamples is substantial:

- Plants included in subsample 1 incur regulatory costs equalling 20 €/tonne in the lower bound scenario and 27 €/tonne in the upper bound, with an intermediate estimate of 24 €/tonne. Environmental regulation is responsible for the largest share (72%) of total costs in the intermediate scenario for plants included in subsample 1. As old long-term contracts and self-generation shielded these plants from ETS indirect costs, expenses to comply with energy policy regulation are the second cost item in order of magnitude (23%).
- In subsample 2, cumulative regulatory costs range from 179 €/tonne to 228 €/tonne, with a value for the intermediate scenario equivalent to 203 €/tonne. For plants procuring electricity in the market, costs linked to energy policies account for about 47% of total costs, ETS for 45%, and environmental outlays for about 8%.
- Whereas expenses linked to the REACH regulation are about 1% of total cumulated costs in all the scenarios for the entire sample and subsample 2, they reach up to 7% in the lower bound scenario for subsample 1.

The difference between the three different scenarios and subsamples is illustrated in the figure below.

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



D. Regulatory costs, production costs and margins

Our analysis led to the following main results:

- The costs generated by EU rules represented on average 8% - and never more than 10% - of total production costs over the entire period (2002-2012). When observed at

plant level, the cumulative cost of EU rules is more limited (i.e. in the area of 1-2% of production costs) for plants procuring electricity via long term contracts signed before the introduction of the ETS or via self-generation (subsample 1). As soon as these long term contracts expire, the cost impact for those primary aluminium plants is expected to move closer to the cost figures for subsample 2.

- Regulatory costs were in the area of 16% in 2006 (an exceptionally good year) to 40% of EBITDA and even higher than this margin in times of crisis (2009 and 2012).
- The impact on price-cost margin was more significant, not only when considering the losses registered in 2009 and 2012, but also in profitable years. Cumulative costs represented about 23% of profits in 2006 (the most profitable year) and 242% in 2011 (the lowest positive profit value) and were constantly higher than this margin from 2008 onward.

The table below summarizes the results of our analysis for the entire period covered by the Study (2002-2012). Calculations are made on the basis of the intermediate scenario and for the entire sample.

**Table D: The impact of cumulative regulatory costs 2002-2012 –
Intermediate scenario on the entire sample**

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Price-Cost Margin	58%	114%	59%	57%	23%	35%	154%	(75%)	109%	242%	(86%)
EBITDA	28%	39%	30%	29%	16%	20%	37%	123%	31%	37%	93%
Price-Raw Materials	10%	12%	11%	10%	7%	8%	9%	12%	9%	9%	9%
Production costs	9%	10%	10%	9%	8%	7%	7%	8%	7%	7%	6%
Market price	8%	9%	8%	8%	6%	6%	7%	9%	7%	7%	7%

Subsample 1

For smelters that are still benefiting from old long-term contract or self-generation to procure electricity, cumulative costs between 2002 and 2012 have been a negligible share - between 1% and 2% - of market price, production costs, and price-raw materials margin. Furthermore, regulatory costs over EBITDA went from only 2% in 2006 to 9% in 2009. When compared to the profit-cost margin, costs measured in this Study were in the area of 3% to 10% in the boom years, and of 12% to 36% during the crisis; they represented one quarter of the loss registered in 2009. These results are summarized in the table below and are based on the assumptions of the intermediate scenario.

Table E: The impact of cumulative regulatory costs (2002-2012)
Intermediate scenario on subsample 1

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Price-Cost Margin	8%	13%	8%	8%	3%	5%	12%	(25%)	10%	13%	36%
EBITDA	4%	5%	4%	4%	2%	3%	4%	9%	4%	4%	5%
Price-Raw Materials	2%	2%	2%	2%	1%	1%	2%	2%	2%	2%	2%
Production costs	2%	2%	2%	2%	1%	1%	1%	2%	1%	1%	1%
Market price	1%	2%	1%	1%	1%	1%	1%	2%	1%	1%	1%

Subsample 2

The impact of cumulative costs due to EU rules were stronger on plants included in subsample 2 because of the combined effect of higher regulatory costs and narrower margins. Over the period 2002-2012, costs measured in this Study represented on average 12% of both production costs - going from 9% in 2012 to 15% in 2003 and 2004 - and aluminium market price – from 9% in 2006 and 2007 to 14% in 2009. Whereas regulatory costs are in the area of 13% to 19% when compared to the price-raw materials differential, they are markedly higher than EBITDA in 2009 and 2012 and higher than price-cost margin over the entire period, except for 2006 and 2007 when the primary aluminium industry was particularly profitable.

Table F: The impact of cumulative regulatory costs (2002-2012)
Intermediate scenario on subsample 2

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Price-Cost Margin	103%	235%	111%	100%	39%	61%	587%	(92%)	344%	(3753%)	(71%)
EBITDA	48%	70%	54%	50%	27%	35%	74%	987%	65%	79%	(568%)
Price-Raw Materials	16%	18%	17%	16%	11%	12%	14%	19%	14%	13%	14%
Production costs	14%	15%	15%	13%	11%	11%	10%	12%	11%	10%	9%
Market price	12%	14%	13%	12%	9%	9%	10%	14%	11%	10%	10%

These results highlight the role of electricity as a crucial input for the competitiveness of the EU primary aluminium industry. Old long-term contracts, which tended to be the norm in the past, and self-generation by carbon neutral power sources shielded plants included in subsample 1 from ETS indirect costs and transmission costs. Moreover, purchasing electricity at low price considerably reduced their costs and improved their margins. Once these contracts expire - for most plants within the next 5 years - things might significantly change. Conversely, electricity prices and the rules affecting them, represent the main source of competitive disadvantage for smelters procuring this input in the market (subsample 2). ETS indirect costs and regulatory costs due to energy policies

imposed a significant burden on plants included in subsample 2 and contributed to curtail the competitiveness of the EU aluminium industry by increasing production costs and narrowing margins.

Finally, we have measured the cost differentials with least cost producers (i.e., smelters located in the Middle East). EU regulatory costs represented about one third of this competitive gap in 2012 (and one fifth for smelters included in subsample 1). It should be noted that our analysis does not investigate the cost of regulation falling upon third-country producers, which would reduce cost differentials in some cases. Moreover, EU regulatory costs are only one of the drivers behind the challenges currently faced by primary aluminium producers. Other factors, including the implementation of rules at the national level, have a direct impact on the competitiveness of the industry. Yet, EU regulatory costs reduced the profitability of the EU primary aluminium industry not only in time of crisis, when the impact of any cost item is amplified, but also in the boom years when they still represent a rather high share of industry margins. As this Study focuses on the cost side of EU rules, the benefits of operating in the EU, such as proximity to high-added value customers and access to a skilled labour force, should be borne in mind when reading our findings.

TABLE OF CONTENTS

1	A METHODOLOGY FOR THE ASSESSMENT OF CUMULATIVE COSTS FOR THE ALUMINIUM INDUSTRY	27
1.1	The framework of the Study	27
1.2	The object of analysis: the cost structure	30
1.3	Assessment or regulatory costs	31
1.4	The selection of typical facilities	33
1.5	The scope of the Study: the policy areas	36
1.6	Final sample and response rate	39
2	THE COST COMPETITIVENESS OF THE EU PRIMARY ALUMINIUM INDUSTRY.....	41
2.1	Methodology and data source	41
2.2	Production costs for primary aluminium	42
2.2.1	Costs for raw materials, electricity, and conversion.....	42
2.2.2	Aggregate production costs	44
2.2.3	Production cost differentials	46
2.2.4	Breakdown of production costs per tonne	47
3	CUMULATIVE COST ASSESSMENT	48
3.1	Cumulative costs of EU regulation.....	49
3.1.1	Cumulative costs of EU rules.....	52
3.2	Production costs and margins of the EU primary aluminium industry	57
3.3	The impact of cumulative regulatory costs	60
3.3.1	Aggregated Sample.....	60
3.3.2	Subsample 1.....	64
3.3.3	Subsample 2	67
3.4	EU regulatory costs for secondary and downstream producers	70
3.4.1	Climate Change	70
3.4.2	Environmental Legislation	72
4	THE ECONOMIC AND TECHNICAL ANALYSIS OF THE ALUMINIUM INDUSTRY.....	76
4.1	Aluminium Life Cycle and Production.....	76

4.1.1	Aluminium life-cycle	77
4.1.2	The extraction of bauxite	77
4.1.3	Alumina extraction from bauxite	79
4.1.4	The production of Aluminium from Alumina	81
4.1.5	Secondary Aluminium Production.....	83
4.2	The Aluminium Value Chain.....	86
4.2.1	Upstream value chain	86
4.2.2	Midstream Value Chain	87
4.2.3	Downstream Value Chain	87
4.3	The Economics of Aluminium.....	91
4.3.1	Players.....	91
4.3.2	Cost Drivers and Trends	94
4.3.3	Product Substitutability	96
4.3.4	Barriers to entry and to exit.....	96
4.3.5	Intra-sector competitive dynamics	97
4.4	The European Aluminium Market	98
4.4.1	Industry definition	98
4.4.2	EU aluminium production.....	98
4.4.3	Demand.....	105
5	GENERAL POLICIES.....	109
6	COMMODITY MARKETS	117
6.1	Markets in Financial Instruments Directive and Regulation (MiFID and MiFIR)	117
6.2	The European Market Infrastructure Regulation (EMIR)	119
6.3	Market Abuse Regulation and Directive	121
7	CLIMATE CHANGE.....	122
7.1	Introduction	122
7.1.1	What is the EU ETS.....	122
7.1.2	Phase 1 (2005 – 2007)	123
7.1.3	Phase 2 (2008 – 2012).....	123
7.1.4	Phase 3 (2013 – 2020).....	123
7.1.5	Scope of the Study	124
7.2	Costs	125
7.2.1	Compliance or direct costs.....	125
7.2.2	Indirect costs	125
7.2.3	Administrative costs.....	125
7.3	Methodology for the quantification of Cumulative Costs.....	126
7.3.1	Indirect costs	126
7.3.2	Administrative Costs	127
7.3.3	Sample	127

7.3.4	Indirect cost Results.....	128
7.3.5	Conclusions.....	133
7.4	Phase 3	133
7.4.1	Administrative costs.....	133
7.4.2	Results.....	134
7.5	Conclusion.....	137
7.5.1	Regulatory developments	137
7.5.2	Are Phase 1 and 2 representative for Phase 3?	139
8	COMPETITION POLICY	140
8.1	State aid and the aluminium industry	140
8.1.1	The regime of state aid in the EU	140
8.1.2	State aid granted to the aluminium industry between 2002 and 2012 in the EU	145
8.2	Antitrust law and the aluminium sector	146
8.2.1	Antitrust law in the EU: agreements/concerted practices, abuse of dominant positions, and merger control.....	146
8.2.2	Agreements, abuses of dominant position, and notified mergers in the aluminium industry between 2002 and 2012 in the EU	147
8.2.3	Long-term contracts for electricity.....	149
9	ENERGY POLICY.....	154
9.1	Comparison of electricity prices	154
9.1.1	Fundamentals of electricity price formation	154
9.1.2	Intra-EU comparison of industrial electricity prices	157
9.1.3	International comparison of industrial electricity prices	166
9.2	Impact of EU regulation.....	170
9.2.1	Third Energy Market Package	170
9.2.2	Renewables.....	174
9.2.3	Energy Infrastructures.....	178
9.2.4	Energy Efficiency.....	179
10	TRADE POLICY	181
10.1	International trade of Aluminium	181
10.1.1	World and EU Trade Flows.....	181
10.1.2	Review of the autonomous tariff measure on unwrought not alloyed aluminium and the future EU tariff schedule for unwrought aluminium	184
10.1.3	Trade Defence Instruments: their impact on the EU Economy.....	191
10.1.4	The Generalised Scheme of Preferences (GSP).....	197
11	ENVIRONMENTAL POLICY.....	199
11.1	Introduction	199
11.2	Review of relevant legislation	199

11.2.1	Prevention and control of industrial emissions	199
11.2.2	Waste Prevention and Recycling	202
11.2.3	Other Environmental Policy Measures	204
11.3	Assessment of Compliance Costs	206
11.3.1	Introduction	206
11.3.2	Investment Costs	207
11.3.3	Financial Costs.....	211
11.3.4	Operating Costs.....	212
11.3.5	Compliance Costs related to EU Legislation	214
11.4	Assessment of Administrative Costs	216
11.4.1	Introduction	216
11.4.2	Estimate of Administrative Costs for the Issuance/Renewal of IEP	217
11.4.3	Estimate of Administrative Costs for Compliance Inspections.....	218
11.4.4	Estimate of Administrative Costs Linked to the Seveso Directive	219
11.4.5	Administrative Costs per Unit of Output	220
11.5	Assessment of Indirect Costs	221
12	PRODUCT POLICY.....	222
12.1	Introduction	222
12.2	Review of Relevant Legislation	222
12.2.1	Eco-Labeling and Eco-Design.....	222
12.2.2	Green Public Procurement.....	224
12.2.3	Life-Cycle Assessment Methodologies	226
12.2.4	Chemical Products.....	227
12.2.5	Construction Products.....	229
12.2.6	Automotive Sector	230
12.3	Assessment of Compliance Costs	232
12.3.1	Introduction	232
12.3.2	Compliance Costs Linked to the REACH and CLP Regulations	232
12.3.3	Compliance Costs Linked to the Construction Products Regulation.....	233
12.4	Assessment of Administrative Costs	234
12.4.1	Introduction	234
12.4.2	Administrative Costs Linked to the REACH Regulation	235
12.5	Assessment of Indirect Costs	238
12.5.1	Introduction	238
12.5.2	Indirect Costs Linked to Different LCA Methodologies	238

LIST OF FIGURES

Figure 1 Raw material costs per tonne of aluminium (\$ 2012)	43
Figure 2 Power costs per tonne of aluminium (\$ 2012).....	44
Figure 3 Conversion costs per tonne of aluminium (\$ 2012)	44
Figure 4 Business costs per tonne of aluminium (\$ 2012)	45
Figure 5 Economic costs per tonne of aluminium (\$ 2012).....	45
Figure 6 Breakdown of production cost per tonne of aluminium (2012)	47
Figure 7 Share of costs per policy area over cumulative regulatory costs for EU primary aluminium production – Intermediate scenario	54
Figure 8 Share of costs per policy area over cumulative regulatory costs for EU primary aluminium production – Lower bound scenario	55
Figure 9 Share of costs per policy area over cumulative regulatory costs for EU primary aluminium production – Upper bound scenario	56
Figure 10 Margins of the EU primary aluminium industry - sample (% over market price).....	59
Figure 11 Margins of the EU primary aluminium industry – subsample 1 and subsample 2 (% over market price)	60
Figure 12 Cumulative regulatory costs vs. price-cost margin (2002-2012, intermediate scenario on the entire sample - €/tonne)	62
Figure 13 Cumulative regulatory costs vs. EBITDA (2002-2012, intermediate scenario on the entire sample - €/tonne).....	62
Figure 14 Cumulative regulatory costs vs. price-raw materials (2002-2012, intermediate scenario on the entire sample - €/tonne).....	62
Figure 15 Cumulative regulatory costs vs. production costs (2002-2012, intermediate scenario on the entire sample - €/tonne)	63
Figure 16 Cumulative regulatory costs vs. market prices (2002-2012, intermediate scenario on the entire sample - €/tonne)	63
Figure 17 The impact of cumulative regulatory costs on cost differential with Middle-Eastern smelters (2012, intermediate scenario on the entire sample - €/tonne).....	63
Figure 18 Cumulative regulatory costs vs. price-cost margin (2002-2012, intermediate scenario on subsample 1 - €/tonne).....	65
Figure 19 Cumulative regulatory costs vs. EBITDA (2002-2012, intermediate scenario on subsample 1 - €/tonne).....	65
Figure 20 Cumulative regulatory costs vs. price-raw materials (2002-2012, intermediate scenario on subsample 1 - €/tonne).....	65
Figure 21 Cumulative regulatory costs vs. production costs (2002-2012, intermediate scenario on subsample 1 - €/tonne).....	66
Figure 22 Cumulative regulatory costs vs. market prices (2002-2012, intermediate scenario on subsample 1 - €/tonne).....	66
Figure 23 The impact of cumulative regulatory costs on cost differential with Middle-Eastern smelters (2012, intermediate scenario on subsample 1 - €/tonne)	66
Figure 24 Cumulative regulatory costs vs. price-cost margin (2002-2012, intermediate scenario on subsample 2 - €/tonne).....	68
Figure 25 Cumulative regulatory costs vs. EBITDA (2002-2012, intermediate scenario on subsample 2 - €/tonne).....	68
Figure 26 Cumulative regulatory costs vs. price-raw materials (2002-2012, intermediate scenario on subsample 2 - €/tonne).....	68
Figure 27 Cumulative regulatory costs vs. production costs (2002-2012, intermediate scenario on subsample 2 - €/tonne)	69
Figure 28 Cumulative regulatory costs vs. market prices (2002-2012, intermediate scenario on subsample 2 - €/tonne).....	69

Figure 29 The impact of cumulative regulatory costs on cost differential with Middle-Eastern smelters (2012, intermediate scenario on subsample 2 - €/tonne).....	69
Figure 30 Aluminium usage by sector (% tot production).....	76
Figure 31 Aluminium life-cycle.....	77
Figure 32 World bauxite production (kTonne)	78
Figure 33 World bauxite production by country, 2012 (kTonne).....	79
Figure 34 World alumina production (kTonne)	80
Figure 35 Alumina production by country, 2010	80
Figure 36 Primary aluminium energy consumption by area, (kWh/tonne)	82
Figure 37 Production of Recycled Aluminium and Primary Aluminium (1950-2010)	83
Figure 38 Number of recycling plants by area, 2008.....	85
Figure 39 Share of aluminium recycling per region, 2010.....	85
Figure 40 Aluminium Value Chain.....	86
Figure 41 LME spot price for primary aluminium 2007-2013	88
Figure 42 Regional premium over LME cash price.....	88
Figure 43 LME cash forward price and regional premia	89
Figure 44 Aluminium global stocks and cancelled warrants	90
Figure 45 US premium and cancelled warrant in North America.....	91
Figure 46 Degree of concentration and integration, 2010	92
Figure 47 Primary Aluminium structure costs	94
Figure 48 Electricity Spot Price in selected EU countries.....	95
Figure 49 Primary Aluminium production in Europe (millions tons, left axis) and EU27 GDP growth (right axis)	99
Figure 50 Share of Primary Aluminium production in EU by member state, 2012	100
Figure 51 Primary Aluminium production in selected EU member states and non EU countries, 1998-2012 ('000 tonnes)	101
Figure 52 Secondary aluminium vs. primary production in EU, 2007-2011 (ktonnes).....	102
Figure 53 Turnover of EU Aluminium Sector (mln €) NACErev.2 24.42	103
Figure 54 Value Added and Gross Operating Surplus EU Aluminium Sector (mln €) NACErev.2 24.42	103
Figure 55 Turnover of the aluminium sector over GDP, 2010.....	104
Figure 56 Number of Employees in the Aluminium industry (EU27 and EFTA), 1997-2012	105
Figure 57 Shipments/deliveries of extruded and flat rolled aluminium products in Europe by sector of final use (tonnes)	106
Figure 58 Total turnover in the EU motor vehicle industry – enterprises included in NACErev.2 Division 29 (mln €)	107
Figure 59 Total turnover in the EU construction sector – enterprises included in NACErev.2 Section F (mln €)	107
Figure 60 Natural gas and oil prices, 1993-2012.....	155
Figure 61 Coal Prices, 1993-2012.....	156
Figure 62 Prices of electricity for the sample aluminium smelters - 2012 (\$/MWh, delivered at plant)	159
Figure 63 Electricity Intensity (€/MWh).....	160
Figure 64 Transmission tariffs in selected EU member states - 2009-2012 (2011-€/MWh).....	161
Figure 65 Costs of RES Support Schemes for 2.5 TWh users in the aluminium industry in 2012 (€/MWh)	164
Figure 66 Indices of real energy prices for industry (2005 = 100).....	167
Figure 67 Prices of electricity for the aluminium smelters in different world areas - 2012 (\$/MWh, delivered at plant).....	169
Figure 68 Prices of electricity for the aluminium smelters in different world areas - 2012 (\$/MWh, delivered at plant).....	169
Figure 69 Share of electricity costs over total costs for aluminium smelters in different world areas - 2012	170
Figure 70: Simulation results: gross welfare benefits from cross-border trade and incremental gain per border – 2011 (€ mln per year)	173
Figure 71: Effects of RES supply on prices (short-term).....	176

Figure 72: Wholesale market prices in Germany/Austria (2008 and 20012)	176
Figure 73 Intra and Extra-EU Trade of Primary Aluminium 2002-2012 (tonnes)	181
Figure 74 Imports of primary aluminium from 2002 onwards by partner countries (millions of tonnes)	182
Figure 75 Trends of importing countries of not alloyed unwrought aluminium from 2003 onwards (%)	186
Figure 76 Weighted Average Tariff Premium (\$/tonne)	190
Figure 77 Rotterdam Premiums duty-paid and duty-unpaid over the LME (\$/t)	191
Figure 78 Average anti-dumping ad valorem duty levels by year of imposition	194
Figure 79 Overview of Environment-related Investments.....	207
Figure 80 Evolution of Environment-related Investments Overtime – 2002 – 2012 (€ mln)	209
Figure 81 Scatter Plot of Investment Intensity per Facility (€/tonne).....	210
Figure 82 Annual and cumulated investment costs - 2002-2012 (€/tonne).....	211
Figure 83 Annual and cumulated financial costs - 2002-2012 (€/tonne).....	212
Figure 84 Annual and cumulated operating costs - 2002-2012 (€/tonne)	214
Figure 85 Average Administrative Costs per Unit of Output/Capacity (€/tonne)	221

LIST OF TABLES

Table 1: List of legislation and policies within the scope of the Study	37
Table 2 : Sample and response rate.....	40
Table 3 Cost differential between EU primary aluminium producers and least cost producers in absolute value per tonne of aluminium (\$ 2012)	46
Table 4 Cumulative regulatory costs for EU primary aluminium production – Intermediate scenario (€/tonne)	54
Table 5 Cumulative regulatory costs for EU primary aluminium production – Lower bound scenario (€/tonne)	55
Table 6 Cumulative regulatory costs for EU primary aluminium production – Upper bound scenario (€/tonne)	56
Table 7 Production costs and margins of the EU primary aluminium industry – sample (€/tonne at current prices).....	58
Table 8 Production costs and margins of the EU primary aluminium industry – subsample 1 (€/tonne at current prices)	59
Table 9 Production costs and margins of the EU primary aluminium industry – subsample 2 (€/tonne at current prices)	59
Table 10 The impact of cumulative regulatory costs (2002-2012, intermediate scenario on the entire sample)	61
Table 11 The impact of cumulative regulatory costs (2002-2012, intermediate scenario on subsample 1).....	64
Table 12 The impact of cumulative regulatory costs (2002-2012, intermediate scenario on subsample 2).....	67
Table 13: Secondary Producers, indirect CO2 costs (€/tonne of finished product)	70
Table 14 Downstream Producers, indirect CO2 costs (€/tonne of finished product)	71
Table 15: Administrative costs (€/tonne)	72
Table 16 Summary of Cumulated Compliance Costs of EU Environmental Legislation (€/tonne)	73
Table 17 Summary of Administrative Costs for the Issuance/Renewal/Updating of IEP – 2002 - 2012	73
Table 18 Summary of Administrative Costs for the Compliance Inspections – Annual Values	74
Table 19 Summary of Administrative Costs for the Seveso Directive – Annual Values	74
Table 20 Aluminium Production, NACE rev2.0 classification	98
Table 21 Dynamic evolution of primary smelters in the EU27	99
Table 22: Average yearly prices per tonne of CO2 (€)	127
Table 23 Primary aluminium, indirect CO2 costs (€/tonne).....	128
Table 24 Primary aluminium: indirect CO2 costs (€/tonne)	129

Table 25 Primary aluminium: indirect CO2 costs (€/tonne).....	129
Table 26 Secondary Producers, indirect CO2 costs (€/tonne)	130
Table 27: Secondary Producers, indirect CO2 costs (€/tonne)	130
Table 28: Secondary Producers, indirect CO2 costs (€/tonne).....	131
Table 29: Downstream producers, indirect CO2 costs (€/tonne of finished product)	131
Table 30: Downstream producers, indirect CO2 costs (€/tonne of finished product)	132
Table 31: Downstream producers, indirect CO2 costs (€/tonne of finished product)	132
Table 32: Primary aluminium, administrative costs (€/tonne)	135
Table 33: Secondary Producers, administrative costs (€/tonne)	135
Table 34: Downstream Producers, administrative costs (€/tonne of finished product)	136
Table 35 List of state aid notified to/registered by the Commission over the period 2002-2012	146
Table 36 List of merger notified to the Commission over the period 2002-2012	148
Table 37: Transmission tariffs for sampled plants, 2012 (€/MWh).....	162
Table 38 Transmission tariffs for sampled plants, 2010-2012 (€/MWh).....	163
Table 39 RES support scheme cost comparison for 2.5 TWh users (2012)	165
Table 40 RES Support for sampled plants, 2012 (€/MWh)	166
Table 41 RES tariffs for sampled plants, 2010-2012 (€/MWh).....	166
Table 42 Trade volumes at power exchanges as a percentage of national demand and annual average day-ahead base load power prices (€/MWh).....	174
Table 43 EU27 exports, imports and net positions in primary aluminium by extra-EU origin/destination countries 2002, 2007 and 2012 (mln tonnes)	183
Table 44 Not alloyed unwrought aluminium EU27 imports and exports by partner country in 2002, 2007 and 2012 - CN Code 7601 10 (mln tonnes)	183
Table 45 EU27 Imports and Exports of primary, secondary and semi-manufactures in 2002, 2007 and 2012. (CN 7601.xx) (mln tonnes)	184
Table 46 Selected EU aluminium trading partners exporting to the EU (tonnes)	187
Table 47 Import duty rates on aluminium products in 2008 (%)	187
Table 48 LME 3 Months and tariffs premiums for alloyed (6%) and not alloyed (3%)	189
Table 49 EU Cases on Anti-dumping in the aluminium international market, from 2003.....	193
Table 50 EU Dumping margins, AD duties and effect of lesser duty rule by sector, (2000-2010)	195
Table 51 Anti-dumping measures in force since 2003	196
Table 52 Composition and Salient Features of the Sample	207
Table 53 Summary of Information on OPEX/CAPEX Ratios.....	213
Table 54 Summary of Cumulated Environment Protection Costs, 2002 – 2012 (€/tonne).....	214
Table 55 Summary of Cumulated Compliance Costs of EU Environmental Legislation (€/tonne)	215
Table 56 Summary of Information Available on Administrative Costs	216
Table 57 Summary of Administrative Costs for the Issuance/Renewal/Updating of IEP – 2002 - 2012.....	218
Table 58 Summary of Administrative Costs for the Compliance Inspections – Annual Values.....	219
Table 59 Summary of Administrative Costs for the Seveso Directive – Annual Values.....	220
Table 60 Summary of Cumulated Administrative Costs Linked to the REACH Regulation (€ mln).....	238

LIST OF BOXES

Box 1 Aluminium regional premia and their implications for the primary aluminium market structure	89
Box 2 Industry concentration indexes - CR(K) & HHI	93
Box 3 Issues in today's European electricity markets	156
Box 4 Validation of Data on Energy Prices	159
Box 5 Electricity Intensity of Primary Aluminium Production	159
Box 6 RES support costs vs. merit order effect. The case of Germany.....	177
Box 7 RES support costs. The case of Romania.....	177
Box 8 Main Environmental Issues in the Aluminium Industry	202
Box 9 Investment Costs - Data Validation	208
Box 10 Operating Costs - Data Validation	213
Box 11 Issues Related to False Certifications for Construction Products.....	234

LIST OF ABBREVIATIONS

ACER	Agency for the Cooperation of Energy Regulators
AD	Anti-Dumping
ADCO	Administrative Cooperation Group
ARM	Approved Reporting Mechanism
BAT	Best Available Technique
BAU	Business-As-Usual
BREE	Bureau of Resources and Energy Economics
BREF	BAT Reference Documents
CAPEX	Capital Expenditures
CCP	Central Counterparty
CCS	Carbon Capture and Storage
CEER	Council of European Energy Regulators
CER	Certified Emission Reduction
CIS	Commonwealth of Independent States
CLP	Classification, Labelling and Packaging
CPD	Construction Products Directive
CPR	Construction Products Regulation
DG Trade	Directorate-General for Trade
EAA	European Aluminium Association
EBITDA	Earnings Before Interest, Taxes, Depreciation and Amortization
ECHA	European Chemicals Agency
EEA	European Economic Area
ECB	European Central Bank
EFTA	European Free Trade Association
EIB	European Investment Bank
EIP	European Innovation Partnership
ELV	Emission Limit Value
ELVD	End of Life Vehicles Directive
EMIR	European Market Infrastructure Regulation
ENTSO-E	European Network of Transmission System Operators For Electricity
EPBD	Energy Performance of Buildings Directive
ERU	Emission Reduction Unit
ESMA	European Securities and Markets Authority
ETS	European Emission Trading System
EUA	European Union Allowance
FAECF	Federation of European Window and Curtain Walling Manufacturers' Associations
FC	Financial Cost
FiT	Feed-in-Tariffs
GAAP	Generally Accepted Accounting Principles
GAINS	Greenhouse gas - Air pollution Interactions and Synergies
GATT	General Agreement on Tariffs and Trade
GBER	General Block Exemption Regulation
GC	Green Certificate
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GPP	Green Public Procurement
GSP	Generalised Scheme of Preferences
IAI	International Aluminium Institute
IC	Investment Cost

IED	Industrial Emission Directive
IEP	Integrated Environmental Permits
IFRS	International Financial Reporting Standards
IIASA	International Institute for Applied Systems Analysis
IO	Information Obligation
IPP	Integrated Product Policy
IPPC	Integrated Pollution Prevention and Control
IPPCD	IPPC Directive
JRC	Joint Research Centre
LCA	Life Cycle Assessment
LCP	Large Combustion Plants
LDR	Lesser Duty Rule
LME	London Metal Exchange
LNG	Liquefied Natural Gas
MAD	Market Abuse Directive
MAR	Market Abuse Regulation
MES	Minimum Efficient Scale
MiFID	Markets in Financial Instruments Directive
MiFIR	Markets in Financial Instruments Regulation
MO	Monetary Obligation
MRV	Monitoring Reporting and Verification
MTF	Multilateral Trading Facilities
NAP	National Allocation Plan
NFM BREF	Non Ferrous Metals Industries BREF
NRA	National Regulatory Authority
OC	Operating Cost
OECD	Organisation for Economic Co-operation and Development
OPEX	Operating Expenditures
OTC	Over The Counter
OTF	Organised Trading Facility
PCI	Project of Common Interest
PEF	Product Environmental Footprint
PFC	Perfluorocarbon
PM	Particulate Matter
PPWD	Packaging and Packaging Waste Directive
R&D	Research and Development
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RES	Renewable Energy Sources
RM	Regulated Market
SCL	Specific Concentration Limit
SCM	Standard Cost Model
SHEC	Safety, Health, Environmental and Consumer
SIEF	Substantial Information Exchange Forums
SME	Small Medium Enterprise
SO	Substantive Obligation
SO _x	Sulphur oxides
SPIRE	Sustainable Process Industry through Resource and Energy Efficiency
SVHC	Substances of Very High Concerns
TDI	Trade Defence Instruments
TFEU	Treaty on the Functioning of the European Union
TSO	Transmission System Operator

UNFCCC	United Nations Framework Convention on Climate Change
WFD	Waste Framework Directive
WR	Wire Rods
WSR	Waste Shipment Regulation
WTO	World Trade Organization

PART I

**THE CUMULATIVE COST
ASSESSMENT**

1 A methodology for the assessment of cumulative costs for the aluminium industry

1.1 The framework of the Study

The objective of the Study is to identify, assess, and where possible quantify, the cumulative costs imposed by EU legislation on the aluminium sector. This Study is part of a broader assessment of the cumulative cost of EU legislation in two industrial sectors in the EU, namely aluminium and steel.¹

Specifically, it is worth recalling the importance of a full assessment of the other and equally important side of the coin with respect to cumulative costs, *i.e.* cumulative benefits. Regardless of their specific area, policies are adopted because they are expected to deliver a set of specific benefits. Overall, benefits of adopted policies are expected to justify the costs generated by the policy under examination, although those affected by the costs and benefits do not always coincide. This is often the case for the so-called “regulatory policies”, which tend to have concentrated costs and more diffuse benefits.² EU policy in particular includes the following provisions:

1. Safety, Health, Environmental and Consumer (SHEC) regulation on different sectors, including the aluminium industry. The adoption of these rules is justified by their expected social benefits; however, while such benefits mostly occur for society at large, the corresponding costs normally remain, if not fully passed on downstream in the form of higher prices, with the addressees, including aluminium manufacturers.³
2. The EU largely maintains a free trade policy which makes the EU Single Market fully open to extra-EU aluminium products. A free trade policy is capable of delivering benefits to the society at large which more than compensate its costs. EU industry benefits directly from a free trade policy by getting better access to third countries markets. A free trade policy does of course not preclude the possibility of resorting to trade defence means (anti-dumping and countervailing duties), when the necessary conditions are met in order to counter unfair trading practices.

¹ The companion report on the steel sector was completed in June 2013 and is available at: http://ec.europa.eu/enterprise/sectors/metals-minerals/files/steel-cum-cost-imp_en.pdf

² While discussing the benefit-cost features of different types of policies (regulatory, distributive, etc.) falls beyond the scope of this study, for a classic contribution on the topic see, M. Olson (1965), *The Logic of Collective Action*, Cambridge, MA: Harvard University Press. For more recent contributions on the costs and benefits of regulatory policies, see e.g. Eisner M. A. et al. (2000) *Contemporary Regulatory Policy*, Lynne Rienner Publishers; and Revesz, R.L. and Livermore, M. A. (2008) *Retaking rationality. How cost-benefit analysis can better protect the environment and our health*, New York: Oxford University Press.

³ With regards to environmental regulation, costs fall on the industry consistently with the 'Polluter Pays Principle', enshrined in art. 192 paragraph 1 of the Treaty on the Functioning of the EU.

3. Competition and state aid rules, such that (with limited exceptions, i.e. aid in restructuring, environmental aid)⁴ the EU aluminium industry operates in a competitive, non-subsidised market. This approach is normally associated with wider benefits for society at large, as resources are free to flow towards the most productive sectors, rather than being artificially allocated to certain industries (so-called “allocative efficiency”). However, the same market approach is not always prevalent in other areas/regions of the world and, as a result, EU aluminium producers may find themselves at a comparative disadvantage.

As explained, these EU policies are expected to deliver benefits. However, when considered together, they present possible trade-offs. In a globalised world, if an economic area pursues these three policies at the same time and in isolation,⁵ its industry - in this case the aluminium sector - might be at risk of losing competitiveness. In particular, SHEC regulations create additional costs for the industry located within that economic area. At the same time, the lack of direct support does not always allow compensation for these costs⁶; and a free trade policy reduces price differentials with international competitors to a minimum, which makes it difficult to compensate for SHEC costs. If SHEC regulatory costs are significant enough to outweigh the benefits of proximity – transport cost savings, as well as less quantifiable benefits stemming from trust, close relationships with customers, and external network economies – producers will find it rational to invest in and/or import from other areas of the world, where SHEC regulation is partly or fully lacking.

This report does not only look at the mere effect of EU policies on the competitiveness of the EU aluminium sector; it also studies other factors that affect the cost structure of the aluminium industry, and thereby its international competitiveness. In particular, we consider energy costs not attributable to regulation, and the costs of access to raw materials at the global level. These factors play a role in creating positive or negative cost differentials with global competitors, and therefore need to be taken into account in the analysis. However, it is important to point out that these costs do not result directly from existing EU policies. Very often, implementation at the national level is equally crucial in determining the final costs and benefits of a given policy. Moreover, EU policies as such cannot fully explain the current evolution of competitiveness in the EU aluminium sector. On the other hand, the fact that these costs do not stem directly from specific EU policies does not mean that EU policy cannot be changed in order to address them: for example,

⁴ By way of example, see the OECD inventory of fossil fuels subsidies and other support at <http://www.oecd.org/site/tadffss/>.

⁵ Please note that we are not claiming here that the EU operates in isolation.

⁶ In other words, when benefits materialize for the society at large and outweigh the overall costs of a given policy, in theory these benefits could also be used to compensate those that have incurred costs during policy implementation. However, this does not automatically imply that parts of these benefits will be used to compensate those that incurred the costs. For further details, see Kaldor, N. (1939) ‘Welfare Proposition of Economics and Interpersonal Comparisons of Utility’, *Journal of Economics* Vol. 49, p.549.

the absence of a fully integrated energy market in Europe can be considered as a cause of high energy prices.

Finally, it should be noted that the EU is not the only tier of government with the power to regulate the aluminium industry. Although trade policy is an exclusive competence of the EU, both SHERC regulations as well as direct subsidies fall within the EU and Member States' sphere of competence. In the Study, national policies will be taken into account where appropriate (e.g. regarding the differences in the costs of electricity), but should be considered a factor that cannot be fully influenced by EU policymakers.

Against this background, the aim of this Study is:

- To identify, assess, and where possible quantify, the cumulative costs of EU legislation in the aluminium sector;
- Compare these costs with the costs of international aluminium competitors, and
- Understand if and how much the costs of EU regulation impact on the cost structure of the European aluminium industry and on its competitiveness.

Given the aim of the Study, it is also worth clarifying what this Study does not do. In particular, **this Study does not contain an assessment of the overall costs and benefits of the legislation analyzed.** As explained above, we assess only the costs of legislation, and only for the aluminium industry. For example, this Study does not assess whether the ETS system delivers net benefits to the EU society, or whether the net impact of the ETS system on the aluminium industry, if any, is positive or negative. It only aims at calculating the costs borne by the aluminium industry due to the ETS system. Any assessment of the appropriateness, effectiveness and efficiency of the legislations as such falls out of the remit of this Study.

Specifically, while in terms of scope this Study follows an approach similar to a “fitness check”, in the meaning of the 2012 European Commission Communication on Regulatory Fitness⁷ (as it considers several legislative acts rather than a single act, and it adopts an ex post perspective, rather than an ex ante one), in reality its scope is more limited. Fitness checks assess the efficiency, effectiveness, burdensomeness and coherence of the EU legislation in a given policy area or sector; conversely, this Study only focuses on the third evaluation criterion, i.e. burdensomeness, as its goal is to assess the **cumulative cost** of EU legislation on the aluminium industry.

In more methodological terms, the assessment of cumulative costs can be performed by adopting a top-down or a bottom-up approach. In the former case, regulatory costs would be assessed on the whole sector by using aggregate data; in the latter, a set of “typical” facilities is chosen, for which the assessment is performed in depth. This Study opts for a

⁷ Communication from the Commission, EU Fitness, COM(2012)746, 12.12.2012.

bottom-up approach, because of its advantages in terms of accuracy, relevance, and actionability thanks to the higher level of granularity of the information obtained. As the aim of the Study is to assess competitiveness and the impacts on investment decisions, overall impacts are likely to be less relevant and actionable for policymakers. Competition and investment decisions depend on the impact of regulation on each firm, rather than on the sector as a whole. Furthermore, a micro analysis of certain typified facilities is likely to ensure a higher degree of accuracy and of comparability with non-EU installations, as it requires a narrower set of assumptions (e.g. on the validity of certain findings for the whole firm population). To ensure the general validity of the Study, defining a sample of “representative” aluminium facilities becomes a key factor. Only when costs for certain typologies of plants are assessed, an estimation for the whole sector can be carried out.

However, also the bottom-up approach may have shortcomings. There are two main reasons for this:

1. Heterogeneity. While this may not be a problem for some portions of the aluminium value chain (i.e., the production of primary aluminium), where the number of plants in the EU27 is relatively limited, when moving “downstream” along the value chain, existing players may not be fully comparable with one another or identifiable ex ante via secondary sources. As a result, it might be impossible to access all the information needed to perform a detailed quantification of costs. In this case, the preferred bottom-up approach will have to be complemented or even substituted by a top-down analysis.
2. Data availability. In some cases, granular data from plants cannot possibly be retrieved, due to issues of confidentiality. Where retrieval of data from primary sources is impossible, secondary sources, which in some cases adopt a top-down (i.e. sector-comprehensive) approach, will be used.

1.2 The object of analysis: the cost structure

The Study considers the costs borne by the firms falling within class 24.42 of the NACEv2 classification: aluminium production (see below, Table 20). This class covers the upstream part of the production of aluminium (e.g., production of alumina and of primary aluminium), the production of secondary aluminium via the refining of waste and scrap, and the production of semi-finished and finished products from rolling, extrusion, and casting. The Study does not cover the extraction of bauxite or the transformation of semi-finished products into finished manufactures. Focusing on this class allows the Study to treat similar entities, thereby increasing the degree of accuracy of the analysis. In line with the terms of reference, after a general overview of the aluminium value chain, this Study will focus on primary aluminium production, on secondary aluminium production and - where possible and relevant - on downstream sections of the industry (e.g., rolling).

Within the aluminium industry, as defined above, the research team aims at Studying the cost structures of a set of typical plants. These cost structures are the core units of analysis

of the Study. Once defined, it will be possible to assess the impact of regulatory costs on these structures, both in terms of operating expenditures and annualised capital expenditures. Furthermore, these cost structures can be compared with the cost structures of comparable non-EU firms.

To define the cost structure of primary aluminium producers in the EU, the research team has relied on a commercial data provider (CRU): the information contained therein was then verified via a set of interviews with a selected sample of plants. CRU maintains a dataset disaggregated at the level of the individual plant for several hundred worldwide facilities. CRU data include both the general cost structure of aluminium producers, as well as a detailed focus on power tariffs for individual smelters. For secondary aluminium production and for downstream sections of the industry, no comparable commercial data provider is available. Hence, we relied on secondary literature and on data collected via interviews to a selected sample of plants.

Once the cost structures have been defined, where relevant, we have also performed a sensitivity analysis based on the quantification of regulatory costs due to EU legislation. This means:

1. Quantifying the costs due to EU legislation. This important step is discussed in detail in Section 1.3 below;
2. Identifying these costs in the aluminium manufacturers' cost structures and assess how they impact on the industry's cost competitiveness (through a sensitivity analysis).

In order to assess the effects on international competitiveness, the costs borne by EU aluminium manufacturers are compared against the costs of typical facilities located in the other world areas, including European Economic Area (EEA) key players such as Norway and Iceland.

1.3 Assessment of regulatory costs

The Study cannot resort to a consolidated methodology to assess the cumulative cost impact of all EU legislation on a given industry. Finding itself in uncharted waters, the research team intends to combine three different approaches:

1. Measurement of administrative costs;
2. Measurement of compliance costs;
3. Measurement of indirect costs.

Administrative costs are those costs incurred by firms to provide information to public authorities and third parties. They are generated by Information Obligations (IOs) included in the legislative acts. At the EU level, administrative costs are normally measured through the Standard Cost Model (SCM, Annex 10 of the EU Impact Assessment

Guidelines), and our methodology follows the EU's SCM. The SCM methodology requires the identification of the annual cost of each IO. To do so, the time devoted to comply with the IO by a "normally efficient firm" is estimated; this value is then multiplied by the salary rate of the staff carrying out the IO; and by the number of yearly occurrences (frequency) of the IO. Once the cost per IO is identified, it is possible to calculate aggregate costs for the whole industry, by multiplying the cost per IO by the number of firms affected (the population). Our assessment suggests that administrative costs, even if significant for some policy areas, are expected to represent a relatively small share compared to overall compliance costs.

The measurement of compliance costs can be done along the same steps; however, its scope is larger. Compliance costs include not only costs due to IOs, but also to Substantive Obligations (SOs) and Monetary Obligations (MOs). SOs are provisions which require the firm to take actions to adapt its productive process to comply with the legal act. The most common example would be the installation of anti-pollution filters to comply with emission limits. MOs are provisions which require the firm to bear monetary costs, such as costs of allowances, fees, taxes and levies.

The methodology to assess compliance costs remains similar to that illustrated with respect to administrative burdens. Hence, the research team tried to quantify the yearly cost per occurrence for each SOs and MOs. This requires identifying the following categories of costs: i) Investment Costs (ICs); ii) Operating Costs (OCs); and iii) Financial Costs (FCs). Once this is done, the annual cost is obtained by either multiplying the cost per occurrence by the annual frequency for recurring obligations; or by annualising the cost per occurrence in the case of one-off obligations. As for IOs, once the cost per SO or MO is identified, it is possible to calculate aggregate costs for the whole industry by multiplying it by the number of firms affected (the population).

Administrative costs and compliance costs cover the set of direct costs imposed by EU legislation on the aluminium industry.

Despite its apparent simplicity, the main challenge in the proposed methodology is estimating the cost per single occurrence, especially in the case of investment costs. Depending on the complexity of the regulatory provisions, and their burdensomeness, the research team adopted the following approaches:

1. Standardised estimates. These can be used when obligations are relatively simple and do not represent a significant burden;
2. Desk research, retrieving from various sources estimates of administrative or compliance costs stemming from a specific act or provision. For example, the cost of certain provisions could have been estimated in Impact Assessments or external preparatory studies;
3. Consultation with stakeholders, in line with the standard methodologies for the assessment of administrative and compliance costs.

To produce a fair picture of the costs of regulation, the Business-As-Usual (BAU) factors should be taken into account. The BAU factor represents the share of regulatory costs which a firm would bear even in the absence of a regulation. For example, a primary aluminium producer must comply with certain energy efficiency limits; however, it would undertake some investments in energy efficiency even if there were no regulations, up to the point in which the marginal cost of investments equals marginal energy savings. Determining the BAU factor can sometimes result in establishing a challenging counterfactual, but it is important because it allows distinguishing between instances in which a regulation is only “consolidating” industry practices, and instances in which a regulation creates a truly additional burden. To provide an estimate of the BAU factor where relevant, the research team will resort to the same methods used to determine regulatory costs. In most cases, the assessment of costs and the BAU factor will be done jointly.

Finally, the issue of indirect costs needs to be unfolded. Indirect costs can be defined as costs of regulation which have an impact on aluminium producers not as direct addressees, but as counterparts of direct addressees. An example can be energy policies, whose addressees are i.a. electricity producers, which are suppliers of the aluminium industry; or product regulation, whose addressees are e.g. the automotive industry, which are customers of the aluminium industry.

In this respect, clear boundaries need to be set to ensure that the Study does not end up being too broad. First of all, the causation link between the act and the effects must be reasonably short. This means that only indirect effects originating from the most proximate counterparts of aluminium producers (such as suppliers) can be taken into account. Secondly, the indirect effects must be significant, i.e. resulting in a measurable cost differential for the aluminium industry.

Our assessment and the feedback we received from stakeholders indicate that the following indirect costs are likely to be proximate and significant for the aluminium industry:

1. Impacts of energy policies on electricity prices;
2. Impacts of climate change regulation on electricity prices.

1.4 The selection of typical facilities

As already recalled, the cost structures of typical EU aluminium facilities are the objects of analysis of the Study. To define the sample of typical facilities, we used the following criteria:

1. Overall capacity and production
2. Electricity generation
3. Geographical coverage

4. Ownership

The following segments of the aluminium value chain are covered in the Study:

- Primary aluminium smelters. The current population includes a total of 16 active plants, located in 10 member states. As will be explained, for the timeframe covered by the Study (2002-2012), the total number of smelters located in the EU27 was higher. The research team has mostly selected smelters that are still operational, but also included in the analysis some of the plants that have recently closed and for which reliable data are available. The cut-off year in this respect is 2007, due to data availability.
- Secondary production (recycling). Recycling is obtained via two different processes: remelting and refining.⁸ Establishing the exact number of plants for both processes was not as simple as with primary production. In one of the latest empirical publications on the topic, Ecofys (2009) estimates that there are more than 30 remelting installations in Europe (EU27 plus Norway and Iceland),⁹ and about 130 refining plants. Since then, some plants have been sold, mergers have taken place, and we have verified this information to the best of our abilities. According to the latest data provided by the European Aluminium Association (EAA)¹⁰, there are some 94 secondary aluminium plants located in 13 EU member states. Remelting operations are in the hands of a few big players and some small ones. Conversely, the landscape for refiners is more diverse, again with some big players and several smaller companies often concentrated in a limited number of member states.¹¹
- Finally, the population of downstream operations covered in the Study (i.e., rolling and extrusion) comprises 48 rolling mills located in 16 member states and some 150 extrusion plants in 22 member states. A few big players cover a sizeable portion of total output; however there are also several independent companies that hold an important place in the market.

We now turn to a more detailed discussion of the selection criteria for the sample of plants covered in this Study.

1. Overall capacity and production.

For primary production, smelters in the EU27 were classified in three groups: high-capacity smelters with a capacity higher than 200,000tpy; medium-capacity smelters that

⁸ For further details, see Chapter 2.

⁹ Ecofys et al. (2009), Methodology for the free allocation of emission allowances in the EU ETS post 2012. Sector report for the aluminium industry, p. 2.

¹⁰ Note that the EAA has recently merged with the Organisation of the European Aluminium Recycling Industry (OEA).

¹¹ According to OEA data from 2005 to 2010, the bulk of EU27 production for refiners is located in 8 Member States.

can produce between 100,000tpy and 200,000tpy; and small-capacity smelters with a capacity below 100,000tpy. The research team has selected high, medium, and low capacity facilities to reflect a distribution capacity similar to that of the primary aluminium production universe (based on CRU data). However, all the four EU high-capacity smelters were included in the sample, as this was instrumental to achieve an adequate geographical coverage. All in all, the research team selected 11 plants (of which 10 active, and one closed), covering more than 60% of the 2012 production in the EU. For secondary and downstream facilities we have followed the same approach. We have thus selected 20 secondary producers (both remelters and refiners) located in member states that represent about 80% of total EU27 secondary production in 2010,¹² and 15 downstream facilities located in member states that cover 60% of the total output.¹³

2. Electricity generation.

We looked specifically at the following aspect:

- The energy mix. The geographical distribution of the sample includes countries with a diversified energy mix for electricity production (e.g., nuclear, coal, hydro).

More specifically, for primary production these additional factors are looked into:

- The origin of supply. Electricity is a key input, especially in the production of primary aluminium, accounting for about 30% of the total cost. It was thus essential to include in the sample different types of primary facilities, ranging from those who meet their entire electricity needs via the market, including via long-term contracts, to plants that rely on self-generated electricity.
- The technology applied. There are two ways of producing primary aluminium: the Soderberg technology and the Pre-bake technology, with the former being more energy-intensive than the second. While the vast majority of EU smelters use the Prebake technology, we have included facilities using any of the two in our sample.

For rolling mills we have included both cold rolling and hot rolling plants.

Electricity and capacity could already allow characterizing a set of typical facilities. However, other criteria need to be taken into account to ensure that the sample provides an appropriate geographical coverage. The application of these criteria, as well as the exact capacity of plants, will be kept confidential, in order for facilities not to be easily singled out. Indeed, the limited number of primary aluminium smelters in the EU would allow an immediate identification if these criteria were made public.

¹² More recent data were not available for secondary production.

¹³ EAA estimates. As mentioned, for secondary and downstream production the research team could not rely on a commercial data provider like CRU. Output figures were thus reconstructed from secondary sources and confidential data provided by the EAA.

3. Geographical coverage.

In this case, the following criteria were applied:

1. Aluminium production per member state. As the most important aluminium producing member states (Germany, Spain, France, Romania, Greece and the Slovak Republic) represent 78% of primary aluminium production, a comparable share of sampled facilities are located therein. With some exceptions (e.g. Romania), these countries are also key players in secondary and downstream production.
2. South vs. East vs. West/North. Selected facilities reflect the relative weight of the following geographical areas:
 - a. Southern European member states (Italy, Spain, Greece, Portugal, Malta, and Cyprus), which represent 30% of primary aluminium production in 2012; and 33% of secondary production (refining and remelting) in 2010.¹⁴
 - b. Central Eastern European member states (Czech Republic, Hungary, Estonia, Lithuania, Latvia, Bulgaria, Poland, Slovenia, Romania, Slovak Republic), which represent 22% of primary aluminium production in 2012; and 13% of secondary production in 2010.
 - c. Western and Northern European Member States (France, Germany, the Netherlands, the UK, Sweden, Ireland, Belgium, Luxembourg, Austria, Finland, Denmark), which represent 48% of primary production in 2012, and 54% of secondary production in 2010.

4. Ownership.

Despite the relatively limited number of players in the EU primary aluminium market, we have included in our sample global players and national companies. As aluminium is a global product, it is important to reflect the differences stemming from a specific type of ownership. This approach is also relevant for secondary and downstream production, where SMEs were also included.

1.5 The scope of the Study: the policy areas

Eight policy areas and 52 EU legislative acts and non-legislative policies fall within the scope of the Study. They are listed in Table 1 below. For commodity markets, 4 acts have been added to the list originally included in the Terms of Reference; they are shown in italics in the table below.

¹⁴ For rolled and extruded products, the research team could access confidential shipment data for a set of EU Member States. However these data are often aggregated per group of countries (e.g., Spain and Portugal; Cyprus, Turkey and Greece). It is thus impossible to provide a detailed breakdown in this case. The biggest producing countries are Germany, Italy, and France.

Table 1: List of legislation and policies within the scope of the Study

Policy Area	Legislative acts and other policies
1. General Policies	<ul style="list-style-type: none"> • Europe 2020 A strategy for smart, sustainable and inclusive growth, COM(2010)2020 • An Integrated industrial policy for the globalisation era - Putting competitiveness and sustainability at centre stage, COM(2010) 614 • Roadmap to a resource efficient Europe, COM(2011) 571 • 2050 low carbon roadmap, (COM(2011) 112) • 2050 energy roadmap, (COM(2011) 885) • Innovation Union - Europe 2020 flagship initiative, COM(2010) 546
2. Climate Change	<ul style="list-style-type: none"> • Carbon leakage list (Decision 24/12/2009) • Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community (ETS) • Directive 2009/29/EC - 3rd phase of ETS • Product-based benchmarks • Decision 2011/278/EU determining transitional Union-wide rules for harmonised free allocation of emission allowances pursuant to Article 10a of Directive 2003/87/EC of the European Parliament and of the Council • Regulation 601/2012 on monitoring and reporting
3. Commodity Markets	<ul style="list-style-type: none"> • Revision of directive on markets in financial instruments – MiFID (2004/39/EC) • <i>Proposal for a Regulation of the European Parliament and of the Council on markets in financial instruments and amending Regulation [EMIR] on OTC derivatives, central counterparties and trade repositories, COM(2011)652</i> • <i>Regulation (EU) No 648/2012 of the European Parliament and of the Council on OTC derivatives, central counterparties and trade repositories</i> • <i>Directive 2003/6/EC of the European Parliament and of the Council on insider dealing and market manipulation (market abuse), as amended by Directive 2008/26/EC and Directive 2010/78/EU [MAD]. MAD is currently under review, cf. Proposal for a Directive of the European Parliament and of the Council on criminal sanctions for insider dealing and market manipulation, COM(2011)654</i> • <i>Proposal for a Regulation of the European Parliament and of the Council on insider dealing and market manipulation (market abuse), COM(2011)651 [MAR]</i>
4. Competition Policy	<ul style="list-style-type: none"> • Revised State aid guidelines (financial compensation for indirect emissions) SWD(2012) 131 • Environmental state aid guidelines 2008/C 82/01 • Anti-trust Regulation (EC) No 1/2003 • Merger Control Regulation (EC) No 139/2004 • Guidelines on national regional aid FOR 2007-2013 (2006/C 54/08)
5. Energy Policy	<ul style="list-style-type: none"> • 3rd Energy Package: <ul style="list-style-type: none"> • Directive 2009/72/EC concerning common rules for the internal market in electricity • Directive 2009/73/EC concerning common rules for the internal market in natural gas • Regulation (EC) No 714/2009 on conditions for access to the network for cross-border exchanges in electricity • Regulation (EC) No 715/2009 on conditions for access to the natural gas transmission networks • Making the internal energy market work , COM(2012) 663 • Renewable Energy Directive (Directive 2009/28/EC) • Energy Efficiency Directive (Directive 2012/27/EC) • Energy Taxation Directive (Directive 2003/96/EC)

6. Environmental Policy	<ul style="list-style-type: none"> • REACH and related legislation • Industrial Emissions Directive (Directive 2010/75/EU) • Air quality framework Directive (Directive 96/62/EC) • Water Framework Directive (Directive 200/60/EC) • Waste Shipment Regulation 1013/2006/EC • End of life Directive 2008/98/EC (Waste Framework Directive) • Packaging and packaging waste directive (Directive 94/62/EC) • End-of-life Vehicles Directive 2000/53/EC • Council Directive 1999/31/EC on the Landfill of Waste
7. Trade Policy	<ul style="list-style-type: none"> • Trade Defence Instruments (anti-dumping, anti-subsidy, safeguard measures) package <ul style="list-style-type: none"> • Anti-dumping: Regulation (EC) No 1225/2009 • Anti-subsidy: Regulation (EC) No 597/2009 • Safeguards (against WTO members): Regulation (EC) No 260/2009 • Safeguards (against non-WTO members): Regulation (EC) No 625/2009 • Review of the autonomous tariff measure on unwrought unalloyed aluminium and the future EU tariff schedule for unwrought aluminium • Generalised Scheme of Preferences (GSP) Regulation 978/2012
8. Products and Life Cycle Assessment	<ul style="list-style-type: none"> • Eco-design Directive 2009/125/EC and Ecodesign work plan 2013-2015 • Eco-label regulation 66/2010 • Energy Labelling Directive (Directive 2010/30/EU) • Directive 2004/18/EC • Directive 2004/17/EC • Green Public Procurement Criteria • Construction Products Regulation No 305/2011 (CPR) • Energy performance Buildings Directive (Directive 2010/31/EU) • CO2 from cars and vans regulations (Regulations 443/2009 and 510/2011) • Existing diverging methodologies for LCA • Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system COM(2011) 144 • Strategy for the sustainable competitiveness of the construction sector and its enterprises COM(2012) 433

The acts listed in the table above are very different in nature and in their effects on aluminium producers. Broadly speaking, acts falling within the scope of the Study can be classified in three different categories from the perspective of the mapping process:

1. Binding acts which create direct obligations for the aluminium industry, and thus impose a direct cost;
2. Binding acts which do not create a direct obligation for the aluminium industry, but may create an indirect cost;
3. Non-binding acts and other policies, which may or may not create costs.

The mapping methodology varies across the different policy areas. Specifically, the mapping process can identify regulatory provisions which create obligations, and thus costs, for the aluminium industry only for those acts falling within the first category. For the other two categories, the mapping process will result in a survey of the effects of the

acts on the aluminium industry. By way of example, the third gas and electricity package has no direct consequences for aluminium facilities; however, as it determines the competitive conditions in these two other markets, it may have an indirect effect on the aluminium sector via energy prices.¹⁵

The difference between direct and non direct obligations is very important to explain the twofold approach to each policy area and the related legislation. We make a sharp distinction between those acts that cause costs, be they direct or indirect, on the aluminium industry, through a proximate and clear causal relationship; and the acts, which define the sectoral environment and the internal and external competitive constraints. Specifically, climate change, energy, commodity markets and environmental legislation are likely to belong to the first class of acts. On the contrary, general policies, trade and competition policies are more likely to belong to the second class, as the causal linkage between policies and costs for companies is not so strong and this would introduce an excessively high element of uncertainty and subjectivity in the quantification exercise; hence a broader and qualitative approach is to be preferred. For instance, while the ETS system imposes a direct and indirect (via electricity prices) cost on the aluminium industry, competition policy does not.

The calculation of regulatory costs is possible only for the first category of acts. For the second, this Study carries out an analysis of the competitive constraints and opportunities that they cause for aluminium producers and their likely effects on investments decisions, in comparison with international competitors.

As already explained above, a separate analysis is devoted to energy costs. This input represents the bulk of operating expenditures for aluminium producers. EU legislation has an impact on energy costs, albeit limited and indirect. For example, even though the amount of transmission tariffs charged to large industrial customers depends on national policies, the general organization of the electricity market depends on the EU *acquis*. Taxation on energy is a shared responsibility between the EU, fixing the minimum level of excises, and the member states, which set excise duties and may impose other levies. However, energy prices depend on several other non-policy factors, such as worldwide markets for hydrocarbons or the distribution of natural resources.

1.6 Final sample and response rate

The final sample that was used for the assessment of the eight policy areas covered by the Study includes the following:

- 11 primary aluminium smelters
- 20 secondary aluminium producers (refiners and remelters)

¹⁵ For further details on the cost impact of individual policy areas, see Part III of the report.

- 15 downstream players (rollers and extruders).

For downstream and secondary production we have included in the sample independent operators or SMEs as far as possible or relevant.

The response rate varied among the different segments of the value chain and also across policy areas. The 11 primary producers included in the sample responded to all or most of the different questionnaires submitted to collect quantitative and qualitative information on various policy areas. Conversely, the response rate was slightly lower among downstream players, and remained the lowest among secondary producers.¹⁶ While all collected and verifiable information was used in the relevant Chapters, we have decided to undertake the cumulative cost assessment of EU legislation only for primary aluminium production. For the other segments of the value chain, the low response rate or a concentration of responses from a given member state did not allow us to provide a fully representative picture. Moreover, confidentiality considerations also applied: given the low response rate, some of the production costs and margins of downstream and secondary players might have been easily recognizable for an informed reader, despite our attempts to anonymize data.

The composition of the sample and the response rate per segment and policy area are summarised in Table 2 below.

Table 2 : Sample and response rate

Policy Area	Primary producers	Secondary producers	Downstream producers
<i>Energy</i>	11/11	NA	NA
<i>Climate Change</i>	11/11	11/20 (7 usable answers)	12/15 (10 usable answers)
<i>Environment</i>	9/11	10/20	9/15
<i>Margins</i>	11/11	5/20 (4 usable answers)	6/15 (5 usable answers)

Source: Authors' own elaboration

¹⁶ Note that we approached secondary plants both via the EU and the national associations and by contacting them individually. In some cases the response rate was very high (3 out of the 5 members of a national association returned our questionnaires). In others, despite various attempts, feedback remained limited, especially as far as margins and production costs are concerned. The response rate for the various policy areas is treated in the relevant Chapters of the study. Finally, we have also carried out a set of more qualitative interviews with the EAA and a selection of sectoral experts in some of the companies included in our sample.

2 The Cost Competitiveness of the EU Primary Aluminium Industry

2.1 Methodology and data source

This Section compares the costs for primary aluminium production on a worldwide basis, and assesses the current competitiveness of EU producers *vis-à-vis* other international players. The following countries/regions are included in the comparison: i) Africa;¹⁷ ii) Asia;¹⁸ iii) Australasia;¹⁹ iv) Canada; v) China; vi) the Commonwealth of Independent States (CIS);²⁰ vii) European Union;²¹ viii) Iceland; ix) Latin America;²² x) Middle East;²³ xi) Norway; and xii) the United States. While global coverage normally refers to regional figures, some countries have been singled out in the analysis insofar as they are acknowledged as main global competitors and represent important commercial partners for the EU in terms of aluminium trade volumes.

The costs of the eleven primary smelters included in the sample are also reported. The analysis hence includes the average cost of production of the sample; the average cost of production of the sampled plants procuring electricity through long-term contracts or self-generation (subsample 1);²⁴ and the average cost of production of the sampled plants procuring electricity in the wholesale market (subsample 2). The representativeness of the sample is confirmed, as the sample average of the various costs is constantly close to the EU27 average, albeit slightly lower. All cost figures are computed as a weighted average of the costs incurred by the relevant plants, by adopting as weights the 2012 production levels.

The comparison relies on data for 2012 and is drawn from the 2012 edition of the Primary Aluminium Smelting Cost Service, an interactive platform provided by CRU and comprising, *inter alia*, operating costs and output levels for each primary aluminium smelter in the world, except for a limited number of Chinese plants. In order to ensure consistency with the analysis of the cost impact of EU energy policies provided in Chapter

¹⁷ Cameroon, Egypt, Ghana, Mozambique, Nigeria, South Africa.

¹⁸ India, Indonesia, Japan, Malaysia.

¹⁹ Australia, New Zealand.

²⁰ Azerbaijan, Kazakhstan, Russia, Tajikistan, Ukraine.

²¹ France, Germany, Greece, Italy, the Netherlands, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom.

²² Argentina, Brazil, Venezuela.

²³ Bahrain, Iran, Oman, Qatar, Saudi Arabia, Turkey, United Arab Emirates.

²⁴ For a more detailed discussion, please see Section 9.1.2.

9, cost models for the EU plants included in the sample are customized by inputting the costs of electricity resulting from the interviews.²⁵

The analysis is devised to ensure the highest degree of comparability: i) costs are always computed in US Dollars per tonne of aluminium; ii) aggregate costs are adjusted to account for differences among smelters in terms of output quality (mainly shape and purity grade) and location of facilities, thus comparing cost figures ‘as if’ the final products of each plant were undifferentiated commodities.

To shed light on sources of competitive cost advantage/disadvantage, total costs are disaggregated and the following cost components are investigated:

- Raw materials, i.e. costs for alumina, which is the main production input;²⁶
- Conversion costs, i.e. all the operating expenses borne to convert alumina into liquid metal;
- Power cost, which is part of the conversion costs, and represents a crucial competitive driver;²⁷
- Business costs, which are computed as the sum of raw material costs, conversion costs, casthouse costs, and expenses for marketing, sales, and transportation (free on board). Business costs are adjusted to account for the different quality of final output produced by each smelter as well as for advantages stemming from tariff protection;²⁸
- Economic costs, i.e. business costs plus overheads, liabilities and capital costs at market value.

2.2 Production costs for primary aluminium

2.2.1 Costs for raw materials, electricity, and conversion²⁹

EU companies are very efficient as regards costs for alumina, spending in average 608\$ per tonne of final product (see Figure 1). Only in Australasia (593\$) and in Asia (607\$)

²⁵ Prices reported by companies have been validated by the research team. See Box 4 in Section 9.1.2.

²⁶ Alumina costs are assessed by adopting the so-called ‘contract methodology’, thus accounting for real prices paid by producers rather than for market prices.

²⁷ This item covers potroom power consumption costs; casthouse power consumption is excluded.

²⁸ The adjustment is based on Value Based Costing (VBC), a proprietary methodology adopted by CRU. In particular, market premiums due to the manufacturing of value added products or high purity aluminium and/or from tariff protection are treated as negative cost items, thus reducing aggregate business costs and considering all smelters on a directly comparable basis.

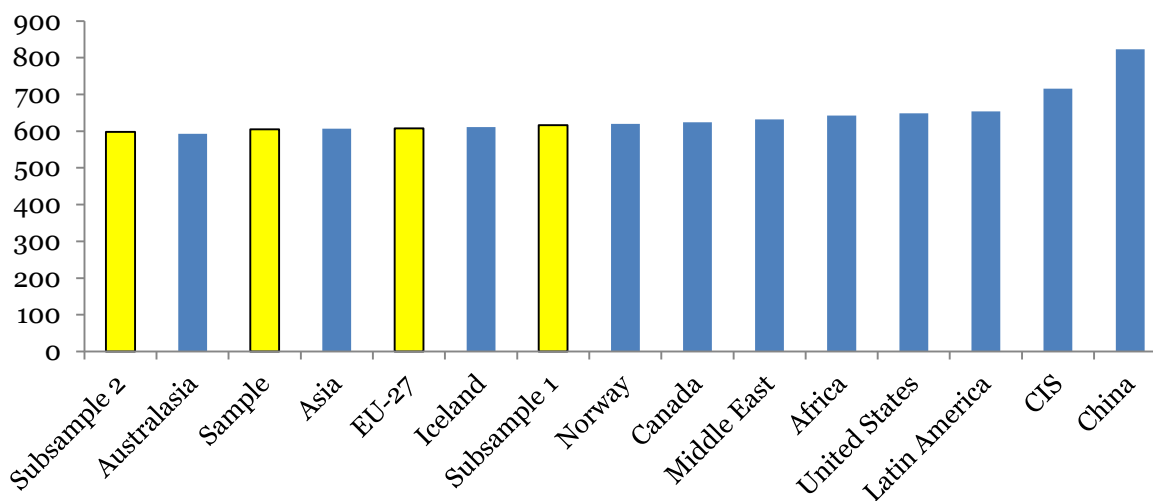
²⁹ Costs assessed in this paragraph are not yet adjusted for differences in the quality of smelter’s output as well as in distance between plant location and pricing point.

aluminium producers are able to incur lower costs, whereas the highest costs are borne by Chinese (823\$) and CIS (716\$) plants.³⁰

On the contrary, per-tonne expenses by EU smelters for electricity (826\$) are a major source of competitive disadvantage (see Figure 2). Power cost is particularly high for those companies that are not in long-term arrangements with electricity suppliers (1,033\$, and labelled in the figures as subsample 2), while primary smelters which procure electricity through long-term contracts or self-generation face a significantly lower expense (440\$, labelled in the figures as subsample 1). Whereas on a regional basis the highest cost is again registered in China (897\$),³¹ Canadian, Icelandic and Middle Eastern producers pay less than 400\$ per tonne.

When considering the costs of converting alumina into aluminium, thus including not only power cost, but also carbon cost, labour cost, fuel cost, bath material cost, other consumable costs as well as maintenance and sustaining capital expenses, producers in the EU face a competitive disadvantage *vis-à-vis* all international competitors (see Figure 3). Per-tonne conversion costs are equal to 1,630\$ in the EU (1,814\$ for smelters in subsample 2), i.e. about 200\$ more than in the US (1,428\$). Middle Eastern smelters are the least cost producers (951\$), paying more than 100\$ less than facilities installed in Africa (1,055\$) and CIS (1,095\$). The EU smelters included in subsample 1 are in a better competitive position, incurring relatively low conversion costs (1,200\$).

Figure 1 Raw material costs per tonne of aluminium (\$ 2012)

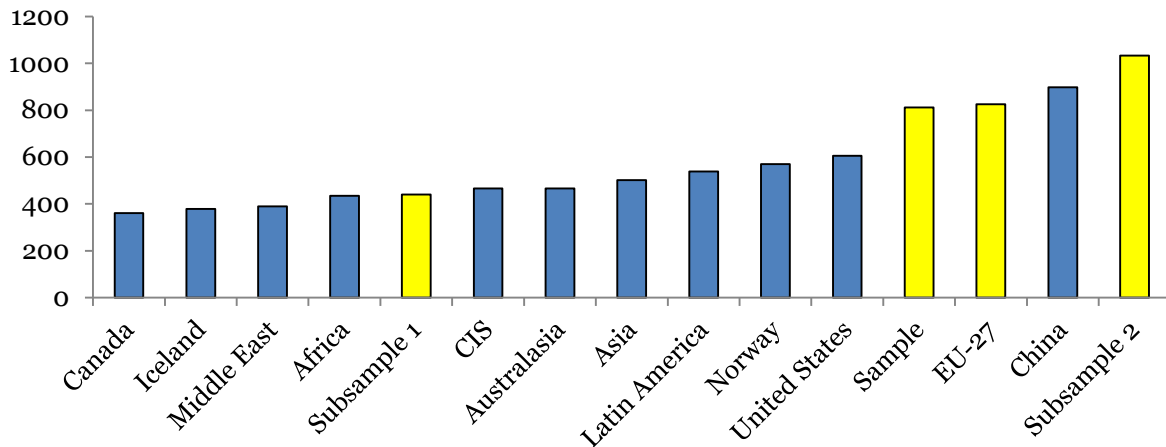


Source: Authors' elaboration on CRU, 2012

³⁰ Please, note that raw material costs represent the full cost of using alumina, including the cost of delivery to the smelter.

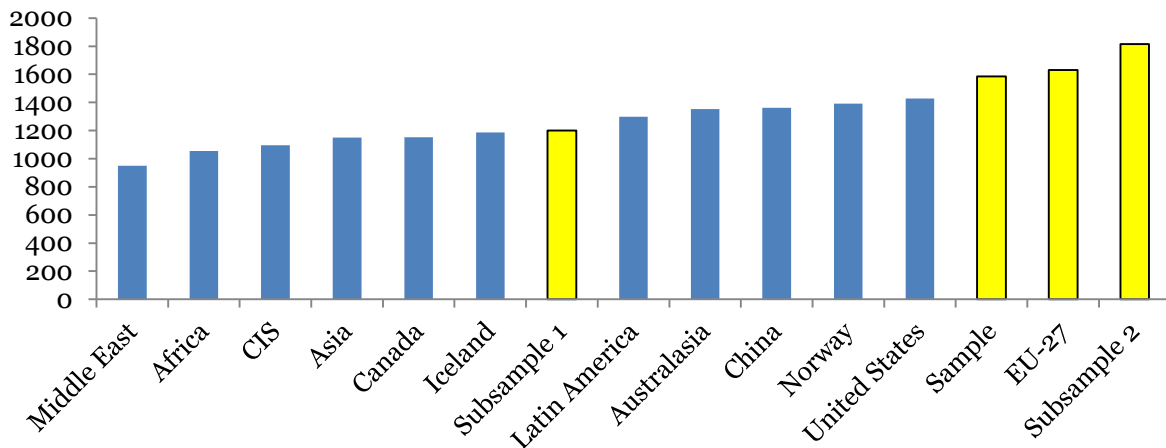
³¹ It is not yet possible to assess to what extent this is the real price for electricity paid by Chinese smelters, or to what extent public subsidies reduce power costs.

Figure 2 Power costs per tonne of aluminium (\$ 2012)



Source: Authors' elaboration on CRU, 2012

Figure 3 Conversion costs per tonne of aluminium (\$ 2012)



Source: Authors' elaboration on CRU, 2012

2.2.2 Aggregate production costs

Whereas the cost comparisons conducted so far might be influenced by differences in the quality of the aluminium produced and the location of smelters, business costs account for these features, thus leading to a more accurate result (see Figure 4).³² On average, EU smelters incur very large business costs (2,032\$), followed by those installed in the US (1,944\$), China (1,923\$) and Australasia (1922\$). While selected EU plants included in subsample 2³³ are estimated to be the highest cost producers, bearing business costs equal

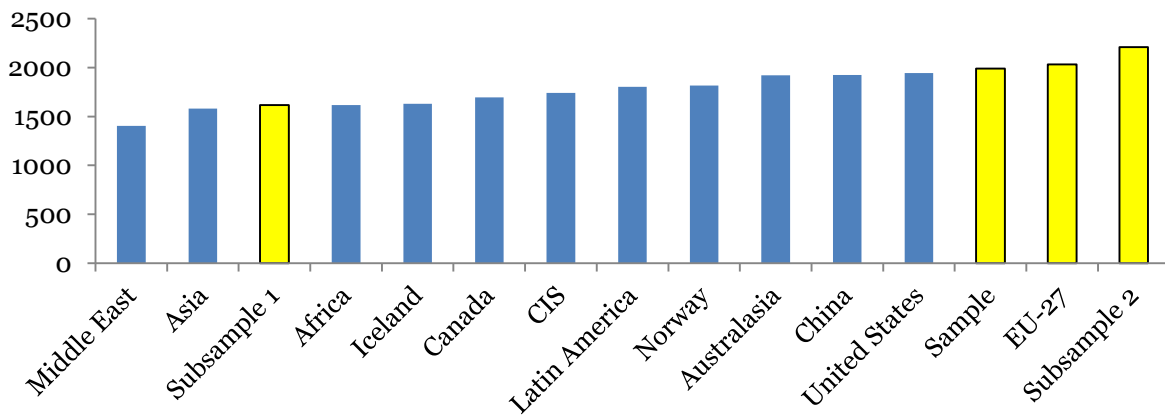
³² As mentioned above, business costs include raw material costs, conversion costs, casthouse costs, and expenses for marketing, sales, and transportation (free on board) and are further adjusted to ensure comparability among smelters' outputs (see footnote 28).

