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**REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE
COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE
COMMITTEE OF THE REGIONS**

Energy prices and costs in Europe

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Contents

Introduction

Having a good understanding of the evolution and drivers of energy prices and costs is essential. In a market economy prices are signals that allow for an efficient allocation of resources. Prices have an impact on costs, influencing our consumption and investment decisions.

Energy prices and costs are important for our economic growth, our personal budget and the competitiveness of our industry. Their economic impact can also affect the achievement of our energy and climate policy objectives. The cost-effectiveness of policy measures can also be related to the impact of such measures on energy prices and costs.

The Energy Union acknowledges that, and the EU energy policy initiatives to implement it are well aligned with this idea. The security of supply gas package (February 2016) and the recent package of legislative proposals (November 2016) for the promotion of energy efficiency, renewable energy sources as well as for a new market design for the electricity market; all have been devised by the European Commission taking into account the interactions and impact on energy prices and costs.

In January 2014 the Commission published a report on energy prices and costs in response to a request from the European Council. The report was widely welcomed and the EU Ministers for energy of the EU requested a follow up. The Commission acknowledged the importance of having a good understanding of energy prices and costs for reaching a fully functioning internal energy market and included the presentation of biennial analysis on energy prices and costs as an Action of the Strategy Framework for the Energy Union[1].

This report aims to shed more light on how energy prices evolved and which were the drivers of prices. The impact of energy prices and costs will also be looked at. The report also provides a general analysis of the energy costs' impact on the international competitiveness of EU industry by looking at the energy costs structures of EU sectors in an international perspective. It also looks more in detail to some sectors via specific case studies. The impact of energy prices on energy expenditure is also addressed in particular as regards that impact across different income levels of households in the EU.

The report relies on recent studies commissioned by the European Commission which partially address all these areas. In-house analysis from the Commission services completes the inputs on which this report is based. The quality of the analysis provided in the report is to a great extent owed to the high quality data on electricity and gas prices and on households energy expenditure collected by the Commission Services during the last months of 2015. This has allowed for an analysis which already includes 2015 data as well for an unprecedented level of detail in the subcomponents of electricity and gas prices.

The report goes deeper in the analysis of components with more detailed analysis of subcomponents. It provides analysis on the two main price subcomponents of energy networks (transmission and distribution). It also provides a rather detailed analysis of price subcomponents of taxes and levies, which allow us to identify the different impact on prices of taxes and levies used to finance certain policies (those used for supporting RES+CHP, nuclear, security of supply or social measures, etc.) as well as others taxes and levies used for other purposes (financing market or system operation, as well as fiscal needs).

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[1] Action 8. Greater transparency on energy costs and prices as well as on the level of public support

Retail price for energy		
Components	Energy	Network	Taxes & Levies
Sub components		Transmission Distribution	Renewable and CHP Social Nuclear System operation Market operation Energy Efficiency Security of Supply Environmental and excise taxes Other VAT
Elements	Wholesale energy cost Supply costs		Individual taxes financing general state budget Ear-marked levies financing policies Impact of meeting obligations

For electricity, gas and oil products, each chapter begins by looking at the developments in prices in the wholesale market and its drivers. Then retail price drivers and interactions between the wholesale and the retail market are examined. The report provides the most rigorous and exhaustive exploration of the data to date, and a more solid understanding of the factors driving energy prices in the EU.

The report then turns to the energy costs for the economy, households and industry. It shows the favourable evolution of the energy import bill of the EU in the last years and the underlying factors that have been driving down the bill. The report then makes a detail analysis of the impact of energy expenditure on households, looking at what factors explain such evolutions like the prices and consumption on different energy carriers (electricity, gas, solid fuels, etc.) and most importantly how energy expenditure affects households with different income levels.

The report also provides the industry perspective and makes an overview of the competitiveness of the EU and analyse the role of energy in the EU's competitiveness. Based on the results of various studies, the report details EU energy intensive sectors, i.e. those industries where energy can be a factor for competitiveness. In some selected energy intensive industries the report provides the evolution of energy costs shares and profit margins and makes a price sensitivity analysis. It then compares with EU trading partners EU industry prices, energy costs shares and profit margins as well as other indicators such as energy intensity. A synthesis of various studies with specific case studies of sectors and market products is made in order to provide a more detailed perspective of competitiveness developments in certain energy industries.

To complete the assessment of energy prices, the role of energy subsidies in the EU is addressed in the final chapters, as well as the implications for the development of government revenues and for inflation.

Energy prices

1 Electricity prices

1.1 Wholesale electricity prices

Over the last decade wholesale electricity markets in Europe have undergone fundamental transition in parallel with regulatory changes at national and EU level. In almost all EU Member States organised wholesale electricity exchange markets have been established, providing for trading opportunities for day-ahead, forward and intraday contracts, giving the right price signals for producers and consumers of electric power. Besides organised power trading platforms the so-called over-the-counter (OTC) markets also have an important role, especially in settling bilateral contracts between sellers and buyers of electricity.

Most of the European wholesale electricity markets are being linked together by market coupling, enhancing the potential welfare benefits of cross-border electricity trade and contributing to better price convergence across markets. Increasing market liquidity, cross-border trade in electricity and wholesale market coupling have all substantially contributed to the integration of national markets and to the realisation of the functioning European internal electricity market, especially for day-ahead and forward power contracts. However, even full market integration cannot assure perfect wholesale price convergence over time, therefore price volatility should be addressed by the market participants, through optimising their purchase contracts and hedging risk arising from price volatility.

In this subchapter the evolution of wholesale electricity prices between 2008 and early 2016 and the main drivers behind are analysed; focussing on the day-ahead base load contracts in different European markets, as the most detailed data we have are related to the day-ahead market.

Main findings

- Although integration of wholesale electricity markets in the EU has been advancing well over the last few years, this has not necessarily resulted in perfect price convergence across different regions. However, in the first quarter of 2008 the price difference between the most expensive and the cheapest European wholesale electricity market was 44 €/MWh, eight years later this difference has shrunk to 24 €/MWh.

- In parallel with high fossil fuel prices, European wholesale electricity prices peaked in the third quarter of 2008; then fell back as the economic crisis broke out, and slightly recovered between 2009 and 2012.

- However, since 2012 wholesale prices have been decreasing, due to lower fossil fuel prices, increasing share of renewables in the EU power generation mix and low demand as electricity consumption decoupled from an already low economic growth, leading in various markets to overcapacity in power generation.

- Compared to the average of 2008, the pan-European benchmark for wholesale electricity prices were down by 55% in the first quarter of 201, reaching 33 €/MWh on average, which was the lowest in the last twelve years.

- Regional wholesale electricity benchmarks followed more or less the same trend since 2008, however, regional features, such as diverse electricity mixes, market couplings and interconnector capacities might substantially influence regional prices, especially on the short run.

- As both coal import prices and natural gas prices decreased significantly since 2011/2012 the competition between the two fuels are rather influenced by other factors, such as low carbon prices. The share of natural gas has been permanently dwindling in the EU power generation mix, however as a result of unfavourable coal to gas ratios, large RES penetration and low carbon prices.

- Different market factors, such as fuel mixes, renewables share, cross border flows and markets couplings and supplier concentration have different impacts on the wholesale price level.

- While increasing share of renewable energy sources generally has decreasing impact on wholesale electricity prices, increase in coal, gas or carbon emission prices normally increases the price level, however, by different magnitudes in different regions in the EU and depending on the fuel source that is being replaced in the power generation mix.

- Market concentration (the combined share of the top three electricity suppliers) and cross-border flows only have minor impact on the wholesale electricity price level at EU average.

- Countries participating in market couplings normally have better wholesale electricity price convergence with their neighbours and temporary price differences are faster eliminated. Surpassing of the 10% threshold in electricity interconnection capacity only has a minor impact on electricity price level.

- The influence of each market factor might strongly very across different regions. For example, the share of renewables and carbon prices have strong impact on wholesale price evolution in North Western Europe, while in Central and Eastern Europe the main price driver is the share of coal and gas in the generation mix.

Regional wholesale price comparison

As price evolution on national markets are being more and more interlinked with neighbouring markets, it is reasonable to make a comparison across Europe through looking at regional price benchmarks. The Central Western European power region (CWE) comprises of six countries, such as Germany, France, Belgium, the Netherlands and Luxembourg; and as Austria is practically the same pricing area as Germany, this country is also part of the CWE region. Since 2010 market coupling has been implemented, linking together the markets of the CWE region. The Nordpool region comprises of the non-EU member Norway, and other EU countries, such as Sweden, Denmark, Finland, Estonia, Latvia, and Lithuania. The market coupling, existing since the 1990ies in the Nordic region, was extended in 2012-2013 on the three Baltic States.

In February 2014 the CWE region, the Nordic region and the United Kingdom were linked together in a larger North-Western Europe coupled area (NWE), and this market coupling was extended in May 2014 to the Iberian region (Spain and Portugal). Although Ireland is not yet coupled with the NWE region, market developments in the UK strongly impact the Irish power market. In early 2015 Italy was also coupled with the NWE region. In May 2015 the

so-called flow based coupling was implemented in the NWE region, contributing to significant increase in cross border electricity flows.

In Central and Eastern Europe (CEE region) four countries (Czech Republic, Slovakia, Hungary and Romania) are coupled since November 2014, while Poland is price coupled with Sweden.

Greece has an own functioning wholesale trading exchange, however, the Greek market is not coupled with any of its EU neighbours. In Bulgaria the new electricity exchange is operational since January 2016, while Croatia and Cyprus still do not have an own wholesale electricity exchange market. Malta is linked with Italy though an electricity interconnector since 2015, though it does not have an own functioning electricity trading platform.

In the following part the Platt's Pan-European Power Index (PEP) is used as European benchmark in order to show how regional average day-ahead wholesale electricity prices compare to each other and how they compare to the European average.

The next two charts (FIGURE 1) and (FIGURE 2) show the monthly evolution of the main regional and national wholesale day-ahead base load contracts since the beginning of 2008. Due to high fossil fuel prices in mid-2008, most of the wholesale prices and the PEP benchmark index as well reached its peak in the third quarter of 2008, and shortly after a steep fall in prices followed in parallel with the outbreak of the 2008-2009 economic crisis; resulting in a dramatic decrease in electricity demand in whole Europe.

As from mid-2009 the EU economy started to recover, demand for electricity also started to increase, however, there are clear signs of decoupling of electricity demand from the economic growth in the EU. *Demand for electricity in the EU-28 grew less than the GDP over the last five-six years, which points to decreasing electricity intensity of the EU economy.* Since the beginning of 2012 the PEP benchmark is on a downward path, owing to decreasing electricity generation costs besides subdued demand for power. At the beginning of 2016 the PEP fell to 30 €/MWh, being an unprecedented low level in the last twelve years.

Although general trends of wholesale price developments were quite similar across the EU, there were significant differences over the last few years between regional markets. As FIGURE 1 shows, both *Central Western and Central Eastern European regional averages followed closely the PEP benchmark.* In the CWE region increasing share of renewables in Germany helped in pushing down electricity generation costs and in France the large share of nuclear in the power mix assured low-cost base load electricity generation. In the CEE region the role of coal (mainly in Poland and Czech Republic) and nuclear is important in assuring competitive base load power generation. Hydro generation has an important share in Romania and the import of hydro-based electricity, generated in the Balkans, also improves regional electricity supply, contributing to competitive price levels.

Wholesale electricity prices in the Nordic markets have been more volatile than the PEP benchmark, primarily owing to the importance of hydro in the regional generation mix. During cold and dry periods (with low hydro reservoir levels and generation), like at the beginning of 2010 and 2011, regional price spikes occurred, while during summer wet periods, like in July 2012 or July 2015 the Nordpool system price fell as low as 10 €/MWh on monthly average. Besides hydro power nuclear generation in Sweden and Finland also contributed to competitive regional base load prices. However, in the Baltic States and to lesser extent in Finland the local wholesale price has had significant premium for a long time as the lack of sufficient level of electricity interconnections hampered the flow of cheap hydro-based power to these countries. *The inauguration of the LitPol and Nordbalt interconnectors in December 2015, linking Lithuania with Sweden and Poland, helped in reducing the price premium of the Baltic markets to other parts of the Nordpool coupled area,*

which underlines the importance of physical interconnections in the accomplishment of the EU internal electricity market.

In the United Kingdom the role of natural gas is decisive in setting the marginal electricity generation costs and thus the wholesale market prices. As until recent times the costs of generating electricity from natural gas remained high compared to other energy sources, the UK had a measurable price premium compared to continental Europe during the last three-four years (bearing in mind that in the CWE region renewables became an important wholesale electricity driver in the last few years). *In order to comply with environmental standards, significant coal fired generation capacities have been retired in the country over the last three-four years, reducing the opportunity to generate power from cheap coal sources.* Furthermore, due to the limited level of electricity interconnections between the UK and the CWE region, the UK could not import sufficient quantity of electricity that would have offered a competitive alternative to domestic generation.

Figure 1 – **Monthly (day-ahead) wholesale electricity prices in European regions**
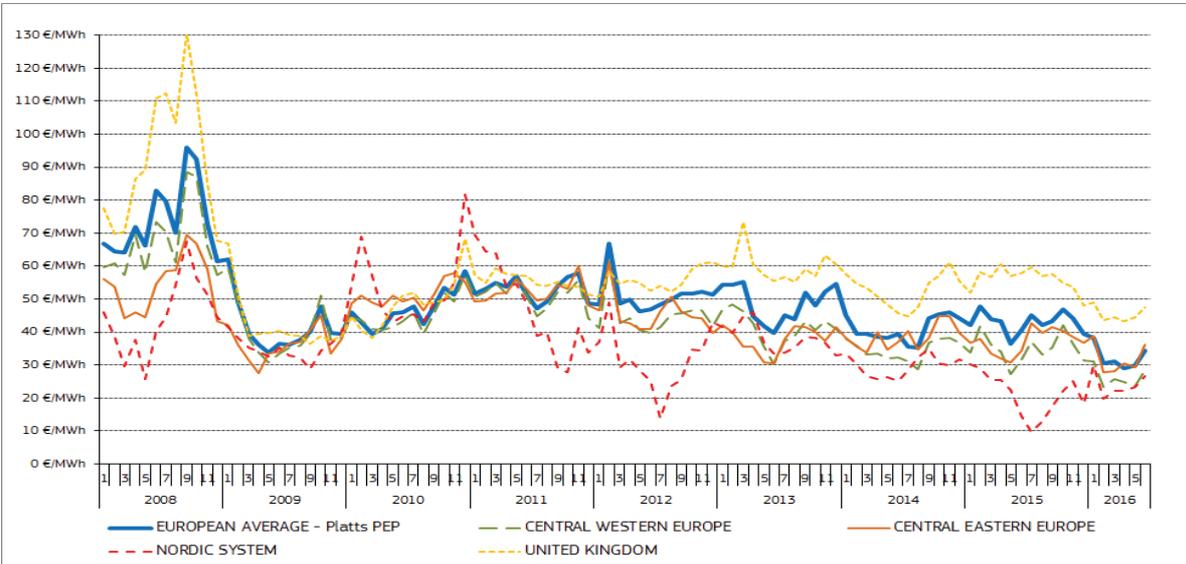
Source: Platts and European power exchanges

As hydro generation plays a significant role in the electricity mix in the Iberian peninsula (Spain and Portugal, constituting a market with practically identical prices in both countries), *volatility of wholesale prices is greater compared to the PEP benchmark.* Wind and solar generation play an increasing role in the Iberian market, and in Spain nuclear has also a significant share. During winter periods hydro generation normally reaches its seasonal peak and wholesale prices are low (e.g.: In February-March of 2010, 2013 and 2014 the wholesale price fell until 20 €/MWh on average). During the dry summer season when high temperatures result in increasing demand for electricity (residential cooling needs), wholesale prices are higher than in other periods of the year. The summer period also coincides with the onset of the planned maintenance period of nuclear generation capacities, which result in switching to costlier coal and gas fired generation, especially in the periods of lower availability of intermittent generation sources (e.g.: wind and solar). Although in 2015 electricity interconnection between France and Spain has been reinforced, existing capacities are still not optimal to reduce price volatility in both markets through enabling sufficient cross-border electricity flows.

Over the last few years, as presented on **Figure 2**, Italy has always had a measurable price premium to the PEP benchmark, primarily owing to the country's structural import dependency on electricity and the large share of natural gas in its domestic generation mix. As

natural gas prices decreased since the beginning of 2012 and the share of renewables (solar and wind) increased in the Italian generation mix, the wholesale price premium to major European peers shrank significantly. During hot summer periods when residential cooling needs increase significantly compared to other seasons, wholesale prices may show sudden upturns.

In EU comparison Greece has rather been among the expensive markets regarding the wholesale electricity prices. As natural gas, which has been imported at relatively high purchasing costs in comparison to other European countries in the last few years, has always had significant share in the country's energy mix, high power generation costs are also reflected in the overall wholesale price level. High domestic generation costs result in structural import dependency, as competitive import electricity from the Balkans helps in putting a lid on the increase of domestic wholesale prices. In parallel with decreasing natural gas prices the premium of the Greek market to the PEP benchmark also decreased at the beginning of 2016.

Figure 2 – Monthly (day-ahead) wholesale electricity prices in Spain, Italy and Greece
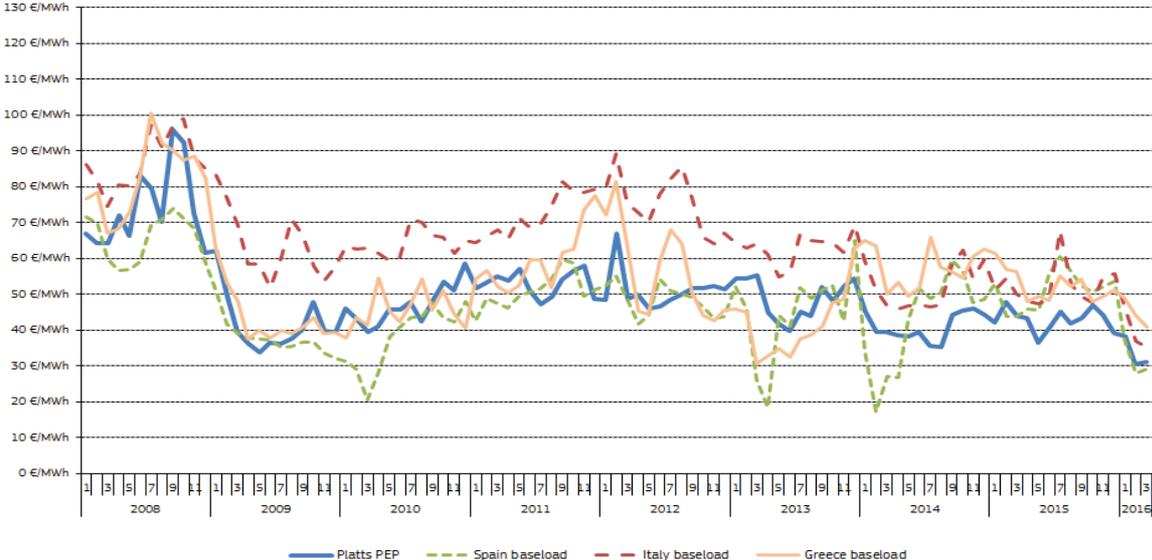
Source: Platts and European power exchanges

Looking at the timely evolution of wholesale electricity price ranges in Europe, Figure 3 shows that over the last eight years wholesale electricity markets in Europe (EU countries with Norway and Switzerland) showed signs of convergence, as the lowest and the highest market price got closer to each other and to the PEP benchmark as well. However, in the short run significant price differentials may occur, as different local power generation mixes can result in differences in electricity generation costs, resulting in the divergence of wholesale prices across different markets, especially which would enable free flow of electricity being necessary for better price convergence.

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Figure 3 –**Wholesale electricity prices–European average, maximum and minimum**
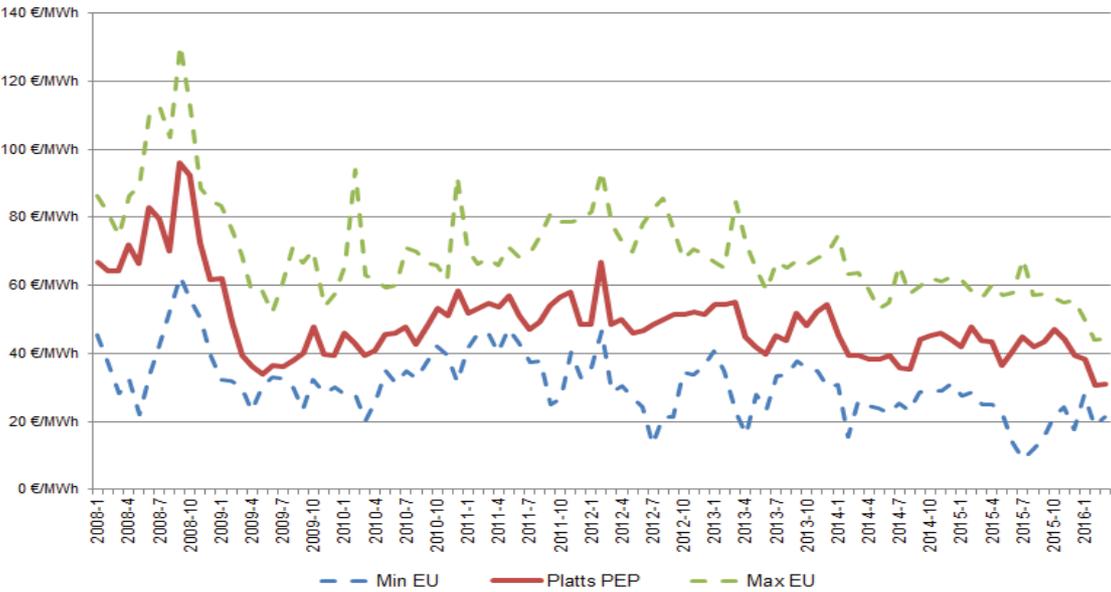
Source: Platts and European power exchanges

Box - Comparison of wholesale electricity prices in the EU with some of its international peers

The next chart (**Figure 4**) shows that wholesale electricity prices in important commercial partners of the EU, such as the United States, Japan and Australia may substantially differ in certain periods.

