

**Trade and electro-intensity of the hardening  
industry in Germany and in the EU**

**Update and re-evaluation of the short study on  
behalf of the  
Industrieverband Härtetechnik e.V. (IHT)**



**Münster, 4th October 2018**

**Hans Georg Buttermann and Tina Baten**

## Introduction

- The European Commission adopted guidelines for environmental and energy aid from 2014 to 2020 (Guidelines on State aid for environmental protection and energy 2014-2020) on 9 April 2014 (**EEAG**).
- According to the new EEAG guidelines, businesses can in future benefit from **aid-compliant relief** from the **costs of promoting the expansion of renewable energies**, if their **competitive position** would be compromised due to their **trade or electro-intensity** in view of the cost of the expansion of renewable energies.

## Criteria for EEAG guidelines

In order to take advantage of the **relief**, companies must

- belong to one of the 68 ex ante identified sectors listed in Annex 3 of the Directive and demonstrate an electro-cost intensity of at least 20 %. Identical risks exist, in terms of competitiveness, in sectors which demonstrate
  - a **trade intensity**  $\geq 10\%$  and an **electro-intensity**  $\geq 10\%$  at an EU level,
  - a low **trade intensity**, though of at least 4 % where there is a markedly higher **electro-intensity**  $\geq 80\%$  or
  - a very high **trade intensity**  $\geq 80\%$  alongside a low **electro-intensity** of  $\geq 7\%$
- or if they are one of the 152 likewise **ex ante identified** sectors (sectors with a trade intensity with third countries of greater than 4% at EU level), which are listed the Directive in Annex 5, and also have an electro-cost intensity (proportion of electricity costs based on the full surcharge rate within gross value added) of at least 20 % on a company level.

## The problem

- When interpreting the **lists**, it should be noted that there are substantial gaps in the data even at the four-digit (economic sector) level for some sectors, where it is **impossible to simply calculate** – using official data alone – **the proportion of electricity costs to gross value added** and that of the **trade intensity with third countries** at EU level.
- The **lack** of a sufficiently detailed, official data basis alone should not be an **exclusion criterion** for consideration as a sector **eligible for relief**.
- The present study attempts, against this background for the electro-intensive sectors “**surface refinement and heat treatment**” (NACE 25.61) as well as “**contract hardening plant**” (NACE 25.61 21), to empirically determine the indicators required in the EEAG guidelines from data scattered over several locations, and through recourse to information from the companies and from the **Industrieverband Härtetechnik e.V. (IHT)**.
- The **examination period** covers the years from 2010 to 2016.

# Trade intensity

## Definition: Trade intensity of a sector

- The **trade intensity** is defined as the ratio of the sum of exports and imports (trade volume) to the entire supply in the domestic market, i.e. the sum of production plus imports.

$$\text{Trade intensity} = \frac{\text{Import value} + \text{Export value}}{\text{Production value} + \text{Import value}}$$

- In principle, the trade intensity indicator may be calculated on the basis of monetary aggregates or, if sufficient statistical information is available, using physical quantity variables.
- The trade intensity can have a value between nil (no external trade) and one (no domestic production).
- It may be determined entirely empirically for a Member State or for the EU as a whole.

# Germany: Calculation of the trade intensity possible for the sector “surface refinement and heat treatment” (NACE 25.61) only

in € mil. (production, export) and in % (trade intensity)

	2010	2011	2012	2013	2014	2015	2016	average 2010 to 2016
Production	5669	6536	6378	6742	7114	7193	7485	6731
Import <sup>1)</sup>								
Export	1330	1605	1546	1708	1985	1945	2077	1742
Trade intensity	23.5	24.6	24.2	25.3	27.9	27.0	27.8	<b>25.8</b>

Source: DESTATIS, FS4R31 and FS4R411, <sup>1)</sup> Import data not available.

However, due to the **lack** of official information relating to imports, this calculation of trade intensity is **incomplete** or corresponds to the export quota.

## Germany: Trade intensity NACE 25.61

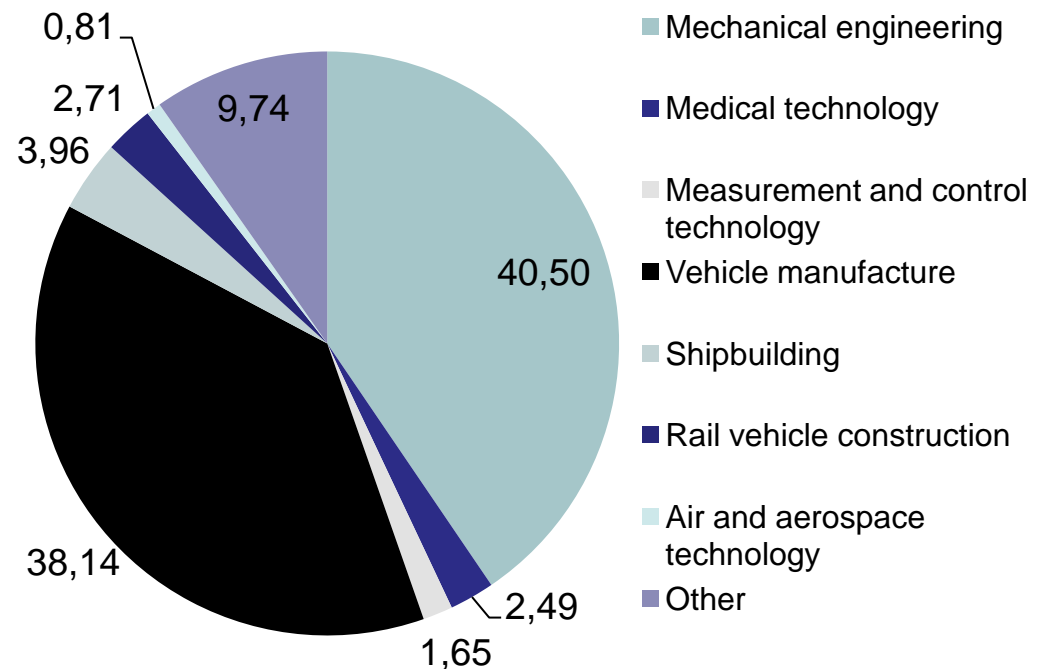
- It is assumed that the trade intensity of the **overall sector** NACE 25.61, i.e. contract hardening plant, results in a trade intensity of 25.9% (average for 2010-2016).
- Because, as a result of the **refining** or service nature of the industry, import data is missing, the **trade intensity** corresponds to the **export rate**. Data on imports would further increase the trade intensity.
- The **trade intensity** or export rate (of the sector NACE 25.61) with **EU third countries** was – according to the official surveys (Specialist Series 4 Number 4.1.1) – an average of 9.5% for the years 2010 to 2016 (22.2% with EU Member States).



# Germany: Determine trade intensity for contract hardening plants on the basis of the customer structure

- The foreign trade statistics do not distinguish between hardened and non-hardened products → generally no foreign trade for contract-hardening-plant products
- **Contract hardening plants** constitute an outsourced production process
- → Calculation of the **trade intensity** on the basis of customer structure (upstream and/or downstream sectors) and their trade intensities (calculated according to EUROSTAT)
- This approach is also transferable to a **European level**

**Customer structure: contract hardening plants, average 2010-2016, Germany, proportion in %**



Source: IHT

# Germany: Empirical results - Trade intensity (extra-EU and intra-EU) on the basis of the customer structure

Average 2010-2016

Sectors	Production (in € mil.)	Import (in € mil.)	Export (in € mil.)	Trade intensity	Customer structure (in %)
Mechanical engineering	161,796	69,842	160,856	99.59	40.50
Medical technology	3,001	3,050	6,519	158.13	2.49
Measurement and control technology	20,199	15,444	28,065	122.07	1.65
Vehicle manufacture	134,633	78,870	184,898	123.54	38.14
Shipbuilding	1,830	365	1,026	63.36	3.96
Rail vehicle construction	4,242	1,766	3,445	86.73	2.71
Air and aerospace technology	14,865	26,147	37,754	155.81	0.81
Other	177,393	149,036	161,977	95.28	9.74

**Weighted trade intensity: 108.8**

# Germany: Empirical results - Trade intensity with EU third countries on the basis of the customer structure

Average 2010-2016

Sectors	Production (in € mil.)	Import (in € mil.)	Export (in € mil.)	Trade intensity	Customer structure (in %)
Mechanical engineering	161,796	25,886	85,868	59.54	40.50
Medical technology	3,001	1,635	4,302	128.06	2.49
Measurement and control technology	20,199	8,827	16,182	86.16	1.65
Vehicle manufacture	134,633	14,823	98,064	75.53	38.14
Shipbuilding	1,830	4,010	3,292	125.03	3.96
Rail vehicle construction	4,242	468	1,305	37.65	2.71
Air and aerospace technology	14,865	7,530	17,455	111.57	0.81
Other	177,393	65,106	64,181	53.31	9.74