³³ Namely the smelters which do not purchase electricity via long-term contracts.

to 2,209\$ per tonne, smelters comprised in subsample 1 (1,615\$)³⁴ have a significant competitive advantage. Only Middle Eastern (1,402\$) and Asian (1,582\$) plants are able to be more cost-efficient.

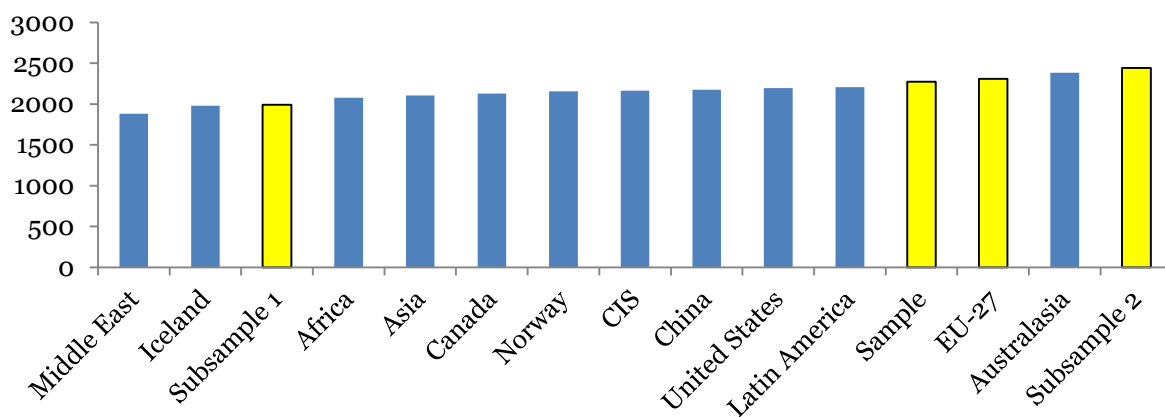
Primary aluminium installations located in the Middle East play the role of least cost producers also when including in the analysis overheads and capital costs, incurring total costs equal to 1,880\$ per tonne of final product (see Figure 5). Middle Eastern companies are followed by Icelandic plants (1,982\$) and selected EU smelters in subsample 1 (1,992\$). On average, the highest economic costs are incurred by Australasian producers (2,383\$) and are similar to those paid by EU27 aluminium producers (2,308\$). EU smelters comprised in subsample 2 (2,442\$) are the least competitive installations. Plants located in Norway, CIS, China, the US, and Latin America face comparable per-tonne costs ranging between 2,157\$ and 2,207\$.

Figure 4 Business costs per tonne of aluminium (\$ 2012)



Source: Authors' elaboration on CRU, 2012

Figure 5 Economic costs per tonne of aluminium (\$ 2012)



Source: Authors' elaboration on CRU, 2012

³⁴ As mentioned, these are the smelters that still purchase electricity via long-term contracts that do not feature the pricing of CO₂.

2.2.3 Production cost differentials

Cost differentials in the production of primary aluminium between EU smelters and the least cost producers, i.e. Middle Eastern plants, are mainly due to smelter power costs, except for EU facilities included in subsample 1 (see Table 3). In relative terms, per-tonne electricity cost is almost 112% higher in the EU and 165% when considering EU smelters in subsample 2.³⁵ Differentials in costs for smelter fuel (more than eight times larger in the EU than in the Middle East) and for carbon (about 25% larger in the EU) have also a significant impact on competitiveness. Labour costs, albeit higher in nominal terms, do not emerge as a clear source of competitive disadvantage, considering that these comparisons do not follow a purchasing power parity approach - crucial to analyse wage differentials - and that for some EU companies labour is even a source of competitive advantage.³⁶ Finally, it is worth stressing that while capital costs are larger in the Middle East due to more modern installations, a negative differential for net realisation costs³⁷ is attributable to the regional ingot premium within the EU, to the existing tariff protection and, to a small extent, to the higher value-added of the product mix made in the EU when compared to Middle Eastern production.

Table 3 Cost differential between EU primary aluminium producers and least cost producers in absolute value per tonne of aluminium (\$ 2012)

	EU-27	Sample	Subsample 1	Subsample 2
Raw materials	-24.54	-27.51	-15.77	-34.52
Carbon cost³⁸	59.75	40.31	40.46	40.23
Smelter power cost	436.92	422.29	51.11	643.88
Smelter fuel cost	36.98	36.77	33.86	38.51
Other costs	87.66	89.46	124.13	68.77
Total casthouse costs	21.86	20.79	7.21	28.90
Smelter Labour Cost	57.49	45.15	-0.26	72.27
Overheads	-12.58	-15.11	-14.79	-15.29
Capital costs	-188.55	-175.85	-86.93	-228.93
Net realisation costs	-46.94	-42.74	-27.63	-51.77
Economic Costs	428.06	393.57	111.38	562.04

Source: Authors' elaboration on CRU, 2012

³⁵ Although cost differentials are the combination of different prices and different efficiency levels, electricity prices are the main driver of smelter power cost differentials.

³⁶ Labour costs show a high variance between different EU member states.

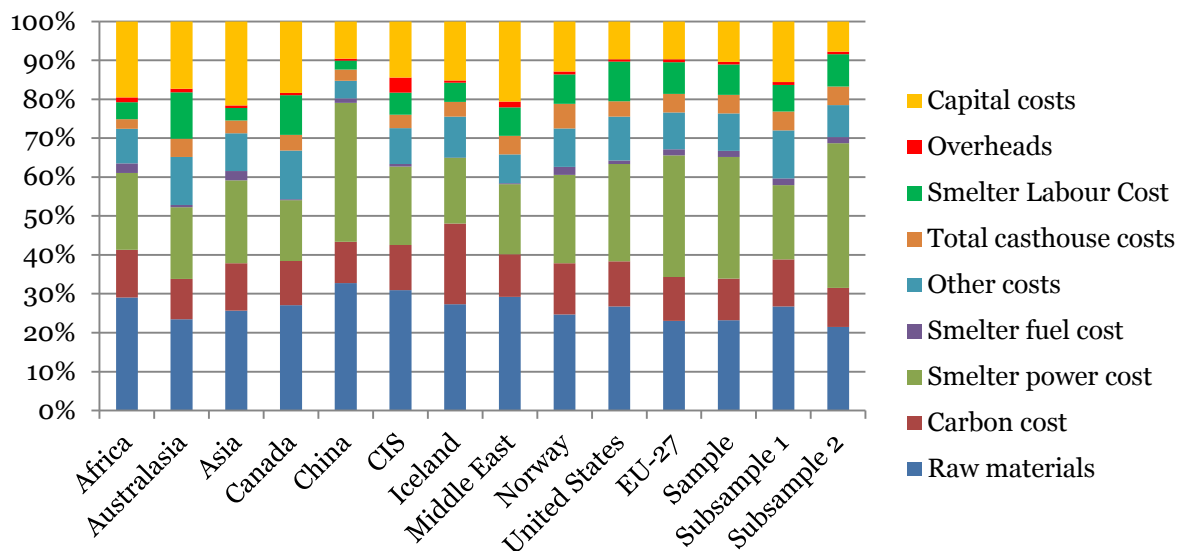
³⁷ Net realisation costs include expenses for marketing, sales, and transportation (free on board) as well as adjustments for quality and purity grade of aluminium produced and for the existing tariff protection.

³⁸ Please note that carbon cost for sampled plants is lower than the EU average because, according to CRU data, carbon is more expensive in some member states that are not represented in the selected sample.

2.2.4 Breakdown of production costs per tonne

A closer look at the breakdown of costs per tonne of aluminium shows that variable costs³⁹ always account for the lion's share of total expenditure, ranging between 70% of total costs in Australasia to 88% in China, where the share of labour costs is particularly low (see Figure 6). Raw materials (i.e. alumina) account for about one fourth of total costs and are the main cost item, with the exception of the EU and China, whose production costs are largely dependent on expenses for electricity, going beyond one third of the total. As expected, electricity has a prominent role also in the cost structure of EU smelters included in subsample 2. In all the other countries/regions, power costs are the second largest variable cost item, the only exception being Iceland where carbon cost accounts for 21% of total expenditure.

Figure 6 Breakdown of production cost per tonne of aluminium (2012)



Source: Authors' elaboration on CRU, 2012

³⁹ Not including labour costs, which can be considered quasi-fixed in the short-term.

3 Cumulative Cost Assessment

This Chapter provides an overview of the overall regulatory costs borne by the EU primary aluminium industry as a result of EU legislation. This assessment is based on the analysis included in Part III of the present Study, where the acts for each policy area are analysed and the methodology behind each quantification is explained.

The analysis covers, to a varying degree, three typologies of costs, namely: i) direct costs (or compliance costs), i.e. the costs incurred to fulfil the substantive obligations spelled out in EU legislation (e.g. the respect of certain emission limits); ii) administrative costs, comprising the costs incurred to fulfil the administrative obligations stipulated in the legislation (e.g. the costs for obtaining certain permits or authorisations); and iii) indirect costs, which refer to the costs incurred by primary aluminium producers as a result of regulatory measures that affect other operators along the value chain.

While the Study analysed the effects in no less than eight EU policy areas, regulatory costs were identified and could be quantified in four areas, namely: i) climate change policy (see Chapter 7); ii) energy policy (see Chapter 9); iii) environmental policy (see Chapter 11); and iv) product policy (see Chapter 12). Different estimation methodologies were employed, making use of a combination of primary and secondary sources. In some cases, estimates were based on information retrieved at plant level from both commercial databases and interviews with plant operators. In other cases, reference was made primarily to sector statistics, complemented as needed with information derived from interviews with selected aluminium producers. In other cases still, data were provided by industry associations, published research, and national regulation.

Cumulative costs are presented in terms of cost per unit of output (€/tonne of primary aluminium). Furthermore, in order to provide an indication of the relative importance of the impact of EU legislation on EU smelters, per tonne, regulatory costs are compared with key performance indicators, such as aluminium price, price-cost margin, EBITDA,⁴⁰ and margin over raw materials.

Cost estimates may have a degree of uncertainty. For instance, in some cases (e.g., environmental policies, energy) the combined impacts of EU and national policies were difficult to disentangle. In other cases (e.g., ETS), assumptions were needed to compute regulatory costs. To cope with uncertainty, sensitivity analyses were performed in the relevant Chapters. Therefore, a range estimate is also provided for cumulative costs by adopting three different scenarios (lower bound, intermediate, and upper bound).

Furthermore, the burden of some EU policies in the areas of climate change and energy have a markedly different impact on smelters procuring electricity in the wholesale market (subsample 2 in the various Chapters of the Study) and smelters relying on self-generation

⁴⁰ EBITDA stands for Earnings Before Interest, Taxes, Depreciation, and Amortization.

or old long-term contracts (subsample 1). Consequently, cumulative costs are estimated not only for the entire sample but also for these two subsamples.⁴¹

There are two limitations to the results of the cumulative cost assessment. First, some regulatory costs are likely to have been incurred by the aluminium industry also in areas not covered by this Study (e.g. labour regulation) and/or for which no meaningful quantification was possible (e.g. some administrative costs linked to additional product regulation). In this respect, the figures presented here may underestimate the actual burden placed by EU legislation on the primary aluminium industry. Second, no attempt is made to provide a comprehensive view of regulatory costs that might be incurred in the future. Some indications regarding future costs could be derived in certain policy areas (e.g. climate change, environmental policy). Nevertheless, in most cases, estimating future costs would require a set of assumptions and forecast which would force this Study to depart from its hard-fact approach.

An additional *caveat* is worth highlighting at the outset. While regulatory costs incurred by secondary aluminium producers and downstream players were computed for selected policy areas and included in the relevant Chapters of the Study, the cumulative cost assessment focuses only on primary production. A similar exercise was not feasible for the other actors of the EU aluminium value chain mainly due to the low response rate among surveyed companies which curtailed the representativeness of the sample - thus hampering the generalization of collected data - and posed confidentiality issues even in showing aggregate information - in particular with regard to data on margins and production costs. However, we report the findings for a selection of policy areas in Section 3.4.

The Chapter proceeds as follows. First, the cumulative regulatory costs are quantified; then, the production costs and margins for the EU primary aluminium industry are estimated; and finally, cumulative regulatory costs are compared against margin indicators, production costs, and market prices.

3.1 Cumulative costs of EU regulation

Below, the categories of regulatory costs quantified in the next Sections and relevant to the cumulative cost assessment are listed per policy area:

1. **Climate Change** (see Chapter 7). As the aluminium sector was not included in the EU ETS during Phase 1 (2005-2007) and Phase 2 (2008-2012), direct costs and administrative costs were not borne by aluminium primary producers;⁴² hence, only indirect costs are computed. *Indirect Costs* refer to the higher electricity bills paid as

⁴¹ For a description of the samples and the response rate, see Sections 1.4 and 1.6.

⁴² Before 1st of January 2013, primary aluminium smelters had already incurred in preparation costs in view of the inclusion in the ETS programme. These costs are accounted for in Chapter 7; however, they are annualised throughout the whole ETS third phase, rather than attributed to 2012.

a result of the price of CO₂ permits passed on through electricity price. The pass-on rate is a figure which is contested and may vary significantly between member states. In Chapter 7, this uncertainty is addressed through a sensitivity analysis. This sensitivity analysis is accounted for in the cumulative cost assessment by adopting: i) a 0.8 pass-on rate to estimate values for the intermediate scenario; ii) a 0.6 pass-on rate for the lower bound; and iii) a 1.0 pass-on rate for the upper bound. Indirect costs were calculated both for Phase 1 and Phase 2 based on the electricity intensity of primary aluminium production, the carbon intensity of electricity generation, and the price of EUAs. Aggregate figures provided in the present Chapter are computed as a weighted average of ETS indirect costs incurred by the sampled plants, based on yearly production levels. Considering that smelters included in subsample 1, i.e. those procuring electricity through old long-term contracts or self-generation,⁴³ did not incur any indirect costs for EU ETS, sample average figures might underestimate the impact of climate change regulation on EU primary aluminium production. Hence, to provide a more complete picture, cumulated costs are quantified for the entire sample, for subsample 1 and for subsample 2 (i.e. for smelters which procure electricity in the wholesale market).

2. **Energy** (see Chapter 9). Two components of the electricity tariffs were decomposed and quantified:
 - a. *Transmission Costs*. Even though the amount of transmission tariffs charged to large industrial customers depends on national policies, the general organization of the electricity market depends on the EU *acquis*. It should also be noted that in every world area, either the customers or the public finances have to bear (explicit or implicit) transmission costs, albeit different policies may result in a different burden sharing between large industrial customers and other market segments. To quantify average transmission costs for 2012, direct information from interviewees was collected. Reported data were validated through official sources and information provided by other industrial customers; in all countries, transmission tariffs reported by interviewees were lower than comparable ETNSO-E data.
 - b. *RES support*. Although the EU has set mandatory targets for the national share of electricity to be generated through renewable sources, EU policies do not specify the amount of support for RES, nor how this burden should be shared among different segments of customers, including large industrial customers. These decisions, which eventually determine if and how much aluminium producers pay for RES support, fall within the sphere of competence of member states. Combining information retrieved from interviews and estimates from

⁴³ Please note that sampled plants which procure energy through self-generation rely on carbon free power sources, therefore they are not included in the EU ETS and do not incur ETS direct costs.

secondary sources, the amount of RES support paid by primary aluminium producers in 2012 was estimated at a plant level.

Disaggregated data for transmission costs and RES support were available for 9 out of 11 plants included in the sample.⁴⁴ In the present Chapter, a weighted average of national values is calculated by adopting as weights the 2012 production levels. Considering that smelters procuring electricity through old long-term contracts or self-generation incur lower costs linked to EU energy policies,⁴⁵ cumulated costs are separately estimated for the whole sample, for subsample 1, and for subsample 2 (as defined in previous Chapters). Non-recoverable energy taxes are not included in the cumulative cost assessment, as they cannot be attributed to any extent to the EU regulation on electricity taxation.⁴⁶

3. **Environment** (see Chapter 11). In the case of environmental policy, the analysis covered the following typologies of regulatory costs:
 - a. *Direct costs.* These refer to the costs incurred by primary aluminium producers to comply with the substantive obligations of EU legislation in terms of pollution prevention and control. Direct costs are further divided into three sub-categories, namely: i) investment costs, i.e. the money spent on pollution abatement measures depreciated over the estimated life of assets; ii) financial costs, i.e. the interest charges linked to investment outlays; and iii) operating costs, i.e. the incremental expenses for personnel, raw materials, consumables, etc. associated with environmental protection interventions. The estimate of direct costs is subject to a certain margin of variability due to the concurrence of EU and national legislation; hence, a sensitivity analysis was included in Chapter 11. While in the upper bound scenario 80% of the costs incurred by the aluminium industry were considered to be linked to EU environmental legislation, in the lower bound a 50% coefficient was adopted. Values for the intermediate scenario are estimated below by averaging the two scenarios.
 - b. *Administrative costs.* Companies incur expenses to fulfil administrative obligations stipulated in the legislation, such as the costs related to the registration, the notification or the permitting of certain activities or the costs sustained for the supply of data or information for monitoring or policy making purposes. Administrative costs borne by aluminium producers and attributable

⁴⁴ This corresponds to 81% of the 2012 production by the 11 plants included in the sample.

⁴⁵ While self-generation affects both RES support and transmission costs, long-term contracts have a direct effect only on transmission fees paid by aluminium producers. However, as a matter of fact, plants enjoying old long-term contracts are located in countries with relatively lower RES support borne by industrial customers.

⁴⁶ Minimum level for excises for electricity is set by Directive 2003/96/EC. However, it excludes electricity used for metallurgical works from its scope of application; any decision to include electricity used for aluminium smelting within the tax base is thus fully attributable to member states.

to EU rules can be divided into three different categories: i) the costs associated with the issuance/renewal/updating of the Integrated Environmental Permits (IEP); ii) the costs connected with the carrying out of inspections for checking compliance with the conditions on the basis of which the IEP was issued; and iii) the costs associated to the safeguard measures to be adopted under the Seveso Directive. Due to the small magnitude of these expenses, in this Chapter only total administrative costs per tonne of finished product are provided.

Expenses to comply with environmental regulation vary significantly among facilities, and the selection criterion we used to establish the two subsamples in the Study⁴⁷ is not a determinant of this variability;⁴⁸ therefore, cumulative costs for environmental policy area are assessed only at a sample level. The methodology adopted to compute average figures is discussed in Chapter 11.

Primary aluminium producers also sustained some indirect costs, in the form of higher electricity prices resulting from the expenses incurred by power producers in order to conform to emission limits. However, these indirect costs, conceptually analogous to those identified above in the case of climate change policy, could not be estimated due to lack of data.

4. **Products and LCA** (see Chapter 12). In the case of product policy, the quantitative analysis focused on the administrative costs related to the Regulation on the Registration, Evaluation, Authorization and Restriction of Chemical Substances (REACH). These encompass five sub-categories of costs, namely: (i) the pre-registration of substances; (ii) the registration of the 'key substances' produced by the aluminium industry; (iii) the registration of other substances used in the production process; (iv) the preparation of authorization dossiers for dangerous substances; and (v) the dissemination of information along the value chain. The information used in the analysis was largely obtained from industry sources, with some additional elements derived from ECHA publications.

3.1.1 *Cumulative costs of EU rules*

For some regulatory costs, as in the case of ETS, the availability of public information complemented by sound assumptions allowed to carry out a diachronic analysis, i.e. throughout the whole period of application of the legislation. For some other categories of costs, the analysis is synchronic, i.e. for a single year. In some cases, this is the outcome of the methodology adopted. For example, for environmental costs a cumulated approach was chosen as the most correct (see Chapter 11); however, this also means that a realistic cost estimate is possible only for the last year of the period under analysis. In other cases, problems were linked to data availability. For instance, in case of RES support and transmission costs (see Chapter 9), it has already proven difficult to retrieve information

⁴⁷ I.e., the presence of an old long-term contract or self generation to procure electricity.

⁴⁸ Please note that median values of the two subsamples are comparable.

about the current tariffs from secondary sources and interviewees, let alone digging back in the past.

Due to the fact that providing a diachronic analysis was not possible, the cumulative cost assessment is mainly based on 2012 information, except for costs of ETS which have been averaged out throughout the period 2005-2012 (see Chapter 7). As mentioned above, three different scenarios are provided: i) an intermediate scenario, assuming that the pass-on rate for ETS equals 0.8 and the average of the lower and upper bounds for environmental costs (see Table 4 and Figure 7); ii) a lower bound scenario, with a 0.6 pass-on rate and 50% of environmental costs due to EU rules (see Table 5 and Figure 8); and iii) an upper bound scenario, with a 1 pass-on rate for ETS and 80% of environmental costs due to EU rules (see Table 6 and Figure 9).

Focusing on the entire sample, cumulative regulatory costs range from 114 €/tonne to 149 €/tonne, with an intermediate estimate of 132 €/tonne. In the intermediate scenario, ETS indirect costs represent more than 45% of total costs, followed by costs due to energy policies (about 41%) and environmental costs (about 13%).

The difference between subsamples is substantial. Plants included in subsample 1 incur regulatory costs equalling 20 €/tonne in the lower bound scenario and 27 €/tonne in the upper bound, with an intermediate estimate of 24 €/tonne. Environmental regulation is responsible for the largest share (72%) of total costs in the intermediate scenario for plants included in subsample 1. As old long-term contracts and self-generation⁴⁹ shielded these plants from ETS indirect costs, expenses to comply with energy policy regulation are the second cost item in order of magnitude (23%). In subsample 2, cumulative regulatory costs range from 179 €/tonne to 228 €/tonne, with a value for the intermediate scenario equivalent to 203 €/tonne. For plants procuring electricity in the market, costs linked to energy policies account for about 47% of total costs, ETS for 45%, and environmental outlays for more than 8%. Whereas expenses linked to the REACH regulation are about 1% of total cumulated costs in all the scenarios for the entire sample and subsample 2, they reach up to 7% in the lower bound scenario for subsample 1.

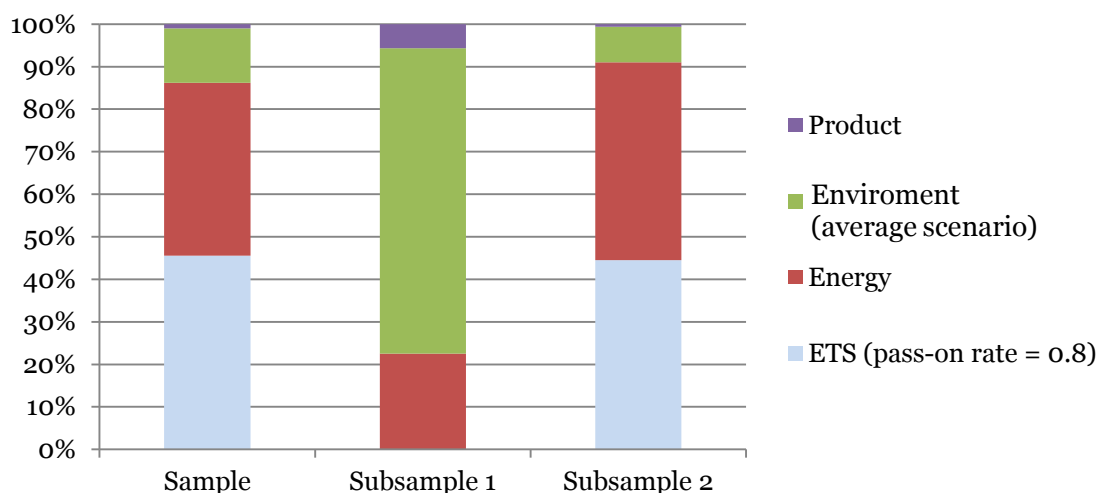
⁴⁹ See note 43.

Table 4 Cumulative regulatory costs for EU primary aluminium production – Intermediate scenario (€/tonne)

Policy area	Cost typology	Sample	Subsample 1	Subsample 2
ETS (pass-on rate = 0.8)	Indirect	59.99	0.00	90.50
	<i>Sub-Total</i>	<i>59.99</i>	<i>0.00</i>	<i>90.50</i>
Energy	Transmission	26.24	0.00	48.67
	RES	27.29	5.30	46.09
	<i>Sub-Total</i>	<i>53.53</i>	<i>5.30</i>	<i>94.76</i>
Environment (average)	Investment	3.70	3.70	3.70
	Direct Financial	1.70	1.70	1.70
	Operating	11.10	11.10	11.10
	Administrative	0.38	0.38	0.38
	<i>Sub-Total</i>	<i>16.88</i>	<i>16.88</i>	<i>16.88</i>
Product	Administrative – REACH	1.34	1.34	1.34
	<i>Sub-Total</i>	<i>1.34</i>	<i>1.34</i>	<i>1.34</i>
Total		131.73	23.52	203.47

Source: Authors' elaboration

Figure 7 Share of costs per policy area over cumulative regulatory costs for EU primary aluminium production – Intermediate scenario



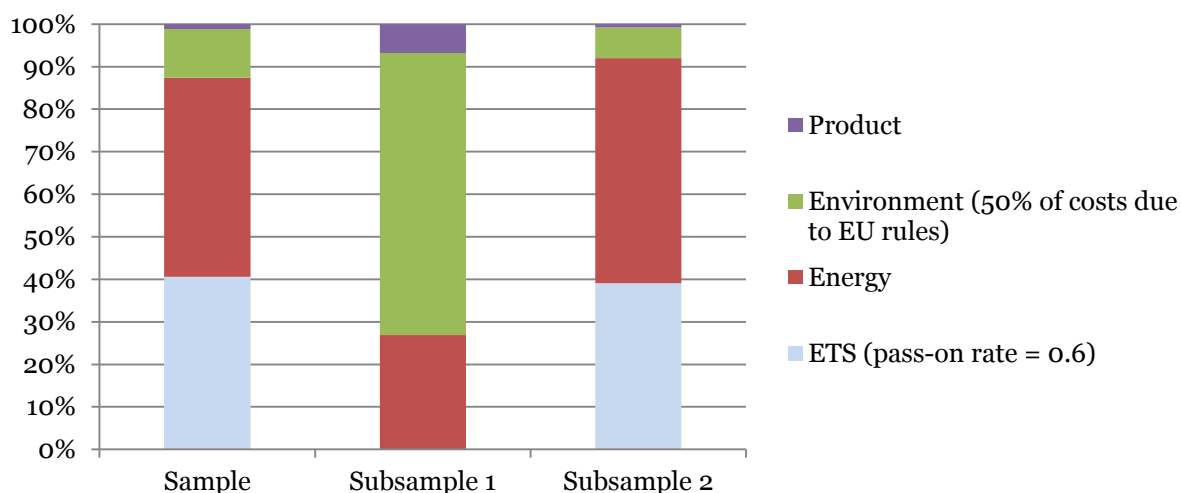
Source: Authors' elaboration

Table 5 Cumulative regulatory costs for EU primary aluminium production – Lower bound scenario (€/tonne)

Policy area	Cost typology	Sample	Subsample 1	Subsample 2
ETS (pass-on rate = 0.6)	Indirect	46.46	0.00	70.09
	<i>Sub-Total</i>	<i>46.46</i>	<i>0.00</i>	<i>70.09</i>
Energy	Transmission	26.24	0.00	48.67
	RES	27.29	5.30	46.09
	<i>Sub-Total</i>	<i>53.53</i>	<i>5.30</i>	<i>94.76</i>
Environment (50% of costs due to EU rules)	Investment	2.85	2.85	2.85
	Direct Financial	1.30	1.30	1.30
	Operating	8.54	8.54	8.54
	Administrative	0.38	0.38	0.38
	<i>Sub-Total</i>	<i>13.07</i>	<i>13.07</i>	<i>13.07</i>
Product	Administrative – REACH	1.34	1.34	1.34
	<i>Sub-Total</i>	<i>1.34</i>	<i>1.34</i>	<i>1.34</i>
Total		114.40	19.71	179.26

Source: Authors' elaboration

Figure 8 Share of costs per policy area over cumulative regulatory costs for EU primary aluminium production – Lower bound scenario



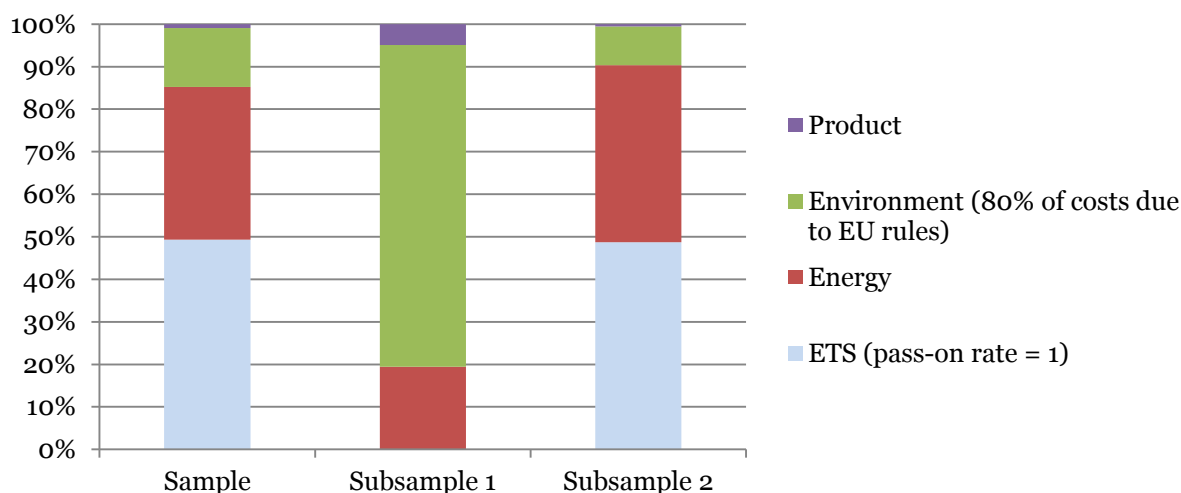
Source: Authors' elaboration

Table 6 Cumulative regulatory costs for EU primary aluminium production – Upper bound scenario (€/tonne)

Policy area	Cost typology	Sample	Subsample 1	Subsample 2
ETS (pass-on rate = 1)	Indirect	73.53	0.00	110.92
	<i>Sub-Total</i>	<i>73.53</i>	<i>0.00</i>	<i>110.92</i>
Energy	Transmission	26.24	0.00	48.67
	RES	27.29	5.30	46.09
	<i>Sub-Total</i>	<i>53.53</i>	<i>5.30</i>	<i>94.76</i>
Environment (80% of costs due to EU rules)	Investment	4.55	4.55	4.55
	Direct Financial	2.09	2.09	2.09
	Operating	13.66	13.66	13.66
	Administrative	0.38	0.38	0.38
	<i>Sub-Total</i>	<i>20.68</i>	<i>20.68</i>	<i>20.68</i>
Product	Administrative – REACH	1.34	1.34	1.34
	<i>Sub-Total</i>	<i>1.34</i>	<i>1.34</i>	<i>1.34</i>
Total		149.07	27.32	227.70

Source: Authors' elaboration

Figure 9 Share of costs per policy area over cumulative regulatory costs for EU primary aluminium production – Upper bound scenario



Source: Authors' elaboration

3.2 Production costs and margins of the EU primary aluminium industry

The assessment of margins registered by the EU primary aluminium industry is not an easy task. Indeed it is very hard to retrieve meaningful information from companies' balance sheet data, since many companies – especially the largest ones accounting for very high share of EU aluminium production – own multiple plants, are involved in several business lines, and carry out activities at different levels of the aluminium value chain, thus making it complex to single out balance sheet indicators, such as profits/losses or EBITDA, representative for primary aluminium production.⁵⁰

In light of the above, both production costs and margins of the EU primary aluminium industry are estimated by relying on data drawn from the 2012 edition of the Primary Aluminium Smelting Cost Service, an interactive platform provided by CRU and comprising, *inter alia*, operating costs and output levels for each primary aluminium smelter in the world. Balance sheet data have been taken into account to validate aggregate estimates based on CRU.

All figures are expressed in Euro per tonne of aluminium at current prices.⁵¹ For each plant included in the sample, the following items are estimated over the period 2002-2012:

- Market price, i.e. the sum of the benchmark price adopted by CRU⁵² and the market premiums paid for the output of the observed plant;⁵³
- Production costs, whose estimate is based on the methodology discussed in Chapter 2;⁵⁴

⁵⁰ The comparisons provided in this Section (3.3) are helpful to understand the impacts of costs linked to EU rules on the profitability of EU producers as well as on total production costs and market prices of primary aluminium. Nonetheless, while it is fair to assume that a certain reduction of regulatory costs would lead to a comparable reduction in production costs, the same conclusion cannot be drawn for prices and margins. In a perfect competitive market, a reduction as well as an increase in variable costs would be reflected by an equivalent variation in the equilibrium price, so that margins per unit of product would not be affected. Insofar as producers enjoy some market power, changes in production costs might be only partially reflected by changes in market prices, thus affecting margins. As the estimation of margins at lower regulatory costs is not feasible at this stage, this Section compares the magnitude of cumulated regulatory costs and margins as they stood over the period 2002-2012, without drawing any additional conclusion about interactions between cost and margin variations.

⁵¹ CRU data are expressed in Dollars. Currency conversion has been performed by relying on annual exchange rates provided by the ECB.

⁵² Yearly average LME 3-month price.

⁵³ Market premiums account for the manufacturing of value-added products and/or high purity aluminium, the location of the facilities, and the existing tariff protection.

⁵⁴ Unlike in Chapter 2, total production costs are not adjusted to account for different quality of final output produced by each smelter, thus reflecting real costs borne by the observed plant.

- Price-cost margin, i.e. the difference between plant market price and total production costs;
- EBITDA, i.e. the difference between plant market price and production costs, excluding capital costs;⁵⁵
- Margin over raw materials, i.e. the difference between plant market price and cost incurred to purchase the required amount of alumina.

As the sample is representative for the EU population, for each year overall production costs and margins of the EU primary aluminium industry are computed as a weighted average of figures estimated at plant level, by adopting as weights the yearly production levels. Margins over market price are also quantified. Estimates are provided for the entire sample (see Table 7 and Figure 10), for subsample 1 (see Table 8 and Figure 11), and for subsample 2 (see Table 9 and Figure 11).

For all the indicators, comparable trends are registered in the two subsamples and in the aggregated sample. After a moderate reduction in 2003, production costs grew steadily between 2003 and 2008. The decline experienced in 2009 was followed by a new upward trend. While in 2006 margins reached an all-time high, 2009 and 2012 were low points. In particular, in 2009 negative values were registered for price-cost margin both at an aggregate level (-175 €/tonne) and in the two subsamples (-93 €/tonne for subsample 1 and -222 €/tonne for subsample 2). The price-cost margin was negative also in 2011 (-5€/tonne) and 2012 for plants included in subsample 2 (-285 €/tonne) and in 2012 for the entire sample (-154 €/tonne). Differently, subsample 1 experienced a softer decline and preserved positive economic results (66 €/tonne in 2012). Whereas estimates for the difference between price and alumina costs are largely overlapping between subsamples, other margins for plants in subsample 2 are narrower and reached an all-time low in 2012 when a dramatic collapse was registered even in EBITDA (-36 €/tonne), due to the combination of a steep growth of production costs and a downward trend of market price.

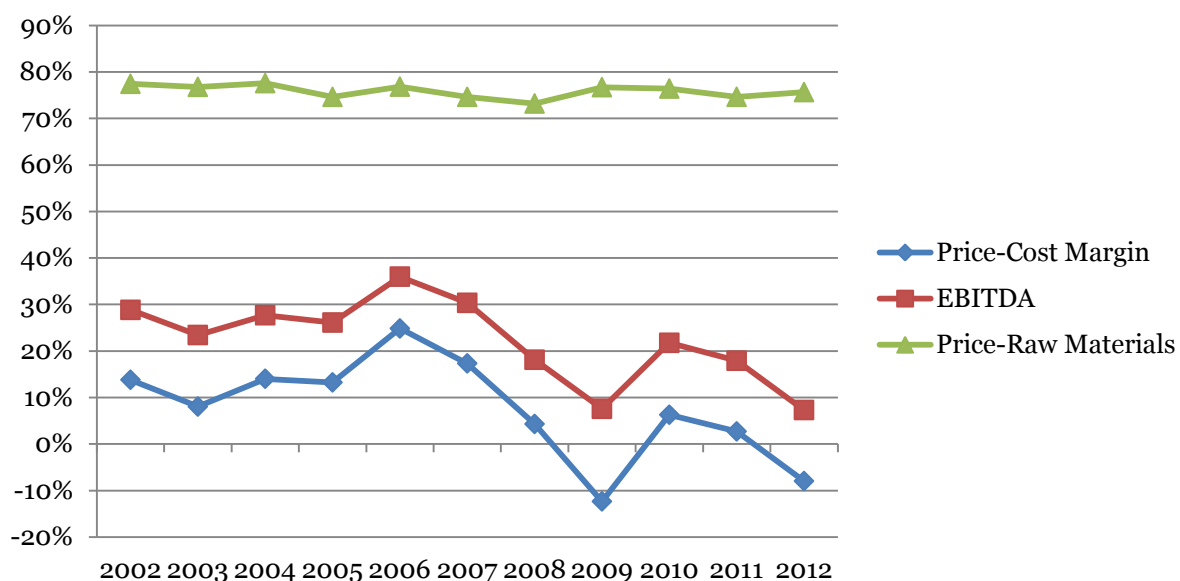
Table 7 Production costs and margins of the EU primary aluminium industry – sample (€/tonne at current prices)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Price-Cost Margin	226	116	222	232	580	379	85	-175	121	55	-154
EBITDA	472	337	439	457	841	663	359	107	418	361	141
Price-Raw Materials	1,267	1,105	1,229	1,306	1,795	1,631	1,450	1,087	1,470	1,503	1,463
Production costs	1,410	1,324	1,362	1,519	1,756	1,807	1,896	1,591	1,802	1,959	2,088
Market price	1,636	1,440	1,585	1,750	2,337	2,185	1,981	1,416	1,923	2,013	1,934

Source: Authors' elaboration on CRU (2012)

⁵⁵ For the purpose of this analysis, capital costs include also pot relining and sustaining capital expenses.

Figure 10 Margins of the EU primary aluminium industry - sample (% over market price)



Source: Authors' elaboration on CRU (2012)

Table 8 Production costs and margins of the EU primary aluminium industry – subsample 1 (€/tonne at current prices)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Price-Cost Margin	289	178	303	292	693	474	195	-93	231	174	66
EBITDA	572	435	560	561	1011	828	543	256	606	566	438
Price-Raw Materials	1,284	1,110	1,237	1,301	1,793	1,608	1,426	1,070	1,444	1,478	1,434
Production costs	1,365	1,279	1,295	1,477	1,659	1,696	1,771	1,489	1,669	1,817	1,848
Market price	1,654	1,457	1,598	1,769	2,352	2,170	1,966	1,396	1,900	1,991	1,914

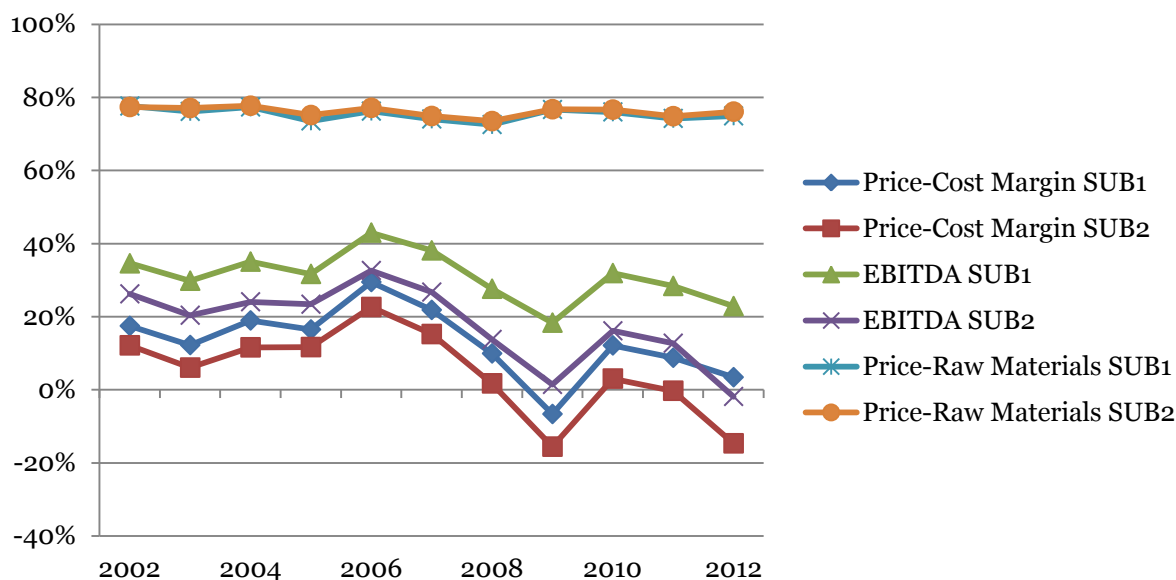
Source: Authors' elaboration on CRU (2012)

Table 9 Production costs and margins of the EU primary aluminium industry – subsample 2 (€/tonne at current prices)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Price-Cost Margin	198	87	183	203	527	334	35	-222	59	-5	-285
EBITDA	427	292	380	407	760	586	274	21	312	258	-36
Price-Raw Materials	1,259	1,103	1,226	1,309	1,797	1,642	1,461	1,096	1,484	1,515	1,480
Production costs	1,430	1,345	1,395	1,538	1,802	1,858	1,953	1,650	1,877	2,030	2,231
Market price	1,628	1,431	1,578	1,742	2,329	2,192	1,988	1,428	1,936	2,025	1,946

Source: Authors' elaboration on CRU (2012)

Figure 11 Margins of the EU primary aluminium industry – subsample 1 and subsample 2 (% over market price)



Source: Authors' elaboration on CRU (2012)

3.3 The impact of cumulative regulatory costs

This Section presents the impact of the overall costs due to EU legislation on the margins and costs of the primary aluminium industry as well as on aluminium market price over the period 2002-2012. The intermediate value of regulatory costs presented in Section 3.1.1 above is used as the reference value. Results are showed in three different Sections to single out the effects on: i) the entire sample (see Section 3.3.1); ii) the plants included in subsample 1 (see Section 3.3.2); and iii) the plants included in subsample 2 (see Section 3.3.3). As shown below, the significance of regulatory costs changes in line with the economic cycle. The figures also point out that the impact of regulatory costs is stronger for those plants whose production costs are not shielded by old long-term contract or self-generation strategies to procure electricity.

3.3.1 Aggregated Sample

Focusing on sample values (see Table 10), costs due to EU rules represented on average 8% - and never more than 10% - of total production costs (see Figure 15) over the entire period (2002-2012). They ranged between 7% and 12% when compared to the difference between primary aluminium price and alumina costs (see Figure 14) and between 7% and 9% when compared to market price (see Figure 16). Regulatory costs (see Figure 13) were in the area of 16% (the 2006 being an exceptionally good year) to 39% of EBITDA and comparable or even higher than this margin in times of crisis (2009 and 2012). The impact on price-cost margin (see Figure 12) was more significant, not only when considering the losses registered in 2009 and 2012, but also in profitable years. Cumulative costs represented about 23% of profits in 2006 (the most profitable year) and 242% in 2011 (the lowest positive profit value) and were constantly higher than this margin from 2008 onward.

Finally, Figure 17 compares EU regulatory costs to the existing cost differentials with Middle Eastern smelters – which are the least cost producers (see Chapter 2) – registered in 2012. Regulatory costs have been representing about one third of this competitive gap. Nonetheless, the comparison has a certain degree of spuriousness, as this Study did not investigate the cost of regulation falling upon third-country producers; thus, once the cost of foreign regulation were taken into account, the differential impact of regulation would likely be lower than our estimates.⁵⁶

Results for the entire sample are straightforward. Regulatory costs markedly reduced the profitability of the EU primary aluminium industry not only in time of crisis, when the impact of any cost item is amplified, but also in the boom years when they still represent a rather high share of industry margins. Nonetheless, when considering these regulatory costs, the benefits of operating in the EU, such as the proximity to high value added customers, should also be borne in mind.

Table 10 The impact of cumulative regulatory costs (2002-2012, intermediate scenario on the entire sample)⁵⁷

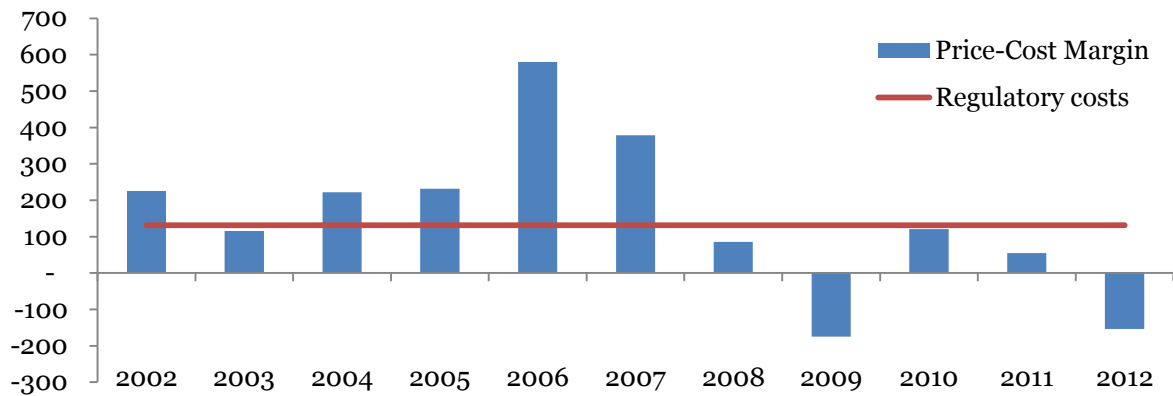
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Price-Cost Margin	58%	114%	59%	57%	23%	35%	154%	(75%)	109%	242%	(86%)
EBITDA	28%	39%	30%	29%	16%	20%	37%	123%	31%	37%	93%
Price-Raw Materials	10%	12%	11%	10%	7%	8%	9%	12%	9%	9%	9%
Production costs	9%	10%	10%	9%	8%	7%	7%	8%	7%	7%	6%
Market price	8%	9%	8%	8%	6%	6%	7%	9%	7%	7%	7%

Source: Authors' own elaboration

⁵⁶ For example, Iceland and Norway are also subject to the ETS system, and thus to the direct, indirect (controlling for the carbon intensity of electricity generation, which in most cases is carbon neutral, i.e. hydroelectric and/or geothermal), and administrative costs; US plants are subject to environmental regulation which is likely to impose similar burdens compared to the European one.

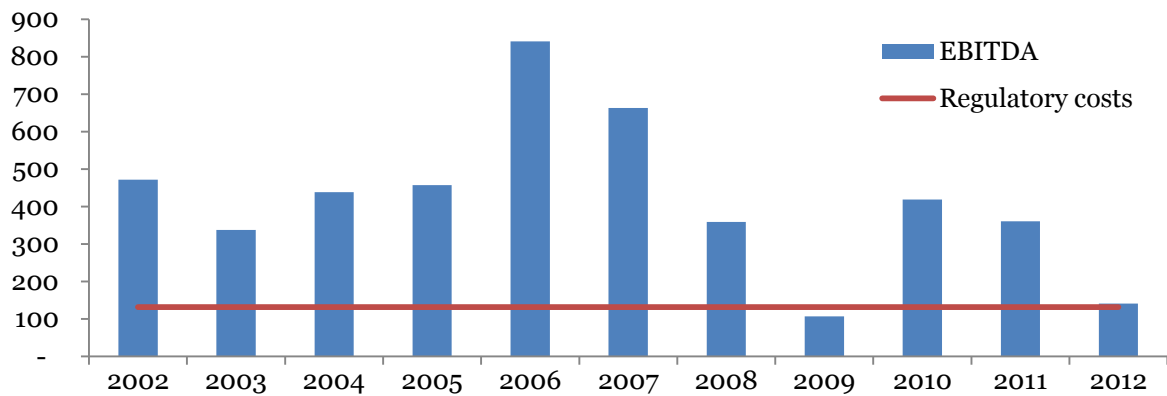
⁵⁷ Percentage values associated to negative margins are reported in brackets. Please, note that for values in brackets comprised between (0%) and (100%), the negative margin is higher than costs due to EU rules; hence, ceteris paribus in terms of market prices and demand, even without regulatory costs, losses would have been registered. On the contrary, for values higher than (100%), e.g. (200%), costs due to EU rules are higher than the negative margin; hence, ceteris paribus, without incurring regulatory costs, plants might have been profitable.

Figure 12 Cumulative regulatory costs vs. price-cost margin (2002-2012, intermediate scenario on the entire sample - €/tonne)



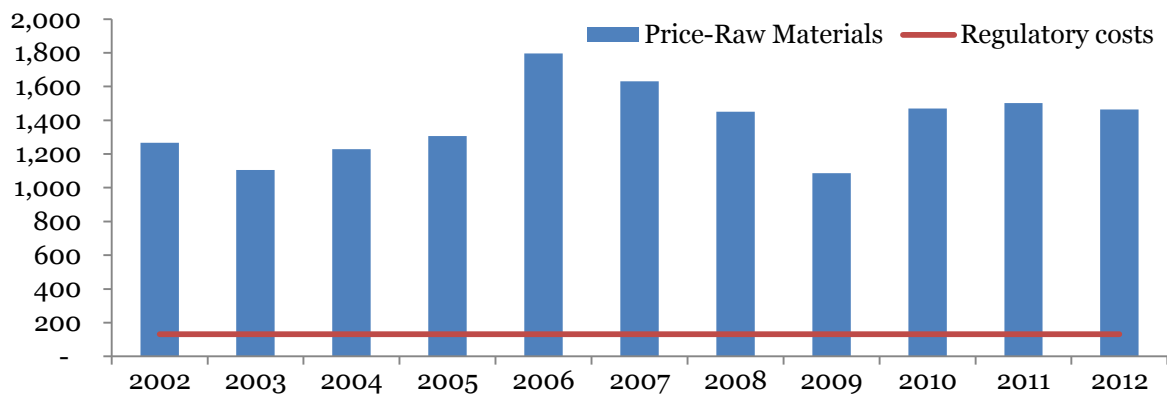
Source: Authors' own elaboration

Figure 13 Cumulative regulatory costs vs. EBITDA (2002-2012, intermediate scenario on the entire sample - €/tonne)



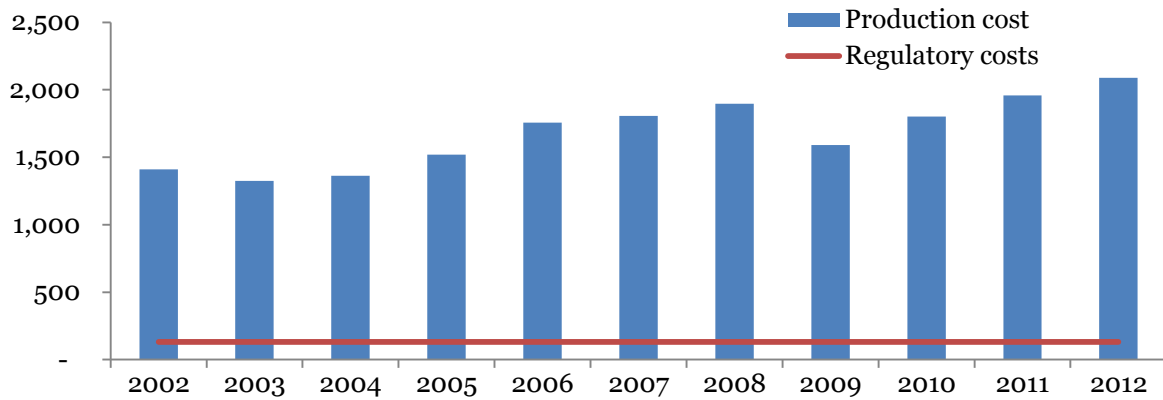
Source: Authors' own elaboration

Figure 14 Cumulative regulatory costs vs. price-raw materials (2002-2012, intermediate scenario on the entire sample - €/tonne)



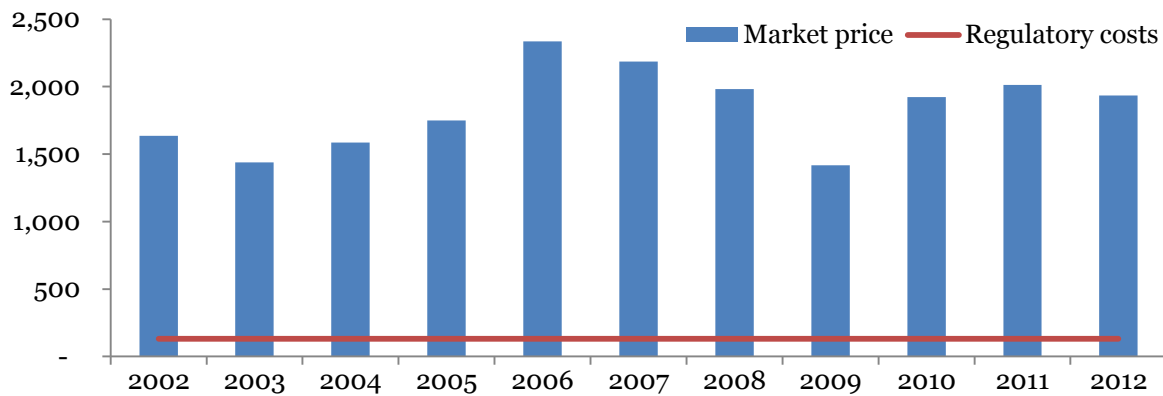
Source: Authors' own elaboration

Figure 15 Cumulative regulatory costs vs. production costs (2002-2012, intermediate scenario on the entire sample - €/tonne)



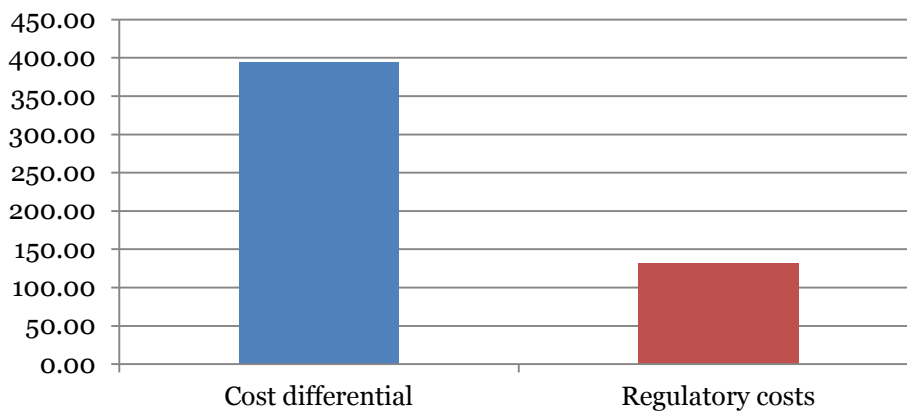
Source: Authors' own elaboration

Figure 16 Cumulative regulatory costs vs. market prices (2002-2012, intermediate scenario on the entire sample - €/tonne)



Source: Authors' own elaboration

Figure 17 The impact of cumulative regulatory costs on cost differential with Middle-Eastern smelters (2012, intermediate scenario on the entire sample - €/tonne)



Source: Authors' own elaboration

3.3.2 Subsample 1

For smelters benefiting from old long-term contract or self-generation to procure electricity (see Table 11), cumulative costs between 2002 and 2012 have been a negligible share - between 1% and 2% - of market price (see Figure 22), production costs (see Figure 21), and price-raw materials margin (see Figure 20). Furthermore, regulatory costs over EBITDA went from only 2% in 2006 to 9% in 2009 (see Figure 19). When compared to profit-cost margin, costs measured in this Study were in the area of 3% to 10% in the boom years, and of 12% to 36% during the crisis; they represented one quarter of the loss registered in 2009. Focusing on cost differentials with least cost producers in 2012 (see Chapter 2), EU rules imposed burdens accounting for one fifth of the gap (see Figure 23). The *caveat* discussed above on the availability of a figure for regulatory costs in the Middle-East also applies here.

These results highlight the role of electricity as a crucial input for the competitiveness of the EU primary aluminium industry. Old long-term contracts and self-generation by carbon free power sources shielded plants included in subsample 1 from ETS indirect costs and transmission costs. Moreover, purchasing electricity at low price considerably reduced their costs and improved their margins. Nonetheless, as soon as long-term contracts will expire, things might significantly change.

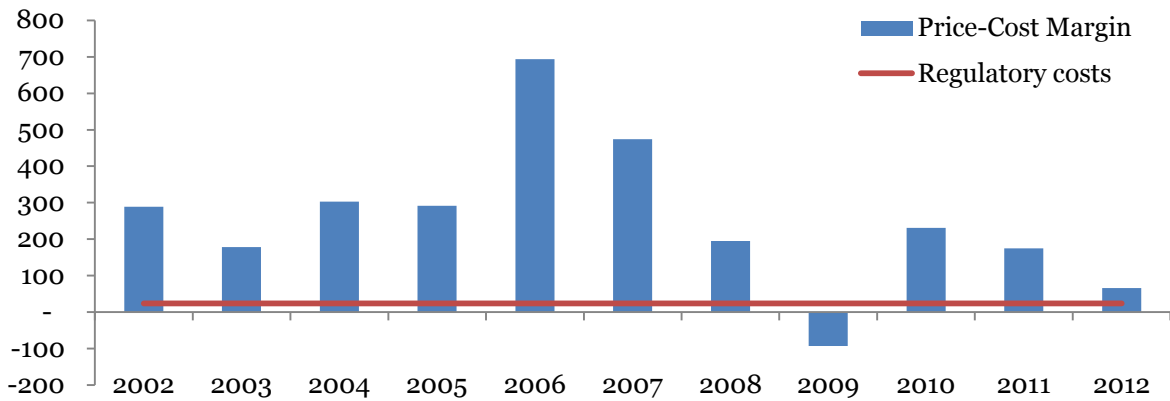
Table 11 The impact of cumulative regulatory costs (2002-2012, intermediate scenario on subsample 1) ⁵⁸

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Price-Cost Margin	8%	13%	8%	8%	3%	5%	12%	(25%)	10%	13%	36%
EBITDA	4%	5%	4%	4%	2%	3%	4%	9%	4%	4%	5%
Price-Raw Materials	2%	2%	2%	2%	1%	1%	2%	2%	2%	2%	2%
Production costs	2%	2%	2%	2%	1%	1%	1%	2%	1%	1%	1%
Market price	1%	2%	1%	1%	1%	1%	1%	2%	1%	1%	1%

Source: Authors' own elaboration

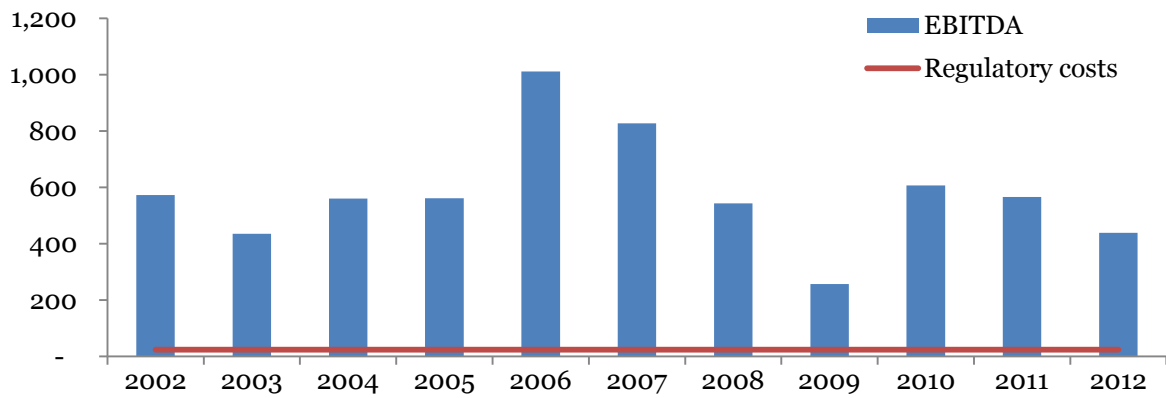
⁵⁸ Percentage values associated to negative margins are reported in brackets. Please, note that for values in brackets comprised between (0%) and (100%), the negative margin is higher than costs due to EU rules; hence, ceteris paribus in terms of market prices and demand, even without regulatory costs, losses would have been registered. On the contrary, for values higher than (100%), e.g. (200%), costs due to EU rules are higher than the negative margin; hence, ceteris paribus, without incurring regulatory costs, plants might have been profitable.

Figure 18 Cumulative regulatory costs vs. price-cost margin (2002-2012, intermediate scenario on subsample 1 - €/tonne)



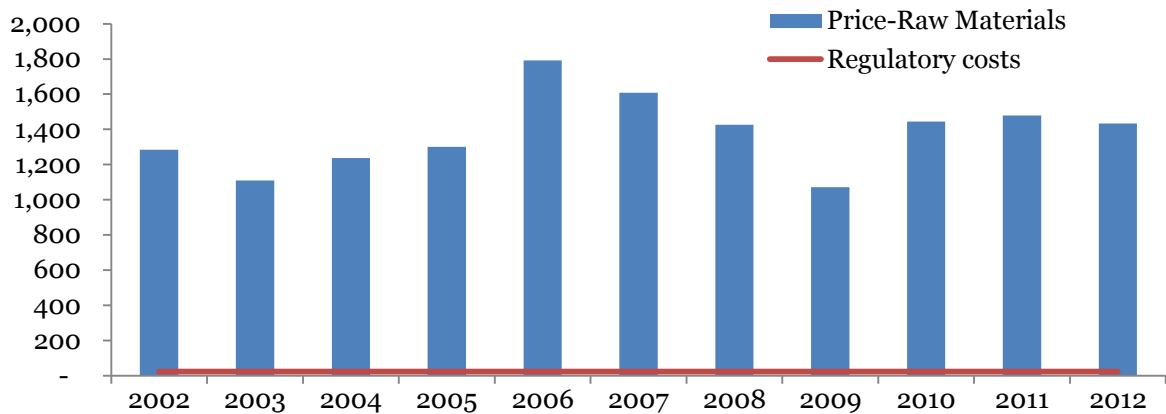
Source: Authors' own elaboration

Figure 19 Cumulative regulatory costs vs. EBITDA (2002-2012, intermediate scenario on subsample 1 - €/tonne)



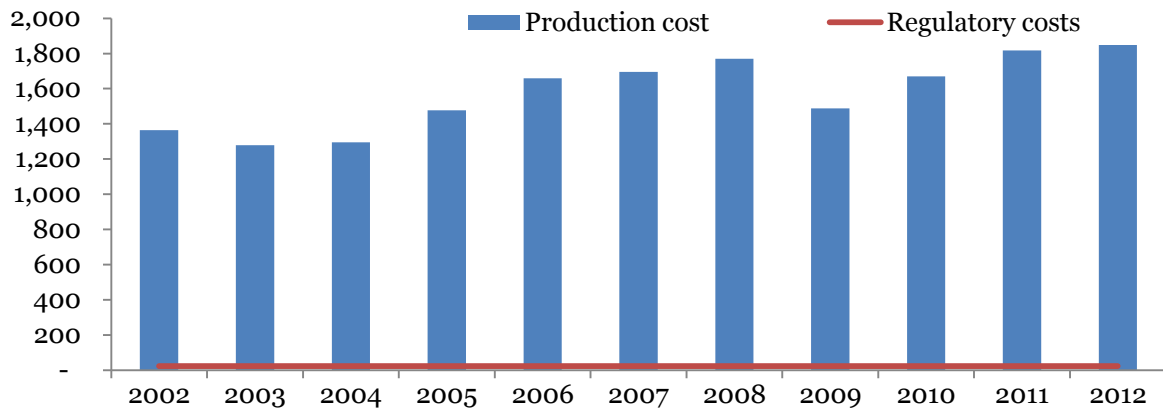
Source: Authors' own elaboration

Figure 20 Cumulative regulatory costs vs. price-raw materials (2002-2012, intermediate scenario on subsample 1 - €/tonne)



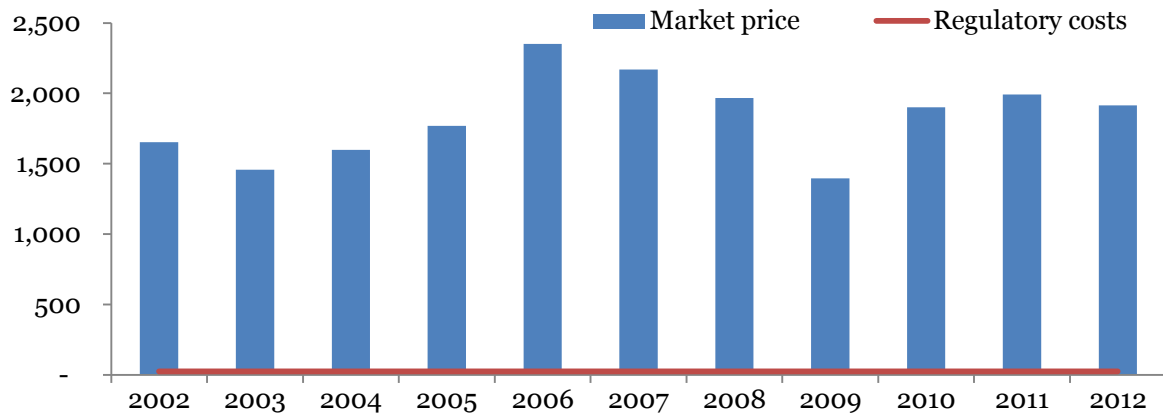
Source: Authors' own elaboration

Figure 21 Cumulative regulatory costs vs. production costs (2002-2012, intermediate scenario on subsample 1 - €/tonne)



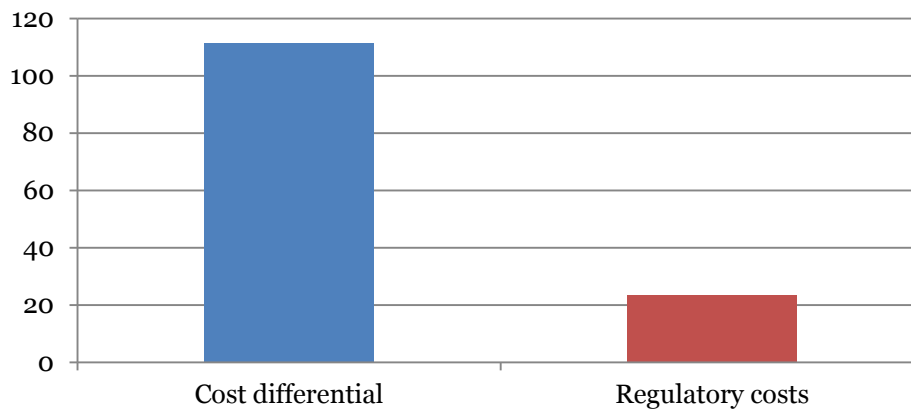
Source: Authors' own elaboration

Figure 22 Cumulative regulatory costs vs. market prices (2002-2012, intermediate scenario on subsample 1 - €/tonne)



Source: Authors' own elaboration

Figure 23 The impact of cumulative regulatory costs on cost differential with Middle-Eastern smelters (2012, intermediate scenario on subsample 1 - €/tonne)



Source: Authors' own elaboration

3.3.3 Subsample 2

The impact of cumulative costs due to EU rules were stronger on plants included in subsample 2 because of the combined effect of higher regulatory costs and narrower margins (see Table 12). Over the period 2002-2012, costs measured in this Study represented on average 12% of production costs - going from 9% in 2002 to 15% in 2003 and 2004 - (see Figure 27) and 11% of aluminium market price – from 9% in 2006 and 2007 to 14% in 2003 and 2009 - (Figure 28). Whereas regulatory costs are in the area of 11% to 19% when compared to the price-raw materials differential (see Figure 26), they are markedly higher than EBITDA (see Figure 25) in 2009 and 2012 and higher than price-cost margin (see Figure 24) over the entire period, except for 2006 and 2007 when the primary aluminium industry was particularly profitable. Again, costs due to EU rules account for approximately one third of cost differential with Middle Eastern smelters (see Figure 29). This differential is significantly higher than the one registered for plants belonging to subsample 1.

As expected, electricity prices - and the rules affecting them - represent the main source of competitive disadvantage for smelters procuring this input in the market. ETS indirect costs and regulatory costs due to energy policies imposed a significant burden on plants included in subsample 2 and contributed to curtail the competitiveness of the EU aluminium industry by increasing production costs and narrowing margins.

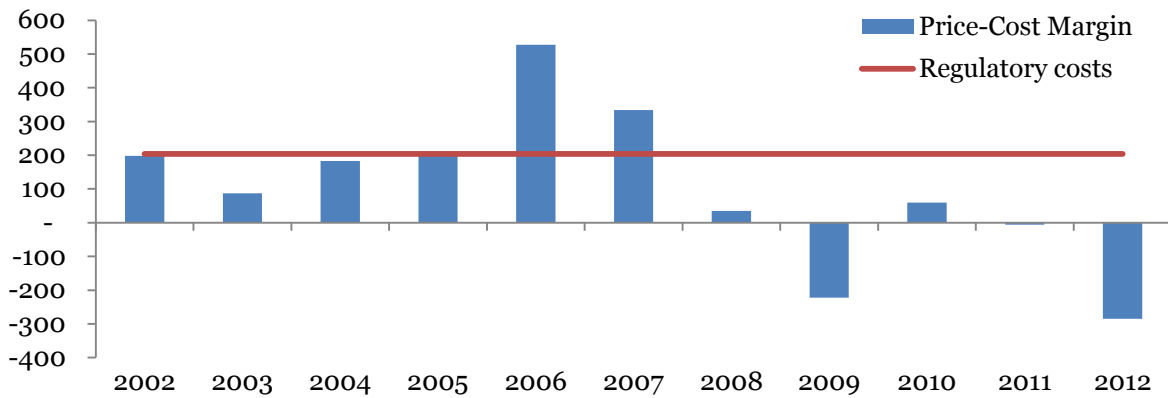
Table 12 The impact of cumulative regulatory costs (2002-2012, intermediate scenario on subsample 2) ⁵⁹

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Price-Cost Margin	103%	235%	111%	100%	39%	61%	587%	(92%)	344%	(3753%)	(71%)
EBITDA	48%	70%	54%	50%	27%	35%	74%	987%	65%	79%	(568%)
Price-Raw Materials	16%	18%	17%	16%	11%	12%	14%	19%	14%	13%	14%
Production costs	14%	15%	15%	13%	11%	11%	10%	12%	11%	10%	9%
Market price	12%	14%	13%	12%	9%	9%	10%	14%	11%	10%	10%

Source: Authors' own elaboration

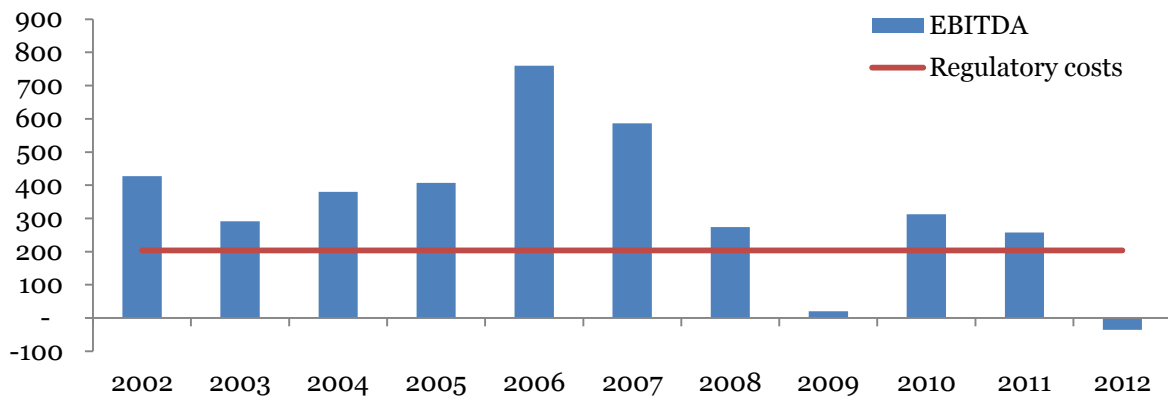
⁵⁹ Percentage values associated to negative margins are reported in brackets. Please, note that for values in brackets comprised between (0%) and (100%), the negative margin is higher than costs due to EU rules; hence, ceteris paribus in terms of market prices and demand, even without regulatory costs, losses would have been registered. On the contrary, for values higher than (100%), e.g. (200%), costs due to EU rules are higher than the negative margin; hence, ceteris paribus, without incurring regulatory costs, plants might have been profitable.