During most of the time in the last six-seven years electricity prices in the US were lower than in the EU (in the first half of 2016 US prices were 35% lower than the EU average), primarily owing to low generation costs in the US, predominantly based on cheap domestic natural gas production. As during the last few years electricity generation costs also decreased in the EU, the EU-US price gap shrunk. However, during cold periods in the winter and hot periods in the summer US wholesale prices might suddenly turn up in parallel with increasing heating or cooling needs.

In 2011 and 2012 wholesale electricity prices in Japan were 2.5-3 times as high as in the EU, primarily owing to the consequences of the nuclear incident at the Fukushima power plant in March 2011, as practically the whole nuclear generation capacity in the country was taken offline and had to be replaced by more expensive gas-fired generation, based on Liquefied Natural Gas (LNG) imports. As from 2014 LNG prices started to converge among different regions in the world and underwent a significant decrease, electricity generation costs in Japan went down as well. Furthermore, some of nuclear generation capacities have been restarted so far, reducing the cost pressure on wholesale electricity prices. However, in the first half of 2016 wholesale electricity prices in Japan were still almost twice as high as in the EU.

Abundant domestic coal resources in Australia and increasing share of renewables in the electricity generation mix assures for the country having one of the lowest wholesale electricity prices in the world, though temporary factors (e.g.: policy measures, availability of coal supply routes, etc.) can result in sudden price increases.

Figure 4 – **Wholesale electricity prices in Europe, United States, Japan and Australia**
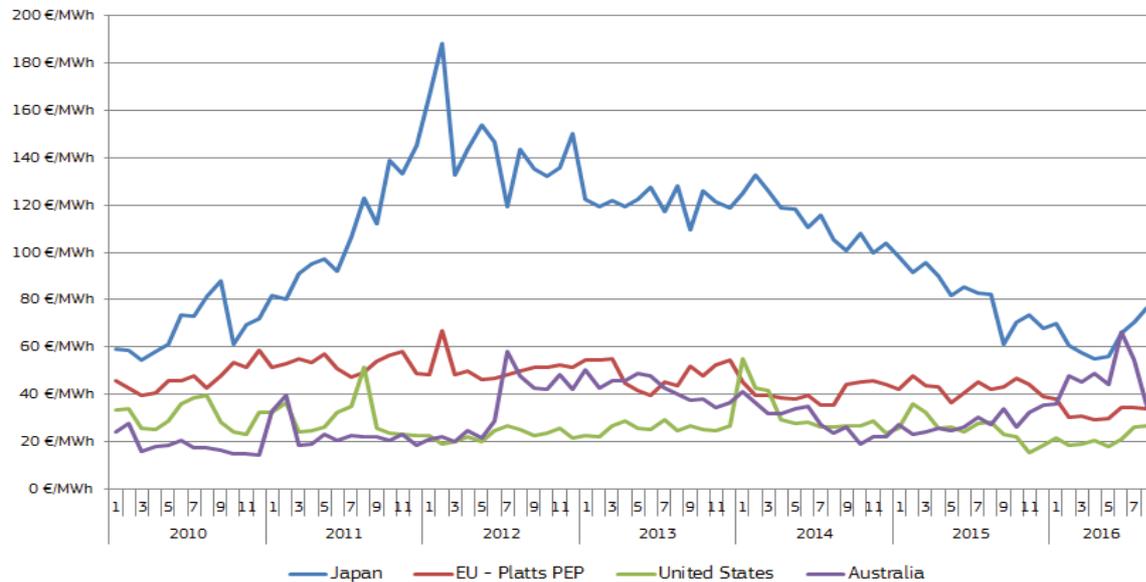
Source: PJM and ERCOT markets in the US, Platts in the EU, JPEX (Japan) and AEMO (Australia)

Changes in the EU power generation mix and the main drivers of wholesale electricity prices

FIGURE 5 shows the evolution of the EU-28 power generation from different energy sources between 2010 and 2015[2]. As it has already been mentioned, generation and consumption of electricity in the EU decoupled from economic growth during the last few years; just as this chart shows but slightly decreasing trend (having high seasonality) of electricity generation. Between 2010 and 2015 the share of fossil fuels decreased by ten percentage points[3] (from 51% to 41%), while the share of renewables doubled (rose from 8% to 17%) in power generation in the EU. At the same time the share of both nuclear and hydro remained practically the same.

Natural gas prices were relatively high compared to import coal prices in the EU over the last few years. While in 2008-2009 the estimated value of gas-coal price ratio was 1.7 on average, in 2014-2015 it amounted to 2.7, implying that gas-fired generation became costlier and the competitive disadvantage of gas increased compared to coal. In parallel with the recent fall in gas prices, the gas-coal price ratio has slightly improved, though in the first quarter of 2016 it was still above 2.

This has resulted in a permanent crowding out of natural gas from the EU electricity generation mix. However, albeit its existing cost advantage over natural gas, coal is also being gradually squeezed out from the EU power mix as renewables have been gaining ground.

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[2] Comparable generation data for all of the EU Member States (with the exception of Malta) is only available as of January 2010 in the database of the European Network of Transmission System Operators for Electricity (ENTSO-E)

[3] Due to methodological differences these numbers might slightly differ from the annual energy balance data from Eurostat

Figure 5 – **Power generation from different energy sources in the EU**
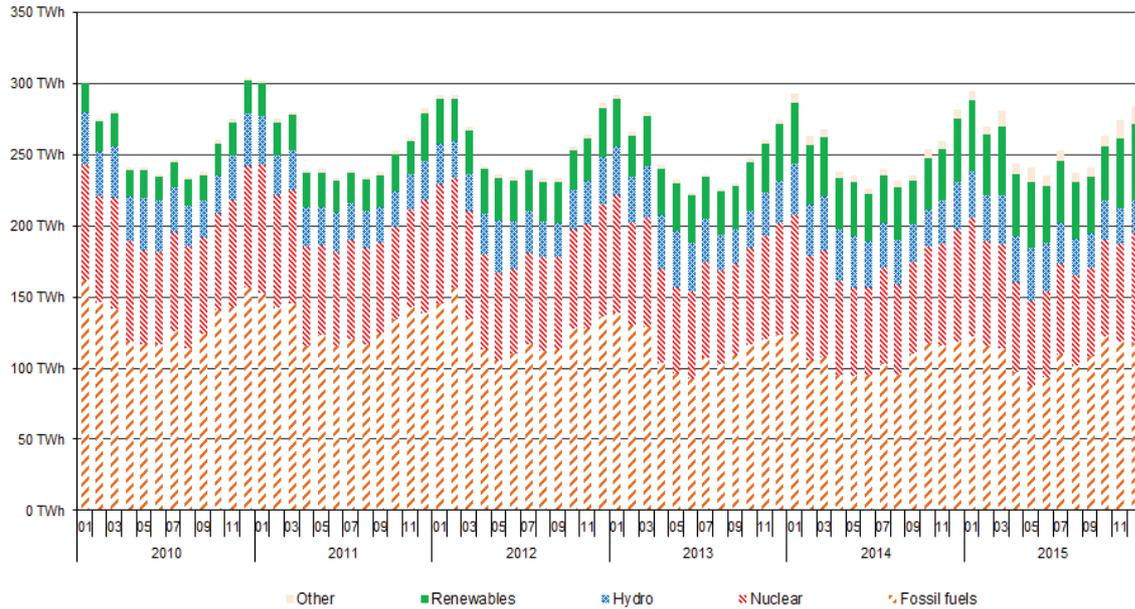
Source: ENTSO-E

Figure 6 puts together the main factors driving electricity generation costs and wholesale electricity prices in the EU.

Figure 6 –**EU electricity prices vs coal, gas prices and renewables share in EU power generation.**
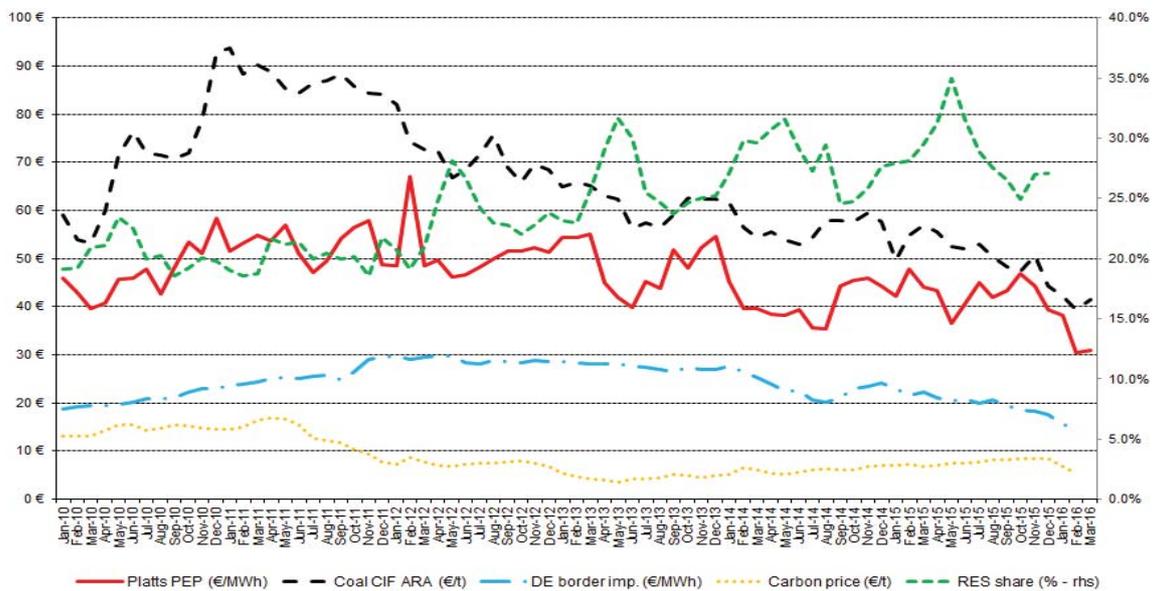
Source: Platts, BAFA
Platts PEP: Pan European Power Index (in €/MWh)
Coal CIF ARA: Principal coal import price benchmark in North Western Europe (in €/Mt)
DE border imp. stands for long term contract based import natural gas price on the German border (in €/MWh)
RES includes hydro, wind, solar and biomass; RES share in the total power generation estimation is based on monthly ENTSO-E data for the EU-28 as a whole
Carbon price: EUA emission allowances in €/tonnes of CO_2 equivalent

Since the beginning of 2011 coal import prices in the EU (CIF ARA contract is used as a benchmark in North Western Europe) decreased from 90 €/Mt to 40 €/Mt, primarily owing to

global coal oversupply, stemming from increasing exports from Colombia and the US (in the consequence of cheap domestic gas resources following the so-called 'shale gas revolution' coal has lost ground against natural gas in the US power generation mix) and decreasing demand in major consumer regions like China or in the EU.

Natural gas prices peaked at the beginning of 2012 after recovering from the lows measured in mid-2009. Since 2012 a gradual decrease in gas prices could be observed across Europe as gradually decreasing importance of oil-indexed gas contracts enables supply and demand forces to independently form market gas prices. Since the end of 2014 the decrease in gas prices has gained momentum, as the price fall of crude oil prices filtered in the oil-priced gas contracts as well. In February 2016 the average German gas import price fell below 15 €/MWh, being about the half of the average price measured in the first quarter of 2012. Hub prices in North Western Europe were even lower in the first quarter of 2016 (around 11-13 €/MWh).

Between April 2011 and May 2013 carbon emission allowance contracts underwent a significant price fall (decreasing from 17 €/t$_{CO2e}$ to 3.5 €/t$_{CO2e}$). Since April 2013 carbon prices slightly recovered, however, they stayed below 10 €/t$_{CO2e}$ during the last three years. *Low emission allowance prices have hardly been able to give any effective incentives to move towards generation sources with lower carbon emission intensity.*

In parallel with decreasing fossil fuel and carbon prices, resulting in decreasing marginal costs of electricity generation, the share of renewable energy sources (wind, solar, biomass, also including hydro) has been gradually increasing over the last few years. In most of the EU countries fossil fuel costs set the marginal cost of electricity generation, being decisive for the wholesale electricity price. However, increasing share of renewables in the electricity mix shifted the generation merit order curve to the right, resulting in lower equilibrium price set by supply and demand. Consequently, we can say that increasing share of renewable energy sources have significantly contributed to low wholesale electricity prices in the EU markets.

In the consequence of these all, the PEP index, being in the range of 50-60 €/MWh in 2011/2012, decreased significantly and in the first quarter of 2016 it was around 33 €/MWh, which was, as it was mentioned, the lowest in the last twelve years.

In the previous paragraphs the main drivers behind the trend of wholesale price developments were described. In the following part quantitative estimation is provided on the impact of each market factor on the wholesale price level.

The impact of different market factors on wholesale electricity prices

In the report on *Prices and costs of EU energy*[4] an econometric analysis has been presented in order to assess the influence of each market factor on wholesale electricity prices in the EU. Several factors, such as fossil fuel prices, the share of renewables, demand for electricity, electricity market concentration in different countries, existence of market couplings, etc. have been analysed and in the following points their impact is briefly described.

Panel data analysis shows highly significant values for shares of all energy sources in the EU except for nuclear power, and existing links between wholesale prices and market competition, integration as well as for demand for electricity and exchange rates (relative to the Euro).

These results should be interpreted by taking into account some general conditions that have been characteristic for the European wholesale electricity markets over the last few years. By

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[4] Report by Ecofys 2016

looking at absolute changes in the wholesale electricity price level, providing details on the impact of renewables, oil, coal and gas share and price changes, it has been assumed that the average electricity price level in the EU was 40-50 €/MWh, the gas price level was around 10-15 €/MWh and the average coal price was around 50-70 €/Mt over the last few years, against which the price change details below in the bullet points should be measured.

The results show that if the share of renewables increases in the power generation mix, the impact on the wholesale electricity price might differ depending on the fuel source that is being replaced by renewables. As the share of renewable energy sources has been rapidly increasing over the last few years in many EU countries, the impact of one percent incremental increase can differ over time. The impact of renewables on wholesale electricity prices also shows measurable differences across different regions in the EU. When the impact of market concentration on the wholesale price level is analysed, a competitive, oligopolistic market structure is assumed against which the impact of increasing or decreasing concentration is measured on the overall electricity price level.

In detail, the results are:]

- The econometric analysis shows a *robust evidence that increase in renewables (solar and wind) share in the electricity generation mix by one percentage point reduces wholesale prices by 0.4€/MWh in the EU on average*, however, the magnitude of the impact also depends on which generation source (mainly fossil fuels) is being replaced by renewables. The *impact is stronger (amounting to 0.6-0.8 €/MWh) in North Western Europe, Baltics and Central and Eastern Europe*. The econometric analysis looked at data with monthly frequency, however, the impact of renewables is suspected to be even stronger, if hourly price data had been taken into account (given the impact of renewables in different time periods of a day).

- *An increase in fossil fuel shares in the generation mix (gas, oil or coal) has an upward impact on the wholesale price level as econometric results show, however, depending on the region in the EU and at the expense of which fuel source this increase occurs, one percentage point increases in the fossil share results in an increase of the wholesale electricity price ranging from 0.2 to 1.3 €/MWh.*

- Similarly, *increases in the price of the two main fuels setting marginal electricity generation costs (gas and coal) by one €/MWh and the increase in CO_2 allowance (ETS) prices by one €/tCO2$_e$,also have an upward impact on the wholesale electricity price level, ranging between 0.2 €/MWh and 0.8 €/MWh in different EU markets*. Weak impact of CO_2 prices on electricity prices also relates to the strong structural oversupply in the ETS market, weakening its impact on the generation mix.

- *Only weak relation has been identified between the increase in the market share of the top three suppliers (by one percentage point) and the wholesale price level (slightly positive relation) and between increasing cross border flows (by one percentage point) and decreasing wholesale prices (the impact was barely measurable) at EU level; in some regions these impacts might be stronger*.

- *Countries belonging to one (or several) market coupling areas tend to have higher number of hours when local wholesale electricity prices converge with the neighbouring markets. The average price difference with the neighbours tend to decrease and temporary price differentials are eliminated faster in most cases after the coupling takes place.* Uneconomic electricity flows against normal price differentials (from higher to lower price area) also significantly decreases after the coupling is implemented.

- *Analytical results do not show strong evidence on the impact of surpassing the 10% electricity interconnection capacity; in the case of countries being below this threshold we can find slightly higher prices than for the ones with higher interconnection than the 10% threshold.*

- Increasing demand for electricity (demand of households, as measured by external temperatures and demand in the business sector, as approximated by economic growth) *definitely has upward impact on wholesale electricity prices*, however, *results are region-specific*, depending on climate conditions and electricity intensity of a given country and economy. As generation fuel supply mostly depends on imports, weakening of the local currency leads to increasing wholesale electricity prices through higher generation costs.

The following major regional differences can be observed:

In the previous points general conclusions on the impact of each factor on wholesale electricity prices at European level were presented. In the next bullet points some qualitative results of these factors in different regions of Europe are summarised:

- In the North-Western Europe region (Central and Western Europe, Nordpool and the UK) *natural gas prices and emission allowance prices (ETS) had stronger impact* on the wholesale price level than in Europe as a whole.

- Temporary price differences in day-ahead wholesale prices between Germany and the neighbouring markets disappeared faster in recent years (2012-2015) than in earlier periods (before 2012). *This indicates that the regional development of the internal market has had an effect in eliminating price differentials.*

- *In the Nord Pool area as a whole change in the coal share showed a stronger impact* on the wholesale electricity price level (given the significant share of coal in some countries of the region, like Denmark, Finland and Estonia[5]) than in Europe on average.

- In the Baltic States change in the *share of renewables* and *natural gas* had measurable influence on the wholesale electricity price, so had *cross border electricity flows*.

- *Cross border electricity flows* also had measurable impact in *Spain and France,* as the interconnector capacity is still limited between the two countries and any increase in border flows might have a large marginal impact.

- In the analysed *Central and Eastern European countries change in the share of coal* (especially high in Czech Republic) had a large impact, similarly to *nuclear power in Hungary and Slovakia*.

- *Concentration of the three largest electricity generators* had particularly strong influence in countries like *France, Austria, Italy, and Slovenia*, and the change in the share of coal in power generation also significantly impacted wholesale prices in these countries.

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[5] In Estonia oil shale is accounted among solid fuels, we took it under coal

1.2 Retail electricity prices

The composition and drivers of retail prices are analysed based on a data collection designed and conducted by DG Energy of the European Commission. The gathered data set has distinct features:

- Cost elements are allocated to harmonized main components, facilitating the targeted identification of price increase drivers on EU and national levels.
- The main component "taxes & levies" is further disaggregated into 10 sub- components, facilitating the quantification of the impact of specific policies and fiscal measures.
- The main component "network" is further decomposed into transmission and distribution costs.
- Energy policy relevant levies and not- earmarked taxes are distinguished.

Summary

Retail prices increased at 3% annual rate for households[6] and at 2% annual rate for industry[7]. The average household price was 20.8 Eurocent/kwh while the average industrial price was 107.3 EUR/MWh in 2015. Large industrial consumers[8] paid 84.5 EUR/MWh on average.

Price increases were driven by government imposed taxes, levies and regulated network tariffs. While VAT remained the largest tax element, RES support costs experienced the fastest growth. They accounted for 12% of the average median household price and for 23% of the average median industrial price in 2015. The impact of other policy supports costs such as energy efficiency, security of supply remained limited on EU level, however certain policies proved to be price increase drivers on Member State level. Taxes & levies increased at the annual rate of 7.9% and 18% for the average household and industrial consumer respectively.

The energy component diminished both in absolute and relative terms. By 2015 it was no longer the largest of the three components in half of the EU Member States and in the weighted EU average price. The energy component decreased at the annual rate of 0.3% and 2.8% for the average household and industrial consumer respectively.

Energy policy relevant levies were out weighted by tax instruments which do not necessarily finance energy or climate related policies. Not- earmarked taxes cost the average EU household 15% more than designated policy support costs.

Progress towards a single EU energy market is mirrored by the significant increase in the convergence of national energy components. Such became 15% and 12% less dispersed since 2008 for households and industry respectively. While total industrial prices also became less dispersed, for total household prices a different trend is to be observed as such are impacted by highly divergent national taxation and policy support costs. Total household prices became 9% more spread out across the EU from 2008 to 2015.

Diminishing energy components might negatively impact investments in the power sector. The energy component is the competitive part of the bill which determines the revenues of suppliers. Decreasing energy components decrease incentives in the private sector to invest in new or refurbished generation capacity. The lack of investment in turn might negatively impact security of supply on the long term.

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[6] Refers to Eurostat consumption band DC covering annual consumption of 2500 to 5000 Kwh.
[7] Refers to Eurostat consumption band ID covering annual consumption of 2000 to 20000 MWh.
[8] Refers to Eurostat consumption band IF covering annual consumption of 70000 to 150000 MWh.

The increase of the average electricity price slowed down to a marginal rate for households[9] and prices decreased for industrial consumers from 2014 to 2015. This might negatively impact energy efficiency investments by both consumer types.