**Weighted trade intensity: 69.9**

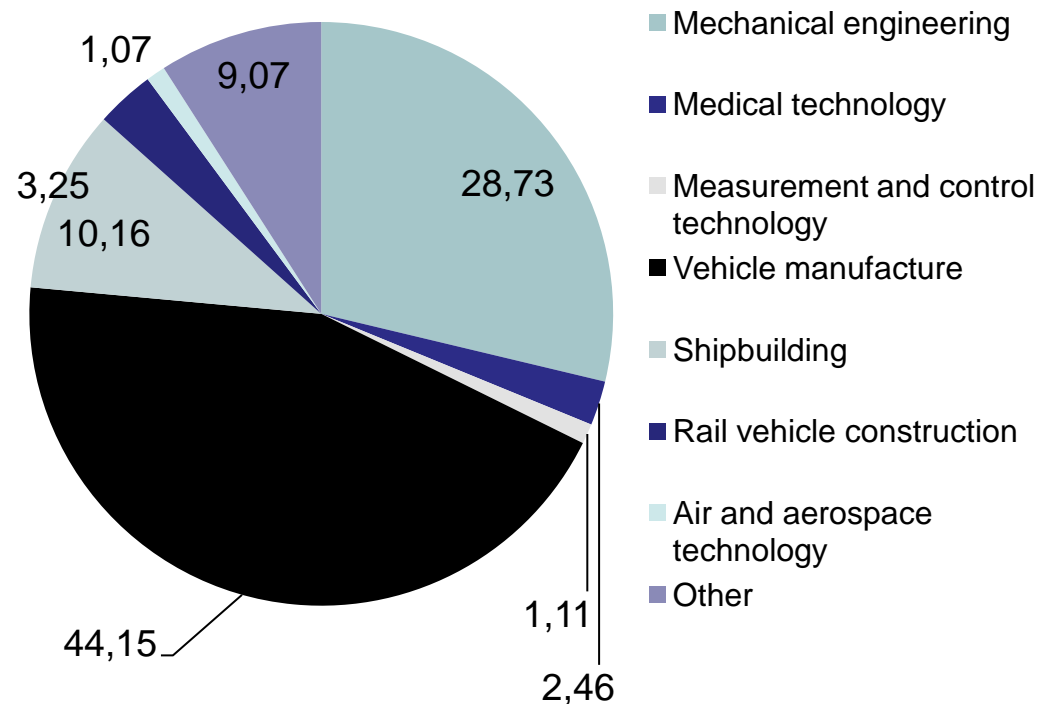
Source: Own calculations based on Eurostat

# EU: Determine trade intensity of the sector “Contract hardening plants” (extra-EU) on the basis of the customer structure

Average 2010 to 2016

- The exact **customer structure** of contract hardening plant in the EU is **not known**
- A new structure can be calculated based on the **customer structure** for Germany as well as the **economic structures** in the EU and Germany
- A new **calculation** for contract hardening plants' intensity of trade can be made based on the **new** structure and on the trade intensities of the sectors in the EU with third countries

**Customer structure: contract hardening plants in the EU, average 2010-2016, proportion in %**



Source: own calculations based on Eurostat, IHT

# EU: Empirical results - Trade intensity of the “contract hardening plant” sector (extra-EU) on the basis of the customer structure

Average 2010-2016

Sectors	Production (in € mil.)	Import (in € mil.)	Export (in € mil.)	Trade intensity	Customer structure (in %)
Mechanical engineering	458,879	320,390	472,430	101.74	28.73
Medical technology	11,865	13,924	19,797	130.75	2.46
Measurement and control technology	54,170	60,221	74,429	117.71	1.11
Vehicle manufacture	623,064	384,010	492,223	87.01	44.15
Shipbuilding	18,761	3,380	6,105	42.84	10.16
Rail vehicle construction	20,332	7,482	10,078	63.13	3.25
Air and aerospace technology	78,251	107,145	139,683	133.14	1.07
Other	660,342	699,597	640,884	98.57	9.07

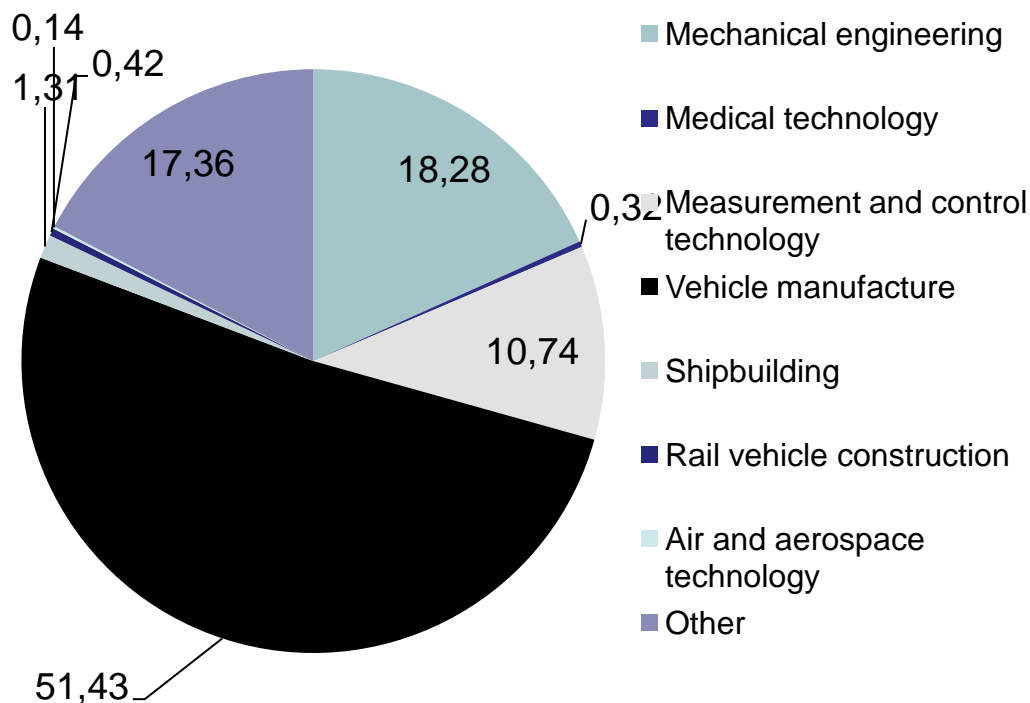
**Weighted trade intensity: 88.9**

# EU: Determine trade intensity of the sector “surface refinement and heat treatment” (extra-EU) on the basis of the customer structure

Average 2010 to 2016

- The exact **customer structure** of Sector 25.61 in the EU is **not known**
- A new structure can be calculated based on the **customer structure** for Germany as well as the **economic structures** in the EU and Germany
- A new calculation for the **weighted intensity of trade of the “surface refinement and heat treatment” sector** can be made based on the **new** structure and on the trade intensities of the sectors in the EU with third countries

**Customer structure of sector NACE 25.61 in the EU, average 2010-2016, proportion in %**



Source: own calculations using Eurostat, IHT

**at an EU level: 94.5 %**

# EU: Empirical results - Trade intensity of the “contract hardening plant” sector (extra-EU) on the basis of the customer structure

Average 2010-2016

Sectors	Production (in €000s)	Import (in €000s)	Export (in €000s)	Trade intensity	Customer structure (in %)
Mechanical engineering	458,879	320,390	472,430	101.74	18.28
Medical technology	11,865	13,924	19,797	130.75	0.32
Measurement and control technology	54,170	60,221	74,429	117.71	10.74
Vehicle manufacture	623,064	384,010	492,223	87.01	51.43
Shipbuilding	18,761	3,380	6,105	42.84	1.31
Rail vehicle construction	20,332	7,482	10,078	63.13	0.42
Air and aerospace technology	78,251	107,145	139,683	133.14	0.14
Other	660,342	699,597	640,884	98.57	17.36

**Weighted trade intensity: 94.5**

Source: Own calculations based on IHT and Eurostat

# **Electro-intensity: Proportion of electricity costs within gross value added**



## Definition: Electro-intensity of a sector

- The electro-intensity criterion is defined in the guidelines as the relationship between the electro-costs (assuming the payment of the full EEG surcharge rate) to gross value added.