Figure 24 Cumulative regulatory costs vs. price-cost margin (2002-2012, intermediate scenario on subsample 2 - €/tonne)



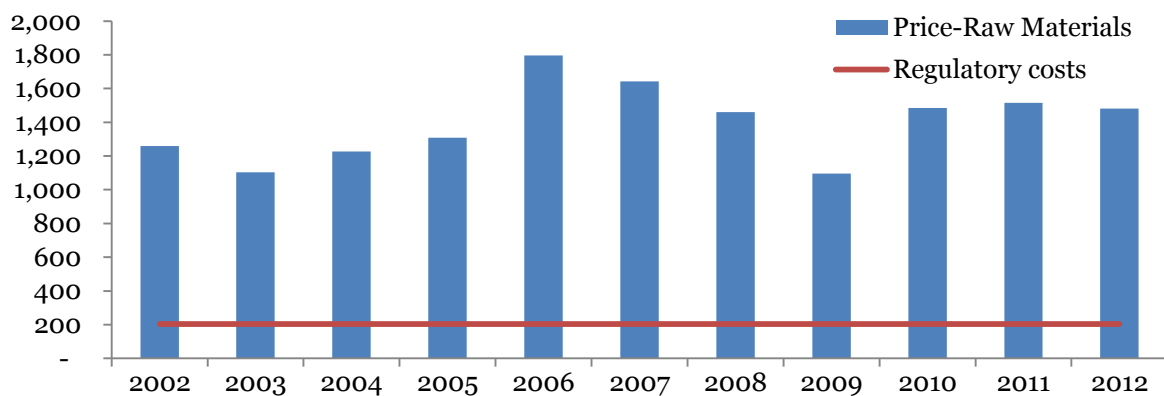
Source: Authors' own elaboration

Figure 25 Cumulative regulatory costs vs. EBITDA (2002-2012, intermediate scenario on subsample 2 - €/tonne)



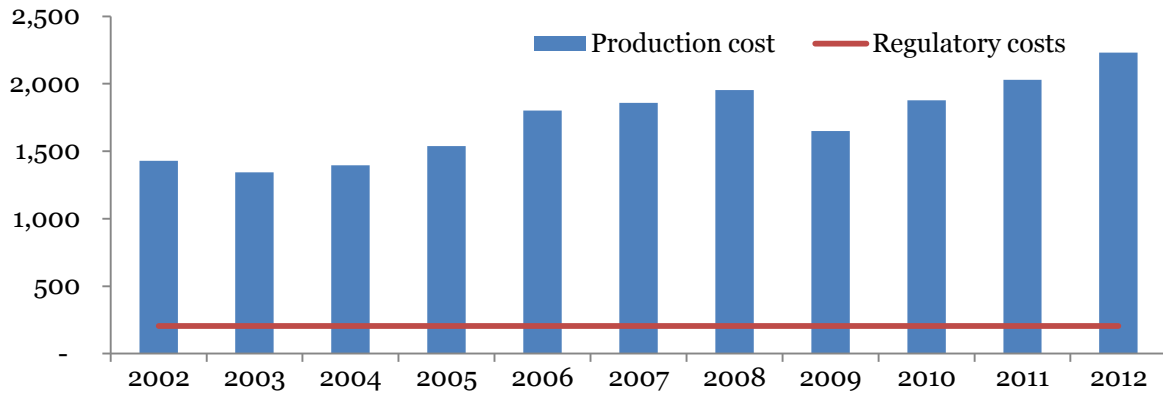
Source: Authors' own elaboration

Figure 26 Cumulative regulatory costs vs. price-raw materials (2002-2012, intermediate scenario on subsample 2 - €/tonne)



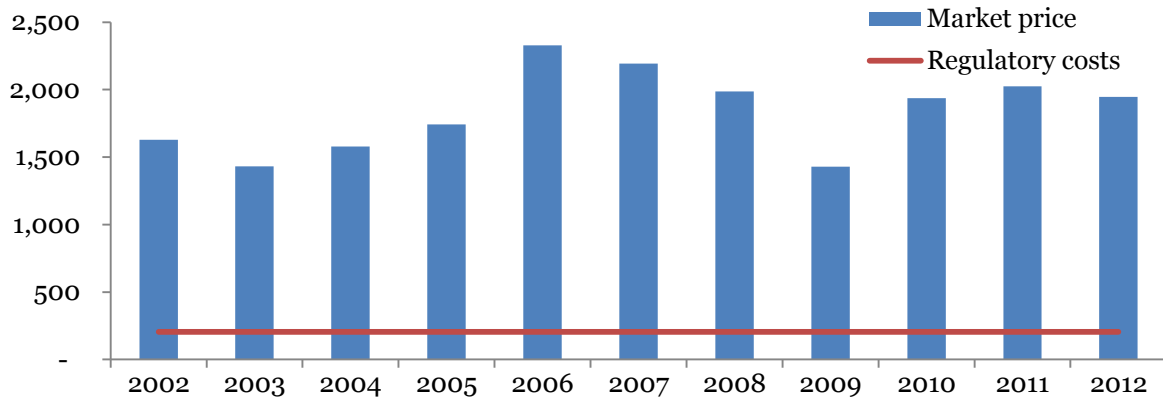
Source: Authors' own elaboration

Figure 27 Cumulative regulatory costs vs. production costs (2002-2012, intermediate scenario on subsample 2 - €/tonne)



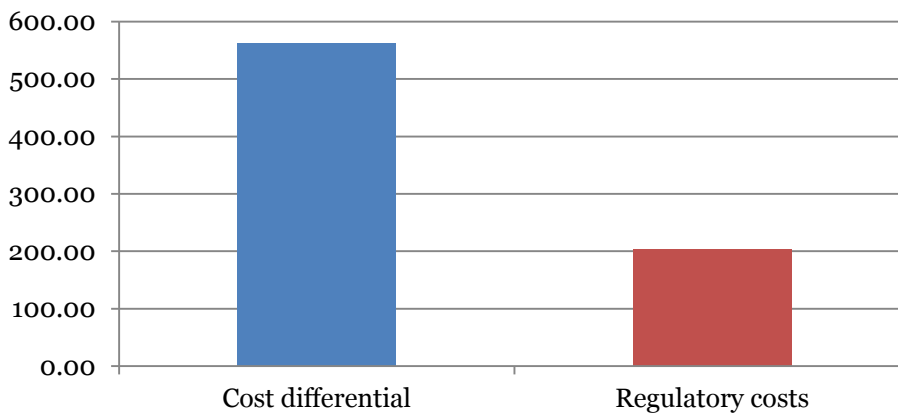
Source: Authors' own elaboration

Figure 28 Cumulative regulatory costs vs. market prices (2002-2012, intermediate scenario on subsample 2 - €/tonne)



Source: Authors' own elaboration

Figure 29 The impact of cumulative regulatory costs on cost differential with Middle-Eastern smelters (2012, intermediate scenario on subsample 2 - €/tonne)



Source: Authors' own elaboration

3.4 EU regulatory costs for secondary and downstream producers

As mentioned, we were unable to complete a cumulated cost assessment based on the 20 secondary producers and the 15 downstream players included in our sample.⁶⁰ However, the feedback we received from some interviewees allows us to provide some quantitative estimation for two of the policy areas covered by this Study, namely Climate Change and Environment. The results for some of the plants included in our sample are summarized below.⁶¹

3.4.1 Climate Change

The indirect costs of ETS

Both secondary producers (remelters and refiners) and downstream operations (rolling and extrusion) were affected by the indirect cost of the ETS passed through electricity prices. The difference in magnitude with the results reported for primary production stems from the far lower electricity intensity of the secondary aluminium production process. Primary smelters consume around 14 to 15 MWh per tonne, secondary producers 150-200 kWh per tonne.

Table 13 shows the indirect ETS costs reported by the secondary producers that replied to our questionnaire. As was done for primary aluminium, we have used three different pass-on rates in our analysis.⁶² As a result, costs range from 0 for some plants (e.g. those procuring electricity via a carbon-neutral generator or relying on self-generation) to 1.46-2.44 €/tonne, depending on the chosen pass-on rate. The median reported values range from 1.04 €/tonne to 1.73 €/tonne under the different scenarios.

Table 13: Secondary Producers, indirect CO₂ costs (€/tonne of finished product)

Phase 1 & Phase 2	Lowest value	Median Value	Upper value
<i>Pass-on rate 0.6</i>	0	1.04	1.46
<i>Pass-on rate 0.8</i>	0	1.39	1.95
<i>Pass-on rate 1</i>	0	1.73	2.44

Note: Averages of indirect costs in Phase 1 and 2. Source: Authors' own elaboration

The same analysis was performed for the downstream section of the value chain. In this case, the results reported by individual plants differ significantly.⁶³ These differences can be attributed to several factors; in particular the type of output, which in turn affects the

⁶⁰ Comparison with production costs and margins are not possible. As for the former, a detailed cost structure could not be retrieved from secondary sources. As for the latter, few responses to the questionnaires on margins were received, and data were eventually hardly comparable, especially because most of information came from vertically integrated operators. For further details on sample composition and response rate, please refer to Section 1.6.

⁶¹ For a more detailed analysis, please refer to Chapters 7 and 11 respectively.

⁶² For further details on this point, see Chapter 7.

⁶³ For further details, see Section 7.3.4.

electricity intensity of the production process at each plant, and the way electricity is procured. For instance, although all rolling mills produce rolled products, there are differences between installations in how specialized those products are and technologies used. Yet, the main factor explaining the variation in the indirect costs reported is the difference in electricity intensity between the various plants. One of the interviewed rolling mills uses about three times more electricity per tonne than another (circa 160 kWh/tonne versus 60 kWh/tonne). On the other hand, some of the plants with comparatively higher electricity intensity purchase this input from a carbon-neutral generator. This compensates for the electricity intensity when compared to another comparable plant that purchases this input on the market. Finally, differences in maximum regional carbon intensity of electricity generation play an important role when analyzing the differences between plants.

Table 14 summarizes the reported costs among the surveyed downstream producers. While some plants are not affected by the indirect ETS costs, the highest reported values ranged between 4.25 €/tonne (assuming a pass-on rate of 0.6) to 7.09 €/tonne (with a pass one rate of 1). Depending on the chosen pass-on rate, the median value of reported costs ranges between 1.15 and 1.92 € per tonne of finished product.

Table 14 Downstream Producers, indirect CO₂ costs (€/tonne of finished product)

Phase 1 & Phase 2	Lowest value	Median Value	Upper value
<i>Pass-on rate 0.6</i>	0	1.15	4.25
<i>Pass-on rate 0.8</i>	0	1.53	5.67
<i>Pass-on rate 1</i>	0	1.92	7.09

Note: Averages of indirect costs in Phase 1 and 2. Source: Authors' own elaboration

The administrative costs of ETS

Data on the administrative costs incurred by sampled plants to prepare for Phase 3 of the ETS and in 2013 when Phase 3 started were also collected.⁶⁴ Not all facilities are concerned by these costs: specifically, some of the sampled facilities are not covered by the ETS regime as their total rated thermal input is lower than 20 MW; in other cases, the ETS is managed at group level and costs are attributed to the higher segment of the value chain.

As shown in Table 15, administrative costs incurred by secondary producers range from 0.08 € per tonne to 0.71 €/tonne, with a median value of 0.18 €/tonne. It should be noted that the companies reporting the highest costs per tonne in the sample are also those with lower production than their peers in the sample; hence, expectedly, administrative burdens, representing a quasi-fixed cost, weigh more than disproportionately on them.

⁶⁴ See Section 7.4 for further details.

As regards downstream producers, reported costs ranged from a minimum of 0.02 €/tonne to a maximum of 0.69 €/tonne. The median value was 0.04 €/tonne. Here again, the plant reporting the highest value is also smaller (in terms of capacity) than the others in the sample. Hence, it can be estimated that ETS administrative burdens represent 0.02-0.04 €/tonne for large downstream players, while they are possibly (and likely) higher for smaller entities.

Table 15: Administrative costs (€/tonne)

Administrative Costs	Secondary producers	Downstream producers
<i>Minimum Value</i>	0.08	0.02
<i>Median Value</i>	0.18	0.04
<i>Maximum Value</i>	0.71	0.69

Source: Authors' own elaboration

3.4.2 Environmental Legislation

The intensity of environmental investments varies significantly across facilities. Variability is greatest in secondary production: while the majority of remelters/refiners have invested less than 40 €/tonne in environmental protection (in one case only 4 €/tonne), a minority displays much higher values, often in excess of 100 €/tonne. As a result, the average value of 62 €/tonne is nearly twice the median value of 36 €/tonne. A more compact distribution was found among operators active in rolling and/or extrusion: while there are some outliers (one facility investing just 5 €/tonne, another investing well above 100 €/tonne), the majority of operators fall in the 10 to 40 €/tonne. And, indeed, in the case of downstream activities, the average value (45 €/tonne) is fairly close to the median (40 €/tonne). Differences in investment intensity depend on a variety of factors, often linked to the specific features of the plants and of their product mix. However, it is worth noting that the highest values (i.e. those in excess of 100 €/tonne) are typically displayed by producers located in Southern or Central EU Member States, while producers in Western Europe usually post values close or lower than the average.

Compliance costs

It is impossible to precisely determine the share of environmental protection costs directly attributable to EU legislation as many factors are at play. On the one hand, there are clear signals that EU legislation has been a significant driver of environmental protection investments in some countries. Against this background, compliance costs linked to EU environmental legislation can only be assessed in an approximate manner. As was done for primary production, we have thus considered two different scenarios. In the first one, EU legislation is assumed to play a key role, accounting for 80% of the costs incurred by the aluminium industry. In the second scenario, national legislation, together with commercial considerations, are assumed to play a comparatively greater role in driving environmentally beneficial activities, and therefore only 50% of the costs are considered to be linked to EU environmental legislation. The results of this exercise are summarized in

Table 16 below. The cumulated compliance costs over the 2002 – 2012 period for secondary production, are 3.79 – 6.06 €/tonne, while for downstream activities cumulated compliance costs range between 1.91 and 3.06 €/tonne.

Table 16 Summary of Cumulated Compliance Costs of EU Environmental Legislation (€/tonne)

	Secondary Production		Downstream Activities	
	EU 50%	EU 80%	EU 50%	EU 80%
<i>Investment Costs</i>	1.15	1.85	0.69	1.10
<i>Financial Costs</i>	0.56	0.89	0.53	0.85
<i>Operating Costs</i>	2.08	3.32	0.69	1.10
Total	3.79	6.06	1.91	3.06

Administrative costs

We have also calculated three categories of administrative costs in the Environmental policy area, namely: i) the costs associated with the issuance/renewal/updating of Integrated Environmental Permit (IEP) incurred by operators over the 2002 – 2012 period; ii) the costs connected with inspections for checking compliance with the conditions on which the IEP was issued; and iii) the costs associated to the safeguard measures to be adopted under the Seveso Directive.

In the first case, the average value for secondary producers is about € 246,000 over 10 years, whereas administrative costs for downstream producers are significantly lower, with an average of € 117,000. Apart from the differences across the industry segments, the magnitude of costs seems to be linked primarily to plant specific factors, with only limited correlation with ‘structural’ variables. For instance, costs tend to be higher in larger plants, but there are also examples of major facilities incurring moderate costs. Similarly, country conditions seem to play only a marginal role.

Table 17 Summary of Administrative Costs for the Issuance/Renewal/Updating of IEP – 2002 - 2012

Industry Segment	Number of Facilities Spending			Average Per Facility
	Up to € 100,000	€ 100,000 to € 200,000	More than € 200,000	
<i>Secondary Production</i>	1	2	5	€ 246,000
<i>Downstream Activities</i>	3	1	1	€ 117,000

Source: Authors’ elaborations and estimates on data provided by producers

As regards the administrative costs of inspections, we have assumed an average of 1.2 and 1.5 visits per year for secondary producers, whereas downstream producers are, on average, subject to 0.8 inspections/year. The time spent by personnel in dealing with inspections is higher for secondary producers, with averages of 0.5 person/months for

managers and 1.5 person/months for technical personnel. Inspections are less labour intensive for downstream producers, with 0.2 person/months for managers and 0.6 person/months for technical staff. The average annual cost is highest for secondary producers, with about € 22,000. Also in this case the magnitude of administrative costs seems to be determined primarily by plant specific features, although country conditions may also play a role (i.e. in two member states costs are always lower than € 10,000 and often lower than € 5,000).

Table 18 Summary of Administrative Costs for the Compliance Inspections – Annual Values

Industry Segment	Number of Facilities Spending			Average Per Facility
	Up to € 10,000	€ 10,000 to € 20,000	More than € 20,000	
<i>Secondary Production</i>	4	1	3	€ 22,000
<i>Downstream Activities</i>	4	0	0	€ 3,000

Source: Authors' elaborations and estimates on data provided by producers

Finally, we conclude with the administrative costs linked to the Seveso Directive, which applies only to plants stocking dangerous substances in excess of certain thresholds. Among the players surveyed, only 3 secondary producers and one downstream operator are subject to the Directive. The time spent by personnel on administrative tasks related to the Seveso Directive is usually in the order of 2-3 person/months per plant per year. Values are higher in secondary production, with averages of 0.8 person/months for managers and 2.0 person/months for technical personnel. The single downstream plant subject to the Seveso Directive reported a work load of 0.6 person/months (0.1 person/months for managers and 0.5 person/months for technical staff). As in the case of inspections, personnel costs are the only cost item considered in the analysis, as there are no out-of-pocket expenses. The average cost is highest for secondary producers, with an average of about € 16,000/year. The cost for the only interviewed downstream producer subject to the Seveso Directive is about € 3,000. These results are summarised in the Table below.

Table 19 Summary of Administrative Costs for the Seveso Directive – Annual Values

Industry Segment	Number of Facilities Spending			Average Per Facility
	Up to € 10,000	€ 10,000 to € 20,000	More than € 20,000	
<i>Secondary Production</i>	0	3	0	€ 16,000
<i>Downstream Activities</i>	1	0	0	€ 3,000

Source: Authors' elaborations and estimates on data provided by producers

In order to facilitate a comparison with other costs related to EU environmental policy and legislation, administrative costs have been expressed in terms of unit of output or unit of capacity. For secondary producers, these annual administrative costs are 0.40 €/tonne, while downstream producers incur in much lower costs, estimated at about 0.16 €/tonne.

PART II

THE ECONOMICS OF

THE ALUMINIUM INDUSTRY

4 The economic and technical analysis of the aluminium industry

In this Chapter we briefly explain the life cycle of aluminium production (Section 4.1).⁶⁵ We then focus on the aluminium value chain (Section 4.2) and on the economics of aluminium production (Section 4.3). Finally, Section 4.4 analyses the EU aluminium market, its key players and geographical distribution, the sector's contribution to GDP and impacts on employment.

4.1 Aluminium Life Cycle and Production

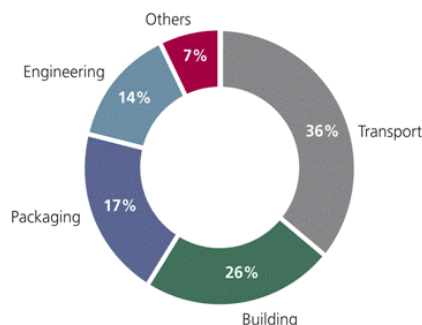
Aluminium is the most abundant crustal metal on earth and its compounds account roughly for 7% of the earth's crust (Bergsdal et al., 2004). It was first produced in 1808, and has since then become a key metal at the core of industrialized economies.

Aluminium has a number of physical properties that make its usage particularly attractive across different industries:

- Light weight and excellent electrical conductivity; as a result, aluminium wires are used on large scale for electricity transmission;
- High workability and strength, often used in the production of vehicles (cars, trains, aircrafts) and other industries where the combination of strength and low weight allows for highly efficient fuels properties;
- High thermal properties and good resistance to corrosion. Aluminium is thus widely used in construction, conditioning, refrigerating and heating exchange industries;
- High malleability, which facilitates the production of thin rolls and sheets that are extensively used by the packaging industry.

The distribution of aluminium usages across different sectors in the EU is illustrated in Figure 30 below.

Figure 30 Aluminium usage by sector (% tot production)



Source: EAA (2011)

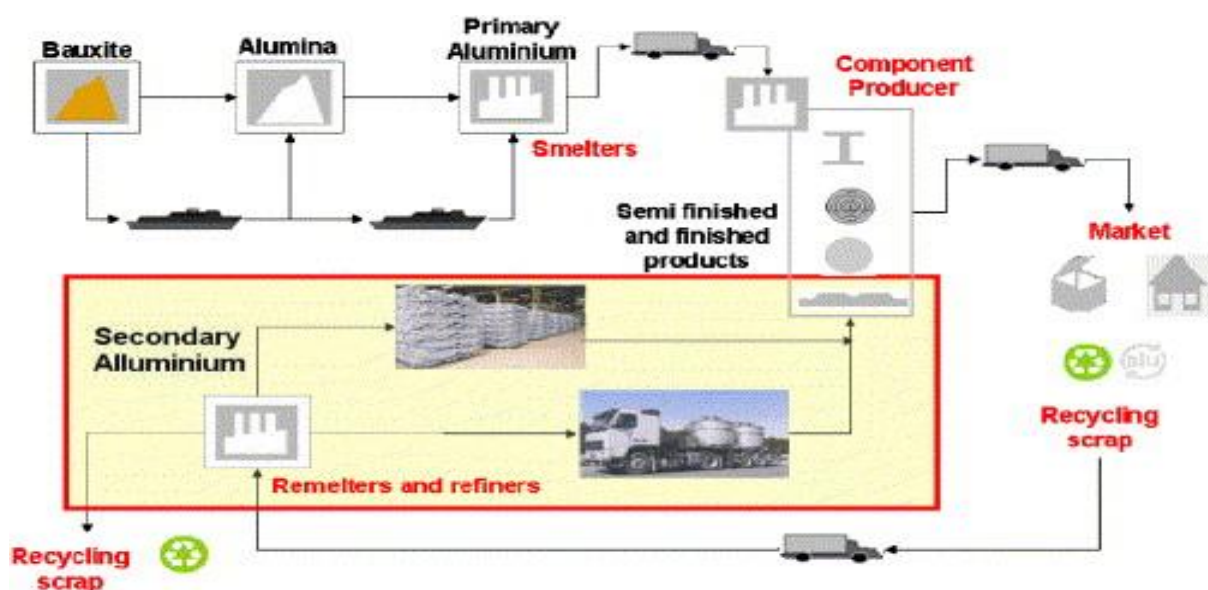
⁶⁵ As mentioned above, the analysis of EU policies only concentrates on primary and secondary production and some downstream sections of the value chain.

4.1.1 Aluminium life-cycle

Aluminium cannot be found “pure” in nature. The production process is elaborate, costly and energy consuming. Once produced, however, aluminium can be recycled indefinitely without losing its major properties. Bertram et al. (2009) estimate that 75% of all aluminium ever produced is in fact still in use today.

In order to obtain a final product suitable for industrial usage, three main production phases are generally distinguished: first, the basic raw material *bauxite* needs to be extracted. Bauxite is then refined into a product called *alumina* and eventually alumina is transformed into *primary aluminium*. The latter can be recycled and brought back to the market as secondary aluminium. These different phases are illustrated in Figure 31 below.

Figure 31 Aluminium life-cycle



Source: Alcoa

4.1.2 The extraction of bauxite

Bauxite is the only mineral ore used for the commercial extraction of aluminium. It has a content of aluminium of about 25%, and nearly 90% of the bauxite globally extracted is devoted to the production of aluminium (OECD, 2010).

Bauxite ores, typically of a deep red colour due to the mixed presence of iron, are more abundant in the tropics areas (mainly South America, West Africa and Australia) and they occur in large horizontal layers in mixed compounds of clay minerals, iron oxides and titanium dioxide. Hydro (2010) estimates known reserves of bauxite around 29 billion metric tons. The biggest reserves of bauxite are currently found in Guinea, Australia, Brazil, Jamaica, and China. Abundant reserves were also discovered in Vietnam, although extraction in the country remains relatively limited to date.⁶⁶

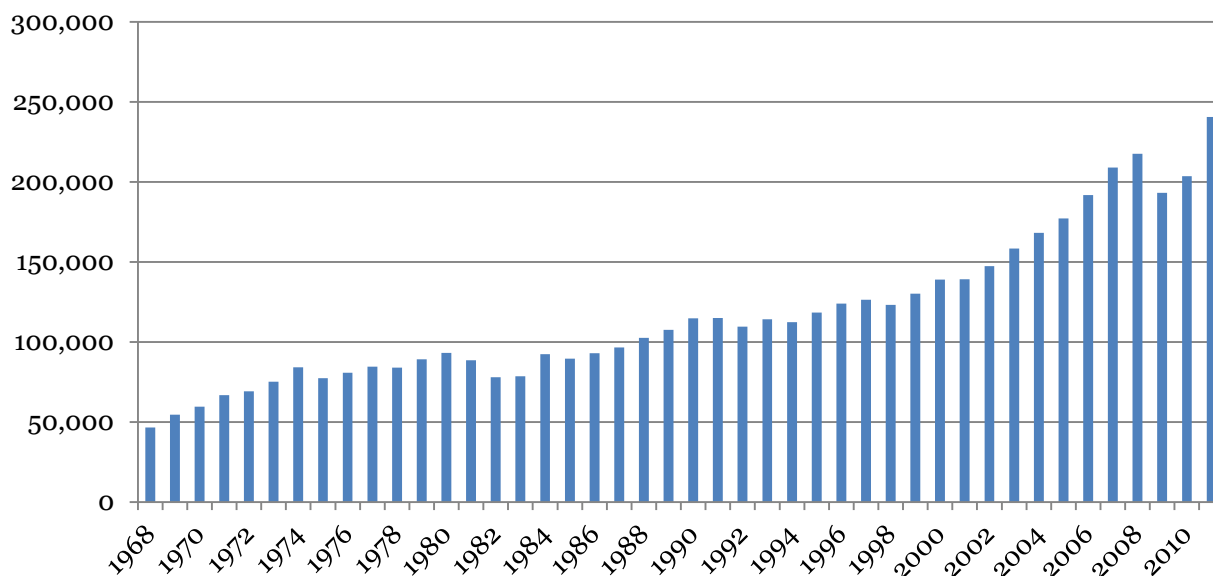
⁶⁶ For further details, see CRU (2013).

Bergsdal et al. (2004) report that the world average costs of mining are estimated to 15 US\$₁₉₉₅/t_{Output}, distributed on 43% labour costs, 46% operating costs and 11% energy costs.

Bauxite mining operations entail large network support and considerable capital and operating costs. According to the International Aluminium Institute (2009), most of the bauxite is mined through open-cut method, which requires eliminating 1-2 meters of the overburden. Standard equipment to perform this activity is diesel-powered bulldozers, backhoes, front-end loaders and excavators. In addition, local factors such as wet or dry mining environment, stripping ratio, scale of production capacity, and distance to shipments points also play a role. Finally, a broad set of auxiliary services to the mining operations need to be put in place, including roads, town sites for workers, energy and water connections, communications facilities (OECD, 2010).

Not all bauxite ores can be directly shipped to the alumina refineries as they need to meet a minimum level of purity. Ores that are not sufficiently pure are transported to specific facilities where the ore grade can be increased by treatments that include crushing, washing, screening, and through which the remaining clay is separated from the bauxite. Once the necessary purity is obtained, ores are dried to reduce transportation costs to the alumina refineries.

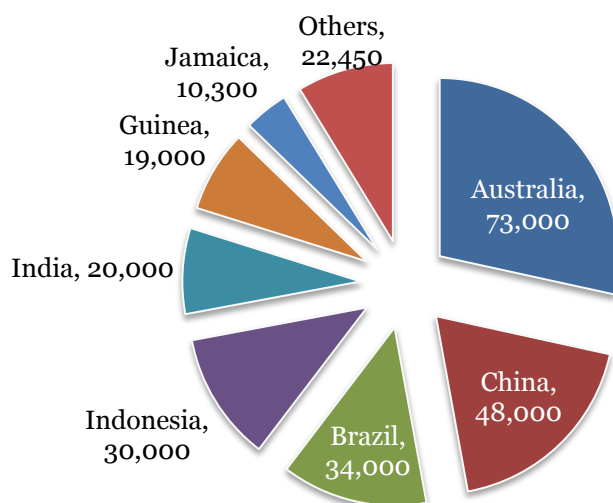
Figure 32 World bauxite production (kTonne)



Authors' elaboration from Bureau of Resources and Energy Economics (BREE) of Australian Government

As shown in Figure 32, since the 1960s the world production of bauxite has been constantly growing. Due to the nature of the activities in which aluminium is employed, the rate of production of bauxite tends to follow the path of economic activities of industrialized countries, as reflected into higher demand during expansion periods and lower demand during recessions. The 2008-drop in the world production reflects this pro-cyclical behaviour (see Figure 33), which led to a rebound in bauxite production in 2011 when the global economy overcame the difficulties triggered by the financial crisis.

Figure 33 World bauxite production by country, 2012 (kTonne)



Source: USGS 2013

4.1.3 Alumina extraction from bauxite

In order to facilitate the transportation of the heavy and bulky bauxite ores, alumina extraction plants are often located close to the mining areas. Bauxite is composed of alumina, silica and titanic dioxide. To produce 1 metric tonne of alumina 2-3 metric tonnes of bauxite need to be refined.

The most common industrial process to refine bauxite into alumina is the so-called Bayer process. The process takes its name from Carl Josef Bayer, the Austrian chemist who, in 1887, developed a procedure for the separation of the alumina from bauxite based on the use of a hot solution composed by caustic soda and lime.

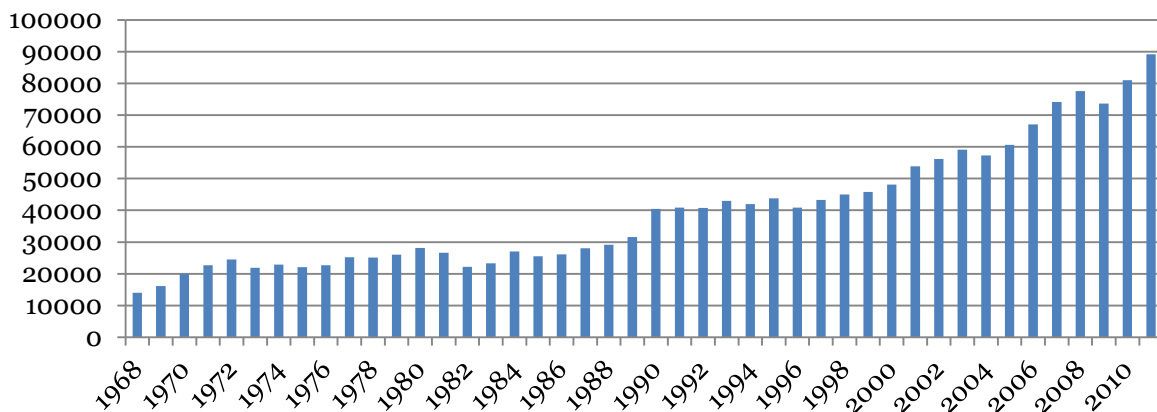
This process, which is highly energy-intensive, consists of four phases (OECD, 2010:20):

1. **Digestion:** bauxite is ground and slurred into caustic soda; the mixture is then pumped into high-pressure containers (digester) where sodium hydroxide reacts with the alumina minerals to form soluble sodium aluminate.
2. **Clarification:** the solution is depressurized and processed through cyclones to remove coarse sand. The remaining fluid is processed in thickeners where flocculants are added to agglomerate solids, which are removed by cloth filters. These residues (red mud) are washed, combined, and discarded, and the clarified solution is passed to the third step.
3. **Precipitation:** the clarified solution is seeded with alumina seed (very small) crystals to aid precipitation of larger agglomerated alumina crystals. The product-sized crystals are separated from the small crystals (recycled as seed) and are washed to remove entrained caustic residue.

4. Calcination: the agglomerates are then placed in rotary kilns or stationary fluidized-bed calciners at temperatures that can exceed 960°C. This drives off the chemically combined water leaving a residue of commercial-grade alumina.

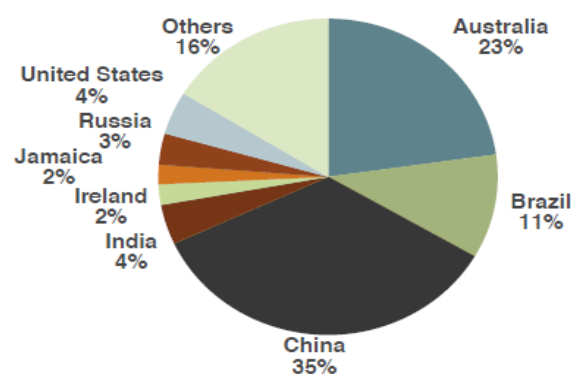
The process of alumina extraction is much more costly than bauxite mining. Bergsdal et al. (2004) report that producing alumina is ten times more expensive than producing bauxite. The operating production costs are shared in the following way: bauxite (34%), labour (13%), electricity (3%), other energy (22%),⁶⁷ caustic soda (13%), and other operating costs (15%). As one fourth of the operating costs are linked to energy, this makes alumina production a highly energy-intensive activity, exposing the industry to the fluctuations of energy prices. Figure 34 and Figure 35 below show the trend in alumina world production and the geographical distribution of production across the globe.

Figure 34 World alumina production (kTonne)



Authors' elaboration from BREE of Australian Government

Figure 35 Alumina production by country, 2010



Source: World Aluminium (2013)

⁶⁷ Fuel costs (oil, gas, and coal) incurred for the digestion, precipitation and calcinations phases of the refining process. Electricity consumption is significantly lower at this stage than during the production of aluminium from alumina, where the global average electricity intensity of the process is around 15,000 kWh/tonne.

As alumina production takes place in plants close to extraction sites, the major alumina producers are countries with a relative abundance of bauxite. Figure 33 and Figure 35 show how the world production is essentially dominated by China and Australia, which together hold more than 50% of the total share of global production. Beyond these 2 players, it is worth noting the dominant role of BRICS countries, the United States and Jamaica.

4.1.4 *The production of Aluminium from Alumina*

The last step of the primary aluminium production process consists of the smelting of alumina. Contrary to the previous phase, the smelting process is carried out in plants spread all over the world, often close to the areas in which the product is eventually consumed or in areas strategically positioned, in order to have constant supplies of cheap electricity (a key costs of this production phase, as explained below).

The industrial process through which alumina is smelted into primary aluminium is called “Hall-Heroult”. This process, invented in 1886 by the American Charles M. Hall and the French Paul L. Heroult, is based on three main inputs:

- Alumina (aluminium oxide)
- Electricity
- Carbon.

The process consists in breaking by electrolysis the bonds through which the aluminium metal atom is tied to oxygen in alumina. This procedure is performed as follow (Hydro, 2013):

1. Alumina is transported to the plants and put into large containers where it is dissolved into an electric bath.
2. Alumina, which has a high melting point, is converted through an electrolytic process. In the electrolytic cells high direct electricity is run through a negative carbon cathode and a positive carbon anode. The reaction with oxygen present in the alumina consumes the anode when generating CO₂.
3. Liquid aluminium is drawn from the cells using specific vehicles and is casted into extrusion ingots, sheet ingots or different ingots depending on how it will be further processed.

Producing aluminium through the Hall-Heroult process entails the use of large quantities of electricity.⁶⁸ The development of electricity-efficient technologies applied to aluminium smelting is therefore of crucial importance for sound cost-effective business strategies. In

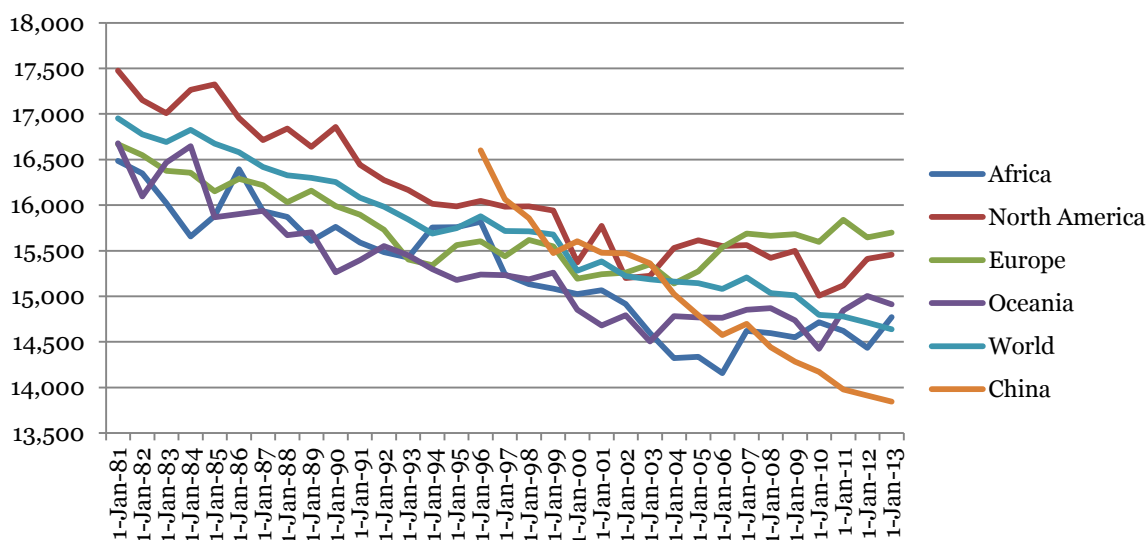
⁶⁸ As explained below, the electricity intensity of aluminium production is on average slightly below 15,000 kWh/tonne of product at the global level.

this respect, the industry has mainly adopted two different technologies, which differ by the type of anode used (Bergsdal et al., 2004):

- The Soderberg technology, which uses a continuous anode delivered to the cell in the form of a paste and baked in the pot itself;
- The Prebake technology, which uses multiple pre-baked anodes in each cell.

The Soderberg technology is the older of the two and has been slowly replaced by plants adopting the Prebake technology. In 2001, 27% of primary aluminium was still produced through the Soderberg technology but all new plants and most plants modernization programs are adopting the new technology. This change is happening because of the higher electricity efficiency of the Prebake technology, which allows for large savings of operating costs (Bergsdal et al., 2004).

Figure 36 Primary aluminium energy consumption by area,⁶⁹ (kWh/tonne)



Authors' elaboration from International Aluminium Institute

Bergsdal et al. (2004) report that of all the electricity consumed in the 3 steps of production, 96% is employed in the smelting phase, against 3% in the production of alumina and a 0.6% in the bauxite mining process. While the Hall-Heroult process consumes a huge amount of electricity, the specific quantity of energy employed varies sharply for each specific producer, the technology employed and the production plant. The world's largest producer of aluminium and the most energy-efficient smelters use about 13,000 kilowatt hours (kWh) of electrical energy to produce one tonne of aluminium, while

⁶⁹ In this table Europe does not refer to EU27. Europe includes: Austria, Bosnia and Herzegovina, Croatia, France, Germany, Greece, Hungary, Iceland, Italy, Montenegro, Netherlands, Norway, Poland, Romania, Russian Federation, Serbia and Montenegro, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom.

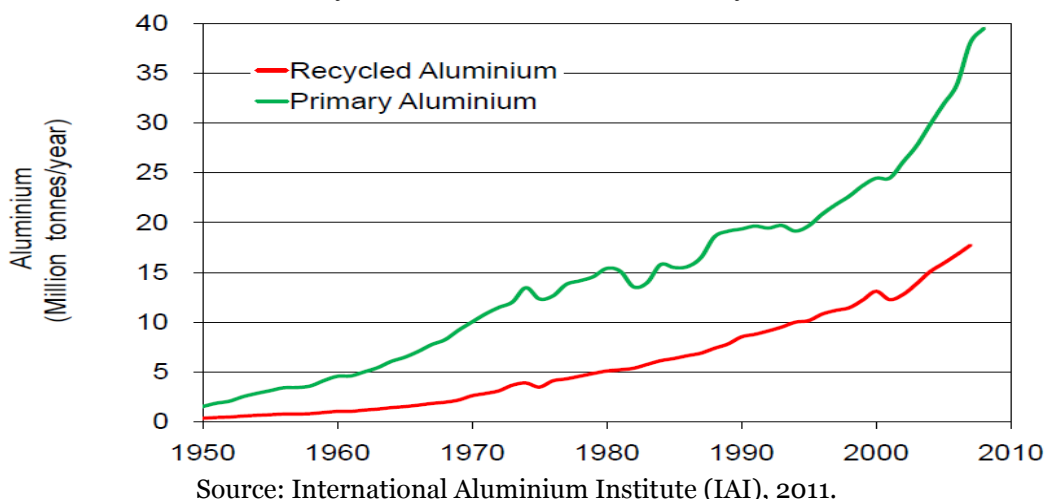
the world average is slightly below 15,000 kWh/tonne.⁷⁰ Nevertheless, in the last three decades there has been a continuous and homogenous improvement of the energy efficiency of the smelting process.

4.1.5 Secondary Aluminium Production

The term “secondary aluminium” refers to all the aluminium produced not by alumina smelting but through the recycling of aluminium scrap.⁷¹ Secondary aluminium is obtained either at the smelter and fabrication plants, or collected post consumption. Post consumption aluminium originates by recycling different kinds of aluminium scrap, like wires, cables, wrought alloys, casting alloys, used beverage cans, turnings, packaging and dross (mixture of metal, alumina and other materials) (OECD,2010).

As mentioned, a key feature of aluminium is the almost indefinite recycling potential without losing fundamental properties. In this regard, it is often said that aluminium is never *consumed* but it is simply *used*. According to the International Aluminium Institute (2009), more than a third of all the aluminium globally produced comes from aluminium scrap.

Figure 37 Production of Recycled Aluminium and Primary Aluminium (1950-2010)



Since the 1950s, the production of secondary aluminium (see Figure 37) has been steadily growing, reaching 18 million tonnes of production in 2010. In fact, in the EU27 more aluminium is produced through the secondary route than through the primary one. In 2012, 4.1 million tonnes of aluminium were produced through recycling (EAA, 2012) while primary aluminium production amounted to 2.6 million tons.

The International Aluminium Institute (2011) estimates that processing aluminium scrap into recycled aluminium requires just 5% of the energy needed to obtain primary aluminium from bauxite. Most of the energy costs required for the production of primary

⁷⁰ For a detailed analysis of the electricity intensity of plants in the EU27, see Box 5.

⁷¹ For further details on the recycling process, see below.

aluminium are in fact embedded in the product since the smelting phase and remain with it along all the following phases giving high market value to aluminium scrap. It is thus not surprising that the aluminium recycling industry displays a continuous growth path in the last few decades.⁷²

Aluminium recycling can be done through two different procedures according to downstream use. A scrap's *refining process* is the procedure through which secondary aluminium is produced using very different types of scraps. This process has a 15% tolerance of impurity (relatively high) and, for this reason, the recycled aluminium can be used by downstream casters (mainly employed in automotive sector). A more complicated procedure to recycle aluminium is the so-called *re-melting* process: this process needs purer scraps (2-3% maximum impurity tolerance) but generates secondary aluminium employable both in rolling mills and extrusion plants.

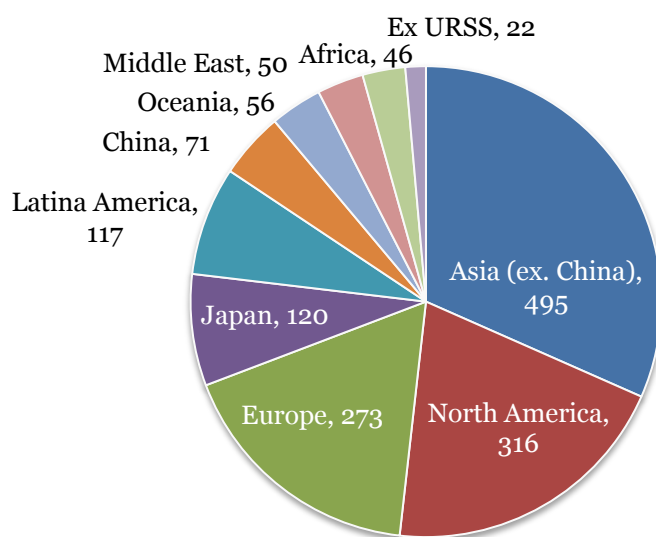
The secondary aluminium production process from post consumption scrap consists of several steps: collection and sorting; pre-treatment; melting and refining. Different types of raw materials undergo different specific treatments across the four phases and are eventually melted in specific furnaces.

Pre-treatment is instrumental in feeding furnaces with scrap of sufficient quality; it includes shredding down metal pieces; cleaning them from oils, coatings and other contaminants. In the melting and refining phase, pre-treated scrap is turned into secondary aluminium in the furnace. This phase includes melting itself, adding of fluxing or alloying metals; removing impurities. The furnace to produce secondary aluminium can be either a high emitting furnace, which can process a large amount of impure scrap; or a low emitting furnace, which can process clean scrap (JRC 2007).

The geography of aluminium recycling is different from the primary aluminium one. Specifically, OECD countries have sufficiently developed the recycling industry to make it a strong and well-organized sector. This industry is evolving also in emerging countries, but African and Latin American countries are still lagging behind, while most of their aluminium scrap is shipped to countries like Australia and Canada where a more developed industry can profitably recycle it (IAI, 2009).

⁷² Besides the intrinsic value of aluminium scrap, other drivers behind the growth of aluminium recycling include concerns about sustainable development, environmental legislation, and technological developments. These aspects are discussed later in the report.

Figure 38 Number of recycling plants by area, 2008

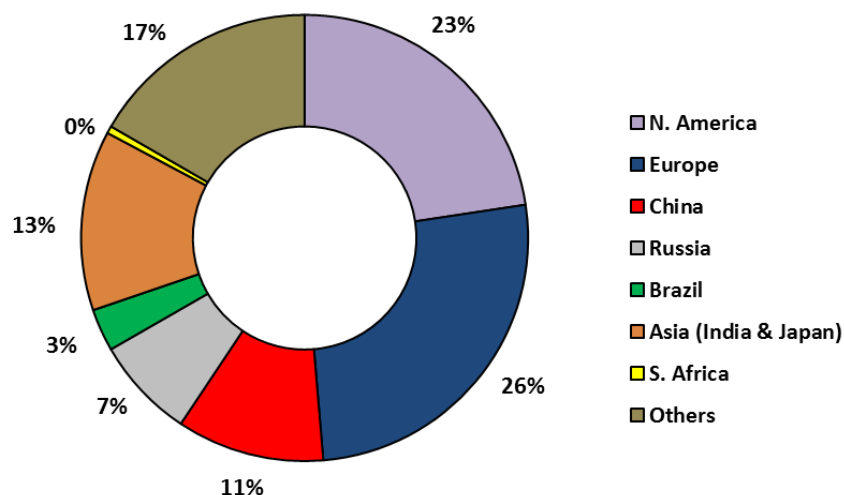


Authors' elaboration on IAI (2009)

As shown in Figure 39 below, Europe⁷³ is at the forefront in terms of volumes of recycled aluminium, with a 26% share in 2010, closely followed by North America (23%)

Figure 39 Share of aluminium recycling per region, 2010

**Share per region of aluminium recycling
- 2010 data -**

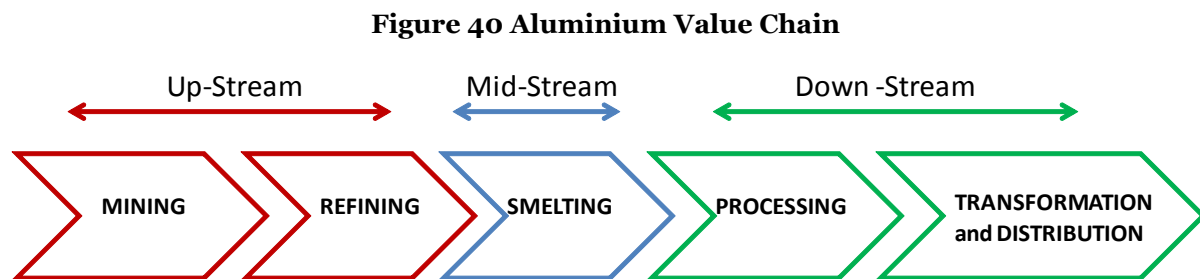


Source: EEA, based on GARC Model

⁷³ In the Figure, Europe includes the EU27, EFTA countries, and Ukraine and Belarus. Reportedly the last two countries only account for less than 3% of the Europe total.

4.2 The Aluminium Value Chain

The aluminium value chain is illustrated in Figure 40. We follow Garren et al. (2009) in defining the phases of rolling, extruding and casting as downstream phases and the production stages that lead to the production of aluminium ingots as the up-stream and mid-stream phases.



Authors' elaboration on Garren et al. (2009)

4.2.1 Upstream value chain

From an industry point of view, it makes sense to consider mining and refining activities together. Mining operations need to take place where bauxite veins are naturally located, but given the bulky nature of bauxite ores, transportation costs represent - as mentioned - a big incentive to set up refining plants close to the extraction site. In many cases, alumina refineries are built and projected to serve a single specific mining site. This further increases the close interdependence between the two activities. It is therefore strategically sound for companies involved in the mining activity to have a strict control over refining activities. The high interconnection between these two activities is expressed in practice either by joint ownership (vertical integration) or by long-term detailed contracts between companies.

A key determinant that makes vertical integration an efficient organizational response to the specific features of this part of the value chain is the high sunk costs. Bauxite extraction and refineries' facilities require large capital investments and are mostly assets hardly employable in other activities. In this context, therefore, the complementary nature of these investments gives a big push towards the creation of long and stable contractual relations among players operating in these fields.

In addition, in the last decade, the upstream section of the value chain has become an economic sector increasingly dominated by very large multinational players operating in the extraction of different metals (horizontal integration). This horizontal and geographical integration can be justified on different economic grounds (Garren et al., 2009): diversification in the extraction of different raw materials allow for the exploitation of economies of scope (e.g., cost synergies, know-how) and helps reducing the financial risk of being exposed to price fluctuations for a single material. Geographical diversification across regions and continents allows for a better management of risks linked to political instability, which characterizes some bauxite-rich countries.

4.2.2 *Midstream Value Chain*

The step of smelting alumina into aluminium is not logistically tied to the two upstream activities described above, as the incidence of alumina transportation costs is much lower than for bauxite. In other words, transportation costs are not able to influence the location of the smelting plants. Energy costs however are key factors in determining where this part of the value chain is developed, as they represent on average more than 30% of the total costs of aluminium production (Garren et al., 2009). Placing aluminium smelters where they can be supplied with cheap energy is essential to produce at a competitive cost.

Although not as strong as for mining/refining activities, efficiency arguments may lead the industry towards more vertical integration. Smelting technology is based on a continuous production process. Its efficiency is therefore highly dependent on a constant and reliable supply of alumina, which makes demand elasticity by primary producers quite low in the short-term. Moreover, common aluminium smelters must work on a minimum efficient-scale per year (Garren et al., 2009). This situation further increases the necessity for reliable cheap supply, pushing the industry towards vertical integration or towards long-term contractual relations. Major players of primary aluminium, like Alcoa, Rio Tinto Alcan, UC Rusal, BHP Billiton, Chinalco and Hydro are in fact mostly integrated across all the up-stream and mid-stream value chain (OECD, 2012).

4.2.3 *Downstream Value Chain*

The downstream part of the value chain includes all the activities of processing and transformation, which turn aluminium ingots into semi-finished/finished products. The necessary transformation at this stage largely depends on the final user (whether in transportation, packaging, electrical, engineering), who will set specific technical requirements.

In *rolling mills*, aluminium can be rolled into sheet and foil. In *extruding plants*, it can be shaped according to specific necessities and in *foundries* it can be casted into different forms.

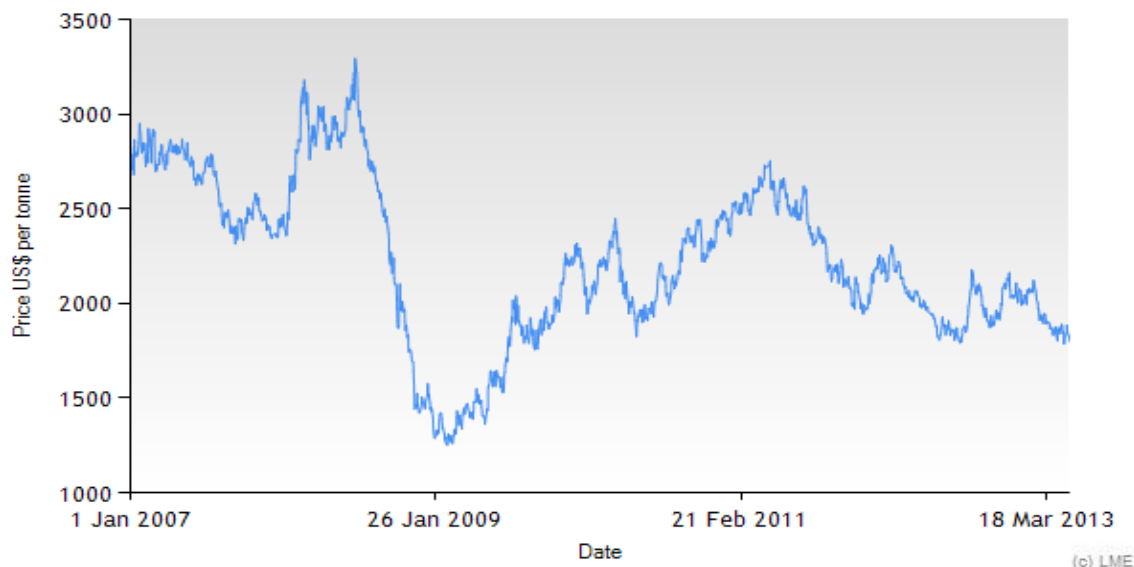
The demand for processed and transformed aluminium from the downstream industries is, as mentioned, inelastic in the short-term and typically pro-cyclical, i.e. high during market expansion and low during recession.

A very important element is of course price. The price of primary aluminium is normally formed through cash forward contracts traded on an open platform, such as the London Metal Exchange (LME). More rarely, price formation occurs via bilateral contracts between the final user and the primary producer. As a result, the LME price is the global aluminium benchmark price.⁷⁴ As shown in Figure 41, the spot price for primary aluminium fell

⁷⁴ For further details, see Box 1.

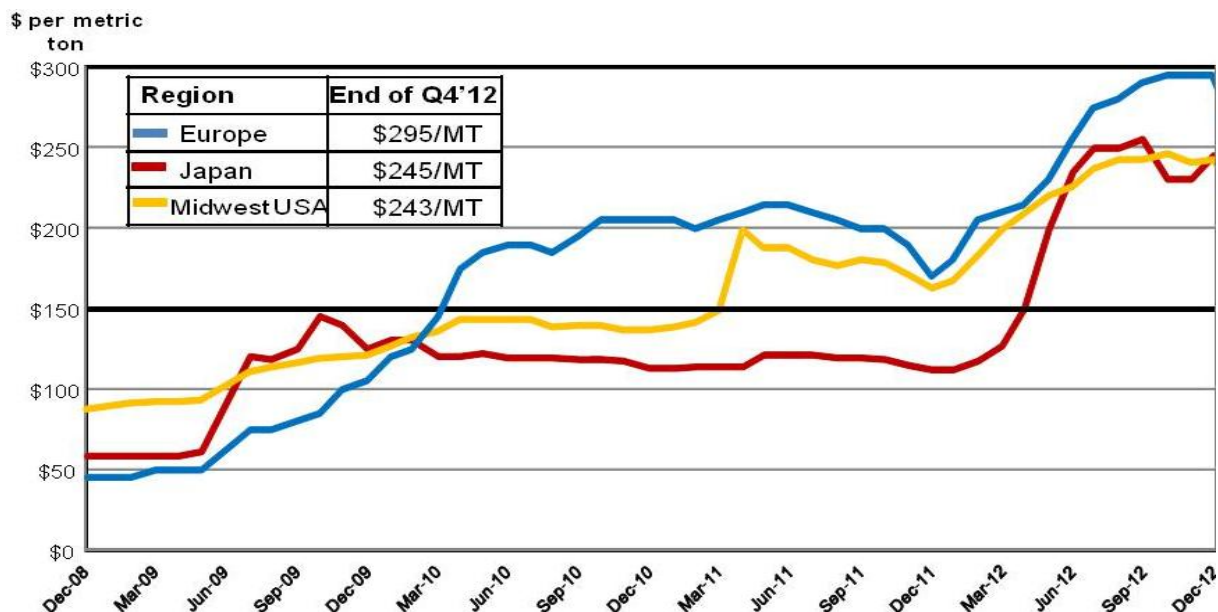
significantly in 2009 and, after a recovery around 2011, started declining again. At the time of writing, the price was around 1800 \$ per tonne.

Figure 41 LME spot price for primary aluminium 2007-2013



As shown in Figure 42, regional premiums are added to or discounted from the LME price to account for local and product factors that influence demand and supply. For Europe this regional premium amounted to 295\$ per metric tonne in the last quarter of 2012. An analysis of the latest evolution of regional premiums is provided in Box 1 below.

Figure 42 Regional premium over LME cash price



Source: Alcoa from month-end pricing – Platt's Metals Week and Metal Bulletin

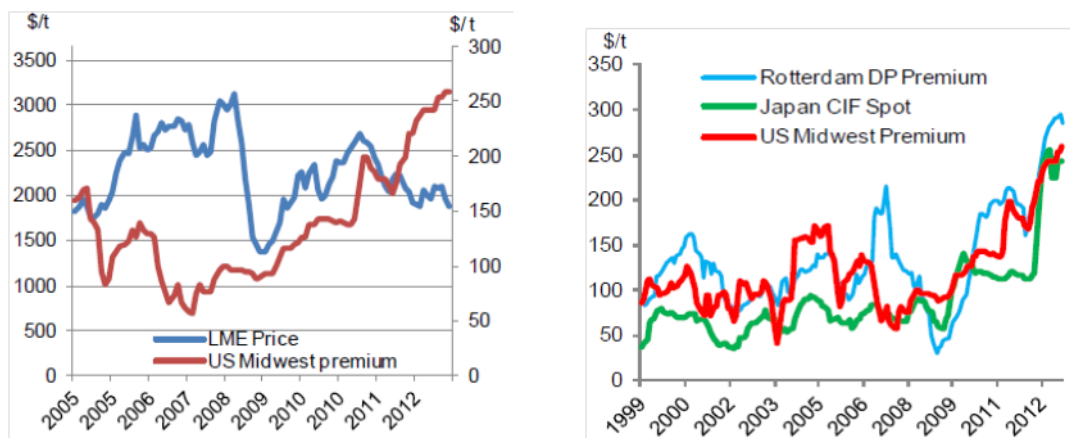
As a result of this key role in the global setting of primary aluminium price, LME has developed in the last decade a network of more than 700 warehouses all around the world, which makes the delivery of aluminium for contracts traded on LME very cheap, thus reducing notably the impact of freight and transportation costs.

Box 1 Aluminium regional premia and their implications for the primary aluminium market structure⁷⁵

The drop in recent months of LME cash forward prices has reflected the oversupply in the underlying physical market. However, the LME aluminium cash forward price is not the final price that aluminium users normally pay (only if they take delivery through the LME warehousing system, plus warehousing and loading out charges). In a physical transaction, regional premia are in fact applied on top of the LME price to discount regional differentials in demand and supply characteristics. Unexpectedly, despite the oversupply across regions, since 2008 the regional premia have increased in all the main regions, partially compensating the drop in the official cash forward price. Regional premia range today (end of June 2013) between 10% and 15% of the LME nominal price.

The unexpected growth of aluminium regional premia has raised several complaints by aluminium final users facing a sharp increase in the regional components of the final price, when LME prices are at historical lows. From the second half of 2008 (see Figure 43) the North American, the European and the Japanese aluminium premia have in fact inverted a historically stable trend and witnessed a steady increase. This has brought the weight of regional premia over the LME price from 3% in 2008 to 14% in 2013. High regional premia are beneficial to producers who are struggling in a phase of historically low LME price and low demand. This situation has however raised concerns among aluminium final users about the artificial nature of aluminium's final price.

Figure 43 LME cash forward price and regional premia



Source: CRU (2013)

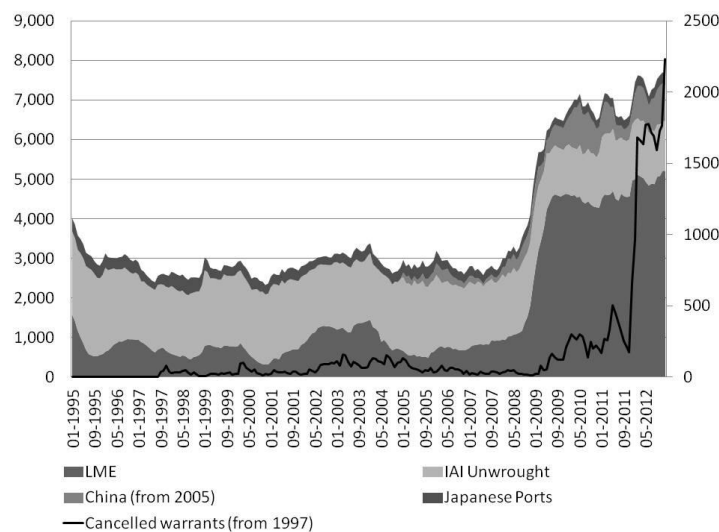
Several aspects contribute to the movement of aluminium regional premia. Yet, two factors can be identified as drivers of aluminium premia. First, the low-interest rates environment (fuelled by prolonged expansionary monetary policies), coupled with a strong contango (low spot prices and higher futures prices), have increased the profitability of cash and carry deals, with the resulting accumulation of huge amounts of aluminium stocks in order to exploit the contango of the market. Second, the organization of the wholesale aluminium market is built around the distribution system dominated by the LME warehouse network. The low degradation of the product and its ease of storability make the 'cheapest-to-deliver' model of distribution

⁷⁵ For this section, two interviews with independent experts operating in the aluminium market were carried out.

particularly efficient for the aluminium market characteristics, reducing dramatically freight and transportation costs for physical traders. The LME warehousing system, with a network of more than 740 licensed warehouses, is designed to make aluminium delivery in strategic areas of net consumption across the world cheap and functional for downstream aluminium users. The warehouse assumes a crucial role in the process of price formation, as it is the place where physical demand meets supply. Any event influencing the regular in/out-flows of goods from the distribution hub and creating artificial 'bottlenecks' will eventually be incorporated in the regional premium of the geographical area where the warehouse is located as a measure of the alternative cost (of going to a producer and negotiate the commodity bilaterally) for having the material readily available.

The combined effect of these two factors (cash and carry trades and a bottleneck in the delivery system), during the last 5 years, has created an unprecedented accumulation of aluminium stocks in the LME warehouses (see Figure 44). As a consequence, while the nominal LME cash forward price dropped reflecting the underlying market oversupply, the warehousing system has seen an unprecedented growth of aluminium stored (at a cost) both in Europe and the US (mainly in Detroit and Vlissingen).⁷⁶ In 2011, LME stocks amounted to more than 11% of yearly production. While the absolute number is still in a reasonable range (but uncommon for other metals) and part of it is certainly justified by the cash-and-carry trade opportunities, the growth of cancelled warrants, i.e. metal that is requested for delivery, signals real problems in loading out aluminium from warehouses at current minimum loading-out rules imposed by the exchange. The waiting time to get delivery queues in Europe and the US are respectively around 355 and 272 days, and there is no sign that this trend can be reversed soon.

Figure 44 Aluminium global stocks and cancelled warrants



Source: Authors' elaboration from Alcoa and LME Sword.

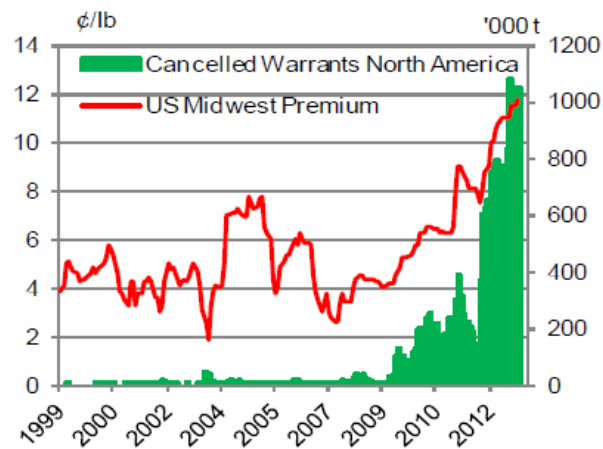
With levels of stocks at unprecedented levels, warehousing services have become very profitable, even attracting the interest of financial players who acquired substantial stakes in main American and European warehouses, thus combining financing of aluminium stocks with their storage services.⁷⁷ Most notably, though, the recent growth of cancelled warrants (see Figure 45) may be caused by the inability of the warehousing system to work at its full loading-out capacity. While loading in (storage) of aluminium is not subject to any threshold, the loading out imposed to the warehouses is subject to a minimum amount, which

⁷⁶ Only warehouses in Vlissingen (Netherlands) hold around 2 million tonnes aluminium stored in its premises.

⁷⁷ Warehouses in Detroit are mainly owned by Metro group (controlled by Goldman Sachs) and Henry Bath (owned by JP Morgan), while those in Vlissingen are owned by Pacorini (Glencore) and Metro Group.

was linked until 2012 to the size of the warehouse (in square meters), and from 2012 onwards to the tonnage stored per location (in tonnes). This change came after complaints from users to alter the warehousing rules.

Figure 45 US premium and cancelled warrant in North America



Source: CRU (2013)

Regardless of the merits of whether the level of the delivery rate compared to the potential loading out capacity of the warehouses is the right one, delivery rates freezes to 3,000 tons/day with the new formula for any warehouse storing more than 900,000 tons of metal. Owners of big warehouses still have the incentive to keep delivery as low as possible (at the minimum delivery rate) and to pile up aluminium above the 900,000 tonnes.

The combination of the above mentioned factors dynamics (low interest rates, futures-spot contango, and delivery rules), followed by the delivery bottleneck in LME warehouses, has gradually pushed the costs for aluminium users upwards. This increase amounts to at least \$160 tonne because of storage costs (considering additional 365 days of storage due to queues), plus the costs of not being able to receive the aluminium when requested (which cannot be immediately quantified). The increase in regional premia corresponds to the ability of producers to ask for a higher price reflecting the higher opportunity costs that consumers are paying for sourcing aluminium outside the LME warehousing system, which currently holds more than 11% of global production. These inefficiencies driving an artificial supply cut are keeping the final price of aluminium above the international price benchmark that still represents a fair market price at the expenses of aluminium users.

Both demand and supply of primary aluminium are characterized by a degree of uncertainty over the underlying fundamentals. More specifically, due to the industrial technologies needed in the mid and downstream part of the value chain, both demand and supply face a certain price rigidity. In addition, the different nature of the activities in which aluminium is employed downstream does not allow for the full exploitation of economies of scale and scope. Therefore, vertical integration between downstream activities and mid/up-stream ones is not very frequent.

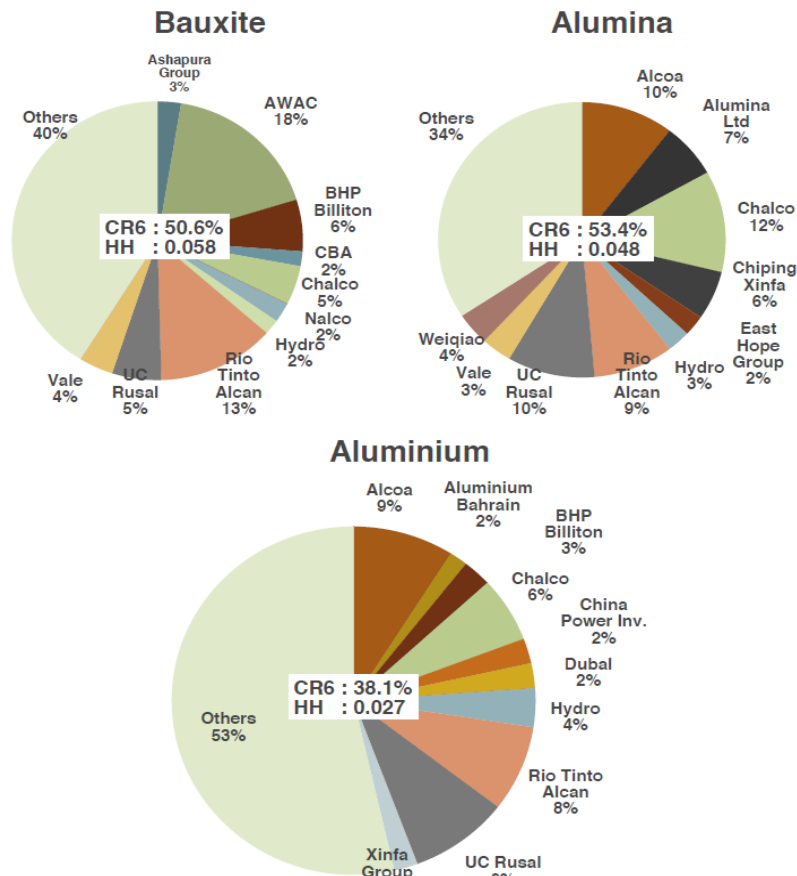
4.3 The Economics of Aluminium

4.3.1 Players

Figure 46 shows the market composition in the up-stream and mid-stream value chain and participants' market power in each of these segments. Together with the market shares

held by each company in the three principal steps of production, the figures report the cumulated market shares held by the 6 biggest firms (CR6 index, see Box 2 below) and the squared value of each participant's market share, i.e. the Herfindahl-Hirschman index (HH index). The HH index gives a better idea of the evolution of market power, as bigger shares are given more importance.

Figure 46 Degree of concentration and integration, 2010



Source: World Aluminium (2013)

The upstream section of the value chain has always been, and still is, characterized by the presence of few large players with significant market power over other segments of the value chain. The downstream level, on the other hand, is more competitive as market power is harder to exploit.

Despite being a market where, for structural reasons, large global companies will always have a comparative advantage over small players, the CR6 index and HH have fallen dramatically in the past few decades. For primary aluminium, the CR6 index dropped from 88.2% in 1955 to 50.6% in 2010 for bauxite, from 90.6% to 53.4% for alumina during the same period, and from 85.9% to 38.1% in 2010 for primary aluminium.

Box 2 Industry concentration indexes - CR(K) & HHI

The k-firm concentration ratio [CR(K)] and the Herfindahl-Hirschman Index [HHI] are two of the most commonly used indexes for measuring concentration in a specific sector/industry.

The CR(K) index – CR6 in the reported case – provides an indication of the market share of the K (6) largest firms in the industry. This index is a linear sum of each firm's (from 1 to K) market share. It is a “user-friendly” index, both for calculation and interpretation, and this is its main advantage. However, because of its structure, the CR(K) index suffers from three shortcomings:

- The relative shares of the largest firms are not taken into account. For instance, if the market share of firm 1 is 85% and the shares of firms 2, 3, 4, 5, 6 are 1% each, then CR6 = 90%. However, the same would be true [CR6=90%] if each firm's share were equal to 15%.
- It does not provide information about changes in the market structure whenever such changes do not affect the first K firms (e.g. a merger between two firms becoming the 7th biggest in the industry will not be reflected in CR6)
- Concentration ratios are not always consistent, when K is changed (e.g. Industry A could be more concentrated than industry B using CR4, while the opposite could be true using CR6).

Conversely the HHI, which is the sum of the squared value of each participant's market share, retains different desirable qualities for measuring industry concentration. In particular:

- HHI considers the size distribution of all firms in the industry;
- HHI is able to show greater concentration (i.e., increase in its value) when the number of firms diminishes and/or when a larger firm acquires market share at the expenses of a smaller firm.

When market concentration is expressed in decimals, the HHI ranges between 0 (theoretical perfect competition) and 1 (monopoly). On the downside, this index is much more demanding in terms of data (i.e., it requires sales data from every firm in the industry). However, when data is available the HHI offers a more complete and coherent measure of industry concentration.

Lower concentration in the aluminium value chain has come inevitably along with the emergence of new players in the global context. Out of the 6 main players dominating the scene from the 50s to the 80s, only Alcoa is still one of the aluminium giants:⁷⁸ others have either been taken over by newcomers (e.g., Alusuisse was first acquired by Alcan who subsequently acquired by Rio Tinto), or are now out of business. Current major aluminium producers are Alcoa (United States) and UC Rusal (Russia), which both control 9% of the market, Rio Tinto Alcan (Canada) with 8%, Chalco (China) 6%, Hydro 4% (Norway), and BHP Billiton (United Kingdom/Australia) with 3 %.

Despite the evolution of the different players in the market and the lower relative weight of each market share, the industry seems to have been constantly characterized by vertical integration. From 1955 to 2010, in fact, all major players have been involved in all the activities required to produce primary aluminium from bauxite (mining, refining and smelting). Moreover, according to World Aluminium (2013), at least until the 90s, vertical integration went beyond up-stream and mid-stream operations, thus covering also down-

⁷⁸ Key players on the global scale for the three phases of production between 1955 and 1979 were Alcoa, Alcan, Reynolds, Kaiser, Pechiney, and Alusuisse. For further details, see World Aluminium (2013).

stream activities like the production of sheet & plate, extruded products, wire, cable & tubes and foil.

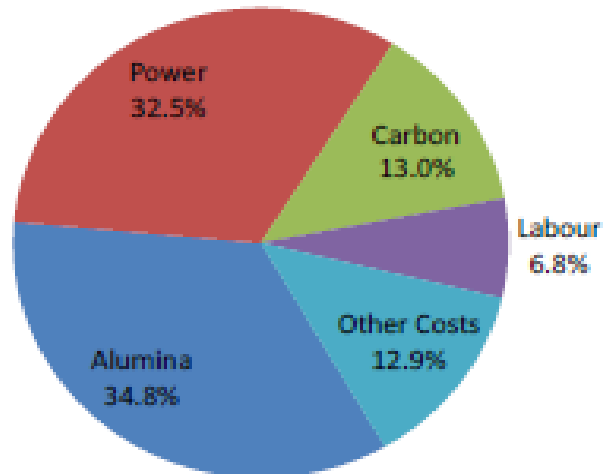
4.3.2 Cost Drivers and Trends

The aluminium industry is very capital-intensive. Up-stream and mid-stream activities are the most capital intensive, while down-stream activities require a relatively lower amount of capital (OECD, 2012).

Independently from the type of technology employed, energy is a major driver of cost. In 2012, the primary aluminium cost structure included as main inputs alumina (34.8%), electrical power (32.5%), carbon (13%), and labour (6.8 %). While these percentages can slightly change from one year to the other, alumina and electrical power account together for more than two-thirds of the total costs. The cost of alumina is based on an international price benchmark and it is therefore roughly the same for all producers. Conversely, electrical power cost varies greatly from country to country, thus becoming the real determinant of an efficient production.

As Figure 48 shows, electrical spot prices differ substantially even within the EU internal market: Italian spot prices have been constantly higher by roughly 20 €/MWh compared to France or Germany. We will come back to this point on the dedicated chapter on energy in this report.