Figure 7 - **Composition of average electricity prices over time**
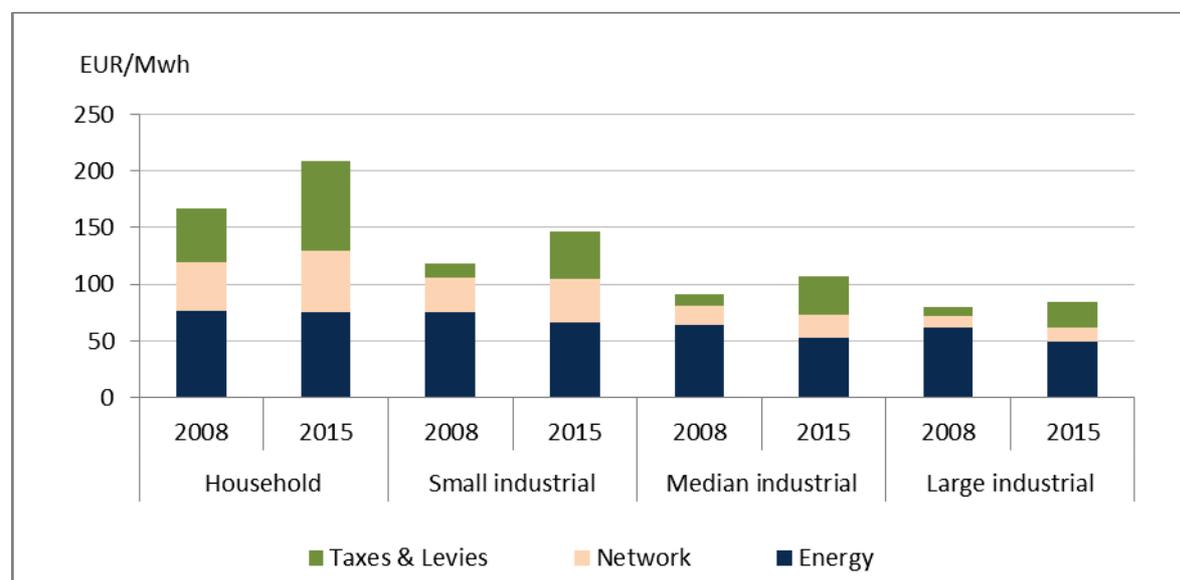
Source: European Commission, Member States

Table 1. Evolution and share of price components by consumer type

Consumer Type	Household (DC)[10]			Industrial (ID)[11]			Large industrial (IF)[12]		
Component	Annual growth	Share 2015	Δ share	Annual growth	Share 2015	Δ share	Annual growth	Share 2015	Δ share
Energy	-0.3%	36%	-10pp	-2.8%	49%	-21pp	-3.2%	58%	-19pp
Network	3.3%	26%	0pp	3.2%	19%	+1pp	3.1%	16%	+2pp
Taxes & Levies	7.9%	38%	+10pp	18%	32%	+20pp	16%	26%	+17pp
Total price	+3.2%	-	-	+2.3%	-	-	+0.8%	-	-

Source: European Commission, Member States

Table 2. Price dispersion by consumer type

Consumer type	Band	Year	Max/Min	Total price dispersion	Energy component

				2008-2015	dispersion 2008-2015
Household	DC	2008	3.2	+9%	-15%
		2015	3.2		
Small industrial	IB	2008	3.2	0%	-2%
		2015	2.6		
Med. industrial	ID	2008	2.9	-6%	-12%
		2015	2.7		
Large industrial	IF	2008	3.7	- 16%	-17%
		2015	3.1		

Source: European Commission, Member States

1.2.1 Household Electricity Prices

The following chapter analyses electricity retail prices paid by consumers whose annual consumption falls in the range 2500 to 5000 kWh. This consumption band is defined by Eurostat terminology as DC and is the most representative consumption band in 23 out of 28 Member States of the European Union[13].

Summary

The average household price was 20.8 Eurocent/kwh in 2015. Household electricity prices increased at an annual rate of 3.2% since 2008 and diverged by a factor of 3 across the EU in 2015.

The energy component diminished both in nominal and relative terms on EU level as well as in most reporting countries. It remained the largest of the three components only in half of the reporting countries by 2015. The moderate decrease of the energy component (annual -0.3%) was overtaken by increases in the network (annual 3.3%) and taxes and levies (annual +7.9%) components, resulting in overall higher prices.

While VAT remained the largest cost element within the taxes and levies component, price increases were mostly driven by RES support costs (annual +22%) and not- earmarked taxes. Energy efficiency support costs grew annually by 73% but still remained to account for less than 1% of the total price in 2015.

Whilst prices for all other electricity and gas consumer types became more convergent since 2008, household electricity prices became 9% more dispersed. This is mostly due to the fact that they are strongly impacted by divergent national taxation and policy measures.

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[13] The aggregated consumption of these countries accounts for approximately three quarters of the total EU consumption. The average household consumption lies above the range of the band DC in Norway and slightly below in Turkey.

The energy component is the only part of the price which is determined by the market. The household EU average energy component became annually 2.3% less dispersed since 2008, mirroring the progress towards a single energy market.

Reporting countries impose a broad variety of taxes and policy support costs on household electricity bills, reflecting various national energy technology priorities, social structures, topographies and market structures. While designated policy support costs have often experienced notable increases, not- earmarked taxes (including VAT) still cost the average EU household 15% more in 2015.

COMPARING PRICE CHANGES: ELECTRICITY VS GENERAL PRICE LEVEL

Electricity prices for median household consumers (2 500 kWh < Consumption < 5 000 kWh) all taxes included

2008 - 2015 % change
All prices in national currency

Indicators are displayed for countries that submitted data for DG Energy's ad- hoc data collection. Data submission was open to all countries reporting to Eurostat in the European Statistical System.

Legend

- Price change electricity smaller than price change HICP
- Price change electricity bigger than price change HICP
- ⚡ Electricity price change
- € HICP change

HICP stands for "harmonised index on consumer prices" and measures the general price level in a given Member State

⚡ +9%
€ +14%

⚡ +9%
€ +16%

⚡ +10%
€ +17%

⚡ -15%
€ +15%

⚡ +22%
€ +16%

⚡ +7%
€ +10%

⚡ +44%
€ +22%

⚡ +48%
€ +17%

⚡ +2%
€ +20%

⚡ +13%
€ +12%

⚡ +37%
€ +4%

⚡ +30%
€ +22%

⚡ -4%
€ +13%

Cyprus

⚡ +36%
€ +10%

⚡ +12%
€ +18%

⚡ -1%
€ +11%

⚡ -4%
€ +13%

⚡ +13%
€ +16%

⚡ -27%
€ +25%

⚡ +20%
€ +31%

⚡ +35%
€ +10%

⚡ +37%
€ +13%

⚡ +12%
€ +15%

⚡ +15%
€ +14%

⚡ +15%
€ +14%

⚡ +49%
€ +10%

⚡ +48%
€ +12%

⚡ +49%
€ +10%

⚡ +5%
€ +77%

⚡ -22%
€ +21%

Malta

0   500   1,000 Kilometers

Source: Eurostat Energy Statistics
© Eurogeographic for the administrative boundaries; © DG ENER - September 2016

Energy
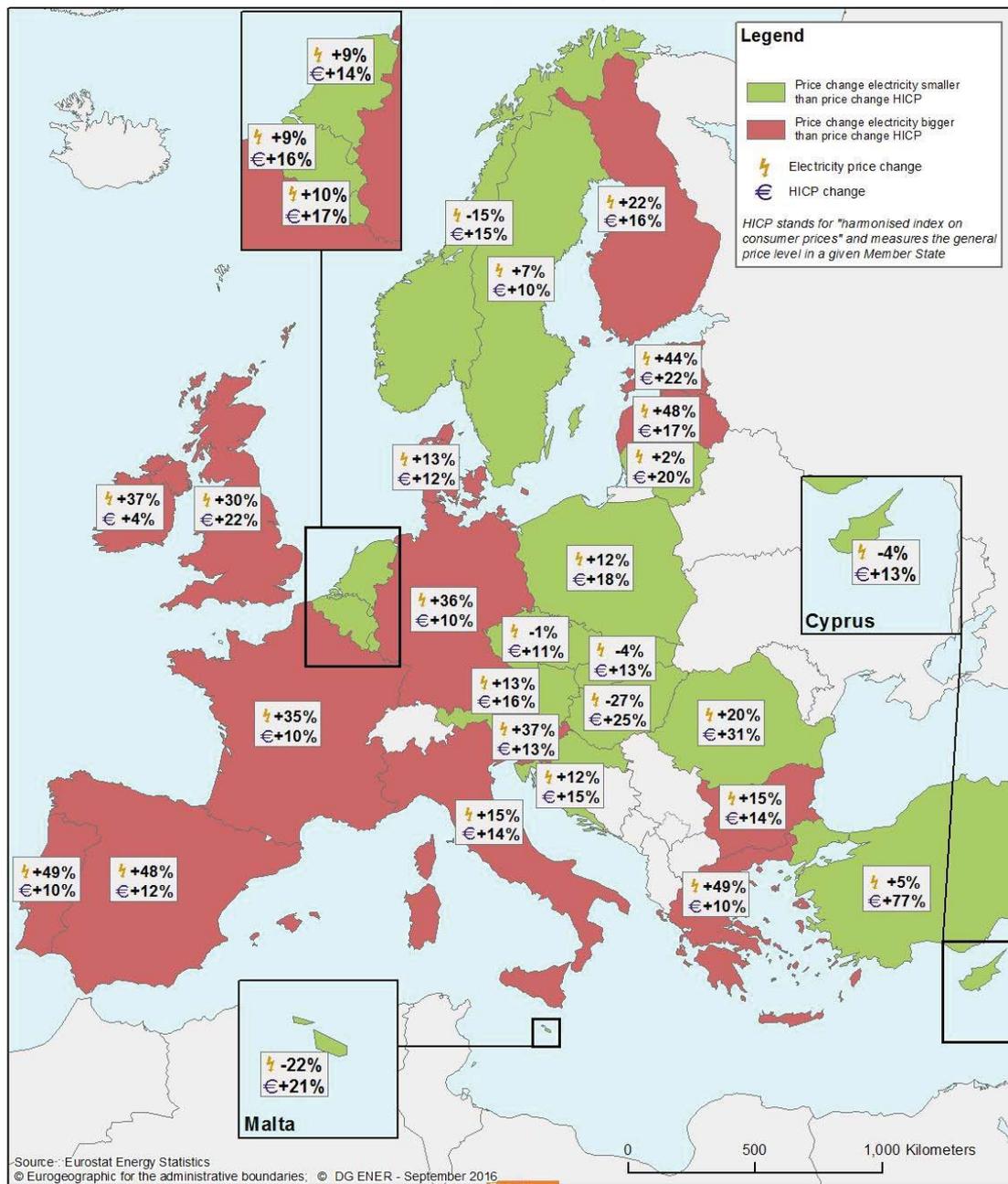
1.2.1.1 Price evolution – Total prices

The weighted average EU household price was 20.8 Eurocent/kWh in 2015. This average price increased from 16.65 Eurocent/kWh at the annual rate of 3.2% from 2008 to 2015[14]. The average inflation was 1.5% during the same period.[15] The increase of electricity retail prices has slowed down to a rate of 2% from 2014 to 2015. This might have negative impacts on energy efficiency investments by households in more efficient appliances and buildings.

Figure 8 - **Evolution of the EU average household price (DC)**
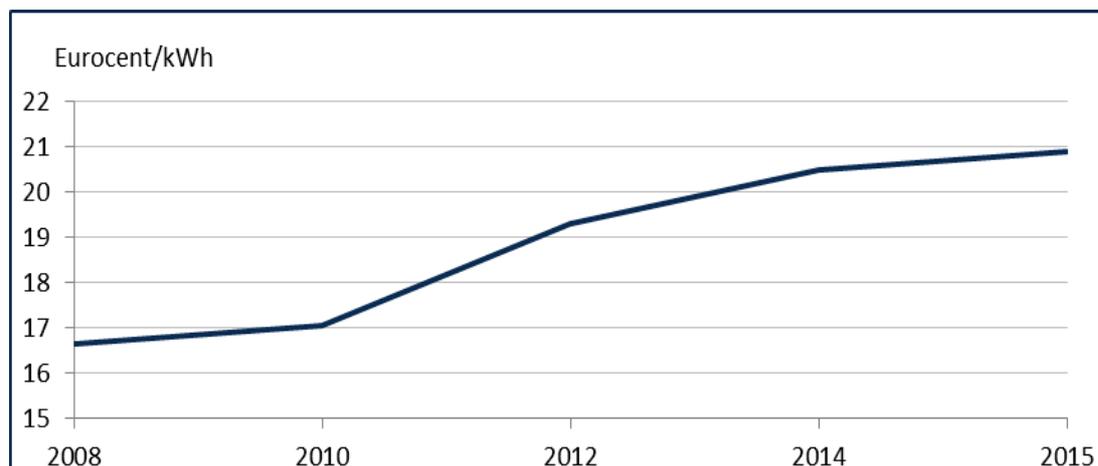
Source: European Commission, Member States

In 2015 the highest national price was more than three- fold of the smallest, as prices ranged from 9.42 Eurocent/kWh in Bulgaria to 30.55 Eurocent/kWh in Denmark. The highest and lowest prices in 2008 were recorded in the same countries with the same ratio.

Figure 9 - **Household electricity prices by country in 2015 (DC)**
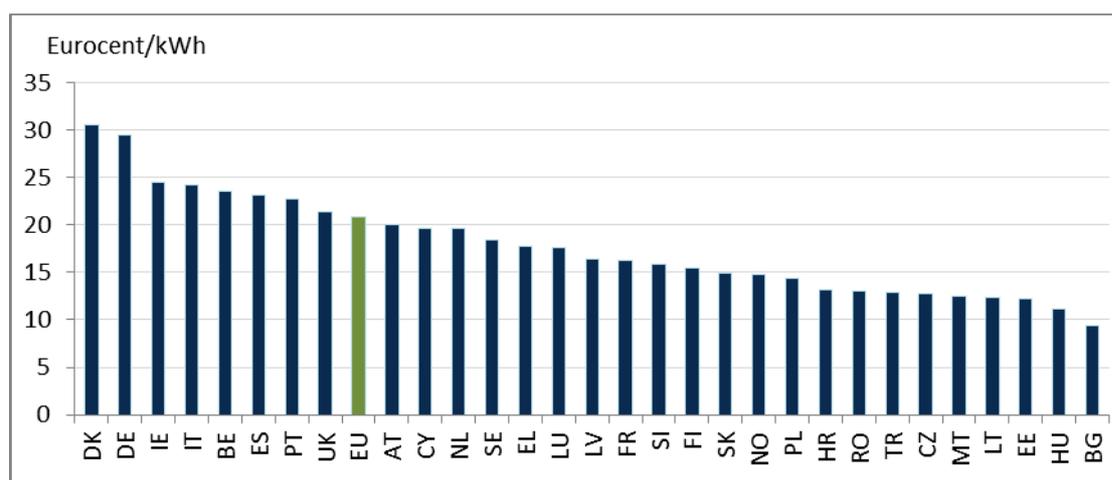
Source: European Commission, Member States

Figure 10 - **Nominal price changes & prices relative to EU av. in 2015 for households (DC)**

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[14] Compound Annual Growth Rate
[15] Harmonized Consumer Price Index (HCPI), Eurostat: prc_hicp_aind
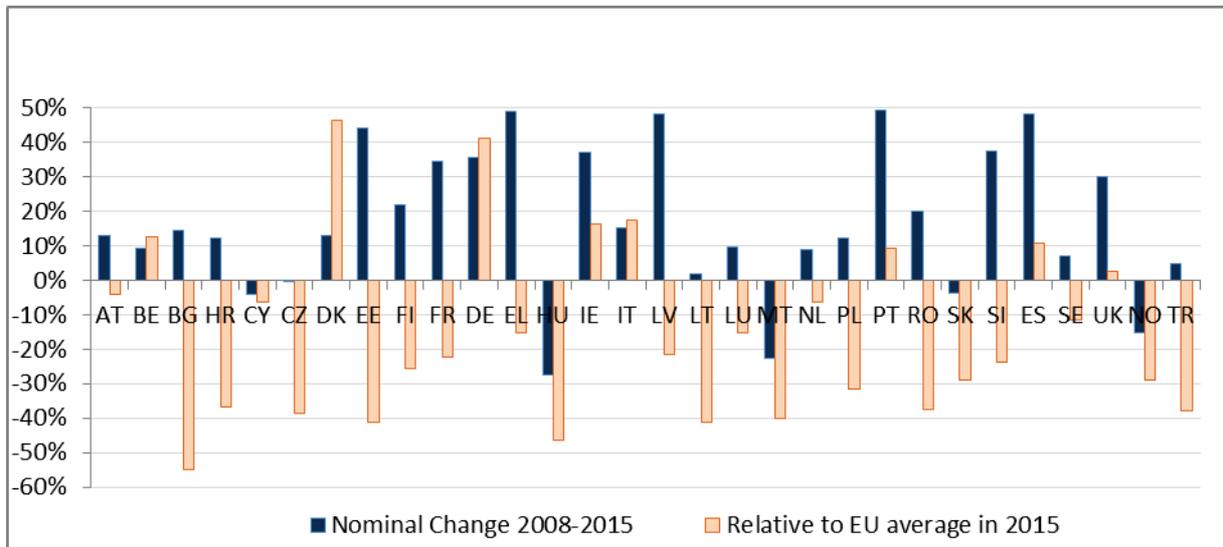
Source: European Commission, Member States

Electricity prices on the island systems of Cyprus and Malta are largely dependent on international oil prices. Falling prices of the commodity are reflected in falling wholesale prices. Three Central- Eastern European countries, namely the Czech Republic, Hungary and Slovakia alongside Norway also reported decreasing nominal prices.

Figure 11 – **Household electricity prices by country (DC)[16]**
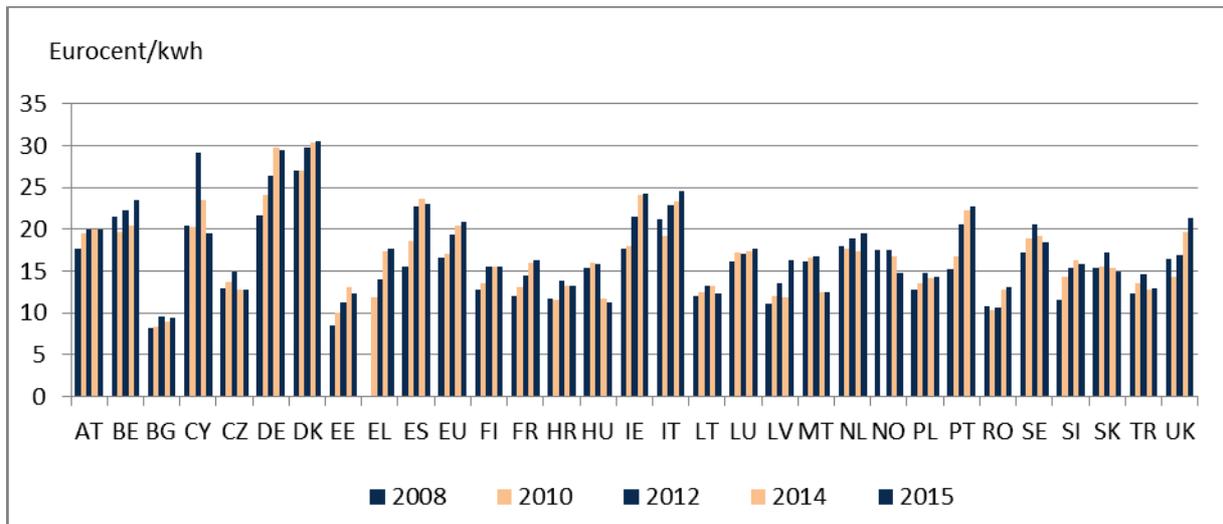
Source: European Commission, Member States

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[16] 2010-2015 value for Greece.

1.2.1.2 Price drivers – Main components

Total prices provide no information on the drivers of price developments. To facilitate the more focussed identification of price increase drivers, total prices are further decomposed into three main components. The components Energy, Network and Taxes & Levies disaggregate the total price along the value chain.

The Energy component typically includes cost elements such as the wholesale price of the commodity, various costs of the supply companies including their operational costs and profit margins, balancing energy as well as metering and billing charges. It also includes ETS costs, which are understood as production costs, rather than levies. The same holds for various taxes, such as property or vehicle taxes paid by supplier companies.

The Network component mainly consists of transmission and distribution tariffs. It might also include further cost elements, such as ancillary services.

The Taxes & Levies component includes a wide range of cost elements that highly vary from country to country. They reflect each country's energy technology priorities, social conditions, geographical characteristics and market structure. Levies are typically designated to specific technology, market or social bound policies, while taxes are general fiscal instruments feeding into the state budget.

Figure 12 **- Weighted EU average household components (DC)**
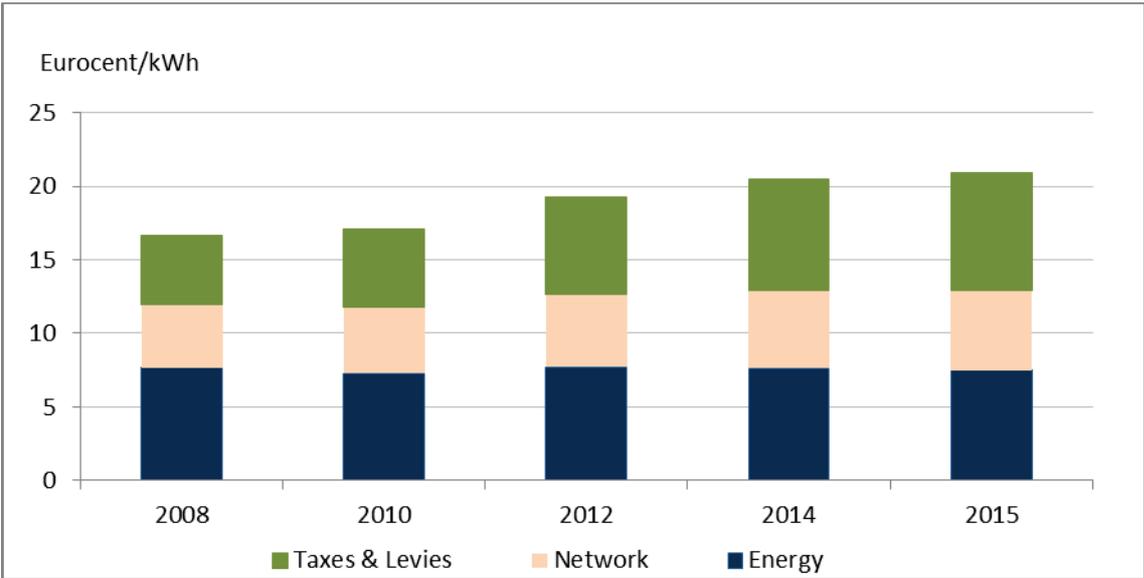
Source: European Commission, Member States

The weighted average **energy component** decreased at the annual rate of 0.3% and accounted for 7.49 Eurocent/kWh in 2015. From 2014 to 2015 the energy component decreased in 23 of the 30 reporting countries. By 2015 the energy component was no longer the largest of the three components in 14 out of 30 reporting countries and in the weighted EU average. The decrease in energy components can be linked to EU energy policies: increased competition resulting from market coupling, the unbundling of electricity generation from system operation, the fall in EU ETS carbon prices and the growth of power generation capacity with low operating costs (such as wind and solar power, in addition to existing nuclear and hydro power).

In 13 reporting countries the nominal level of energy costs increased from 2008 to 2015. In these countries the fall of wholesale prices has not translated into a reduction in the energy

component. Such results may imply that price competition in a number of retail markets is weak, allowing suppliers to avoid passing on wholesale price reductions to retail prices.