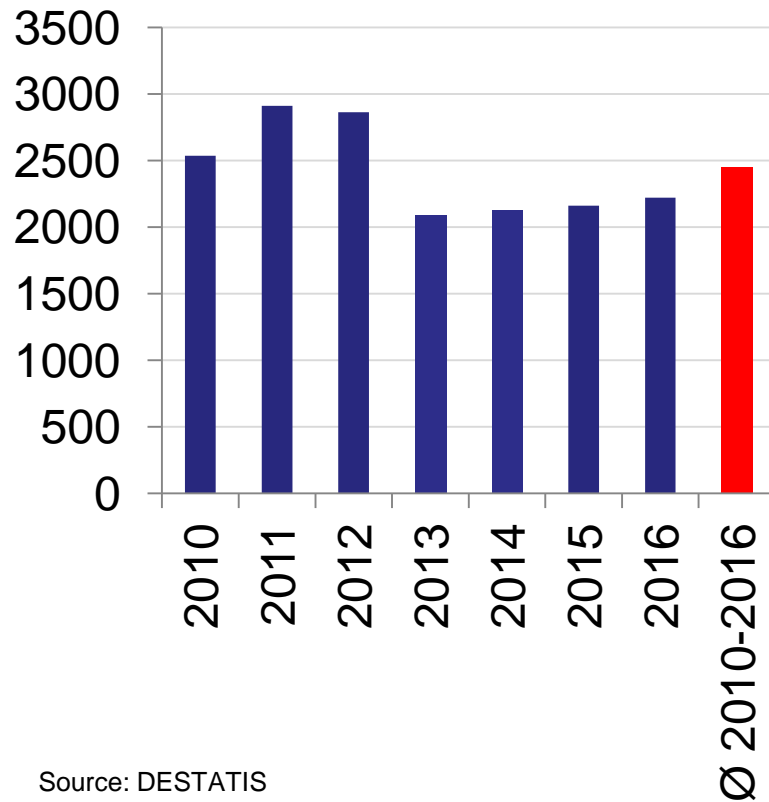
$$\text{Trade intensity} = \frac{\text{Import value} + \text{Export value}}{\text{Production value} + \text{Import value}}$$

- The payments can, in principle, be limited to 4% of the gross value added (GVA cap)
- For companies whose electro-intensity is higher than 20%, the surcharge payment can be limited to 0.5% of the gross value added (“super GVA cap”)

# Germany: Electricity consumption

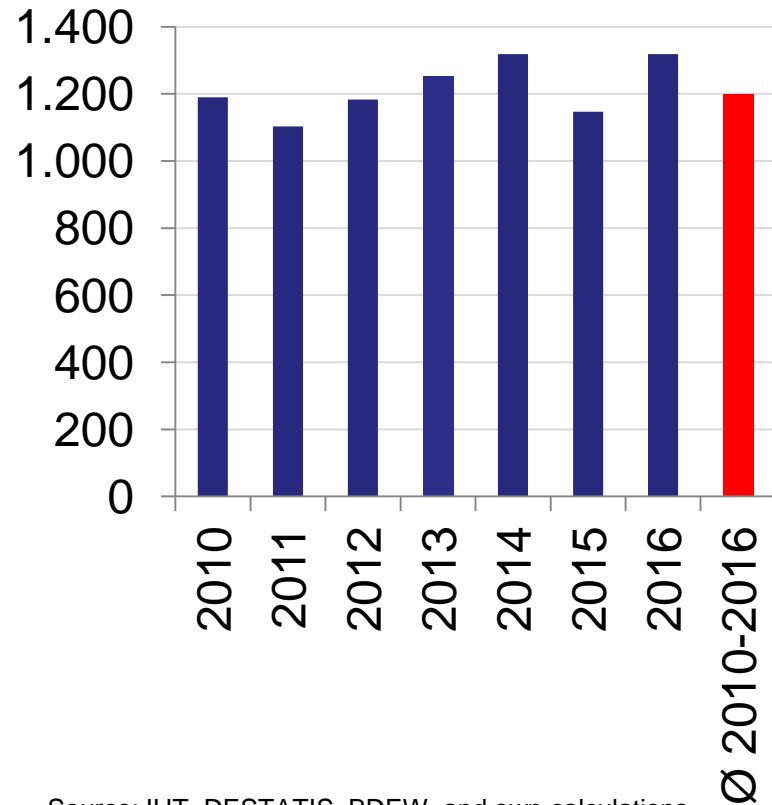
2010 to 2016, average 2010 to 2016, in GWh

## Surface refinement and heat treatment (NACE 2561)



Source: DESTATIS

## Contract hardening plants (NACE 2561 21)

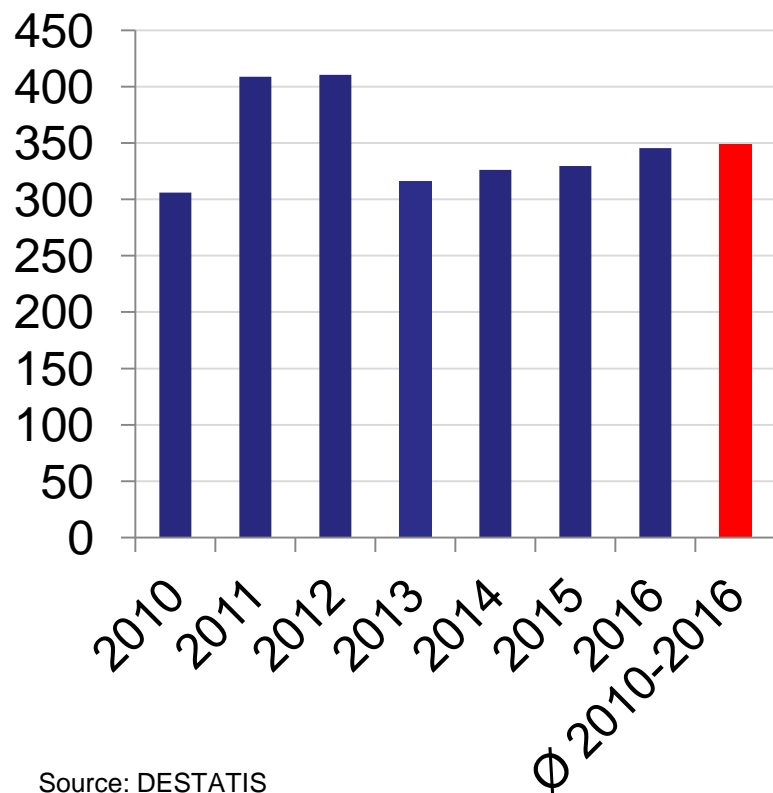


Source: IHT, DESTATIS, BDEW and own calculations

## Germany: Electro-costs

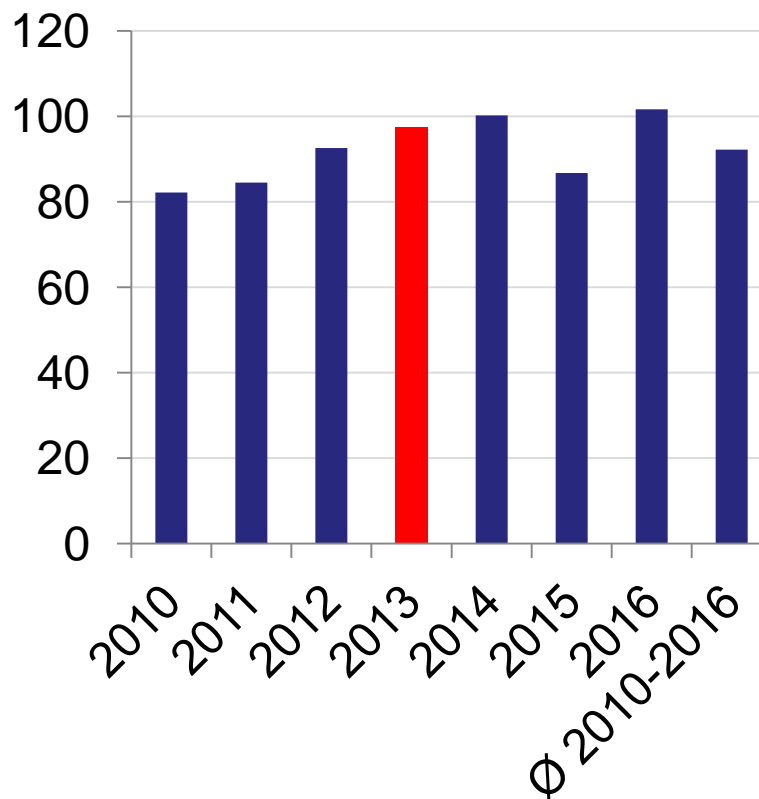
2010 to 2016, average 2010 to 2016, in € mil.