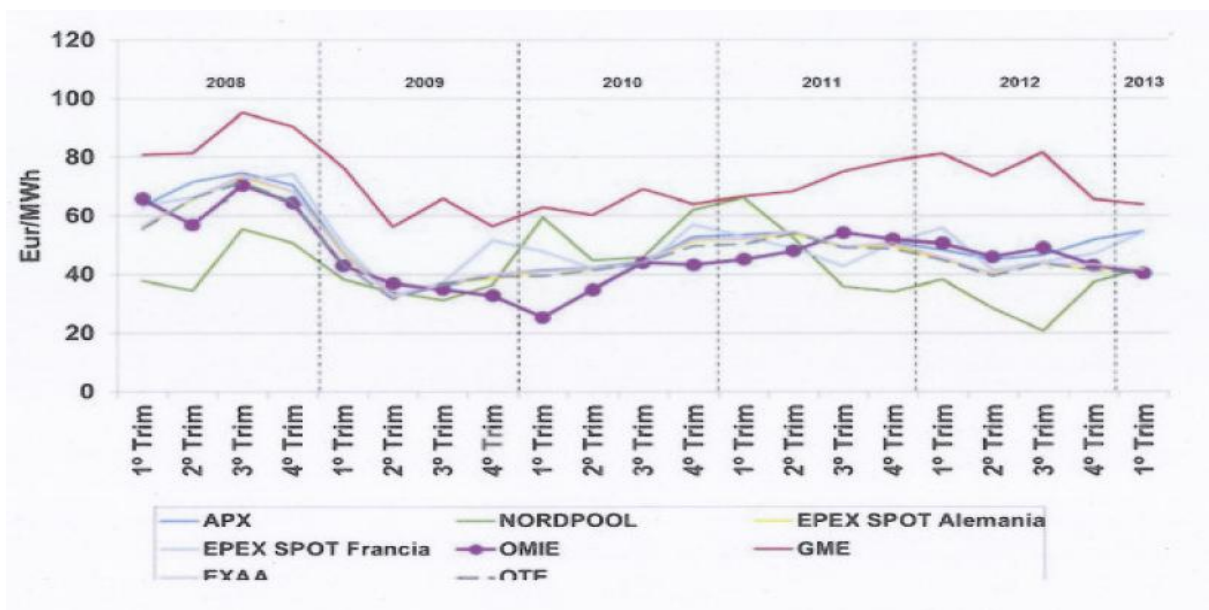
Figure 47 Primary Aluminium structure costs



World average \$C,
2012 = \$2,083/t

Source: CRU (2013)

Figure 48 Electricity Spot Price in selected EU countries⁷⁹



Source: OME (2013)

According to World Aluminium (2013), the evolution of primary aluminium production costs has followed two major trends since the 80s: a declining phase from 1980 to 2003, and an increasing phase from 2003 onwards. Specifically, the major drivers that pushed down the cost curve between 1980 and 2003 have been:

- A more energy-efficient technology, with the upgrade in many plants from the obsolete Soderberg technology to the Prebake technology;
- A general decline in energy prices (especially coal, crude oil and gas);
- A constant appreciation of the US dollar, pushing down not only the costs of the metals but even inputs costs;
- Low and relatively stable alumina real prices over time.

This positive cycle pushing down the production cost of aluminium ended around 2003, when new forces reversed the trend and increased production costs. These new forces can be summarised as follows:

- Strong economic growth experienced by BRICs countries, with China in particular generating very high demand and pushing up energy prices;
- A stronger Chinese Yuan;

⁷⁹ Day-ahead prices. APX: the Netherlands, Belgium, United Kingdom; EPEX: France; Germany; EXAA: Austria; NORDPOOL: Norway, Sweden, Denmark, Finland, Estonia, Latvia and Lithuania; OMIE: Spain and Portugal; OTE Czech Republic; GME: Italy.

- Higher Alumina prices; and
- The introduction of environmental regulation affecting carbon-intensive industries.

4.3.3 *Product Substitutability*

Despite having some characteristics (e.g., highly recyclable and being lighter than steel)⁸⁰ that help to protect its market against other substitutes, aluminium faces competition from a number of potential substitutes depending on the downstream final sector of use. The main substitutes are:

- Copper, due to its high conductivity, is a major competitor for all electrical applications;
- Steel, as a major substitute in the automotive sector;
- Composites, wood and steel that can be employed as aluminium substitutes in a number of applications in the construction sector, and
- Plastic, paper and glass, as major competitors in the packaging market.

4.3.4 *Barriers to entry and to exit*

High initial capital investments and substantial sunk costs are natural barriers to entry in the aluminium market. Yet there has been significant new entry since the 1960s, reducing concentration and increasing competition globally. In particular, the technologies applied along the mid and up-stream process are standardized and fairly well-known, thus exposing producers to fierce competition by those players that can access more favourable energy price conditions. This squeezes the margins of smelters in high-cost countries.

As mentioned, major primary aluminium producers tend to control the biggest shares of bauxite resources. This makes new players willing to enter in the primary aluminium business dependent on their supplies.

Thanks to relatively lower capital investments, the absence of substantial sunk costs and of scale economies, downstream production activities are more open to potential new entrants. On the other hand, and in contrast to mid-upstream activities, product differentiation strategies can be an effective answer to tighter competition.

Since the 1960s, when the entry of new private producers attracted by high margins reduced the market shares of the 6 major players, a key factor influencing notably the competitive environment of the upper phases of the supply chain has been the political one. The pursuit of political objectives by national governments have affected aluminium producers in different ways: control over the market has been exercised through the

⁸⁰ This is particularly appealing to the automotive industry as a means to lower consumptions and CO₂ emissions.

direct/indirect holding of important stakes in aluminium companies, through interventionist policies on the exploitation rights for mineral resources,⁸¹ and via favourable royalties, taxation and exchange rate depreciation.

The objectives of such policies can be summarized as follows (World Aluminium, 2013):

- To address uncompetitive market structure generated by scale and scope economies, marketing and distribution systems, patents or ownership of mineral resources;
- To compensate for insufficient investment resulting from excessive risk-aversion or short-term focus of private players;
- To boost national employment;
- To pursue political goals like national natural resources' autonomy.

UC Rusal, for example, has benefitted from the Russian model of creating national champions by being granted favourable conditions to compete more effectively on a globalised scale. Middle-eastern producers such as Dubal (Dubai), Alba (Bahrain), Qatalum (Qatar), Sohar (Oman) and other joint ventures in Saudi Arabia were granted long-term contracts for the supply of cheap energy, thanks to government intervention (Garen et al., 2009). While these kind of political projects are fairly common in the mid/up-stream operations, they are less common for downstream activities which, as noted above, seem to operate on more neutral competitive grounds.

4.3.5 Intra-sector competitive dynamics

In contrast to the continuous and sharp fall of concentration indices in the mid and up-stream sectors, concentration levels have been lower among downstream producers and this part of the value chain is expected to become more fragmented (Bakken, 2011). As a consequence, the ability to control the supply chain by downstream actors is notably lower. The same applies to their bargaining power with the mid/up-stream actors of the supply chain.

The volatility of the aluminium price on the international markets induces mid/up-stream companies to pursue strategies for covering potential losses coming from unfavourable price conditions, so as to be less exposed to higher buyer-power (Garen et al., 2009). Up-stream companies can achieve this in different ways, which include: the enlargement of their operations horizontally (i.e. portfolio differentiation), through hedging operations on commodities derivatives markets, via vertical integration of future downstream activities.

⁸¹ On this point, see for instance the recent amendments to the Indonesian mining law that foresee significant restrictions to the export of bauxite from 2014. Companies will be required to obtain an export licence from the Ministry of Trade, raw materials will have to be certified by the government prior to export, and a 20% export duty will be applied (Metal Bulletin, March 14 2013). This is likely to have an impact on China, currently the main importer of Indonesian bauxite. India is also planning to introduce a 10% export duty on an ad valorem basis for bauxite.

Today only in a few cases (e.g. Norsk Hydro) operations are fully integrated vertically, and include upstream parts of the supply chain (bauxite extraction) and downstream operations.

The degree of concentration among downstream producers and their customers is less relevant to determine the dynamics of power in these sectors, as the possibilities created by product differentiation and by projecting tailor-made products allow for the exploitation of customers lock-ins. Nevertheless, a consequence of the frequent necessity of producing for specific customers requirements leads to backward integration in some of these sectors: Toyota, for example is equipped to perform remelting and casting in plants of its own property (Garen e al., 2009).

4.4 The European Aluminium Market

4.4.1 Industry definition

According to the NACE (rev.2.0) statistical classification of economic activities in the European Union, aluminium producers are included in class 24.42, comprising the activities reported in Table 20.

Table 20 Aluminium Production, NACE rev2.0 classification

Sub-sector	NACE	Definition
Aluminium Producers	<i>Section: C</i> <i>Division: 24</i> <i>Group: 24.4</i> <i>Class: 24.42</i>	This class includes: <ul style="list-style-type: none"> • production of aluminium from alumina • production of aluminium from electrolytic refining of aluminium waste and scrap • production of aluminium alloys • semi-manufacturing of aluminium • manufacture of wire of these metals by drawing • production of aluminium oxide (alumina) • production of aluminium wrapping foil • manufacture of aluminium foil laminates made from aluminium foil as primary component

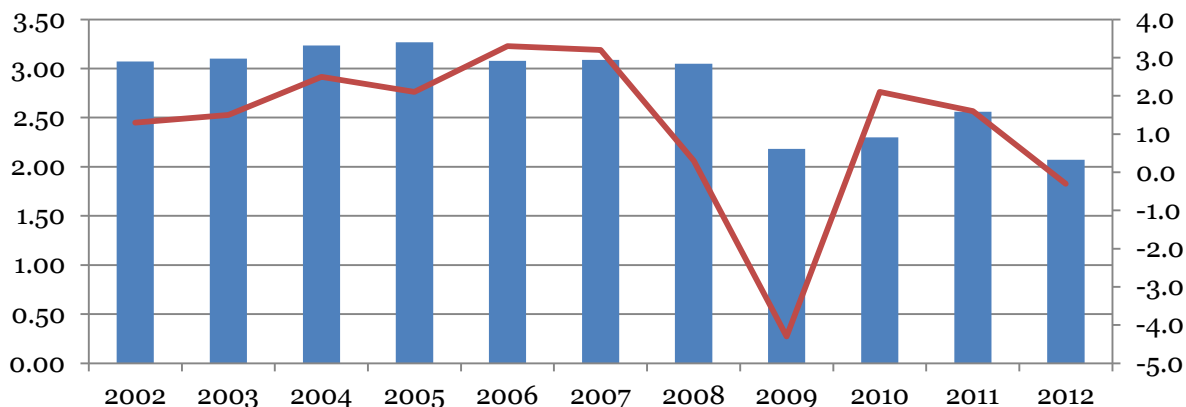
Source: EUROSTAT (2008)

4.4.2 EU aluminium production

For the timeframe covered by the present report, the EU27 primary aluminium production has been growing from 2002 to 2005, when the total output of EU primary production reached 3.27 million tons. After three years (2006-2008) in which production settled around 3 million tons, the economic recession at global level strongly hit downstream demand, triggering an unprecedented drop (-28%) in the EU primary production in 2009. These events confirm the pro-cyclical nature of aluminium markets, as the EU27 GDP growth fell by 4.3% in the same year. EU production partially recovered between 2010 and

2011, reaching again 2.5 million tons in 2011. However, this did not last long, and in 2012 levels plummeted again by 19%.

Figure 49 Primary Aluminium production in Europe (millions tons, left axis) and EU27 GDP growth (right axis)



Authors' elaboration on EAA and Eurostat

In 2012, the European production of primary aluminium (see Figure 49) was dominated by three member states, each holding similar market shares. Germany was the largest producer, holding 18% of production, followed by Spain and France, each holding roughly 17% of total production. Member states with smaller shares were Romania (10%), the Slovak Republic (8%), Greece (8%), Sweden (6%), Italy (5%), the Netherlands (4%) and the UK (3%).

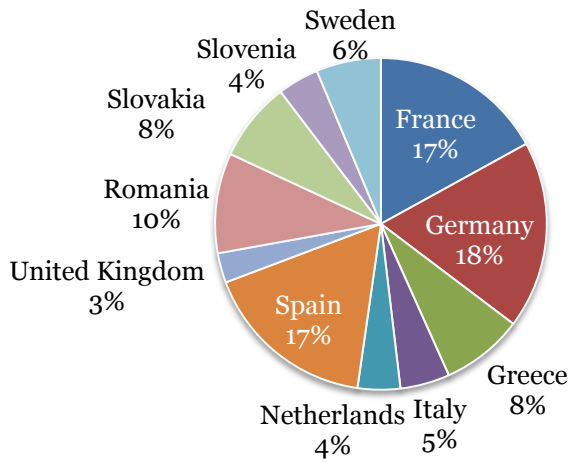
Looking at the evolution of major EU producers over the period 2002-2012 (see Figure 51), it emerges how, besides a general declining trend, countries saw different evolutions. Some member states managed to keep approximately a constant production over this period (Sweden, Slovenia, Romania, France and Spain). Others, especially during the financial crisis, had a more volatile output (particularly Germany, UK and the Netherlands) and saw the closure of some smelters in the country (e.g., plants in Lynemouth and Anglesey/Holyhead in the UK and Vlissingen in the Netherlands). For some others, the production of primary aluminium ceased completely: this has been the case for Hungary in 2006, Poland in 2010, and Italy as of 2013. The dynamic evolution of primary smelters in the EU27 is summarized in Table 3 below.

Table 21 Dynamic evolution of primary smelters in the EU27

MS	Company	Smelter	Open/ Closed	Year of Closure
FR	Rio Tinto Alcan	Auzat	Closed	2003
HU	Magyar	Aluminium Inota	Closed	2006
DE	NorskHydro	Stade	Closed	2007
FR	Rio Tinto Alcan	Lannemezan	Closed	2009
IT	Alcoa	Fusina	Closed	2009
UK	Anglesey Aluminium	Holyhead	Closed	2009

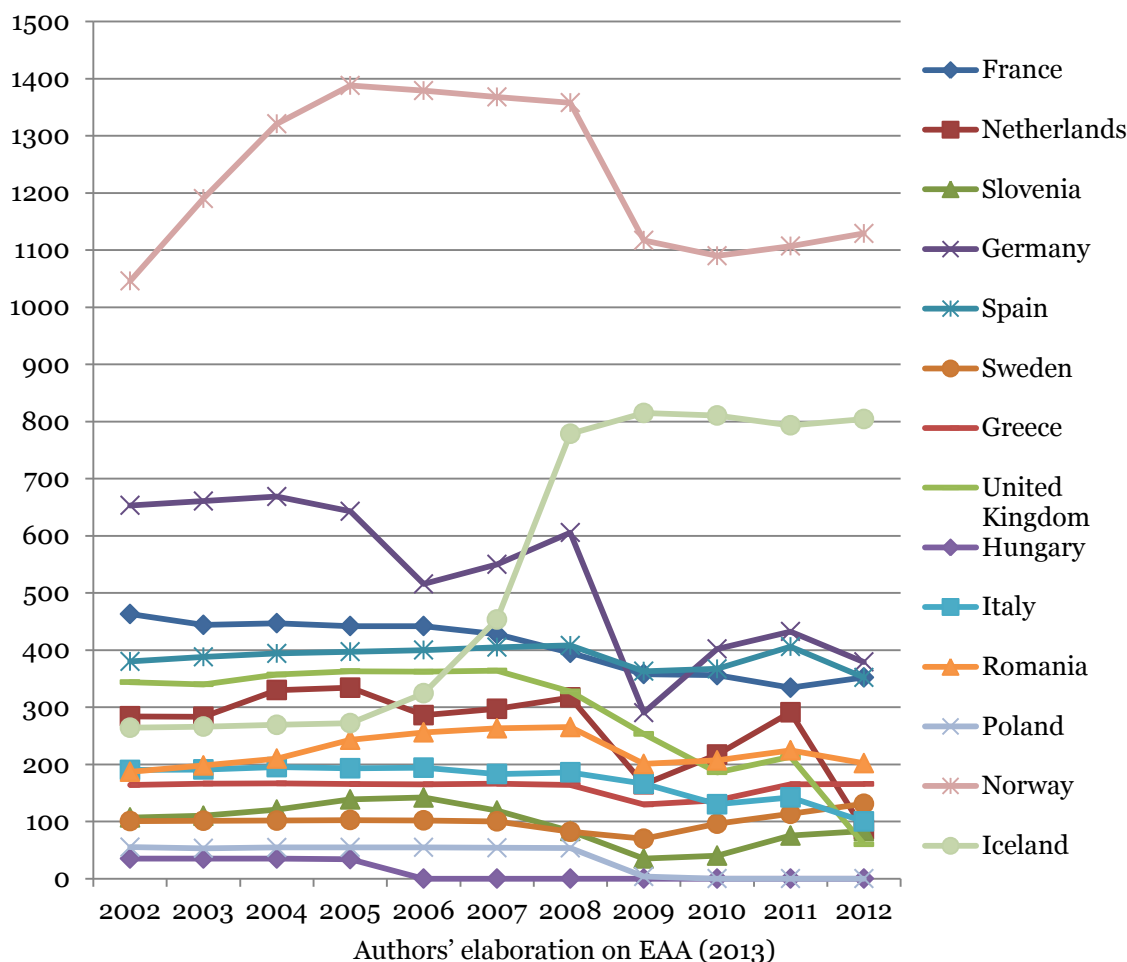
PL	Impexmetal	Konin	Closed	2010
NL	ZALCO	Vlissingen	Closed	2011
IT	Alcoa	Porto Vesme	Closed	2012
UK	Rio Tinto Alcan	Lynemouth	Closed	2012
SI	Unial	Talum	Open	
FR	Rio Tinto Alcan	Dunkirk	Open	
FR	Rio Tinto Alcan	St.Jean	Open	
DE	Hamburg	Aluminium Werk Hamburg	Open	
DE	NorskHydro	Neuss	Open	
DE	Trimet	AG Essen	Open	
DE	Klesch&Company	Limited Voerde	Open	
GR	AluminiumdeGrece	S.A. Distomon	Open	
NL	Klesch&Company Ltd.	Delfzijl	Open	
RO	ALRO	Slatina	Open	
SK	Slovalco	Ziar nad Hronom	Open	
ES	Alcoa	San Ciprian	Open	
ES	Alcoa	Aviles	Open	
ES	Alcoa	La Coruna	Open	
SE	Kubikenborg Aluminium	Sundsvall	Open	
UK	Rio Tinto Alcan	Lochaber	Open	

Figure 50 Share of Primary Aluminium production in EU by member state, 2012



Authors' elaboration on EAA (2013)

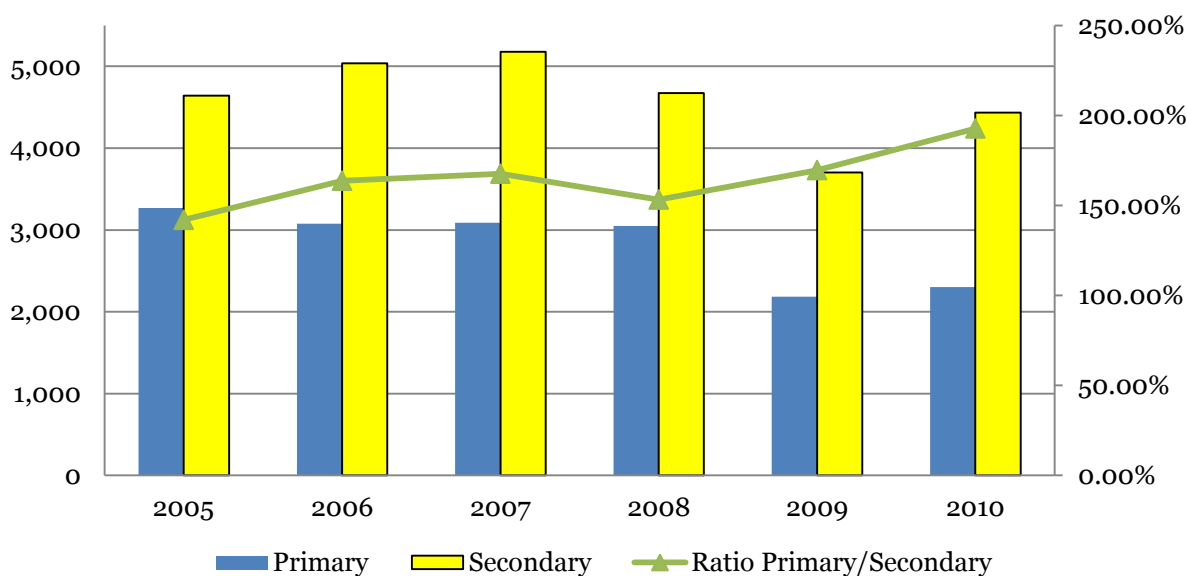
Figure 51 Primary Aluminium production in selected EU member states and non EU countries, 1998-2012 ('000 tonnes)⁸²



As for the production of secondary aluminium at EU aggregate level, Figure 52 highlights interesting structural differences of the EU industry when compared to the world industry (see Figure 38). In particular, the EU is at the forefront of world aluminium recycling. Since 2005, the majority of the aluminium produced in the EU comes from scrap. These figures are well above the world average, where secondary production is about 40% of the primary production. Secondary aluminium production in 2007 overcame 5 million tons before being hit, as was the case of primary production, by the global financial crisis. However, the post-crisis recovery of secondary production has been faster compared to primary production. In 2010, production regained 85% of its pre-crisis level, against 74% of primary production. Moreover, after the crisis, the relative weight of secondary over primary production has been constantly increasing, reaching 192% in 2010, an even higher level than in the pre-crisis period (167%). This shows how secondary aluminium production, due to its cost-efficiency properties (in particular, lower electricity costs in comparison to primary production), can have a partial anti-cyclical behaviour.

⁸² Italy completely stopped its primary production in December 2012.

Figure 52 Secondary aluminium vs. primary production in EU, 2007-2011 (ktonnes)



Authors' elaboration on EAA (2012)

Turnover, value added and gross operating surplus

This Section provides a brief overview of the main features of the enterprises operating in the aluminium industry across the EU27, with details for the different members states insofar as they are available.

The turnover, value-added, and gross operating surplus of the EU aluminium industry grew considerably between 2002 and 2007. The aggregate turnover increased quickly until 2007 (+46%), before suffering a recession with a revenues drop of 40% over two years (2008-2009), due to the financial crisis. A similar pattern is observable for the value added (-43% over the period 2008-2009) and the gross operating surplus (-88% over the same period).

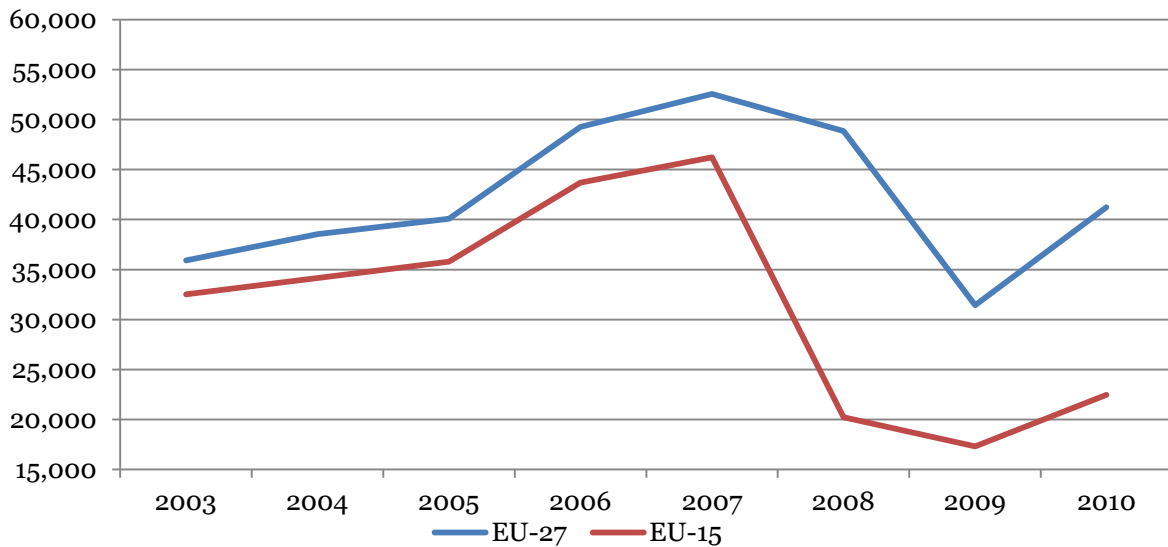
While still below pre-crisis levels, turnover, value-added and gross operating surplus started showing some signs of recovery. In particular, turnover in 2010 increased by 24% over 2009. Recovery for the value-added has been even stronger (+42%), and this was also the case of the gross operating surplus (+82%). It is interesting to note how new member states positively contributed to the aggregate EU-27 situation.

Figure 53 shows how the situation changes quite dramatically if we consider only the EU-15 countries. The turnover reduction over 2008-2009 has been much higher among those countries (-62%), and the 2009 recovery lower, at +29%.

Finally, Figure 55 below shows the relative significance of the turnover of the aluminium sector over total GDP. On average, turnover of the aluminium industry represented 0.34% of EU27 GDP in 2010. In seven member states (Hungary, Austria, Slovakia, Luxembourg, Greece, Bulgaria, and Romania) the share is higher than 0.5%. As for the largest producing

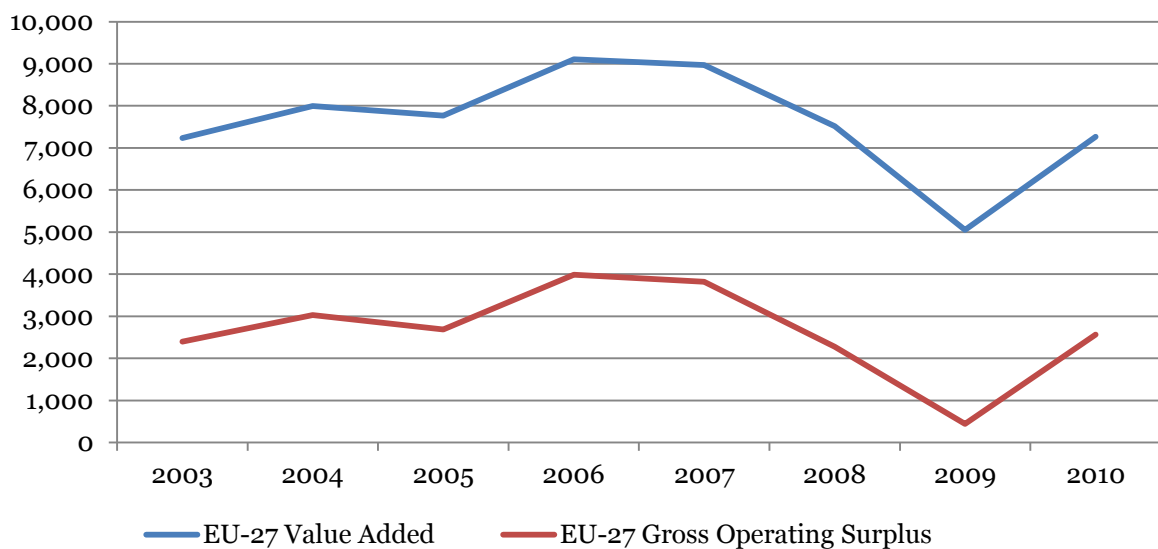
countries, in Germany aluminium turnover represents 0.49% of GDP, while in France it is 0.29%.

Figure 53 Turnover of EU Aluminium Sector (mln €) NACErev.2 24.42



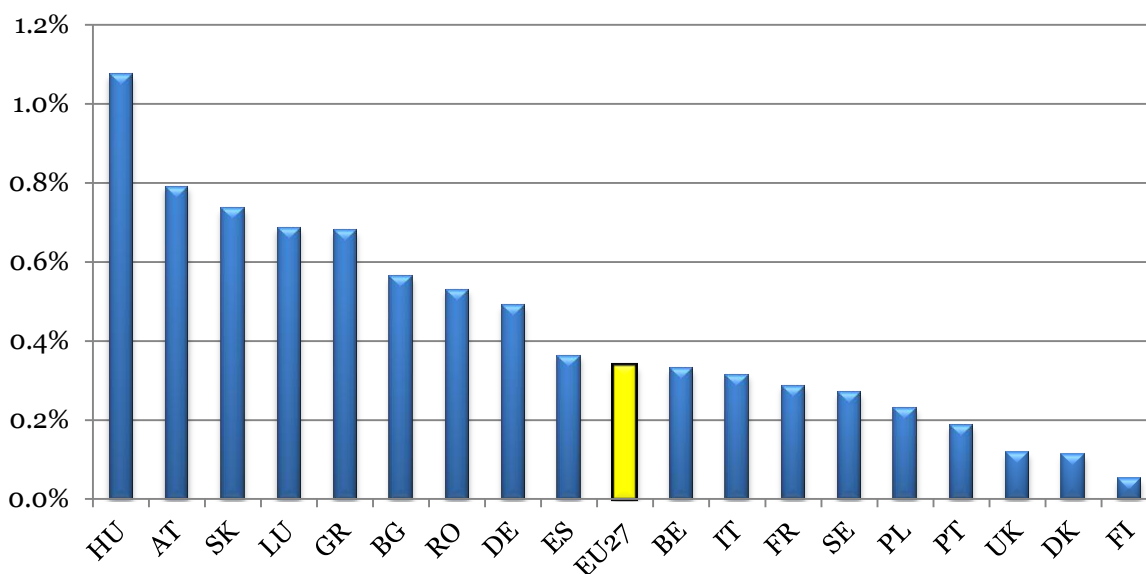
Source: Authors' elaboration on EUROSTAT

Figure 54 Value Added and Gross Operating Surplus EU Aluminium Sector (mln €) NACErev.2 24.42



Source: Authors' elaboration on EUROSTAT

Figure 55 Turnover of the aluminium sector over GDP, 2010

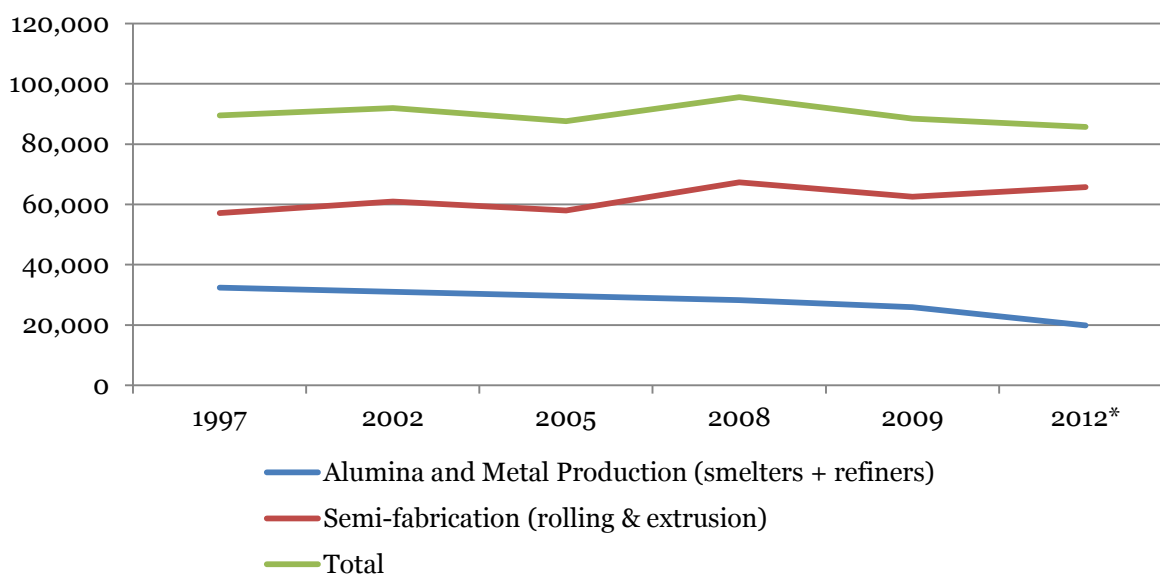


Note: missing data for the remaining member states; for GR, FI, and LU, aluminium turnover refers to 2009.
Source: Authors' elaboration on Eurostat

Employment and Labour costs

Eurostat data on the employment in the aluminium industry are not complete for several member states, and not homogeneous in terms of coverage of the segments of the value chain. Hence, EAA data were resorted to. However, these data cover both the EU27 and EFTA countries, and detailed figures for member states are not available; furthermore, downstream players such as casters, manufacturers of foils, wires, and other finished products are not included. According to EAA estimates, if all these segments are also taken into account, the total number of employees in the EU27 and EFTA countries would amount to about 255,000. In 2012, about 20 thousand persons were employed in primary and secondary aluminium production (including alumina production), and 65 thousands in rolling and extrusion plants, for a total of 85,635 employees. Compared to 2002, the aluminium industry has lost about 6,000 employees, or 7% of the total workforce. However, trends in these two segments of the value chain are very different: the workforce in primary and secondary producers shrank by 11,000 units, or 36% of the total, while in downstream rollers and extruders the workforce increase by about 5,000 employees, or 8% of the total. Trends from 1997 to 2012 are summarised in Figure 56 below.

Figure 56 Number of Employees in the Aluminium industry (EU27 and EFTA), 1997-2012



*: estimated value. Source: EAA.

4.4.3 Demand

We conclude this overview of the EU aluminium market by taking a closer look at the demand for aluminium products. As explained above, primary aluminium is generally processed for the production of semi-finished/finished products with three main different techniques: rolling, extrusion, and casting. Each of these semi-finished/finished products has different characteristics that make it particularly suited for certain end uses. For instance, rolled products are used for foil-stock, while extruded ones are suitable for construction and transport.

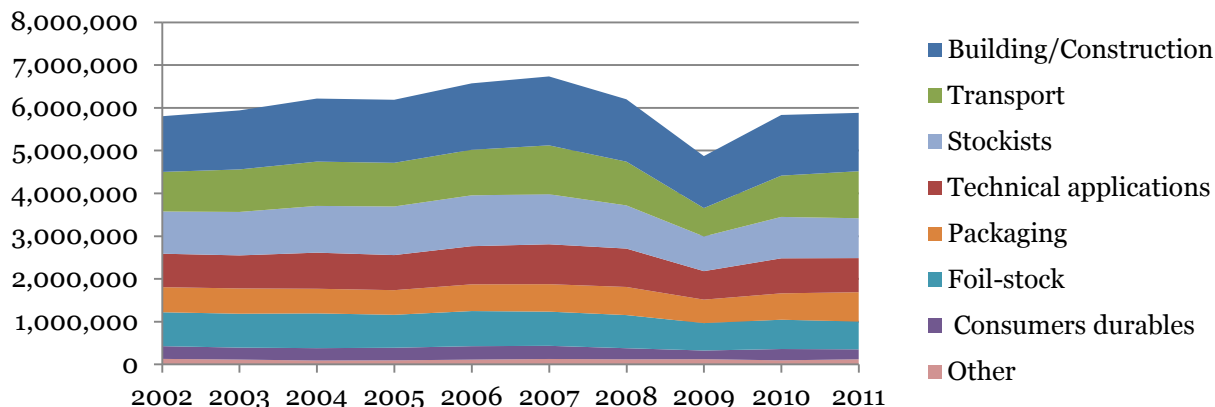
Demand for extruded and flat rolled aluminium products

Figure 57 below shows the shipments/deliveries of extruded and flat rolled aluminium products for a group of European countries. To build a proxy of the European aluminium demand, data on shipments⁸³ to EU countries of extruded and flat rolled aluminium products by sector of final use can be analysed.

In the last ten years European demand for extruded and flat rolled aluminium experienced an expansionary phase (2002-2007), a sharp recession during the crisis (2007-2009), and a recovery phase between 2009 and 2011.

⁸³ Data accounts for total aluminium products shipped to Europe, whose origin can be both EU and extra-EU.

Figure 57 Shipments/deliveries of extruded and flat rolled aluminium products in Europe⁸⁴ by sector of final use (tonnes)



Source: EAA (2012)

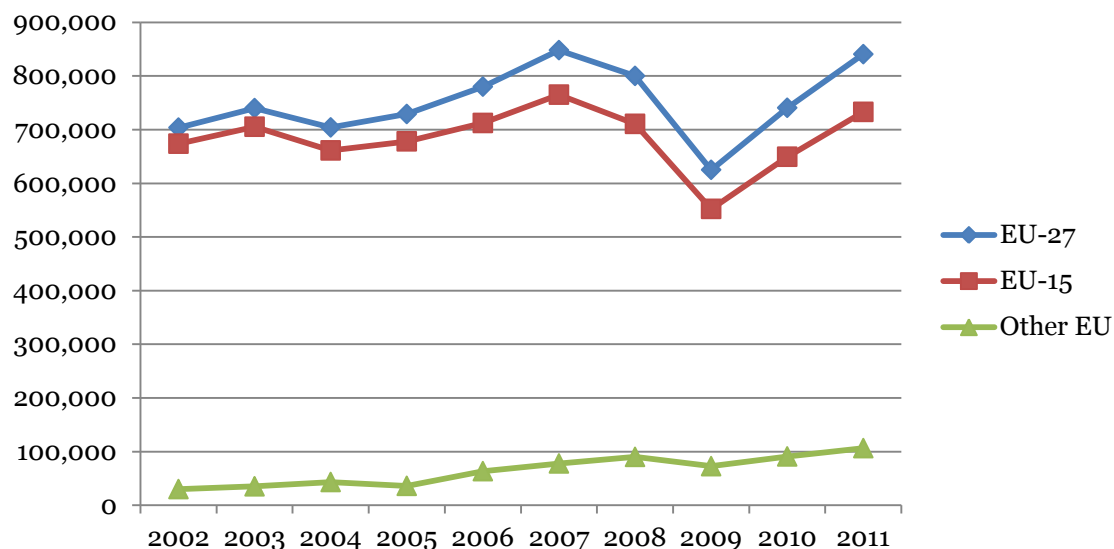
European demand between 2002 and 2011 was driven by construction and transport. Those two sectors experienced the highest reduction during the crisis and the strongest recovery afterwards. However both sectors experienced a new slow-down in 2011. Demand from the other major sectors (foil-stock, stockists and packaging), besides minor reductions during the crisis, has mostly remained constant.

Demand for aluminium end-products

As mentioned, in 2012 the main applications of aluminium in the EU27 concerned transport (36%), construction (26%), packaging (17%), engineering (14%), and other uses (7%). Automotive and construction sectors have constantly been the two largest aluminium end users (see Figure 30), driving demand. Available data clearly show how turnover fluctuations in these industries directly affect the demand for aluminium. As shown in Figure 58, trends in the EU motor vehicle industry follow a similar trend as those of primary aluminium production (see Figure 49). Specifically, a strong growth between 2005 and 2007 (+18%) preceded a remarkable decline by 25% over the period 2007-2009. As for aluminium revenues, a new increase was registered in 2010 (+18% on yearly basis). However as of 2010, revenues in the automotive sector managed to climb back at the 87% of their pre-crisis level while primary aluminium's revenues only regained 78% of their 2007 value. Comparable fluctuations affected the construction sector (Figure 59), where a similar downturn was experienced one year later and no sign of recovery could be visible in 2010, as production is "build to order".

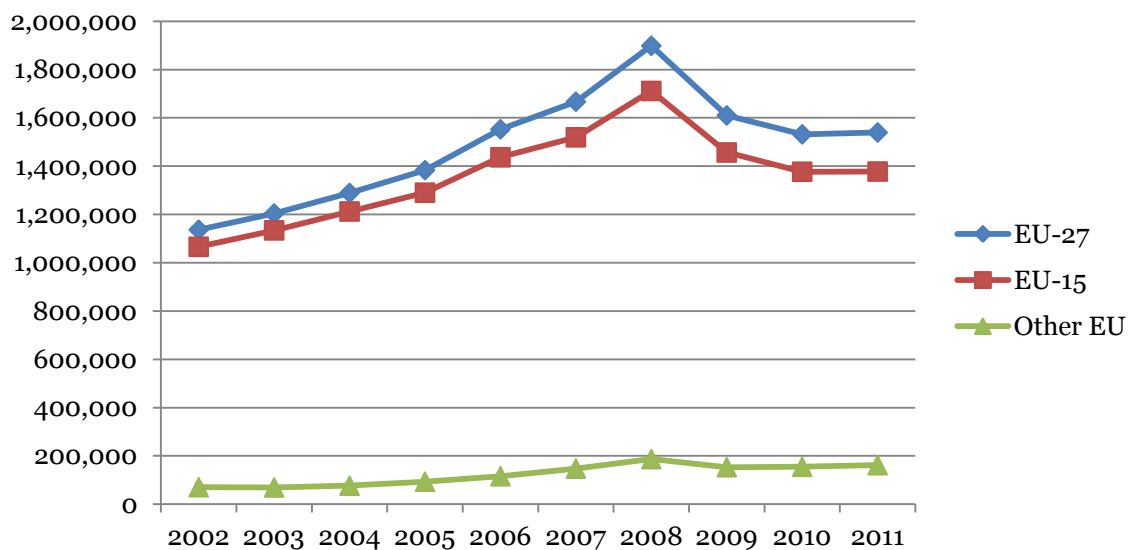
⁸⁴ Data refer to Austria, Belgium, Denmark, France, Finland, Germany, Iceland, Ireland, Italy, Luxemburg, Netherland, Norway, Portugal, Spain, Sweden, Switzerland, and the UK.

Figure 58 Total turnover in the EU motor vehicle industry – enterprises included in NACErev.2 Division 29 (mln €)⁸⁵



Source: Authors' elaboration on EUROSTAT.

Figure 59 Total turnover in the EU construction sector – enterprises included in NACErev.2 Section F (mln €)⁸⁶



Source: Authors' elaboration on EUROSTAT.

⁸⁵ Missing data points: BE (2002); CZ (2005); EE (2011); IE (2011); GR (2002, 2008, 2010 and 2011); LU (whole period); MT (2006, and 2008-2011); PT (2006, 2007).

⁸⁶ The aggregate is the sum of national country data. Missing data points: BE (2002); IE (2011); GR (2002, 2008 and 2010); MT (2006, 2008-2010).

PART III

**LEGAL ANALYSIS AND
COST ASSESSMENT**

5 *General Policies*

Regularly, the European Commission releases non-binding communications which pave the way for future policies. In the context of a cumulative costs assessment, these communications cannot be treated in the same manner as many of the other acts discussed in the coming chapters. As non binding acts, they do not represent a direct or indirect cost for businesses. Yet, as they are released at the highest possible level of EU policymaking, they are good indicators of the political climate and of the direction which the EU intends to pursue in the following years, even decades. Given the particular nature of policymaking in Brussels, general policies represent a sort of consensus view within the Commission and among EU institutions. As such, although non-binding, they cannot be underestimated by businesses. Hence, it can be argued that they have a role in setting the business climate, even though they do not have an immediate impact on business operations. In a nutshell, they represent a policy risk, or a policy opportunity.

Currently, the most important general policy setting the “direction of travel” of EU action across all policy areas in the current decade is the so-called EU2020 strategy.⁸⁷ The EU2020 strategy aims at ensuring that Europe achieves a smart, sustainable, and inclusive growth. It acknowledges that ensuring that Europe keeps and improves its industrial base and that its competitiveness is sustained through higher productivity is a pre-condition to achieve any growth. A competitive industry requires, and the Commission is committed to it, securing a better market access for EU businesses and a level playing field vis-à-vis our external competitors. The EU2020 strategy is articulated through seven flagship initiatives, three of which have a specific relevance for the aluminium sector, as well as any other manufacturing industries:

1. An Industrial Policy for the Globalisation Era;
2. Resource Efficient Europe;
3. Innovation Policy.

The Communication on industrial policy⁸⁸ acknowledges that the manufacturing industry is a key driver of the European economy and employment levels, and that a “strong, competitive and diversified industrial manufacturing value chain” is of “central importance”. The Commission undertakes to have a “fresh approach” to Industrial Policy. The Commission commits itself to craft direct actions that have a beneficial impact on costs, prices and innovation of industry in general and individual sectors in particular; and to take into account the competitiveness effects of all other policy initiatives, including

⁸⁷ Communication from the Commission, Europe 2020. A strategy for smart sustainable and inclusive growth, COM(2010)2020, 3.3.2010.

⁸⁸ Communication from the Commission, An Integrated Industrial Policy for the Globalisation Era. Putting Competitiveness and Sustainability at Centre Stage, COM(2010)614, 28.10.2010.

transport, energy, environmental, social policies, consumer protection, single market and trade policies. Not the whole Communication on industrial policy is relevant for the aluminium industry, but several key points are touched upon: i) the completion of a single market for network industries, especially energy and railways; ii) a better access to financing and support for demonstration R&D projects; iii) standardisation; iv) the fight against trade restrictions, including distortions in raw material markets; and v) ensuring predictability and legal certainty of the energy and climate change EU strategies. Moreover, the Communication explicitly addresses the concerns of energy-intensive industries and stresses the need to balance the transition to a low-carbon and resource-efficient economy with the provision of the conditions for a competitive manufacturing in the EU.

Last but not least, the Communication recalls the importance of following a “smart regulation” approach at all levels of regulatory intervention in order to improve framework conditions for industry and ensure that the combined impact on competitiveness of existing and future initiatives is better understood. To this end, the Communication refers to the coordinated use of *ex ante* and *ex post* analytical tools, ranging from a transparent and open impact assessment process, to the use of competitiveness-proofing, the analysis of administrative burdens generated by future proposals, and the *ex post* evaluation of existing policies.⁸⁹ The latter should not only concern individual pieces of legislation, but also include a more comprehensive analysis of selected policy areas, via the so-called “fitness checks”.⁹⁰ While smart regulation tools and regulatory fitness checks do not generate direct costs for businesses (except those incurred to contribute i.a., to the decision-making process via public consultation submissions, data provision, and so on), they offer an additional opportunity to shed light on the direct costs and benefits of EU policies.

The 2010 industrial policy Communication was followed by an update in 2012,⁹¹ where it is restated that “a strong industrial base is essential for a wealthy and economically successful Europe”, so much that the Commission aims at “reindustrialising” Europe, raising the share of industry added value over GDP from 16% to 20%, and gross fixed investments as a share of GDP from 18.6% to 23%. More attention is paid to the issue of energy and raw material prices, which are higher than in most other industrialised countries. The Commission better defines what it intends for “industrial policy”, stating that it shall not substitute market mechanisms, as competition is deemed the only way to ensure an efficient allocation of resources and a dynamic economy, and that public

⁸⁹ For further details, see the ad hoc guidance on evaluating competitiveness in Impact Assessments: Commission Staff Working Document, Operational Guidance for Assessing Impacts on Sectoral Competitiveness within the Commission Impact Assessment System. A “Competitiveness Proofing” Toolkit for use in Impact Assessments, SEC(2012)91, 27.1.2012.

⁹⁰ The approach and content of “fitness checks” was further clarified in the recent Communication on Regulatory Fitness, COM(2012)746, 12.12.2012.

⁹¹ Communication from the Commission, A Stronger European Industry for Growth and Economic Recovery. Industrial Policy Communication Update, COM(2012)582, 10.10.2012.

intervention should be aimed at creating the right business environment and at remedying to market failures. It also commits to undertake a “fitness check” of the aluminium sector to assess the interaction and implementation of EU policies that are most relevant for competitiveness.⁹² This exercise should serve as a pilot for future assessments in other industrial sectors. Among the six priorities set forward by the Communication, the aluminium industry is positioned to benefit in particular from the intention to set up markets for advanced clean technologies, including financing for demonstration of Carbon Capture and Storage (CCS) projects; and from the attention paid to recycling, sustainable solutions in transport and buildings, and raw materials. The EIB, which has been endowed with an additional capital of €10bln by the Member States, is expected to step up its line of financing to resource efficiency investments, with up to €15-20bln of additional funding.

Moving to the Resource Efficient flagship initiative, and as is the case of other energy-intensive industries, the aluminium industry is affected by resource efficiency policy in at least three areas: i) efficiency in the use of raw materials; ii) energy efficiency; and iii) carbon efficiency. In all three respects, the challenge is to decouple output from use of natural resources: in other words, to produce the same quantity of aluminium by using fewer raw materials, less energy and by emitting less CO₂.

Energy and carbon efficiency are usually tangled concepts for many industries: the lower the energy consumed – usually burnt – the lower the carbon intensity. In the case of aluminium, the greater energy and environmental concerns are linked to primary production with its high electricity intensity.⁹³ Reportedly, energy efficiency gains up to 10% can be obtained through better process control; however a significant reduction could only derive from technological breakthrough (e.g., by using inert cathodes/anodes).⁹⁴

Secondary aluminium production is much less electricity intensive and has also a more limited impact in terms of GHG emissions. This is indeed one of the drivers behind the remarkable development of the recycling industry in the EU, as explained in Chapter 4 above.

The EU has a very ambitious strategy to move to a competitive low carbon economy in 2050.⁹⁵ It aims at cutting GHG emissions by 80% in 2050 compared to 1990 levels.

⁹² A second fitness check on petroleum refining is also foreseen in the Communication.

⁹³ (Primary) aluminium remains the largest electric energy consumer among manufactured products. For further details, see US Energy Department (2007), US Energy Requirements for Aluminium Production. Historical Perspective, Theoretical Limits and Current Practices.

⁹⁴ On this point, see among others, JRC (2013, draft), “BAT Reference Document for the Non-Ferrous Metal Industries”; US Energy Department (2007); Tangen et al. (2011), Energy efficiency in industry. A main path for value creation and sustainable energy use. The Joint Research Centre of the European Commission is about to launch a study on the current status of technology and future prospects of the European aluminium industry to explore the potential for efficiency improvement and GHG emission reduction. The study is expected to cover the EU and Iceland. Further details at <http://web.jrc.ec.europa.eu/callsfortender/index.cfm?action=app.tender&id=2074&instdir=3415>.

⁹⁵ Communication from the Commission, A Roadmap for moving to a competitive low carbon economy in 2050, 8.3.2012, COM(2011)112.

Current policies are estimated to lead to a 40% reduction, and additional efforts would be needed to meet the 80% level. As for sector-specific burden sharing, the industry is expected to cut emissions between 34 and 40% by 2030, and 83 to 87% by 2050.

In terms of GHG emissions, besides CO₂, primary aluminium production generates two perfluorocarbons (PFCs), CF₄ and C₂F₆. These emissions are generated by anode consumption during the electrolysis, currently the only technology available for primary aluminium production.⁹⁶ Given the high electricity intensity of primary production, CO₂ impacts are also closely related to the primary fuel used for electricity generation at a given plant. Direct CO₂ emissions have been reduced significantly in the last two decades⁹⁷, and research indicates that direct emissions from carbon anode consumption can be entirely eliminated. It seems however, that the relevant technology will be commercially available only around 2030.⁹⁸

Such a bold target will require more efficient processes and equipments, increased recycling and abatement technologies. However, such targets would not be achievable through the usual retrofitting, but would rather require the development of entirely new solutions. Indeed, current technologies can lead the industrial sector only to cut emissions by about half, according to Commission forecasts. On top of this reduction, only CCS will be able to ensure such a level of decarbonisation. CCS cuts CO₂ emissions rather than increasing efficiency. It would thus bring to aluminium producers no benefits in terms of increased productivity; however, it would allow them to save the cost of ETS allowances, following the recent introduction of the aluminium sector in the ETS. However, CCS is not yet a technology ready for market deployment, as it still has to undergo the demonstration phase, and doubts remain on its feasibility.⁹⁹

The Energy Roadmap 2050¹⁰⁰ explores a similar path towards the decarbonisation of the energy system. This is especially relevant for the case of aluminium, and in particular primary aluminium as explained above. Decarbonisation of the energy system will require substantial investments, both in new capacity and grid equipments (estimated at €1.5-2.2 bln over four decades).¹⁰¹ This will result in higher energy prices until 2030. According to the Commission, the adverse effect of price spikes on EU competitiveness is to be addressed through international policy coordination and the availability of sufficient

⁹⁶ For further details, see JRC (2007), Prospective Study of the World Aluminium Industry, available at <ftp://ftp.jrc.es/pub/EURdoc/JRC40221.pdf>.

⁹⁷ The EAA report a reduction of 50% since 1990. For further details, see EAA (2012), An aluminium 2050 roadmap to a low-carbon Europe: lightening the load.

⁹⁸ EAA (2012).

⁹⁹ A pilot project for CCS directly related to (primary) aluminium production was foreseen for the Lynemouth smelter in the UK. The smelter was connected to a coal power station to meet its energy needs. The project was cancelled due to lack of funding. In addition, the smelter ceased operating in 2012.

¹⁰⁰ Communication from the Commission, Energy Roadmap 2050, COM(2011)885.

¹⁰¹ For further details, see also 'Energy challenges and policy', Commission contribution to the European Council of 22 May 2013.

safeguards for energy intensive industries at risk of carbon leakage. Furthermore, as some investments in energy have a public good character, the Commission considers that some support, e.g. via the EIB or the EBRD, can be warranted to early movers, including industrial players.

Given how natural resources are distributed across the world, non-energy resource efficiency¹⁰² is crucial for Europe, as it is the world area with the highest net imports of resources per capita. The Commission released in 2011 its roadmap,¹⁰³ where an overall strategy for raw materials is deployed to overcome what have been considered the four most important barriers in this area: i) market prices, taxes and subsidies which do not reflect real costs of resource use; ii) innovation in resource use by businesses; iii) R&D in resource efficiency; and iv) international competitiveness concerns.

In the field of raw materials, the EU had launched an initiative already in 2008,¹⁰⁴ then updated in 2011.¹⁰⁵ According to the Commission, the two most important challenges in this area are: marked price volatility – or better, sharp price increases – and export dependency. Prior to 2008, price volatility and the price increases experienced at the global level were mainly due to the surge in demand originating from emerging countries, and to the growing impact of finance in commodity markets. Although the growth of global demand was put to a halt by the global crisis, demand, and thus prices, has started increasing again. They are expected to further grow in the near future, given the steadfast need for raw materials in emerging countries, especially in China. On top of these two drivers, trade barriers such as restrictions on the exports of raw materials exacerbate these effects, limiting supply at a time when demand is on the rise.

Existing and future challenges in the field of raw materials are now being addressed through the Raw Material Initiative, which is based on three pillars:

1. Ensuring access to third countries mineral resources on an even and fair playing field, especially in Africa, through a better coordination of Commission and EIB development policies. European and developing countries needs are, to a certain extent, complementary: Europe needs access to a sustainable supply of raw materials,

¹⁰² Land and soil are included among non-energy resources. The Commission launched a soil strategy in 2006, which is of relevance for the aluminium industry as it includes the duty to clean and restore industrial sites. The Commission also proposed a Framework Directive on soil protection to harmonise national standards, and introduce them where non-existing. However, the directive was never approved by the Council of the EU and is still pending. Cf. Communication from the Commission, Thematic Strategy for Soil Protection, COM(2006)231, 22.9.2006; and Proposal for a Directive of the European Parliament and of the Council establishing a framework for the protection of soil and amending Directive 2004/35/EC, COM(2006)232, 22.9.2006.

¹⁰³ Communication from the Commission, Roadmap to a Resource Efficient Europe, COM(2011)571, 20.9.2011.

¹⁰⁴ Communication from the Commission, The raw materials initiative – meeting our critical needs for growth and jobs in Europe, COM(2008)699, 4.11.2008.

¹⁰⁵ Communication from the Commission, Tackling the Challenges in Commodity Markets and on Raw Materials, COM(2011)25, 2.2.2011

and, in exchange, it can provide developing countries with the physical and human capital needed to develop their mining industries, including the infrastructure to bring resources to the world markets;

2. Ensuring that raw materials markets are not distorted through trade policy. Trade distortions are being prevented through the inclusion of a ban on export restrictions of raw materials in bilateral and multilateral negotiations, and through WTO dispute settlements;
3. Fostering and coordinating Member States to improve access to European resources, and thus widening the internal supply of raw materials. This includes R&D financing for the exploration and mining industry. On other aspects, the Commission tries to act as a facilitator, given that member states mostly retain their competence over this policy area. In particular, the EU pushes member states to define a National Mineral Policy for the sustainable exploitation of natural resources; and to put in place effective and efficient land use planning policies and authorisation processes for the mining industries, which minimise red tape;
4. Developing efficiency in resource use, including boosting recycling of raw materials. For a continent which is not blessed with abundant raw materials or has already exploited its reserves, recycling is of the utmost importance. Secondary raw materials sources, including ‘urban mining’ (i.e., the extraction of materials from urban waste), are still largely untapped in many member states. The exploitation of secondary raw materials requires a concerted action at national and European level, improving reusability and recyclability of products; supporting research projects and pilot actions; fostering the competitiveness of the EU recycling industry and the feasibility of eco-designed products.

Access to raw materials at a reasonable cost and efficiency in the use of resources is an imperative for aluminium producers and their global competitiveness. After all, alumina is a key component among non-energy costs in primary production.¹⁰⁶ At the same time, recycling policies are very important for secondary aluminium production, as non-energy raw materials, mainly scrap, represent even a much higher share (more than 60%) of total costs. Scrap is a scarce resource, given the relatively long life of aluminium products.¹⁰⁷ The International Bureau of Recycling estimates that 75% of the 700,000 million tonnes of aluminium produced globally since the 1880s are still in use. This implies that today we

¹⁰⁶ As explained above, aluminium does not exist in a pure form in nature and is obtained from bauxite mining, followed by the production of alumina. Reserves of bauxite in the EU are rather limited and concentrated in a few Member States (e.g. Greece, Hungary). They cannot meet the raw material demand driven by primary aluminium production in the EU. For further details, see also Ecorys (2011), *Competitiveness of the EU Non-ferrous Metals Industries*.

¹⁰⁷ For the latest trends in scrap flows and the security of supply, see Dhamen et al. (2013), *Global scrap flows and the contribution of the metal trade to securing the supply to the aluminium industry*, *International Aluminium Journal* 89(5), pp.20-25. The data provided in the article are taken from an unpublished study by CRU for the Bureau of International Recycling (BIR). See also Ecorys (2011),

are recycling, on average, aluminium produced several decades ago (with the exception of used beverage cans, which can be back on the shelf after 60 days), when the levels of production were much lower than today. Not much more can be recovered through increasing recycling, as recycling rates for aluminium in the EU are already between 63% for beverage cans and 90% in construction, automotive and transportation. Scarcity of scrap is exacerbated by the exports of scrap materials towards low-cost countries, where scrap is treated at a much lower cost due to, among other reasons, lower requirements in terms of corporate social responsibility and environmental regulation.¹⁰⁸

The Raw Materials Initiative¹⁰⁹ links policies on resource efficiency with the EU 2020 innovation policy via the European Innovation Partnership (EIP).¹¹⁰ An EIP, introduced by the Innovation Union Flagship Initiative, is a partnership launched “in cases where the combined strength of public and private efforts at regional, national and EU level in innovation and R&D and demand-side measures are needed to achieve societal targets quicker and more efficiently.” The Commission considered in 2012 that a secure and sustainable supply of raw materials represents a challenge worth of being tackled through an EIP. The EIP on raw materials aims at contributing to the mid- and long-term security of sustainable supply of non-energy non-agricultural raw materials (including metallic ores). This will be achieved through a reduction of imports dependency which, in line with the raw materials initiative, requires increased levels of EU production, increased recycling, and increased resource efficiency.

The EU innovation policies are of course not only relevant in terms of resource efficiency. As already discussed, a lot of attention is devoted to R&D in the context of energy and carbon efficiency. Finally, it is worth mentioning that the new Horizon 2020 programme,¹¹¹ still under legislative procedure, includes a public-private partnership, SPIRE,¹¹² devoted to energy intensive industries and including non-ferrous metals, where the aluminium industry could benefit in terms of financing carbon abatement projects.

As stated in the beginning of this Chapter, the general EU policies described above may have a significant impact on the aluminium industry. They represent policy opportunities and risks. The risk evoked by the industry is that a lack of clarity and predictability on how to implement general policies towards a resource efficient Europe, especially as far as energy and carbon efficiency is concerned, discourages any additional investment by aluminium producers in the EU. To avoid misunderstanding, this statement does not refer

¹⁰⁸ On this point, see also Ecorys (2011).

¹⁰⁹ Communication from the Commission, Making Raw Materials Available for Europe's Future Well-Being Proposal for a European Innovation Partnership on Raw Materials, COM(2012)82, 29.2.2012

¹¹⁰ Communication from the Commission, Europe 2020 Flagship Initiative Innovation Union, COM(2010)546, 6.10.2010

¹¹¹ Communication from the Commission, Horizon 2020 - The Framework Programme for Research and Innovation, COM(2011)808, 30.11.2011. For the full legislative package, cf. http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=h2020-documents.

¹¹² For further details, <http://www.spire2030.eu/>.

so much to investments in additional capacity (the last primary aluminium smelters were built in the early 90s), but rather to investments in retrofitting and upgrading existing facilities. For instance, primary aluminium plants normally undergo two types of investments: ordinary maintenance, which is done on a yearly basis and allows for some efficiency improvements and cost reductions; and upgrade investments to significantly improve efficiency, productivity, the quality, and thus the added value, of end products. This second type of investments has earnings over 10-20 years. Reportedly, without upgrading, current installations will lose their competitiveness and die at the end of their investment lifecycle. As noted by Ecorys (2011), in some cases plants that are running below capacity are not the less efficient ones but simply those that do not have a favourable electricity contract at the moment. Overall and as far as general policies are concerned, we could summarize the main points raised by our industry interviewees as the availability of electricity at competitive prices and the indirect effect of the ETS on electricity prices. These, and particularly the cost of electricity, are seen by industry as the main drivers behind the closure of existing primary aluminium plants in the period covered by the Study.¹¹³

Albeit reasonable, it is difficult to assess empirically the validity of these claims. One of the industry associations we interviewed claims that primary production would eventually disappear from the EU toward low-cost energy regions, regardless of EU general policies. On the other hand, some of the companies interviewed for the Study explained that there is a clear competitive advantage in ensuring the geographical proximity of different parts of the value chain, from primary production to downstream segments and end-customers. Such proximity is also an asset in terms of Research & Development.

In any event, investment decisions are always confronted with specific policy risks or opportunities. The Middle East may have cheap and abundant energy, but the region presents a higher risk of turmoil. India may be a booming and expanding market, but suffers from infrastructure deficit. The US have shale gas, but building aluminium plants there to re-import semi manufactured products into the EU will be subject to the currency risk. What can be fairly and clearly said is that if the EU intends to impose ambitious targets on its manufacturing base, it should at the same provide the tools to achieve them, and that this target should also be put in the current and foreseeable technological context. In a recent study focusing on ferrous metals, the JRC (2012) clearly pointed out that only a combination of technological-push and demand-pull factors, and among them both taxes, prices and caps as well as public subsidies and investments, procurement strategies, standards and certification policies, can meet the targets defined in the EU general policies. This is at any rate applicable also to the case of aluminium.

¹¹³ On these points, see also Sartor O. (2012), Carbon Leakage in the Primary Aluminium Sector: What evidence after 6 ½ years of the EU ETS?, *CDC Climate Research Working Papers*, available at: http://hal.archives-ouvertes.fr/docs/00/77/64/51/PDF/What_Evidence_of_Carbon_Leakage_from_the_Aluminium_Sector_after_6.5_years_of_the_EU_ETS.pdf.

6 Commodity Markets

This Chapter presents a general overview of the legislation included in the terms of reference for this policy area. Besides the Markets in Financial Instruments Directive (hereinafter MiFID),¹¹⁴ we have decided to cover also the new proposed Markets in Financial Instruments Regulation (hereinafter MiFIR);¹¹⁵ the European Market Infrastructure Regulation (hereinafter EMIR);¹¹⁶ the Market Abuse Directive (MAD)¹¹⁷ and the new proposed Market Abuse Regulation (MAR),¹¹⁸ as all this legislation is part of the financial regulation which may have an impact on aluminium producers, both concerning trading of commodity derivatives and financial instruments.

To assess the impacts of legislation two interviews were carried out with the trading office of two primary producers.

6.1 Markets in Financial Instruments Directive and Regulation (MiFID and MiFIR)

Primary aluminium producers are *commodities firms* that enjoy a broad exemption from the application of MiFID and the MiFIR.¹¹⁹

Information collected via interviews suggests that aluminium companies trade commodity derivatives and other financial instruments on their own account (with no high-frequency algorithmic techniques) and do not provide intermediary services for other aluminium companies as main business (art. 2.1(i)). As a result, cumulative exemptions from the application of the Directive and Regulation specified in article 2.1(d), 2.1(i), and 2.1(o) MiFID apply to aluminium firms that deal on own account in commodity derivatives, emission allowances and other financial instruments, perform investment activities as

¹¹⁴ Directive 2004/39/EC of the European Parliament and of the Council on markets in financial instruments amending Council Directives 85/611/EEC and 93/6/EEC and Directive 2000/12/EC of the European Parliament and of the Council and repealing Council Directive 93/22/EEC, as amended by Directive 2006/31/EC, Directive 2007/44/EC, Directive 2008/10/EC, and Directive 2010/78/EU. MiFID is currently under review, cf. Proposal for a Directive of the European Parliament and of the Council on markets in financial instruments repealing Directive 2004/39/EC, COM(2011)656, 20.10.2011.

¹¹⁵ Proposal for a Regulation of the European Parliament and of the Council on markets in financial instruments and amending Regulation [EMIR] on OTC derivatives, central counterparties and trade repositories, COM(2011)652, 20.10.2011

¹¹⁶ Regulation (EU) No 648/2012 of the European Parliament and of the Council on OTC derivatives, central counterparties and trade repositories

¹¹⁷ Directive 2003/6/EC of the European Parliament and of the Council on insider dealing and market manipulation (market abuse) [MAD], as amended by Directive 2008/26/EC and Directive 2010/78/EU. MAD is currently under review, cf. Proposal for a Directive of the European Parliament and of the Council on criminal sanctions for insider dealing and market manipulation, COM(2011)654, 20.10.2011.

¹¹⁸ Proposal for a Regulation of the European Parliament and of the Council on insider dealing and market manipulation (market abuse), COM(2011)651, 20.10.2011.

¹¹⁹ The text considered for the new MiFID and MiFIR is the Council compromise of April 15th.

ancillary to the main business (in commodities), or trade on behalf of electricity and natural gas undertakings.¹²⁰ An additional exemption (under article 2.1(p)) applies to those firms providing investment services on emission allowances for the purpose of hedging a commercial risk. Finally, intra-group transactions are exempted under art. 2.4(a). However, the inclusion of emission allowances among the list of financial instruments (as per Annex I Section C) may create space for interpretation about the application of the exemption in art. 2.1(i) as ‘ancillary activity’ for customers or suppliers of the main business. This is the case for some of the aluminium companies that regularly trade the certificates on behalf of third companies. The exemption will be applicable as long as these ‘third companies’ are customers or suppliers of the main business.

Two articles give rise to direct costs for the aluminium producers:

- Art.59 MiFID, on position limits and position management controls in commodity derivatives. MiFID requires trading venues to monitor commodity derivatives positions. Commodities firms may be required to: i) provide additional information; ii) to reduce the size of their exposure; or even iii) to terminate it (on a temporary or permanent basis), to prevent market abuse or support orderly pricing and settlement conditions. Where the position is ascertained as “dominant”, the commodity firm may also be required to provide liquidity back to the market at agreed price and volume on a temporary basis. Besides the administrative costs to comply with these requirements, detailed disclosure of positions may cause investment costs by revealing the companies’ position to the market. By disclosing this information to regulators on a confidential basis, costs may be substantially lower, also depending on the harmonisation of reporting standards across the different legislations.
- Art.35 MiFIR, on the obligation to trade on Regulated Markets (RMs), Multilateral Trading Facilities (MTFs) or Organised Trading Facility (OTFs). MiFIR provides that transactions in derivatives, which are not intra-group transactions as defined by art. 3 of EMIR, pertaining to a class of derivatives that has been declared subject to the trading obligation as a subset of derivatives that are subject to mandatory clearing obligation (under art. 5.2 and 5.4 EMIR), should be traded on RMs, MTFs or OTFs or third country's trading venues (in equivalent jurisdictions). This could increase financial and operating costs for commodities firms that need perhaps to unwind big OTC transactions and split them in smaller transactions to be executed on an open and transparent platform. It may also cause investment costs, as liquidity in open markets may not be always favourable, especially when the position is sufficiently high to cause market impact.

Nevertheless, there is room for indirect costs to arise from some of the new provisions included in the legislative text. Immediate indirect costs will potentially come from the

¹²⁰ As defined under indent 35 of art. 2 of Directive 2009/72/EC and indent 1 of art.2 of Directive 2009/73/EC).

inclusion of emission allowances among financial instruments, which will require firms that trade allowances as main business (also on behalf of aluminium firms) to become a MiFID investment firm. This can potentially increase the cost of trading of such instruments, in particular for aluminium companies that provide trading services in emission allowances for third parties that are not directly linked to their main business.

Additional indirect costs may also come from the removal of the exemption for those providing MiFID investment services (see annex I, Section A) or dealing on own account in commodity derivatives as main business. Spot trading venues for emission allowances would also require MiFID authorisation as RM, MTF or OTF. This means that spot trading venues would need to apply strict requirements on transparency and supervision, which may increase cost of trading and produce exposure (in terms of transparency of positions) to aluminium companies. Under article 31 of MiFIR, the European Securities and Markets Authority (ESMA) or national competent authorities, which need to receive a non-binding opinion from ESMA, can restrict or prohibit the marketing, distribution or sale of a financial instrument (including commodity derivatives) or an activity if there is a threat for the orderly functioning and integrity of the commodity markets. No distinction has been made between physical or derivatives commodities markets. Under art.35 of MiFIR, ESMA can limit the ability to enter into a commodity derivative to preserve stability of financial system and/or integrity of commodities markets. Art. 23 of MiFID obliges all investment firms to report transactions in financial instruments (or their underlying) listed on MiFID trading venues to competent authorities through an Approved Reporting Mechanism (ARM). Transactions that were not reported before are required now to be disclosed. This could potentially increase administrative costs, which may indirectly impose additional administrative burdens on commodities firms.

6.2 The European Market Infrastructure Regulation (EMIR)

Regulatory obligations for aluminium firms arise under EMIR, as they typically have exposures towards Over The Counter (OTC) derivatives.

Under EMIR derivative contracts are considered as financial instrument as defined by points (4) to (10) of Section C of Annex I to Directive 2004/39/EC as implemented in Article 38 and 39 of Regulation (EC) No 1287/2006. OTC means a derivative contract which execution does not take place on a regulated market as within the meaning of Article 4.1(14) of Directive 2004/39/EC or on a third-country market considered as “equivalent” to a regulated market in accordance with Article 19.6 of Directive 2004/39/EC. See art. 2.7 of EMIR.

Some exemptions from the application of EMIR apply. Intra-group transactions in derivatives contracts (as per art. 3) are not subject to the clearing obligation. Commodities firms will be exempted from the clearing obligation if the volume of the OTC derivatives trades does not exceed a certain threshold over a predefined period of time. These thresholds (of notional value for the whole group) are: €1 billion (each) for credit and

equity derivatives and €3 billion (each) for interest rate, foreign exchange and commodity derivatives. When the amount for one class of OTC derivative contracts is surpassed, the commodity firm exceeds the clearing threshold and needs to undergo the clearing obligation. One additional exemption for non-financial counterparties (including commodities firms) is that OTC derivatives contracts that are objectively measurable as reducing risks directly related to the commercial or treasury financing activity should not be taken into account when determining the volume of OTC derivatives trades. This is also defined as a hedging exemption. More specifically, ESMA clarified that hedging for EMIR means:

- OTC derivative contracts entered into for the purpose of “proxy hedging” (i.e. risk reduction through entering into a closely correlated instrument rather than an instrument directly related to the exact risk);
- Transactions that are defined as “hedging” under IFRS (art.3 EC Regulation 1606/2002) or GAAP accounting standards;
- OTC derivative contracts entered into as part of a portfolio hedging arrangement;
- OTC derivative contracts concluded in order to offset hedging derivatives contracts; stock options and OTC derivatives contracts related to employee benefits;
- OTC derivative contracts that reduce risks related to the acquisition of a company; and
- OTC derivative contracts that reduce credit risk.

Information gathered from aluminium companies confirms that trading in OTC derivatives contracts is only limited to activities falling under the “hedging” definition, so it appears unlikely that any of the European aluminium companies will exceed the threshold for the mandatory clearing obligation.

EMIR articles giving rise to direct costs for aluminium producers are:

- Art.4 on clearing obligations. EMIR provides that above clearing thresholds, OTC derivatives contracts must be cleared through central counterparties (CCPs) if available.
- Art.9 on reporting obligations. EMIR provides that counterparties and CCPs shall ensure that the details of any derivative contract they have concluded and of any modification or termination of the contract are reported to a trade repository.
- Art. 10 on non-financial counterparties. EMIR provides that when a non-financial counterparty takes positions in OTC derivative contracts exceeding the clearing threshold, the non-financial counterparty shall: i) notify ESMA; ii) become subject to the clearing obligation (art. 4); and iii) clear all contracts within 4 months.

- Art.11 on risk-mitigation techniques for OTC derivative contracts not cleared by a CCP, such as timely confirmation, portfolio compression, and reconciliation services.

Costs are not quantifiable because information about derivatives positions, number and details of contracts are not disclosed by the companies to protect commercial strategies. In addition, fees for risk mitigation services are negotiated bilaterally and vary with the characteristics of the transaction. Costs would be partially offset by the beneficial effects in terms of lower probability of litigation around the terms of the contract due to a better management of derivatives exposures. Finally, an alignment of reporting formats for disclosure under EMIR and REMIT may further reduce costs of legal provisions.

6.3 Market Abuse Regulation and Directive

The revision of MAD and the new MAR may indirectly affect aluminium producers. The Commission proposal extends the scope of MAD to any financial instrument admitted to trading on a MTF or an OTF (on top of RMs), as well as to any related financial instruments traded OTC that can have an effect on the covered underlying market.

The proposal will also cover commodity derivatives and the related spot commodity contracts, which will be addressed in part under the REMIT regulation.¹²¹ The proposal extends the definition of inside information to price sensitive information relevant to the related spot commodity contract as well as to the derivative itself, to ensure consistency of the application of the regulation to both markets. It introduces a specific definition of inside information for emission allowances that reflects the new classification as a financial instrument under MiFID. For the purpose of detecting cases of insider dealing and market manipulation, competent authorities have to have the possibility to access private premises and to seize documents of the company. The definition of inside information therefore is applied for trading commodity derivatives and emission allowances to individuals that are part of the company (art. 6 of MAR). Overall, the legislation may increase administrative costs and investment costs if the definition of inside information may discourage employees to undertake actions that are in the best interest of the company, due to the risk that could fall under insider trading or market manipulation activities.

¹²¹ Regulation (EU) No 1227/2011 of the European Parliament and the Council on wholesale energy market integrity and transparency

7 *Climate Change*

7.1 Introduction

This Chapter starts with a brief introduction to the EU Emissions Trading Scheme (EU ETS), followed by a discussion on the different types of costs associated with it. Then methodology, data and results are presented in Section 7.3.

7.1.1 *What is the EU ETS*

The EU ETS is a cap-and-trade system first implemented in 2005, with the goal of providing a cost-effective tool to reach the greenhouse gas (GHG) targets which the EU had committed to. The legislation setting up the ETS is Directive 2003/87/EC of the European Parliament and the Council Establishing a scheme for GHG emission allowance trading within the Community (hereinafter the ETS Directive) and its amendments.¹²² The EU ETS was extended to the non-EU members of the European Economic Area (Lichtenstein, Norway and Iceland) in 2007.