Box - Pass through effect on electricity

Our 2014 report on energy prices and costs indicated that the fall in wholesale prices had not translated into a reduction in the energy component of retail prices, and that this result may imply that price competition in a number of retail markets was weak. The fact that cost fluctuations are reflected in final prices, is a sign that a market works properly. Such responsiveness of retail prices can however be diminished by the lack of competition and by the presence of price regulation (as it happens in some Member States) which can also be detrimental for competition by deterring new entrants. The analyses conducted in our 2016 report to test the cost reflectiveness of wholesale prices are overall aligned with these ideas.

To assess how wholesale prices impact the energy component of final prices (the pass through effect – see also box below), we should look at *how quickly* and *how strongly* energy supply prices adjust to changes in wholesale prices. The *speed of the pass through* could be evaluated by using a correlation analysis with lags between the retail price component and the wholesale price. A panel analysis based on fixed and random effects (which allow incorporating time series and country specific characteristics) was used to evaluate *the magnitude of the pass-through*.

Electricity

On the *speed of the pass through*, the correlation analysis reveals a heterogeneous picture across Europe in which wholesale prices seem to be passed through faster in some countries than in others *[0 months in NO, SE, AT, LV while it takes 8 months in NL, IT, CZ, DE, FR]*. These differences could depend on the market and tariff design of the retail markets, given that in some countries prices are still regulated, in some countries prices are fixed for a given time period (with monthly prices relying on old and new contracts) while in others they are indexed to the wholesale market price.

On the *magnitude of the pass through* the econometric analysis shows that wholesale prices are the main drivers and strongly affect the energy component (i.e. a price drop of 1 Eurocent would result in a decrease of the energy component by about €0.04 – 0.09 ct.).

The econometric analyses also show that there is an impact of the *competitive structure* and *regulated prices* on the pass through effect[17]:

— Markets with a market share above 80% of the three largest suppliers show a higher energy supply price (mean is about €1ct per kWh higher) while under regulation the energy price component seems to be slightly lower (mean is about €0.8 ct/kWh lower). However, low retail prices often go hand in hand with a low level of customer satisfaction as their service and range of products is modest, as the ACER MMR 2015 report highlights.

— In a competitive and deregulated market the impact on wholesale prices is significantly stronger (about €0.2 ct/kWh per one Eurocent change for the household consumption band DC), signalling that suppliers react to wholesale price changes. Econometric analysis shows that competitive structure of markets and price regulation significantly impacts the pass through of wholesale price. Panel data analysis reveals that the speed and magnitude of the pass through differs between the group of Member States with competitive retail markets and the group of Member States with regulated

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[17] For a literature review supporting the methodology used for the econometric analysis, please consult Error! Reference source not found.

prices. For the deregulated group it can be stated that the more competitive markets are, the higher the magnitude of the pass through.[18]

— There are further market characteristics, or different market behaviour or product designs, be it at the supply (e.g. number of suppliers, offers, price transparency) or demand side (switching behaviour) that certainly exert an influence on the energy component. However there are no suitable data available across all Member States to capture these factors.

Source: Ecofys study sections 3.2.2.1 & 3.2.2.2 and related Annex 2

Box - Cost reflectiveness of wholesale prices and the evolution of retail prices

Retail energy suppliers can compete on their offers on energy supply costs which depend to an important extent on wholesale energy prices. In a properly functioning market, the higher or lower wholesale prices should be translated to energy component of the (final) retail price. This however does not necessarily mean that retail prices will strictly mimic the evolution of lower energy costs given that retail prices are also impacted by the evolution of its other components (e.g. network costs and taxes & levies). E.g. in the energy market, lower wholesale should be passed through to final consumers in the form of lower cost of the energy supply component but this does not mean that final prices will necessarily decrease because *network costs* and *taxes & levies* could, for instance, have risen, compensating lower energy costs.

The **network component** increased at the annual rate of 3.3% and cost the average EU household 5.45 Eurocent/kWh in 2015. Network tariffs steadily increased over the whole observation period. From 2014 to 2015 they increased in 18 out of the 30 reporting countries. The network component was the largest of the three components in 7 reporting countries (BE, CZ, EE, NO, RO, SE) in 2015. In Poland energy costs were only marginally higher than network costs.

Box - Network quality and charges

A frequently used indicator for measuring the quality electricity networks is the annual number of minutes of supply disruption. Disruptions can occur at different levels of the transmission and distribution networks (e.g.: high voltage, middle voltage and low voltage networks). They can be *planned* (disruptions related to grid maintenance activities) or *unplanned* (those resulting from an unexpected event).

Error! Reference source not found. shows that there are significant differences across EU Member States in the extent of electricity supply disruptions (data from 2013). The highest number of minutes of disruptions could be observed in Central Eastern European Member States (Romania, Latvia, Estonia, Croatia, Czech Republic, Lithuania, Poland) while disruptions were less frequent in North Western European countries (e.g.: Luxembourg, Denmark, Netherlands, Germany, Austria, Belgium). The duration of planned disruptions was also higher in those Member States with a higher number of the overall outage minutes, indicating lower quality electricity supply in those countries.

Figure 13 – **Minutes of electricity supply disruption in EU Member States, 2013**

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[18] R-squared values of estimated regressions are in the range of usual panel data results

System Average Interruption Duration Index (SAIDI), 2013
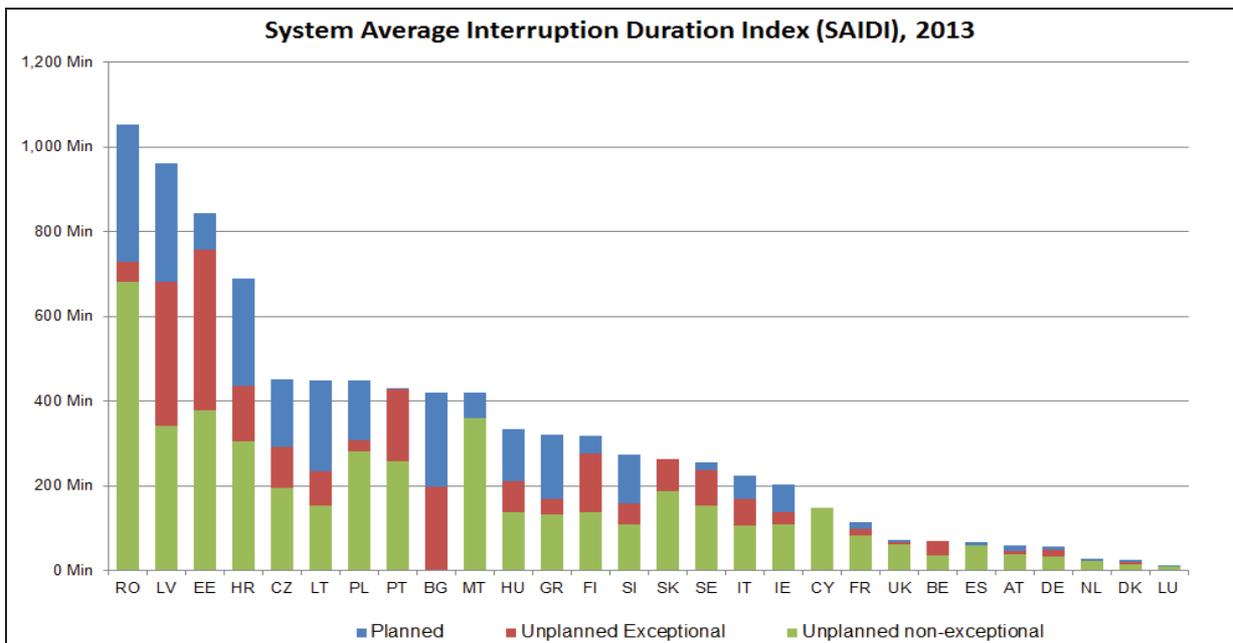
Source: CEER Benchmarking Report 5.2 on the Continuity of Electricity Supply, February 2015

However, it is worth noting that in most EU Member States the annual interruption time has been decreasing over time, suggesting improvements in the quality of the electricity grid. In 2005 the EU average interruption time was 373 minutes, by 2009 this figure decreased to 365 minutes and by 2013 to 309 minutes.

Results of customer satisfaction surveys can also foster the understanding of the quality of electricity supply. They can be especially useful for global comparison. The satisfaction survey on electricity supply of the World Economic Forum (Global Competitiveness Index) takes into account basically two factors: disruptions and fluctuations of power voltage. **Error! Reference source not found.** shows that the quality of supply in the EU on average scores well when compared to other non-EU G-20 countries. On a scale of 1 to 7, the average satisfaction rate in the EU-28 was 5.95, while in the case of non-EU G-20 countries the same figure was 4.97. The upper third of the satisfaction ranking consists entirely EU Member States (with the exception of Canada), while in the lower third there were only five EU Member States (Bulgaria, Romania, Malta, Greece and Estonia):

Figure 14 – **Customer satisfaction with electricity supply in the EU and G-20 countries**
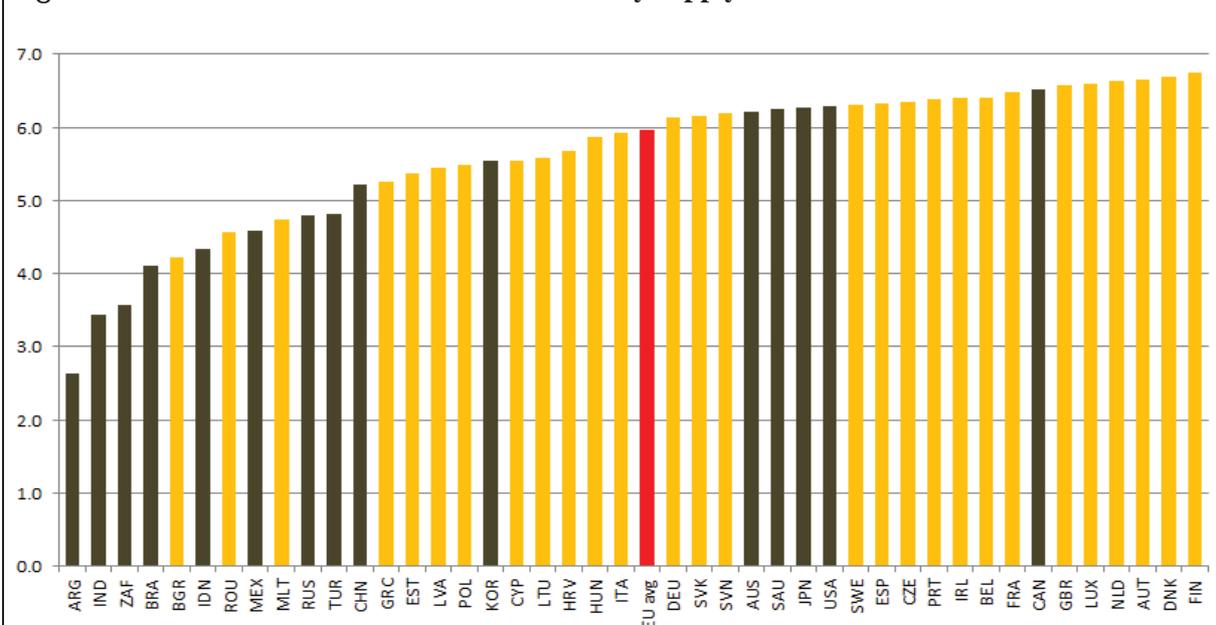
Source: World Economic Forum Global Competitiveness Index, 2014-15edition - (1=worst, 7= best)

Increased expenditure for improving network quality subsequently increases network costs. However, it is important to emphasise that good network quality does not always appear associated with higher network costs. In some cases network costs are higher in those EU Member States where the supply interruption periods are longer, or the consumer satisfaction is lower. It is therefore not easy to establish a direct link between the quality of electricity supply and network costs in a given country. In international comparison, it is even more difficult to analyse network cost differentials and their impact on the quality of electricity supply across different countries. For these reasons, a more thorough data collection and methodological considerations should be carried out to establish and quantify this impact (which goes beyond the framework of the current energy prices and costs staff working document).

The report by *Ecofys on prices and costs of energy in the EU* provides some descriptive information on the impact of different factors on electricity and gas network costs:

There are three potential factors to calculate network costs: A *lump sum for the connection* of an installation, a *capacity fee* for the connected capacity (e.g.: kW) and a *consumption fee based on the usage* of the network. In most countries, *households* only pay a *consumption fee*, sometimes there is a lump sum fee for the connection. For *industries*, the capacity fee for the connected capacity (or peak load) is often more important.

In the case of *gas*, network costs for households largely depend on the fixed price component and capacity elements. In the case of the existence of the former (fixed) component, network costs are significantly higher. For industrial customers we do not see such big differences.

Network costs can be driven by several factors, such as replacements (investments) of existing equipment, substitution or new infrastructures, number of connections, by renewables energy generation shares in the case of electricity, and the existence of fixed capacity charges

The **taxes & levies** component of household prices grew at a faster annual rate of 7.9% and accounted for 7.92 Eurocent/kWh in 2015. Taxes and levies continuously increased over the

whole observation period, at times by double digit figures. From 2014 to 2015 the increase of the component slowed down to a pace of 2% and in 11 of the 30 reporting countries it even decreased. The taxes & levies component was the largest of the three components in 7 reporting countries as well as in the weighted EU average price (DK, DE, ES, PT, AT, LV, SK) in 2015. The two Member States (DK, DE) that recorded the highest prices in 2015, reported the highest taxes and levies components across all reporting countries. It is to be noted that only these two countries are represented in the top 5 countries with the highest retail prices. Contrarily, in Italy, Ireland (rank 3 and 4 on the list of highest prices) energy costs accounted for the largest part for the bill, while in Belgium (ranks 5) network costs weighted out the two other components.

Within the taxes and levies component, two sets of cost elements can be distinguished. Levies finance energy, environmental, climate change related and social policies, while taxes contribute to financing general public expenditure as outlined in the state budget. Taxes, such as excise duty, environmental or greenhouse gas emission taxes do not necessarily finance energy related policies. It is important to note that the current study analyses only the direct impact of policies and fiscal measures on retail prices. Some reporting countries supplement the financing of policies from the state budget. This means that additionally to the explicit levy, which represents a cost element in the retail price in the structure of the current study, policies are also supported by other public resources.

Non- energy policy relevant charges (taxes) were 15% higher than energy policy relevant charges (levies) in 2015. Taxes cost the average EU household 4.2 Eurocent/kWh in 2015. The average sum of costs related to policies such as renewable energy support, energy efficiency and vulnerable consumers equalled to 3.7 Eurocent/kWh, while taxes cost the average EU household 4.2 Eurocent/kWh. Levies made up 46% of the average taxes and levies component and 17% of the average total price. Taxes accounted for 54% of the average taxes and levies component and 20% of the average total price. These shares also reflect the development of VAT, which as an ad valorem tax is levied on the sum of the underlying components.

Figure 15 - **Weighted average levels of taxes and levies for median households (DC)**
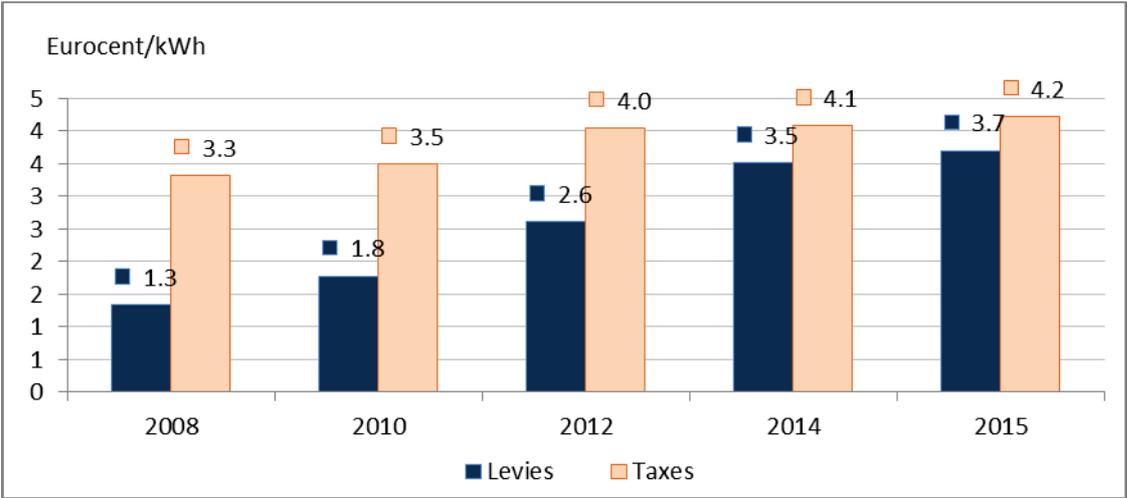
Source: European Commission, Member States

Energy taxation is harmonised on EU level by Directive 2003/96/EC. The directive sets minimum levels for VAT and excise duty, however most Member States apply rates higher than the binding minimum levels. VAT, at different rates, exists in all reporting countries. Beyond VAT and excise duty, Member States are generally free to apply any additional

national taxes[19]. It should be noted that excise duty on some energy products, including electricity, is levied according to the volume of the product. Hence, it is determined independent of the price and its share in the final price will increase with falling prices. Excise duty on other products, such as natural gas is levied on the basis of their energy content. VAT is an ad valorem tax, determined as a percentage of the sum of all other costs, such as the energy component, network component and other taxes and levies. Hence, its share remains constant with falling prices.

Figure 16 - **Share of EU average components for households (DC)**
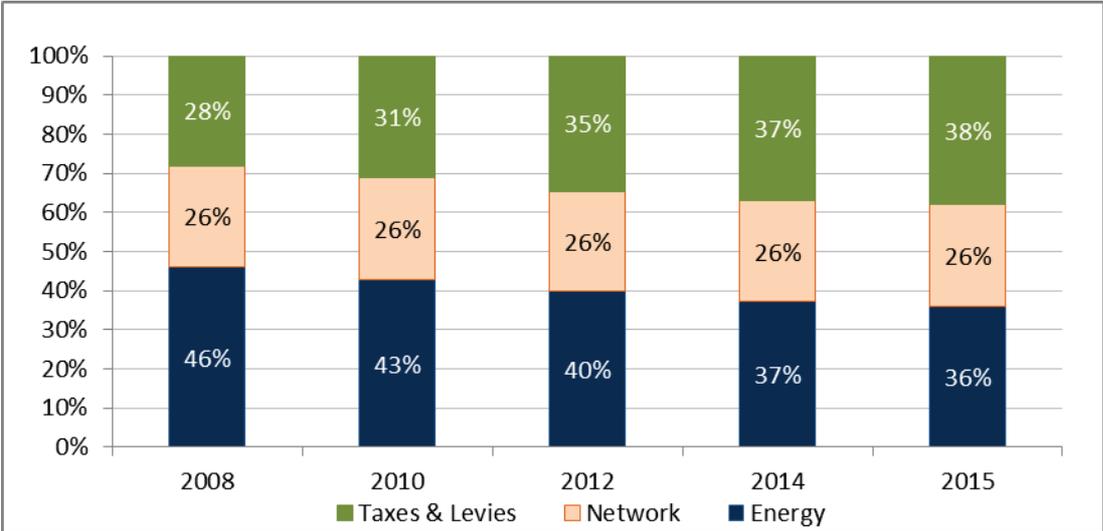
Source: European Commission, Member States

The relative share of the energy component in the total price gradually diminished over time. It decreased by 10 percentage points from 46% to 36%. The share of the Network component in the total price remained constant at 26%. The share of the taxes & levies component in the total price increased by 10 percentage points from 28% to 38%.

Figure 17 - **Price components by country in 2015 for households (DC)**

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[19] Provided that these do not hinder cross border trade between Member States by enhancing formalities.
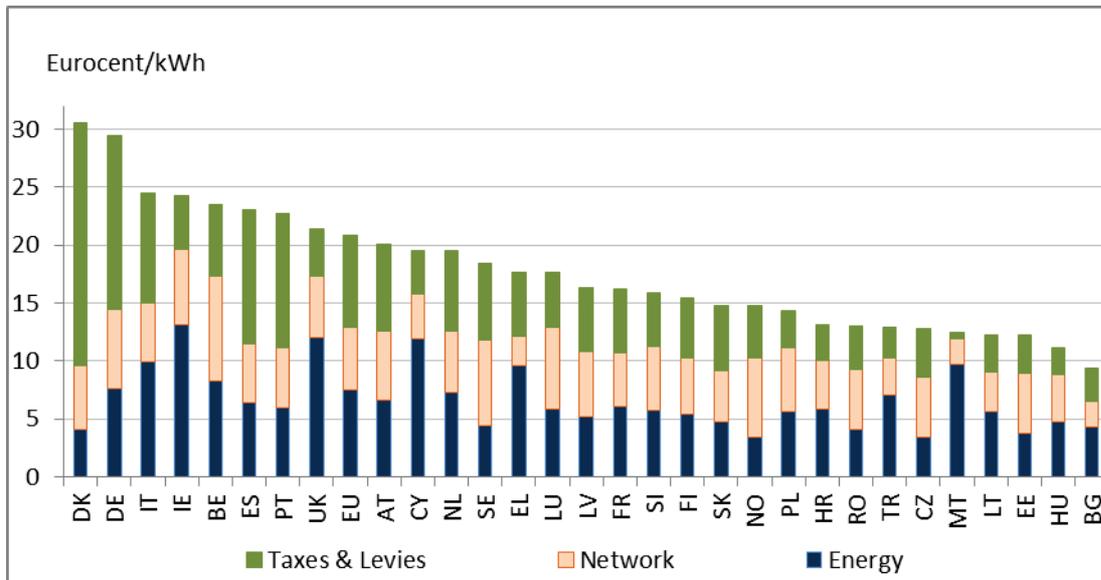
Source: European Commission, Member States

Figure 18 **- Share of price components by country in 2015 for households (DC)**
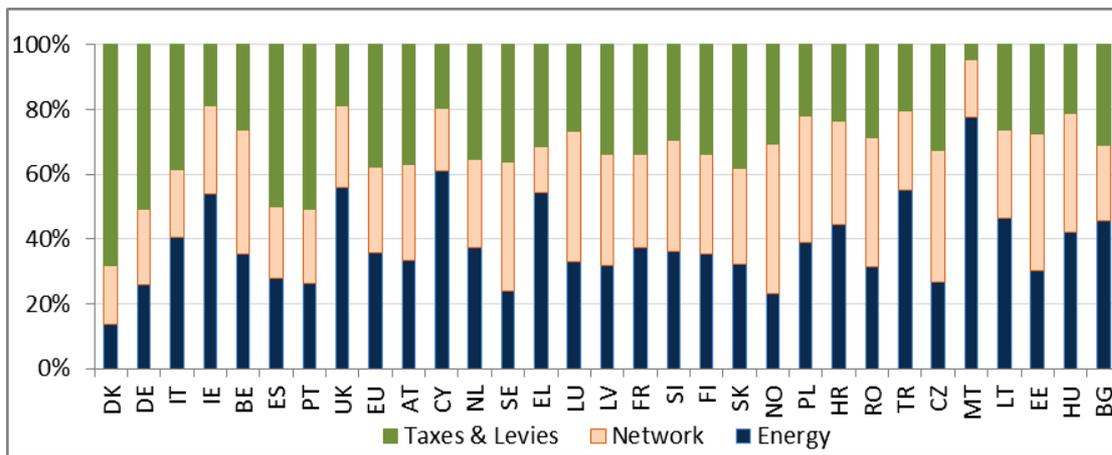
Source: European Commission, Member States

As of 2015 in 4 Member States the Taxes & Levies component accounts for at least 50% of the total price. In 4 Member States and Turkey the share of the Taxes & Levies component was 20% or below in the same year.