### Surface refinement and heat treatment (NACE 2561)



Source: DESTATIS

### Contract hardening plants (NACE 2561 21)

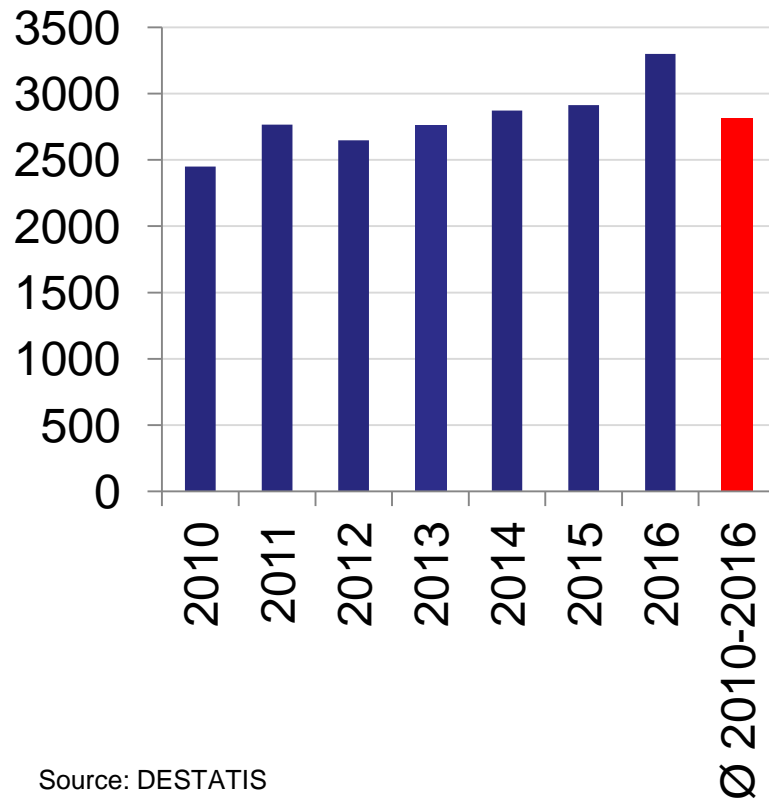


Source: IHT, DESTATIS, BDEW and own calculations

# Germany: Gross value added (at factor cost)

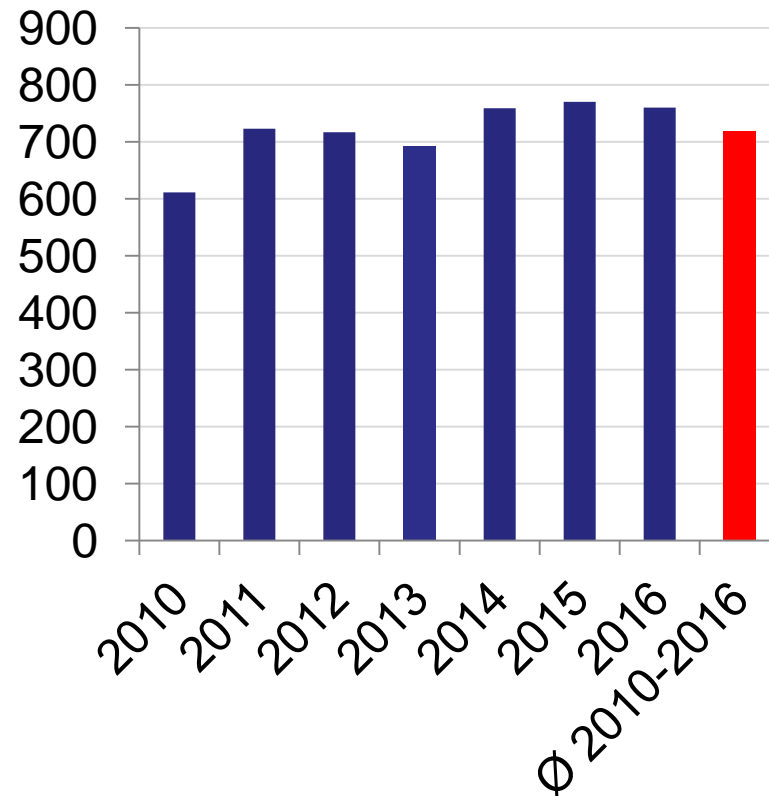
2010 to 2016, average 2010 to 2016, in € mil.

## Surface refinement and heat treatment (NACE 2561)



Source: DESTATIS

## Contract hardening plants (NACE 2561 21)

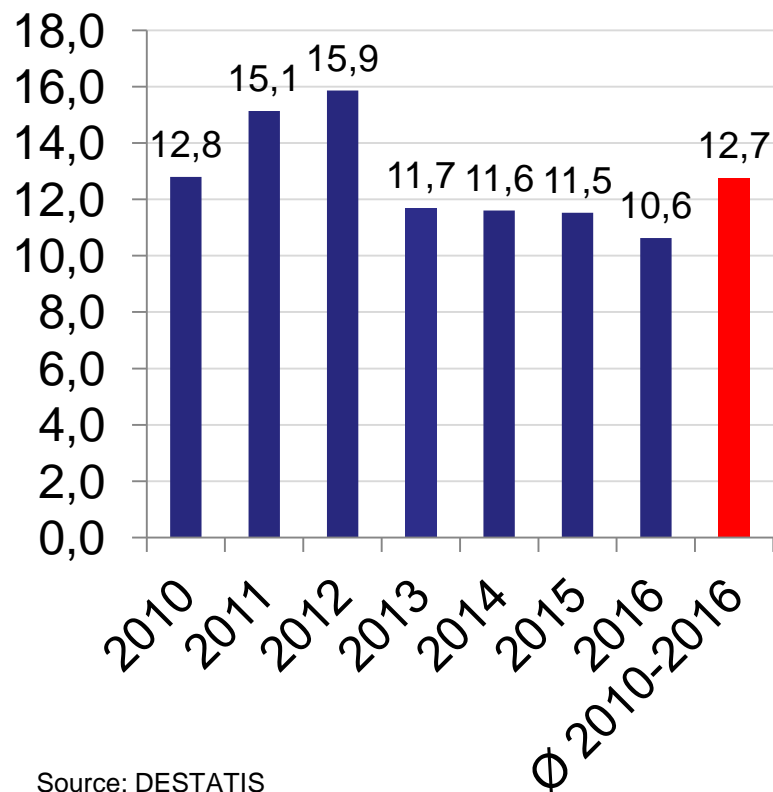


Source: IHT, DESTATIS, BDEW and own calculations

# Germany: Electricity cost share within gross value added at factor cost

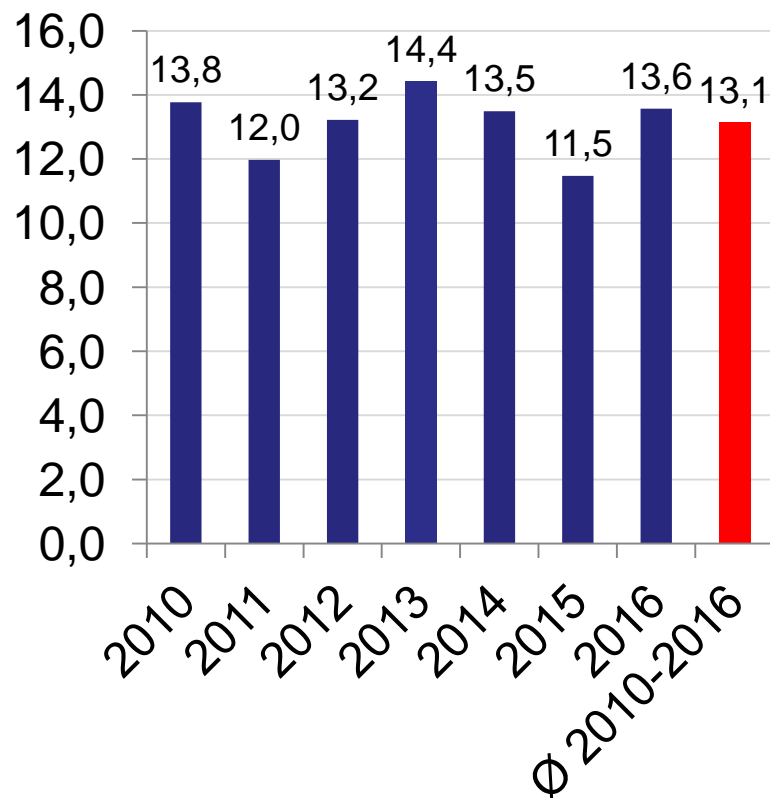
2010 to 2016, average 2010 to 2016, share in %