The EU ETS compliance is managed at the installation level. More than 11,000 installations are covered by the scheme. Each year, each installation must surrender a number of emission permits equal to its emissions during the past year. European Union Allowances (EUAs) are compliance units and represent one tonne of CO₂-equivalent emissions. Other units that can be used to comply with this provision are Emissions Reduction Units (ERUs, from Joint Implementation projects) and Certified Emission Reductions (CERs, from Clean Development Mechanism projects).

The total cap for emissions is equal to the total amount of EUAs made available each year through free allocation or auctioning. Underneath that cap, market participants, including covered installations, are free to trade. The total cap for installations covered by the EU ETS is set to decrease every year by 1.74%.

The EU ETS is now in its third phase. The characteristics of these different phases are discussed below. Given their different characteristics, each phase has different cost impacts on the aluminium sector.

It is important to note that the aluminium sector was not included in the EU ETS during Phase 1 and Phase 2, but that has changed for Phase 3. Aluminium producers will need to surrender EUAs for emissions of CO₂ and perfluorocarbons for the first time in 2014, for their 2013 emissions.

¹²² Amending acts were as follows: i) Directive 2004/101/EC of the European Parliament and of the Council; ii) Directive 2008/101/EC of the European Parliament and of the Council; iii) Regulation (EC) No 219/2009 of the European Parliament and of the Council; and iv) Directive 2009/29/EC of the European Parliament and of the Council. The latter act is the most relevant, as it introduces the third phase of the emissions trading scheme.

7.1.2 Phase 1 (2005 – 2007)

During the first phase, which was a pilot phase, caps were set at the national level through the National Allocation Plans (NAPs), which had to be approved by the European Commission. A maximum of 5% of the allowances could be auctioned; the rest was allocated free of charge on the basis of estimates of historical emissions. Due to a lack of good quality data and no banking provisions between phases,¹²³ this resulted in a sizable over-supply of EUAs, driving prices close to zero at the end of the phase.

Despite being a pilot phase, Phase 1 resulted in significant outcomes. A price for carbon was established. It also helped create the necessary infrastructure for future phases: at the installation level this included monitoring, reporting and verification (MRV); while in the marketplace National Registries, the Community Independent Transaction Log and carbon exchanges were founded.

7.1.3 Phase 2 (2008 – 2012)

In phase 2, allocation was granted on the basis of the reported emissions in the first phase. This process of grandfathering was considered fit to solve the problem of over-supply observed in Phase 1. However the economic crisis had a clear impact and substantially decreased emissions in Phase 2. The European Commission estimates that between 1.5 and 2 billion EUAs were carried over to Phase 3.¹²⁴ The amount of allowances that could be auctioned was also increased, to a maximum of 10% of the total.

7.1.4 Phase 3 (2013 – 2020)

The functioning of the ETS saw some significant changes at the start of the third phase. Auctioning was increased, and more than 40% of all allowances will be auctioned (including full auctioning for the power sector).

Energy-intensive industries will continue to receive a large part of their needed allowances for free, and will have to buy any shortfall at auctions or in the market (as was the case during Phases 1 and 2). Allocation to energy-intensive industries is largely determined by using benchmarks,¹²⁵ established per product, according to Decision 2011/27/EU.¹²⁶ The

¹²³ Meaning that EUAs from Phase 1 could not be carried over to Phase 2.

¹²⁴ Report from the Commission, The state of the European carbon market in 2012, 14.11.2012, COM (2012)652.

¹²⁵ The setting of benchmarks for the aluminium industry is discussed in Methodology for the free allocation of emission allowances in the EU ETS post 2012. Sector report for the aluminium industry, Study commissioned by the European Commission to Ecofys (project leader); Fraunhofer Institute for Systems and Innovation Research; and Öko-Institut. Available at: http://ec.europa.eu/clima/policies/ets/cap/allocation/docs/bm_study-aluminium_en.pdf.

¹²⁶ Commission Decision determining transitional Union-wide rules for harmonised free allocation of emission allowances pursuant to Article 10a of Directive 2003/87/EC of the European Parliament and of the Council (2011/278/EU)

average carbon-intensity of the 10% best performers represents the benchmark for allocating free emissions.

Those installations that meet the benchmark receive a greater percentage of free allowances than those that do not. The latter are thereby incentivized to catch up to their best-performing peers. This approach also rewards early action by industry towards reducing emissions.

Free allocation is granted at the 80% level of the benchmark, a share which is set to decrease to 30% in 2020 for sectors not deemed exposed to the risk of carbon leakage, and which are listed in the carbon leakage Decision.¹²⁷ These installations received free allowances at 100% of their benchmarks. The production of aluminium (NACE v.2 sector 24.42) is included in the carbon leakage list.

As a result of the lessons learned in Phases 1 and 2, several important EU ETS functions have been centralized in Phase 3. Member states registries were incorporated in the EU registry, and allocation is harmonized at the EU level. Electric utilities now have to effectively buy all their allowances linked to electricity production; additional measures have been included to compensate energy-intensive industries, especially those exposed to international competition. This is based on ETS Directive Art. 10a.6, which allows member states to compensate for the indirect costs of emissions passed through electricity prices.¹²⁸

7.1.5 *Scope of the Study*

This Study analyses the cost impact of the EU ETS over the period 2005-2012. As the aluminium sector was not included in the EU ETS during that period, only indirect costs are assessed. This report includes a quantitative analysis for Phases 1 and 2.

Conducting a full quantitative analysis for Phase 3 is beyond the scope of this Study and much of the necessary information is unknown at this stage. For Phase 3 the only quantitative analysis undertaken is that of the administrative costs. Please note that this is not intended to be a forward looking impact assessment.

In addition, a short qualitative discussion on regulatory changes throughout Phase 3 was undertaken. Although some administrative costs were incurred before the start of Phase 3, a precise amount or percentage has proven difficult to calculate. Therefore, all administrative costs are included in the discussion on Phase 3.

Three different segments of the aluminium value chain are included in this analysis: *primary* aluminium, *secondary* aluminium (*refining* and *remelting*) and *downstream manufacturers* (*rolling mills* and *extrusion plants*).

¹²⁷ Commission Decision determining, pursuant to Directive 2003/87/EC a list of sectors and subsectors which are deemed to be exposed to a significant risk of carbon leakage (2010/2/EU)

¹²⁸ See Section 8.1.1 below.

7.2 Costs

This Study identifies three types of costs: direct or compliance costs, indirect costs and administrative costs.

7.2.1 *Compliance or direct costs*

At the end of each year, installations surrender EUAs to match their CO₂ emissions in that year (in tonnes). Any shortage of allowances can be purchased through auctioning or in the secondary market.

Essentially, the cost of compliance is the difference between the amount of EUAs each installation needs to surrender and the number of allowances allocated, multiplied by the cost of the allowances purchased.

As mentioned above, the aluminium industry only entered the EU ETS at the start of Phase 3. Hence, there are no direct costs for the aluminium industry for the timeframe covered by this Study.

7.2.2 *Indirect costs*

Electric utilities face increased production costs through their ETS compliance cost. They pass those costs on to their customers via higher electricity rates. Both industry and households therefore face an extra cost because of the cost of CO₂ embedded in electricity prices. This is an additional cost, which industries cannot pass on to the ultimate customers if they are active in a globally competitive sector. As an electricity intensive sector (especially with regards to the production of primary aluminium), the aluminium industry still faced indirect costs in Phase 1 and 2, even if it was not formally part of the EU ETS.

The pass-on rate of the CO₂ cost for producing electricity is subject to considerable debate and may vary significantly between member states. Interviews with various stakeholders revealed a possible range for the actual pass-on rates. This information is very challenging to ascertain for each installation, or even Member State. Therefore the decision was made to undertake a basic sensitivity analysis, with three pass-on rates.

7.2.3 *Administrative costs*

Two kinds of administrative costs can be identified under the EU ETS: one-off costs for the start-up of the process, and recurring costs, mostly related to the Monitoring, Reporting and Verification (MRV) process.

The start-up costs are caused by the investments necessary for monitoring compliance. For illustrative purposes, the infrastructure needed for the correct calculation of emissions would represent a one-off start-up cost.¹²⁹

MRV costs are the additional burdens placed on installations for continued compliance with monitoring duties, for example the wages of the staff dealing with the administrative aspects, or the cost of hiring a verifier.

Administrative costs are incurred internally, through staff time, or externally by retaining help and advice, in some cases mandatory, such as verifying.

7.3 Methodology for the quantification of Cumulative Costs

The ultimate objective of this chapter is to provide the cost of ETS per tonne of aluminium produced between 2005 and 2012. Because the aluminium value chain was only introduced into the ETS in Phase 3, only indirect costs are calculated in this chapter. The level of information is aggregated at the plant level.

7.3.1 Indirect costs

Indirect cost (€/Tonne aluminium) = Electricity intensity (kWh/Tonne of aluminium)

** Carbon intensity of electricity (Tonne of CO₂/kWh)*

** CO₂ Price (€/Tonne of CO₂) * Pass-on rate*

Where:

- Electricity intensity of aluminium production: the amount of electricity used to produce one tonne of aluminium. This amount is plant and process specific;
- Carbon intensity of electricity generation indicates the amount of tonnes of CO₂ emitted by utilities to generate one kWh;
- CO₂ Price: is the average yearly market-price of CO₂.
- Pass-on rate: the proportion of their direct costs that utilities pass on to electricity consumers.

Sources:

- Electricity intensity of production; this was acquired from interviews with and questionnaires answered by industry members. For primary aluminium CRU data are used, unless supplemented by more recent data provided by plant operators.

¹²⁹ Detailed Information Obligations are spelled out in the Commission Regulation (EU) No 601/2012 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC.

- Carbon intensity of electricity generation: the maximum regional carbon intensity of electricity is utilised, provided by the Commission's Guidelines on State aid measures.¹³⁰ Note that these figures are not national. Member States who are highly interconnected or have electricity prices with very low divergences are regarded as being part of a wider electricity market and are deemed to have the same maximum intensity of generation (for example, Spain and Portugal).
- It must be noted that the maximum regional carbon intensity of electricity generation is much higher for certain jurisdictions than the national average intensity (e.g. for France it is 9 times higher).
- CO₂ Price:
 - o 2005: yearly average EUA spot prices, reported daily by the European Environment Agency;
 - o 2006-2012: yearly averages of the daily settlement prices for Dec Future contracts for delivery in that year. The daily settlement prices were reported by the European Energy Exchange.

Table 22: Average yearly prices per tonne of CO₂ (€)

Year	2005	2006	2007	2008	2009	2010	2011	2012
CO ₂ Price	21.82	18.62	0.74	23.03	13.31	14.48	13.77	7.56

Source: European Energy Exchange

7.3.2 Administrative Costs

As mentioned, this type of cost was not an issue during the analysis of Phases 1 and 2. However, administrative burdens are dealt with at the end of this Chapter in the Section on Phase 3.

7.3.3 Sample

A separate sample is used for each of the aforementioned segments of the value chain. The composition of the final sample as well as the response rate at the time of writing is described in Section 1.6.

Information on the indirect costs of ETS was provided by all the primary smelters in the sample, while data on the administrative costs of ETS was provided by 7 primary smelters out of 11.

¹³⁰ Communication from the Commission: Guidelines on certain State aid measures in the context of the greenhouse gas emission allowance trading scheme post-2012 (2012/C 158/04)

For secondary aluminium, 20 secondary producers are included in the sample. Eleven of those replied to both the questionnaire on administrative costs of ETS and the questionnaire on the indirect costs of the scheme.

However, four of the indirect cost questionnaires are excluded from the analysis. Two are excluded because respondents presented information related to two plants in different segments of the value chain together. The two other questionnaires did not include all the information necessary to conduct the full analysis.

Of the 15 downstream players included in the sample, 12 replied to the questionnaire on indirect ETS costs. Three of those installations are not represented in the results; two are excluded because information related to different production activities were presented together (as mentioned above) and the third one because it did not include all the necessary information.

Fourteen installations replied to the questionnaire on the administrative costs of the ETS scheme.

7.3.4 Indirect cost Results

Primary aluminium

Table 23, Table 24, and Table 25 show the average yearly indirect costs per tonne of primary aluminium for eleven installations at three different pass-on rates.

Table 23 Primary aluminium, indirect CO₂ costs (€/tonne)

PASS-ON RATE 0.6	Primary 1	Primary 2	Primary 3	Primary 4	Primary 5	Primary 6
<i>Phase 1</i>	92.65	0	0	0	0	72.30
<i>Phase 2</i>	97.37	0	0	0	0	75.99
<i>Phase 1 and 2</i>	95.60	0	0	0	0	74.61
	Primary 7	Primary 8	Primary 9	Primary 10	Primary 11	
<i>Phase 1</i>	73.24	75.78	64.18	32.16	90.77	
<i>Phase 2</i>	76.97	79.64	64.18	33.80	95.40	
<i>Phase 1 and 2</i>	75.57	78.19	64.18	33.19	93.66	

Note: Averages of indirect costs in Phase 1 and 2. Pass-on rate: 0.6. Source: Authors' own elaboration

Table 24 Primary aluminium: indirect CO₂ costs (€/tonne)

PASS-ON RATE 0.8	Primary 1	Primary 2	Primary 3	Primary 4	Primary 5	Primary 6
<i>Phase 1</i>	123.53	0	0	0	0	96.40
<i>Phase 2</i>	129.83	0	0	0	0	101.32
<i>Phase 1 and 2</i>	<u>127.46</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>99.47</u>
	Primary 7	Primary 8	Primary 9	Primary 10	Primary 11	
<i>Phase 1</i>	97.66	101.04	64.18	42.89	121.03	
<i>Phase 2</i>	102.63	106.18	64.18	45.07	127.19	
<i>Phase 1 and 2</i>	<u>100.77</u>	<u>104.25</u>	<u>64.18</u>	<u>44.25</u>	<u>124.88</u>	

Note: Averages of indirect costs in Phase 1 and 2. Pass-on rate: 0.8. Source: Authors' own elaboration

Table 25 Primary aluminium: indirect CO₂ costs (€/tonne)

PASS-ON RATE 1	Primary 1	Primary 2	Primary 3	Primary 4	Primary 5	Primary 6
<i>Phase 1</i>	154.41	0	0	0	0	120.50
<i>Phase 2</i>	162.28	0	0	0	0	126.65
<i>Phase 1 and 2</i>	<u>159.33</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>124.34</u>
	Primary 7	Primary 8	Primary 9	Primary 10	Primary 11	
<i>Phase 1</i>	122.07	126.30	64.18	53.61	151.28	
<i>Phase 2</i>	128.29	132.73	64.18	56.34	158.99	
<i>Phase 1 and 2</i>	<u>125.96</u>	<u>130.32</u>	<u>64.18</u>	<u>55.32</u>	<u>156.10</u>	

Note: Averages of indirect costs in Phase 1 and 2. Pass-on rate: 1. Source: Authors' own elaboration

Primary producers 2 to 5 did not face indirect costs during Phase 1 and Phase 2. These installations had long term contracts with electricity providers that date from before the launch of the EU ETS. In other words, those plants did not face any indirect costs because their electricity price was negotiated before the EU ETS was incorporated into the price structure.

Primary 9 and 10 are also special cases. Primary 9 has indicated that they pay an explicit CO₂ price per MWh. This explicit price is far lower than the indirect cost, if calculated in the same manner as done for the other plants. Primary 10 has a long-term arrangement with a CO₂-free generator covering over half of its electricity needs; the remainder is purchased on the market and thus subject to CO₂ indirect costs.

Primary 1 and 11 have a significantly higher indirect cost compared with Primary 6, 7 and 8; this is due to the higher maximum CO₂ intensity of electricity in the regions where they

the former are located. This difference in carbon intensities of electricity more than compensate for the higher carbon efficiency of Plants 1 and 2.

Furthermore, there is also a clear trend of a small increase in indirect costs from Phase 1 to Phase 2, which can be attributed to a higher average price for EUAs in Phase 2.

Secondary producers

Table 26 Secondary Producers, indirect CO₂ costs (€/tonne)

PASS-ON RATE 0.6	Refiner 1	Refiner 2	Refiner 3	Refiner 4
<i>Phase 1</i>	1.42	1.10	1.09	0
<i>Phase 2</i>	1.49	1.15	1.15	0
<i>Phase 1 and 2</i>	<u>1.46</u>	<u>1.13</u>	<u>1.13</u>	<u>0</u>
	Remelter 1	Remelter 2	Remelter 3	
<i>Phase 1</i>	0.79	1.01	0.67	
<i>Phase 2</i>	0.83	1.06	0.70	
<i>Phase 1 and 2</i>	<u>0.81</u>	<u>1.04</u>	<u>0.69</u>	

Note: Averages of indirect costs in Phase 1 and 2. Pass-on rate: 0.6. Source: Authors' own elaboration

Table 27: Secondary Producers, indirect CO₂ costs (€/tonne)

PASS-ON RATE 0.8	Refiner 1	Refiner 2	Refiner 3	Refiner 4
<i>Phase 1</i>	1.89	1.46	1.46	0
<i>Phase 2</i>	1.99	1.54	1.53	0
<i>Phase 1 and 2</i>	<u>1.95</u>	<u>1.51</u>	<u>1.50</u>	<u>0</u>
	Remelter 1	Remelter 2	Remelter 3	
<i>Phase 1</i>	1.05	1.34	0.89	
<i>Phase 2</i>	1.10	1.41	0.94	
<i>Phase 1 and 2</i>	<u>1.08</u>	<u>1.39</u>	<u>0.92</u>	

Note: Averages of indirect costs in Phase 1 and 2. Pass-on rate: 0.8. Source: Authors' own elaboration

Table 28: Secondary Producers, indirect CO₂ costs (€/tonne)

PASS-ON RATE 1	Refiner 1	Refiner 2	Refiner 3	Refiner 4
<i>Phase 1</i>	2.36	1.82	1.82	0
<i>Phase 2</i>	2.48	1.92	1.91	0
<i>Phase 1 and 2</i>	<u>2.44</u>	<u>1.89</u>	<u>1.88</u>	<u>0</u>
	Remelter 1	Remelter 2	Remelter 3	
<i>Phase 1</i>	1.31	1.68	1.11	
<i>Phase 2</i>	1.38	1.77	1.17	
<i>Phase 1 and 2</i>	<u>1.36</u>	<u>1.73</u>	<u>1.15</u>	

Note: Averages of indirect costs in Phase 1 and 2. Pass-on rate: 1. Source: Authors' own elaboration

Three remelting plants and four refiners provided data. There are relatively large differences in this small sample.

Refiner 4 uses a long term contract to acquire electricity, and has not faced any indirect costs. Refiner 1 faces a significantly larger indirect cost than the others, due to a higher electricity intensity of production.

It is clear that the indirect costs are in a different order of magnitude compared to primary aluminium smelters. This is mainly caused by far lower electricity intensity in their production process. Primary smelters consume around 14 to 15 MWh per tonne, secondary producers 150-200 kWh per tonne.

Downstream Producers

Table 29: Downstream producers, indirect CO₂ costs (€/tonne of finished product)

PASS-ON RATE 0.6	Rolling 1	Rolling 2	Rolling 3	Rolling 4	Rolling 5
<i>Phase 1</i>	1.00	2.69	0	2.03	0.70
<i>Phase 2</i>	1.05	2.83	0	2.14	0.73
<i>Phase 1 and 2</i>	<u>1.03</u>	<u>2.78</u>	<u>0</u>	<u>2.10</u>	<u>0.72</u>
	Rolling 6	Rolling 7	Rolling 8	Extruder 1	Extruder 2
<i>Phase 1</i>	0.29	1.32	4.12	0	1.11
<i>Phase 2</i>	0.30	1.39	4.33	0	1.17
<i>Phase 1 and 2</i>	<u>0.30</u>	<u>1.36</u>	<u>4.25</u>	<u>0</u>	<u>1.15</u>

Note: Averages of indirect costs in Phase 1 and 2. Pass-on rate: 0.6. Source: Authors' own elaboration

Table 30: Downstream producers, indirect CO₂ costs (€/tonne of finished product)

PASS-ON RATE 0.8	Rolling 1	Rolling 2	Rolling 3	Rolling 4	Rolling 5
<i>Phase 1</i>	1.33	3.59	0	2.71	0.93
<i>Phase 2</i>	1.40	3.77	0	2.85	0.98
<i>Phase 1 and 2</i>	<u>1.37</u>	<u>3.70</u>	<u>0</u>	<u>2.80</u>	<u>0.96</u>
	Rolling 6	Rolling 7	Rolling 8	Extruder 1	Extruder 2
<i>Phase 1</i>	0.38	1.76	5.49	0	1.49
<i>Phase 2</i>	0.40	1.85	5.77	0	1.56
<i>Phase 1 and 2</i>	<u>0.39</u>	<u>1.82</u>	<u>5.67</u>	<u>0</u>	<u>1.53</u>

Note: Averages of indirect costs in Phase 1 and 2. Pass-on rate: 0.8. Source: Authors' own elaboration

Table 31: Downstream producers, indirect CO₂ costs (€/tonne of finished product)

PASS-ON RATE 1	Rolling 1	Rolling 2	Rolling 3	Rolling 4	Rolling 5
<i>Phase 1</i>	1.66	4.49	0	3.39	1.16
<i>Phase 2</i>	1.75	4.71	0	3.56	1.22
<i>Phase 1 and 2</i>	<u>1.72</u>	<u>4.63</u>	<u>0</u>	<u>3.50</u>	<u>1.20</u>
	Rolling 6	Rolling 7	Rolling 8	Extruder 1	Extruder 2
<i>Phase 1</i>	0.48	2.20	6.89	0	1.86
<i>Phase 2</i>	0.50	2.31	7.22	0	1.95
<i>Phase 1 and 2</i>	<u>0.49</u>	<u>2.27</u>	<u>7.09</u>	<u>0</u>	<u>1.92</u>

Note: Averages of indirect costs in Phase 1 and 2. Pass-on rate: 1. Source: Authors' own elaboration

The relatively large differences between the downstream producers in this sample are due to a number of factors. Please note that the different installations are not perfectly comparable when it comes to the type of output. For instance, although all rolling mills produce rolled products, there are differences between installations in how specialized those products are and technologies used. Both hot and cold rolling mills are included in the sample.

But the main factor explaining the wide range of indirect costs is the difference in electricity intensity between the various plants. Rolling 1 for instance uses about three times more electricity per tonne than Rolling 6 (circa 160 kWh/tonne versus 60 kWh/tonne).

Rolling 3 and 7 are more electricity intensive (580 kWh/tonne) than Rolling 1. However, Rolling 3 has a long-term contract and Rolling 7 purchases most of its electricity from a carbon-neutral generator. This compensates for their electricity intensity, especially compared to Rolling 8; this plant also has high electricity intensity, but buys its electricity in the market. Rolling 8 is the most electricity intensive plant in the sample and therefore faces the highest indirect cost.

Once again differences in maximum regional carbon intensity of electricity generation play an important role when analyzing the differences between plants. Rolling 7 is located in a region where the carbon intensity of electricity is significantly higher.

Extruder 1 has a long term contract and Extruder 2 faces indirect costs comparable to other downstream producers.

7.3.5 Conclusions

- 1) The position of the plant in the value chain is an important factor for the costs due to the EU ETS. Primary aluminium faces a far higher indirect cost (between 125 Euros and 160 Euros per tonne), predominantly because of the electricity intensive production process.
- 2) There is a trend of increased indirect costs between Phase 1 and 2, though the differences are relatively small.
- 3) Large differences exist between plants within the same segment of the value chain. This due to higher carbon intensity of electricity in some regions and countries within the EU. Variations in electricity intensity between installations, caused by different technologies can also, partly, explain these differences. For rolling mills this can also be attributed to differences in types of output.

7.4 Phase 3

This Section includes a quantitative analysis of administrative costs for the aluminium industry in Phase 3 and a qualitative assessment of regulatory changes between Phases 2 and 3.

7.4.1 Administrative costs

The model used to calculate administrative costs is:

$$\begin{aligned} \text{Administrative cost (€/Tonne of aluminium)} \\ &= \text{External costs (€/Tonne of aluminium)} \\ &\quad + \text{Internal costs (€/Tonne of aluminium)} \\ &\quad + \text{One-off Internal costs (€/Tonne of aluminium)} \end{aligned}$$

+ *Equipment costs (€/Tonne of aluminium)*

Where:

- *External Costs* are the outsourced annual costs due to recurring MRV tasks;
- *Internal Costs* are the annual costs due to recurring MRV tasks, carried out by company employees;
- *One-off Internal Costs* are the start-up costs, incurred internally, for example training and familiarization with ETS procedures. To calculate an annual value, the total one-off internal costs have been spread equally across Phase 3 (i.e. 8 years);
- *Equipment Costs* are the capital and operating expenditures due to the installation of monitoring equipment. The capital expenditures have been annualised with a depreciation period of 10 years and a financial cost related to a 5% loan of the same maturity.¹³¹

Source:

- During interviews, operators provided detailed information on both staff and external experts necessary for preparing Phase 3. This information was supplemented by CRU data on salary levels. Several installations also reported costs related to new and necessary equipment.
- Production data refer to 2012 and were either obtained through interviews or retrieved from the CRU database.

7.4.2 Results

Primary smelters

Out of 11 smelters, seven replies were received to the questionnaire on administrative burdens originated by the ETS regime. As shown in Table 32 below, the variance in administrative costs is relatively high. Three smelters bear a cost in the area of 0.4-0.7 Euros per tonne; three other smelters bear a cost in the area of 0.05-0.2 Euros per tonne. Primary 5 has a cost close to one Euro per tonne, and can be considered an outlier.

¹³¹ Consistently with the rest of the report, financial costs of investments are calculated as if they are financed through bank loans. Results would not change if the opportunity cost of internal (equity) resources was taken into account. In this section, the depreciation period has been shortened from 20 to 10 years to take into account of the lower durability of monitoring equipment.

Table 32: Primary aluminium, administrative costs (€/tonne)

	Primary 1	Primary 2	Primary 3	Primary 4	Primary 5	Primary 6
<u>External Costs</u>	-	-	0.033	0.014	0.073	N/A
<u>Internal Costs</u>	0.090	0.033	0.394	0.154	0.860	N/A
<u>One-off Internal Costs</u>	0.033	0.013	-	-	-	N/A
<u>Equipment Costs</u>	0.03	0.011	-	-	-	N/A
<u>Total</u>	0.15	0.06	0.43	0.17	0.93	
	Primary 7	Primary 8	Primary 9	Primary 10	Primary 11	
<u>External Costs</u>	N/A	N/A	0.030	0.037	N/A	
<u>Internal Costs</u>	N/A	N/A	0.602	0.396	N/A	
<u>One-off Internal Costs</u>	N/A	N/A	-	-	N/A	
<u>Equipment Costs</u>	N/A	N/A	-	0.005	N/A	
<u>Total</u>			0.63	0.44		

Source: Authors' own elaboration

The difference between both clusters (if we exclude Primary 5 as an outlier) is largely attributable to differences in labour costs.

Secondary Producers

Out of a sample of 20 refiners and remelters, eleven replies were received from secondary aluminium producers. In three cases, the facilities are not covered by the ETS regime as their total rated thermal input is lower than 20 MW; in two cases, the ETS is managed at group level and costs are attributed to the higher segment of the value chain. The analysis is carried out on the remaining 6 sites that replied.¹³²

Table 33: Secondary Producers, administrative costs (€/tonne)

	Remelter 2	Remelter 4	Remelter 5	Refiner 2	Refiner 3	Refiner 4
<u>External Costs</u>	0.076	0.018	-	0.094	0.476	-
<u>Internal Costs</u>	0.092	0.117	0.076	0.082	0.238	0.395
<u>One-off Internal Costs</u>	-	-	-	-	-	-
<u>Equipment Costs</u>	-	0.022	-	-	-	-
<u>Total Costs</u>	0.17	0.16	0.08	0.18	0.71	0.39

Source: Authors' own elaboration

¹³² In two cases, replies concerned both a secondary producer and an integrated rolling mill. Also in this case, costs have been attributed to the highest segment of the value chain, that is the secondary producer.

For three installations administrative burdens per tonne of aluminium are clustered in the narrow range of 0.16-0.18 €/tonne. According to the SCM methodology, such an assessment could be considered representative of the normally efficient firm. In one case, burdens are significantly lower (0.08 €/tonne), and in two other cases burdens are significantly higher, in the area of 0.4-0.7 €/tonne. However, these two companies have a lower production than their peers in the sample; hence, expectedly, administrative burdens, representing a quasi-fixed cost, weigh more than disproportionately on them.

Downstream Producers

Table 34: Downstream Producers, administrative costs (€/tonne of finished product)

	Rolling 1	Rolling 4	Rolling 9	Rolling 10	Rolling 11	Extruder 1
<u>External Costs</u>	0.012	0.002	0.006	-	0.015	0.229
<u>Internal Costs</u>	0.016	0.015	0.031	0.027	0.141	0.457
<u>One-off Internal Costs</u>	-	-	-	-	-	-
<u>Equipment Costs</u>	-	-	-	-	-	-
<u>Total Costs</u>	0.03	0.02	0.04	0.03	0.16	0.69

Source: Authors' own elaboration

Replies were received from 14 downstream producers – 13 rolling mills and one extruder - out of the 15 included in the sample. In four cases, downstream producers are not covered by ETS, given that their total rated thermal input is lower than 20 MW; in four installations, downstream producers are integrated with primary or secondary producers, and burdens have been attributed to the higher segment of the value chain. Thus, only six replies could be used to carry out the analysis of the administrative costs originated from the ETS regime.

As shown in Table 34, four out of six downstream players face very low administrative costs, between 0.02 and 0.04 Euros per tonne of finished product. According to the SCM methodology, this range could be considered as an approximation of the burdens borne by the normally efficient firm.

In one case, costs are much higher, at about 0.7 €/tonne. However, this is caused by the significantly smaller size (in terms of capacity) of that plant compared to the other plants in the sample. Indeed, total costs of outsourced services and personnel remain comparable across all the plants in the sample.

Hence, it can be estimated that ETS administrative burdens represent 0.02-0.04 €/tonne for large downstream players, while they are possibly (and likely) higher for smaller entities. However, as we only have one small downstream player in the sample which is also covered by the ETS system, no precise estimation of ETS burdens is possible.

7.5 Conclusion

Administrative costs are very small for all samples, ranging from a few Eurocents per tonne for rolling mills to nearly one Euro per tonne for one primary aluminium plant.

7.5.1 Regulatory developments

The most important difference for aluminium plants between Phase 2 and 3 is that they will enter the EU ETS, and so will need to surrender EUAs to cover their emissions starting in 2013.¹³³ The aluminium sector will start facing direct costs. However, they are exposed to international competition and as being on the leakage list they will receive a large part, if not all, of their allocation for free.

In Phase 3, auctioning plays a stronger role with more than 40% of all allowances being auctioned. There are three different treatments:

- *The power sector* will essentially need to buy all its EUAs via auctions, increasing their direct costs;
- *The industrial sectors* will start bearing direct costs. *Product benchmarks* have been established, at the level of the carbon-intensity of production of the 10% best performers. In 2013, non-exposed industry will receive allowances at 80% of the benchmarked level freely. This percentage will be reduced to 30% by 2020. Installations reaching the benchmark are rewarded: free allowances represent for them a higher percentage of their total surrendered EUAs compared to *less-than-best performers*. The latter are thereby incentivized to catch up in terms of carbon efficiency.
- Industrial installations, in sectors deemed exposed to significant risk of *carbon leakage*, which are responsible for the vast majority of emissions, receive a higher share of free allowances. In Phase 3, they will receive 100% of *benchmark level allocation* compared to 80% for the non-leakage exposed ones. However, these percentages do not take the cross-sectoral correction factor into account. This correction factor guarantees that the sum of the free allocation proposed by each Member State does not exceed the EU ETS-wide cap on free allocation. The cross-sectoral correction factor determines the proportion of the proposed free allocation that is granted to each installation that is eligible to receive allocation. In 2013 the correction factor is circa 94, 27%, and it will decrease yearly to circa 82, 44% in 2020.

This has implications for the aluminium industry. Only the plants that reach the benchmark for carbon-efficiency will receive all their allocation for free. The others will

¹³³ Provided that the plant thermal power is higher than 20 MW. All primary smelters are above this threshold; however, this is not the case for all the secondary smelters in the sample, and for a large part of downstream producers.

need to supplement with EUAs bought at auctions or in secondary markets, resulting in direct costs.

Two measures are in place to compensate energy-intensive industries for direct and indirect costs. First, as mentioned above, free allowances are made available for sectors that comply with the conditions for ‘significant risk for carbon leakage’. Aluminium production (NACE code 2742) is on the leakage list, at least till 2015, when the revised leakage list enters into force.

Secondly, member states can use state aid to compensate energy-intensive industries, though state-aid provisions and guidelines need to be observed in this case.¹³⁴

In addition, two other issues are worth mentioning:

- The EU ETS scheme itself is under review. The current discussion on a structural reform to strengthen the scheme could still include changes that may affect the treatment of industries, such as aluminium.
- Around the globe, various cap-and-trade systems are emerging. EU installations will no longer be the only ones facing ETS costs and competitive disadvantages. The Californian scheme is up and running, several Chinese pilot projects will kick-off this year and Australia’s carbon pricing mechanism is in operation.

Although compensation mechanisms are discussed in other chapters of the Study, a brief discussion of the measures in Australia¹³⁵ and California follows:

The EU ETS has two mechanisms for compensating industries for loss of competitiveness: the leakage list discussed above and the possibility for member states to financially compensate their industries for indirect CO₂ costs.

The Californian scheme includes several compensation measures:

- Energy-intensive industries can opt to have the allocation/cap determined on the basis of their energy consumption, instead of their production output;
- Sectors are labelled as low, medium or high risk of leakage and receive 30 – 100% of their allowances for free, depending on how they are categorized;
- The proceeds of certain auctions of emission permits by private utilities are earmarked to compensate the customers that face higher electricity rates.

Compensation under the Australian pricing mechanism focuses on ‘emissions-intensive trade-exposed’ activities, granting them free carbon permits and other assistance, based on

¹³⁴ See Section 8.1.

¹³⁵ Note that draft legislation aimed at terminating the Australian carbon pricing mechanism has been announced, but no decision had been taken at the time of writing.

their total emissions and indirect costs. Certain sectors also receive public investment and research grants to aid them in their transition to a low-carbon economy.

7.5.2 Are Phase 1 and 2 representative for Phase 3?

To conclude, there will be significant changes for aluminium producers at the start of Phase 3. Direct emissions will now have to be reported under the ETS, but the sector will also be compensated with free allowances from two sources: the benchmarks and the leakage list.

The picture is less clear as regards indirect costs. Utilities may already have included CO₂ prices in Phase 2 to a large extent. The effect of the expiring of long term contracts is also difficult to predict.

Another factor that will have an impact is the carbon price, which is currently low. There is currently an ongoing strong policy debate that may have unpredictable outcomes. The effect of that ongoing debate on future carbon prices and its impact on energy-intensive industries is highly uncertain.

8 Competition Policy

As stated in 1 above, this report addresses the cumulative cost of EU legislation on the aluminium sector. Competition policy is one of the eight policy areas in scope of the report. However, strictly speaking, competition policy creates no, or very little, direct regulatory costs for aluminium producers. Rather, it is one of the factors which shape the competitive environment where the European aluminium industry operates. This Chapter does not intend to assess EU competition policy as such, which is by nature a horizontal policy, nor the purposes it serves or the benefits it delivers. Nor should any part of this Chapter be interpreted as an assessment of e.g. the state aid regime or the rules on abuse of dominant position. As mentioned in several instances, the focus of this report is sectoral. Hence, the research team only discusses the impacts of selected competition law and policies on the aluminium industry.

This Chapter proceeds as follows: Section 8.1 discusses the state aid regime with regard to aluminium producers; Section 8.2 discusses antitrust law and policies. A general description of competition policies and their application on the aluminium industry is provided; then a qualitative assessment of any barriers to meeting the simplification and smart regulation objectives and of the coherence of the legislation is carried out.

8.1 State aid and the aluminium industry

8.1.1 The regime of state aid in the EU

The legal regime of state aid in the EU aims at avoiding distortions of competition and trade among member states, due to direct or indirect government interventions, thus ensuring a level playing field among EU market players. The basic principles are laid down in art. 107 TFEU. The first paragraph of this article provides a definition of state aid deemed incompatible with the EU internal market. In particular, aid measures granted by member states which are able to distort competition and trade in the EU by favouring certain undertakings or the production of certain goods are generally prohibited. The second paragraph provides *de jure* derogations to the general principle of incompatibility, thus allowing i) aid granted to consumers and having a social character; ii) aid aimed at restoring damage caused by natural disasters; and iii) aid granted to the economy of certain areas of the Federal Republic of Germany affected by the division of Germany, in so far as such aid is required in order to compensate for the economic disadvantages caused by this division. Finally, the third paragraph introduces cases of discretionary derogation, when the aid purpose consists in: i) fostering the economic development of relatively poor areas; ii) enabling the execution of an important project of common European interest; iii) facilitating the development of certain economic activities; or iv) promoting culture and heritage. Based on art. 108 TFEU, to ensure that the general prohibition is respected and exemptions are applied equally across the EU, the Commission is responsible for monitoring the existing national state aid systems, and is entitled to ask member states to

abolish or revise aid measures which are deemed not to be compatible with the good functioning of the internal market. The member states have to inform the Commission of any plans to grant new aid or modify existing one, thus rendering the monitoring activity more reliable.

State aid which is not targeted at proven market failure distorts the markets and there is little guarantee that it will improve the industry's capability to compete worldwide on its own merits. This is why state aid policy looks at the design of the aid in order to prevent overcompensation, not to hamper incentives, and to minimise distortions of competition.

Procedural rules are laid down in Council Regulation (EC) No 659/1999 - implemented by Commission Regulation (EC) No 794/2004 - which sets the obligations of member states to notify aid measures and to provide annual reports, as well as the powers of the Commission to carry out investigations and make decisions.

While state interventions conferring an advantage to selected recipients are to undergo an assessment by the Commission, general measures, i.e. not selective and applying to all companies regardless of size, location, and sector, are not considered state aid *stricto sensu*. Specific aid measures can be implemented only after the approval of the Commission, which is also entitled to recover unlawful aid. All the interested parties have the right to comment on Commission decisions; and to submit complaints reporting any aid allegedly incompatible with the TFEU or any misuse of aid. With small exceptions (e.g. for agricultural products), DG Competition is responsible to perform state aid control on most of economic sectors.

Council Regulation (EC) No 994/1998 enables the Commission to adopt both group and *de minimis* exemptions by means of a regulation. General block exemptions can apply to aid favouring small and medium-sized enterprises (SMEs), research and development (R&D) activities, environmental protection, employment and training, or complying with national maps for the granting of regional aid. Commission Regulation (EC) No 800/2008 (the so-called General Block Exemption Regulation or GBER) provides automatic approval (without notification) under the conditions therein specified for a wide range of aid measures (26 categories, including i.a. aid to SMEs, R&D aid to SMEs, aid for employment, training aid, regional aid, environmental aid, innovation aid, R&D aid for large companies, aid in the form of risk capital, and aid for enterprises newly created by female entrepreneurs). *De minimis* exemptions are regulated by Commission Regulation (EC) No 1998/2006 which exempts aid measures not exceeding € 200,000 over three fiscal years and loan guarantees for debt not exceeding € 1.5 million. To avoid abuses, this kind of exemption cannot be applied to “non-transparent” aid, i.e. when the total budget cannot be calculated accurately in advance; or to aid granted to firms at risk of failure.

Based on art. 107(3), several horizontal non-binding guidelines are set to define the Commission position towards certain categories of aid. Regional aid measures, aiming at promoting the economic development of certain disadvantaged areas within the EU, are currently covered by Guidelines on national regional aid for 2007-2013 (2006/C 54/08).

The Community framework for state aid for R&D and innovation (2006/C 323/01) governs aid direct to strengthen the scientific and technological base of the EU industry. Horizontal environmental aid measures are covered by Community guidelines on state aid for environmental protection (2008/C 82/01) and by Guidelines on certain state aid measures in the context of the greenhouse gas emission allowance trading scheme post-2012 (2012/C 158/04). Community guidelines on state aid for rescuing and restructuring (2004/C 244/02)¹³⁶ are another horizontal tool set on the basis of art. 107(3). Finally, also risk capital investment in SMEs which may have insufficient access to capital markets, in particular at their earlier growth stages, is governed by two *ad hoc* communications of the Commission (2006/C 194/02, amended by 2010/C 329/05).

Under the existing state aid regime, the aluminium sector faces no sector-specific rules. Like any other sector, it may benefit from state support measures that contribute to the EU 2020 objectives, e.g. R&D and innovation, training and employment aid, SME aid, aid to increase environmental protection. For instance, in some Member States the aluminium sector has benefited from exemptions from environmental and energy taxes, from state aid for energy efficiency measures, and from aid to go beyond EU environmental standards.

Environmental aid

Based on rules established by Community guidelines on state aid for environmental protection (2008/C 82/01), aluminium producers can have access to aid measures aiming at promoting environmental protection - without adversely affecting trade between member states to an extent contrary to the EU common interest.

According to the Guidelines, “[t]he primary objective of State aid control in the field of environmental protection is to ensure that State aid measures will result in a higher level of environmental protection than would occur without the aid and to ensure that the positive effects of the aid outweigh its negative effects in terms of distortions of competition, taking account of the polluter pays principle”.¹³⁷ The possibility to grant environmental aid allows balancing the requirements of environmental protection with competition rules, thus promoting sustainable development.

An aid is deemed lawful if it is appropriate, proportional – i.e. the same result cannot be achieved with lower aid -, and if it has an incentive effect. The latter criterion implies that the company to which the aid is granted changes its behaviour because of the aid, i.e. that it would not undertake the same environmental protection measure, absent the aid. ¹³⁸

¹³⁶ The application of these guidelines has been extended by Communications 2009/C 156/02 and 2012/C 296/02 until new rules will be enacted following the ongoing discussions on the EU state aid regime modernization.

¹³⁷ Community guidelines on state aid for environmental protection (2008/C 82/01); § 6.

¹³⁸ *Ibid.*, § 16; 27.

Environmental aid measures are appropriate if they: i) provide positive incentives for undertakings to carry out activities or make investments which are not mandatory and would otherwise not be undertaken by profit-seeking companies; or ii) enable member states to adopt national environmental regulation going beyond Community standards, preventing a disproportionate loss of competitiveness.¹³⁹ The latter criterion is an exception as it considers loss of competitiveness as an objective of common interest, and therefore as a lawful ground for appropriate state aid.

The following categories of environmental aid are particularly relevant for the aluminium sector:

- Aid for undertakings which go beyond community standards or which increase the level of environmental protection in the absence of community standards;
- Aid for early adaptation to future community standards;
- Aid for energy saving;
- Aid involved in tradable permit schemes;
- Aid in the form of reductions of or exemptions from environmental taxes.

In 2012, the Commission has adopted a Communication on the modernisation of the EU state aid regime.¹⁴⁰ Within such a process, the Environmental State Aid Guidelines are also to be reviewed. To this aim, the Commission has published a Consultation Paper for notice and comments.¹⁴¹ Therein, the Commission is considering expanding the scope of the Guidelines to cover both environmental and energy policy interventions. The new Guidelines will be updated to reflect the current challenges for environmental and energy policies, e.g. as far as RES, network stability and generation adequacy are concerned. Furthermore, the Commission states that it may be necessary to consider the impact of increasing energy system costs on the competitiveness of certain undertakings.¹⁴²

State aid to compensate for increases in electricity price due to ETS

The ETS Directive (Directive 2003/87/EC as subsequently amended)¹⁴³ allows for special and temporary aid measures: i) aid to compensate for increases in electricity prices resulting from the inclusion of the costs of ETS allowances; ii) investment aid to highly efficient power plants; iii) optional transitional free allowances in the electricity sector in

¹³⁹ *Ibid.*, § 26.

¹⁴⁰ Communication from the Commission EU State Aid Modernisation, 8.5.2012, COM(2012)209.

¹⁴¹ European Commission, DG Competition, Environmental and Energy Aid Guidelines 2014-2020, Consultation Paper, 11.3.2013.

¹⁴² *Ibid.*, p. 2.

¹⁴³ Directive 2003/87/EC has been amended by Directive 2004/101/EC, Directive 2008/101/EC, and Directive 2009/29/EC, the so-called “ETS third phase directive”, through which the provisions on special and temporary aid were added.

some member states; and iv) the exclusion of certain small installations from the EU ETS. Detailed rules on state aid permissible under the ETS directive were laid down in the Commission Guidelines on certain state aid measures in the context of the greenhouse gas emission allowance trading scheme post 2012 (2012/C 158/04), generally applicable to costs incurred by undertakings as from January 2013.

The aluminium sector is affected by the first set of measures, i.e. those governing aid to companies in sectors deemed to be exposed to a significant risk of carbon leakage due to EU ETS allowance costs passed on in electricity prices, the so-called “indirect ETS costs”. Annex II to the Guidelines includes aluminium production among the sectors concerned.¹⁴⁴

In providing Guidelines for these aid measures, the Commission aims at achieving three objectives: i) minimising the risk of carbon leakage; ii) preserving the EU ETS price signal to spur cost-efficient decarbonisation; iii) minimising competition distortions in the internal market. As a result, aid measures can be granted, but have to fall short of the full costs of ETS allowances in electricity prices and be based on efficient benchmarks;¹⁴⁵ and the aid has to decline over time.¹⁴⁶ These two features are deemed pivotal to avoid aid dependency and preserve both long-term incentives to internalize environmental externalities and short-term incentives to switch to less polluting production technologies.

Although the Commission guidelines are crafted to address the risk of carbon leakage and to minimise distortions in the internal market, state aid to compensate “indirect ETS costs” may have unintended consequences in terms of creating an even playing field “in particular whenever undertakings in the same sector are treated differently in different Member States due to different budgetary constraints.”¹⁴⁷ In the context of the current sovereign-debt crisis (and of the related austerity measures), national finances may have no room for compensation, thereby putting at risk the objective of fighting carbon leakage. Should financially-constrained countries be unable to fund state aid measures to compensate indirect costs of ETS, the aluminium producers located therein may experience a competitive disadvantage *vis-à-vis* other EU and third country smelters.¹⁴⁸

¹⁴⁴ NACE code v.1.1 27.42 (equivalent to NACE code v.2 24.42).

¹⁴⁵ Special formulas to calculate the annual aid amount are provided in sub-section 3.1 (2012/C 158/04).

¹⁴⁶ “The aid intensity must not exceed 85% of the eligible costs incurred in 2013, 2014 and 2015, 80 % of the eligible costs incurred in 2016, 2017 and 2018 and 75 % of the eligible costs incurred in 2019 and 2020” (Guidelines on certain state aid measures in the context of the greenhouse gas emission allowance trading scheme post 2012, § 26).

¹⁴⁷ *Ibid.*, § 8. The Commission reported to be in informal contacts with several Member States willing to grant the scheme. At the time of writing, one compensation scheme (proposed by the United Kingdom) had been approved. Two other schemes, from the Netherlands and Germany, have been submitted.

¹⁴⁸ Indirect ETS costs amount to about €120-160 per tonne of aluminium (for the primary smelters which are not shielded from them e.g. through long-term contracts or self-generation).

8.1.2 *State aid granted to the aluminium industry between 2002 and 2012 in the EU*

In the EU, the majority of national state aid is granted under framework schemes, i.e. either under schemes approved by the Commission or under schemes exempted from the notification obligation in compliance with GBER. In 2011, state aid granted under the block exemption and through notified schemes represented around 88% of total aid granted.¹⁴⁹

According to the State Aid Scoreboard, between 2002 and 2011, non-crisis state aid measures in the EU (excluding aid to railways) reached about € 753 bln. In particular, € 411 bln (around 55% of the total) were channelled towards the manufacturing sector.¹⁵⁰

Aid under scrutiny by the Commission

Based on the Commission online tool “Search Competition Cases”,¹⁵¹ it is possible to list state aid cases under scrutiny by the Commission during the period 2002-2012. Nine cases concerning the aluminium sector could be retrieved and are reported in Table 35.¹⁵²

Out of the nine cases, five concern preferential electricity tariffs granted to aluminium producers (and other industries) in Greece, Italy, and Romania (still pending). In four of these cases, preferential tariffs which were pushing electricity prices under market level were considered unlawful and recovery was mandated. In Italy, preferential electricity tariffs for aluminium producers are no longer in place, following the closure of the two primary smelters previously operating in Fusina and Portovesme. In two cases, state aid measures were granted to Alcoa plants in Galicia for fuel switching, and both measures were considered compatible with EU law. The remaining cases concern the reduction of the UK climate change levy granted to aluminium producers and steel makers; and a training programme notified by the Belgian government.

¹⁴⁹ Report from the Commission, State Aid Scoreboard - Report on State Aid Granted by the EU Member States, COM(2012) 778 final.

¹⁵⁰ No information amount at a level of disaggregation sufficient to identify aid for the aluminium industry is reported in the State Aid Scoreboards.

¹⁵¹ “Search Competition Cases” by the European Commission is available online at: http://ec.europa.eu/competition/elojade/isef/index.cfm?clear=1&policy_area_id=3 (last accessed on 19 June 2013).

¹⁵² Cases have been retrieved by setting as fixed search parameters: i) state aid; and ii) a decision date between 1st January 2002 and 31 December 2012. Then, the following additional parameters were considered: NACE Code 24.42; 24.4; name of the case “aluminium”, “alumin”; names of several aluminium companies.

Table 35 List of state aid notified to/registered by the Commission over the period 2002-2012

#	Number	MS	Last Decision Date	Title	Outcome	Amount
1	XT30/2004	BE	-	Corus Aluminium N.V.	Notification only	0.09
2	C38a/2004	IT	19.11.2009	Preferential electricity tariff in favour of Alcoa	Negative + Recovery	n.a.
3	N624/2009	ES	14.12.2009	Aid to fuel switching for Alcoa Galicia	Positive	1.00
4	N501/2010	ES	17.12.2010	Aid to fuel switching for Alúmina Española SA (ALCOA) – Galicia	Positive	0.99
5	SA.15390	IT	23.02.2011	Preferential electricity tariff in favour of Portovesme, ILA and Euroallumina.	Negative + Recovery	n.a.
6	SA.20850	IT	23.03.2011	Preferential electricity tariff – Alcoa	Negative + Recovery	12.85
7	SA.26117	GR	13.07.2011	Alleged aid to Aluminium of Greece	i) Positive; ii) Negative + Recovery	17.4
8	SA.31349	UK	04.04.2012	Climate Change Levy reduction for metal recycling activities	Positive	9.5mln GBP/ year
9	SA.33624	RO	25.04.2012	Preferential electricity tariffs for ALRO Slatina - Romania	Pending	n.a.

Note: Amount in € mln where not otherwise specified. Source: “Search Competition Cases” (data extracted on 19 June 2013).

Aluminium makers have also benefited from non-sector specific state aid, such as aid and exemptions granted to energy intensive industries and to pollutant production process emitting CO₂ and NO_x. Over the period 2002-2012, according to the “Search Competition Cases” engine, nine measures targeting energy intensive producers, five on NO_x emitters, and 19 on CO₂ emitters were under scrutiny by the Commission.

8.2 Antitrust law and the aluminium sector

8.2.1 Antitrust law in the EU: agreements/concerted practices, abuse of dominant positions, and merger control

Antitrust law in the EU is based on the provisions included in two articles of the TFEU, and on the Merger Control Regulation:

- Art.101 TFEU covering agreements, concerted practices, and decisions by associations of undertakings;
- Art.102 TFEU covering abuses of dominant position.

The enforcement of these articles is governed by Council regulation (EC) No 1/2003, which entered into force on 1st May 2004. This regulation, *inter alia*, provides procedural rules and defines powers of the Commission, of national courts, and of national competition authorities, especially obliging national bodies to apply articles 101 and 102 whenever they deal with cases which may affect trade between member states.

In addition, merger control in the EU is governed by Council regulation (EC) No 139/2004 which applies to mergers and acquisitions with a community dimension (based on turnover thresholds) and aims at avoiding that concentrations between undertakings hamper effective competition in the internal market or in a substantial part of it. Prior notification of concentrations above the thresholds is required, and the Commission is in charge of assessing the compatibility of the notified cases with the good functioning of the common market. Concentrations below the thresholds are dealt with by national competition authorities.

8.2.2 Agreements, abuses of dominant position, and notified mergers in the aluminium industry between 2002 and 2012 in the EU

No cartels or abuses of dominant position have been investigated in the aluminium industry over the last decade. Only two cases marginally concerned aluminium products or production equipments. In 2003, the Commission cleared the Austrian collective scheme for the disposal and recycling of packaging waste – including aluminium packaging – considering that it did not hamper competition in the single market.¹⁵³ More recently, Rio Tinto Alcan offered commitments to close a case which concerned the tied sale of aluminium smelters technologies, a product market where Rio Tinto Alcan has been preliminarily considered as dominant, with handling equipments for aluminium smelters.¹⁵⁴ Investigations had been opened in 2008, and in 2012 commitments were offered concerning the possibility for smelters to buy handling equipments from third-party suppliers.

The “Search Competition Cases” engine sorts 19 cases, when adopting as parameters i) mergers; ii) a decision date between 1st January 2002 and 31 December 2012; and iii) the NACE rev.2 code 24.4 and 24.42. Other cases were retrieved by searching for the keywords “aluminium” and “alumin”. Over the period 2002-2012, 16 selected mergers out of 19 were deemed fully compatible with the common market (see Table 36), and no remedies were required; in one case, namely Alcan’s acquisition of Pechiney in 2003, remedies were required for the clearance of the mergers. Remedies consisted i.a. in divestments and licensing commitments. In two cases, applicants withdrew the notification.

The fact that in the period 2002-2013 only one merger out of 19 was initially deemed incompatible¹⁵⁵ with the common market can be a symptom of the low level of concentration of the various product markets of the aluminium sector. Indeed, mergers are assessed over numerous product markets, depending on the different stages of the value chain (e.g. alumina, primary aluminium, finished products) under examination. At each stage, more product markets can co-exist, depending on product quality, usage, or shape. For example, different product markets for primary aluminium are defined, depending on

¹⁵³ Case No. 35473, “Argev” (ex EFTA 0042), closed on 16.10.2003

¹⁵⁴ Case No. 39230, “Rio Tinto Alcan”, opened on 20.02.2008; final commitments published on 28.01.2013.

¹⁵⁵ Note that the merger at stake has been declared compatible following the implementation of remedies.

purity levels and shapes of the semi-finished products. Concerning the geographical market definition, upstream markets, i.e. up to primary aluminium, are considered wider than the EEA, and hence global or close to global. Geographical markets for finished products are either EEA-based, or global for some specific products (e.g. aerospace products).¹⁵⁶ In a recent case, a joint venture between Orkla and Norsk Hydro,¹⁵⁷ the Commission raised serious doubts on the EEA-wide geographical dimension of the relevant markets for extruded products, for which a Nordic (Norway and Sweden) market could be defined. However, the geographical segmentation seems to concern only the Scandinavian region; in any case, the question is left undecided.

This may not have been the case in the upstream market for aluminium raw materials. In 2008, the Commission had opened an in-depth investigation on the proposed acquisition of Rio Tinto by BHP Billiton.¹⁵⁸ Such a merger would have led to a high level of concentration in the markets for several commodities (iron ore, uranium, bauxite, mineral sands), which may have been deemed incompatible with the common market. However, given the deteriorating financial market conditions, the proposed merger was unilaterally withdrawn, and hence no assessment was published by the Commission.

Table 36 List of merger notified to the Commission over the period 2002-2012

#	Case Number	Decision date	Title	Outcome
1	M.2720	13.03.2002	Alcoa / Elkem	Withdrawn
2	M.2702	04.03.2002	Norsk Hydro / Vaw	Non-opposition
3	M.1715	29.09.2003	Alcan / Pechiney (II)	Approval with remedies
4	M.3170	29.01.2004	Sapa / Remi Claeys Aluminium	Non-opposition
5	M.4205	16.06.2006	Aleris International / Corus Group	Non-opposition
6	M.4441	01.02.2007	En+ / Glencore / Sual / Uc Rusal	Non-opposition
7	M.4524	23.02.2007	Nemak / Hydro Castings	Non-opposition
8	M.4500	28.04.2007	Nemak / Tk Aluminium "A"	Non-opposition
9	M.4605	08.06.2007	Hindalco / Novelis	Non-opposition
10	M.4864	13.09.2007	Dubal / Mubadala / Emal Jv	Non-opposition
11	M.4840	28.09.2007	Fiat / Teksid Aluminium	Non-opposition
12	M.4827	02.10.2007	Rio Tinto / Alcan	Non-opposition
13	M.4985	26.11.2008	Bhp Billiton / Rio Tinto	Withdrawn
14	M.5459	02.03.2009	Alcoa / Elkem	Non-opposition
15	M.5465	02.03.2009	Orkla / Sapa	Non-opposition

¹⁵⁶ For a comprehensive review of the different relevant markets in the aluminium sector, see Case No COMP/M.4827, Rio Tinto / Alcan, 02.10.2007. Even though this case concerned a merger between two major players of the aluminium sector, many relevant markets show such a low level of concentration that product and geographical definitions are mostly left open.

¹⁵⁷ This case is the second merger in the aluminium sector for which remedies were required from 2002 onwards. Cf. Case No COMP/M.6756 - Norsk Hydro/ Orkla/ JV.

¹⁵⁸ Case No. M.4985, BHP Billiton / Rio Tinto, notified on 30.5.2008; withdrawn on 26.11.2008.

16	M.5653	11.11.2009	Gda / Furukawa-Sky / Mitsui / Jv	Non-opposition
17	M.5816	18.05.2010	Oaktree / Aleris	Non-opposition
18	M.5906	18.06.2010	One Equity Partners / Constantia	Non-opposition
19	M.5919	21.10.2010	Apollo / Alcan	Non-opposition

Source: “Search Competition Cases” (data extracted on 19 June 2013)

8.2.3 Long-term contracts for electricity

The aluminium industry is highly energy intensive and electricity plays a pivotal role as an input, in particular for the production of primary aluminium. According to CRU data, power costs represent about one third of total costs of production.¹⁵⁹ An appropriate strategy for energy portfolio management aimed at securing the supply of the required electricity at competitive and stable prices over a sufficiently long time horizon is, in the stakeholders’ view, a fundamental element for the viability of aluminium production. Besides, the industry considers stability of the electricity price as a necessary (albeit not sufficient) condition for investment planning, both concerning greenfield investments and, more relevant for the EU market, brownfield refurbishment and retrofitting of existing plants.

In order to soften the impact of the volatility of electricity prices, aluminium producers have three options for their energy strategy:

- Signing long-term contracts with electricity suppliers;
- Investing in productive capacity of electric power;
- Trading in the energy derivatives market.

The second option is very capital intensive.¹⁶⁰ However, given that electricity is one of the two main costs for primary aluminium producers, historically several smelters in Europe had their own electricity generator. Others have considered investing in a power plant, either directly or through a consortium, albeit plans have been postponed due to the financial crisis and because of the uncertainties of the electricity market and regulatory framework. The third option is currently limited because of the shallow liquidity of electricity markets. As for signing long-term contracts, EU competition law may limit the feasibility of the first option as far as electricity suppliers holding a dominant position in a relevant market are concerned.

Long-term contracts are not *per se* forbidden by EU competition law. Nevertheless, when concluded by a dominant undertaking, these contracts might be forbidden under art. 102 TFEU if they have the effect of foreclosing the relevant downstream market for the supply of electricity, acting as a strategic barrier to entry and/or expansion. Indeed, this anticompetitive effect depends on the market scope, the duration, and the nature of those

¹⁵⁹ See Section 2.2 above.

¹⁶⁰ CRU estimates that investment in own generation can increase capital expenditures by 50%.

supply contracts. On the contrary, when non-dominant electricity suppliers conclude long-term contracts, they can be presumed compliant with competition law, unless there is a cumulative effect resulting from similar behaviour by multiple suppliers (to be assessed under art. 101 TFEU).

A limitation on long-term contracts entered into by dominant suppliers exists to prevent the foreclosure of the electricity market. Market foreclosure is to be prevented to the benefit of all consumers, including the industrial consumers which would themselves enter into a long-term contract. Indeed, once the market is foreclosed, the monopolist is free from competitive constraints and can impose higher prices. Notwithstanding the rationale of this prohibition, the limitation for European aluminium producers, as well as any other energy intensive industries, to the freedom to enter into long-term contracts with certain clauses and under certain market configurations is a competitive constraint, which is absent in some other world regions. Acknowledged the rationale of this limitation, and according to the methodology of this report, the analysis that follows addresses the impacts of this legal framework only on the aluminium sector, rather than on the whole economy.

The first case on long-term energy contracts concerns the Belgian gas market for large industrial customers, the so-called Distrigaz case.¹⁶¹ In 2004, Distrigaz and its connected undertakings controlled between 70 and 80% of the relevant market of high-calorific gas for large industrial customers; hence it was considered as holding a dominant position. In this market configuration, the concern of the European Commission was that “the effect of these long-term contracts could be to foreclose the market to alternative suppliers and therefore hinder the development of competition following liberalisation of the gas sector.”¹⁶² Two practices were particularly sources of concern, i.e. the foreclosure of the market and resale restrictions. The latter were unilaterally removed by Distrigaz before receiving the Statement of Objections, and removal was subsequently confirmed through remedies; the former was resolved through a series of remedies accepted by the Commission. In a nutshell, Distrigaz committed to: i) ensure that each year on average 70% of the customers in the relevant market return to the market; ii) not to conclude contracts longer than 5 years with industrial customers; iii) to amend existing contracts longer than 5 years with industrial customers, including a free opt-out clause for the customer.

Long-term electricity contracts were later dealt with in the so-called EDF case.¹⁶³ EDF is the incumbent operator in the French market for the supply of electricity to large industrial and commercial customers. By investigating the supply contracts concluded by EDF with some French industrial customers, the Commission identified a potential abuse of dominant position (under art. 102 TFEU). In particular, contracts bound a significant part of the relevant market, were long-term, and included *de jure* (exclusivity clauses) or *de*

¹⁶¹ Case COMP/B-1/37966 – Distrigaz, 11.10.2007.

¹⁶² Case COMP/B-1/37966 – Distrigaz, 11.10.2007, § 5.

¹⁶³ Case COMP/39.386 – Long-term contracts France, 17.03.2010.

facto (through a set of clauses, such as take-or-pay schemes) exclusivity, thus foreclosing competition and preventing newcomers to enter or expand in the market for the supply of electricity to large industrial customers. Furthermore, resale restrictions were added to the contracts with a detrimental effect on the development of the wholesale electricity market.

In reply to the Commission's objections, EDF offered commitments: i) to give other competitors a chance to conclude a contract with EDF's industrial customers by returning substantial volumes to the market every year; ii) to avoid a cream-skimming strategy by the incumbent, i.e. to secure more profitable large industrial customers; iii) to allow customers to purchase energy from two suppliers at the same moment. *Inter alia*, EDF committed itself to limit the duration of contracts without opt-out options for customers to 5 years. EDF also offered to delete resale restriction clauses and to provide support to customers who intend to resell the purchased electricity in the wholesale market. Finally, the Commission accepted and made legally binding the commitments submitted by EDF.

The EDF case shows the importance of a case-by-case evaluation of long-term contracts, concluded by dominant electricity suppliers, based on the assessment of the scope, nature and duration of the contract, as well as the underlying market structure. In light of this case, it can be presumed that energy suppliers – even dominant – are generally allowed to conclude long-term contracts up to 5 years and even longer, provided that these contracts include free opt-outs for customers (at least every five years).

The question shifts then from competition law to business strategy, i.e. whether electricity producers have any incentive to offer long-term contracts subject to the above mentioned commitments. Long-term contracts for energy intensive industries present a counterfactual dilemma which the research team has not been able to solve, that is whether in the absence of competition policy limitations electricity producers would offer long-term contracts. Or, to the contrary, in the current regulatory and market framework for electricity generation and sale, long-term contracts, which used to be very common in the regulated days, are *de facto* not feasible because electricity producers cannot, or do not want to, bear themselves the market and regulatory risks, independently from the competition law framework.

Contracts, be they long-term or short-term, are an instrument through which parties allocates risks and rewards. How risks and rewards are allocated has an impact on the value of the contracts for both parties. If the clauses required making a contract compliant with competition law changes this allocation, this may change the incentives of the parties to enter into such a contract. If some of the commitments prescribed by the “EDF case” lower the economic value of such contracts, this is going to impact on the decision of electricity producers to enter into long-term agreements. For example, unilateral opt-outs are hardly juicy options for producers, as one of the main benefit of long-term deals that is stability, is enjoyed by customers, but not by the producers themselves. At the same, the prohibition of resale restrictions, which could prevent arbitrage, may make it more difficult

for the incumbent generator to carry out price discrimination.¹⁶⁴ Hence, Competition policies may be facing a trade-off between preventing market foreclosure and forcing contractual parties into adding certain clauses which lower the value of the contract for one of the two parties. Protecting customers, be they professionals or consumers, comes at a cost, and this cost may result in higher electricity prices or less favourable contractual conditions.¹⁶⁵

Long-term contracts are clearly an issue for aluminium producers. These contracts are possible under current EU competition law, under the conditions set out in the EDF and Distrigaz cases, albeit only a case-by-case assessment is possible. Indeed, the Commission acknowledged that “[d]ownstream bilateral supply agreements provide an opportunity to energy intensive industries to obtain more predictable prices” while at the same time they “risk foreclosing the downstream market”. To better explain as these two competing interests may be balanced, in 2007 the Commission announced, in order “to reduce uncertainty in the market”, that it would “provide guidance in an appropriate form on the compliance of downstream bilateral long-term supply agreements with EC competition law.”¹⁶⁶ In the recent “Action Plan for a competitive and sustainable steel industry in Europe”, the Commission states that it is “prepared to issue a Guidance Letter” upon request by the industry.¹⁶⁷ Indeed, such guidance would clear out the dilemma of whether electricity producers resist long term contracts on their own business considerations, or because of a cautious approach towards a competition-sensitive issue. This is especially important at the present moment, considering that these two cases concerned countries with a strong concentration of energy markets; and that the additional grid interconnections among formerly separated national electricity markets may result in a different assessment of the geographic dimension of the relevant market (e.g. along the

¹⁶⁴ Price discrimination is indeed what industrial customers want: as they are bulk base load consumers, they would like to get consequently lower prices. However, in the absence of resale restrictions, large industrial customers may, e.g. in times of low product demand or high (peak) electricity price, resell electricity, thus competing with the electricity producer. Thereby, without the possibility of introducing a binding re-sale prohibition, the producer might increase the price of electricity sold to industrial customers in order to make the option to resell electricity in the wholesale market less attractive. Or, at one extreme, the producer may charge all consumers the same price, to avoid arbitrage. Price discrimination is a “strange animal” in competition economics. On the one hand, it increases the monopolist’s profits; on the other, it can also increase social welfare.

¹⁶⁵ See *i.a.* Van den Bergh, R.K. (1997) ‘Wer schützt die europäischen Verbraucher vor dem Brüsseler Verbraucherschutz? Zu den möglichen adversen Effekten der europäischen Richtlinien zum Schutze des Verbrauchers’, in C. Ott and H.-B. Schäfer (eds.) *Effiziente Verhaltenssteuerung und Kooperation im Zivilrecht* (Tübingen; Mohr Siebeck).

¹⁶⁶ Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/54/EC concerning common rules for the internal market in electricity, 19.9.2007, COM(2007) 528.

¹⁶⁷ Communication from the Commission, Action Plan for a competitive and sustainable steel industry in Europe, 11.6.2013, COM(2013)407. Issuing of guidance is possible if the conditions laid out in a Commission’s notice are respected. Cf. The Commission’s notice on informal guidance relating to novel questions concerning Articles 81 and 82 of the EC Treaty that arise in individual cases (informal guidance), OJ C 101/78, 27.4.2004.

supra-national markets considered by the Guidelines on compensation for indirect ETS costs).

9 Energy Policy

This Chapter first compares electricity prices across the world and within Europe. Then, the impact of selected EU legislation on the energy prices paid by aluminium producers is discussed.¹⁶⁸ As mentioned, power price is one of the two most important cost components of primary aluminium production, together with the price of alumina. On average, electricity costs represent one third of total costs for aluminium smelters.¹⁶⁹ Given a global average electricity intensity of 15 MWh/tonne of aluminium, each additional €/MWh translates into additional 15 €/tonne of aluminium, which corresponds to about 1% of total costs.

For this Chapter the relevant sample consists of 11 primary aluminium producers. All have been interviewed. Where data were missing, we relied on the CRU dataset and other secondary sources.

9.1 Comparison of electricity prices

This Section first explains the fundamentals of electricity price formation. Then, it presents the average price of electricity paid by industrial consumers in the EU and compares it to the prices paid by their counterparts in other areas of the world. The Section then takes a closer look at the EU, providing an intra-EU comparison of electricity prices for industrial consumers among the countries where the plants belonging to the selected sample are located.¹⁷⁰

9.1.1 Fundamentals of electricity price formation

Notably, the cost of generating electricity varies depending on which generation technology is used. As the short-run marginal costs of fossil-fuel fired power plants often set the electricity price in liberalised electricity markets,¹⁷¹ the cost of fossil fuels (generally coal or gas) plays a key role in the price formation. As a consequence, the price of energy commodities has a significant impact on the cost of electricity. Irrespective of country-

¹⁶⁸ The focus of this Chapter is on energy prices paid by aluminium producers; household prices are not reported.

¹⁶⁹ CRU (2012). Costs exclude depreciation and interests. The actual share may vary slightly from year to year depending on the relative price of electricity and other production factors.

¹⁷⁰ These countries are: Germany, Spain, Italy, France, the Slovak Republic, Romania, Greece, and the United Kingdom.

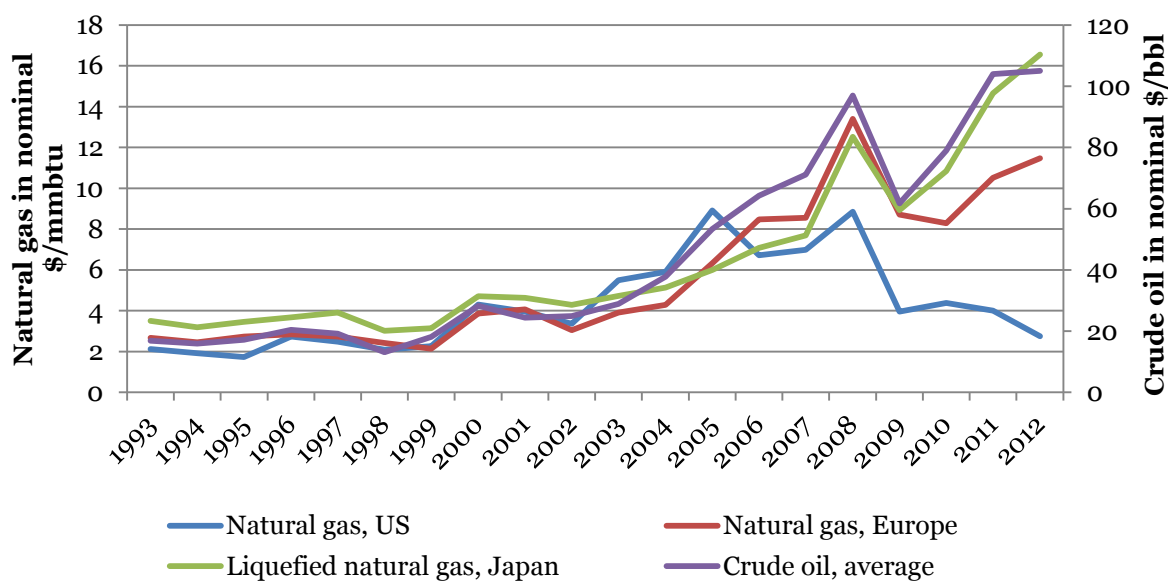
¹⁷¹ In the energy-only market model, sources of power generation are dispatched according to their short-run marginal costs. The most expensive generation unit needed to meet demand determines the market clearing price. All dispatched generation units except the marginal power plant earn infra-marginal rents, allowing producers to cover fixed costs and invest in new generation capacity. In most European power markets, either coal or natural gas is generally the most expensive unit most of the time. At times when other forms of generation with low short-run marginal costs (e.g. nuclear, hydro and especially solar and wind) are able to meet demand, electricity prices are significantly lower and may even be negative.

specific energy policies and market structures, regional differences in the price of energy commodities thus lead to significant electricity price differentials across the world.¹⁷²

The most relevant commodity prices are those of coal, natural gas and oil. Oil is no longer directly relevant for electricity price formation in most developed countries, as oil-fired generation capacities are generally only used in emergency situations. However, as natural gas prices are frequently (though decreasingly) indexed to the oil-price, this oil-gas price linkage means that the oil price is still relevant.

Figure 60 shows natural gas price developments from 1993 to 2012, in comparison with the oil price. From the 1990s to 2007/2008, prices for US, EU, and Japanese natural gas were increasing almost in parallel, and also in line with the oil price. As prices are reported in nominal US dollars, the general increasing trend is partly due to inflation. As a result of the unexpected shale gas revolution in the United States, US natural gas prices have since fallen to 1990 levels. Recall that these figures are in nominal terms, so in real terms US gas prices are even lower than 20 years ago. US have also decoupled from the oil price. In the EU, by contrast, gas prices have been three to four times higher than in the US as of 2009, and are not yet fully decoupled from the oil prices. Japanese LNG import prices are even higher than in Europe and still linked to the oil price.