Developments within components

The current study introduces sub- components within the Network and Taxes & Levies components. These sub- components facilitate the more focussed analysis of developments within the two components.

Energy component

EU ETS costs are included in the energy component for all consumption bands. A 2014 study by DG ECFIN found that EU ETS costs had no significant impact on electricity prices. As the price of ETS allowances only moderately increased since, it can be stated that ETS costs further remain insignificant in terms of price increases.

The energy component is the only one of the three price components determined by market forces. Increasing competition is likely to lead to decreasing energy components. The share of the energy component decreased by 10 percentage points and accounted for 36% of the total price. The levels of the network and taxes & levies components are set by divergent national laws and regulations. Their joint share in the average median household price increased from 54% to 64%. As the part of the price which is set by market forces has been gradually decreasing, total prices are imperfect indicators for the measurement of price dispersion. The dispersion of the energy component however adequately reflects to progress towards an internal energy market. The energy component of the average median household price became 19% less dispersed since 2008. Results of econometric analysis support the finding that wholesale prices, which constitute the bulk of the energy component, became less spread out over time. The overall convergence however, conceals of shorter periods characterized by higher variance of the energy component. Increasing share of RES might be a contributing factor to the higher variance.

Network component

The Network component is broken down into two sub- components, namely Transmission and Distribution. Both transmission and distribution tariffs are regulated in all EU Member States as well as in Norway and Turkey. The allocation of cost elements (for example costs of infrastructure, losses, ancillary services and re-dispatching) to the two sub- components might differ from country to country. Therefore, cross- country comparisons are to be considered with caution. Household consumers are typically supplied with electricity by being connected to the distribution grid, therefore have to pay both transmission and distribution fees. 17 out of 30 reporting countries submitted the split between transmission and distribution costs.[20]

Figure 19 – **Transmission & distribution shares in network tariffs in 2015 for households (DC)**

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[20] The graph displays 2014 shares for the United Kingdom.
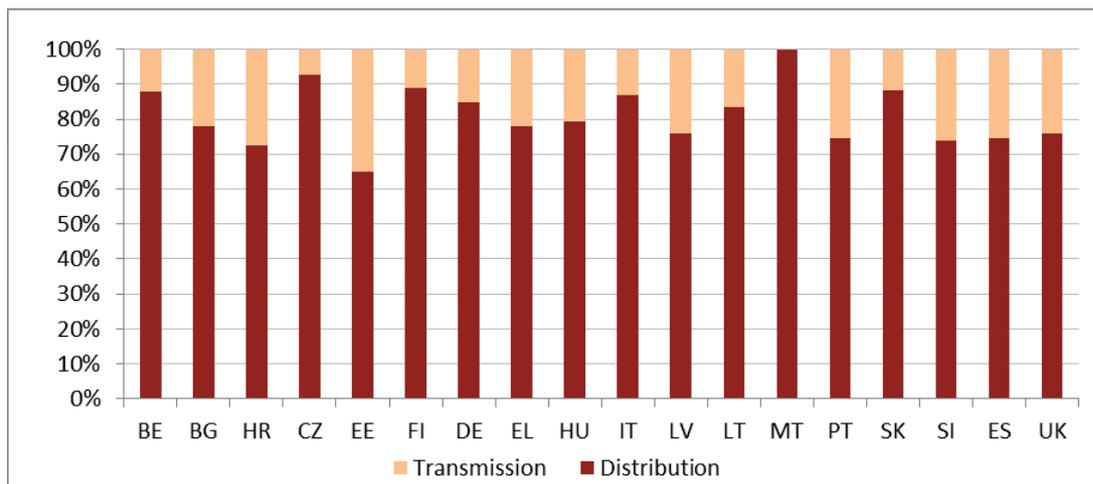
Source: European Commission, Member States

The share of distribution costs ranged from 13% in Italy to 100% in France, highlighting the lack of harmonized definitions of distribution and transmission tariffs. It is to be noted that there is no transmission system operator on Malta, therefore all costs are accounted for as distribution costs.

Taxes & Levies component

It is to be noted, that only explicitly reported cost elements could be allocated to specific policies and consequently taken into account for the analysis of sub- components. For example, RES support costs exist in several countries which could not report such costs

explicitly. In other countries the revenues collected through a levy that supports a specific policy are complemented by other resources. Such additional resources are not covered by the underlying study.

Cost elements within the Taxes & Levies component were assigned to 10 sub- components. Sub- components 1-8 are considered energy policy relevant while sub- components 9-10 consist of general fiscal measures.

1. Renewable energy sources and combined heat and power (RES & CHP): contains any cost imposed to support renewable energy technologies, grid connection of renewable energy generation units and any support to combined heat and power.

2. Social: the most common cost elements in this sub- component are related to vulnerable consumers, social tariffs, island system tariff equalization, last resort supply, special tariffs, and sectorial employment policies.

3. Nuclear: includes any support to the nuclear sector, most notably nuclear decommissioning.

4. Energy Efficiency: includes any support to energy efficiency and energy saving measures.

5. **Security of supply**: includes any support to security of supply policies, support to indigenous electricity generation or fuel production and emergency stockpile fees.

6. Concession fees: include concession fees and other charges for the occupation of public and municipal land.

7. Regulator and Market: cost elements in this sub- component are typically imposed to finance the National Regulatory Agency (NRA) or the Market Operator.

8. Other Levies: the sub- component includes a small number of designated cost elements that could not be assigned to any of the above sub- components, most notably R&D, deficit annuities and public television fees.

9. Value Added tax (VAT): VAT is imposed on electricity and natural gas prices in every EU Member State as well as in Norway and Turkey.

10. Other taxes: this sub- component includes any manifestation of excise duties, environmental taxes as well as distribution, transmission and greenhouse gas emission taxes. If revenues from a tax are earmarked for specific policies, the tax was allocated to the policy specific sub- component.

Figure 20 - **Composition of (EU weighted av.) Taxes & levies in 2015 for households (DC)**
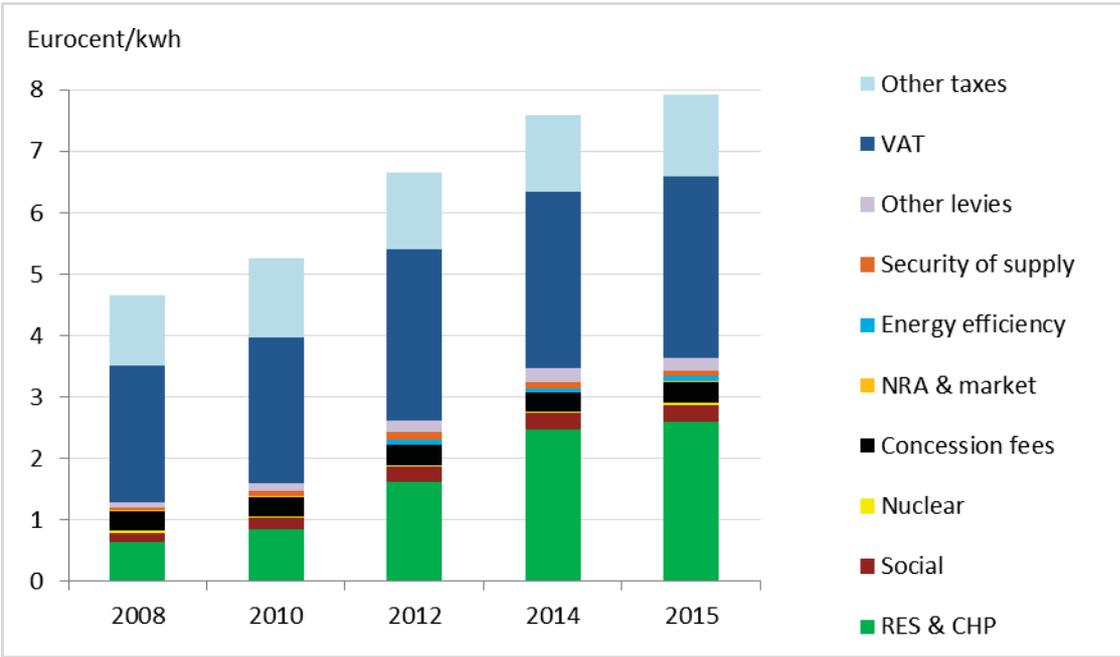
Source: European Commission, Member States

Figure 21 – **Share of sub-components in (weighted EU av.) Taxes and Levies for households (DC)**
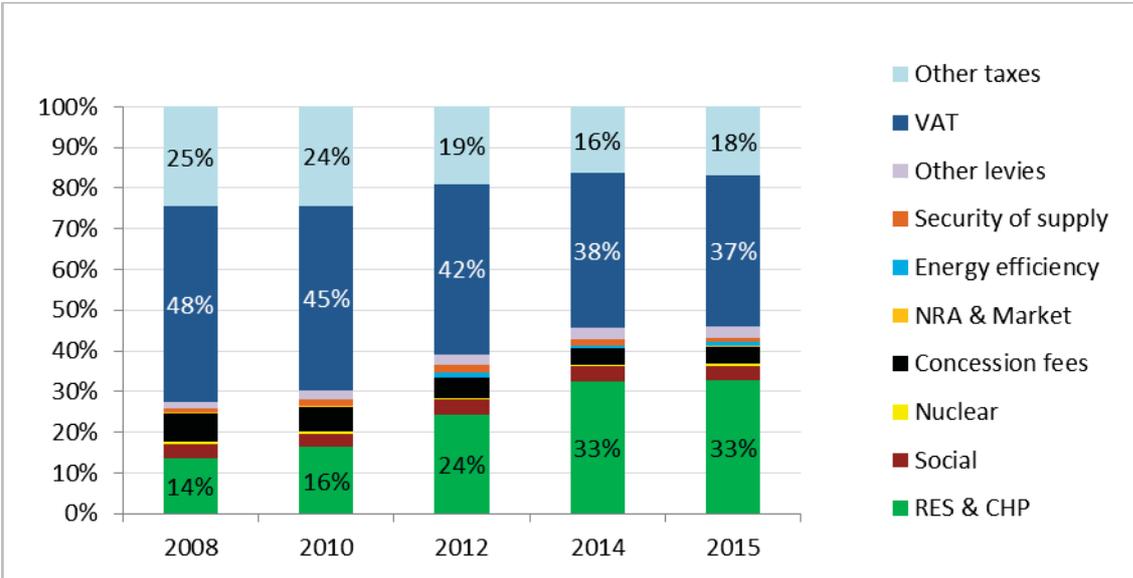
Source: European Commission, Member States

VAT was the largest sub- component within the taxes and levies component. It accounted for 37% of the weighted average taxes and levies component while other not- earmarked taxes (such as, excise duties, environmental, greenhouse gas emission and distribution taxes) made up 17% of the taxes and levies component.

The largest energy policy relevant sub- component was RES & CHP accounting for 33% of the total Taxes & Levies component, followed by social cost elements (4%), concession fees

(4%) and security of supply measures (1.2%). The share of energy efficiency, nuclear sector and institutional costs were each below 1%.

1.2.1.3 Price drivers – Sub- components

Value Added Tax

VAT is imposed in all reporting countries on household electricity prices, whereas the EU VAT Directive[21] explicitly allows Member States to apply reduced rates to electricity. As a result, VAT rates range from 6% in the United Kingdom to 27% in Hungary. As the largest sub- component, VAT made up more than a third of the weighted average taxes & levies component.

Figure 22 **- Household (DC) VAT costs in 2015 by country**
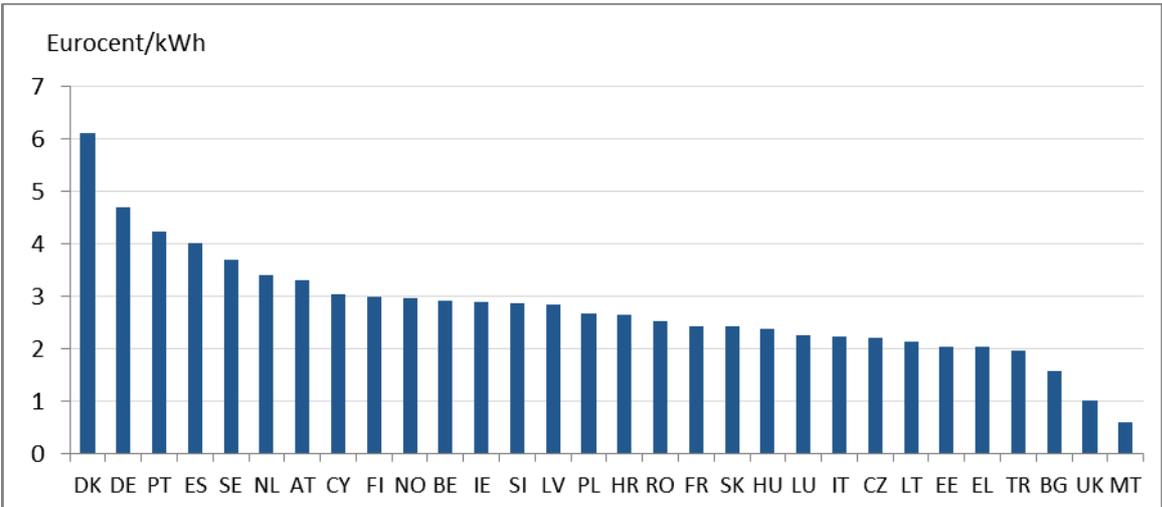
Source: European Commission, Member States

Renewable energy and Combined Heat and Power

This sub- component includes any support to renewable energy and combined heat and power generation. Explicit RES & CHP support costs were reported by 23 countries in 2015 for households. 5 EU countries did not report explicit RES or CHP cost elements. They are: Finland, Malta, Netherlands Poland and Sweden. Norway and Turkey also did not report explicit RES or CHP support costs. It is important to note that consumers in these countries are paying RES support despite the fact that such costs are not explicitly levied on electricity bills. They are captured either in the energy component or are financed through general fiscal measures. The Netherlands introduced a Sustainable Energy Levy in 2013 as part of the SDE+ mechanism. This levy could not be calculated separately for the current study.

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[21] Council Directive (2006/112/EC) of 28 November 2006 on the common system of value added tax (OJ L 34711.12.2006, p. 1).

Figure 23 - **Evolution of the EU weighted average RES support cost for households (DC)**

Eurocent/kWh

[Line chart showing values rising from about 1 in 2008 to about 3 in 2015 S1, with x-axis years 2008, 2010, 2012, 2014, 2015 S1 and y-axis from 0 to 3]
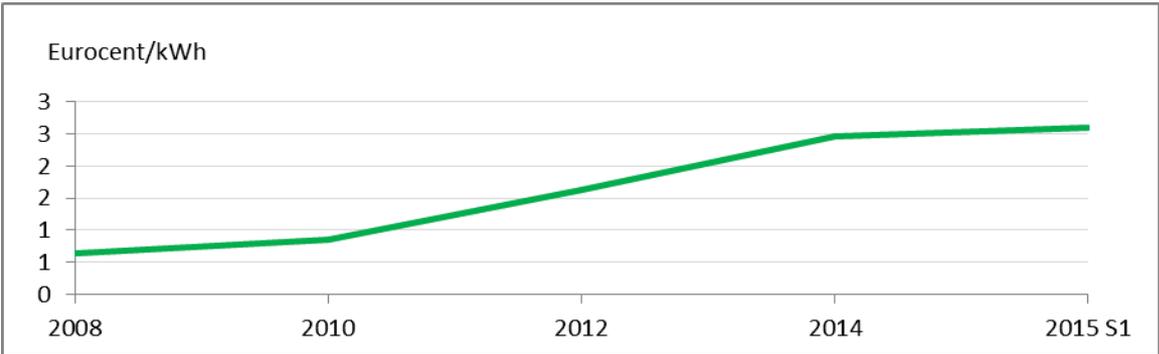
Source: European Commission, Member States

The EU 28 weighted average RES & CHP support cost tripled from 2008 to 2015. While the annual compound average growth rate of RES & CHP costs was 22% over the whole period, from 2014 to 2015 the increase slowed down to 4%.

Figure 24 – **EU average RES & CHP costs relative to EU average total price for households (DC)**

[Line chart showing percentage rising from about 4% in 2008 to about 12% in 2015, with x-axis years 2008, 2010, 2012, 2014, 2015 and y-axis from 0% to 14%]
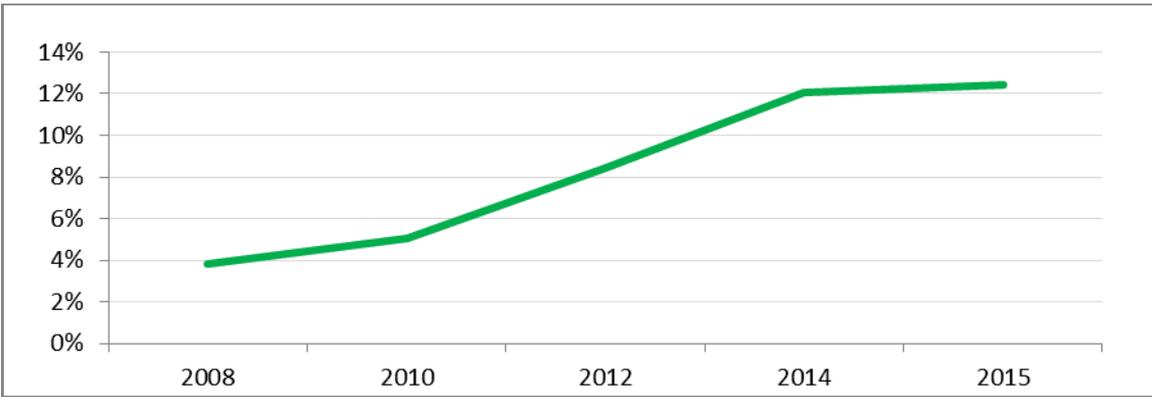
Source: European Commission, Member States

Figure 25 - **Nominal RES and CHP support cost by country in 2015 for households (DC)**

Eurocent/kWh

[Bar chart showing values by country: DE ~6.4, PT ~5.2, IT ~4.6, ES ~3.9, DK ~2.8, LV ~2.7, AT ~2.4, EL ~2.3, LU ~2.0, CZ ~1.9, SK ~1.7, UK ~1.6, SI ~1.4, FR ~1.3, BG ~1.2, RO ~1.1, BE ~1.0, LT ~0.9, EE ~0.9, CY ~0.5, IE ~0.5, HR ~0.45, HU 0. Y-axis from 0 to 7]
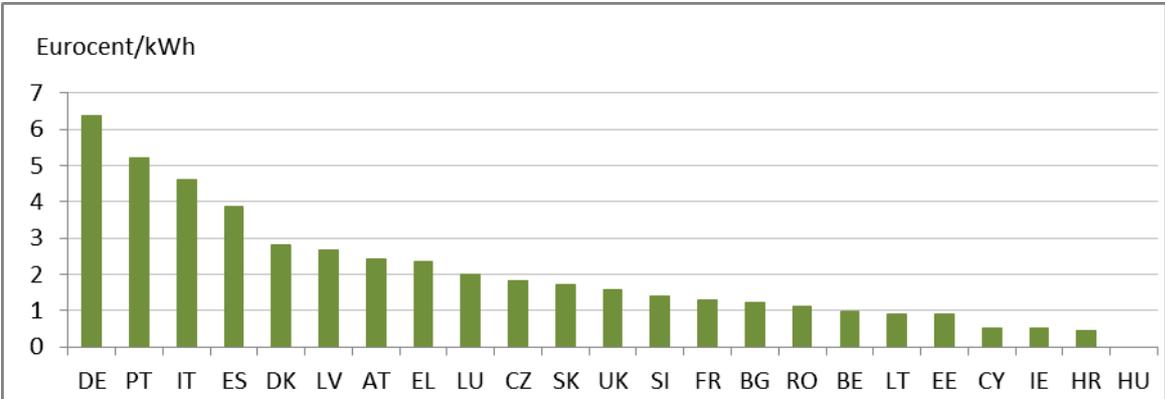
Source: European Commission, Member States

In 2015 Germany recorded the highest rate of RES & CHP support accounting for 61 Eurocent/kWh. The smallest amount of the same cost, 0.45 Eurocent/kWh was recorded in Croatia. In Hungary households are exempted from the RES levy as of 31 October 2013.