## Surface refinement and heat treatment (NACE 2561)



Source: DESTATIS

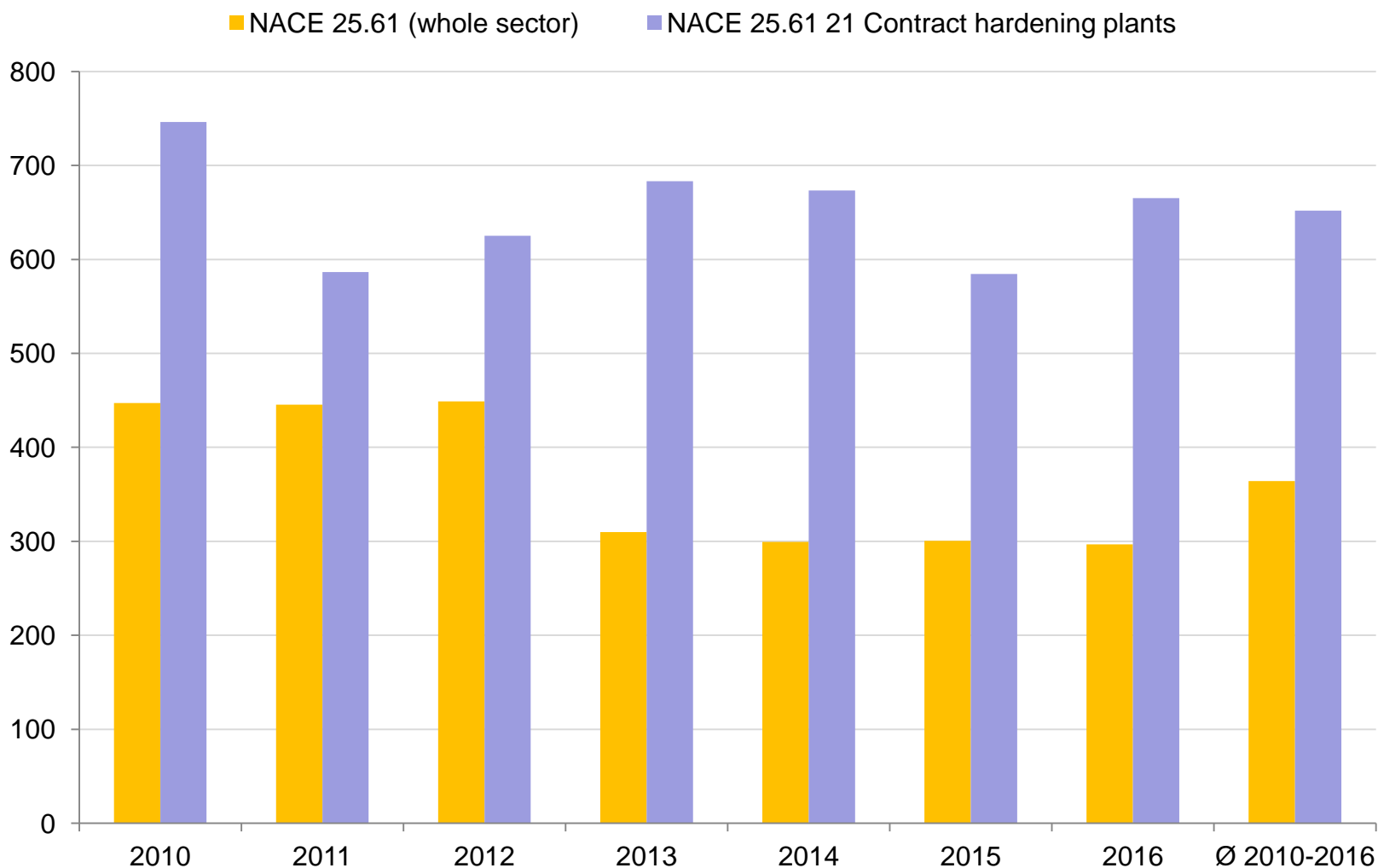
## Contract hardening plants (NACE 2561 21)



Source: IHT, DESTATIS, BDEW and own calculations

# Germany: Specific electricity consumption of the sectors surface refinement and heat treatment (NACE 25.61 21) and “contract hardening plants” (NACE 25.61 21)

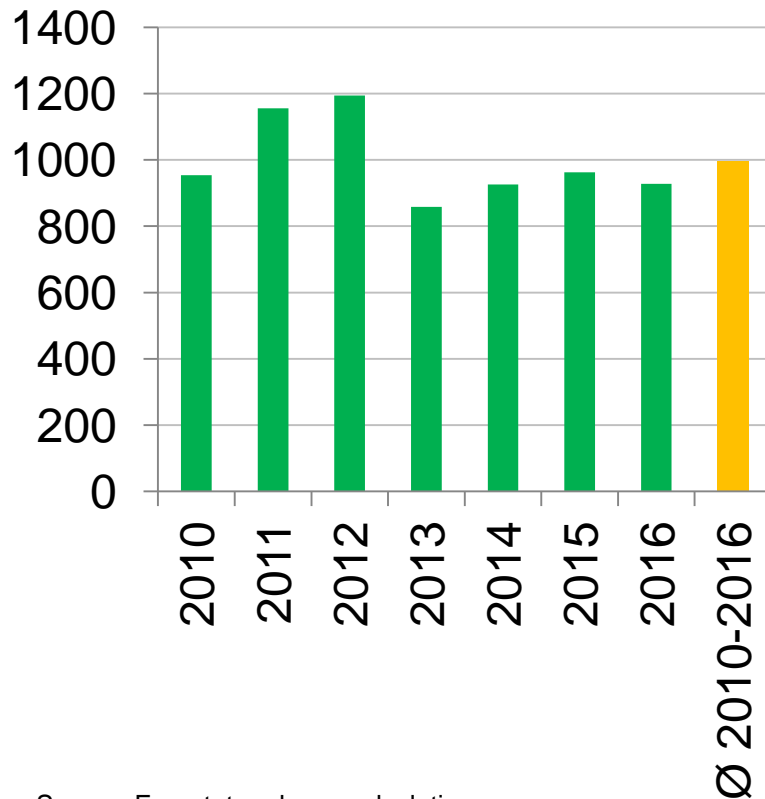
2010 to 2016, average 2010 to 2016, in kWh/€000s gross production value



## EU: Electro-costs

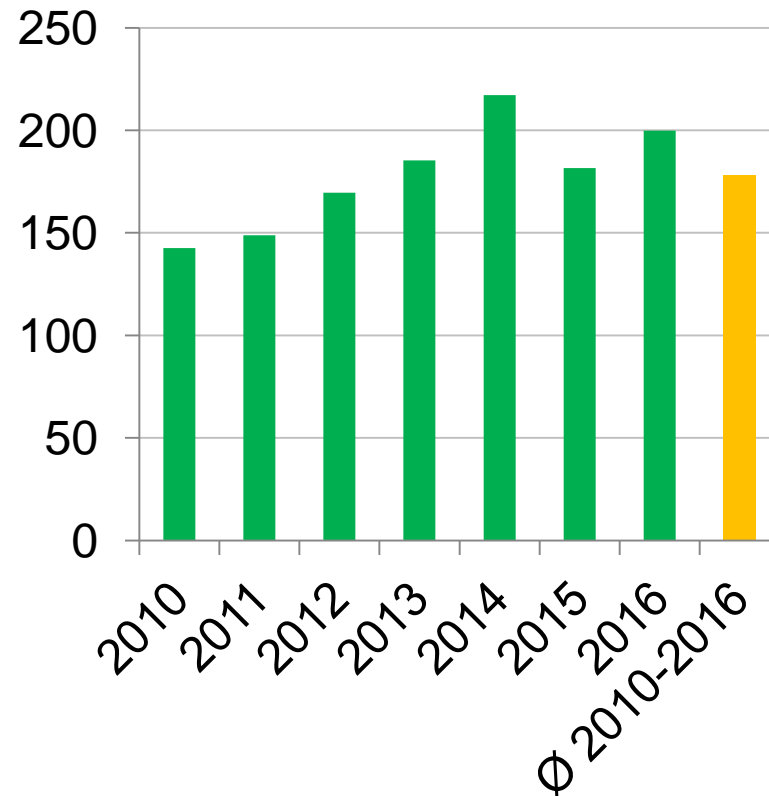
2010 to 2016, average 2010 to 2016, in € mil.