Figure 60 Natural gas and oil prices, 1993-2012

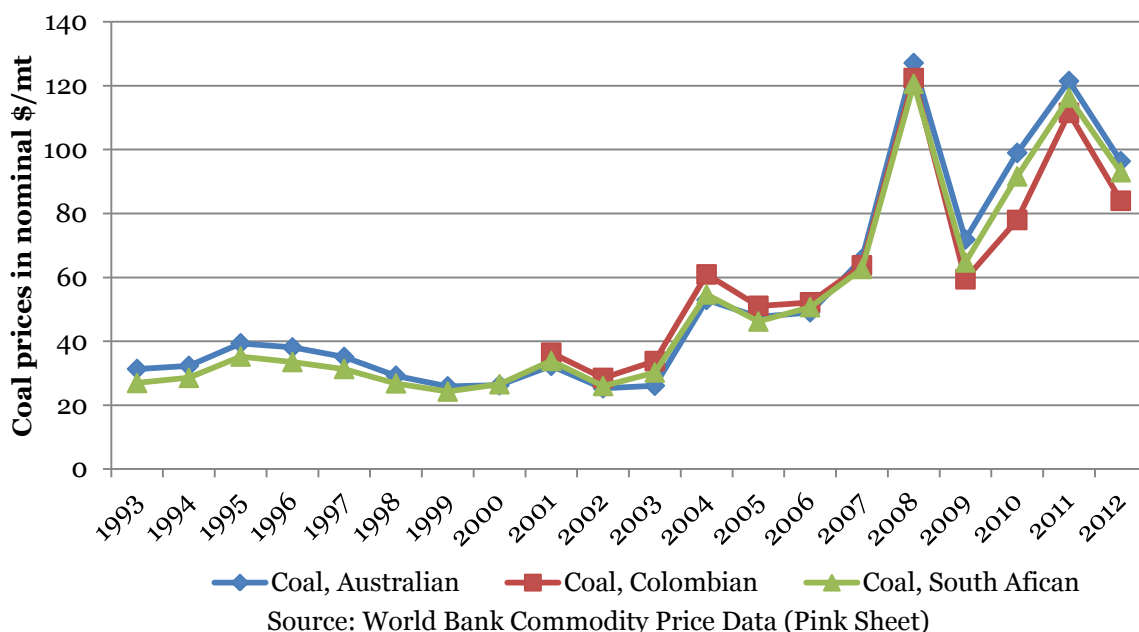


Source: World Bank Commodity Price Data (Pink Sheet)

¹⁷² Commodity and electricity prices are not directly linked in countries with regulated or (cross-) subsidised electricity prices. However, even in those situations, the price of the commodities is non negligible as it determines the extent to which subsidies (or other forms of government intervention) are needed. The higher the cost of electricity generation, the less sustainable are support policies, especially in situations when public budgets are constrained and ageing generation fleets require reinvestments. Also, aluminium producers sometimes dispose of their own generation facilities.

Figure 61 provides an overview of coal price developments from 1993 to 2012. As CO₂ prices are currently either non-existent (most of the world) or very low (EU), coal is currently a highly competitive source of power generation in many parts of the world, despite its significant carbon footprint. An exception is the US where the low gas prices, in connection with environmental regulation, imply that natural gas is increasingly replacing coal in power generation. US coal producers are forced to export their coal to other markets, putting downward pressure on the price of coal in other parts of the world. This development is particularly visible in the EU, where the spread between coal and gas prices and low CO₂ prices are increasingly pushing natural gas-fired power plants out of the merit order.¹⁷³

Figure 61 Coal Prices, 1993-2012



Box 3 Issues in today's European electricity markets

The EU internal energy market for electricity and gas is yet to be completed and energy policy is still heavily influenced by national objectives. As a consequence, the various national electricity markets have different issues. Therefore, the analysis provided below touches on some of the common issues in today's wholesale electricity markets.

In general, liberalisation can be seen as the main driver for the transformation of the European power sector. Especially during the last decade, the increasing share of renewable electricity generation (RES-E) has become another major driver for change. The deployment of RES-E is promoted by dedicated support schemes (e.g. feed-in tariffs) designed to incentivise the investment in renewable energy technologies. In some EU countries, these support schemes have been a major success as reflected by the high pace of development. For example, Germany was able to increase the installed capacity of wind power by 20 GW in 10 years. Generally, the focus of existing energy policy has been to support RES-E growth and provide a secure investment framework for RES-E.

¹⁷³ Natural gas is about half as carbon intensive as coal.

But it has not been successful at controlling this growth and its cross-border effects (e.g. loop flows). This has greatly affected wholesale electricity markets and the investment environment for non-RES technologies. It should be also noted that RES schemes have generated costs for consumers (both households and industry), and that these costs are not uniform across the member states, as explained in greater detail below.

A major part of current RES-E is based on wind and solar power, which – in contrast to fossil fuel fired power plants – have negligible variable costs. As a result, renewables have been pushing conventional generation units out of the market and have therefore been reducing their capacity utilisation. This is especially the case for gas-fired units but is also increasingly affecting coal-fired units. Known as the merit-order effect, this has led to lower wholesale power prices (Sensfuss et al. 2008). At the same time, the market value of RES-E has decreased as grid-operators trade renewable electricity on wholesale markets. Consequently, this has provided for rising RES support costs. The long-term effect of RES-E on wholesale market prices is not yet clear (see Section 9.2.2).

The main issue here is the uncertainty about the future development of RES-E. As a result, there is uncertainty about the amount and the type of conventional capacity that is needed to maintain the current level of security of supply. Ultimately, more flexibility will be required to integrate renewables into markets and grids. As there are other flexibility options (e.g. a better interconnection between the various member states, energy storage or the development of demand response), this creates additional uncertainty about the required conventional capacity. Moreover, due to the decreasing level of wholesale electricity prices, profit margins for power producers are in decline. Consequently, it is not surprising that generators are currently showing reluctance to invest in new power plants. There is a general debate about the need for capacity remuneration mechanisms to create a more favourable investment environment for conventional power plants. If put into practice, this would likely create another cost component on the consumers' electricity bills.

This high level of uncertainty makes it very challenging to predict long-term electricity prices, which are determined by wholesale market prices, levies (e.g. for RES-E and possibly capacity payments), grid fees and taxes.

9.1.2 Intra-EU comparison of industrial electricity prices

The prices of electricity vary not only throughout the world, but also among EU member states. As mentioned above, understanding what aluminium producers actually pay for their electricity consumption may be difficult. The analysis provided below is thus based on different sources, namely Eurostat data, the data provided by CRU and other secondary sources, and those retrieved via interviews to the facilities included in our sample.

Eurostat data for industrial consumers with an annual consumption superior to 150,000 MWh is not available for all of the countries under scrutiny. Moreover, this consumption band is hardly representative of the level of consumption of a primary aluminium smelter. Hence, CRU data are resorted to as the main data source for comparison of electricity price. To better understand the impact of national policies, we have also analysed to the extent possible with available data the different components of the energy prices (e.g. transmission costs, RES-E levies etc.) based on information retrieved from the interview

and validation through secondary sources (including norms and regulation, interviews with public authorities, and scholarly research).

Since the impact of the EU on the level of energy taxation in the case of energy products and electricity use for metallurgical process is negligible, it falls outside the scope of this Study, albeit some member states do impose excise taxes on electricity used for metallurgical processes.¹⁷⁴

In Figure 62 below, we provide the data on electricity prices delivered at plant retrieved from the interviews and from the CRU database.¹⁷⁵ The aluminium smelters included in the sample pay on average 57.4 \$/MWh (44.7 €/MWh).¹⁷⁶

However, given that the standard deviation is very large, at 25.3 \$/MWh, the mean value is not very informative. The highest cost smelter paid (as it is closed now) for electricity more than five times what the lowest cost smelter is paying. The high variance is due to the fact that the sample is essentially split in two groups: the low cost smelters and the high cost smelters. Low cost smelters, grouped in subsample 1, are those with self-generation facilities and those procuring electricity through old long term contracts. High cost smelters, grouped in subsample 2, are those procuring electricity on the market. The mean cost of electricity in subsample 1 is 31.3 \$/MWh (24.3 €/MWh); the mean cost of electricity in subsample 2 is 71.9 \$/MWh (56 €/MWh), that is 230% higher.

The main difference explaining cost differentials lies in how and when electricity is purchased. Low cost smelters are those which have their own generation, or that are still in a long-term electricity contract signed in the pre-liberalisation phase and thus non-replicable. As a result, smelters in old long term contracts have been mostly shielded from the effects of subsequent EU and national energy policies. Entering in a long-term contract today would provide stability in terms of electricity price; however the current obtainable price would not be at levels comparable to existing long term contracts, and would be affected by the current policy framework. Among the 11 smelters in our sample, 3 can count on old long-term contracts, which however will all expire within the next five years. As soon as these contracts expire, low cost smelters will move rightward in the cost curve and reach the power cost level of the highest cost smelters. For high cost smelters, that are those buying electricity in the market, differences in terms of national wholesale price, national policies, energy mix, grid costs, or other tariffs have an impact: the standard deviation among high cost smelters, is in the area of 17 \$/MWh (22 €/MWh) . However, the average difference between an average low cost smelter and a high cost smelter, that is the average cost differential resulting from having own generation or a long term contract,

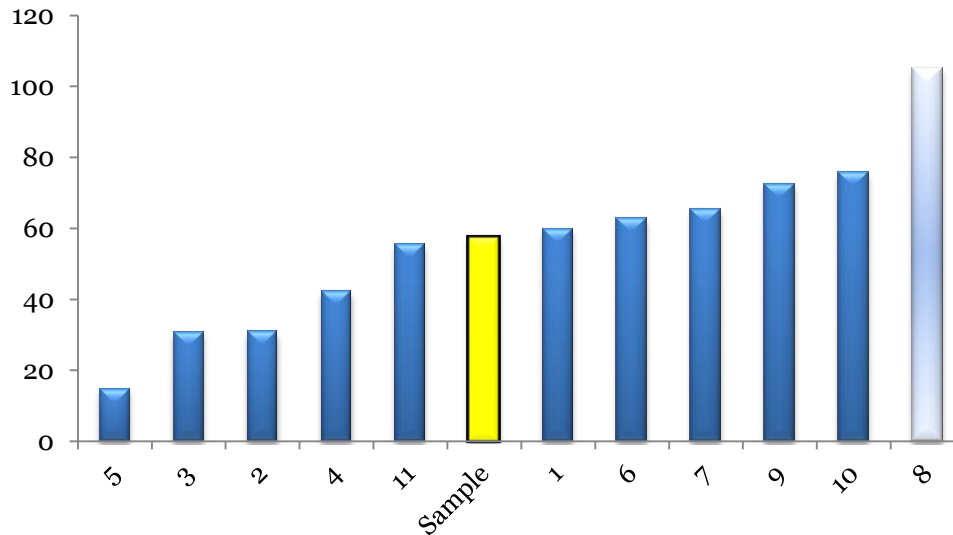
¹⁷⁴ Minimum level for excises for electricity is set by Directive 2003/96/EC. However, it excludes electricity used for metallurgical works from its scope of application; any decision to include electricity used for aluminium smelting within the tax base is thus fully attributable to member states.

¹⁷⁵ CRU values are used when interviewees could not report electricity prices. Sample average is weighted by production (production data from 2012).

¹⁷⁶ Average weighted by 2012 production. EUR/USD exchange rate: 1.2848. 2012 annual value, source ECB.

is worth alone 40.6 \$/MWh (52 €/MWh). In a nutshell, the way a smelter procures electricity is a much more powerful driver of costs than EU and national energy policies.

Figure 62 Prices of electricity for the sample aluminium smelters - 2012 (\$/MWh, delivered at plant)



Note: Plant 8 was shut down. Source: Interviews and CRU

Box 4 Validation of Data on Energy Prices

The cost of energy was the most sensitive information retrieved in the context of this report. Most interviewees delivered this information; when interviewees declined to report it, CRU estimates for power tariffs were used. The competitiveness analysis was thus refined, where possible, with first-hand validated information.

Information provided by interviewees was validated by cross-checking public information on energy costs and tariffs in national markets and regulation; and by comparing the value provided during the interviews with the CRU reference value.

CRU values are used when interviewees could not report electricity prices. It is worth stressing that there is no stable relation between the power price level from interviews and from CRU, i.e. not all CRU-based power prices are lower than those provided by interviewees and not all interview-based power prices are higher than CRU's.

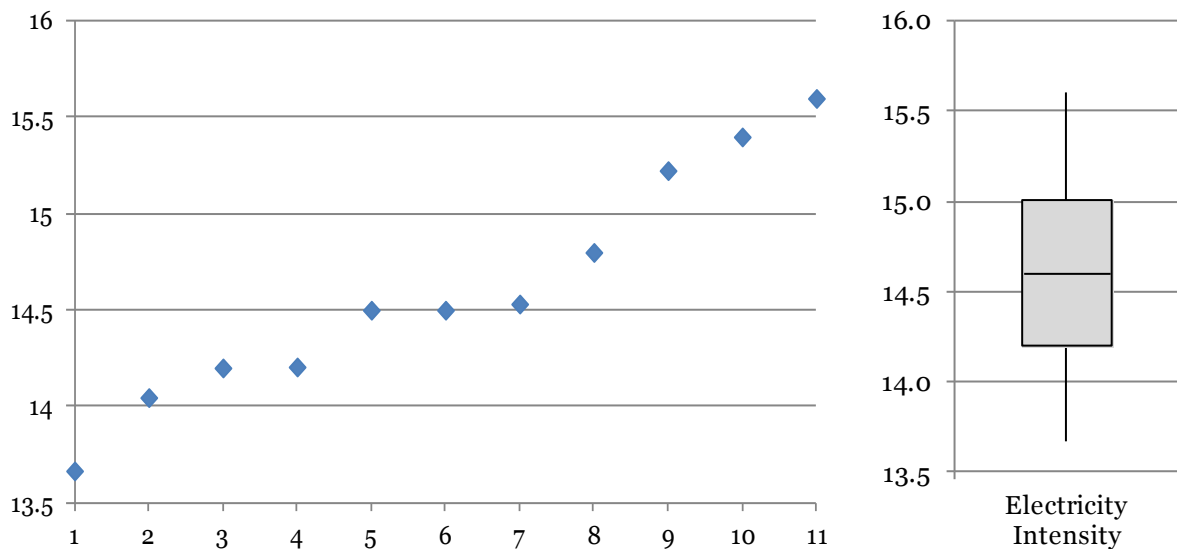
Box 5 Electricity Intensity of Primary Aluminium Production

The average electricity intensity of the plants in the sample is equal to 14.61 MWh/tonne.¹⁷⁷ The standard deviation is equal to 0.60, resulting in a very low coefficient of variation of 0.04. This means that most of the plant values are close to each other. Another measure of dispersion, the interquartile range, amounts to 0.81, that is 6% of the mean value. Figure 63 shows the curve of electricity intensity and the electricity intensity plot. In the right part of Figure 63, the vertical segment shows the whole range of values for electricity

¹⁷⁷ Data retrieved from interviews and CRU (2012 edition).

intensity, while the grey rectangle shows the interquartile range of values: the horizontal line represents the mean value.¹⁷⁸

Figure 63 Electricity Intensity (€/MWh)



Source: Authors' elaboration on Interviews and CRU

To give a better idea of the origin of such differences, we now break down industrial electricity prices into two components (i) the cost of electricity transmission,¹⁷⁹ and (ii) the costs of the national RES support schemes. The impacts of the carbon price on electricity prices, which are another relevant factor for the industrial customers' price structure, are discussed above in Section 7.3.

The cost of the transmission tariffs:

Figure 64 provides an overview of the evolution of tariffs for electricity transmission in selected member states based on ENTSO-E data. However, as it will be shown below, some aluminium smelters do not pay transmission tariffs or pay a lower tariff. Distribution tariffs can be ignored as aluminium smelters are usually connected to the high-voltage grid.

As shown in the bar graph, there is no overarching increasing or decreasing trend in the level of transmission tariffs. The level of these tariffs varies significantly from one country to another. In 2012, the member state with the lowest level of tariffs was France (5.73 €/MWh). Inversely, the tariffs imposed by the Slovak Republic (16.30 €/MWh), Spain (8.64 €/MWh) and Italy (8.57 €/MWh) are the highest among the selected countries. The tariff for electricity transmission represents 16.2% of the final price of electricity without

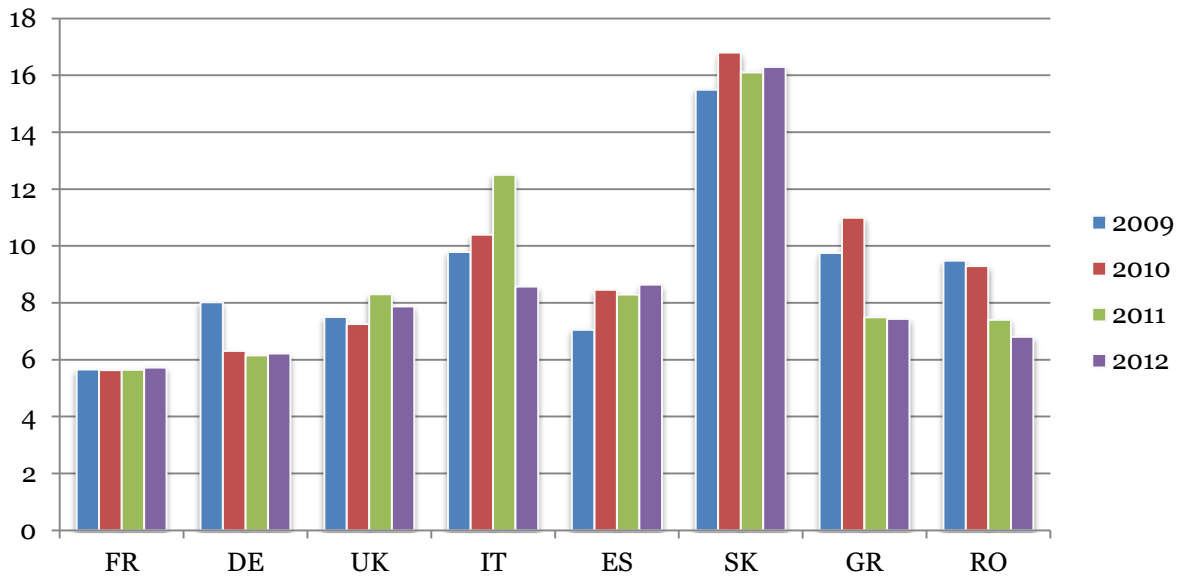
¹⁷⁸ Plant number are randomly assigned, to avoid that through electricity intensity, which is a punctual and unique value provided i.a. by CRU, other information included in this report could be de-anonymised.

¹⁷⁹ Even though the amount of transmission tariffs charged to large industrial customers depends on national policies, the general organization of the electricity market depends on the EU *acquis*.

taxes charged to large industrial consumers based in Spain, and this is the highest among the selected member states.

Other regulatory charges, not directly related to activities of the Transmission System Operator (TSO), might influence the final cost of electricity. While in most of the member states selected for this Study these costs have a limited impact on the final price of energy (e.g. 0.50 €/MWh in Germany), their impact is greater in Greece (7.16 €/MWh).¹⁸⁰

Figure 64 Transmission tariffs in selected EU member states - 2009-2012 (2011-€/MWh)



Source: ENTSO-E 2012

For 2012, a breakdown of transmission tariffs is provided for eight plants out of 11; for the remaining three plants, network costs could not be disaggregated from RES support and other system charges, and are thus not comparable. Data are reported in Table 37 below. In all countries, transmission tariffs reported by interviewees are lower than ENTSO-E data, by a difference ranging between -32% and -100%.

Considering the eight plants for which disaggregated data are available, average transmission tariffs amount to 1.4 €/MWh, that is 3.1% of total electricity costs. It is worth noting that four smelters do not pay for transmission costs, while in one case the costs, albeit positive, are negligible. Average network costs are 0 €/MWh for subsample 1¹⁸¹ and 2.77 €/MW for subsample 2.

¹⁸⁰ In Greece, the increase of costs not directly related to TSO activities is mainly due to a sharp increase of tariff for costs related to the compensation of RES Units and due to a higher tariff for public services. For more details, see ENTSO-E 2012.

¹⁸¹ Smelters with self-generation capacities do not pay for network costs, as they are not connected to the transmission network. Smelters with old long term contracts do not pay for network costs, as these contracts were stipulated in the pre-liberalisation era with the vertically integrated monopolist. More

Table 37: Transmission tariffs for sampled plants, 2012 (€/MWh)

Plant	Transmission Tariffs
2	0.00
3	0.00
4	0.00
5	0.00
1	0.04
11	1.00
9	3.01
10	4.64
Average	1.40
Plant	Transmission Tariffs and Other System Charges
6	6.71
7	9.99
8	11.01

Source: Interviews with plants

For seven out of 11 smelters, the breakdown of network costs was provided also for the years 2010 and 2011; for the remaining three plants, information is also available for 2010 and 2011, but network costs could not be disaggregated from RES support and other system charges, and are thus not comparable. Data are reported in Table 38 below. Average network tariffs for the seven smelters have decreased by 33% in two years.¹⁸² The decrease of average network costs is caused by the decrease experienced by two smelters; the remaining five smelters faced stable network costs. It is not possible to extrapolate the trend of network costs from the aggregated data provided by last three plants reported in Table 38.

correctly, their contract price already includes network costs, which existed also in the pre-liberalisation era, albeit they did not constitute a separate line in the energy bill.

¹⁸² Part of the reduction is due to the different availability of data points for 2010 and 2012. Considering only plants for which information is available for both years, average network tariffs have decreased by 31%.

Table 38 Transmission tariffs for sampled plants, 2010-2012 (€/MWh)

Plant		Transmission Tariffs		
		2010	2011	2012
2		0.00	0.00	0.00
3		0.00	0.00	0.00
4		0.00	0.00	0.00
5		0.00	0.00	0.00
1		1.81	0.05	0.04
9		3.01	3.01	3.01
10		7.25	6.34	4.64
Average		2.10	1.81	1.40
Plant		Transmission Tariffs and Other System Charges		
6		6.08	6.24	6.71
7		10.52	7.78	9.99
8		9.14	10.65	11.01

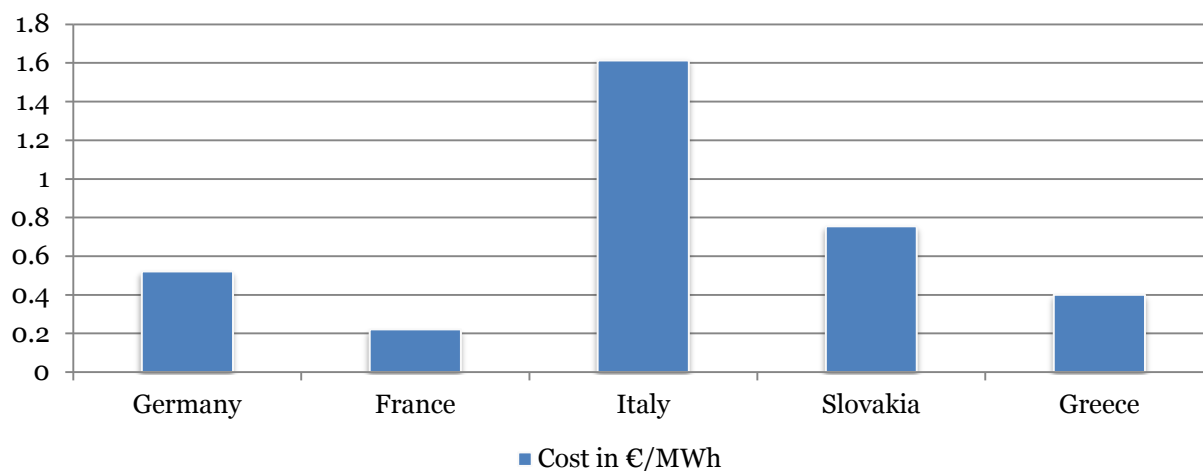
Source: Authors' own elaboration

Costs of the RES Support Schemes

One of the key goals of the Climate and Energy Package is to increase the share of energy generated by RES to 20% by 2020. RES Support Schemes are national mechanisms that were set up to achieve this goal. These mechanisms are differentiated across the EU member states. The costs of the support schemes for RES are significant for household consumers in member states with ambitious RES targets and/or in member states with inefficient RES support schemes. For large industrial consumers the picture can look different: Depending on the member state, large industrial consumers share RES costs with some smelters being heavily affected, while some are exempted. Comparative data on the extent to which aluminium producers are affected by RES support schemes is, however, rare. This issue will be tackled again in Section 9.2.2 where the merit-order effect is also discussed.

Figure 65 reports the costs of RES support schemes for large industrial consumers consuming 2.5 TWh per year in selected EU member states. The RES levies are relatively lower at this level of consumption, due to various exemptions. The values vary across the member states: aluminium smelters in Italy have to contribute at least twice as much to RES support than smelters in Germany, France, Greece or the Slovak Republic. These differences are not only due to varying total RES support costs, but also to the fact that RES support charges are passed on to the end consumers in a very different way. Depending on the member state, the abovementioned exemptions are set by the national regulator (e.g. in Italy) or on a ministerial level (e.g. Germany).

Figure 65 Costs of RES Support Schemes for 2.5 TWh users in the aluminium industry in 2012 (€/MWh)



Source: AEEG, CRE, Urso (2012), EEG-KWK, RAE

In Italy, the nominal RES tariff for industrial customers ranges between 20.99 and 41.98 €/MWh (2012 data). For the first 4 GWh of monthly consumption, the levy to be paid is of 41.98 €/MWh; for the subsequent 8 GWh of monthly consumption it decreases to 20.99 €/MWh. After having surpassed the level of 12 GWh, any additional consumption is exempted from the levy for RES support. Thus, the total annual amount to be paid for RES support for a consumption level of more than 12 GWh would be € 4,030,000.¹⁸³

In France, the levy is of 10.5 €/MWh, but the total costs are capped: a single industrial site cannot pay more than € 559,350 regardless of its consumption level (2012 data). Moreover, the amount paid by a company for RES support cannot exceed 0.5% of its annual added value.¹⁸⁴ In Greece the tariff is of 1.79 €/MWh. As in France, the total costs are capped, at a ceiling of € 1 million per site.¹⁸⁵

In Germany, on the other hand, caps are not applied but the tariffs are relatively low for energy intensive industries, once a certain consumption level is exceeded.¹⁸⁶ For the first GWh of consumed electricity, an industrial consumer pays the RES levy as any other consumer, which is of 35.92 €/MWh (2012 data). For the subsequent 9 GWh of consumption, the levy decreases to 10% of its original value, i.e. to 3.59 €/MWh. After that, it decreases to 1% of its original value for the subsequent 90 GWh, i.e. to 0.359 €/MWh.

¹⁸³ Delibera 28 dicembre 2012 581/2012/R/com of the Autorità per l'Energia Elettrica e il Gas, available at <http://www.autorita.energia.it/it/docs/13/279-13.htm>

¹⁸⁴ Loi n° 2003-8 du 3 janvier 2003 and Délibération du 5/02/2013 sur les règles de la comptabilité appropriée, available at <http://www.cre.fr/operateurs/service-public-de-l-electricite-cspe/mecanisme>

¹⁸⁵ RAE Decision 323/2013, available at http://www.rae.gr/site/file/categories_new/about_rae/actions/decision/2013/2013_A0323?p=files&i=0

¹⁸⁶ Renewable Energy Act 2009, available at http://www.gesetze-im-internet.de/eeg_2009/BJNR207410008.html

For any consumption above 100 GWh, the levy is fixed to 0.5 €/MWh. Thus, the total amount to be paid for RES support by a smelter consuming 2.5TWh per year would be € 1,300,576 euro.

Finally, in the Slovak Republic, some intensive industries (including aluminium) are entitled to obtain a discount of 95% for the regular RES levy, which amounts to 15.07 €/MWh (2012 data), hence paying a levy of 0.75 €/MWh.¹⁸⁷

These figures are summarised in Table 39. Note that figures do not take the merit order effect into account.

Table 39 RES support scheme cost comparison for 2.5 TWh users (2012)

	Italy	Germany	France	Greece	Slovakia
Annual average (in €/MWh)	1.61	0.52	0.22	0.40	0.75
Annual cost (in €)	4,030,000	1,300,576	559,350	1,000,000	1,883,750

Source: AEEG, CRE, Urso (2012), EEG-KWK, RAE

Complementing information retrieved from interviews and secondary sources, the RES tariffs for 2012 could be estimated for nine smelters out of 11. Corresponding data are reported in Table 40 below. For reason of confidentiality, the plants are labelled differently than elsewhere in this Study.

On average, RES tariffs¹⁸⁸ amount to 2.2 €/MWh, that is 4.9% of total electricity costs. The distribution is however skewed, as only one smelter pays RES tariffs in excess of 2 €/MWh. Indeed, the median value is 0.50 €/MWh, and the mean value without the outlier is 0.58 €/MWh. Average RES tariffs are 0.36 €/MWh for subsample 1¹⁸⁹ and 3.10 €/MW for subsample 2 (0.81 €/MWh without the outlier). When expressed as a share of price-cost margins, RES represented 18% of the negative margin in 2012 for the entire sample; for subsample 1 this share corresponds to 8% of a positive margin in the same year, and 16% of a negative margin for subsample 2.

¹⁸⁷ Act 250/2012, available at http://www.urso.gov.sk/sites/default/files/z_250-2012_sk.pdf and Annual Report 2011 Regulatory Office for Network Industries, available at http://www.urso.gov.sk/sites/default/files/VS2011_en.pdf

¹⁸⁸ In one case, the RES support tariff also includes co-generation support.

¹⁸⁹ Smelters with self-generation capacities do not pay for network costs, as they are not connected to the transmission network. Smelters with old long term contracts do not pay for network costs, as they were stipulated with a vertically integrated monopolist. More correctly, their contract price also includes network costs, as they existed also in the pre-liberalisation era, albeit they did not constitute a separate line in the energy bill.

Table 40 RES Support for sampled plants, 2012 (€/MWh)

Plant	RES Support
D	0.00
B	0.16
F	0.35
C	0.37
A	0.50
I	0.52
H	0.75
E	1.84
G	10.70
Average	2.19

Source: Authors' own elaboration

For six out of 11 smelters, the breakdown was provided also for the years 2010 and 2011. Data are reported in Table 41 below. Average RES tariffs for these six smelters have increased more than five-fold in two years; however, this is again caused by the presence of an outlier. The other five smelters show a stable and low level of RES tariffs per MWh in 2010 and 2011.

Table 41 RES tariffs for sampled plants, 2010-2012 (€/MWh)

Plant	Transmission Tariffs		
	2010	2011	2012
D	0.00	0.00	0.00
B	0.14	0.15	0.16
F	0.35	0.31	0.35
C	0.31	0.34	0.37
A	0.51	0.50	0.50
G	0.85	5.40	10.70
Average	0.39	1.51	2.19

Source: Authors' own elaboration

9.1.3 International comparison of industrial electricity prices

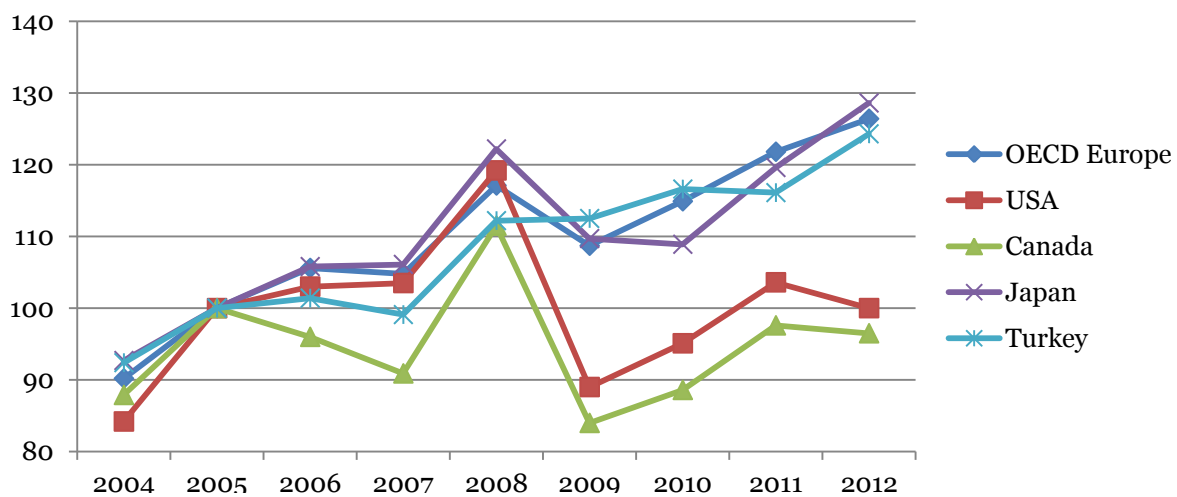
On a worldwide scale, industrial electricity prices vary greatly. The price differences are due to many elements. Among them, are the type of technology used for power generation; costs of fuels, or in the case of renewables, the local climate; network costs, and also the regulatory framework concerning fiscal, environmental and energy issues. It is important to note that electricity prices are still subject to subsidies and/or price regulations in many parts of the world, especially, but not only, outside of the OECD.

Making an international comparison of electricity prices paid by the aluminium industry, as well as by any other large industrial customers, based on generalist sources such as the International Energy Agency (IEA) is challenging, as electricity prices are not very transparent. Indeed, an international comparison of very large industrial consumers requires access to the prices actually paid by the operators, as international statistics usually focus on lower consumption bands. Furthermore, a proper comparison requires understanding the amount of taxes actually paid by specific consumers in each jurisdiction, information which is extremely difficult to retrieve from secondary sources. Hence, after providing general trends of electricity prices worldwide, CRU data are resorted to, in order to compare power prices for primary aluminium production.

For the overall comparison, the source is the International Energy Agency’s Energy Prices and taxes publication series. However, the publication only reports industrial energy prices for low consumption levels (i.e. below 20,000 MWh per year), while aluminium producers consume several GWh per year. The prices can thus only serve as a very rough indication of the prevailing price differences.

Figure 66 illustrates the evolution of end-user electricity prices paid by the industry in key OECD countries over the last nine years.¹⁹⁰ The figure shows that since 2008, the prices of electricity paid by the industrial users operating in North American countries have been decreasing significantly. Inversely, electricity prices in other key OECD countries have been rising in the same period of time. These differences are commonly attributed to the decrease in gas prices following the shale gas ‘revolution’ discussed above.

Figure 66 Indices of real energy prices for industry (2005 = 100)



Source: International Energy Agency, 2013

In 2011, the average end-user price of electricity for industrial consumers¹⁹¹ in the US, including taxes, was of € 49.6 per MWh.¹⁹² Thanks to the extraction of its domestic energy

¹⁹⁰ For comparison with other countries, including BRICS, please refer to Figure 67 and Figure 68 below.

¹⁹¹ Band ID: 2,000 MWh < Consumption < 20,000 MWh.

sources, the US are a major producer of fossil fuels. In 2011, the following sources of energy were responsible for the electricity production in the US: (i) conventional thermal (67%)¹⁹³, (ii) nuclear (19%), (iii) hydro (8%) and (iv) 5% other RES¹⁹⁴. The impact of shale gas is reflected in the growing role of gas as a fuel for electricity generation. Additionally, energy taxation in the US is very limited. The rates of the taxes applied on electricity consumption varied between 2 and 6%, depending on the state.¹⁹⁵

In China, the prices of energy are regulated by the central government. By controlling the prices of energy, the Chinese authorities can limit the effects of volatility and inflation, *de facto* assuring the competitiveness of their industry.¹⁹⁶ In 2011, the average price of electricity for industrial consumers¹⁹⁷ in China was of € 80.10 per MWh.¹⁹⁸ Coal remained the main fuel used for power generation in China followed by hydro, new RES and nuclear.¹⁹⁹

In 2011, the average price of electricity for industrial consumers²⁰⁰ in the EU27, including taxes, was of € 120.4 per MWh.²⁰¹ In 2011, the following sources of energy were responsible for the EU's electricity production: (i) 55% conventional thermal, (ii) 28% nuclear, (iii) 11% hydro, and (iv) 6% other RES.²⁰² As the EU is a big importer of fossil fuels, 52% of its energy need was covered by imports.²⁰³

Figure 67 below reports the comparison of power prices for aluminium smelters in the world, based on CRU data and our interviews. The yellow bars show the average price in the EU: "EU27 (universe)" represents the weighted average²⁰⁴ of CRU power price of smelters in the EU; while "EU27 (sample)" represents the weighted average of sampled smelters, based on interviews and CRU data. EU smelters, both in the universe and the sample, pay more for electricity than smelters in any other area of the world, excluding China.

¹⁹² International Energy Agency, Energy Prices and taxes, Quarterly Statistics, first quarter 2012.

¹⁹³ Of which coal was responsible for 42% and natural gas for 25% of power generation.

¹⁹⁴ EIA data.

¹⁹⁵ International Energy Agency, Energy Prices and taxes, Quarterly Statistics, first quarter 2012

¹⁹⁶ Toff J. Edwards, China's Power Sector Restructuring and Electricity Price Reforms, [in] Asia Paper 6.2, Brussels Institute of Contemporary China Studies.

¹⁹⁷ Band ID: 2,000 MWh < Consumption < 20,000 MWh.

¹⁹⁸ OECD Economic Surveys: China, OECD, 2013.

¹⁹⁹ Unconventional Gas: Potential Energy Market Impacts, JRC Scientific and Policy Report, European Commission, 2012

²⁰⁰ Band ID: 2,000 MWh < Consumption < 20,000 MWh.

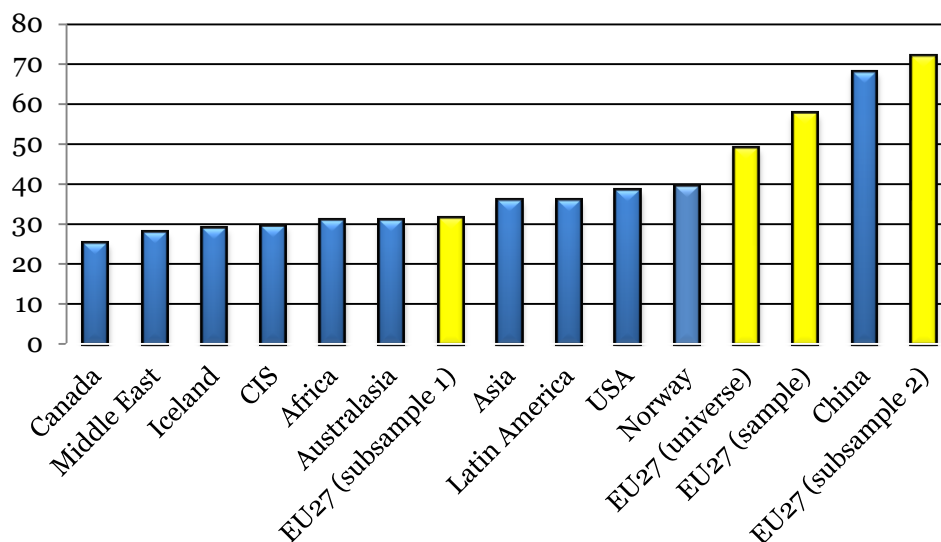
²⁰¹ Based on Eurostat data.

²⁰² Eurostat data.

²⁰³ Eurostat data.

²⁰⁴ Weight: production 2011.

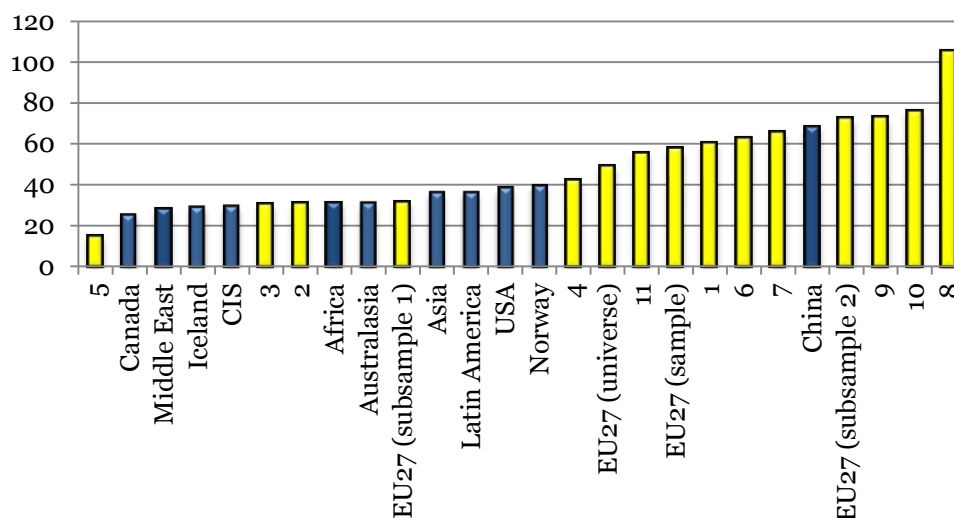
**Figure 67 Prices of electricity for the aluminium smelters in different world areas - 2012
(\$/MWh, delivered at plant)**



Source: Interviews and CRU

However, as already recalled, the average power price for sampled smelters hides a lot of information, given the very high variance. Figure 68 below shows the comparison between each smelter in the sample and the power price in other world areas. It clearly appears that speaking of an average “EU smelter” is not the appropriate approach to power price. EU smelters with own generation or existing long-term contracts are among the most competitive in the world, with a power price even lower than the lowest cost area, i.e. Canada. On the contrary, EU smelters buying electricity in the market or whose old long-term arrangements have expired are among the least competitive, with a power price even higher than the highest cost area, i.e. China.

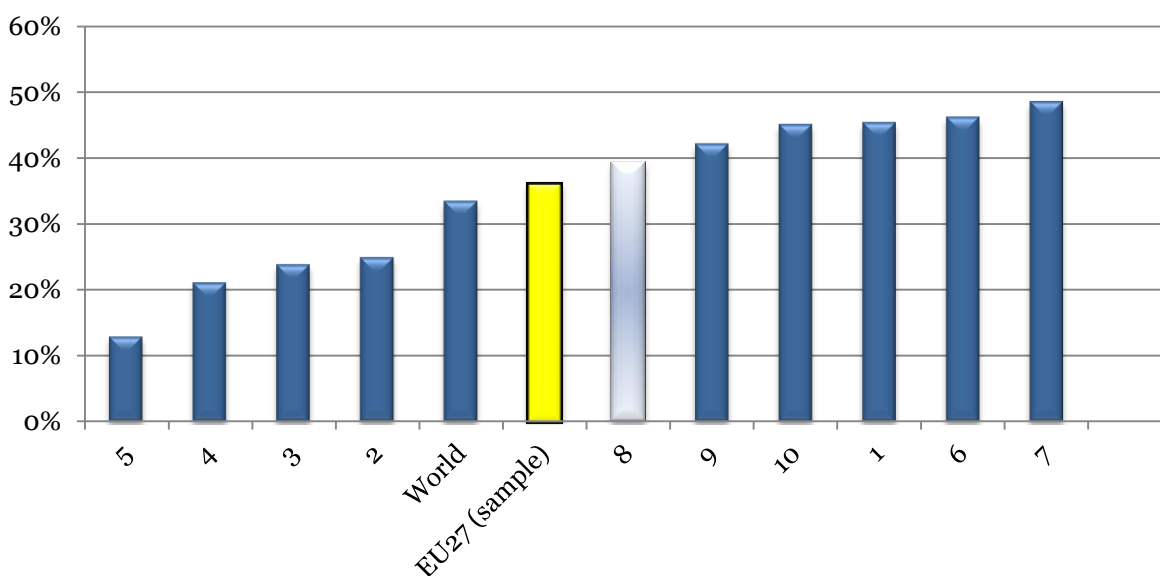
**Figure 68 Prices of electricity for the aluminium smelters in different world areas - 2012
(\$/MWh, delivered at plant)**



Note: Plant 8 was shut down. Source: Interviews and CRU

Figure 69 below shows the share of electricity costs over total costs for EU sample plants *vis-à-vis* the world average. Plants with the highest costs of electricity face power costs between 40% and 50% of total costs, while the world average is at about 33%. Interestingly, the difference in terms of cost share is not driven by differences in terms of efficiency in the use of electricity. If the average electricity efficiency of aluminium smelters in the world is normalized to 1, the average efficiency for the selected plants is 0.98. More specifically, the range goes from 0.93 for the least efficient sampled plant to 1.05 for the most efficient.²⁰⁵

Figure 69 Share of electricity costs over total costs for aluminium smelters in different world areas - 2012



Note: Plant 8 was shut down. Source: Interviews and CRU

9.2 Impact of EU regulation

9.2.1 Third Energy Market Package

The Electricity and Gas Directives from 2009²⁰⁶ establish common rules for the internal market in electricity and gas, respectively. Together with a regulation establishing the Agency for the Cooperation of Energy Regulators (ACER),²⁰⁷ and two regulations determining the conditions for access to the network for cross-border exchanges in

²⁰⁵ Efficiency is calculated as the ratio between the share of electricity costs over total costs at world power price, and the world average share of electricity costs over total costs.

²⁰⁶ Directive 2009/72/EC of the European Parliament and of the Council concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC; and Directive 2009/73/EC of the European Parliament and of the Council concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC.

²⁰⁷ Regulation (EC) No 713/2009 of the European Parliament and of the Council establishing an Agency for the Cooperation of Energy Regulators.

electricity²⁰⁸ and natural gas,²⁰⁹ they constitute the Third Energy Market Package (hereinafter Third Package). The Third Package provides for the legislative framework of rules for generation, transmission, distribution, and wholesale and retail trade in electricity and gas. The internal market in electricity and gas aims to deliver choice for all consumers of the EU and create new business opportunities,²¹⁰ thereby achieving competitive prices and higher standards of service. Fostering cross-border trade shall achieve efficiency gains. In electricity this means, for instance, that more efficient generation capacities replace the less efficient ones, security of supply is increased, e.g., through the pooling of backup capacities and a sustainable electricity system is built, *inter alia* through the integration of renewables.

The attention is turned to some of the main aspects of the market liberalisation agenda, and their implications for industry are discussed. As there are generally no direct costs for aluminium producers associated with the Third Package, this Section rather scrutinises the indirect effects resulting from its implementation. The focus is on electricity, as this is the area where the consulted stakeholders from the aluminium industry felt that the impact of EU regulation was particularly salient.

Regulated prices

In 2011 electricity prices for non-household consumers were still regulated in 12 EU member states (ACER/CEER, 2012). In some countries, prices are regulated at levels below market costs (European Commission, 2012). As regulated end-user prices prevent suppliers from improving their services (e.g. developing pricing schemes that take the individual characteristics of different consumer groups into account) and also discourage new entrants that could challenge the incumbents, the Commission insists on phase-out timetables for those countries that still have regulated end-user prices.

- ⇒ While the deregulation of energy prices is important to ensure the functioning of liberalised energy markets, in those countries where the aluminium industry used to benefit from favourable “industrial tariffs”, deregulation may lead to higher power prices for the aluminium industry.

²⁰⁸ Regulation (EC) No 714/2009 of the European Parliament and of the Council on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003.

²⁰⁹ Regulation (EC) No 715/2009 of the European Parliament and of the Council on conditions for access to the natural gas transmission networks and repealing Regulation (EC) No 1775/2005.

²¹⁰ In order to develop competition in the internal market in electricity, large non-household customers should be able to choose their suppliers and enter into contracts with several suppliers to secure their electricity requirements. Such customers should be protected against exclusivity clauses the effect of which is to exclude competing or complementary offers (to be monitored by NRAs, cf. art. 37.1.(k)).

Similarly for gas, in order to develop competition in the internal market in gas large non-household customers should be able to choose their suppliers and enter into contracts with several suppliers to secure their electricity requirements. Such customers should be protected against exclusivity clauses the effect of which is to exclude competing or complementary offers (to be monitored by NRAs, cf. art. 41.1.(k)).

Network codes

Network codes are probably the most underestimated tool in the Third Package – some stakeholders informally refer to them as the “Fourth Energy Package”. Network codes that are of particular interest to energy intensive industries include the balancing network code as well as the network code on forward markets, both expected to start the legislative procedure in the first quarter of 2014. Improving the cross-border pooling of balancing resources should bring down balancing costs, and thereby help limiting the costs stemming from the integration of variable renewables into the electricity grid. A network code on forward markets could help the energy-intensive industry to hedge the risk of energy price increases and generally decrease uncertainty.²¹¹

- ⇒ Network codes are crucial to bring down energy system costs and their development is going to be finalised by 2014. Targets should be in the interest of the electricity-intensive industry.
- ⇒ One of the main drivers for creating harmonised solutions for the internal energy market is the “Network Code on Requirements for Grid Connection applicable to all Generators”, also known as the RfG Network Code.
- ⇒ The RfG Network Code aims at easing the transition from a power system dominated by large fossil fired power plants to decentralised and renewable energy sources.

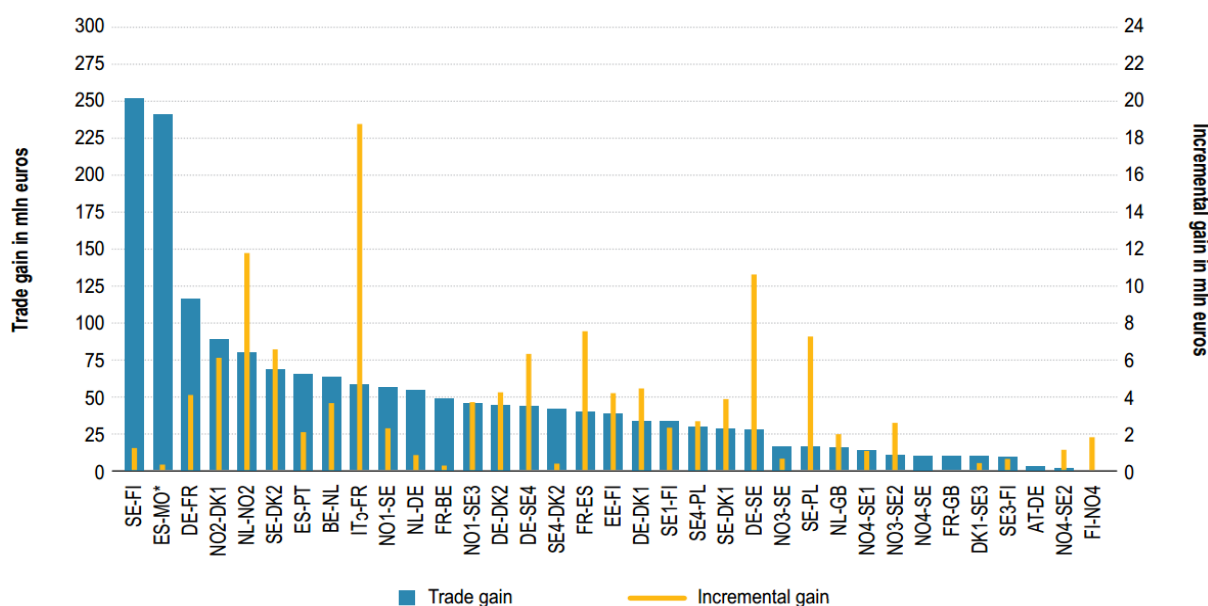
Trade

Trading electricity across borders brings social welfare benefits. By requiring the development of proper market rules in the form of the above mentioned network codes – in particular the network code on capacity allocation and congestion management expected to be adopted through delegated acts still in 2013– the Third Package allows cross-border trading to flourish in practice. According to a calculation performed by energy regulators, the existing electricity interconnectors do already bring significant welfare gains (see Figure 54, ACER/CEER 2012). For example, in 2011, the existing interconnection capacity between Germany and France, both under study in this report, brought social welfare benefits of some € 115 mln. If additional interconnector capacity of 100 MW had been available for trade on this border, social welfare would have increased by an additional € 4 mln. Particularly striking is the example of the border between France and Italy, also under study in the report, where an additional interconnector capacity of 100 MW would have increased social welfare by € 19 mln. It is important to note that the extra capacity in this context does not need to come from new physical transmission infrastructure (discussed below in the Section on the Energy Infrastructure Package), but can instead be the result of more efficient capacity calculation methods that are being developed in the process of energy market integration.

²¹¹ Several stakeholders from energy-intensive industries have raised concerns about the current situation in which they find it difficult to enter into long-term electricity supply contracts (i.e. > 5 years); see below.

⇒ Generally, cross-border trading can thus make a contribution to increasing the competitiveness of EU energy prices, and therefore of the EU's energy intensive industry such as aluminium.

Figure 70: Simulation results: gross welfare benefits from cross-border trade and incremental gain per border – 2011 (€ mln per year)²¹²



Source: ACER/CEER 2012

Market liquidity

Due to their high consumption levels, large industrial electricity consumers need liquid wholesale markets to be effectively free in choosing their suppliers. If markets are fragmented on the supply-side, industrial consumers may not have a choice but to procure electricity from the largest supplier, often the historical incumbent. Liquid markets are an important prerequisite for entering into long term contracts, which may otherwise be problematic from a competition perspective, as they would further decrease market liquidity and may be considered as engendering market foreclosure. Market liquidity is also important to get a first idea of how much wholesale electricity prices say about the price paid by industry. In principle, one would expect that in countries where a greater share of the total electricity consumption is traded at a power exchange, end-user prices better reflect the wholesale price.

Liquidity in EU electricity wholesale markets varies widely. Table 42 lists the liquidity²¹³ of the eight countries under study as well as day-ahead base load power prices, both for 2011. Among the eight countries under scrutiny, market liquidity was only above 50% in Italy and Spain. In countries with very low levels of liquidity, such as France, Romania, or the

²¹² For a detailed discussion of the methodology please consult the original source.

²¹³ This refers to the day-ahead spot market.

UK, the volumes traded at power exchanges were probably too small to be a meaningful indicator of end-user prices. The relatively low levels of liquidity in a number of member states also suggests that large industrial electricity consumers may sometimes not really have a choice yet, when it comes to choosing their electricity supplier.

- ⇒ The development of network codes and efforts to expand electricity infrastructures should further increase market liquidity in the future, but, especially when it comes to physical infrastructures, this is a time-consuming process. Yet, the success of these efforts is key to ensure that large industrial electricity consumers can reap the benefits of energy market liberalisation in practice.
- ⇒ It should be noted that power exchanges, if well organized, increase the transparency of electricity price formation. However, while the establishment of power exchanges does, in theory, allow for the introduction of financial products of interest to the aluminium industry (e.g. futures contracts to hedge the price risk), feedback received from the industry suggests that the potential benefits do not necessarily materialise in practice.

Table 42 Trade volumes at power exchanges as a percentage of national demand and annual average day-ahead base load power prices (€/MWh)²¹⁴

Country	Market liquidity	Day-ahead price (EUR/MWh)
	2011	2011
France	13%	48.9
Germany	40%	51.1
Greece	n.a.	59.4
Italy	58%	72.2
Romania	16%	52.1
Slovakia	31%	50.9
Spain	67%	50.8
UK	15%	56.9

Source: ACER/CEER 2012, EC 2012

9.2.2 Renewables

Directive 2009/28/EC on the promotion of the use of energy from renewable sources²¹⁵ sets mandatory targets for RES (Art. 3.1). Member states shall ensure that the share of energy from RES in gross final consumption of energy reaches the national overall targets.

²¹⁴ Market liquidity is measured by a proxy indicator, dividing the total quantity of electricity day-ahead marketed on any power exchange of the corresponding market by the total quantity of power consumed on the corresponding territory.

²¹⁵ Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC

Member states are free to devise national renewable energy action plans, and to decide how to fund them. National targets depend on the starting point and the economic situation. As the support for renewable electricity is either passed on through electricity prices or directly added to electricity bills, the costs of achieving the agreed objectives will ultimately be borne by end-users. However, as noted above, in some member states, aluminium producers - as other energy intensive industries - only have to shoulder a relatively smaller burden of these costs, as the main share in most member states falls on households.

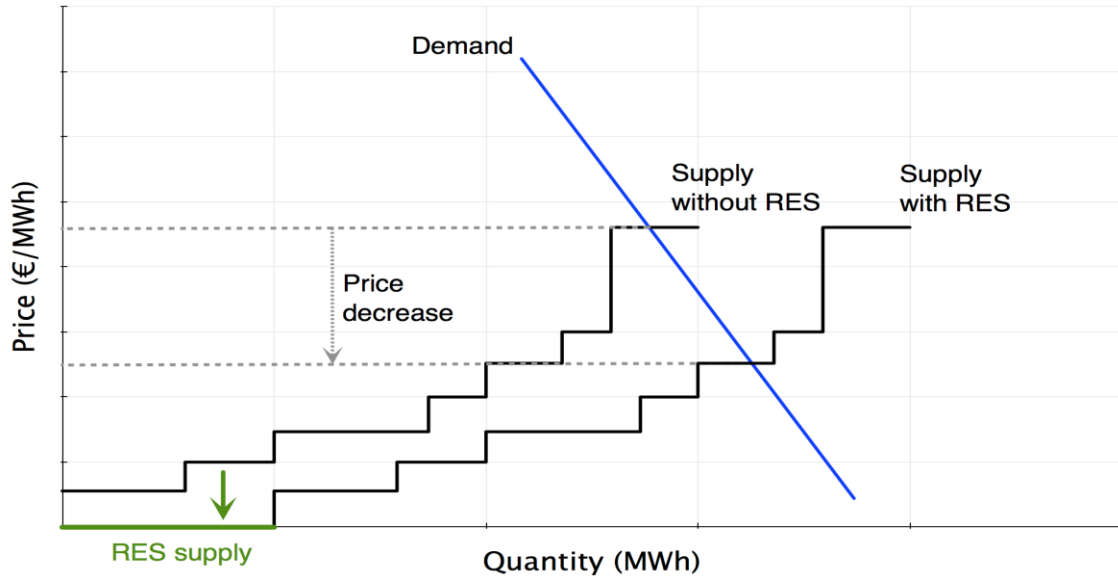
When assessing the costs of RES support schemes for industry, it is crucial to also look at the cost savings that materialise through the merit order effect that puts downward pressure on wholesale electricity prices (Pöyry 2010). As explained earlier, in liberalised and competitive electricity markets, the supply curve, also called “merit order curve”, is based on the marginal costs²¹⁶ of the available generation technologies, i.e. the short-term generation costs composed of costs for fuel, variable operation & maintenance and emission allowances²¹⁷. Wind generation, as the largest-scale example of RES-E capacity additions in recent years, has short-term generation costs close to zero (no fuel cost). When a large wind-based generation capacity is added to the system as a result of the RES support, the whole curve shifts to the right, thus - *ceteris paribus* - reducing the unit price that utilities can charge and the associated rent they would get (Figure 71). This can benefit the customers to the detriment of generators – if suppliers pass these cost savings caused by lower wholesale prices on to their customers.²¹⁸

²¹⁶ It is worth noting that uplifting bids is theoretically possible. However, the power sector is currently struggling with overcapacity, which hampers adding mark-ups to supply bids. Moreover, due to market coupling of various national markets, the number of players has increased, which also hampers uplifting bids.

²¹⁷ It has to be noted that generators in concentrated markets are able to include mark-ups in their bids to make some contributions to fixed costs, especially in times of scarce capacity (see Möst and Genoese (2009)). However, the extent of such “uplifts” is limited and is expected to diminish with the implementation of the internal energy market.

²¹⁸ As discussed in the Section on Climate Change in the companion report on steel, the added EU ETS allowance price has the opposite effect on the merit order curve. When carbon prices are added on top of the marginal costs of each fossil fuel, the curve as a whole is shifted upwards and the market price increases for any given demand volume. The difference becomes windfall profits for the electricity producing sector and is covered by higher prices for the consumers. The analysis of the indirect costs of ETS is provided below.

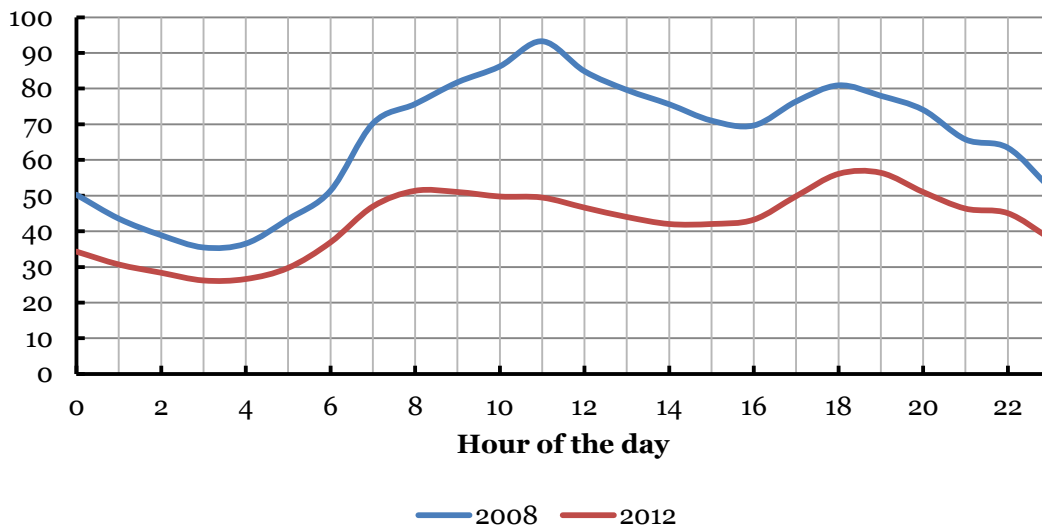
Figure 71: Effects of RES supply on prices (short-term)



Source: Authors' elaboration

To illustrate the dampening effect of renewables on today's wholesale market prices, one can look at the German-Austrian electricity system. As shown in Figure 71, the wholesale market prices in Germany and Austria have been in decline since 2008. In 4 years, the average price has decreased from 65.7 to 42.6 €/MWh. The graph also shows that the biggest price dip has occurred at around noon. This is mostly due to the massive deployment of solar photovoltaics (PV). From 2008 to 2012, the installed capacity of PV increased from 6.1 to 32.6 GW in Germany. Since the production peak of PV is at midday, the impact of PV generation on wholesale prices is most visible at this time.

Figure 72: Wholesale market prices in Germany/Austria, 2008 and 2012 (€/MWh)



Source: Authors' elaboration

The current scale of the merit-order effect cannot be easily extrapolated to the future, because the present situation will affect the investment decisions of generators. As the utilisation of base-load and mid-load power plants keeps diminishing with the increasing share of renewables, it will not be economical to maintain a large block of these types of power plants but instead move to a higher share of generation technologies with lower investment costs and higher variable costs (e.g. gas-fired units), thus reducing the dampening effect of renewables on wholesale market prices.

It is worth noting that net effect is always negative, if the consumer has to shoulder the full burden of RES support costs. However, if there is an exemption from paying RES levies, the net effect may, somewhat counter intuitively, be positive and thus bring down electricity costs for aluminium producers (see Box 6 for the example of Germany). In other cases, the net effect is clearly negative (see Box 7 for the example of Romania). Generally, the net effect depends on various factors:

- the extent to which producers share RES support costs
- the price-dampening effect of renewables on wholesale prices
- the efficiency of the RES support scheme (i.e. support costs per MWh generated)
- the aluminium producer's channel of electricity supply (i.e. to what extent it benefits from lower wholesale market prices).

Box 6 RES support costs vs. merit order effect. The case of Germany.

Reusler and Nestle (2012) estimate the net effect of RES support schemes on the so called privileged electricity consumers (e.g. aluminium producers) in Germany, that do not have to share the full burden of the RES support schemes. The maximum amount these consumers contribute to RES support schemes is capped at 0.50 EUR/MWh. At the same time, the industry benefits from RES support schemes through the merit-order effect that puts downward pressure on electricity prices. The authors conclude that so far the privileged industry has received a net benefit from RES support in Germany. More precisely, in 2010 the merit-order effect decreased electricity prices by 5 EUR/MWh. According to estimates from the Germany Ministry of the Environment reported by Reusler and Nestle (2012), in 2011 the effect increased to 8.7 EUR/MWh.

It should be noted that aluminium producers may be affected by RES support scheme costs even if they are among the privileged electricity consumers, as some parts of the aluminium value chain may not be exempted.

Box 7 RES support costs. The case of Romania.

According to a study prepared by PriceWaterhouseCoopers, Romania has one of the most generous RES support schemes in the EU. In contrast to Germany, the public authorities have applied a support scheme that is not based on a feed-in system but on a quota system (also known as green certificates system). The revenues of RES-E plant owners therefore consist of the wholesale electricity market price plus the green certificate (GC) price. The GC price is set by the marginal price of the most expensive RES-E technology needed to reach the RES target defined by the government. This allows for windfall profits for more mature technologies, as all technologies receive the same income from GC – in contrast to a feed-in system, where different feed-in tariffs are applied for different technologies to reflect their different stage of technological maturity.

As a consequence of the generous windfall profits, RES support costs in Romania are comparatively high. For example, the authors of the study estimate that the intensity of support for wind energy is 224% of the EU average. The support scheme reportedly adds 19.6 EUR/MWh to final consumer electricity prices, which corresponds to 39% of the current wholesale market price. While the study does not state any information about the merit-order effect in Romania, it is to be assumed that, in this case, the RES support costs exceed the benefits of renewables lowering wholesale prices. If the support scheme is not adapted, the burden on final consumer electricity prices is expected to increase to about 30.5 EUR/MWh by 2017, according to the authors of the study

- ⇒ The costs of support schemes in general and for aluminium producers in particular depend on member states' implementation of the RES directive and the national context.
- ⇒ If aluminium producers are exempted from paying RES levies, the merit-order effect of renewables can lead to lower electricity supply costs.
- ⇒ Uncertainty has a negative impact on the industry's investments, due to the regulatory risk associated with exemptions to RES support schemes.

9.2.3 Energy Infrastructures

As mentioned in the Section on the Third Package, expanding physical energy infrastructures of cross-border relevance is crucial to making the internal energy market work, as emphasised by the Commission Communication of the same name from November 2012:²¹⁹

Energy must be able to flow to where it is needed, without physical barriers at national borders. This implies *inter alia* addressing the effects of unplanned power flows ("loop flows") on cross-border market integration. Serious investment in energy networks is needed to enable certain areas of the EU to emerge from isolations and to achieve our Europe 2020 targets"

Regulation (EU) No 347/2013²²⁰ provides guidelines for trans-European energy infrastructure. At the heart of the new regulation are the so-called Projects of Common Interest (PCIs), which will benefit from streamlined and faster permit-granting procedures, improved cost-allocation procedures and access to (very limited) EU funding through the "Connecting Europe" facility.

Originally, the main purpose of cross-border electricity interconnections was to contribute to security of supply. Interconnectors were built to allow for mutual support in case of supply disruptions, thereby ensuring the reliability of electricity supply. More recently, their role in fostering competition and other efficiency gains related to cross-border trading has received growing attention. Given the ambitious renewable-energy targets of

²¹⁹ Communication from the Commission, Making the internal energy market work, COM(2012)663, 15.11.2012

²²⁰ Regulation (EU) No 347/2013 of the European Parliament and of the Council on guidelines for trans-European energy infrastructure and repealing Decision No 1364/2006/EC and amending Regulations (EC) No 713/2009, (EC) No 714/2009 and (EC) No 715/2009

the EU, a new motive for interconnectors is emerging: the integration of electricity from RES.

- ⇒ While expanding electricity infrastructures may lead to somewhat higher transmission tariffs, they generally decrease electricity system costs and increase social welfare. While transmission tariffs have been rather stable in recent years (see Section 9.1.2), concerns about future increases are reportedly an issue for the industry.

9.2.4 *Energy Efficiency*

The Energy Efficiency Directive²²¹ includes some provisions that shall provide incentives for large enterprises to make investments in energy efficiency improvements and may be associated with some direct and indirect costs for aluminium producers.

Direct costs

Art. 8.4 foresees energy audits, meaning that large enterprises (incl. aluminium producers) must undergo an independent energy audit. The energy audit should be carried out by December 2015 and at least every four years afterwards; a higher frequency is possible. Companies implementing an energy or environmental management system certified according to European or International Standards would be exempted (provided equivalence). According to the accompanying impact assessments, an audit should cost a few hundred thousand Euros. Art. 13 stipulates that member states shall lay down rules of penalties in case of non-compliance with audit provisions – member states may decide the level of penalty (if any), there is thus not necessarily a regulatory cost associated with this provision. After 5 June 2014, Art. 14.5 requires that aluminium producers as well as any other industrial player, in case of refurbishment of industrial installations generating waste heat at a useful temperature level with a total thermal input >20MW, carry out a cost-benefit analysis to assess the option of introducing co-generation in heating. There is an exception for Carbon Capture and Storage (CCS).

Indirect Costs

Art. 7 contains an obligation for energy companies to achieve end-use energy savings of 1.5% of the annual energy sales to final customers. The provision is valid from 2014 to 2020. Member states have the option to exclude aluminium producers as well as other manufacturers, hence at the moment it is not possible to assess whether any indirect costs will materialise.

- ⇒ While there may be some (low) costs for aluminium producers resulting from the energy efficiency directive (depending on the member states' implementation), in

²²¹ Directive 2012/27/EU of the European Parliament and of the Council on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC-

aggregate the provisions may well be beneficial for companies. Some regulatory intervention may thus be needed and beneficial to overcome investment inefficiencies.

10 Trade Policy

10.1 International trade of Aluminium

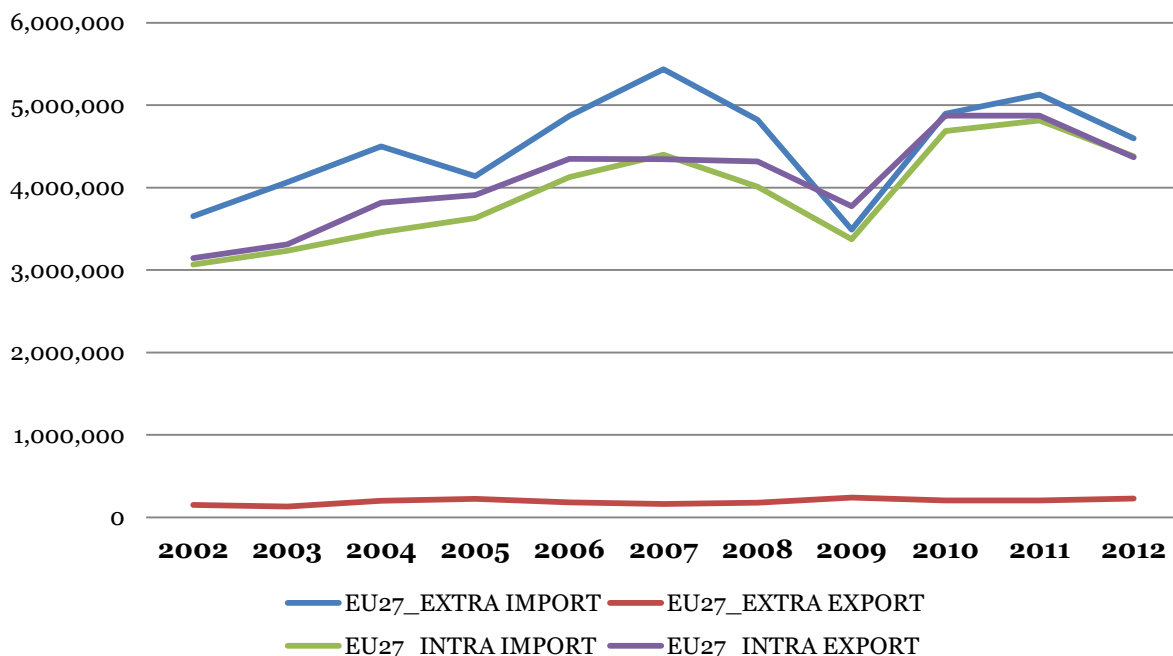
10.1.1 World and EU Trade Flows

Europe is a net importer of primary aluminium products. Between 2002 and 2012, the EU27 international trade of primary aluminium has been extremely import oriented, as shown in Figure 73. Specifically, in 2012, 95% of the EU27 cross-border primary aluminium flows were in fact imports, showing how dependent the EU is on foreign aluminium, while being a trivial exporter in the global market.

Trends have been quite stable during the last decade, with some interesting developments. Extra-EU27 imports are those who have been more volatile during the years. They reached a peak of 5.4 mln tonnes in 2007, followed by a 36% fall in the period 2008/2009. During those two years, intra-EU trade flows showed a much lower reduction in the order of -24% for imports and -13% for exports, indicating how, during the crisis, EU27 countries partially substituted extra-EU aluminium with EU production.

All trade flows showed significant signs of recovery between 2010 and 2011, while in 2012 a general reduction in trade flows affected the primary aluminium market once again. In this case, intra and extra EU flows were affected in the same way (-10%).

Figure 73 Intra and Extra-EU Trade of Primary Aluminium 2002-2012 (tonnes)



Source: COMEXT (2013)

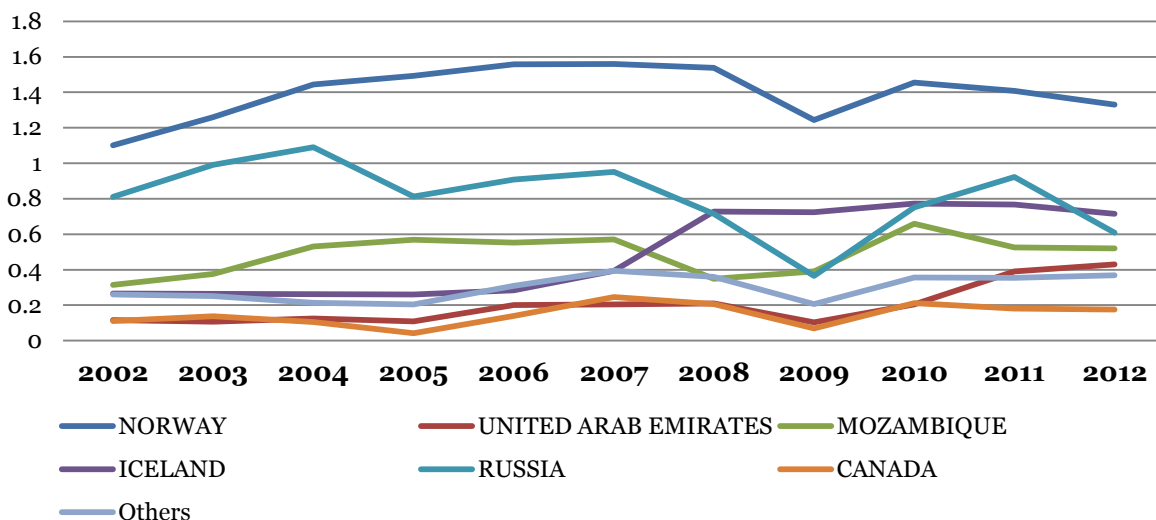
Trade with the main extra-EU27 primary aluminium partners is summarized in Figure 74. Between 2002 and 2012, the net position of the EU27 trade balance did not change significantly, confirming the import-oriented nature of EU27 trade and its negligible role in global exports of primary aluminium.

The EU major trading partner in 2012 was Norway, with a negative EU trade balance of 1.3 mln tonnes of primary aluminium, followed by Iceland from which the EU imported 0.7 mln tonnes of aluminium and Russia with 0.6 mln tonnes.

When observing the trend of exporting countries to the EU from 2002 to 2012 (see Figure 74), Norway is the main commercial partner for primary aluminium and it kept its primacy for the entire period under observation. Conversely, imports from Russia displayed a decreasing trend between 2002 and 2009, when they sharply increased again until 2011 to reach 0.6 mln tonnes in 2012.

A fairly stable import flow comes from Mozambique (with the exception of a slowdown from 2008 to 2010) and Canada. Primary aluminium imports from the United Arab Emirates have considerably grown, going from 0.1 mln tonnes in 2002 to almost 0.5 in 2012.