Figure 26 – **Share of RES & CHP support costs in national prices in 2015 (DC)**
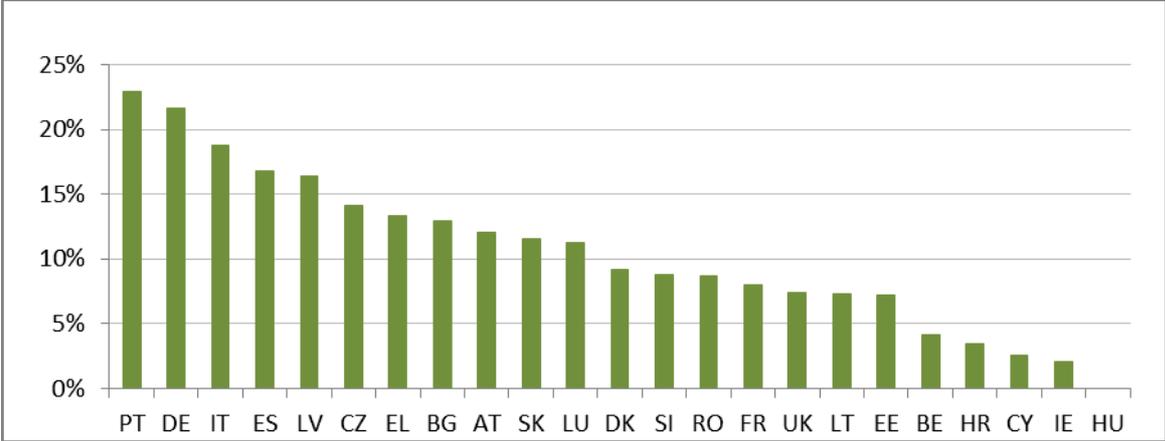
Source: European Commission, Member States

While Germany recorded the highest nominal amount of RES & CHP cost to households, the share of supporting such policies was the highest in Portugal, accounting for almost a quarter of the total price. The smallest share of 3% was reported by Ireland.

Other not earmarked taxes

The sub- component includes any manifestation of excise duty, environmental- , greenhouse gas emission- , transmission- and distribution taxes. Minimum tax levels on energy products and electricity are harmonised on the EU level and are defined by the Council Directive 2003/96/EC[22]. Normally those taxes are not earmarked to energy, climate or environment related policies. The sub- component excludes VAT.

Such taxes accounted for 6% of the weighted average EU price and 17% of the weighted average taxes & levies component. 21 reporting countries (19 EU member States, Norway and Turkey) imposed not- earmarked taxes (other than VAT) averaging at 1.29 Eurocent/kWh in 2015. Not- earmarked taxes increased at an annual rate of 2%.

Figure 27 **- Nominal cost of not- earmarked taxes for households (DC) in 2015**

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[22] Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity

Eurocent/kWh
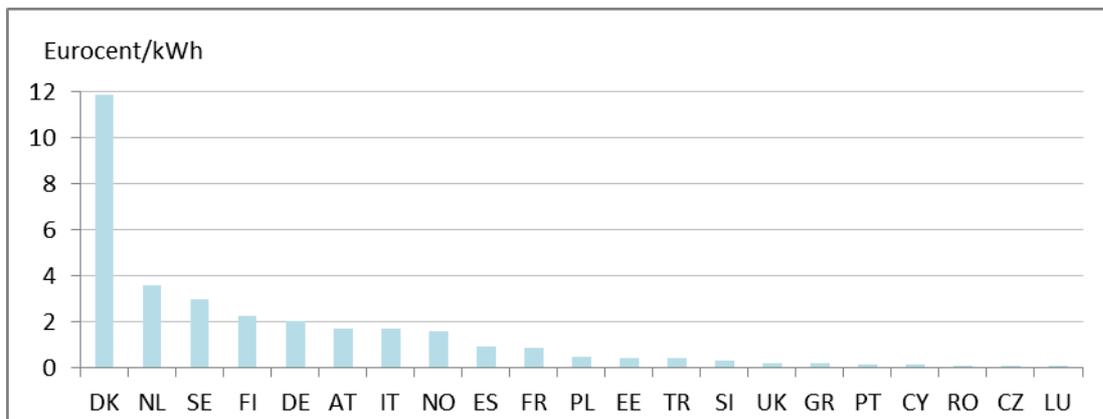
Figure 28 - Share of not-earmarked taxes(excl. VAT)in national prices in 2015 for households(DC)
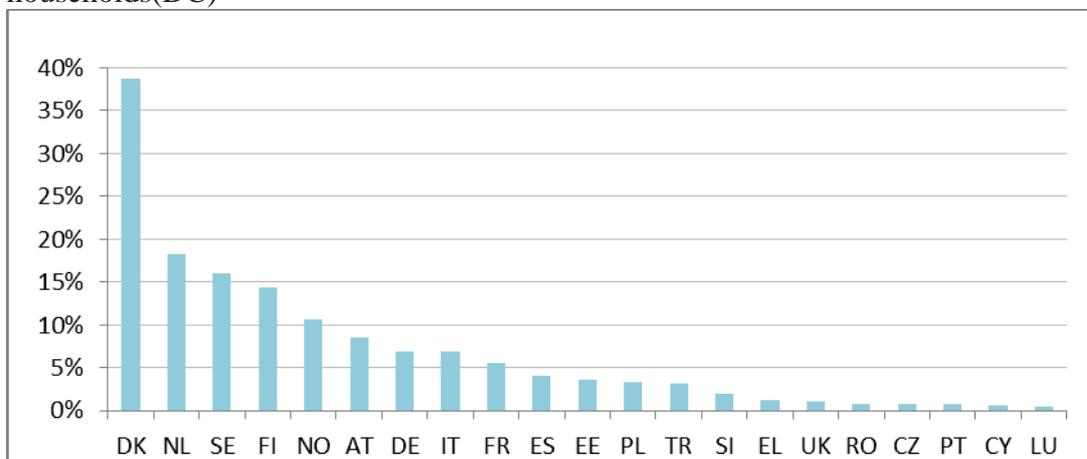
Not- earmarked taxes (other than VAT) accounted for 39% of the total price in Denmark, 18% in the Netherlands, 16% in Sweden and 14% in Finland. It is to be noted that the latter 3 countries could not report explicit RES support costs. In 13 Member States such taxes accounted for 1% or less of the total price.

Social charges

Social charges include any support to vulnerable consumers, island system tariff equalization, social funds and support to sectorial employment policies. Such charges were the second most important energy policy relevant charges across the EU in terms of nominal costs.

The impact of the weighted average social charge on the weighted average EU price was negligible (1.3%) and limited on the weighted average taxes and levies component (4%). The share of social charges in the weighted average EU taxes and levies component marginally increased by one percentage point from 3% to 4%

10 EU Member States imposed social charges during the reporting period. In Bulgaria and Portugal the reported cost element in 2015 was negative as social rebates effectively decreased the total prices in these countries. In Portugal the cost element was positive in years prior to 2015. The number of Member States imposing social levies in 2015 totalled at 9 as Hungary discontinued a social levy after 2012.

The United Kingdom's Warm Home Discount is a redistributive levy. All households pay towards this levy via their gas and electricity bills. All the money collected is recycled back as £140 annual rebates on the electricity bills of eligible low-income and vulnerable households. As such, the net effect of the policy on average dual fuel (gas and electricity) bills is £0. In the current study, only the gross cost is reflected as the rebate only applies to a subset of households.

Figure 29 - **Nominal cost of social charges for households (DC) in 2015 by country**
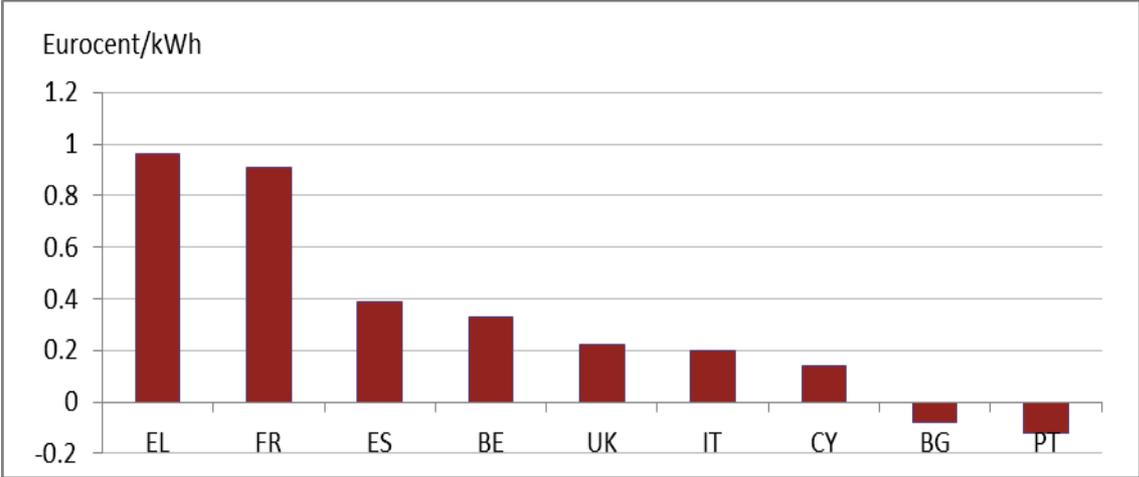
Source: European Commission, Member States

Figure 30 - **Share of social charges in national prices in 2015 for households (DC)**
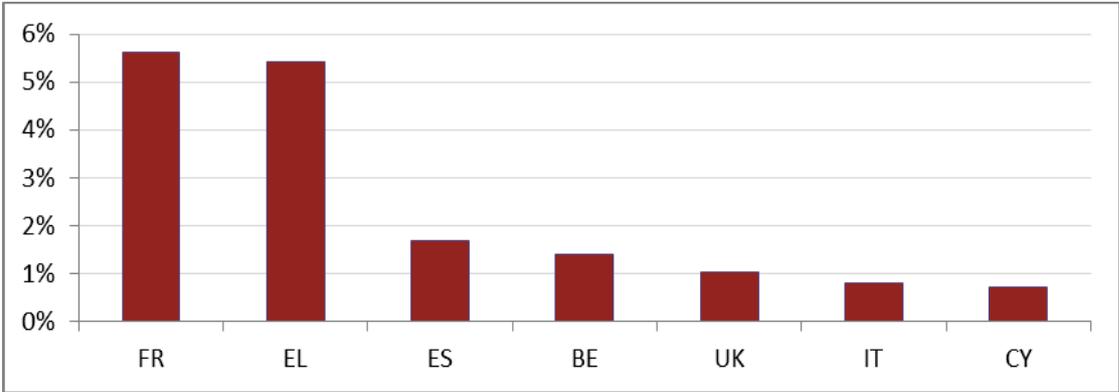
Source: European Commission, Member States

In 2015 France reported the highest share of social charges of 5.6% in the total price while in Greece the share of such charges was 5.4%. In all other countries the share of social charges in the total price was below 2%.

Security of supply

Security of supply related levies were imposed by 10 Member States in 2015. It is to be noted that at the beginning of the observation period in 2008 only 6 Member States imposed such levies. The impact of the weighted average security of supply cost on the weighted average EU price was negligible (below half a percent). Security of supply charges accounted also for less than 1% of the average taxes & levies component.

Figure 31 **- Nominal security of supply support cost for households (DC) in 2015 by country**
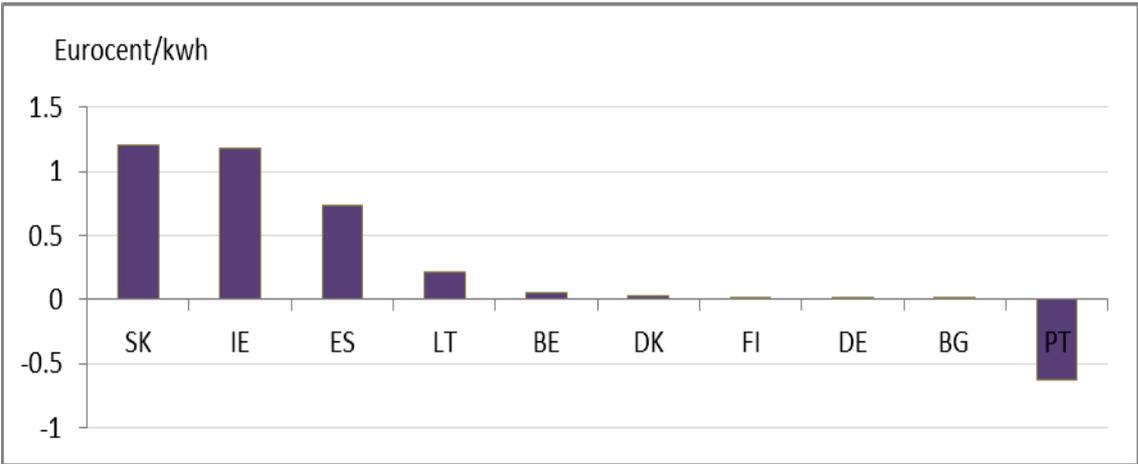
Source: European Commission, Member States

In 2015 Slovakia reported the highest nominal level of security of supply related charges accounting for 1.21 Eurocent/kWh. In Portugal the charge manifested as a rebate and was therefore negative. The share of security of supply related charges in the total price is not significant in any of the reporting countries.

Other energy policy relevant charges

The explicit impact of other energy policy relevant costs remained limited. Cost elements imposed to support energy efficiency, nuclear sector and market operation policies account for 1% or less of the average EU price. Albeit concession fees for the occupation of public land account for 4% of the weighted average EU price, such fees are imposed only in four Member States (BE, DE, LU, PT). The relatively prominent presence of concession fees in the weighted average price is mostly due to the German concession fee of 1.89 €c/kWh. Charges for the financing of the National Regulatory Agency or a market operator are levied in 6 Member States (BE, CZ, PT, SK, SI, ES). Nuclear[23] sector related levies are imposed by four Member States (BE, IT, SK, ES). Energy efficiency measures are explicitly levied also in 4 Member States (BE, IT, SI, UK).

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[23] It is to be noted that Sweden applies a Nuclear Capacity tax. This tax is not allocated to the nuclear sub-component of the taxes & levies main component, as the sub- component contains only costs elements that support the nuclear sector.

1.2.2 Industrial Electricity Prices

The following chapter analyses electricity retail prices paid by industrial[24] consumers whose annual consumption falls in the range 2000 to 20000 MWh. This consumption band is defined by Eurostat terminology as ID and is the most representative consumption band in the majority of EU Member States.

Summary

The average industrial[25] price was 107 EUR/MWh in 2015.Industrial electricity prices increased at an annual rate of 2.3% since 2008 and diverged by a factor of 3 across the EU in 2015. From 2014 to 2015 the average industrial price decreased for the first time since 2008.

The energy component diminished both in nominal (at the annual rate of 2.8%) and relative terms (by 21 p.p.) but still remained the largest of the three components in all but 2 reporting countries and in the weighted EU average price.

Price increases were mostly driven by RES support costs and not- earmarked taxes other than VAT. Taxes and levies tripled on average from 2008 to 2015 for the industrial consumer, however due to their initial low level, they still accounted only for a third of the EU average price. Due to the recoverability of VAT, the taxes and levies component for industrial consumers consisted mostly (91%) of designated levies rather than not- earmarked taxes as seen in the case of households.

Industrial electricity prices became 10% less spread out across the EU since 2008. The energy component is the only part of the price which is determined by the market. The weighted EU average energy component became 12% less dispersed since 2008, mirroring the progress towards a single energy market.

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[24] According to Directive 2008/92/EC of the European Parliament and of the Council : Industrial end-user may include other non-residential user.
[25] Refers to Eurostat consumption band ID covering annual consumption of 2000 to 20000 MWh.

COMPARING PRICE CHANGES: ELECTRICITY VS GENERAL PRICE LEVEL

Electricity prices for median industrial consumers (500 MWh < Consumption < 2 000 MWh) net of VAT and other recoverable taxes and levies

2008 - 2015 % change
All prices in national currency

Indicators are displayed for countries that submitted data for DG Energy's ad- hoc data collection. Data submission was open to all countries reporting to Eurostat in the European Statistical System.

Legend

- Price change electricity smaller than price change PPI
- Price change electricity bigger than price change PPI
- No data on electricity price change
- ⚡ Electricity price change
- € PPI change

PPI stands for "producer prices in industry". It measures the average price level of goods and related services resulting from all industrial activities except construction, sewerage, waste management and remediation.

⚡ -11% € 2%

⚡ +1% € 10%

⚡ -28% € 2%

⚡ +6% € 4%

⚡ -17% € 2%

⚡ +26% € 13%

⚡ +34% € 20%

⚡ +16% € 5%

⚡ -4% € 7%

⚡ -3% € 8%

⚡ +45% € 11%

⚡ -27% € 8%

Cyprus

⚡ -6% € 14%

⚡ +38% € 6%

⚡ -22% € 5%

⚡ -11% € -6%

⚡ -7% € 5%

⚡ -22% € 20%

⚡ -6% € 28%

⚡ +52% € 4%

⚡ -11% € 8%

⚡ -1% € 12%

⚡ +4% € 18%

⚡ +11% € 4%

⚡ +26% € no data

⚡ +9% € 12%

⚡ +10% € 11%

⚡ +2% € -5%

Malta

0   500   1,000 Kilometers

Energy
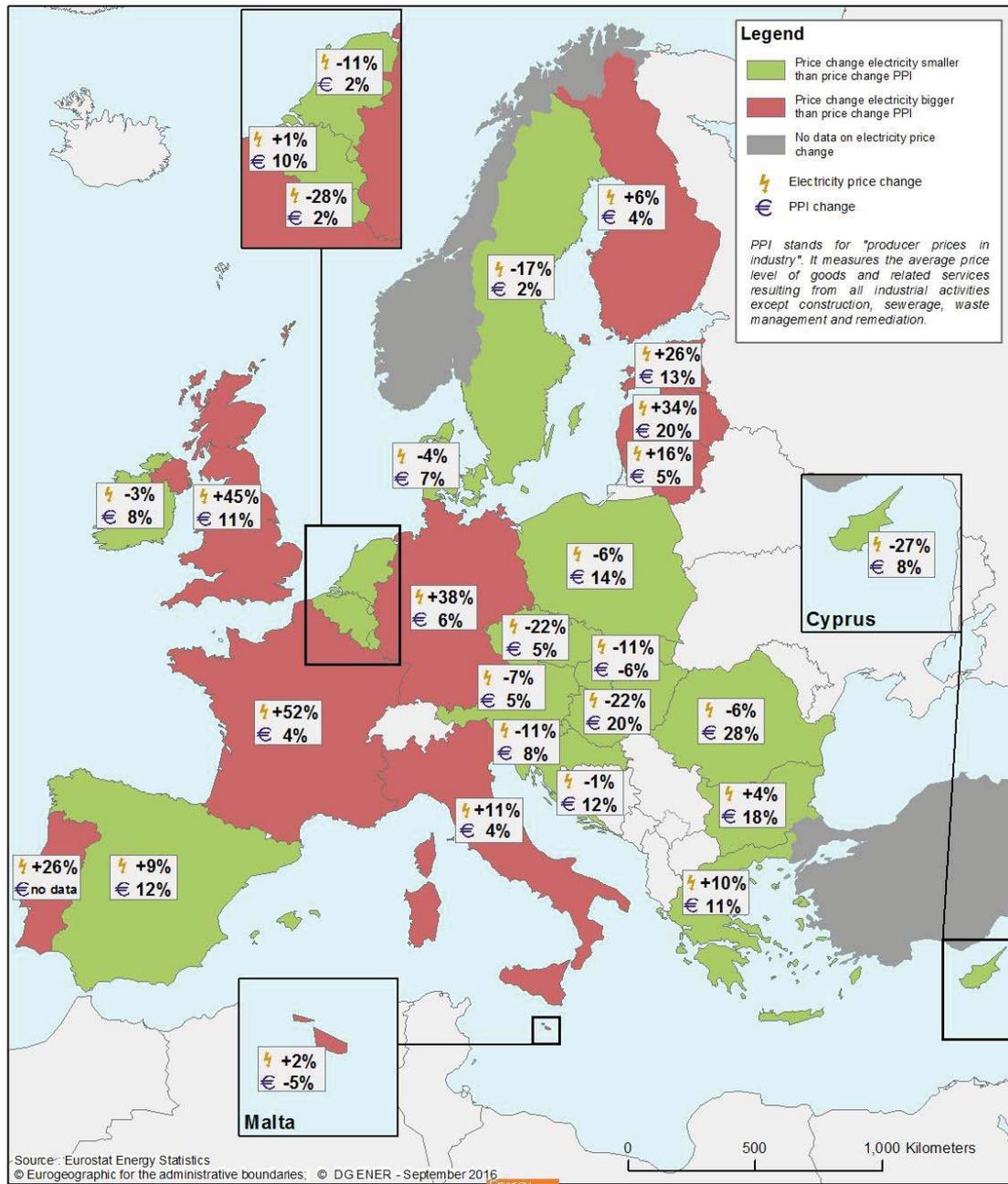
1.2.2.1 Price evolution – Total prices

The average[26] industrial[27] price was 107 €/MWh in 2015, having experienced an annual increase of 2.3% from 91 €/MWh in 2008[28]. The average annual inflation rate accounted for 0.5% during the same period.[29] While the average price steadily increased from 2008 to 2014, it marginally decreased from 2014 to 2015.

Figure 32 **- Evolution of the weighted average EU electricity price for industrial consumers (ID)**
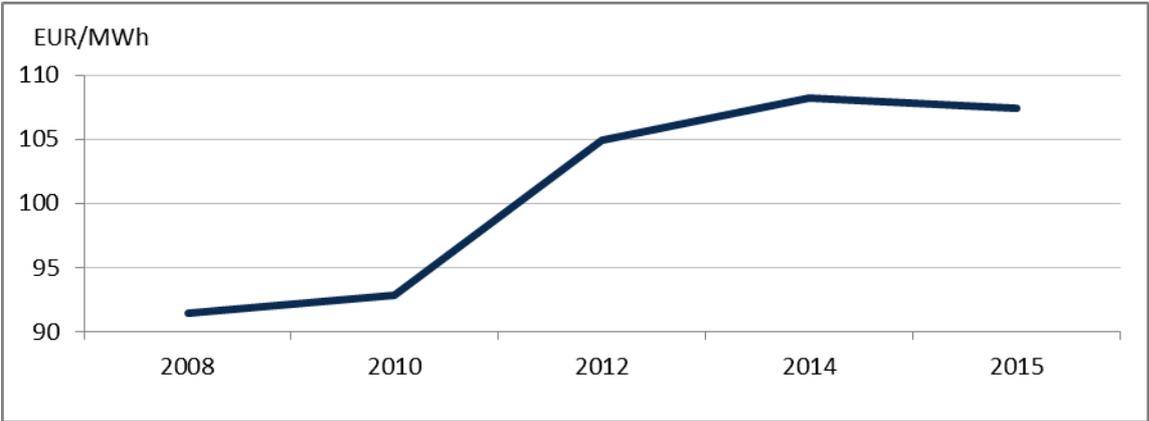
Source: European Commission, Member States

In 2015 the highest recorded price was 2.7 fold of the smallest, as prices ranged from 54 €/MWh in Sweden to 148 €/MWh in Italy. The highest and lowest prices in 2008 were recorded in Cyprus and France respectively.