### Surface refinement and heat treatment (NACE 2561)



Source: Eurostat and own calculations

### Contract hardening plant (NACE 2561 21)

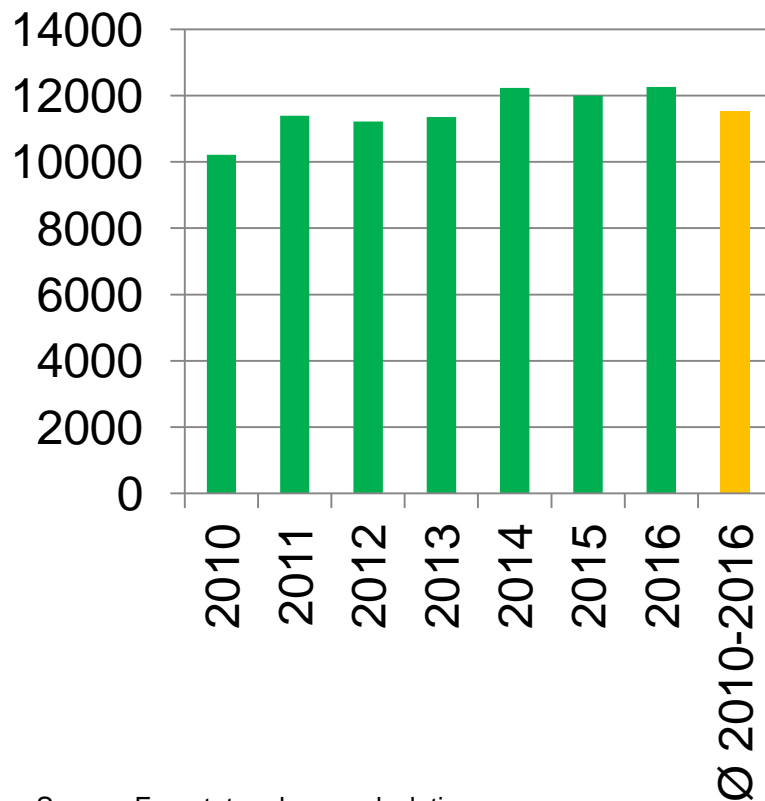


Source: Eurostat and own calculations

## EU: Gross value added at factor cost

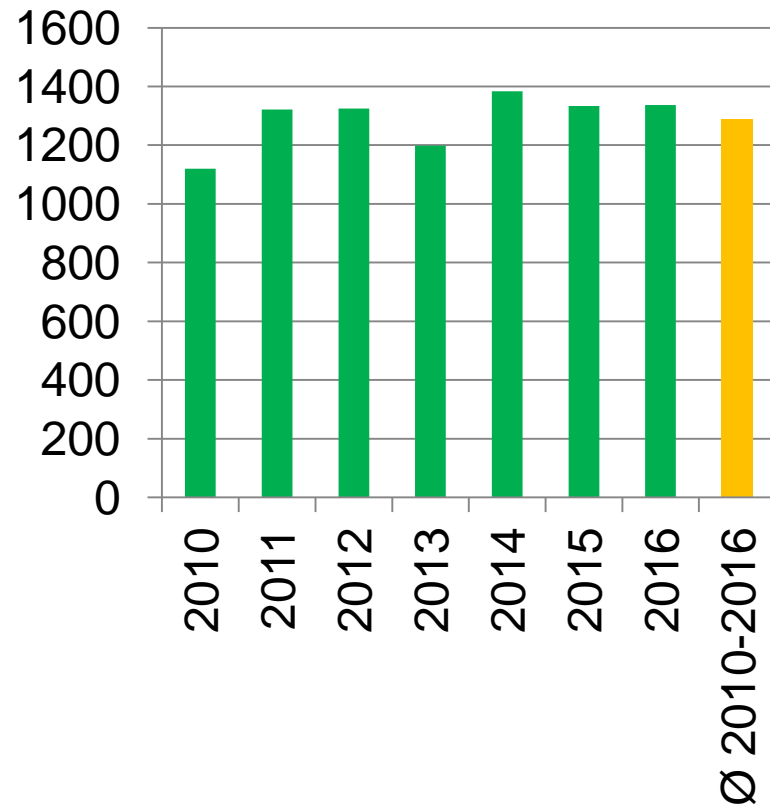
2010 to 2016, average 2010 to 2016, in € mil.

### Surface refinement and heat treatment (NACE 2561)



Source: Eurostat and own calculations

### Contract hardening plants (NACE 2561 21)



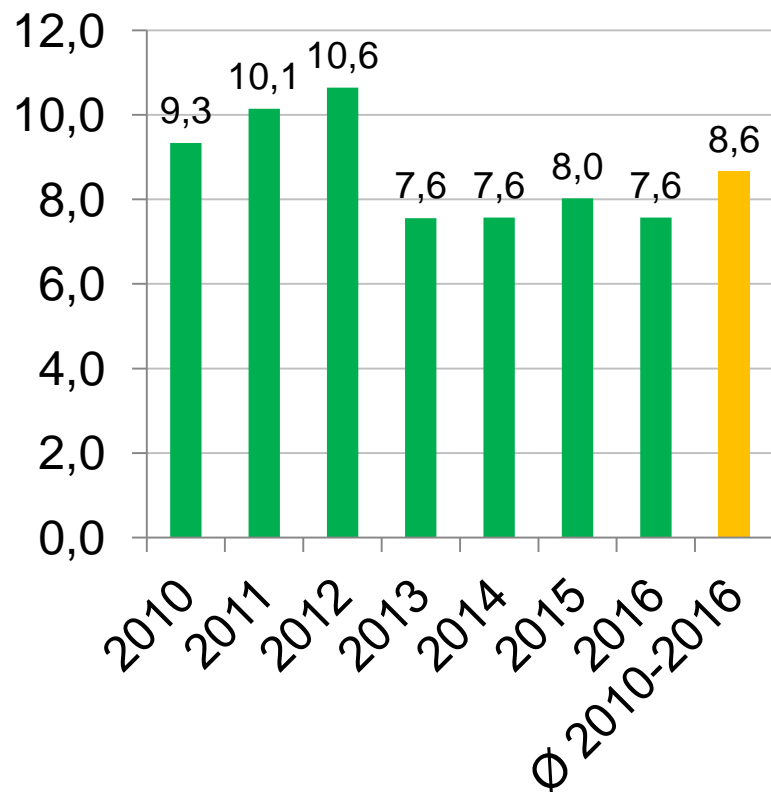
Source: Eurostat and own calculations



# EU: Share of electro-costs within gross value added at factor cost

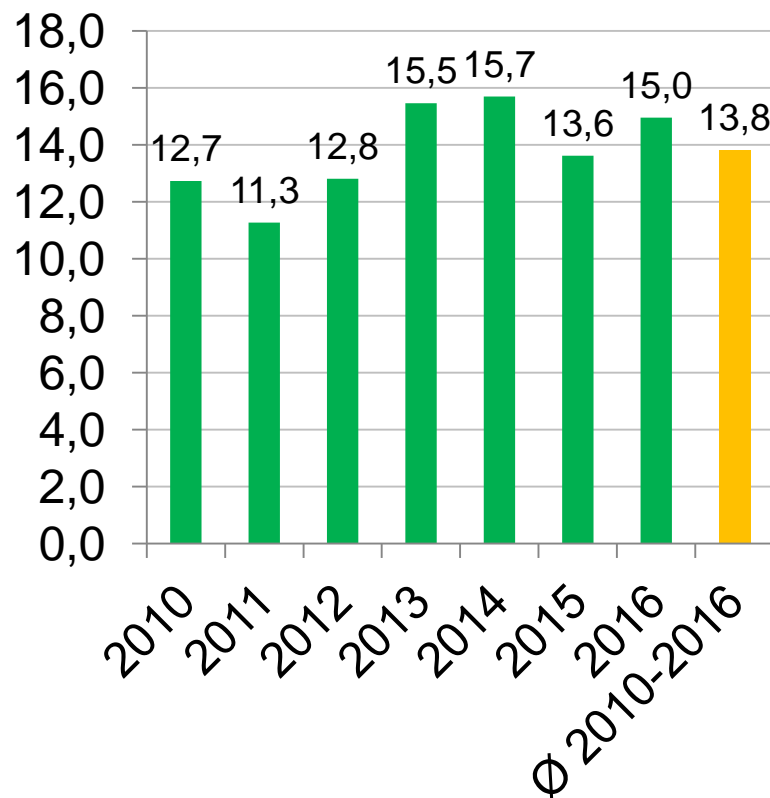
2010 to 2016, average 2010 to 2016, share in %

## Surface refinement and heat treatment (NACE 2561)



Source: Eurostat and own calculations

## Contract hardening plants (NACE 2561 21)

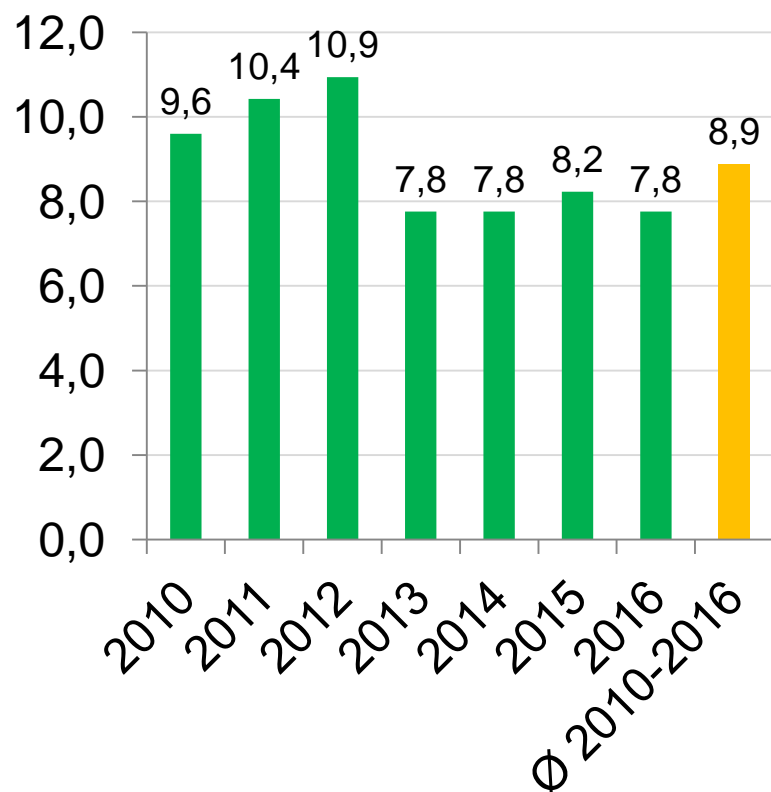


Source: Eurostat and own calculations

# EU: Share of electro-costs within gross value added at factor cost (scenario: around 3% higher electro-efficiency in Germany compared to EU)