Figure 74 Imports of primary aluminium from 2002 onwards by partner countries (millions of tonnes)



Note: OTHERS include Egypt, Bahrain, Montenegro, Bosnia and Herzegovina, Tajikistan, New Zealand and Turkey. Source: COMEXT (2013)

Table 43 shows in greater detail import and export flows from/to main commercial partners (through a descending order observed in 2012 imports) compared to the total extra EU27 flows in 2002, 2007 and 2012. The main patterns did not change drastically overtime, as shown by the net negative balances observed at three points in time in the past decade (- 3.5 mln tons in 2003, - 5.3 in 2007 and - 4.4 in 2012).

Table 43 EU27 exports, imports and net positions in primary aluminium by extra-EU origin/destination countries 2002, 2007 and 2012 (mln tonnes)

	2002			2007			2012		
	IMP	EXP	NET	IMP	EXP	NET	IMP	EXP	NET
Extra-EU27	3.655	0.149	-3.506	5.433	0.161	-5.272	4.596	0.227	-4.369
Norway	1.101	0.013	-1.088	1.560	0.013	-1.547	1.330	0.005	-1.325
Iceland	0.266	0.001	-0.265	0.394	0.001	-0.393	0.715	0.000	-0.714
Russia	0.810	0.001	-0.809	0.952	0.001	-0.951	0.608	0.001	-0.606
Mozambique	0.315	0.000	-0.315	0.571		-0.571	0.521	0.000	-0.521
UAE	0.115	0.006	-0.109	0.205	0.001	-0.204	0.430	0.001	-0.429
Canada	0.110	0.002	-0.108	0.246	0.001	-0.246	0.176	0.001	-0.175
Egypt	0.064	0.001	-0.063	0.072	0.001	-0.072	0.108	0.001	-0.108
Baharain	0.009	0.000	-0.009	0.100	0.000	-0.100	0.101	0.000	-0.101
Montenegro			0.000	0.132	0.000	-0.132	0.089	0.000	-0.089
Bosnia and Herzegovina	0.071	0.002	-0.070	0.072	0.002	-0.071	0.057	0.006	-0.051
Tajikistan	0.112		-0.112	0.100	0.000	-0.100	0.053		-0.053
New Zealand	0.007	0.000	-0.007	0.038	0.000	-0.038	0.052	0.000	-0.052
Turkey	0.005	0.016	0.011	0.049	0.013	-0.036	0.050	0.012	-0.037

Source: COMEXT (2013)

The EU can be considered a stable importer of primary aluminium and the main supplying countries did not change over the last ten years except a few. However, by zooming in on the sub categories of unwrought primary aluminium, we find a slightly different picture for the supplying countries involved. In particular, as shown by Table 44, in 2012, imports of not alloyed aluminium mainly came from Iceland (542,900 tonnes in 2012, followed by Mozambique with 520,600 tonnes and Russia with 482,400). The trends of other countries did not change excessively, except for Norway that used to be an important importer of not alloyed aluminium in 2002 (270,700 tonnes) but was not anymore in 2012 (15,300 tonnes). The same goes for Tajikistan.

Table 44 Not alloyed unwrought aluminium²²² EU27 imports and exports by partner country in 2002, 2007 and 2012 - CN Code 7601 10 (mln tonnes)

	2002			2007			2012		
	IMP	EXP	NET	IMP	EXP	NET	IMP	EXP	NET
Extra-EU27	2.277	0.020	-2.257	3.022	0.025	-2.997	2.255	0.010	-2.245
Iceland	0.1451	0.0002	-0.1449	0.3318	0.0002	-0.3316	0.5429	0.0000	-0.5429
Mozambique	0.2926	0.0000	-0.2926	0.5382	0.0000	-0.5382	0.5206	0.0000	-0.5206
Russia	0.7163	0.0000	-0.7163	0.7605	0.0000	-0.7605	0.4824	0.0000	-0.4824
Canada	0.0935	0.0001	-0.0934	0.2081	0.0001	-0.2080	0.1495	0.0000	-0.1495
Montenegro	0.0000	0.0000	0.0000	0.1308	0.0000	-0.1308	0.0878	0.0000	-0.0878
UAE	0.0203	0.0057	-0.0146	0.0324	0.0002	-0.0322	0.0797	0.0000	-0.0797
Tajikistan	0.1099	0.0000	-0.1099	0.0936	0.0000	-0.0936	0.0522	0.0000	-0.0522
New Zealand	0.0069	0.0000	-0.0069	0.0365	0.0000	-0.0365	0.0506	0.0000	-0.0506
South Africa	0.0461	0.0001	-0.0461	0.1321	0.0000	-0.1321	0.0392	0.0000	-0.0392
Cameroon	0.0350	0.0000	-0.0350	0.0594	0.0000	-0.0594	0.0353	0.0000	-0.0353
Brazil	0.1453	0.0000	-0.1453	0.2673	0.0000	-0.2673	0.0341	0.0001	-0.0340
Egypt	0.0306	0.0001	-0.0306	0.0125	0.0000	-0.0125	0.0288	0.0000	-0.0288
Turkey	0.0009	0.0003	-0.0006	0.0416	0.0001	-0.0414	0.0241	0.0000	-0.0240
India	0.0000	0.0001	0.0001	0.0063	0.0001	-0.0062	0.0165	0.0004	-0.0161
Norway	0.2707	0.0021	-0.2686	0.1825	0.0010	-0.1815	0.0153	0.0002	-0.0151

Source: COMEXT (2013)

²²² Not alloyed trends are reported in light of the autonomous tariff's suspension enacted in 2007. The latter is briefly discussed below.

Finally, Table 45 reports the pattern of specific products imported and exported in 2002, 2007 and 2012. The aim of this table is to provide a clear picture of the product composition of trade in aluminium products. The table shows that the EU27 meets its primary aluminium needs by importing, but this is not the case for the other product categories. In particular, on waste and scrap, the EU27 generally shows a positive net trade balance, rising to 742,090 tonnes in 2012. Indeed, in 2012, exports of scrap have almost doubled since 2007. Destinations countries, however, did not change too much over time as most of the EU scrap is increasingly exported to China and India, followed by South Korea and Pakistan (data on countries provided by EAA). Semi-manufactures also enjoy positive net balances except few exceptions, even though much smaller (the same applies to import and export flows).

Table 45 EU27 Imports and Exports of primary, secondary and semi-manufactures in 2002, 2007 and 2012. (CN 7601.xx) (mln tonnes)

	2002		2007		2012	
	IMP	EXP	IMP	EXP	IMP	EXP
UNWROUGHT ALUMINIUM	3.6550	0.1487	5.4333	0.1610	4.5957	0.2272
WASTE AND SCRAP	0.3377	0.4744	0.4032	0.6331	0.3393	1.0814
POWDER AND FLAKES	0.0190	0.0081	0.0213	0.0139	0.0185	0.0203
BARs, RODS AND PROFILES	0.1630	0.1305	0.3351	0.1960	0.3393	0.1907
ALUMINIUM WIRE	0.2011	0.0493	0.2729	0.0450	0.2623	0.0772
PLATES, SHEETS AND STRIP	0.4012	0.4446	0.6944	0.7066	0.7946	0.7609
ALUMINIUM FOIL	0.1050	0.2894	0.1918	0.2960	0.2110	0.2728
ALUMINIUM TUBES AND PIPES	0.0148	0.0241	0.0385	0.0293	0.0400	0.0268
OTHER TUBE OR PIPE S	0.0030	0.0024	0.0053	0.0028	0.0044	0.0033
STRUCTURES AND PARTS OF STRUCTURES	0.0345	0.0875	0.0754	0.1321	0.0972	0.1341
RESERVOIRS, TANKS, VATS	0.0004	0.0055	0.0017	0.0104	0.0005	0.0091
CASKS, DRUMS, CANS, BOXES	0.0142	0.0445	0.0361	0.0627	0.0323	0.0811
ALUMINIUM CONTAINERS	0.0018	0.0019	0.0036	0.0049	0.0041	0.0048
STRANDED WIRE, CABLES, PLAITED BANDS	0.0128	0.0141	0.0157	0.0080	0.0262	0.0125
TABLE, KITCHEN, HOUSEHOLD ARTICLES	0.0178	0.0484	0.0644	0.0450	0.0936	0.0432

Source: COMEXT (2013)

10.1.2 Review of the autonomous tariff measure on unwrought not alloyed aluminium and the future EU tariff schedule for unwrought aluminium

This Section investigates the EU import tariff regime for unwrought aluminium by analysing, in particular, the autonomous review of the tariff schedule on unwrought not alloyed primary aluminium that took place in 2007. Imports of unwrought (both alloyed and not alloyed) aluminium were previously subject to an import duty rate of 6%²²³. However, in 2007, an autonomous suspension of the tariff on not alloyed aluminium²²⁴ was proposed in order to support the production of semi-finished and finished aluminium products mainly produced in new Member States by small and medium enterprises, with

²²³ Commission Implementing Regulation (EU) No 927/2012 amending Annex I to Council Regulation (EEC) No 2658/87 on the tariff and statistical nomenclature and on the Common Custom Tariff.

²²⁴ CN Code 7601 10.

the intention of reviewing the suspension after three years. According to data provided by the Commission, in 2007, SMEs using unwrought not alloyed aluminium for the production of semi-finished and finished industrial goods were losing competitiveness, especially in third markets, against downstream producers located in other areas with no import duties²²⁵.

In 2010, three years after the suspension, it was not straightforward to assess the effectiveness of the provisional suspension, given the peculiarity of the industrial structure of the aluminium value chain and the particular crisis condition the entire industry was suffering from. However, increasing production capacity in duty-free third countries and drastic changes in the downstream demand due to the ongoing crisis (especially in 2008 and 2009) were arguments to keep the tariff level at 3% without further reductions. Indeed, a further reduction would have negatively affected the EU aluminium production by offering an easier access to the EU to countries that would not have reciprocated the offer.²²⁶

Interviews conducted with some stakeholders confirmed that for primary unalloyed users, the autonomous suspension has been indeed beneficial (the rough estimates of the \$ per tonnes saved by the reduction from 6 % to 3% over the LME *price* are presented in Table 48). However, they also argued that the joint use of alloyed and not alloyed (still dutiable at 6%) for each primary user makes transferring the reduction to final users difficult. As a result, they are often charged as if the tariff was unchanged.²²⁷

It is worth noticing that a reduction of import tariffs that is considered beneficial for downstream users is regarded as costs for primary producers. Primary producers, however, realized that, import tariffs at 6% on alloyed would create a competitive disadvantage for EU downstream users. Hence, in 2010 they agreed to propose a reduction from 6% to 4%, keeping the unalloyed as 3%²²⁸.

Figure 75 shows the trend of imports from the main trading partners (Iceland, Mozambique, Russia and Canada cover roughly 70% of imported not alloyed unwrought aluminium). The vertical dark blue line in the Figure marks the date of the provisional suspension of the full duty rate: one can see that some duty free countries (i.e. Iceland) increased the exports flows into the EU while others (mainly from dutiable countries) have reduced it after 2007.

²²⁵ Council Regulation (EC) No 501/2007 amending Annex I to Council Regulation (EEC) No 2658/87 on the tariff and statistical nomenclature and on the Common Custom Tariff.

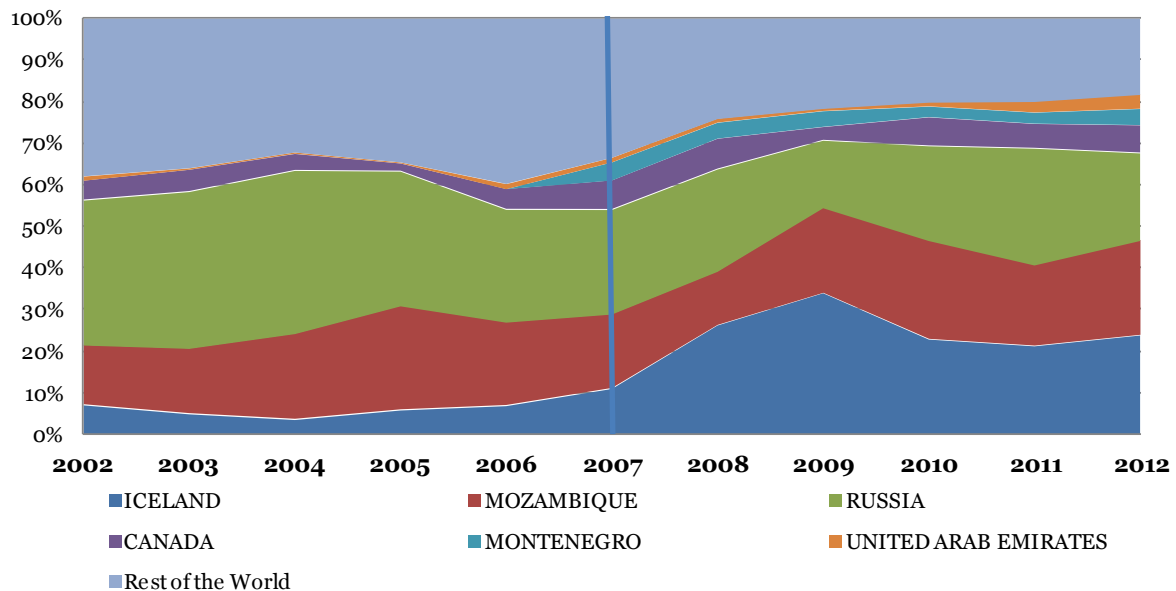
²²⁶ Information Note of the European Commission, available at: http://ec.europa.eu/taxation_customs/resources/documents/common/publications/info_docs/customs/info-note-alu-duties_en.pdf

²²⁷ This happens by remelting unalloyed ingots into alloyed ones.

²²⁸ According to EAA, a debate on this proposal is still ongoing and has been delayed until 2014.

Not all countries exporting to the EU are subjected to the import duty. Indeed, exports to the EU from most countries are duty-free as they are covered by preferential agreements with the EU or by *Generalised System of Preferences* status.²²⁹

Figure 75 Trends of importing countries of not alloyed unwrought aluminium from 2003 onwards (%)



Source: COMEXT (2013)

Statistics show that the European needs of primary aluminium are mainly satisfied by external producers be they covered or not by a preferential commercial status. This is due to the fact that producing both alloyed and unalloyed primary aluminium in the EU is a costly process.²³⁰ The long term perspective suggests that future increases in EU primary production are out of the question as for multinationals it is cost efficient to establish their plants where energy input costs are lower²³¹.

As shown by Table 46, in 2012, almost 5 mln tonnes of primary aluminium were imported of which, less than 30% from countries subjected to the 3-6% import duty on not alloyed /alloyed primary aluminium.

²²⁹ Please, see the paragraph below for more detailed information of the review of the GSP Regulation.

²³⁰ See Chapter 2.

²³¹ In this respect, ECORYS (2010) concludes that EU primary production will not be adversely affected by tariff reduction.

Table 46 Selected EU aluminium trading partners exporting to the EU (tonnes)

PARTNER/FLOW	IMPORT	EXPORT	NET	Commercial Status	
EU27_EXTRA	4,595,738	227,211	-4,368,527		
NORWAY	1,330,386	4,916	-1,325,471	EEA Country	duty-free
ICELAND	714,686	392	-714,293	EEA Country	duty-free
RUSSIA	607,878	1,429	-606,449	MFN GATT bound duty	dutiable
MOZAMBIQUE	520,674	1	-520,673	Interim Economic partnership Agreement	duty-free
UAE	429,606	835	-428,772	EU-GCC Cooperation Agreement	dutiable

Source: WTO (2013)

Moreover, as shown in Table 47, compared to main competitors such as US, China and Japan, the EU has kept the highest tariffs level except for Chinese imports of finished products, creating a potential competitive issue for small and medium primary users.

Table 47 Import duty rates on aluminium products in 2008 (%)

	EU	US	Japan	China
Unalloyed unwrought aluminium	0-3	0-2.6	0	0
Alloyed Aluminium	0-6	0-2.6	0	7
Semi-manufactures	0-7.5	0-6.5	7.5	5-8
Finished products	0-6	0-5.7	0-3	8-25

Source: ECORYS (2010)

Many stakeholders (mainly downstream users not vertically integrated with EU primary producers) argued that, irrespective of the country of origin, the European premium paid over the LME price is always augmented by the duty, even though dutiable imports are only one third or less of the total demand for primary aluminium. The practice that the import price set for primary users has converged over time towards the LME plus the duty-paid premium creates a rent for duty-free (and European) primary producers that - in theory - could sell their products at the market price.

In this respect, it is worthwhile to realize that there are only few large multinationals producing primary aluminium, and covering a very high share of the world output. It is therefore perhaps misleading to focus on export *countries* (e.g. Iceland, Mozambique, Gulf states like Qatar), because the companies exporting to the EU are often the same as those importing it here, producing inside the EU and/or maintaining value chains in the European Union or the EEA. When the EU imports from a duty-free country, what this means in actual practice is, more often than not, a genuine intra-company trade transaction. The market structure might therefore not automatically generate the best market price. This extra mark-up might nullify the advantage that the absence of a tariff gives to users, but this matter has not been fully examined in the context of this Study.

The marginal rent created by the import duty has to be analyzed in conjunction with a newer phenomenon observed in the international financial markets since 2010. Box 1 above explains how the regional premiums (EU, Japan and US) dramatically increased during the last three years over the LME-3 months price (Japan and US). The main drivers appear to be the high profitability of *cash&carry* deals and bottlenecks in the physical delivery of primary aluminium from warehouses. The mark-up has also altered the final price; this creates a further burden to downstream users that is not reflecting the fundamentals of supply and demand of primary aluminium. Indeed, as clearly shown in Box 1, primary aluminium is globally experiencing an oversupply pushing the LME price down in sharp contrast with the increasing trend characterizing the regional premiums.

Although the two issues (marginal duty effects on one side, financial opportunity and warehousing systems on the other) contribute both to some extent to the price setting mechanism, by increasing it, their consequences have to be analyzed separately. While the premium's increase due to lower interest rates environment, *contango* effect and slow delivery system, is a recent phenomenon that is creating uncertainty for every agent in the aluminium value chain; the premium's margin created by the import duty is certain and fully incorporated by the balance sheet of each actors of the aluminium value chain.

There are three main market premiums for unwrought aluminium: *US MidWest*, *CIF Spot Japan* and *Rotterdam duty-paid*. According to some of the interviewed stakeholders, the Rotterdam duty-paid premium has become over time the benchmark price for all the transactions, including those coming from duty-free countries. This makes a proper comparison with other competitors (with lower or no import duties) difficult, given that the duty-unpaid series is basically unavailable.

As a result, when compared to a competitor such as the US, the unwrought aluminium price set in the EU is the LME cash price augmented by the duty plus costs relate to warehouses and delivery. By way of example, for an LME quoted at \$2200, premium for unalloyed unwrought is 66\$/ton (3% for the import duty) plus around other \$60/tons, for a total of around \$126/tons. In case of purchase of alloyed aluminium, the price is thus set as follows: \$2200 plus \$132 (6% to be paid on many products of the downstream industry such as billets, foundry alloys and parts of rolling slab) plus delivery costs, around \$60/tons.²³²

²³² This example was provided during one of the interviews conducted for the study.

Table 48 LME 3 Months and tariffs premiums for alloyed (6%) and not alloyed (3%)

	2008	2009	2010	2011	2012	2013	2014
LME 3-Months (\$/t)	2,620	1,701	2,198	2,419	2,076	2,365	2,541
LME 3-Months, lagged 3 months (\$/t)	2,776	1,661	2,114	2,485	2,081	2,279	2,513
Not-alloyed tariff (3% over the LME (\$/t))	78.6	51.0	65.9	72.6	62.3	70.9	76.2
Alloyed tariff (6% over the LME(\$/t))	157.2	102.1	131.9	145.1	124.5	141.9	152.5

Source: authors' elaboration on CRU data (2013)

Regardless of any unusual trends observed in the regional premium and the divergent effects of those trends both on the upstream producers and downstream users, it is important to explore the rationale for keeping an import tariff on primary aluminium from a pure economic perspective.

Assuming that EU trade policy solely works for EU economic welfare in the longer run, as economic theory would suggest, there is no justification for the aluminium tariff. However, in a more practical 'political economy' perspective, where those directly benefitting from tariff duties are allowed to make their case and (EU) policy strategies might possibly allow their arguments to dominate, such a duty might be justified when it does protect the local industry and facilitates its output growth in the presence of market distortions in export countries. In this case, a duty having such effects is likely to be considerably higher (than 6%), and moreover might impact too negatively on independent downstream users.

Moreover, it could be in the EU's interest, at least in the medium term, to maintain the entire value chain in Europe although the incentives in the long term to transfer primary production to locations where energy costs are lower are likely to become higher over time. However, evaluating long-term industrial strategies or assessing the benefits of the current EU schedule fall outside the scope of this report.

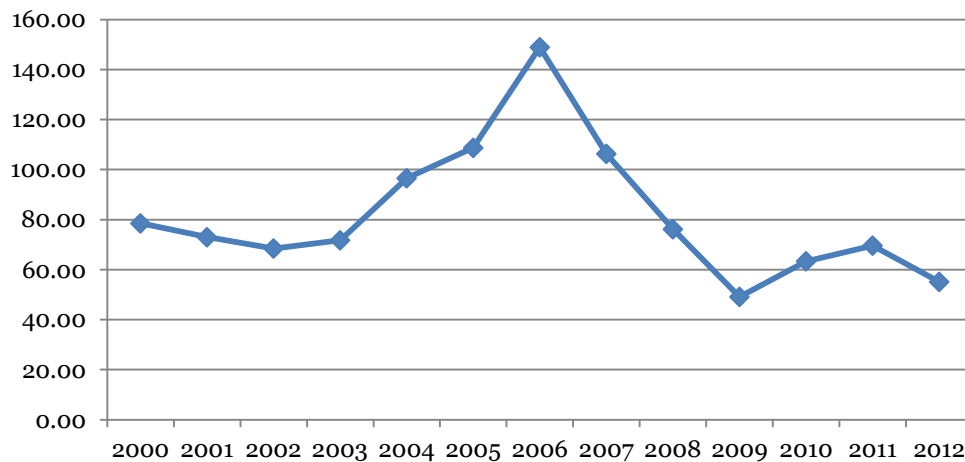
The impacts of the tariff premium on unwrought aluminium creates a net realisation cost²³³ for primary producers and an additional cost (through an augmented regional premium) for downstream users not vertically integrated with the rest of the value chain. The latter deserves further analysis.

In Figure 76, we have reported the weighted average tariff premium of the sample of 11 primary aluminium smelters, covered in this Study. According to the CRU smelting cost model, the tariff premium represents the import duty paid by primary users to import aluminium from dutiable countries. In accordance with this definition, it represents a premium that producers located in a country where imports are subjected to tariffs can benefit from. In the model, the premium applies only to sales within the tariff protected state or zone. The percentages on the LME are normally based on trade data by country.

²³³ According to CRU Report (2013), these are costs involved in realising the fair market value of the product.

As shown by Figure 76, since 2006, when the average tariff premium calculated was 148.96 \$/tonne dropped by almost 70% in 2008 to remain on average around 60\$/t until 2013).

Figure 76 Weighted Average Tariff Premium (\$/tonne)²³⁴



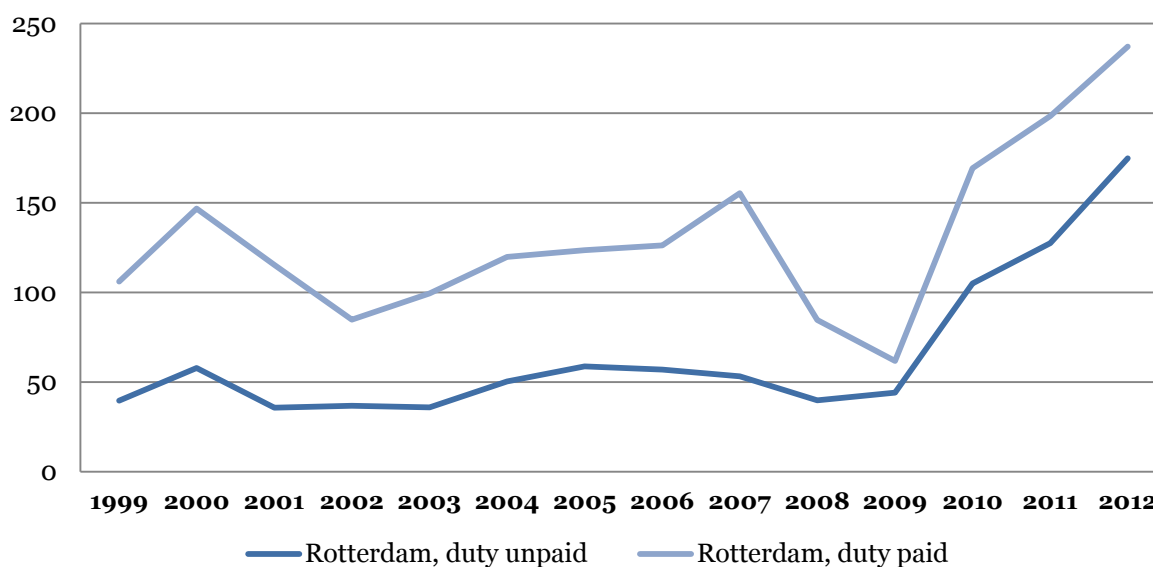
Source: Authors' elaboration on CRU (2013)

Differently, for primary users the import duty increases the EU regional premium to pay over the LME cash price of the amount as specified in Figure 77. The basic components of the premium, as briefly explained before, include besides the duties, additional costs due to delivery service and warehouses' rules. The difference between the two trends clearly shows the additional costs paid by primary users, irrespective of the origin countries.

As noticed in the Commission Information Note, the decision of removing an import duty (albeit relatively small in absolute value), is not only dependent on its effectiveness inside EU borders across the value chain but it is primarily considered a negotiation instrument. Regardless of the possible effects, its definitive removal is mainly due to bilateral negotiation with dutiable countries.

²³⁴ Premiums are weighted by actual production.

Figure 77 Rotterdam Premiums duty-paid and duty-unpaid over the LME²³⁵ (\$/t)



Source: CRU (2013)

10.1.3 Trade Defence Instruments: their impact on the EU Economy

A general concern for the EU industry is that competition with third countries is negatively affected by unfair trading practices, such as dumping and subsidies that artificially make third country aluminium products more competitive. The difficult recovery phase from the economic crisis is forcing the EU to better monitor the market, without moving towards a protectionist approach. Trade Defence Instruments (TDIs) are not instruments for ordinary protection, they are “targeted, contingent and [...] temporary”.²³⁶ Hence, they are not a comprehensive tool to ensure a fair playfield; furthermore, their (dynamic) effect over time is difficult to assess.

As it happens in other sectors, (deep and comprehensive) trade agreements could indeed ensure a fairer environment through a bilateral bargain of the competitive conditions for companies. However, given the state of ongoing and future bilateral negotiations, in many cases and in particular with some commercial partners, TDIs remain the only valid instruments to defend companies against unfair trading practices.

The EU legal framework makes three instruments available: anti-dumping duties (AD), anti-subsidy duties, and safeguards measures. They are all defined in EU binding acts. For anti-dumping measures, the EU Regulation²³⁷ in compliance with the WTO Anti-dumping

²³⁵ The European Rotterdam price duty paid is the premium over the LME cash price for western ingot delivered in Rotterdam with high-grade minimum 99.7%. The same goes for the Rotterdam price duty unpaid except than the application of the duty.

²³⁶ Evaluation of the European Union’s Trade Defence Instruments (2012)

²³⁷ Council Regulation (EC) No 1225/2009 on protection against dumped imports from countries not members of the European Community.

Agreement²³⁸ applies. For subsidies, the anti-subsidy rules²³⁹ and the Regulation on protection against subsidized imports from non-EU Member States²⁴⁰ provide the legal basis to start a complaint. Recently, the Commission adopted a proposal to modernise the regulation on protection against dumped and subsidised imports from third countries. Finally, safeguard measures, aiming at temporarily protecting the industry under extremely strict circumstances against sharp surge in imports, are regulated according to the status of the importing counterpart (WTO²⁴¹ and non-WTO members²⁴²).

Analyzing the impact on EU trade of the use of TDIs against third countries may be challenging. By definition, anti-dumping measures are imposed against imports of a specific product originating from specific country (-ies) to restore an undistorted competitive environment for that specific product. . This implies that even if the impact on the bilateral flows hit by dumping is not large, the effect on the specific product output is normally positive as it should reduce dumped imports. Moreover, TDIs can affect entry decisions of the firms and alter the probability of exit from the market, since they ensure a provisional protection against unfair competitors. As noticed in some interviews, the effectiveness of TDIs is not only motivated by the possibility of restoring competitiveness, but also in terms of threat. If TDIs are used in a credible and thorough way, the commercial counterpart will have a higher incentive to abide by trade rules.

According to the Independent Evaluation Report published by DG Trade, there are at least three reasons that make the impact of TDIs difficult to evaluate. First, due to confidentiality reasons, the actual imports flows from the specific companies affected by the investigation is not available;²⁴³ secondly, it is difficult to define counterfactual flows, which would be needed to measure the effect of the non-application of the duty in. Finally, at micro-level, the application of an AD duty creates uncertainty for those firms that usually deal with foreign markets by increasing the costs incurred: this scenario can both prevent some foreign firms to enter the EU market and deter their performance in terms of innovation or productivity, without necessarily affecting existing trade flows.

Anti-dumping and anti-subsidy measures

Since 2003, the EU carried out five investigations in the aluminium sector, involving mainly China (Table 49). At the time of writing, there were no ongoing investigations and the measures in force only pertain to anti-dumping.

²³⁸ Agreement on Implementation of Article VI of the General Agreement on Tariffs and Trade 1994.

²³⁹ Council regulation (EC) No 2026/97 on protection against subsidized imports from countries not members of the European Community.

²⁴⁰ Council Regulation (EC) No 597/2009 on protection against subsidised imports from countries not members of the European Community.

²⁴¹ Council Regulation (EC) No 260/2009 on the common rules for imports.

²⁴² Council Regulation (EC) No 625/2009 on common rules for imports from certain third countries.

²⁴³ Trade flows can be proxied through the selections of HS codes, which however results in an overestimation

Table 49 EU Cases on Anti-dumping in the aluminium international market, from 2003

Case Numbers	Product	Countries investigated	Measures
AD541	Aluminium road wheels (certain)	People's Republic of China	Measures in force
AD578	Aluminium radiators	People's Republic of China	Measures in force
AD582	Aluminium foil in small rolls	People's Republic of China	Measures in force
AD534 R565	Aluminium foil (certain)	Armenia, People's Republic of China, Brazil	Measures in force
AD428 R330 R352	Aluminium Foil		Expired

According to the current EU legislation, the EU can initiate an anti-dumping or anti-subsidy investigation on the basis of a properly substantiated complaint from the relevant EU industry or on an ex-officio basis

The Council Regulation 1225/2009 on protection against dumped imports, in compliance with the WTO Anti-dumping agreement,²⁴⁴ allows the EU to set an *ad valorem duty* to counteract dumping, once there is sufficient evidence that a dumped price has been applied causing injury to the Union industry. There are additional elements to be proved, such as the link between the dumping and the injury, and the fact that the potential anti-dumping measure would not be against the interest of the Union.

The setting of the anti-dumping duty follows the “*lesser duty rule*” (LDR), according to which the duty applied to the importers does not always correspond to the dumping margin (defined as difference between the normal value of the good imported and the export prices applied) when the duty can cover the (lower) injury margin ²⁴⁵suffered by the company. The injury margin is usually chosen to set the anti-dumping duty, so the methodology behind its calculation is crucial to offset the effect caused by dumped imports. The investigation period for AD cases usually lasts 15 months, (nine months after

²⁴⁴ See http://www.wto.org/english/docs_e/legal_e/19-adp.pdf.

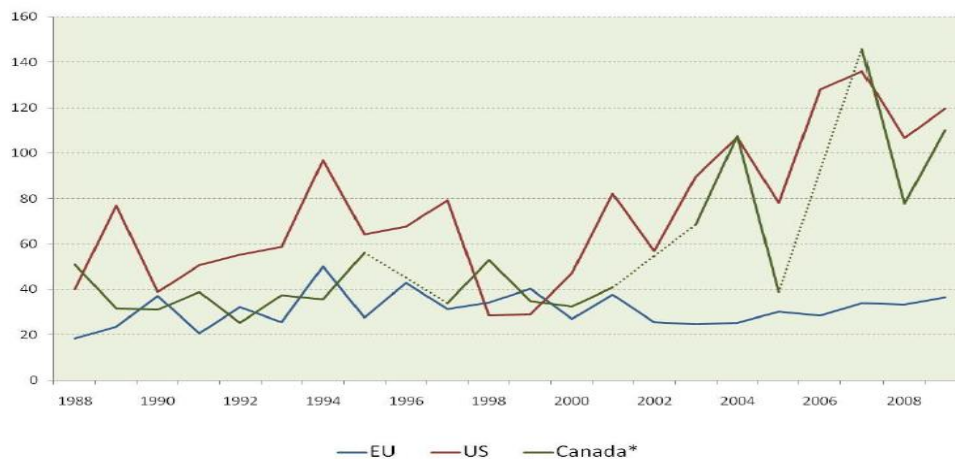
²⁴⁵ To define the injury margin, the Commission has to verify the impact of the dumped imports on the Community market shares. In order to prove this, they have to see to what extent the dumped price undercuts the Community price. The analysis considers many other variables as output, profits, productivity, return of investment etc. (DG Trade, also see art. 3 of Regulation (EC) No 1225/2009.

initiation at the latest) provisional measures can be imposed and then definitively collected at the end of the period, where the implementing regulation confirms or eventually modifies the conditions set in the provisional act. Definitive measures can be in force for five years, after which the measure may be reviewed and possibly prolonged.

The application of the LDR is considered a “WTO plus” (art. VI of GATT and Anti-Dumping Agreement) and is often considered the cause of a weaker trade defence, especially compared to the US. Higher AD duties are not only important *per se*, i.e. to counter specific dumping actions, but also because the existence of higher AD duties in other countries can divert imports flows towards the EU.

In this respect, Figure 78 shows that from 1989 to 2009, EU average anti-dumping duties have been constantly lower than the ones applied by US and Canada. As noticed by Rovegno and Vandebussche (2011), the US and Canadian duties show an increasing trend overtime compared to the more stable EU average of 30%. Moreover, the variability of the US average trend, due to a higher flexibility of adjusting the duty over time, creates uncertainty for every long-term internationalization strategy of foreign companies.

Figure 78 Average anti-dumping ad valorem duty levels by year of imposition²⁴⁶



Source: Rovegno and Vandebussche (2011) based on Global Antidumping Database (World Bank)

Disentangling the quantitative effect of the application of the LDR on the level of duties is not straightforward. As shown by the Evaluation Report of EU Trade Defence Instruments,²⁴⁷ the LDR indeed contributes to the lower and more stable trend of EU duties, but it is not the only cause. The lowering effect of the rule on the average EU duties has been estimated as equal to 9.3 percentage points, resulting in duties 28% lower than the ones computed without the application of the rule. However, even the removal of the LDR would not fill the gap existing between the EU and the US.

²⁴⁶ The dotted lines correspond to years when no antidumping duties were imposed.

²⁴⁷ See http://trade.ec.europa.eu/doclib/docs/2012/march/tradoc_149236.pdf.

Table 50 quantifies the LDR effect across sectors and over time and compares the effect of the rule on the aluminium industry with respect to other sectors and the EU average. The LDR effect for aluminium (HS code 76) is -46%. This means that on average duties have been 46 percent lower than in the absence of the LDR, compared to the across sectors average of -26%. The effect has been particularly strong in 2005-2010, with around 15 percentage points of difference between the average dumping margin and the average final duty.

Table 50 EU Dumping margins, AD duties and effect of lesser duty rule by sector, (2000-2010)²⁴⁸

HS chapter and description	2000-2004		2005-2010		2000-2010		
	Avg def. dumping margin	Avg definitive duty	Avg def. dumping margin	Avg definitive duty	Avg def. dumping margin	Avg definitive duty	Avg LDR Effect
20 Vegetable, fruit, nut etc.			9.05	7.95	9.05	7.95	-12%
28 Inorganic chemicals, precious metals compound, isotope	27.16	26.56	35.32	22.76	30.56	24.98	-18%
29 Organic chemicals	7.64	7.58	29.49	21.89	21.08	16.38	-22%
31 Fertilisers	34.68	9.3			34.68	9.3	-73%
39 Plastics and articles thereof	31.03	27.14	12.75	12.75	18.08	16.95	-6%
41 Raw hides and skins and leather			69.8	58.9	69.8	58.9	-16%
44 Wood and articles of wood, wood charcoal	14.15	14.15	25.18	25.18	20.28	20.28	0%
54 Manmade filaments	11.27	6.87	7.1	7.1	8.66	7.01	-19%
55 Manmade staple fibres	34.47	19.37			34.47	19.37	-44%
64 Footwear, gaiters and the like			39.9	9.85	39.9	9.85	-75%
72 Iron and steel	37.65	20.76	30.36	20.12	32.29	20.29	-37%
73 Articles of iron and steel	21.9	21.9	45.46	36.53	42.19	35.5	-18%
76 Aluminium and articles thereof			33.21	17.86	33.21	17.86	-46%
81 Other base metals, cermets, articles thereof			64.62	29.3	64.62	29.3	-55%
83 Miscellaneous articles of base metals			27.1	27.1	27.1	27.1	0%
84 Nuclear reactors, boilers, machinery etc.			41.84	41.84	41.84	41.84	0%
85 Electrical, electronic equipment	28.34	27.58	47.33	27.84	35.94	27.69	-23%
87 Vehicles other than railway, tramway	15.8	15.8	32.57	16.87	31.04	16.77	-46%
90 Optical, photo, technical, medical, etc. apparatus			38.8	34	38.8	34	-12%
95 Toys, games, sports requisites			5.8	5.8	5.8	5.8	0%
Total average	36.17	20.23	33.63	24.3	31.35	23.05	-26%

Source: Evaluation of the European Union's Trade Defence Instruments (2012)

Table 51 reports the anti-dumping measures in force in the aluminium industry. The aim of the Table is to give a rough idea of the difference between the dumping and the injury margin. The main limitation of this simple exercise is that the AD-duty is company-specific and what we show is just a range of duties set for different companies.

²⁴⁸ The lesser duty effect is the difference between the final duty and the dumping margin in percent of the dumping margin.

Table 51 Anti-dumping measures in force since 2003²⁴⁹

	Product	Country	Year *	Dumping margin** (%)	Injury margin (%)	AD Duty
AD541	Aluminium road wheels	China	2009	23.81-67.66		23.81-67.66
AD578	Aluminium Radiators	China	2011	23-76.6	12.6-61.4	12.6-61.4
AD 582	Aluminium Foil in small rolls	China	2011	28.6-43.4	13-35.4	13-35.4
AD 534 (R565)	Aluminium Foil (certain)	China, Brazil, Armenia	2008 (2012)	23.9-42.9	10.7-52	10.7-42.9

Source: Council Regulations

Since 2003, there are no countervailing duties applied on aluminium products. The two legislative acts regulating the action against dumped and subsidised imports from non-member states are currently under review. In April 2013, a new proposal²⁵⁰ has been made by the Commission to amend the two original regulations aiming at removing the lesser duty rule in case of structural distortions in the raw material market and in case of subsidisation; and also at improving the transparency about the imposition of provisional measures. Moreover, the Commission proposes to reimburse duties to importers which were paid during the period where an expiry review is conducted but which results in the termination of the measure. In general, the costs of compliance with TDI regulation are not an issue. This is not to say that procedural costs are negligible, but that private benefits of trade protection outweigh them. As trade complaints are not an obligation, but an opportunity, companies will undertake them only as far benefits outweigh costs in the case at hand. A substantive part of the procedure is coordinated by the relevant trade association, incurring the compliance costs. According to the Evaluation report of 2012, the estimated average costs of complaints for an association (across all sectors) is around € 60,000 (ranging from less than € 10,000 to more than € 200,000). On top of internal costs, this amount may also include external costs, e.g. the costs of external consultants or

²⁴⁹ Anti-circumvention investigations not considered. The duties mentioned pertain only to the implementing regulation. Where injury margins are not available (see AD541 for instance), this is due to the fact that they are higher than dumping margins: according to the LDR, these are the ones used to define AD duties. (*)Year of the beginning of the investigation; (**) Percentage of CIF Union frontier price, duty unpaid

²⁵⁰ Proposal for a Regulation of the European Parliament and the Council amending Council Regulation (EC) No 1225/2009 on protection against dumped imports from countries not members of the European Community and Council Regulation (EC) No 597/2009 on protection against subsidized imports from countries not members of the European Community; COM(2013)192.

legal support²⁵¹. The report also shows that the costs of making a complaint in the EU are lower than the ones incurred by US and Canadian companies.

On safeguards measures

Safeguard measures can be imposed when the EU experiences a sharp increase of imports from non-EU countries causing a severe injury to the domestic market. The imposition of safeguard measures is regulated by acts, distinguishing either WTO²⁵² or non-WTO countries.²⁵³ The investigation period usually lasts nine months. Afterwards, the EU can impose import tariffs or tariff quota for 200 days, and then for four years in case of definitive measures. The import quota is generally equal to the average level of imports over the last three representative years (EC 2013).²⁵⁴

Currently, no safeguards measures are applied by the EU or against EU exports concerning the aluminium industry.

10.1.4 The Generalised Scheme of Preferences (GSP)

The legislative framework²⁵⁵ that regulates the Generalized Scheme of Preferences will soon be replaced by a new regulation²⁵⁶, which will start to apply in January 2014.²⁵⁷

GSP grants unilateral tariff preferences to developing countries to support their growth and development. The beneficiary countries are divided in three groups: i) Standard GSP (standard generalized preference) beneficiaries; ii) beneficiaries of the GSP+ special incentive arrangement for sustainable development and good governance (enhanced preferences for countries which are economically vulnerable and ratify and implement core international conventions on labour and human rights, environment and good governance); and iii) Everything but Arms beneficiaries (duty free quota free access with the exception of arms and ammunitions, for the Least Developed countries).

The main aim of the reform is to focus preferences on countries most in need of it. Countries that already enjoy special trade conditions due to bilateral trade agreements or,

²⁵¹ In one of our interviews, it emerged that the external costs can be much higher. In particular, the can range from Euro 500,000 to Euro 3,000,000 depending on the complexity of the case.

²⁵² Council Regulation (EC) No 260/2009 on the common rule for imports.

²⁵³ Council Regulation (EC) No 625/2009 on common rules for imports from certain third countries.

²⁵⁴ See http://trade.ec.europa.eu/doclib/docs/2013/april/tradoc_151031.pdf.

²⁵⁵ Council Regulation (EC) No 732/2008 applying a scheme of generalised tariff preferences for the period from 1 January 2009 to 31 December 2011 and amending Regulations (EC) No 552/97, (EC) No 1933/2006 and Commission Regulations (EC) No 1100/2006 and (EC) No 964/2007

²⁵⁶ Regulation (EU) No 978/2012 of the European parliament and of the Council applying a scheme of generalized tariff preferences and repealing Council regulation (EC) No 735/2008.

²⁵⁷ The Regulation will be rolled over by Council Regulation (EC) No 512/2011.

according to World Bank classification, are categorized as high or upper middle income economies for at least three years in a row will no longer receive GSP preferences, since they do not need them to be competitive on the EU market (they will, however, still remain “eligible”, meaning that in the future they could benefit again, should their situation change). This will create more opportunities for poorer economies, which will instead maintain preferences. The reformed scheme maintains the “graduation system”: it excludes from GSP the sectors performing well albeit located in a GSP beneficiary country, based on the quantity of exports compared to exports from other GSP beneficiary countries.

When considering the main exporting countries to the EU, we see that according to the new Regulation, Tajikistan is categorized as “Low and Lower Middle Income Partners” and will still enjoy duty-free opportunities as exporter.

Among the countries that will no longer benefit from the GSP Scheme, we find Egypt and Cameroon, as they are already covered by other trade arrangements with the EU granting them almost equivalent market access conditions. In these cases, a change in exports is not foreseen.

Finally, Bahrain and the United Arab Emirates are listed as high-income partners by the World Bank while Russia is listed as an upper-middle income partner. Hence, they will not benefit anymore from the GSP scheme either.

11 Environmental Policy

11.1 Introduction

EU environmental policy is embedded in a number of legislative measures covering a wide range of aspects, from air quality to the management of solid waste and from water quality to the prevention of noise pollution. EU environmental policy exerts an important influence on the aluminium industry, with about ten main pieces of EU legislation having a more or less direct impact on the operations of aluminium producers. This Chapter reviews the impact of EU environmental legislation concerning (i) the prevention and control of industrial emissions; and (ii) the prevention and recycling of waste, as well as the influence of (iii) various other legislative and policy measures.

The analysis covers, with varying degree of detail, the three categories of regulatory costs considered in this Study, namely: (i) compliance costs, i.e. the costs incurred to fulfil the substantive obligations spelled out in EU legislation (e.g. respecting certain emission limits); (ii) administrative costs, comprising the costs incurred to fulfil the administrative obligations stipulated in the legislation (e.g. the costs for obtaining an environmental permit); and (iii) indirect costs, which refer to the costs incurred by aluminium producers as a result of environmental protection measures that affect other operators along the value chain.

This Chapter is structured as follows: (i) Section 11.2 reviews the main pieces of relevant legislation, with an assessment of the implications for the aluminium industry; (ii) Section 11.3 presents an estimate of compliance costs; (iii) Section 11.3 deals with administrative costs; (iv) Section 11.5 elaborates on indirect costs.

11.2 Review of relevant legislation

11.2.1 Prevention and control of industrial emissions

Overview

The **Industrial Emission Directive** (IED)²⁵⁸ is currently the main piece of EU legislation in the area of industrial emissions (apart from GHG, which are covered under the ETS). IED applies an integrated pollution prevention and control (IPPC) framework for industrial activities in the EU and accordingly it “lays down rules designed to prevent or, where that is not practicable, to reduce emissions into air, water and land and to prevent the generation of waste, in order to achieve a high level of protection of the environment taken as a whole” (article 1). The IED is the successor of the **IPPC Directive** of 1996

²⁵⁸ Directive 2010/75/EU of the European Parliament and of the Council on industrial emissions (integrated pollution prevention and control).

(IPPCD) which first introduced a set of common rules for the permitting and controlling of industrial installations.²⁵⁹ However, the IED also recasts six other pieces of EU legislation concerning industrial emissions,²⁶⁰ thereby providing for a comprehensive regulatory framework applicable to all industrial activities in the EU. The IED also applies to large combustion plants (LCP), i.e. thermal power plants with a total rated capacity of 50 MW or more. Agreed in late 2010, the IED entered into force on 6 January 2011 and was to be transposed into national legislation by member states by 7 January 2013.²⁶¹ Upon transposition, IED provisions will become applicable from 7 January 2014 for existing industrial installations while minimum requirements for LCPs will come into effect on 1 January 2016.

Key Provisions

The IED (as well as the previous IPPCD) is based on the principle that operators of industrial installations must obtain an **integrated environmental permit** from the competent Member State authorities. Permits are to specify the applicable Emission Limit Values (ELVs), based on the so called Best Available Techniques (BATs). The BATs and the associate emission levels applicable to the various lines of business covered by the Directive are to be specified in technical documents, the so called BAT Reference Documents (BREF), whose conclusions are formally adopted by the Commission through an Implementing Decision (the so called “BAT Conclusions”).²⁶² EU legislation does provide for **some flexibility in the implementation of emission limits** and national authorities are allowed to set less strict ELVs under certain circumstances, notably when “the achievement of emission levels associated with the best available techniques as described in BAT conclusions would lead to disproportionately higher costs compared to the environmental benefits” (IED article 15.4) as a result of the local environment, geographical location or technical characteristics of the installation.²⁶³ However, the minimum ELV set directly in the Annexes to the IED cannot be derogated. In order to ensure effective implementation, the IED includes provisions regarding the **monitoring of emission levels** and the **carrying out of environmental**

²⁵⁹ Council Directive 96/61/EC concerning integrated pollution prevention and control (IPPC).

²⁶⁰ The six recast Directives include (i) the three Titanium Dioxide Directives (78/176/EEC, 82/883/EEC and 92/112/EEC on waste from the titanium dioxide industry); (ii) the Volatile Organic Compounds (VOC) Solvents Directive (99/13/EC); (iii) the Waste Incineration Directive (2000/76/EC); and (iv) the Large Combustion Plants (LCP) Directive (2001/80/EC).

²⁶¹ The majority of Member States did not transpose (or only partially transposed) the directive by the deadline of 7 January 2013. For details, see <http://ec.europa.eu/environment/air/pollutants/stationary/ied/transposition.htm>.

²⁶² The BATs are to be developed through “an exchange of information” involving all the stakeholders and coordinated by the European IPPC Bureau of the Institute for Prospective Technology Studies (IPTS) at the EU Joint Research Centre (JRC) in Seville (Spain).

²⁶³ Additional, temporary elements of flexibility are provided for the LCPs, in particular through the application of article 32 on Transitional National Plans and article 33 concerning limited life derogations.

inspections, to take place at least every one to three years, depending upon the level of risk. Furthermore, in the case of plant closures, the IED envisages the adoption of **remediation measures** in order to return the site to the *status quo ante*.

Relevance for the Aluminium Industry

Legislation on industrial emissions applies to the vast majority of installations of the aluminium industry, including (i) the production of key inputs for the aluminium production process (i.e. alumina and prebaked anodes), (ii) primary and secondary aluminium production, and (iii) downstream operations (i.e. rolling and extrusion), to the extent that they also operate a casting facility for remelting (a fairly frequent situation).²⁶⁴ EU industrial emissions legislation also extends to power plants included in integrated primary aluminium plants, which, however, is a rare occurrence. The facilities subject to the IED (and, formerly, to the IPPCD) are (i) required to obtain a permit (or to renew the existing permit within specified deadlines) based on the emission limits associated with the BATs (the so called BATAELs); (ii) subject to monitoring and inspection requirements; and (iii) required to adopt the other measures specified in the IED (e.g. on the closure of sites).

The main reference document for the emission levels applicable to the aluminium industry is the **Non Ferrous Metals Industries BREF** (NFM BREF) which covers the refining of alumina, the production of prebaked anodes and primary and secondary aluminium production (aluminium smelting, re-melting and refining operations).²⁶⁵ Downstream operations (i.e. rolling and extrusion) are not covered by the NFM BREF and the relevant parameters are set by national/regional authorities, taking into account - whenever relevant - the BREF for some 'cross-industry activities', such as the storage and handling of materials and the cooling systems.

The BREF identify a series of BATs for the prevention or minimization of pollution applicable to the various stages of the aluminium production process. These BATs concern the introduction of certain **technologies for pollution abatement** (typically, in the form of end-of-pipe devices) and/or the **modification of production processes** (e.g. through a modification in the composition of inputs) and/or the adoption of **enhanced**

²⁶⁴ According to Annex I, the IED is applicable to "Installations (a) for the production of non-ferrous crude metals from ore, concentrates or secondary raw materials by metallurgical, chemical or electrolytic processes; [and] (b) for the smelting, including the alloyage, of non-ferrous metals, including recovered products, (refining, foundry casting, etc.) with a melting capacity exceeding 4 tonnes per day for lead and cadmium or 20 tonnes per day for all other metals." as well as to "Installations for surface treatment of metals and plastic materials using an electrolytic or chemical process where the volume of the treatment vats exceeds 30 m³."

²⁶⁵ European Commission, Reference Document on *Best Available Techniques in the Non Ferrous Metals Industry*, December 2001. The document, developed in the framework of the IPPC Directive, is currently under revision and a new version is expected to be adopted in the near future. See, European Commission, *Best Available Techniques (BAT) Reference Document for the Non-Ferrous Metal Industries*, Draft 3, February 2013.

process control methods of a general (e.g. the implementation of environmental management systems) or specific nature (e.g. the adoption of measures to control fugitive emissions). Given the nature of the production process, the BATs largely focus on the prevention and control of air emissions, with special emphasis on the emissions of dust (particulate matter, PM), fluorides, dioxins, and sulphur oxides (SOx). However, in line with the integrated approach inspiring the EU legislation, the BATs also concern water consumption and the treatment of effluent water, the minimization of waste generation, energy consumption and re-utilization, and noise control. The techniques listed and described in the BAT conclusions are neither prescriptive nor exhaustive and other techniques may be used that ensure at least an equivalent level of environmental protection.

Box 8 Main Environmental Issues in the Aluminium Industry

Environmental issues mostly concern primary and secondary aluminium production, while the impact of downstream activities is generally more limited. In **primary aluminium** the main environmental issues relate to the emission of SO₂ during the reduction process, the emission of dust, and the generation of solid waste (the so called ‘red mud’) from alumina production (which, however, concerns a limited number of facilities in the EU). For **secondary aluminium** the main issues refer to the emission of dust during pre-treatment, the emission of organics and chlorides from the smelting/refining process and the production of solid waste (salt slag, mostly from rotary furnaces). In **downstream activities**, the main issues concern the emission of particulate and chlorides.

11.2.2 Waste Prevention and Recycling

Overview

EU policy on waste is set out in the ***Thematic Strategy on Waste Prevention and Recycling***²⁶⁶ and is embodied in various pieces of horizontal and product/waste-specific legislation. Legislation particularly relevant for this Study include: (i) the Landfill Directive;²⁶⁷ (ii) the Waste Framework Directive;²⁶⁸ (iii) the Scrap Metal Regulation;²⁶⁹ (iv) the Waste Shipment Regulation;²⁷⁰ (v) the Packaging and Packaging Waste Directive,²⁷¹ and (vi) the End of Life Vehicles Directive.²⁷² Approved in 1999 and amended in 2003 and

²⁶⁶ Communication from the Commission, Taking sustainable use of resources forward: A Thematic Strategy on the prevention and recycling of waste, 21.12.195, COM(2005)666.

²⁶⁷ Council Directive 1999/317/EC of 26 April 1999 on the landfill of waste.

²⁶⁸ Directive 2008/98/EC of the European Parliament and of the Council on waste and repealing certain Directives.

²⁶⁹ Council Regulation (EU) No 333/2011 establishing criteria determining when certain types of scrap metal cease to be waste under Directive 2008/98/EC of the European Parliament and of the Council.

²⁷⁰ Regulation (EC) No 1013/2006 of the European Parliament and of the Council on shipments of waste.

²⁷¹ European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste.

²⁷² Directive 2000/53/EC of the European Parliament and of the Council on end-of life vehicles.

2008, the **Landfill Directive** is intended to prevent or reduce the adverse effects of the landfill of waste on the environment. To this end, the Directive defines the various categories of waste and sets the requirements for the establishment and operations of landfills. Approved in late 2008, the **Waste Framework Directive** (WFD) sets the basic concepts and definitions related to waste management and lays down basic waste management principles. It also sets recycling and recovery targets for certain waste materials, to be achieved by 2020. To this effect, the Directive requires Member States to adopt waste management plans and waste prevention programs. The WFD was to be transposed by Member States by 12 December 2012, but delays were experienced in several countries. Closely connected to the WFD is the **Scrap Metal Regulation**, which, building upon provisions in the WFD (article 6), determines the criteria under which scrap metal ceases to be regarded as waste. The **Waste Shipment Regulation** (WSR) seeks to prevent and control environmental and health hazards in relation to shipments of waste both within the EU and between the EU and third countries, strengthening the provisions of previous legislation dating back to the early 1990s. Approved at the end of 2006, the WSR entered into force on 12 July 2007. The **Packaging and Packaging Waste Directive** (PPWD) provides for measures aimed at limiting the production of packaging waste and promoting recycling, re-use and other forms of waste recovery. Adopted in 1994, the PPWD was amended during the 2000s, in particular to extend the deadlines for compliance for New Member States. Finally, the **End of Life Vehicles Directive** (ELVD) aims at reducing the waste arising from end-of-life vehicles and covers various aspects along the life cycle of vehicles as well as aspects related to treatment operations (e.g. prevention of the use of certain heavy metals, collection of vehicles at suitable treatment facilities, etc.). Approved in 2000, the ELV had to be transposed by 21 April 2002.

Key Provisions

The **Landfill Directive** lays down the criteria for the permitting of landfill operations as well as the waste acceptance procedures and, in line with the polluter pays principle, requires that fees for landfilling adequately reflect investment and operating costs. The **WFD** includes a number of provisions concerning the measures to be put in place by Member States in order to achieve the recycling and recovery targets. Regarding operators, the WFD reiterates earlier provisions regarding the permitting of waste management operations and the registration of waste collectors, transporters and brokers and requires Member States to strengthen inspection mechanisms so as to ensure compliance. The **Scrap Metal Regulation** specifies the criteria under which aluminium scrap may benefit from the so called “end-of-waste” status and sets the requirements that have to be fulfilled by operators (statement of conformity and quality management system). The **WSR** envisages a mechanism for the notification of shipments of waste and reiterates earlier bans on the export of waste outside the EFTA countries as well as on the export of hazardous waste to non-OECD countries. In order to ensure compliance, Member States are required to perform inspections of establishments and spot checks of shipments. The **PPWD** requires Member States to take measures to prevent the formation of packaging

waste and to develop packaging reuse systems in order to reduce the impact on the environment. In particular, Member States are required to introduce systems for the return and/or collection of used packaging to achieve specific recycling targets (e.g. 50% for metals). Similarly, the **ELVD** sets targets for the re-use, recycling and other forms of recovery of end-of-life vehicles. To this effect, the Directive: (i) establishes requirements for waste prevention and for the collection of vehicles; (ii) sets environmental standards for treatment; and (iii) requires Member States to establish a system for the permitting of treatment facilities (with the possibility of derogation in certain cases).

Relevance for the Aluminium Industry

Given the recyclability properties of aluminium, EU waste policy and legislation is of paramount importance for the industry. Traditionally, aluminium producers have been vocal in supporting a stronger approach towards recycling, in order to increase the availability of a crucially important raw material. For instance, in the framework of the current **review of waste policy and legislation**,²⁷³ the aluminium industry has been advocating (i) the setting of more ambitious recycling targets under the PPWD (to be set uniformly at 60% across all waste streams), (ii) the reformulation of criteria for the calculation of recycling rates for construction and demolition waste (i.e. with the exclusion of backfilling operations), as well as (iii) the introduction of a clear distinction between endless recycling and recycling that results in a degradation of materials.²⁷⁴ In this context, a piece of EU waste legislation having a major impact on the aluminium industry is the **Scrap Metal Regulation**. In fact, by effectively removing aluminium scrap from the list of materials regarded as waste, the Regulation frees operators from the substantive and administrative obligations applicable under the WFD. At the same time, the “end-of-waste” status granted to aluminium scrap makes it possible to export scrap to third countries, which at times may have a negative effect on the availability of scrap in the EU market.

11.2.3 Other Environmental Policy Measures

Overview

Other pieces of environmental legislation relevant for the Study include (i) the Air Quality Framework Directive;²⁷⁵ (ii) the Water Framework Directive;²⁷⁶ and (iii) the so called

²⁷³For a general presentation of the review process see http://ec.europa.eu/environment/waste/target_review.htm. The process is based inter alia on a Communication on the implementation of the Thematic Strategy on Waste Prevention and Recycling. See Report from the Commission to the European Parliament, the Council, The European Economic and Social Committee and the Committee of the Regions on the Thematic Strategy on the Prevention and Recycling of Waste, 19.1.2011, COM(2011)13.

²⁷⁴ The industry position on these aspects is summarized in the recent EAA, Position Paper on the EU Waste Legislation, 9 September 2013.

²⁷⁵ Directive 2008/50/EC of the European Parliament and of the Council on ambient air quality and cleaner air for Europe.

Seveso Directives.²⁷⁷ Approved in 2008, the ***Air Quality Framework Directive*** merged four directives and one Council decision into a single measure, providing a coherent framework for the improvement of air quality in the EU. To this effect, the Directive sets standards and target dates for reducing concentrations of fine particles. Adopted in 2000, the ***Water Framework Directive*** also consolidates previous EU legislation on water, with the aim of achieving the ‘good ecological and chemical status’ of ground and surface waters. The ***Seveso Directives*** aim at improving the safety of industrial sites containing large quantities of dangerous substances. The first Directive (Seveso I) was adopted back in 1999. The scope of legislation was progressively expanded, first with amendments and then with the passing of two new Directives, the Seveso II, adopted in 1999, and the Seveso III, adopted in July 2012 and to be transposed by 1 June 2015, in connection with the entry into force of the new classification of chemicals under the CLP Regulation (see the following Chapter 12 on Product Policy).

Key Provisions

The ***Air Quality Framework Directive*** and the ***Water Framework Directive*** provide the general framework for environmental protection in the respective domains. They include a number of provisions concerning the measures to be put in place by Member States in order to achieve the intended objectives, including the development of national plans or strategies and the establishment of appropriate surveillance and enforcement mechanisms. In addition, as in the case of the Landfill Directive, the Water Framework Directive requires the full cost recovery for water services, in line with the polluter pays principle. The ***Seveso Directives*** have required Member States to ensure that industrial operations have a policy in place to prevent major accidents. In particular, operators handling dangerous substances above certain thresholds must develop a safety management system, establish an internal emergency plan, and regularly inform the public likely to be affected by an accident, providing safety reports. In addition, the Seveso III provides for stricter standards for inspections, to ensure more effective enforcement of safety rules.

Relevance for the Aluminium Industry

The ***Air Quality Framework Directive*** has limited direct relevance for the aluminium industry, as the key parameters for air quality are incorporated in the legislation on the prevention and control of industrial emissions. Similar considerations apply to the ***Water Framework Directive***, especially considering the intrinsically ‘dry’ nature of the aluminium production process (with the exception of the alumina process). Regarding the

²⁷⁶ Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for Community action in the field of water policy.

²⁷⁷ Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances, amending and subsequently repealing Council Directive 96/82/EC.

Seveso Directives, as their applicability is linked to the volume of substances stocked, in practice they concern only primary aluminium smelters and the largest secondary producers as well as selected downstream operations.

11.3 Assessment of Compliance Costs

11.3.1 Introduction

Compliance costs refer to the costs incurred by aluminium producers to fulfil the substantive obligations spelled out in EU legislation in terms of prevention and control of air emissions, effluent waters, waste generation, etc. This Section provides an assessment of compliance costs for the industry over the 2002 – 2012 period. Three categories of compliance costs are considered, namely: (i) **investment costs**, i.e. the resources invested in the retrofitting of plants (e.g. the installation of dry scrubbers to control primary emissions during electrolysis) and/or in the adoption of more environmentally-friendly technologies; (ii) **financial costs**, represented by the opportunity cost of the capital invested or by the interest charges paid in case of borrowing; and (iii) **operating costs**, which include the incremental expenses associated with environmental protection investments (e.g. for the maintenance of new equipment or facilities) and/or the implementation of other environmental protection measures (such as the incremental expenses associated with the use of higher quality raw materials).

Compliance costs were estimated based on the information provided by a **sample of operators** active at the various stages of the production process, from primary production (sometimes associated with the production of alumina and/or anodes) to downstream activities, i.e. rolling and extrusion of aluminium products. Information was provided by **28 production facilities, located in eight Member States**. Operators participating in the survey account for about half of the EU primary production capacity, one quarter/one third of secondary production capacity, and one quarter of output in downstream activities. In geographic terms, all the main aluminium producing countries are represented, although the presence of Spanish and Italian operators is comparatively smaller (the two countries cumulatively account for one seventh of the facilities participating in the survey, all of them in secondary production or downstream activities). The composition and salient features of the sample of aluminium producers providing information are summarized in Table 52 below

Table 52 Composition and Salient Features of the Sample

Industry Segment	Number of Facilities Surveyed	Capacity of Facilities Surveyed	Location of Facilities Surveyed
<i>Primary Production (prebaked process)</i>	9	1.6 mln tonnes	France, Greece, Germany, Romania, Slovakia, United Kingdom
<i>Secondary Production (remelters or refiners)</i>	10	1.0 mln tonnes	France, Greece, Germany, Italy, Spain, United Kingdom
<i>Downstream Activities (rolling and/or extrusion)</i>	9	1.5 mln tonnes	France, Greece, Germany, Italy, Romania, Slovakia.

Source: Authors' elaborations and estimates on data provided by producers

11.3.2 Investment Costs

Introduction

The total value of environment-related investments made by the operators surveyed over the 2002 – 2012 period is **€ 228 million**. Predictably, the value is higher in the case of primary production, with aluminium smelters investing about € 140 million. Investments in secondary production and in downstream activities are in the order of € 40 – 45 million. The intensity of investments is also greater in aluminium smelters, with about € 87 invested per tonne of capacity, compared with 62 €/tonne in secondary production and 45 €/tonne in downstream activities.

Figure 79 Overview of Environment-related Investments

Industry Segment	Total Investment (€ mln)	Investment Intensity (€/Tonne of Capacity)
<i>Primary Production</i>	140.0	87
<i>Secondary Production</i>	45.9	62
<i>Downstream Activities</i>	42.1	45

Source: Authors' elaborations and estimates on data provided by producers

The following aspects are worth noting:

- The information provided by the operators participating in the survey is fairly detailed. In most cases, operators provided data on an annual basis, together with a description of the nature of the investments made. In several cases, information was provided even for fairly small items, with some operators listing investments in items worth as little as € 10 – 15,000. Only a couple of operators provided cumulated data

for the whole period analyzed. The data provided were cross checked with other sources of information (see Box 9 below) and found to be realistic;

- In some instances, environment-related investments were undertaken in the framework of large investments, involving the general upgrading of production facilities or, more rarely, the building of new plants. In these cases, the value of investments linked to environmental protection was estimated as a share of total investments. There are, however, cases in which investments data also include capital expenditures for energy efficiency intervention primarily targeted at reducing CO₂ emissions. Therefore, in these cases, the data provided tend to slightly over estimate environment-related investments.

Box 9 Investment Costs - Data Validation

In order to verify the accuracy of the information provided by the operators participating in the survey, data on environment-related investments were compared with information on the total investments made by aluminium producers retrieved from financial accounts. This validation exercise is subject to limitations as financial accounts provide only an approximate indication of investments.²⁷⁸ Also, in the case of multi-plant operators, financial accounts were often available only at the company level, which effectively precludes a detailed comparison. Nonetheless, in all the cases analyzed, the figures provided by the operators surveyed appear to be realistic, as in most cases the value of declared environment-related investments is a fraction (usually a fairly small fraction) of total investments.

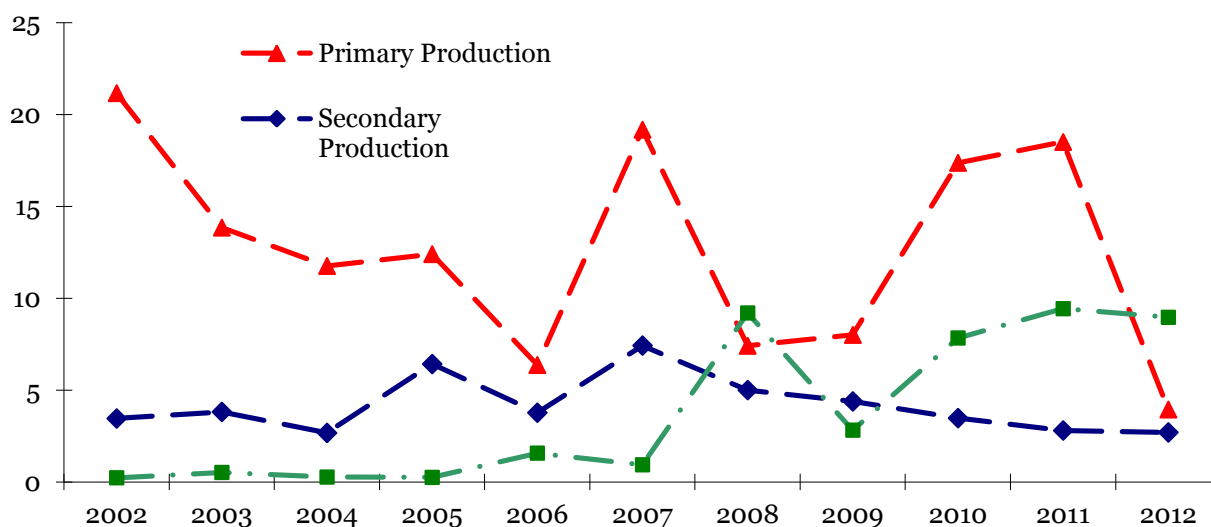
Main Trends

The evolution of environmental investments overtime highlights significant differences among the various industry segments. In the case of primary production, data display an oscillating trend, with a decline from 2002 through 2006, a sharp increase in 2007 followed by an abrupt decline the subsequent year, a recovery in 2009 – 2011, followed by another decline in 2012. In secondary production, environment-related investments display a growing trend (albeit with some oscillations) until 2007, followed by a constant decline in subsequent years. In downstream activities, environment-related investments remained at fairly low levels in the first half of the 2000s, increased sharply in 2008 with an equally sharp decline in the following year, and increased again in 2010 – 2011, with a marginal reduction in 2012. Being referred to a sample of facilities and not to the whole industry, these patterns are obviously influenced by plant specific conditions (e.g. large investments in environmental protection are linked to general investment cycles, which in turn depend upon the age of plants) and, therefore, the presence of significant oscillations is not particularly surprising. However, there are also general factors at work. On the one hand, the peak recorded in 2007 for both primary and secondary production is clearly linked to deadline set by the IPPCD (31 October 2007) for fulfilling the conditions for obtaining environmental permits. On the other hand, general market conditions also appear to play an important role, as witnessed by the

²⁷⁸ Investments were approximated by computing the difference between fixed assets in consecutive years.

abrupt decline in the value of investments in 2008/2009 and in 2012 (at least in the case of primary producers).

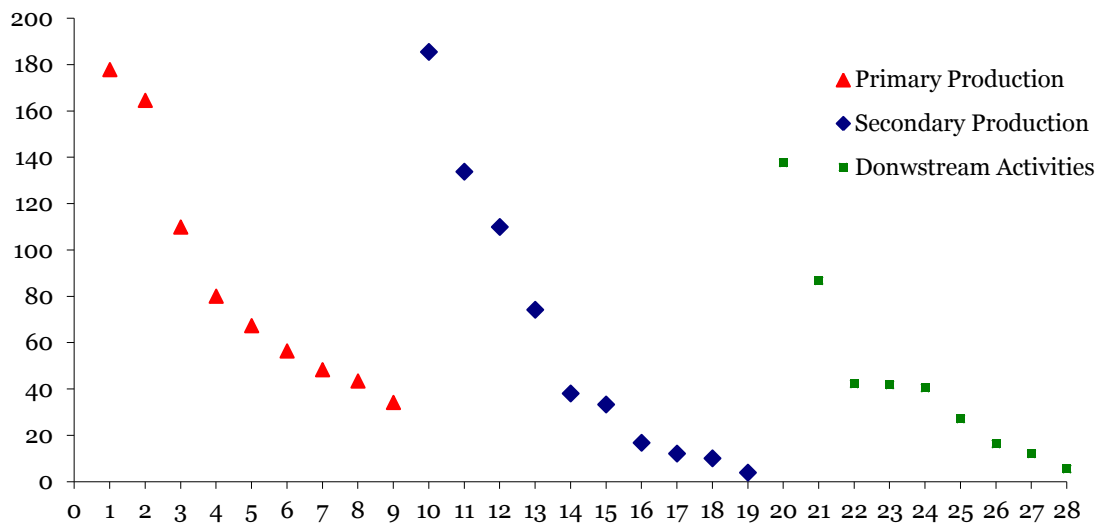
Figure 80 Evolution of Environment-related Investments Overtime – 2002 – 2012 (€ mln)



Source: Authors' elaborations and estimates on data provided by producers

The intensity of environmental investments varies significantly across facilities. Variability is greatest in secondary production: while the majority of remelters/refiners have invested less than 40 €/tonne in environmental protection (in one case only 4 €/tonne), the others display much higher values, often in excess of 100 €/tonne. As a result, the average value of 62 €/tonne is nearly twice the median value of 36 €/tonne. A significant variation is also found among primary producers, with two thirds of plants investing between 40 and 80 €/tonne and the remainder investing between 110 and 180 €/tonne. A more compact distribution is found among operators active in rolling and/or extrusion: while there are some outliers (one facility investing just 5 €/tonne, another investing well above 100 €/tonne), the majority of operators fall in the 10 to 40 €/tonne. And, indeed, in the case of downstream activities, the average value (45 €/tonne) is fairly close to the median (40 €/tonne). Differences in investment intensity depend on a variety of factors, often linked to the specific features of the plants and of their product mix. However, it is worth noting that the highest values (i.e. those in excess of 100 €/tonne) are typically displayed by producers located in Southern or Central EU Member States, while producers in Western Europe usually post value close or lower than the average.

Figure 81 Scatter Plot of Investment Intensity per Facility (€/tonne)



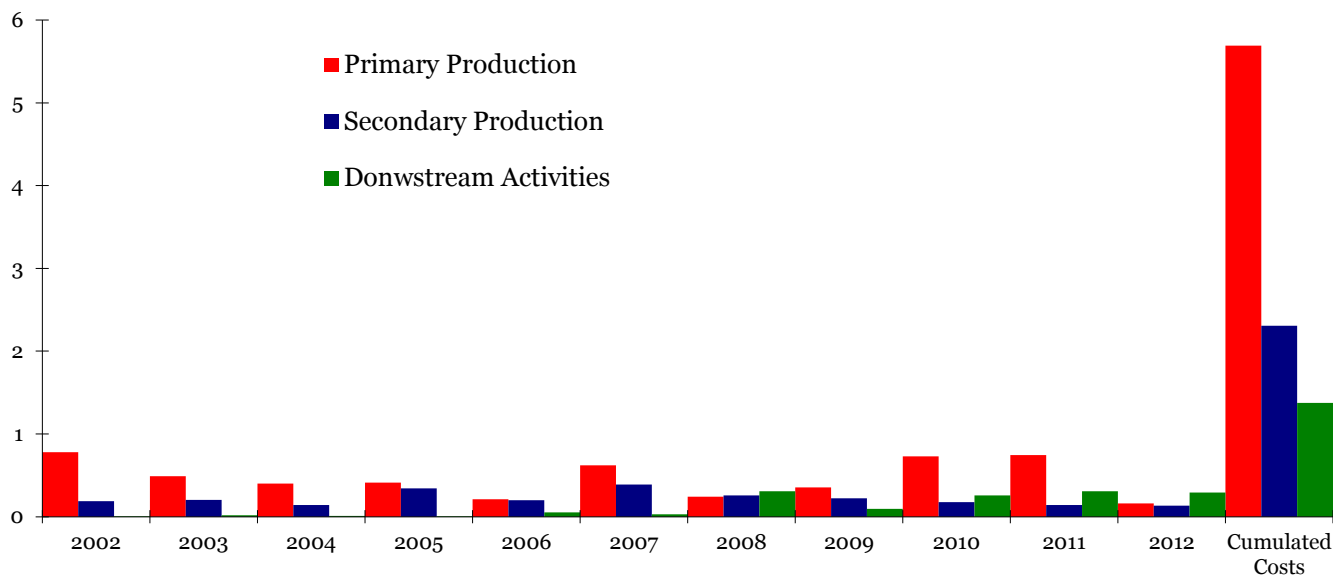
Source: Authors' elaborations and estimates on data provided by producers

Investment Costs per Unit of Output

Environment-related investments influence aluminium producers' financial accounts via depreciation charges. Annual depreciation charges were computed considering an average life of the assets of 20 years, a fairly typical value for capital expenditure in the metals industry. The resulting values were then divided by the volume of output in the corresponding year.²⁷⁹ In the case of primary producers, annual investment costs per unit of output range between € 0.2 and € 0.8, with an average of 0.5 €/tonne. Figures are significantly lower for secondary producers and downstream activities, with averages of, respectively, 0.2 €/tonne and 0.1 €/tonne. However, annual figures provide only a partial indication of the impact of environmental investments on aluminium producers, as investments made in previous years continue to affect financial accounts until they are fully depreciated. Therefore, in order to provide a comprehensive view of the effects, annual values for the eleven-year period considered in the analysis were cumulated. ***The cumulated investment costs at the end of 2002 – 2012 period are 5.59 €/tonne for primary producers, 2.31 €/tonne for secondary producers (i.e. remelters and refiners) and 1.38 €/tonne for operators active in rolling and/or extrusion.*** A summary presentation is provided in Figure 82 below.