Median industrial electricity prices have marginally decreased on average across the EU from 2014 to 2015. This might negatively impact energy efficiency investment in more efficient industrial processes.

Figure 33 – **Total prices for industrial consumers (ID) by country in 2015**
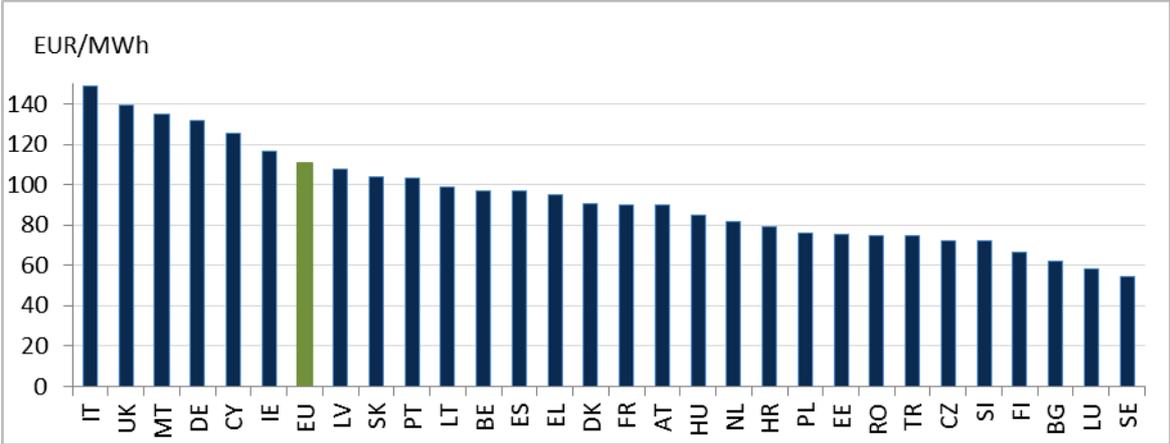
Source: European Commission, Member States

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[26] All average prices refer to weighted EU 28 average prices
[27] Refers to Eurostat consumption band ID covering annual consumption of 2000 to 20000 MWh.
[28] Compound Annual Growth Rate
[29] Producer Price Index, Eurostat sts_inpp_a

Industrial electricity prices are less dispersed across Europe than their industrial counterparts. This is largely due to the fact that household electricity prices are more impacted by highly divergent national policy and fiscal driven additions.

Figure 34 - **Nominal price changes & prices relative to EU av. price for industry (ID)**
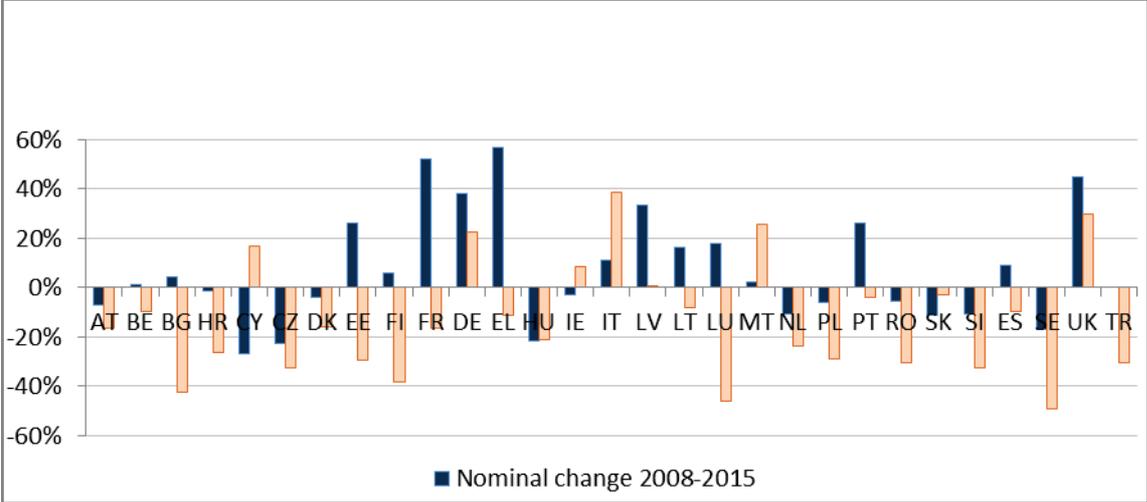
Source: European Commission, Member States

Figure 35 - **Industrial (ID) price levels by reporting period and country**

Source: European Commission, Member States

47
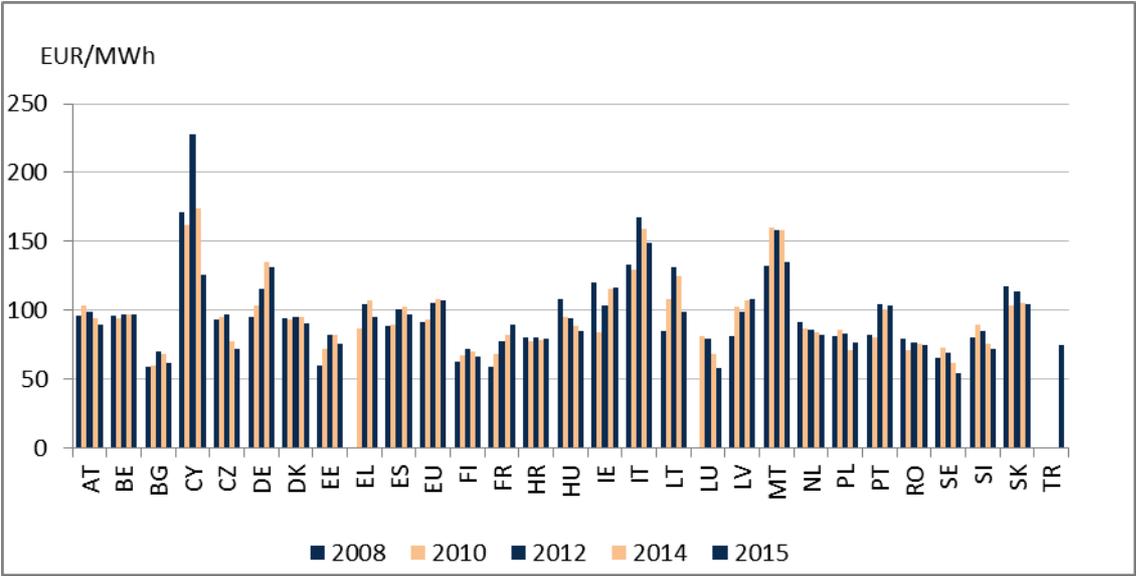
1.2.2.2   Price drivers – Main components

For a detailed description, please consult the section on the **three main components**.

Figure 36 **- Evolution of industrial (ID) EU weighted average components**
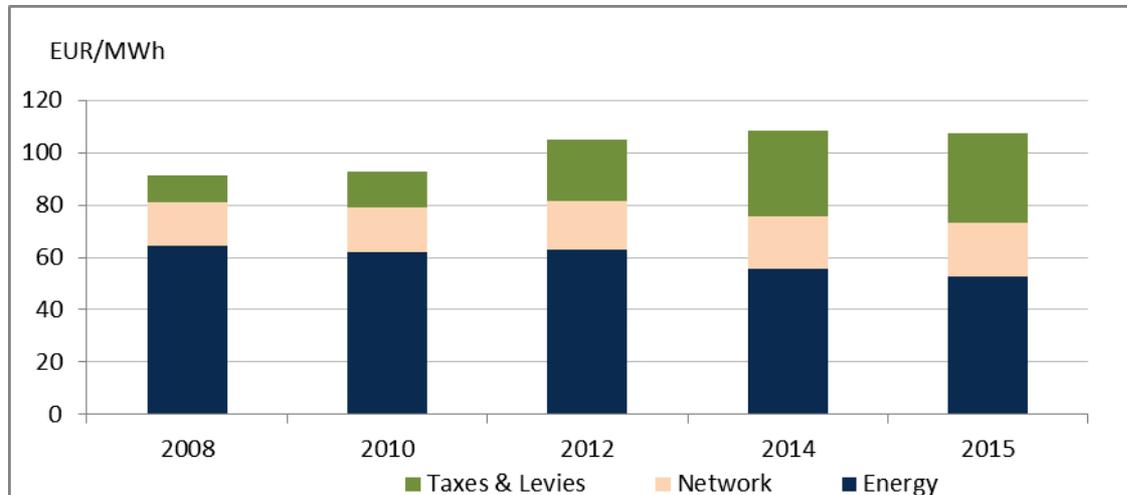
Source: European Commission, Member States

The average energy component decreased at the annual rate of 2.8% and accounted for 52.8 €/MWh in 2015. It decreased in 21 of 28 EU member States from 2014 to 2015. By 2015 the energy component remained the largest of the three components in all but 2 reporting countries (DE, SK).

In 7 EU Member States (HR,FR,IE,LV,PL,PT,UK) the nominal level of energy costs increased from 2008 to 2015. In these countries the fall in wholesale prices has not translated into a reduction in the energy component of retail prices despite the fact that this is the part of the energy bill where energy suppliers should be able to compete. Such results may imply that price competition in a number of retail markets is weak, allowing suppliers to avoid passing on recent wholesale price reductions to retail prices.

The average network component increased at the annual rate of 3.2% and cost the average industrial consumer 20.5 €/MWh in 2015. From 2014 to 2015 the network component increased in 16 out of 28 EU Member States. The network component was the largest of the three components only in Slovakia in 2015.

The taxes & levies component grew at the annual rate of 18%. Despite the significant increase, due to the component's initial low level it accounted for a fifth of the total price in 2015. Taxes and levies continuously increased from 2008 to 2014. From 2014 to 2015 the taxes & levies component decreased in 8 Member States. Due to decreases in these bigger Member States, the weighted EU average also shows a decrease. The taxes & levies component was the largest of the three components for median industrial consumers only in Germany in 2015. It is to be noted that VAT is recoverable for industrial consumers, therefore the current study analyses prices without VAT and other recoverable taxes.

Within the taxes and levies component, two sets of cost elements can be distinguished. Levies finance energy, environmental, climate change related and social policies, while taxes contribute to financing general public expenditure as outlined in the state budget. Taxes, such as excise duty, environmental or greenhouse gas emission taxes do not necessarily finance energy related policies. It is important to note that the current study analyses only the direct impact of policies and fiscal measures on retail prices. Some reporting countries supplement the financing of policies from the state budget. This means that additionally to the explicit

levy, which represents a cost element in the retail price in the structure of the current study, policies are also supported by other public resources.

Due to the recoverability of VAT, the taxes and levies component for industrial consumers consists mostly (91%) of designated levies rather than not- earmarked taxes as seen in the case of households. The average sum of cost related to policies such as renewable energy support, energy efficiency and vulnerable consumers equalled to 30.8 €/MWh. Not-earmarked taxes cost the average industrial consumer 3.1 €/MWh.

Figure 37 **- EU weighted average cost of taxes and levies in 2015 for industrial consumers (ID)**
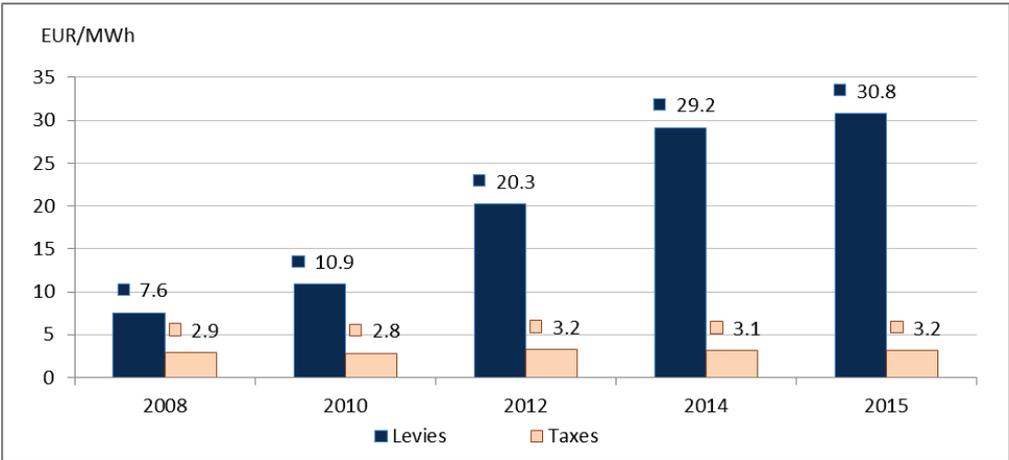
Source: European Commission, Member States

For further information on energy taxation, please consult page 36. Energy taxation

Figure 38 **- Share of components in the EU average price for industrial consumers (ID)** [30]
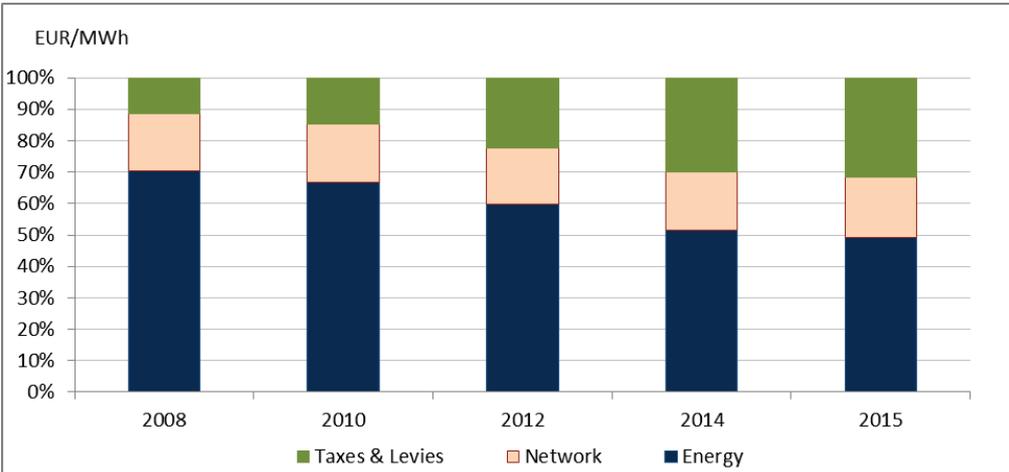
Source: European Commission, Member States

The relative share of the energy component in the total price gradually diminished, as it decreased by 22 percentage points from 71% to 49%. The share of the Network component in

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[30] EU 28 weighted average

the total price remained constant at around 19%. The share of the Taxes& Levies component in the total price increased by 22 percentage points from 11% to 32%.

Figure 39 - **Total prices by component and country in 2015 for industrial consumers (ID)**
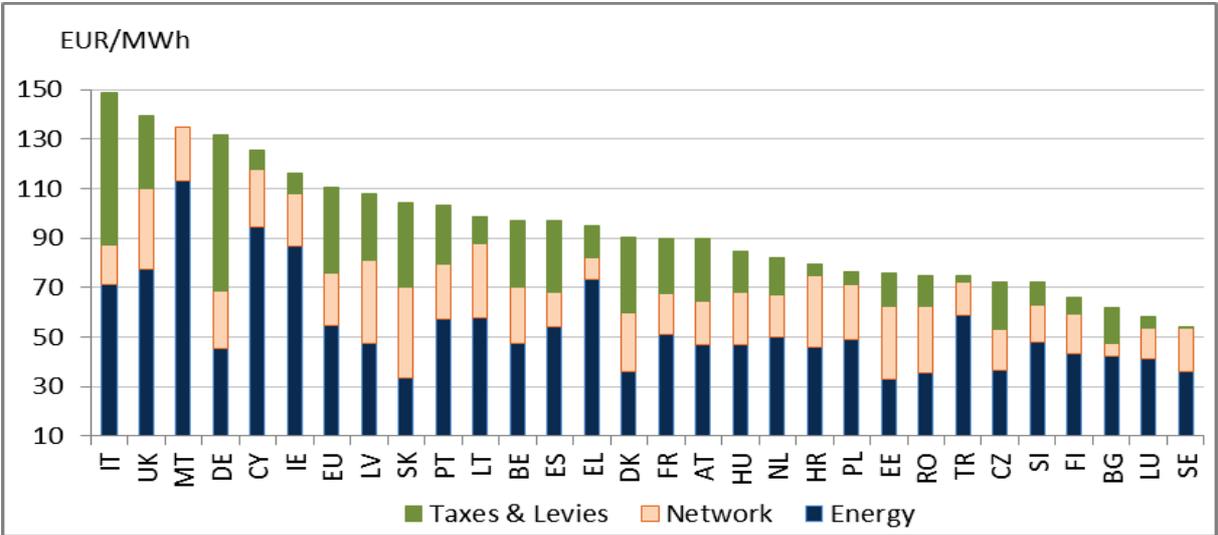
Source: European Commission, Member States

Figure 40 – **Shares of price components in the total price by country in 2015 for industry (ID)**
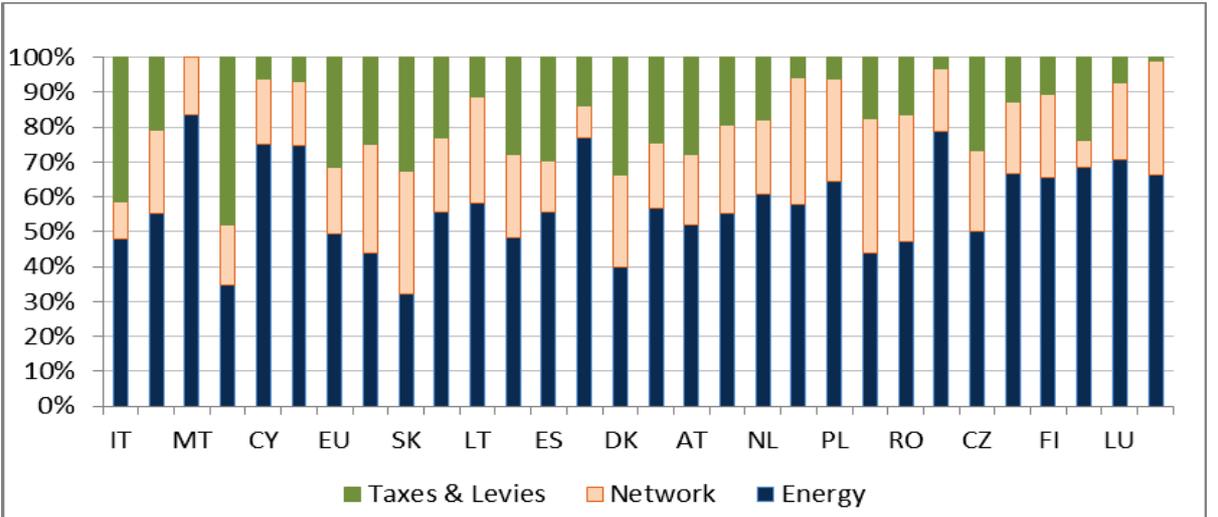
Source: European Commission, Member States

Developments within components

The current, second edition of the Energy Prices and Costs study introduces sub- components within the Network and Taxes & Levies components. These sub- components facilitate the more focussed analysis of developments within the two components.

Energy component

EU ETS costs are included in the energy component for all consumption bands. A 2014 study by DG ECFIN found that EU ETS costs had no significant impact on electricity prices. As the price of ETS allowances only moderately increased since, it can be stated that ETS costs further remain insignificant in terms of price increases.

Only one of the three price components, the energy component is determined by the market. Increasing competition contributes to decreasing energy components. The share of the energy component decreased by 21 percentage points and accounted for 49% of the average median industrial price in 2015. The level of the network and taxes & levies components are set by divergent national laws and regulations. Their joint share in the average median household price increased from 30% to 51%. As the part of the price which is set by market forces has been gradually decreasing, total prices are imperfect indicators for the measurement of price dispersion. The dispersion of the energy component however adequately reflects to progress towards an internal energy market. The energy component of the average median industrial price became 12% less dispersed since 2008.

Network component

The Network component is broken down into two sub- components, namely Transmission and Distribution. Both transmission and distribution tariffs are regulated in all EU Member States as well as in Norway and Turkey. The allocation of cost elements (for example costs of infrastructure, losses, ancillary services and re-dispatching) to the two sub- components might differ from country to country. Therefore, cross- country comparisons are to be considered with caution. Household consumers are typically supplied with electricity by being connected to the distribution grid, therefore have to pay both transmission and distribution fees. 18 out of 30 reporting countries submitted the split between transmission and distribution costs.

Figure 41 – **Shares of transmission and distribution costs in 2015 for industry (ID)[31]**
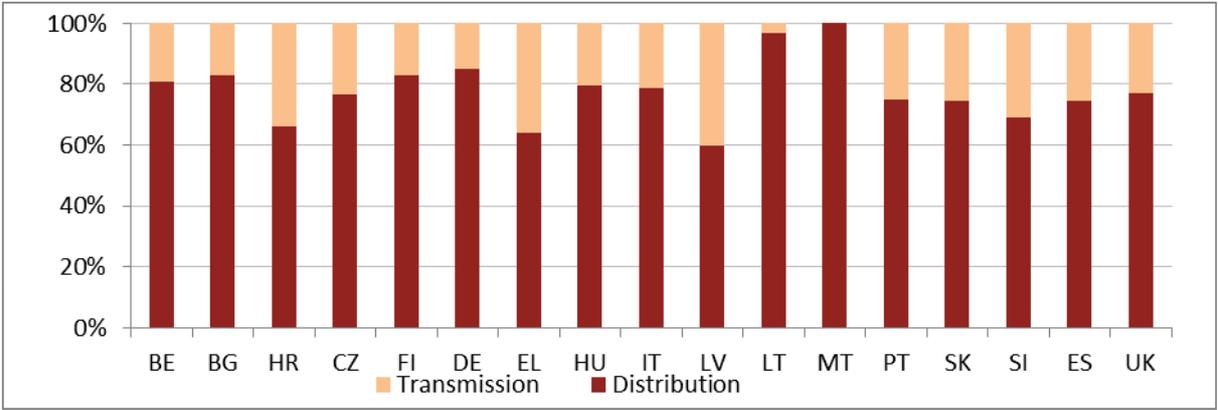
Source: European Commission, Member States

The share of distribution costs ranged from 17% in Bulgaria to 97% in Lithuania, highlighting the lack of harmonized definitions of distribution and transmission tariffs. Another reason for this heterogeneity among Member States might be the fact that in certain countries industrial users are connected only to transmission grid, while in others industrial consumers are connected both to the distribution and transmission grid. It is to be noted that there is no transmission system operator on Malta, therefore all costs are accounted for as distribution costs.