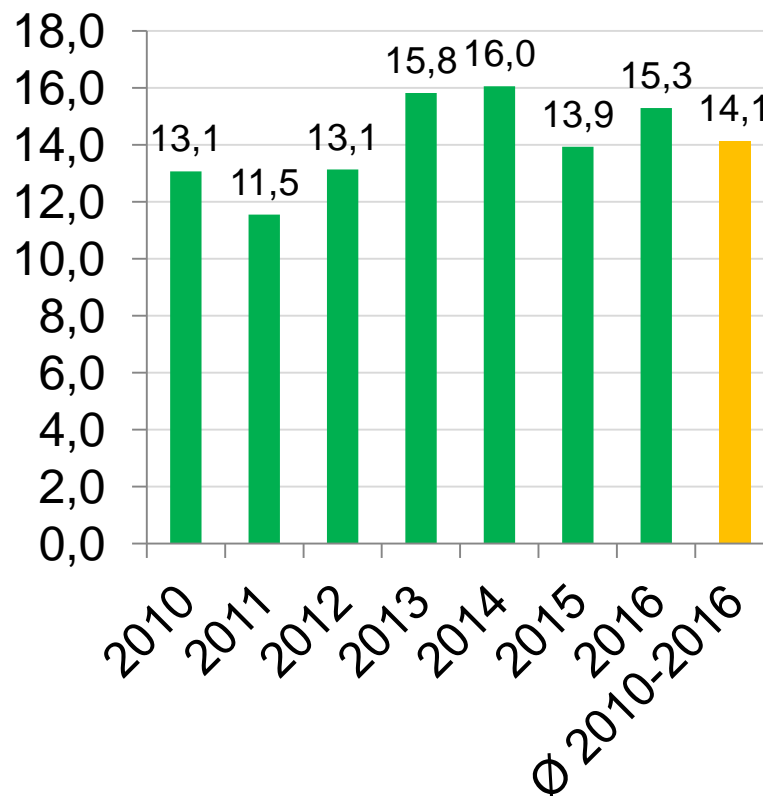
2010 to 2016, average 2010 to 2016, share in %

## Surface refinement and heat treatment (NACE 2561)



Source: Eurostat and own calculations

## Contract hardening plants (NACE 2561 21)



Source: Eurostat and own calculations

# Conclusion

## Conclusion I: Trade intensity

- In terms of **trade intensity** with third countries at an **EU level**, a value of 88.9% (average 2010-2016) is calculated for the sector “contract hardening plants” (NACE 25.61 21) (i.e. from the weighted trade intensity of the **customer structure**).
- At the NACE four-digit level, the “surface refinement and heat treatment” sector (NACE 25.61) has a trade intensity with non-EU Member States of 94.5% (average for the years 2010 to 2016), likewise calculated using the customer structure.

## Conclusion II: Proportion of electricity costs within gross value added

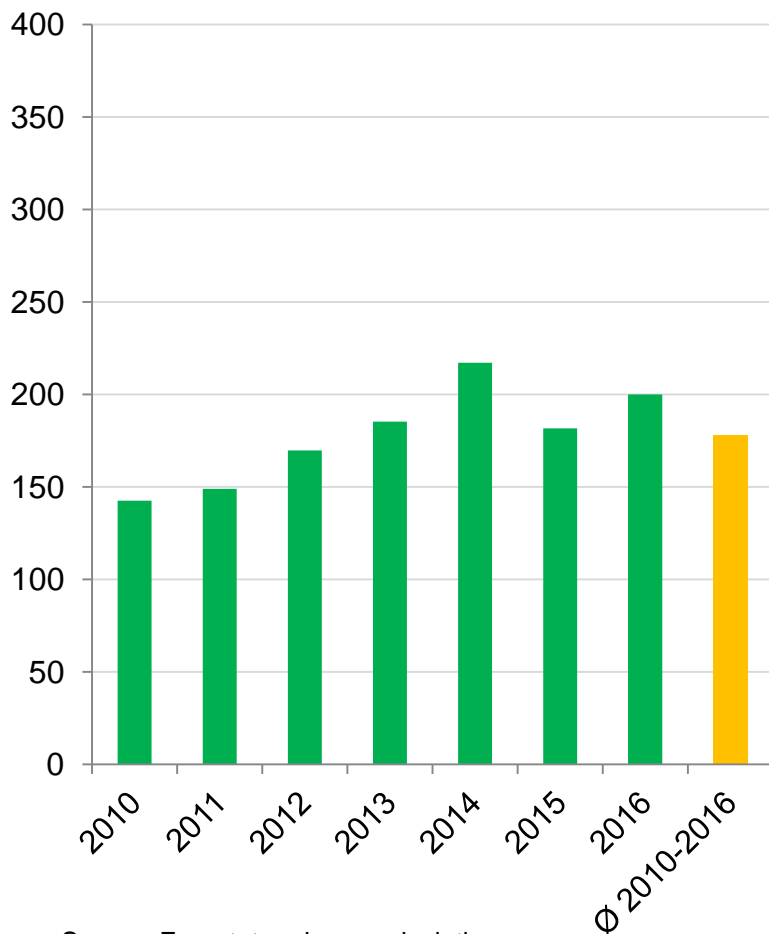
- The **electro-intensity** (proportion of energy costs within gross value added at factor cost) in the “surface refinement and heat treatment” sector in **Germany** reached 12.7 % (average 2010-2016); for “contract hardening plants”, the respective figure was 13.1 %.
- The **proportion of electricity costs within the gross value added** (at factor cost) at **EU level** for the sector “surface refinement and heat treatment” had a total value of 8.6% (average for 2010 to 2016); for the contract hardening plants, the corresponding figure was 13.8% (in each case taking into account the full EEG surcharge for companies from Germany).
- If one **also** takes into account the **superior** (in comparison to the EU average) **electrical efficiency** in the German “surface refinement and heat treatment industry”, the proportion of electricity costs within gross value added increases to 8.9 % for the entire sector (NACE 25.61) (average 2010 to 2016) and to 14.1 % for contract hardening plants.

# Backup slides for text document

# EU: Electro-costs

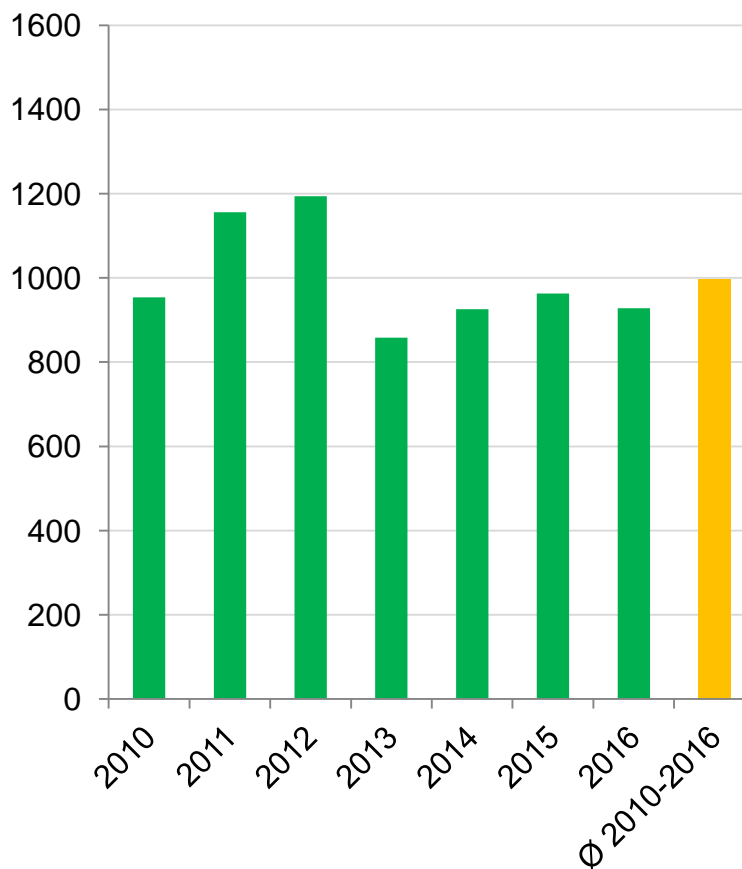
2010 to 2016, average 2010 to 2016, in € mil.