²⁷⁹ Comprehensive output figures are available only for primary producers (source CRU). In the case of secondary producers and of operators active in downstream activities, data on production capacity were used instead.

Figure 82 Annual and cumulated investment costs - 2002-2012 (€/tonne)



Source: Authors' elaborations and estimates on data provided by producers and EAA statistics

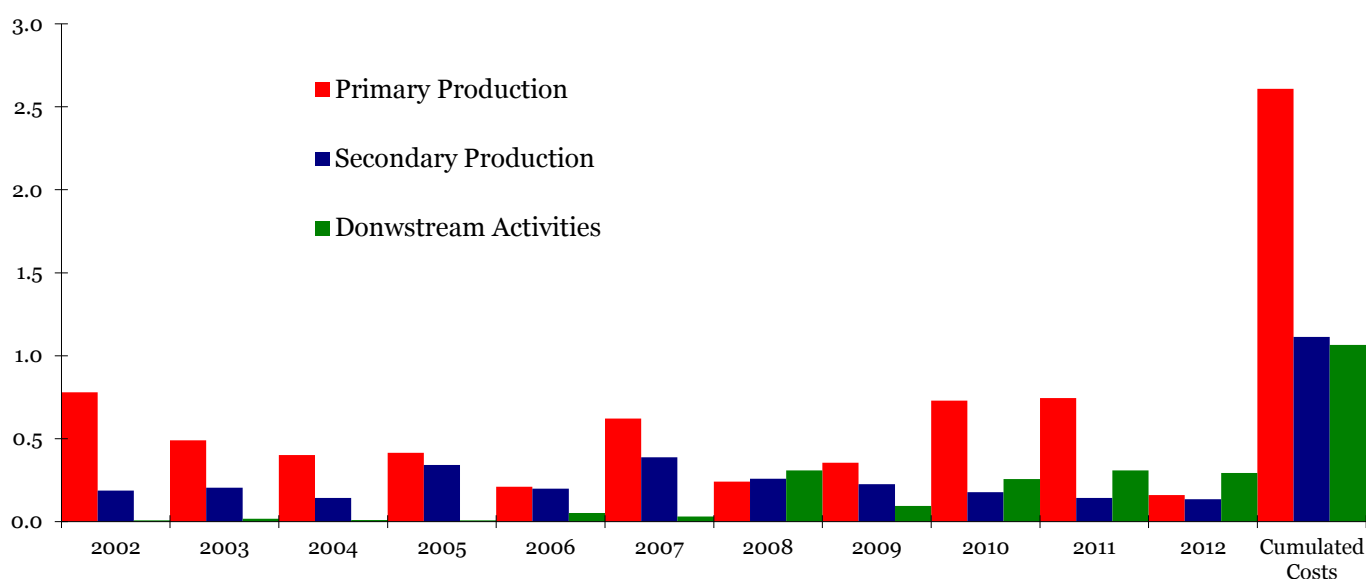
11.3.3 Financial Costs

The financial costs incurred by aluminium producers in connection with environmental protection investments depend upon a variety of factors, such as the financing modalities adopted (i.e. the combination of debt and equity), the status and financial conditions of the investor (in the case of bank lending, large corporations are typically charged more favourable interest rates than SMEs) and the prevailing conditions in the relevant financial markets (which vary across countries and overtime). In the framework of this exercise, it is obviously impossible to take into account all the possible influencing factors and it is therefore necessary to resort to some 'average' parameters. Therefore, financial costs have been estimated assuming that environmental protection investments were entirely financed through bank loans, carrying an interest rate of 5% and with a maturity of 10 years. While certainly an approximation, these parameters are aligned with available information regarding prevailing conditions in the EU financial markets in the years covered by our analysis.²⁸⁰

²⁸⁰ For instance, according to ECB data, over the 2003 – 2012 period (data for 2002 are not available), average lending rates in key aluminium producing countries ranged between 3.7-3.8% in Spain, France and Italy and 4.3% in Germany. Considering the less favourable credit conditions in other Member States (especially New Member States), a 5% interest rate appears as a reasonable assumption. ECB data refer to "loans other than revolving loans and overdrafts, convenience and extended credit card debt", with a maturity of over 1 year, worth more than € 1 million, and irrespective of the presence of a guarantee or collateral. Loans with longer durations (such as the 10 years envisaged in our exercise) were probably more expensive (no data are available), but this was in all likelihood offset by the presence of collateral,

As in the case of investment costs, the financial costs linked to the environmental protection investments implemented in each of the eleven years covered by the analysis range were calculated per unit of output/capacity. In the case of primary producers, annual financial costs per unit of output range between 0.2 and 0.8 €/tonne, with an average of 0.5 €/tonne. Financial costs are significantly lower for secondary producers and downstream activities, with averages of, respectively, 0.2 €/tonne and 0.1 €/tonne. The ***cumulated financial costs for the 2002 – 2012 period are 2.61 €/tonne for primary producers, 1.11 €/tonne for secondary producers and 1.06 €/tonne for operators active in rolling and/or extrusion.*** A summary presentation of results is provided in Figure 83 below.

Figure 83 Annual and cumulated financial costs - 2002-2012 (€/tonne)



Source: Authors' elaborations and estimates on data provided by producers and ECB statistics

11.3.4 Operating Costs

Operating costs (OPEX) connected with environmental protection measures were estimated 'indirectly', as a share of investment expenditure (CAPEX). Information on OPEX/CAPEX ratios was also provided by the producers surveyed and the data are summarized in Table 53 below. Figures show significant variations across the three industry segments, with aluminium smelters posting higher values, usually between 10% and 20%, than those indicated by remelters/refiners and downstream producers, who typically mention OPEX/CAPEX ratios lower than 10%. There are also significant variations operators within each industry segment, with some facilities providing fairly extreme values (i.e. in excess of 30% or below 5%), seemingly because of plant specific

that most industry players (at least in the primary and secondary segments) do not seem to have problems in providing.

factors. In order to reduce the influence of these special cases, it was decided to refer to median values rather than to average values. Therefore, ***the OPEX/CAPEX ratios retained for the analysis are 15% for primary production, 9% for secondary production and 5% for downstream activities.***

Table 53 Summary of Information on OPEX/CAPEX Ratios

Industry Segment	Comments
<i>Primary Production</i>	Information provided by seven producers, of which four indicate OPEX/CAPEX ratios between 10% and 20%, two indicated higher values (30-35%) and one a lower value (5%). The average value is 18%, with a median of 15%.
<i>Secondary Production</i>	Information available for eight producers. Five indicated OPEX/CAPEX ratios between 2% and 8% and three provided higher values, including one case above 50%. The average value is 16%, with a median of 9%.
<i>Downstream Activities</i>	Information available for eight producers. Six indicated OPEX/CAPEX ratios between 5% and 10% and two provided higher values (20-30%). The average value is 7%, with a median of 5%.

Box 10 Operating Costs - Data Validation

An attempt was made to validate the data provided by operators with other sources of information namely the BREF for Non Ferrous Metals and the GAINS model developed by the International Institute for Applied Systems Analysis (IIASA).²⁸¹ The BREF document provides limited information on the economics of BATs, but in the few cases for which data are available the OPEX/CAPEX ratios are aligned with those provided by the operators surveyed, and sometimes even higher.²⁸² Lower OPEX/CAPEX ratios, 3% to 4%, were found in the case of GAINS. However, these data concern only dust abatement measures (i.e. only a small part of the environment-related investments undertaken by the aluminium industry) and, most importantly, refer only to fixed operating and maintenance expenditures, which obviously understate the total value of operating expenses.²⁸³ Overall, subject to the limitations of the alternative sources reviewed, the data provided by operators appear to be reasonably accurate.

As in the case of other components of compliance costs, OPEX were expressed in terms of unit of output. For aluminium smelters, annual operating costs range from 0.5 €/tonne to 2.3 €/tonne, with an average of 1.4 €/tonne. Operating costs are significantly lower for secondary producers and, especially, downstream activities, with averages of, respectively,

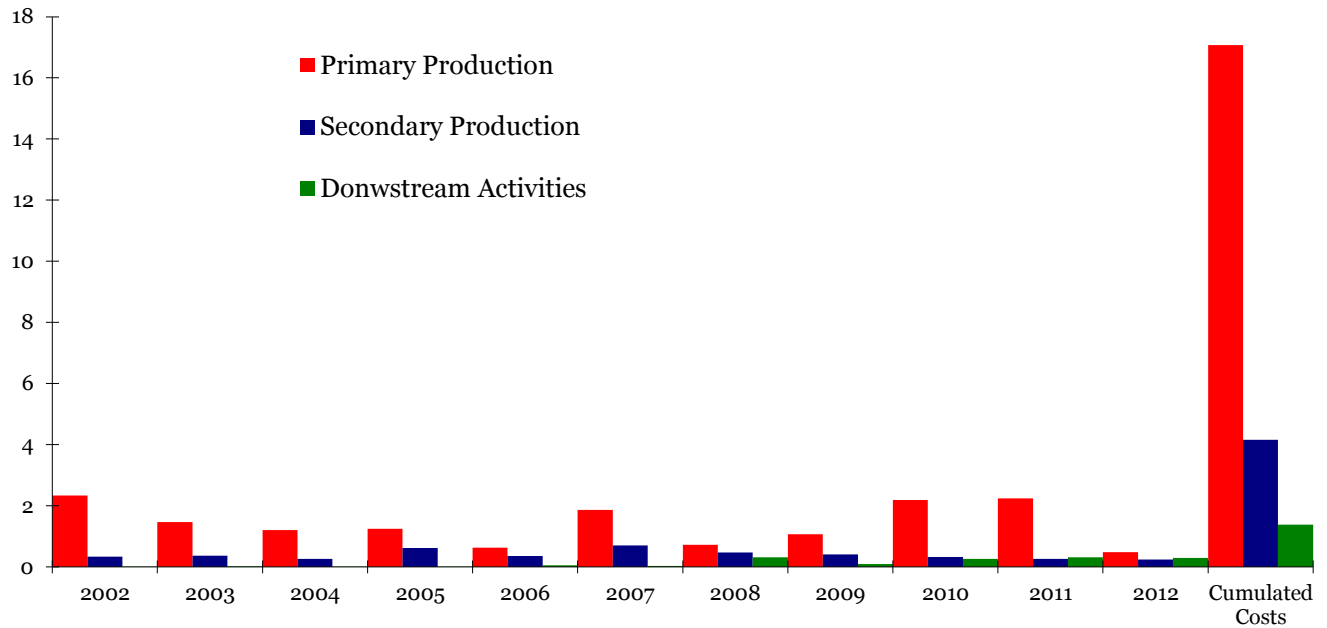
²⁸¹ The GAINS (Greenhouse gas - Air pollution Interactions and Synergies) model is used to assess the impact of environmental policies. To this effect, the model incorporates cost data for a selection of control technologies applicable to various sectors, including the aluminium industry (primary and secondary production).

²⁸² For instance, in the case of wet scrubbers in primary aluminium operating with saltwater, the 2001 BREF anticipates investment costs in the order of € 75 to 250 per tonne of capacity and operating costs of € 40 to 70 per tonne of aluminium, which implies OPEX/CAPEX ratios ranging between 16% and 53%.

²⁸³ See Klimont Z. and others, Modelling Particulate Emissions in Europe - A Framework to Estimate Reduction Potential and Control Costs, Interim Report IR-02-076. Data refer only to control technologies for particulate matter.

0.4 €/tonne and 0.1 €/tonne. In order to assess the overall impact on aluminium producers' operating conditions, operating costs also have to be cumulated over the whole period analyzed, as the operating costs related to investments made in a certain year continue to be incurred also in subsequent years. The **cumulated operating costs for the 2002 – 2012 period are 17.07 €/tonne for primary producers, 4.16 €/tonne for secondary producers and 1.38 €/tonne for operators active in rolling and/or extrusion**. A summary presentation of results is provided in Figure 84 below.

Figure 84 Annual and cumulated operating costs - 2002-2012 (€/tonne)



Source: Authors' elaborations and estimates on EUROSTAT and national statistics

11.3.5 Compliance Costs related to EU Legislation

The cumulated costs incurred by the European aluminium industry for the implementation of environmental protection measures over the 2002 – 2012 period are summarized in Table 54 below.

Table 54 Summary of Cumulated Environment Protection Costs, 2002 – 2012 (€/tonne)

Item	Primary Production	Secondary Production	Downstream Activities
<i>Investment Costs</i>	5.69	2.31	1.38
<i>Financial Costs</i>	2.61	1.11	1.06
<i>Operating Costs</i>	17.07	4.16	1.38
Total	25.37	7.58	3.82

It is impossible to precisely determine the share of environmental protection costs directly attributable to EU legislation as many factors are at play. On the one hand, there are clear signals that EU legislation has been a significant driver of environmental protection investments in some countries. For instance, some of the plants included in our sample

explicitly linked their investment plans to the goal of meeting the standards set by the European Union. On the other hand, in some countries aluminium producers have been subject to environmental permitting well before the adoption of the IPPC Directive (some respondents got their first permits back in the 1970s) and national regulations are not necessarily less stringent than the emissions limits recommended in the BREF.²⁸⁴ Finally, the BATs adopted in 2001 include some control measures that also have generally positive effects on the operations of plants (e.g. through energy savings and/or lower use of certain materials), and therefore it is reasonable to assume that the environmentally-related investments made over the 2002 – 2012 period were not exclusively motivated by regulatory compliance considerations.

Based on the above, compliance costs linked to EU environmental legislation can only be assessed in an approximate manner. This was done by making reference to two scenarios. In the first scenario, EU legislation is assumed to play a key role, accounting for **80% of the costs** incurred by the aluminium industry. In the second scenario, commercial considerations (together, possibly, with national legislation) are assumed to play a comparatively greater role in driving environmentally beneficial activities, and therefore only **50% of the costs** are considered to be linked to EU environmental (and climate change) legislation. The results of this exercise are summarized in Table 55 below. In the case of primary production, cumulated compliance costs over the 2002 – 2012 period are in the order of **12.69 – 20.30 €/tonne**. The corresponding values for secondary production, are **3.79 – 6.06 €/tonne**, while for downstream activities cumulated compliance costs are a much more modest **1.91 – 3.06 €/tonne**.

Table 55 Summary of Cumulated Compliance Costs of EU Environmental Legislation (€/tonne)

	Primary Production		Secondary Production		Downstream Activities	
	EU 50%	EU 80%	EU 50%	EU 80%	EU 50%	EU 80%
<i>Investment Costs</i>	2.85	4.55	1.15	1.85	0.69	1.10
<i>Financial Costs</i>	1.30	2.09	0.56	0.89	0.53	0.85
<i>Operating Costs</i>	8.54	13.66	2.08	3.32	0.69	1.10
Total	12.69	20.30	3.79	6.06	1.91	3.06

²⁸⁴ For instance, in Germany, the ELVs for dioxins set by national regulations in force in the mid 2000s were more stringent than those indicated in the BREF for Non Ferrous Metals. Also, national regulations included measures for the minimization of odorous releases and noise, two aspects not covered by the BREF. For a detailed comparison, see VITO and others, Assessment of the use of general binding rules for the implementation of the IPPC Directive, Report for the European Commission – DG Environment, 29 November 2007, especially the case study on aluminium. It is important to recall that currently there is no BREF directly applicable to downstream activities, which leaves comparatively more room for the application of national legislation or practices (hence the expression - used by some industry representatives - that the relevant parameters are ‘negotiated’ with environmental authorities).

11.4 Assessment of Administrative Costs

11.4.1 Introduction

Administrative costs refer to the expenses incurred for the fulfilment of administrative obligations stipulated in the legislation, such as the costs related to the registration, the notification or the permitting of certain activities or the costs sustained for the supply of data or information for monitoring or policy making purposes. This Section provides an assessment of three categories of administrative costs incurred by aluminium producers, namely: (i) the costs associated with the **issuance/renewal/updating of the Integrated Environmental Permits (IEP)**; (ii) the costs connected with the carrying out of **inspections for checking compliance** with the conditions based on which the IEP was issued; and (iii) the costs associated to the **safeguard measures to be adopted under the Seveso Directive**.

Following standard practice, administrative costs are estimated taking into account: (i) the frequency of the relevant obligations (which can be annual, semi-annual, etc.); (ii) the time spent by personnel on the various tasks, expressed in staff/months; (iii) unit labour costs, for the various categories of personnel involved (managerial staff and technical staff); and (iv) out-of-pocket expenses that may have been incurred (e.g. for fees, consulting services, etc.). Administrative costs are estimated separately for operators active in the three industry segments, i.e. aluminium smelters, remelters/refiners, and downstream producers.

Administrative costs are estimated on the basis of the information provided by a sample of 20 facilities, located in eight Member States (France, Germany, Greece, Italy, Romania, Slovakia and United Kingdom). While the information provided by operators is not always homogenous or complete, it is nonetheless considered sufficient to achieve reasonably robust estimates. A summary of the information available is presented in Table 56 below.

Table 56 Summary of Information Available on Administrative Costs

Industry Segment	Comments
<i>Primary Production</i>	Information provided by seven producers. The information covers all the three categories of administrative costs considered (issuance/renewal/updating of IEP, compliance inspections, Seveso Directives).
<i>Secondary Production</i>	Information provided by eight producers. All producers provided data related to the issuance/renewal/updating of IEP and compliance inspections. The Seveso Directives are applicable only to larger remelting facilities and relevant data were provided by only three operators.
<i>Downstream Activities</i>	Information was provided by five producers. All producers provided data concerning the issuance/renewal/updating of IEP and compliance inspections. The Seveso Directives are applicable only in rare cases and information was provided by only one large producer.

Three points are worth noticing:

- In some cases, the data provided by aluminium producers cumulatively refer to integrated plants, i.e. plants where primary or secondary production is integrated with downstream activities. In these cases, administrative costs were referred to primary or secondary production;
- The time spent by personnel is expressed in terms of staff/months. Time parameters were converted into monetary values using an annual cost of € 100,000 for managers and € 60,000 for technical staff;
- In principle, the analysis should differentiate between costs that are genuinely attributable to EU environmental legislation and costs that are linked to national legislation. However, such a distinction is very difficult to make and therefore all the administrative costs are attributed to EU legislation.²⁸⁵ The only exception is represented by administrative fees that are entirely dependent upon national legislation (EU legislation is silent in this respect) and which, accordingly, were excluded from calculations.

11.4.2 Estimate of Administrative Costs for the Issuance/Renewal of IEP

All the facilities surveyed were issued a new IEP or had to undergo a fully fledged IEP renewal during the 2002 – 2012 period. The vast majority of operators also had to update the IEP, due to changes in operating conditions (e.g. in connection with capacity expansion or modernization) or (more rarely) upon request from the competent authorities. The frequency of updates was much higher for aluminium smelters (up to ten updates), while secondary and downstream producers typically had only one update (and some had none).

The ***time spent by personnel*** working on IEP renewals/updates varies considerably across the facilities surveyed, with some plants indicating a workload of just a few days and others declaring a much more intensive effort (with two plants indicating values in excess of 12 person/months). The overall average values are 1.1 person/months for managers and 4.4 person/months for technical personnel. Staff involvement is highest in secondary production, with an average of 9.4 person/months (heavily influenced by two outliers, the median is 4.8 person/months). In primary production the average workload is 3.5 person/months, while much lower values are found for downstream activities (average of 1.3 person/months).

Total personnel costs for the 2002 – 2012 period are calculated considering the frequency of renewals/updates, the level of effort deployed and unit labour costs. Given the much more frequent updates, the highest costs are found in the case of primary producers,

²⁸⁵ The validity of this assumption is confirmed by the results of earlier studies on administrative burdens, which found that nearly all the administrative costs incurred by operators in the three areas considered by this Study were linked to EU, rather than to national legislation. For details see Capgemini, Deloitte and Ramboll Management, Measurement data and analysis as specified in the specific contracts 5&6 on Modules 3&4 under the Framework Contract n° ENTR/O6/61 - Report on the Environment Priority Area, 15th July 2009.

with five plants out of seven posting costs in excess of € 80,000. For remelters/refiners (i.e. secondary production) personnel costs tend to fall in the € 40 – 60,000 range. Costs are usually lower for downstream producers, with three plants out of five posting costs below € 15,000 and two plants displaying values in the € 40 – 60,000 range.

Out-of-pocket expenses refer primarily to fees paid to consultants for the preparation of technical documentation to be submitted to competent authorities. This cost item is quite substantial: during the 2002 – 2012 period, over one third of the facilities surveyed spent in excess of € 100,000, with two plants reporting expenditures in excess of € 350,000. Primary producers and remelters/refiners post the highest out-of-pocket expenditures, with a majority of facilities spending between € 100,000 and € 200,000, whereas downstream producers usually spent less than € 100,000.

Total administrative costs linked to the issuance/renewal/updating of IEP incurred by operators over the 2002 – 2012 period range from a minimum of about € 19,000 (in the case of a rolling mill) to a maximum of almost € 700,000 (for a medium sized smelting facility). Costs are higher for primary producers, with the majority of plants spending more than € 200,000 and an average value of € 297,000. The average value for secondary producers is about € 246,000, whereas administrative costs for downstream producers are significantly lower, with an average of € 117,000. Apart from the differences across the three industry segments, the magnitude of costs seems to be linked primarily to plant specific factors, with only limited correlation with ‘structural’ variables. For instance, costs tend to be higher in larger plants, but there are also examples of major facilities incurring moderate costs. Similarly, country conditions seem to play only a marginal role. In fact, while the majority of plants in the low cost category (i.e. spending up to € 100,000) are based in Central-Eastern and South European member states, these regions are also home to facilities incurring much higher costs, sometimes well in excess of € 200,000.

Table 57 Summary of Administrative Costs for the Issuance/Renewal/Updating of IEP – 2002 - 2012

Industry Segment	Number of Facilities Spending			Average Per Facility
	Up to € 100,000	€ 100,000 to € 200,000	More than € 200,000	
<i>Primary Production</i>	1	2	4	€ 297,000
<i>Secondary Production</i>	1	2	5	€ 246,000
<i>Downstream Activities</i>	3	1	1	€ 117,000

Source: Authors’ elaborations and estimates on data provided by producers

11.4.3 Estimate of Administrative Costs for Compliance Inspections

Aluminium producers are regularly subject to inspections to verify the fulfilment of conditions specified in the IEP. The frequency of inspections varies, although in most cases

it ranges from one inspection every two years to two inspections per year.²⁸⁶ Inspections are comparatively more frequent for primary and secondary producers, with averages of 1.2 and 1.5 visits per year, whereas downstream producers are, on average, subject to only 0.8 inspections/year. The **time spent by personnel** in dealing with inspections is higher for secondary producers, with averages of 0.5 person/months for managers and 1.5 person/months for technical personnel. Values for primary producers are a bit lower; with 0.5 person/months for managers and 0.8 person/months for technicians. Inspections are much less labour intensive for downstream producers, with just 0.2 person/months for managers and 0.6 person/months for technical staff. Inspections do not entail material out-of-pocket expenditure, and therefore labour costs are the only item considered. Overall, **annual costs** linked to compliance inspections range from a minimum of € 375 (an extrusion plant) to a maximum of € 75,000 (for an integrated plant). The average annual cost is highest for secondary producers, with about € 22,000, followed by primary producers, with € 8,000, and by downstream activities, with € 3,000. Also in this case the magnitude of administrative costs seems to be determined primarily by plant specific features, although country conditions may also play a role (i.e. in two member states costs are always lower than € 10,000 and often lower than € 5,000).

Table 58 Summary of Administrative Costs for the Compliance Inspections – Annual Values

Industry Segment	Number of Facilities Spending			Average Per Facility
	Up to € 10,000	€ 10,000 to € 20,000	More than € 20,000	
Primary Production	5	0	1	€ 8,000
Secondary Production	4	1	3	€ 22,000
Downstream Activities	4	0	0	€ 3,000

Source: Authors' elaborations and estimates on data provided by producers

11.4.4 Estimate of Administrative Costs Linked to the Seveso Directive

The Seveso Directive applies only to plants stocking dangerous substances in excess of certain thresholds. In the case of the 21 plants surveyed, only 11 are subject to the Directive, i.e. all the seven smelters interviewed, three secondary producers and one downstream operator. The **time spent by personnel** on administrative tasks related to the Seveso Directive is usually in the order of 2-3 person/months per plant per year. Values are higher in secondary production, with averages of 0.8 person/months for managers and 2.0 person/months for technical personnel. In primary production average values are 0.6 person/months for managers and 1.4 person/months for technicians, while the single downstream plant subject to the Seveso Directive reported a work load of just 0.6 person/months (0.1 person/months for managers and 0.5 person/months for technical

²⁸⁶ An integrated plant with primary production and downstream activities located in a Central Eastern country declared 12 inspections per year. However, this figure seems to refer to 'light' inspections rather than to fully fledged checks of plant conditions. Therefore, the data from this plant were excluded from the analysis.

staff). As in the case of inspections, personnel costs are the only cost item considered in the analysis, as there are no out-of-pocket expenses. Total **annual costs** range from a minimum of € 500 (for a smelter devoting only a few person/days) to a maximum of about € 32,000 (another smelter declaring a workload of 5 person/months). The average cost is highest for secondary producers, with an average of about € 16,000/year, while primary producers spend about € 12,000/year. The cost for the only interviewed downstream producer subject to the Seveso Directive is about € 3,000.

Table 59 Summary of Administrative Costs for the Seveso Directive – Annual Values

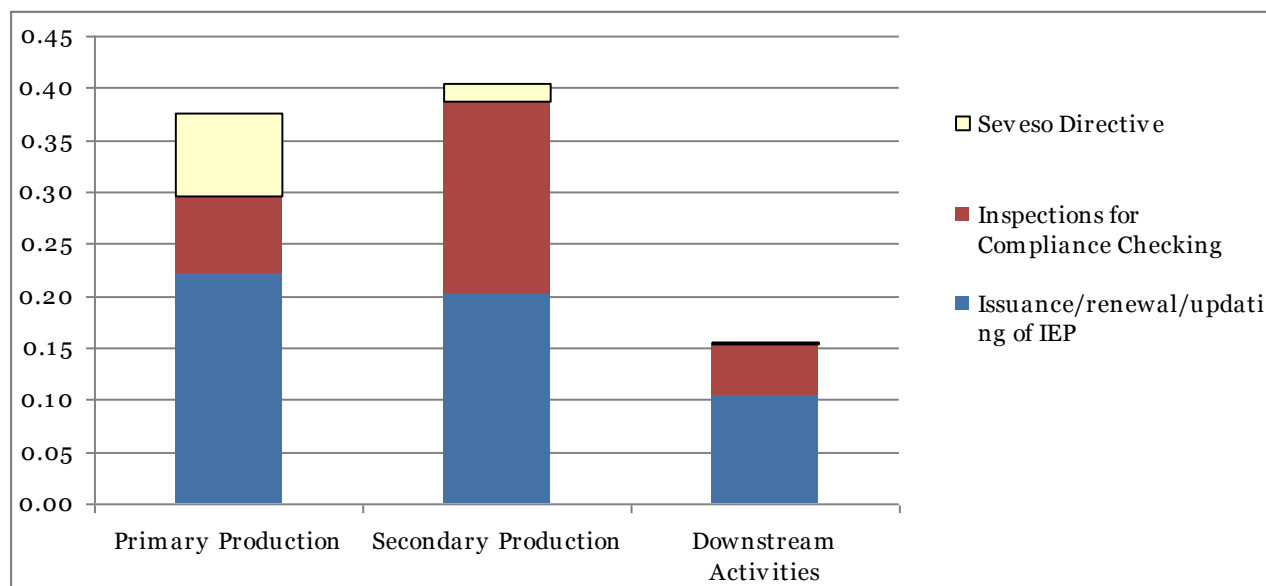
Industry Segment	Number of Facilities Spending			Average Per Facility
	Up to € 10,000	€ 10,000 to € 20,000	More than € 20,000	
<i>Primary Production</i>	4	1	2	€ 12,000
<i>Secondary Production</i>	0	3	0	€ 16,000
<i>Downstream Activities</i>	1	0	0	€ 3,000

Source: Authors' elaborations and estimates on data provided by producers

11.4.5 Administrative Costs per Unit of Output

In order to facilitate a comparison with other costs related to EU environmental policy and legislation, administrative costs have been expressed in terms of unit of output or unit of capacity. In the case of administrative costs for the issuance/renewal/updating of IEP, the value of total costs incurred for the 2002 – 2012 was divided by the total value of output/capacity over the period. In the case of administrative costs linked to compliance inspections and to the Seveso Directive, annual costs were divided by the annual average value of output/capacity over the 2002 – 2012 period. The results of this exercise are summarized in Figure 85 below. **Administrative costs are similar for primary and secondary producers, with annual values of, respectively, 0.38 €/tonne and 0.40 €/tonne, while downstream producers incur in much lower costs, estimated at about 0.16 €/tonne.** The composition of administrative costs varies across the three categories: while costs linked to the issuance/renewal/updating of IEP are by far the main cost item for primary and downstream producers, in the case of secondary producers costs associated with inspections are comparatively much more important.

Figure 85 Average Administrative Costs per Unit of Output/Capacity (€/tonne)



Source: Authors' elaborations and estimates on data provided by producers

11.5 Assessment of Indirect Costs

Indirect costs are defined as costs borne by aluminium producers as a consequence of regulatory provisions not addressed to them but rather to their counterparts. In practice, indirect costs arise in the form of higher costs paid by operators as a result of the influence exerted by EU environmental legislation on operators active at other stages of the value chain, typically suppliers of key inputs.

In the case of EU environmental legislation, the main instance of indirect costs relates to the **higher prices of electricity paid by aluminium producers as a result of the compliance costs incurred by power plants in order to conform to emission limits stipulated in EU legislation** (initially, under the LCP Directive and, subsequently, under the IED). The 'passing on' of compliance costs from power producers to their clients was noted by earlier studies, especially in the case of energy-intensive industries, such as base metals.²⁸⁷ The phenomenon was mentioned in discussions with aluminium producers and is privately confirmed by representatives of the power industry. However, the magnitude of these indirect costs is hard to gauge, due to lack of data.

²⁸⁷ See VITO, Sectoral Costs of Environmental Policy, December 2007 ("As the electricity market is not subject to open international competition, electricity suppliers can pass on any financial burden resulting from environmental regulation onto their customers. Hence, while the [LCP and IPPC] Directives may not cause a competitive distortion in the electricity market, they may very well lead to distortions in other, energy-intensive sectors, such as steel and base metals." page 88).

12 Product policy

12.1 Introduction

EU product policy pursues a dual objective. On the one hand, it aims at increasing the efficient use of resources and at preventing negative consequences for the health of consumers and/or for the environment. This objective is stated *inter alia* in the Commission's Green Paper on Integrated Product Policy (IPP) adopted in 2001²⁸⁸, which led to the EC Communication on IPP of June 2003.²⁸⁹ On the other hand, product policy aims at ensuring that information on the characteristics of products is available to operators and users, so as to facilitate the uniform assessment of performance. This second goal is particularly evident in the case of EU policy towards the construction industry, where the theme of product performance is linked to that of industry competitiveness.

This Chapter reviews the influence of EU product policy in **three 'thematic areas'**, i.e. eco-labelling & eco-design, green public procurement, and life-cycle assessment methodologies, and for **three 'product groups/sectors'**, i.e. chemical substances, construction products and the automotive sector. The analysis focuses on the three categories of regulatory costs covered by this Study, namely: (i) compliance costs, i.e. the costs incurred for fulfilling the substantive obligations spelled out in EU legislation; (ii) administrative costs, comprising the costs incurred to fulfil the administrative obligations stipulated in the legislation (e.g. the costs for the registration of certain products); and (iii) indirect costs, which include the costs incurred by aluminium producers as a result of legislative provisions affecting other entities (e.g. operators at other stages of the production chain).

This Chapter is structured as follows: (i) Section 12.2 provides a review of the relevant legislation and policy documents, with an assessment of the implications for the aluminium industry; (ii) Section 12.3 analyzes compliance costs; (iii) Section 12.4 focuses on administrative costs; (iv) Section 12.5 deals with indirect costs.

12.2 Review of Relevant Legislation

12.2.1 Eco-Labelling and Eco-Design

Overview

Ecolabels are voluntary environmental labelling systems, enabling consumers to recognize eco-friendly products. The EU Ecolabel system was set up in 1992: the general legal

²⁸⁸ European Commission, Green Paper on Integrated Product Policy, Brussels, 07.02.2001, COM(2001)68.

²⁸⁹ Communication from the Commission, Integrated Product Policy - Building on Environmental Life-Cycle Thinking, 18.6.2003, COM(2003)302.

framework is provided by the **Ecolabel Regulation**²⁹⁰ while the requirements that have to be met by specific products are spelled out in subsequent Commission Decisions. Key criteria for the award of the EU Ecolabel include: (i) the ecological impact of goods (with reference to climate change, nature and biodiversity, energy and resource consumption, generation of waste, pollution, emissions and the release of hazardous substances into the environment); (ii) the substitution of hazardous substances by safer substances; and (iii) the durability and reusability of products. A related piece of EU legislation is the **Energy Labelling Directive** of 2010,²⁹¹ which extends the scope of the energy labelling regime introduced in 2001 and establishes new efficiency classes for the most energy-efficient products. Eco-design aims at reducing environmental impacts of products by incorporating environmental considerations since the earliest stage of design. In EU policy, the focus so far has been placed on improving product design with a view to reduce energy consumption. The framework is set by the **Eco-design Directive** of 2009,²⁹² which recast previous legislation on energy-using products²⁹³ and expanded the application of eco-design to energy-related products. Implementing measures for specific products or product groups are presented in the three-year **Eco-design Working Plans**²⁹⁴ and are implemented via subsequent Commission Regulations.

Relevance for the Aluminium Industry

Being entirely voluntary, eco-label systems do not impose any specific obligation on operators and, therefore, they do not have any immediate impact on the aluminium industry. However, being aimed at orienting consumers' preferences, they may nonetheless exert a significant influence on market developments. This is particularly the case for the EU Eco-label system, which, under certain conditions, may be used in green public procurement (see below)²⁹⁵ and, therefore, has the potential of affecting a substantial share of the market. Therefore, in the case of the aluminium industry, eco-labelling legislation is relevant to the extent that it may influence the replacement of aluminium with other materials (or, conversely, favour the use of aluminium over competing materials). A more

²⁹⁰ Regulation (EC) No 66/2010 of the European Parliament and of the Council on the EU Eco-label.

²⁹¹ Directive 2010/30/EU of the European Parliament and of the Council on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products.

²⁹² Directive 2009/125/EC of the European Parliament and of the Council establishing a Framework for the setting of eco-design requirements for energy-related products.

²⁹³ Directive 2005/32/EC of the European Parliament and of the Council establishing a framework for the setting of eco-design requirements for energy-using products.

²⁹⁴ Commission Staff Working Document, Establishment of the Working Plan 2012-2014 under the Ecodesign Directive, 7.12.2012, SWD(2012)434.

²⁹⁵ On the use of the EU Ecolabel in public procurement see <http://ec.europa.eu/environment/ecolabel/ecolabel-and-green-public-procurement.html> as well as the fact sheet included in the GPP Toolkit (European Commission, Green Public Procurement and the European Ecolabel - Fact sheet, 2008).

direct impact on the aluminium industry may result from the eco-design legislation. In fact, the Eco-design Working Plan for 2012 – 2014 includes windows among the priority product groups to be considered for the adoption of implementing measures, following a preparatory study for the identification of possible policy actions.²⁹⁶ The applicability of the Eco-design Directive to windows is seen with significant scepticism by the aluminium industry, as windows are already subject to other EU legislation, namely the Construction Products Regulation and the Energy Performance of Building Directive (see below). Reportedly, making them subject also to the Eco-design Directive would result in the possibility of conflicting provisions.²⁹⁷ A similar issue has emerged in the case of the furnaces used by aluminium producers, which are included in the product group ‘Industrial and laboratory furnaces and ovens’, also considered a priority by the Eco-Design Working Plan. In this case, the risk of conflicting provisions is linked to the fact that industrial furnaces are already subject to the Industrial Emissions Directive as well as to the ETS Directive.²⁹⁸

12.2.2 Green Public Procurement

Overview

The concept of green public procurement (GPP) refers to the development of criteria that minimize the negative externalities on the environment of public expenditure on goods and services. At the EU level, an early reference to GPP can be found in the **Communication on Sustainable Europe** of 2001, which encouraged Member States to make better use of public procurement to favour environmentally-friendly products and services.²⁹⁹ The first operational indications on how to implement GPP were provided by an **Interpretative Communication on public procurement rules**, also adopted in 2001, which explained the possibilities offered by current legislation of taking into account

²⁹⁶The study was launched in July 2013 and is expected to be completed by March 2015. See <http://www.ecodesign-windows.eu/index.html>.

²⁹⁷ The industry also laments that windows are treated differently from thermal insulation products, which are also covered by the Eco-design Working Plan but placed in the so called ‘conditional list’, i.e. among the product groups for which the launch of a preparatory study and the subsequent adoption of implementation measures are subject to regulatory review. On this aspect, see EAA, Position Paper on Eco-design Working Plan, 20 December 2012.

²⁹⁸ In addition, industrial furnaces are typically custom designed and part of a complex production process, and therefore their energy efficiency cannot be assessed in isolation, as it is the case for, say, bakery ovens. On this aspect see the position paper developed by Eurometaux (of which EAA is part) and eleven other European industry associations (“Custom designed industrial kilns and furnaces are already sufficiently regulated – an eco-design regulation for these installations is not needed”, April 2013).

²⁹⁹ Communication from the Commission, A Sustainable Europe for a Better World: A European Union Strategy for Sustainable Development, 15.5.2001, COM(2001)264.

environmental considerations in public purchases.³⁰⁰ This was followed by (i) the incorporation GPP-related aspects in the revision of the Public Procurement Directives approved in 2004,³⁰¹ and (ii) the formulation of a comprehensive approach towards GPP in the Communication on ‘Public procurement for a better environment’ (‘GPP Communication’) adopted in 2008.³⁰² The **Public Procurement Directives** contain several references to GPP, including specific provisions on (i) the inclusion of environmental requirements in technical specifications (Article 23(3)b); (ii) the use of eco-labels (Article 23(6)); (iii) the setting of social and environmental conditions for the performance of contracts (Article 26); (iv) the requirement for economic operators to demonstrate that they have met their environmental obligations (Article 27) and that they can perform a contract in accordance with environmental management measures (Articles 48(2)f and 50); and (v) the inclusion of environmental characteristics among the criteria that may be taken into consideration in the case of award procedures adopting the ‘most economically advantageous’ approach (Article 53). The **GPP Communication** seeks to foster a wider use of GPP by Member States through the identification of common ‘GPP criteria’, with special reference to a set of ‘priority sectors’ where GPP is deemed capable of yielding the greatest potential impact.

Relevance for the Aluminium Industry

EU legislation on GPP does not impose any obligation on operators and therefore it exerts only an ‘indirect’ impact on the aluminium industry, by influencing market developments. So far, this impact has been relatively limited, due to two factors. First, most of the priority sectors for which GPP criteria have been devised have a ‘distant’ relationship with the aluminium industry and this is reflected in the nature of GPP criteria. There are instances when the linkage is stronger, namely in the case of the criterion ‘use of environmental friendly materials’ in the construction industry, but even in this case aluminium is only one of the many materials to be considered (and, in any event, a significant share of aluminium used in construction is indeed the result of recycling and, therefore, can qualify as being environmentally friendly). Second, the uptake of GPP principles is still relatively modest across the EU, with most public authorities making reference to only some of the GPP criteria, which obviously reduces the magnitude of whatever impacts may occur.³⁰³ For

³⁰⁰ Interpretative Communication of the Commission on the Community law applicable to public procurement and the possibilities for integrating social considerations into public procurement, 15.10.2001, COM(2001)566.

³⁰¹ Directive 2004/17/EC of the European Parliament and of the Council coordinating the procurement procedures of entities operating in the water, energy, transport and postal services sectors; and Directive 2004/18/EC of the European Parliament and of the Council on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts.

³⁰² Communication from the Commission, Public procurement for a better environment, 16.7.2008, COM(2008)400.

³⁰³ For a recent analysis of the utilization of GPP criteria see CEPS and College d’Europe, The Uptake of Green Public Procurement in the EU27, report submitted to DG Environment, 29 February 2012.

instance, in the case of the construction industry, the ‘use of environmental friendly materials’ criterion was present in less than one third of a sample of public procurement contracts finalized in 2009 – 2010. A more general issue refers to the fact that current EU policy places emphasis on the recycled content rather than on the end-of-life recyclability of products. Given the full recyclability of aluminium, this approach is perceived as a disadvantage for the aluminium industry.

12.2.3 Life-Cycle Assessment Methodologies

Overview

Life-cycle Assessment (LCA) is a methodology to assess environmental impacts associated with the various stages of a product's life, from raw material extraction through materials processing, manufacture, distribution, use, repair and maintenance, and disposal or recycling. Early LCA analyses focused on energy consumption, but the methodology was quickly extended to encompass air emissions, waste water and solid waste.³⁰⁴ LCA is often mentioned in EU product policy. The carrying out of LCA analyses was already envisaged by the **Directive on Packaging and Packaging Waste** of 1994³⁰⁵ while the already mentioned **Communication on IPP**³⁰⁶ of 2003 qualified LCA as “the best framework for assessing the potential environmental impacts of products currently available” (page 10). More recently, recourse to LCA was also emphasized in the **Resource-efficient Europe Flagship Initiative**,³⁰⁷ which recognizes the “need to consider the whole life-cycle of the way we use resources, including the value chain and the trade-offs between different priorities” (page 4). However, there are instances in which a less comprehensive approach to the assessment of environmental impacts is adopted. This is the case of the **Vehicles Emissions Regulations** (see below), where emissions are considered only for the usage phase, adopting the so called ‘tailpipe’ approach. In other cases, EU policy relies on variants of the LCA approach that attribute different weights to various forms of end-of-life treatment of materials (e.g. recycling vs. recovery). This is the case, in particular, of the methodology proposed in the recent **Communication on the Single Market for**

³⁰⁴ For a review of early developments in LCA, see Boustead I, “LCA - How it Came About, The Beginning in the UK”, *The International Journal of Life Cycle Assessment*, volume 1, issue 3, 1996. For a comprehensive review of LCA, see European Environment Agency, Life Cycle Assessment - A guide to approaches, experiences and information sources, Environmental Issues Series n° 6, August 1997.

³⁰⁵ European Parliament and Council Directive 94/62/EC on packaging and packaging waste.

³⁰⁶ Communication from the Commission, Integrated Product Policy - Building on Environmental Life-Cycle Thinking, 18.6.2003, COM(2003)302.

³⁰⁷ Communication from the Commission, A resource-efficient Europe – Flagship initiative under the Europe 2020 Strategy, 26.1.2011, COM(2011)21.

Green Products,³⁰⁸ which attributes only 50% of the recycling credit at end-of-life as opposed to the full credit granted to energy recovery.

Relevance for the Aluminium Industry

The use of LCA methodologies is generally seen with favour by aluminium producers and, indeed, industry associations at the European and world level have been quite active in promoting the utilization of LCA.³⁰⁹ However, there are still differences in the concrete application of LCA and the use of different methodological approaches may yield substantially different results for final products made of aluminium. To the extent that results of LCA exercises are expected to exert an influence on consumers' behaviour, the adoption of LCA methodologies that do not (fully) take into account the recyclability of aluminium may favour the utilization of alternative products, with a negative impact on sales.

12.2.4 Chemical Products

Overview

The production and use of chemical products ("substances") and their potential impacts on both human health and the environment are addressed by the **Regulation on the Registration, Evaluation, Authorization and Restriction of Chemical Substances** (REACH Regulation).³¹⁰ The purpose of the Regulation is "to ensure a high level of protection of human health and the environment, including the promotion of alternative methods for assessment of hazards of substances" (Article 1). This objective is to be attained through the better and earlier identification of the intrinsic properties of chemical substances. To this effect, the REACH Regulation introduces a system of registrations and authorizations for all the chemical substances and the objects containing chemical substances produced or otherwise supplied in the EU. Operational tasks related to the implementation of the REACH Regulation are entrusted to the European Chemicals Agency (ECHA), a decentralized EU agency. Approved at the end of 2006, the REACH Regulation entered into force on 1 June 2007 and its provisions are to be gradually phased-in over an eleven years period, until 2018. REACH provisions are complemented by those

³⁰⁸ Communication from the Commission, Building the Single Market for Green Products - Facilitating better information on the environmental performance of products and organisations, 9.4.2013, COM(2013)196.

³⁰⁹ For instance, the International Aluminium Institute (IAI) has been collecting data for the performance of LCA analyses since the late 1990s. For a recent review, see IAI, Global Life Cycle Inventory Data for the Primary Aluminium Industry - 2010 Data – Final, August 2013. The EAA is also very active on this front and since the early 2000s has been collecting data on the European industry. See in particular EAA, Environmental Profile Report for the European Aluminium Industry - Data for the year 2010, April 2013.

³¹⁰ Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.

of the ***Regulation of the Classification, Labelling and Packaging*** of substances and mixtures (CLP Regulation),³¹¹ which aims at ensuring that the hazards presented by chemicals are clearly communicated to workers and consumers through appropriate classification and labelling. Adopted at the end of 2008, the CLP Regulation has progressively replaced previous legislation on dangerous substances (the Dangerous Substances Directive and the Dangerous Preparations Directive) and will become fully effective in 2015.

Key Provisions

The key principle of the REACH Regulation is that the marketing of substances that have not been registered with ECHA is unlawful, in line with the ‘no data, no market’ principle (Article 5). Registration is the responsibility of producers and importers, which can act individually or collectively, through the mechanism of ‘joint submissions’ (Article 11). To simplify the registration process, all the manufacturers, importers and other entities dealing with the same substance are required to form the Substance Information Exchange Forums (SIEF). The registration process is to be implemented in stages, depending upon the volume marketed in the EU. Substances with an annual tonnage in excess of 1,000 tons (the so called ‘first tonnage band’) were to be registered by the end of November 2010. The deadline for the registration of substances with a tonnage between 100 and 1,000 tons (‘second tonnage band’) was end May 2013, while substances traded in amounts between 1 and 100 tons (‘third tonnage band’) will have to be registered by May 2018. While the REACH Regulation applies to all chemical substances (estimated to be in excess of 140,000), special provisions are envisaged for the so called “Substances of Very High Concern” (SVHC), which are subject to a specific authorization mechanism, and for high risk substances, whose placing on the market may be subject to restrictions. Another key feature of the REACH Regulation is the requirement to communicate information up and down the supply chain. This is aimed at ensuring that manufacturers, importers and ‘downstream users’ are aware of the information relating to health and safety of the products supplied. The CLP Regulation aligns the EU system of classifying, labelling and packaging chemicals with the Globally Harmonised System developed by the United Nations. Accordingly, the Regulation requires operators to appropriately classify, label and package their substances and mixtures before placing them on the market.

Relevance for the Aluminium Industry

The REACH Regulation deploys its effects across all sectors and also exerts a significant influence on the aluminium industry: operators are subject to registration requirements for certain products and to the obligation of providing information along the supply chain. In addition, the utilization of some substances may be subject to authorization or

³¹¹ Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006

restrictions. Registration obligations concern primarily aluminium metal, aluminium oxide and hydrate but they extend as well to other products used in the production process (e.g. cryolite, aluminium fluoride, etc.) to the extent that they are imported directly by aluminium producers. The requirement to provide information along the supply chain entails the development and dissemination of technical documentation to ensure the safe use of products by ‘downstream users’ as well as interactions with suppliers to notify the ‘identified use’ of substances. Potentially more far reaching effects are associated with the authorization and restriction mechanism, as it may influence the availability of some substances used in the production process, with an impact on production costs. Similar consequences may result from the classification of substances under the CLP Regulation, as the classification of certain substances as hazardous may lead to an increase in operating costs and/or have a negative impact on market developments, as users of aluminium (and in particular secondary aluminium) may be induced to consider switching to alternative products.

12.2.5 Construction Products

Overview

EU initiatives in this area concern the performance of products used by the construction industry, including aluminium products, as well as the environmental performance of buildings. The main legislative measures and policy initiatives include: (i) the Strategy for the Competitiveness of the Construction Sector;³¹² (ii) the Energy Performance of Buildings Directive;³¹³ and (iii) the Construction Products Regulation,³¹⁴ which replaced the Construction Products Directive.³¹⁵ The **Strategy for the Competitiveness of the Construction Sector** addresses the broad theme of the development of the construction industry. Adopted in mid 2012, it formulates a number of proposals for short and medium-long term measures aimed at increasing the contribution of the construction sector to Europe’s sustainable growth. In this context, special emphasis is placed on the issues of improving resource efficiency and environmental performance. The achievement of higher levels of energy efficiency (the “nearly-zero energy building” concept) is the objective of the **Energy Performance of Buildings Directive** (EPBD). A recast of previous legislation adopted in the early 2000s, the EPBD lays down a comprehensive framework to achieve the target of ‘nearly-zero energy buildings’ by 2020. In particular, the Directive requires Member States (i) to develop a methodology for calculating the energy performance of

³¹² Communication from the, Strategy for the sustainable competitiveness of the construction sector and its enterprises, 31.7.2012, COM(2012)433.

³¹³ Directive 2010/31/EU of the European Parliament and of the Council on the energy performance of buildings (recast).

³¹⁴ Regulation (EU) No 305/2011 of the European Parliament and of the Council laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC.

³¹⁵ Council Directive 89/106/EEC of December 1988 on the approximation of laws, regulations and administrative provisions of the Member States relating to construction products.

buildings, (ii) to set minimum requirements for energy performance in order to achieve cost-optimal levels, and (iii) to establish a system for the energy performance certification of buildings. The theme of product performance is addressed by the **Construction Products Regulation** (CPR), which replaced the previous **Construction Products Directive** (CPD). The purpose of the CPR is to create a set of “harmonised rules on how to express the performance of construction products in relation to their essential characteristics” (Article 1). To this effect, the Regulation provides a ‘common technical language’ on the performance of products that can be used by all parties involved and establishes a system for attesting the performance of products, in particular through the generalization of the use of the CE Mark.

Relevance for the Aluminium Industry

The Strategy for the construction sector exerts only a limited, indirect influence on the aluminium industry. It emphasizes the re-use, recycling and recovery of construction and demolition waste, including metal. However, the matter is extensively covered by other pieces of EU legislation (i.e. the Waste Framework Directive) and the Strategy only reiterates the objectives previously set. More relevant for the industry are the EPBD and, especially, the CPR, which is immediately applicable to operators. In particular, the CPR introduces the mandatory CE-marking for all products used in construction (including aluminium doors, windows, and curtain walls), starting from 1 July 2013.³¹⁶ Moreover, the CPR envisages the possibility of setting minimum performance requirements for construction products, an aspect also covered by the EPBD.

12.2.6 Automotive Sector

Overview

The most recent EU policy initiative in the automotive sector is the **CARS 2020 Action Plan** presented by the Commission in November 2012.³¹⁷ The first deliverable issued in the framework of the New European Industrial Policy, the Action Plan aims at reinforcing the competitiveness and sustainability of the auto industry heading towards 2020. The proposed measures aim at: (i) promoting investment in advanced technologies and innovation for clean vehicles, (ii) improving market conditions, (iii) facilitating access to the global market, and (iv) strengthening the industry’s skills base. EU legislation on the automotive sector covers a wide range of aspects, primarily linked to the safety and environmental impact of motor vehicles. Of particular relevance for this Study are the

³¹⁶ For a review of technical aspects linked to the CE-marking of aluminium products used in construction, see EAA and FAECF, CPR Guideline for Aluminium Doors, Windows and Curtain Walls, December 2012.

³¹⁷ Communication from the Commission to the European parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, CARS 2020: Action Plan for a competitive and sustainable automotive industry in Europe, 8.11.2012, COM(2012)636.

Regulation on CO₂ emissions from passenger cars of 2009³¹⁸, the so called **Cars Regulation**, and its counterpart for vans of 2011³¹⁹, the **Vans Regulation**. The two Regulations, sometimes cumulatively referred to as the Vehicles Emissions Regulations, introduce mandatory emission limits for vehicles and set CO₂ emissions targets to be achieved in the medium term (by 2015 for cars and 2017 for vans) as well as in the long term (2020). The Regulations also envisage financial penalties for manufacturers that fail to achieve the stipulated targets as well as rewards (in the form of ‘CO₂ credits’) for the adoption of innovative solutions. Proposals for a revision of the Vehicles Emissions Regulations, aimed at defining the modalities for achieving the 2020 target, were recently put forward by the Commission and are currently under discussion before the European Parliament.³²⁰

Relevance for the Aluminium Industry

The automotive sector is a major user of aluminium and EU policy and legislation on motor vehicles has an obvious impact on the industry. Therefore, any measures aimed at reinforcing the competitiveness of the EU auto industry, such as those envisaged by the Action Plan, are expected to have a positive influence on aluminium producers. In principle, the same applies to legislation on CO₂ emissions. In fact, as reduction in mass is one of the most obvious ways to reduce fuel consumption and, thus, CO₂ emissions, aluminium is susceptible to find a greater utilization by automakers. However, the aluminium industry maintains that the approach currently used in EU legislation for setting CO₂ targets does not allow to fully reap the advantages associated with the use of lighter materials and, therefore, puts aluminium and other light weighting materials at a relative disadvantage compared with other CO₂ abatement solutions.³²¹ The issue is

³¹⁸ Regulation (EC) No 443/2009 of the European Parliament and of the Council setting emission performance standards for new passenger cars as part of the Community’s integrated approach to reduce CO₂ emissions from light-duty vehicles.

³¹⁹ Regulation (EU) No 510/2011 of the European Parliament and of the Council setting emission performance standards for new light commercial vehicles as part of the Union’s integrated approach to reduce CO₂ emissions from light-duty vehicles.

³²⁰ Proposal for a Regulation of the European Parliament and of the Council amending Regulation (EC) No 443/2009 to define the modalities for reaching the 2020 target to reduce CO₂ emissions from new passenger cars, 11.7.2012, COM(2012)393 and Proposal for a regulation of the European Parliament and of the Council amending Regulation (EU) No 510/2011 to define the modalities for reaching the 2020 target to reduce CO₂ emissions from new light commercial vehicles, 11.7.2012, COM(2012)394.

³²¹ The approach currently adopted in EU legislation is to set admissible emission limits according to the mass of vehicles, using a linear relationship between mass and emissions. Instead, the aluminium industry favours the use of an approach based on the ‘footprint’ of vehicles (i.e. track width times wheelbase). For a detailed presentation of the industry position see EAA, Position on the revision of the regulations on CO₂ from cars (EC No 443/2009) and vans (EC No 510/2011), January 2013 as well as EAA, Questions and answers about the methodology to reduce CO₂ emissions from cars, 21 September 2013. The industry position is also supported by other entities, such as The International Council on Clean Transportation (see Peter Mock, Setting the Scene: Technology Potential to Reduce CO₂ Emissions from Cars, presentation, Brussels, November 7, 2012). It should be noted that the use of alternative approaches was analyzed in some detail in the impact assessment for the revision of the two Regulations (Commission Staff Working Document, Impact Assessment, accompanying the documents Proposal for a regulation of the European Parliament and of the Council amending Regulation (EC) No 443/2009 to define the

currently the subject of a lively discussion in the framework of the ongoing revision of the Vehicles Emissions Regulations.³²²

12.3 Assessment of Compliance Costs

12.3.1 Introduction

Compliance costs refer to the expenses incurred by operators to fulfil the substantive obligations spelled out in EU legislation. These costs typically take the form of incremental operating and/or investment costs. However, whenever the regulatory regime exerts an influence on market developments, operators may also face additional costs, in the form of reduced or missed business opportunities. In the case of EU product policy, compliance costs for aluminium producers originate primarily from the legislation on chemical products, i.e. the REACH Regulation and the CLP Regulation. The concept of compliance costs is in principle applicable also to measures regulating construction products, although – as it will be shown below – in practice the magnitude of these costs appears to be negligible. Instead, no compliance costs are connected with EU actions in eco-labelling, green procurement and LCA, as the relevant legislative and policy documents do not impose any specific obligation upon the operators.

12.3.2 Compliance Costs Linked to the REACH and CLP Regulations

In the case of the REACH Regulation compliance costs refer to the expenditures associated with the need to replace chemical substances whose utilization has not been authorized or is subject to restrictions. The authorisation and restriction mechanism established by the REACH Regulation is not yet fully operational and so far no authorization has been granted or denied. However, fears have been voiced that the simple nomination of certain substances for future authorization (i.e. the placing of substances on the so called ‘candidate list’) could generate an ‘announcement’ effect, triggering the removal of substances from the market even before any decision is formally made.³²³ So far, the

modalities for reaching the 2020 target to reduce CO₂ emissions from new passenger cars and Proposal for a regulation of the European Parliament and of the Council amending Regulation (EU) No 510/2011 to define the modalities for reaching the 2020 target to reduce CO₂ emissions from new light commercial vehicles, 11.7.2012, SWD(2012)213). The preference eventually accorded by the Commission to the ‘mass approach’ over the ‘footprint approach’ was based on the consideration that in the case of cars “providing certainty for manufacturers ruled out a change of the basis for the regulation for 2020” whereas in the case of vans “[footprint] can be easily manipulated and this could raise the risk of strong perverse effects” (see European Commission, Memo - Climate action: Questions and Answers on the proposals to reduce CO₂ emissions from cars and vans further by 2020, 11 July 2012).

³²² The adoption of the footprint approach after 2020 was recently supported by the ENVI Committee of the European Parliament, which proposed amendments to this effect to the proposals formulated by the Commission. See European Parliament, Committee on the Environment, Public Health and Food Safety, Compromise and Consolidated Amendments 1 -5, 23.4. 2013. Predictably, the vote of the ENVI Committee was warmly welcomed by the aluminium industry. See EAA Statement on the ENVI Committee vote, Brussels, 24th April 2013.

³²³ See CSES, Interim Evaluation: Functioning of the European chemical market after the introduction of REACH, 30 March 2012 and CSES, Interim Evaluation: Impact of the REACH Regulation on the

aluminium industry has been only marginally affected by this phenomenon: according to industry representatives, there were worries regarding certain auxiliary products (lubricants, oils) but operators were reportedly able to find suitable alternatives, with no appreciable impact on production costs.

More significant effects are potentially associated with the classification of certain substances under the CLP Regulation. This is especially the case of lead, that is currently expected to be classified as category 1A – Reproductive Toxicity, with a Specific Concentration Limit (SCL) of 0.03%. As secondary aluminium from post consumption scrap typically displays lead concentrations in excess of the SCL, secondary aluminium would be classified as ‘toxic for reproduction’. This is expected to result in an increase in operating costs for the transportation, handling and storage of both final products and raw materials as well as to influence the behaviour of downstream users, with potential negative consequences on market developments. This is particularly the case of secondary aluminium used for consumer products, as downstream users are obviously very sensitive to anything even remotely linked to consumers’ health and safety. The classification process is still ongoing and therefore it is currently impossible to determine the potential cost with any degree of accuracy. However, given the orders of magnitude at stake (secondary production accounts for about half of total EU aluminium output), a significant burden for the industry cannot be excluded.³²⁴

12.3.3 Compliance Costs Linked to the Construction Products Regulation

In the case of construction products, compliance costs refer to the expenses incurred: (i) to ensure that the products comply with the declared performance (the ‘essential characteristics’); (ii) to put in place a system for the Assessment and Verification of Constancy of Performance (AVCP); and (iii) in documenting the performance of products. Regarding the first aspect, the CPR does not seem to have had any material impact, as the ‘essential characteristics’ are specified in harmonized standards that have been gradually developed over more than a decade in the framework of the previous CPD. The development of these standards obviously required a certain investment for the industry but it also produced significant ‘systemic benefits’, which is why the aluminium industry has actively supported the standardization process in the first place. Regarding the AVCP, costs vary significantly depending upon the solution adopted, ranging from very low in the case of System 4 to fairly high in the case of System 1+, depending upon the level of

innovativeness of the EU chemical industry, 14 June, 2012. The latter report, in particular, notes that “Premature de-selection of substances (“blacklisting”) is also a major issue” (page vii) and that “A further result has been the “blacklisting” of substances used in sectors such as metals, construction chemicals, printing inks, or paints and coatings. Companies decide to remove substances or not to use them to avoid the extra costs of compliance related to use of those substances” (page 71). It should be noted that the ‘announcement’ effect associated with the ‘candidate list’ is not a novelty and indeed its possible role in accelerating the replacement of unwanted substances was extensively analyzed in the preparatory works for the REACH Regulation. See in particular Ókopol, Case study on “Announcement effect” in the market related to the candidate list of substances subject to authorisation, January 2007.

³²⁴ See EAA, Proposal for the new harmonised classification of Pb, September 2013.

involvement of notified bodies. As for the third aspect, the main innovation concerns the mandatory use of the CE Mark to attest the certified performance of products. However, the CE-marking was already in use in most Member States under the previous Directive, with the only exception of Sweden, Finland, Ireland and the United Kingdom. This is particularly the case of products made with extruded aluminium components, as the CE Mark was introduced in 2005 for curtain walls and in 2009 for windows and pedestrian doors.³²⁵ In addition, while the CPR introduced some changes in manufacturers' obligations compared with the CPD, it also incorporates provisions (i.e. the possibility for downstream manufacturers to rely upon test reports from suppliers, the so called 'cascading') that allow to minimize costs along the whole value chain. Overall, ***the EU legislation on construction products does not seem to have resulted in significant incremental costs for the aluminium industry.***

Box 11 Issues Related to False Certifications for Construction Products

Industry representatives report the frequent falsification of documentation attesting the performance of construction products. The problem is confirmed by the Administrative Cooperation Group (ADCO) for construction products, composed of Market Surveillance Authorities.³²⁶ The phenomenon of false certificates is deemed to have a significant impact on market developments, as it puts 'law abiding' producers at a disadvantage vis-à-vis unscrupulous competitors. However, whatever costs are potentially associated with this behaviour, they fall outside the scope of this Study, as market surveillance is the responsibility of member states and related problems cannot be attributed to EU policy and legislation.

12.4 Assessment of Administrative Costs

12.4.1 Introduction

Administrative costs refer to the expenses incurred by operators to fulfil the administrative requirements spelled out in legislation (e.g. the registration with a certain entity, the provision of information, etc.). Administrative costs may include a wide range of cost items, from the payment of registration fees to the cost of personnel handling the relevant administrative procedures. In the area of product policy, the main source of administrative costs is the REACH Regulation. In the case of the legislation on construction products, administrative obligations (e.g. the issuance of the declarations of performance, which leads to the affixing of the CE Mark) are not easily separable from compliance costs, which – as indicated in the previous Section – are at any rate considered to be of limited importance. The other pieces of product legislation do not impose specific requirements upon operators and therefore do not generate administrative costs.

³²⁵ See the guidance notes produced, in collaboration with EAA, by FAECF (CE marking of curtain walling, November 2004) and EuroWindoor (CE marking of windows and pedestrian doors, December 2007).

³²⁶ See Draft Minutes for the 12th AdCo-CPD meeting, November 14th 2012 – rev.1 and Minutes of the 13th AdCo Meeting: Market Surveillance Construction Products (CPD-CPR) April 24th 2013.

12.4.2 Administrative Costs Linked to the REACH Regulation

Introduction

The analysis of administrative costs linked to the REACH Regulation focuses on five types of obligations, namely: (i) the pre-registration of substances; (ii) the registration of the 'key substances' produced by the aluminium industry; (iii) the registration of other substances used in the production process; (iv) the preparation of authorization dossiers for dangerous substances; and (v) the dissemination of information along the value chain. The information used in the analysis was mostly obtained from industry sources, with some additional elements derived from ECHA publications.

Pre-Registration of Substances

Pre-registration was the first stage in the implementation of REACH and involved the submission of applications with ECHA through a dedicated IT system. The number of applications received by ECHA was quite substantial, about 2.7 million, i.e. 15 times larger than initially envisaged, as many operators tended to adopt a 'just in case' approach. The aluminium industry also participated heavily in the pre-registration phase and the number of applications submitted is estimated by EAA at about 9,500. Pre-registration did not involve the payment of any fee to ECHA and the costs incurred by operators were essentially linked to the human resources devoted to the process. Considering the time spent by operators to familiarize themselves with their obligations under the Regulation, to collect data and to fill the applications, an average cost of € 1,000 per registration was retained. This yields a **total cost of € 9.5 million**.

Registration of Key Substances

The registration of substances involves the submission of an application to ECHA, supported by technical documentation ('dossier'). Unlike pre-registration, registration involves the payment of a fee to cover for ECHA's operating expenses. The aluminium industry has taken responsibility for the coordination of the SIEF for aluminium metal, aluminium oxide and hydroxide, with Rio Tinto Alcan acting as Lead Registrant. According to EAA, a total of 692 registration dossiers have been submitted, of which 482 for substances falling under the first tonnage band and 210 for the second tonnage band. The activities of the three SIEF are supported by the Aluminium REACH Consortium, set up in 2005 upon initiative of the EAA and IAI to assist producers with the analysis of data and studies necessary for the preparation of registration dossiers as well as with the development of guidance documents and templates. The costs incurred by the aluminium industry in connection with the registration of the 'key substances' include three components, namely: (i) the costs for the setting up and the operations of the Aluminium REACH Consortium; (ii) the registration fees paid to ECHA, and (iii) the costs for preparing the individual registration dossiers. In particular:

- **Aluminium REACH Consortium:** according to EAA, the costs incurred by the Consortium as of end 2012 are € 5.0 million. Another € 2.5 million are expected to be spent over the 2013 – 2018 period. This latter figure includes the cost of updating registration dossiers submitted in previous years, so as to reflect new evidence on the effects of substances as it becomes available;
- **Registration Fees paid to ECHA:** the fees payable to ECHA vary depending upon three parameters: (i) the tonnage band, with fees for higher volume substances being more expensive; (ii) the nature of the submission, with ‘joint submissions’ being less expensive than ‘individual’ ones; and (iii) the nature of the applicant, with SME paying less than large companies. In the case of registrations under the first and second tonnage band, all submissions were joint submissions. As for the nature of applicants, it is assumed that the totality of registrations for the first tonnage band (concerning volumes in excess of 1,000 tonnes) originated from large companies. Instead, in the case of the second tonnage band, large companies are assumed to account for 70% of total registrations, with medium enterprises accounting for the balance. Based on these parameters, the average fees paid to ECHA are estimated at € 22,600 for the first tonnage band and € 7,800 for the second tonnage band.³²⁷ Considering the total number of registrations filed by aluminium producers (see above), the total value of registration fees paid until end 2012 can be estimated at about € 12.5 million, of which € 10.9 million for the first tonnage band and € 1.6 million for the second one.³²⁸ No estimate can be provided for the costs to be incurred for registration under the third tonnage band, although it is reasonable to assume that expenses would be lower;
- **Preparation of Individual Registration Dossiers:** this cost item refers to the time spent by personnel for the collection and elaboration of data to be included in the individual registration dossiers. While costs are likely to vary across companies, industry sources suggest an average cost of € 3,000 per registration dossier, without any distinction between the first and second tonnage bands. This unit value, multiplied by the number of registrations, yields a total cost of € 2.1 million. As in the case of registration fees, no estimate can be provided regarding the costs to be incurred in future years.

Based on the above, the total costs incurred by the industry for the registration of key substances can be estimated at **€ 19.6 million**

³²⁷ The applicable fees for ‘joint applications’ under the first tonnage band were € 23,250 for large companies and € 16,275 for medium enterprises. The corresponding values for the second tonnage band were € 8,625 and € 6,038. These fees were in force until March 2013, when a new schedule was adopted by the Commission. See Commission Implementing Regulation (EU) No 254/3013.

³²⁸ As the deadline for registrations under the second tonnage band was 31 May 2013, these figures also include fees that were paid in 2013.

Registration of Other Substances

Aluminium producers were also involved in the registration of substances covered by other SIEF. In this case, detailed data are not available. Based on consultations with some aluminium producers, the EAA estimates the total cost for the registration of other substances at some **€ 15 million**. Considering the above cost parameters for the registration of 'key substances', this value is equivalent to about 900 registrations, half for the first tonnage band and half for the second one. This appears a realistic figure, equivalent to one tenth of the pre-registrations filed by the aluminium industry.

Preparation of Authorization Dossiers for Dangerous Substances

The authorization process requires an intensive interaction with the operators concerned, involving the submission of fairly complex dossiers (including a detailed analysis of the effects of substances, a socio-economic analysis, etc.). The aluminium industry recently started to work on the authorization dossier for coal tar pitch, mostly used in primary production. The total cost for this dossier is estimated at some **€ 1.5 million**, but the bulk of expenditures is expected to be incurred in 2013 and subsequent years. Additional costs are expected to be incurred for the preparation of authorization dossiers for other substances placed (or expected to be placed) on the candidate list (ceramic refractory fibres and chromium compounds), but in these cases no estimates are available.

Provision of Information along the Value Chain

The REACH Regulation requires producers to provide information to their clients and users of substances to notify suppliers about the identified use of substances. In addition, operators supplying dangerous substances are requested to provide detailed information to downstream users in the form of Safety Data Sheets. In the case of the aluminium industry, the costs associated with the provision of information along the value chain are difficult to assess precisely, due to the large number of operators involved (some producers may have to provide information to hundreds of clients) and the different level of customization of the information to be provided. Overall, the cost incurred by operators is estimated by EAA at about **€ 1 million**.

Summing-Up

Based on the above parameters, ***total administrative costs associated with the REACH Regulation incurred by the aluminium industry up to the end of 2012 can be estimated at about € 45.1 million***. More than three quarters of these costs refer to the registration process proper, with pre-registration accounting for 21% and the provision of information for a mere 3%. Future costs cannot be estimated with any degree of precision. However, considering the (few) cost components for which some data are available as well as the fees charged by ECHA for the third tonnage band (much lower than for previous bands), it seems reasonable to assume that they could range between € 15 and 20 million.

Table 60 Summary of Cumulated Administrative Costs Linked to the REACH Regulation (€ mln)

Cost Items	Costs Incurred up to end 2012	Expected Costs for the 2013 – 2018 Period
<i>Pre-registration of Substances</i>	9.5	0.0
<i>Registration of Key Substances</i>	19.6	2.5 (only for consortium expenses)
<i>Registration of Other Substances</i>	15.0	n.a.
<i>Preparation of Authorization Dossiers</i>	negligible	n.a. (presumably fairly high, i.e. 1.5 just for CTP)
<i>Provision of Information along the Value Chain</i>	1.0	n.a. (presumably low)
Total	45.1	n.a.

Although the Regulation was approved at the end of 2006, administrative costs were mostly incurred over the five-year period spanning from 2008 through 2012, probably with a peak in 2010, in correspondence with the deadline for the registration of substances falling in the first tonnage band. Average annual costs for the period are therefore in the order of € 9.0 mln per year. When compared with the average aluminium output for the period, **average annual administrative costs can be estimated at about € 1.34 per tonne.**

12.5 Assessment of Indirect Costs

12.5.1 Introduction

Indirect costs are usually defined as the costs borne by certain operators as a consequence of regulatory provisions not addressed to them but rather to their counterparts (e.g. the increase in the cost of key inputs). In the context of product policy, the notion of indirect costs can be broadened to encompass the negative ‘side effects’ resulting from legislative provisions and policy orientations that may affect developments in the market for final products. In the case of the aluminium industry, the only situation potentially giving rise to indirect costs is related to the use of different LCA methodologies.

12.5.2 Indirect Costs Linked to Different LCA Methodologies

While the basic tenets of LCA have been progressively refined over time and can be regarded as well accepted, there are still significant differences in the way in which LCA is concretely applied to specific cases. In the case of the aluminium industry the main issue refers to the treatment reserved to scrap metal, which in an LCA perspective obviously constitutes one of the key advantages of aluminium over competing products. In this respect, issues have emerged with the methodology for the calculation of the Product Environmental Footprint (PEF) proposed in the recent Communication on the Single

Market for Green Products.³²⁹ In fact, the PEF methodology, somewhat at odds with the waste hierarchy stipulated in the Waste Framework Directive, attributes only partial credit to end-of-life recycling as opposed to the full credit granted to energy recovery. As the PEF methodology is expected to be applied for the development of benchmarks to assess the degree of environmental friendliness of a variety of products, the aluminium industry is concerned that the positive features of aluminium may not be fully accounted for, with potential negative long term effects compared with competing products.³³⁰ However, it should be noted that the methodology is still in the testing phase and that the Commission has already indicated its willingness to consider alternative approaches. Therefore, ***the potential negative effects on future market developments are at this stage highly hypothetical and may well not materialize.***

³²⁹ The methodology is presented in detail in an annex to above mentioned Communication. See Annex II: Product Environmental Footprint (PEF) Guide.

³³⁰ The position of the aluminium industry is presented in the joint position paper Eurofer – Eurometaux – European Aluminium Association, Ferrous and non-ferrous metals comments on the PEF methodology, Brussels, 25th April 2013. The point was reiterated in more general terms in a note jointly developed by Eurometaux and Eurofer on the methodology to assess the environmental footprint of products published in July 2013.