**“Contract hardening plants” sector  
NACE 25.61.21**



Source: Eurostat and own calculations

**“Surface refinement and heat treatment”  
sector (NACE 2561)**

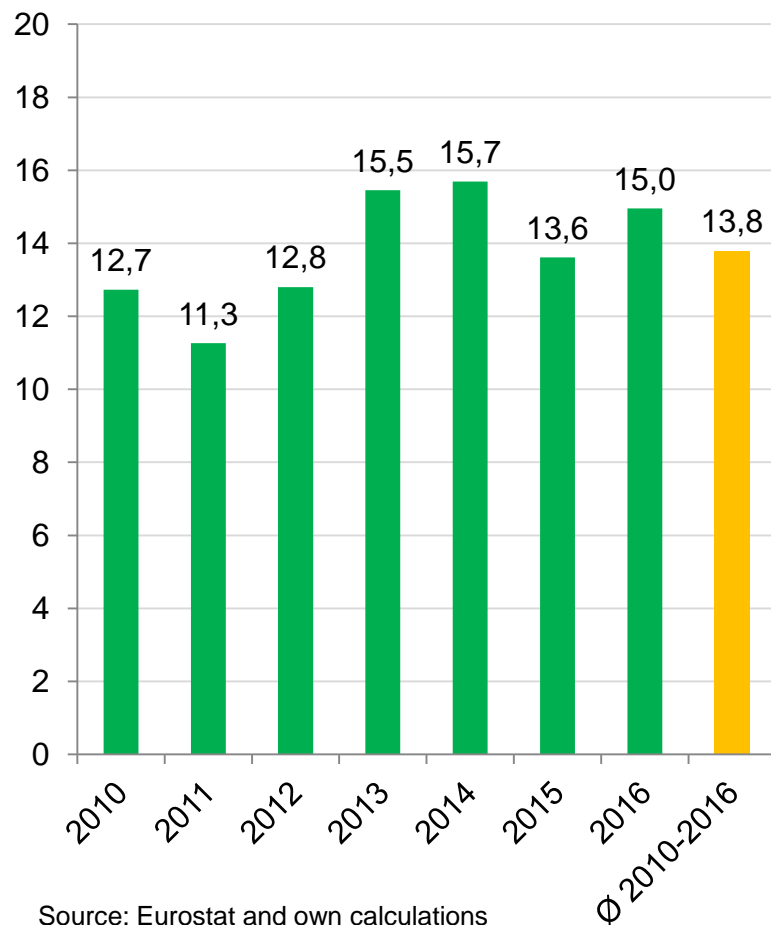


Source: Eurostat and own calculations

# EU: Share of electro-costs within gross value added at factor cost

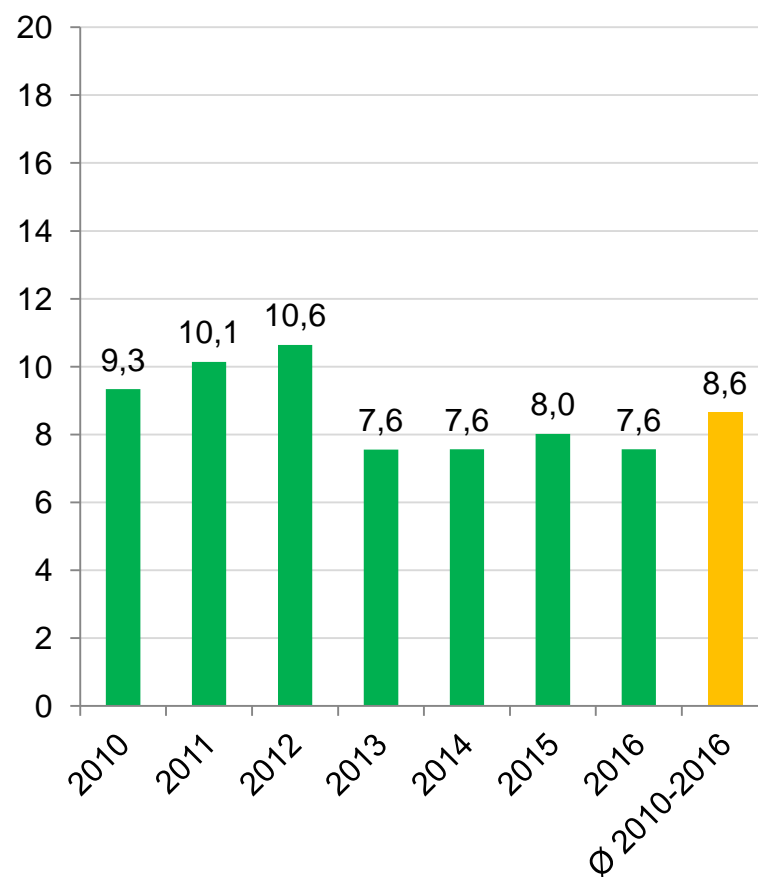
2010 to 2016, average 2010 to 2016, share in %

**“Contract hardening plants” sector  
NACE 25.61.21**



Source: Eurostat and own calculations

**“Surface refinement and heat treatment”  
sector (NACE 2561)**



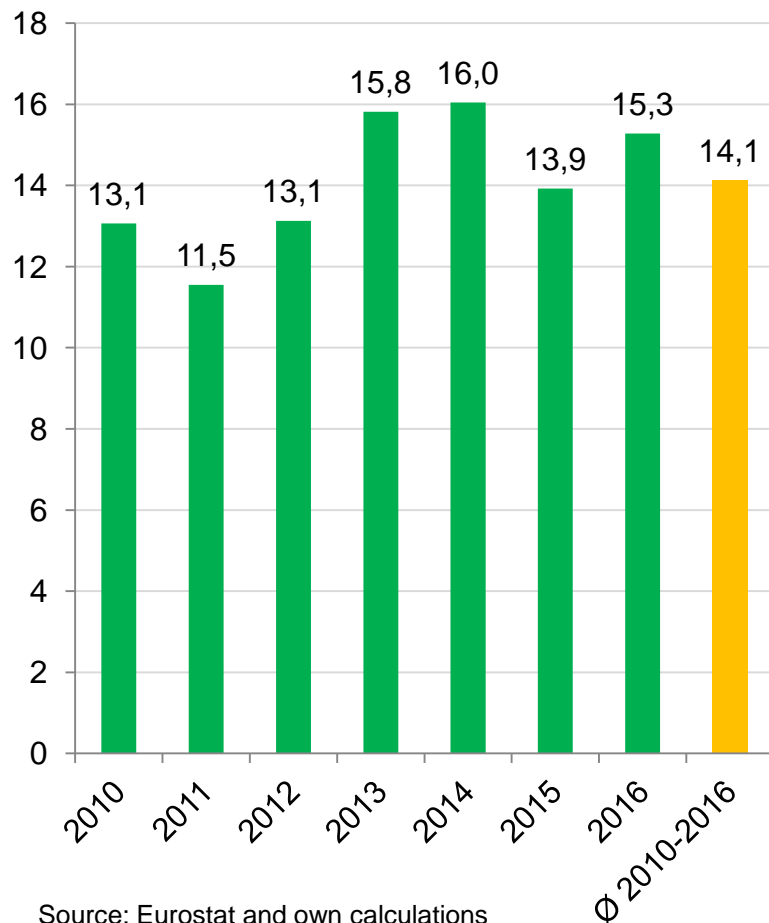
Source: Eurostat and own calculations



# EU: Share of electro-costs within gross value added at factor cost (scenario: around 3% higher electro-efficiency in Germany compared to EU)

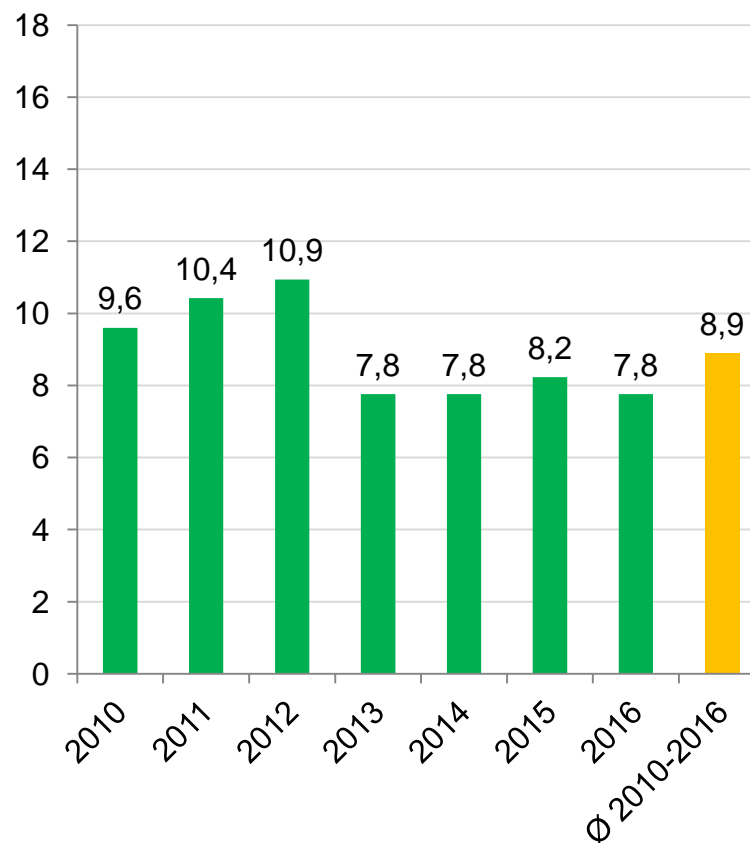
2010 to 2016, average 2010 to 2016, share in %

**“Contract hardening plants” sector  
NACE 25.61.21**



Source: Eurostat and own calculations

**“Surface refinement and heat treatment”  
sector (NACE 2561)**



Source: Eurostat and own calculations