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[31] The graph displays 2014 shares for Estonia and the United Kingdom.

Taxes & Levies component

It is to be noted, that only explicitly reported cost elements could be allocated to specific policies and consequently taken into account for the analysis. For example, RES or nuclear decommissioning costs exist in several countries which could not report such costs explicitly.

For a detailed description, please consult the section on Taxes & Levies sub- components.

Figure 42 **- Sub-components in Taxes and Levies in 2015 for industry (ID)**
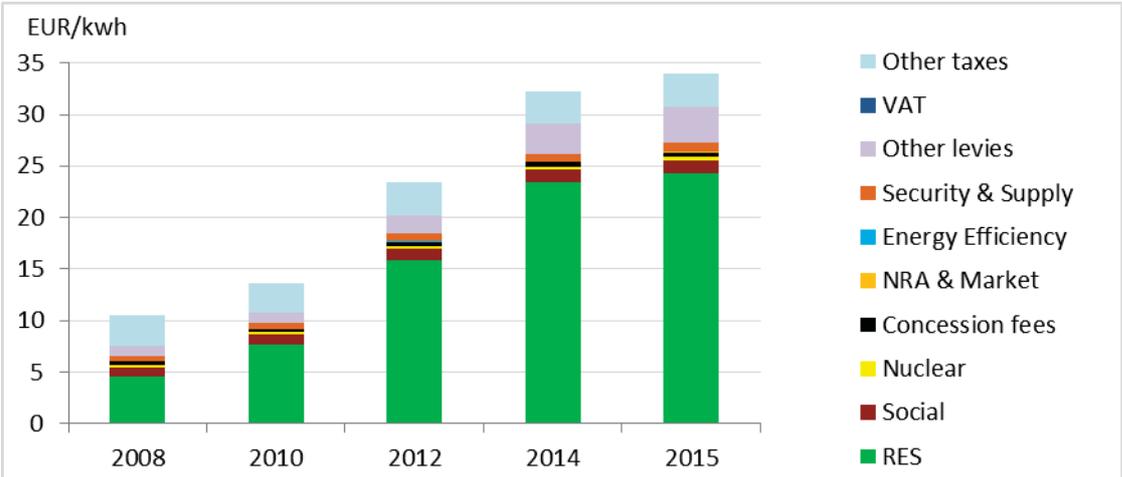
Source: European Commission, Member States

Figure 43 – **Share of sub-components in Taxes and levies in 2015 for industry (ID)**
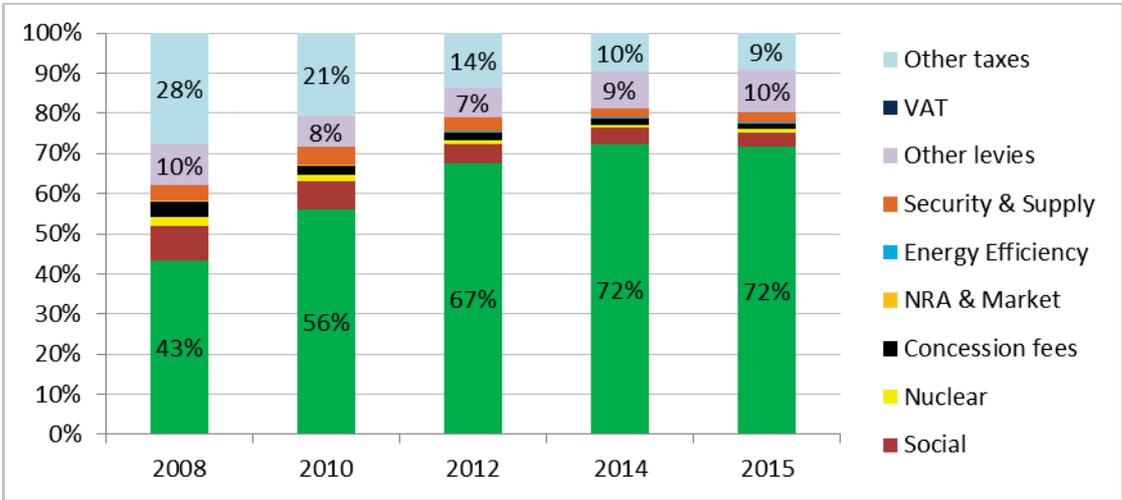
Source: European Commission, Member States

The largest energy policy relevant sub- component in 2015 was RES & CHP accounting for 72% of the total Taxes & Levies component, followed by social cost elements (4%) and security of supply (3%). The EU weighted average share of energy efficiency, nuclear sector, concession fees and market operation related costs were each below 1%. Excise duty, environmental, greenhouse gas and distribution taxes made up 9% of the taxes and levies component.

1.2.2.3 Price drivers – Sub- components

Value Added Tax

VAT is reimbursable for industrial consumers in all reporting countries, therefore it is not further analysed.

RES & CHP

Explicit RES & CHP support costs were reported by 22 countries in 2015 for industrial consumers. 6 EU countries did not report explicit RES or CHP cost elements. They are: Finland, Malta, Netherlands Poland, Sweden and the United Kingdom. Norway and Turkey also did not report explicit RES or CHP support costs. It is important to note that consumers in these countries are paying RES support costs despite the fact that such are not explicitly levied on electricity bills. The Netherlands introduced a Sustainable Energy Levy in 2013 as part of the SDE+ mechanism. This levy could not be calculated separately for the course of the current study. In the United Kingdom RES support costs are part of the Climate Change Levy which could not be further disaggregated in the course of the current study.

Figure 44 **- Evolution of (weighted EU av.) RES & CHP support cost for industry (ID)**
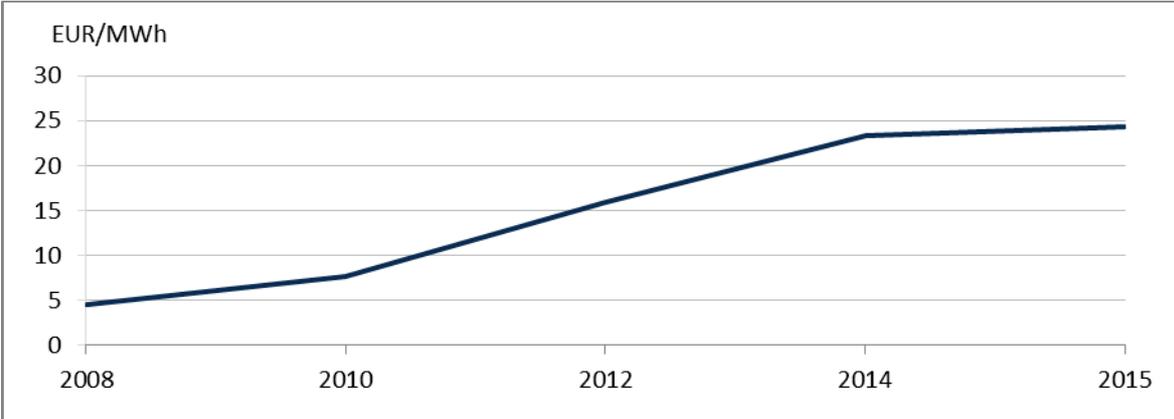
Source: European Commission, Member States

While the annual growth rate of RES & CHP costs was 27% over the whole period, from 2014 to 2015 the increase slowed down to 4%.

Figure 45 – **Share of RES& CHP support costs in the EU price over time for industry (ID)**
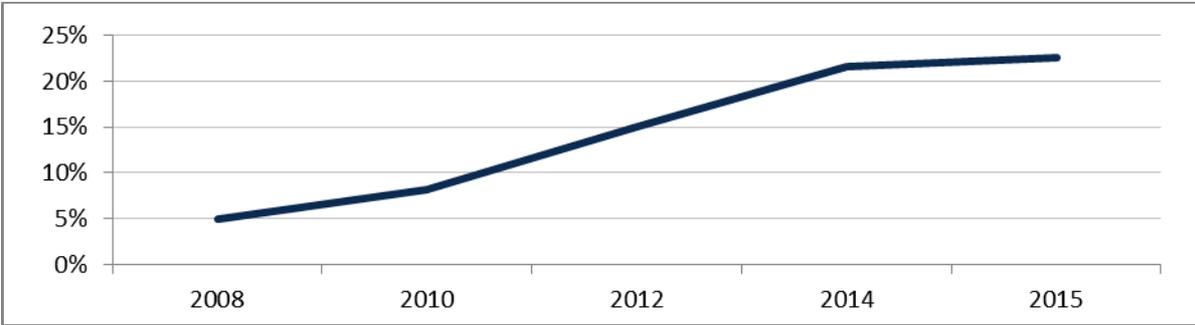
Source: European Commission, Member States

Figure 46 **- Nominal RES & CHP support cost in 2015 by country for industry (ID)**
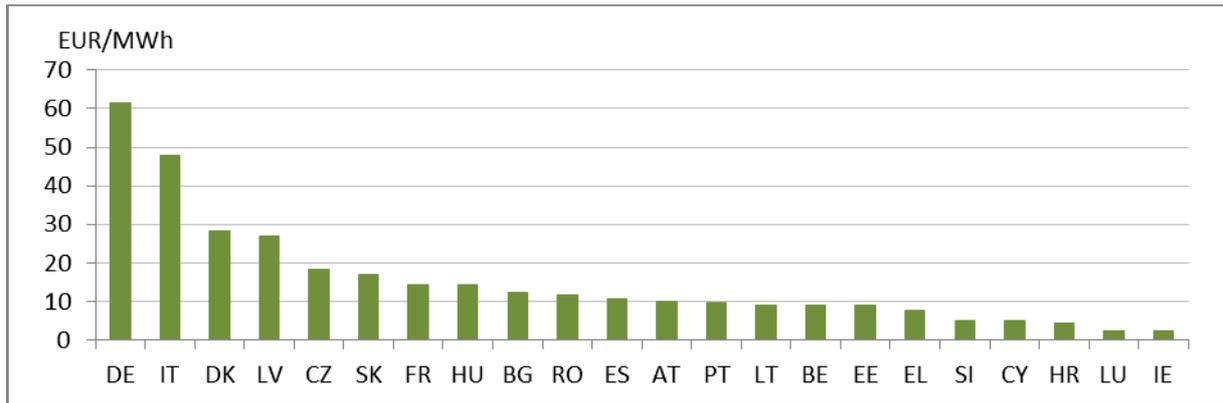
In 2015 Germany recorded the highest rate of RES & CHP support accounting for 61 €/MWh. The smallest amount of the same cost, 2.3 €/MWh was reported by Ireland.

Figure 47 -– **Share of RES & CHP support costs in national prices for industry (ID) in 2015**
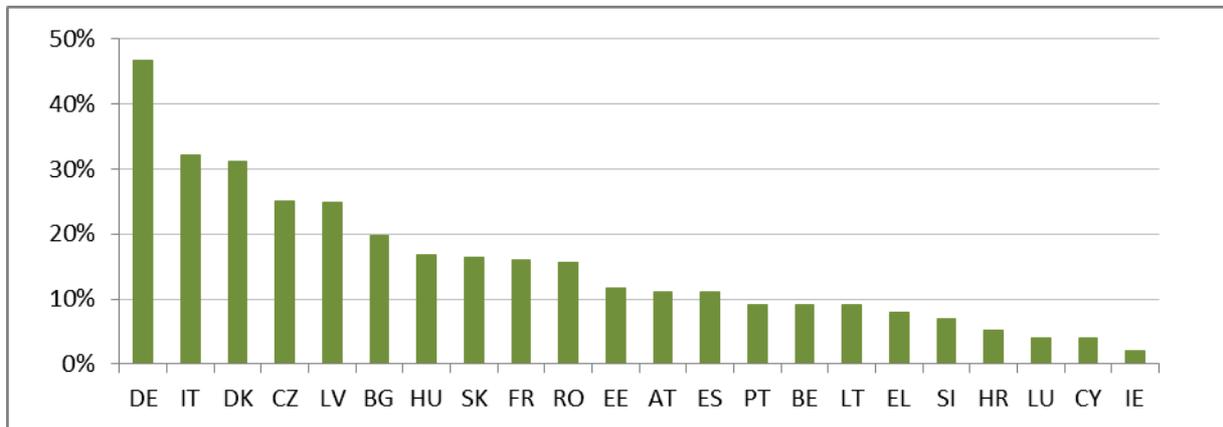
Germany recorded the highest share of RES & CHP costs accounting for 47% in the total price. The smallest share of 2% was reported by Ireland.

1.2.2.3.1 Other not earmarked taxes

The sub- component includes any manifestation of excise duty, environmental- , greenhouse gas emission-, transmission- and distribution taxes. Minimum taxes on energy are harmonised on the EU level and are defined in the Council Directive 2003/96/EC[32]. As a general rule those taxes are not earmarked to energy, environment or climate related policies.

Such taxes accounted for 3% of the weighted EU average price and 9% of the weighted EU average taxes & levies component. 24 reporting countries (23 EU member States and Turkey) imposed not- earmarked taxes other than VAT averaging at 3.1 €/MWh in 2015.

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[32] Council Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity

Figure 48 – **Cost of not-earmarked taxes (excl. VAT) for industry (ID) in 2015**
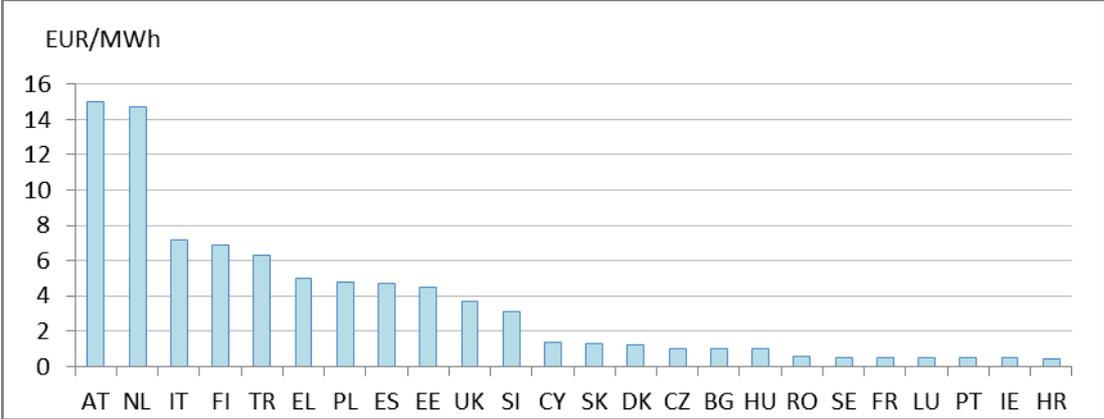
Source: European Commission, Member States

In 2015 Austria reported the highest nominal value of not- earmarked taxes (entirely consisting of excise duty), accounting for 15 €/MWh .

Figure 49 **- Share of not-earmarked taxes (excl. VAT) in national prices for industry (ID) in 2015**
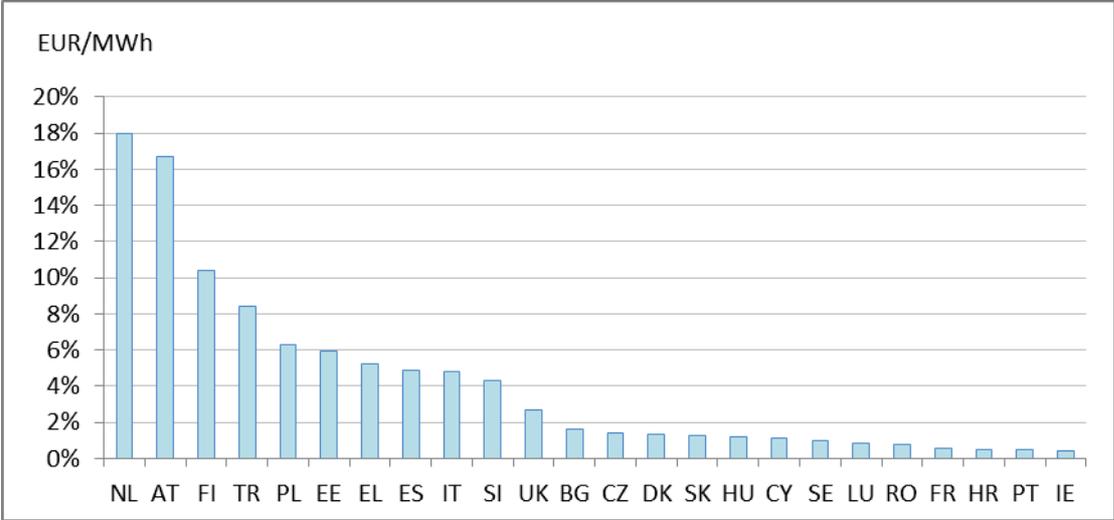
Source: European Commission, Member States

Not- earmarked taxes, other than VAT accounted for 39% of the total price in Denmark. In 7 Member States such taxes accounted for 1% or less of the total price.

Social charges

Social charges[33] include any support to vulnerable consumers, island system tariff equalization, sectorial employment policies and social funds. Such charges were the second most important energy policy relevant charges across the EU in terms of nominal cost. The

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[33] In Greece such charges include supply of electricity to consumers on non-interconnected islands for the same prices as for customers on the interconnected system; supply of electricity to customers eligible for the discounted Social Residential Tariff by decisions of the Minister of Environment and Energy (such as persons of low income, families with three or more children, long-term unemployed people, people with special needs as well as people on life support), supply of electricity to multi-member families at special tariffs; supply of electricity to non-profit social welfare organizations and institutions at special tariffs and costs of last resort and the universal service provider

impact of the weighted average social charge on the weighted average EU price was negligible (1.3%) and was limited on the weighted average taxes and levies component (4%). The share of social charges in the weighted average EU taxes and levies component has decreased by 5 percentage points from 9% to 4%.

10 EU Member States applied social charges during the whole reporting period however the Warm Homes Discount in the United Kingdom could not be separately reported in the course of the current study. In Bulgaria the reported cost element manifested in 2015 as a rebate and was therefore negative. In Portugal, while for households the cost element was a negative rebate, for industrial consumers it was positive in 2015. In Hungary a social levy related to restructuring employment in the coal industry is imposed on industrial prices while households are exempted.

Figure 50 **- Social charges by country in 2015 for industrial consumers (ID) in 2015**
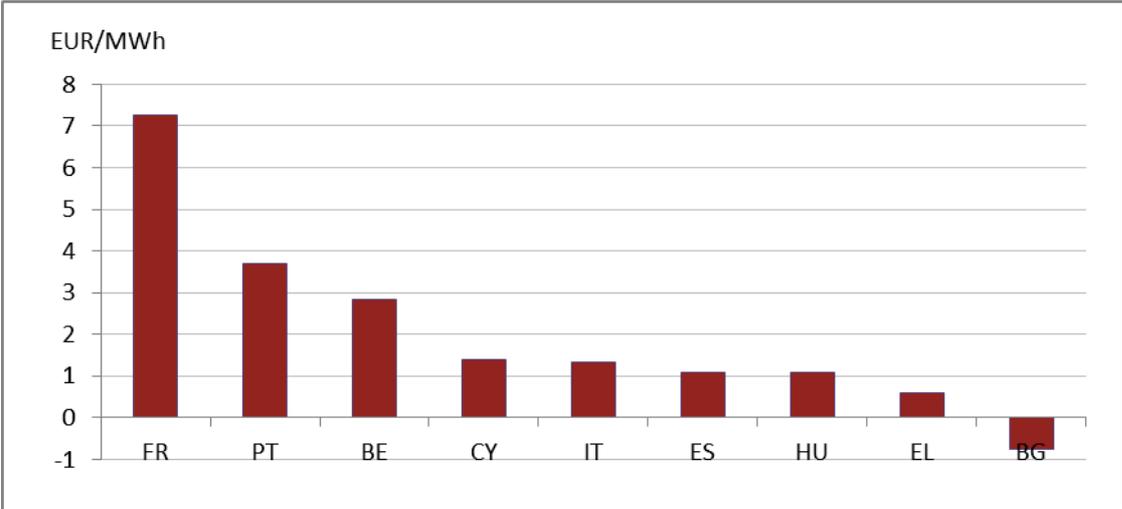
Source: European Commission, Member States

Figure 51 **- Share of social costs in national prices for industry (ID) in 2015**
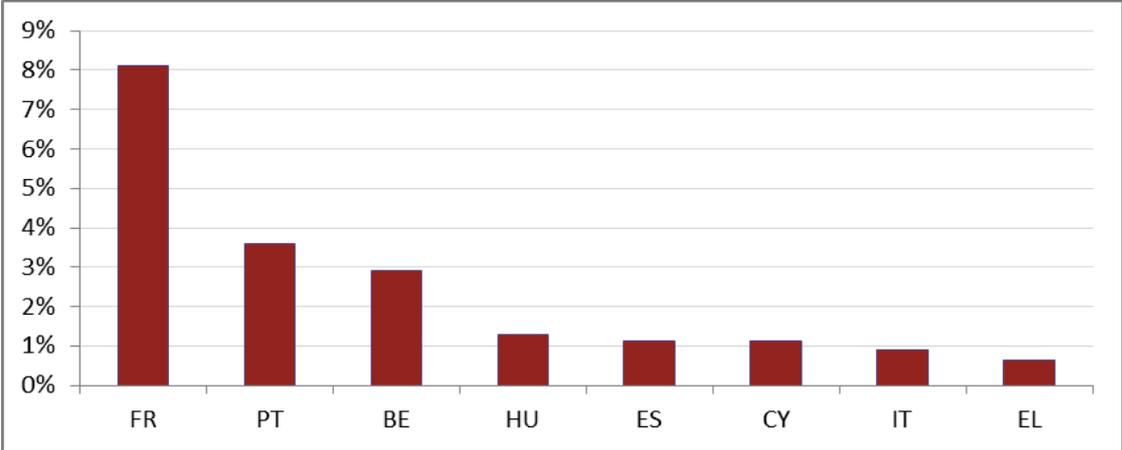
Source: European Commission, Member States

Security of Supply

Security of supply related levies were imposed by 12 Member States in 2015. It is to be noted that at the beginning of the observation period only 9 Member States imposed such levies.

The impact of the weighted EU average security of supply charge was below 1% both on the weighted EU average price and the weighted EU average taxes and levies component.

Figure 52 **- Security of supply charges for industry (ID) in 2015**
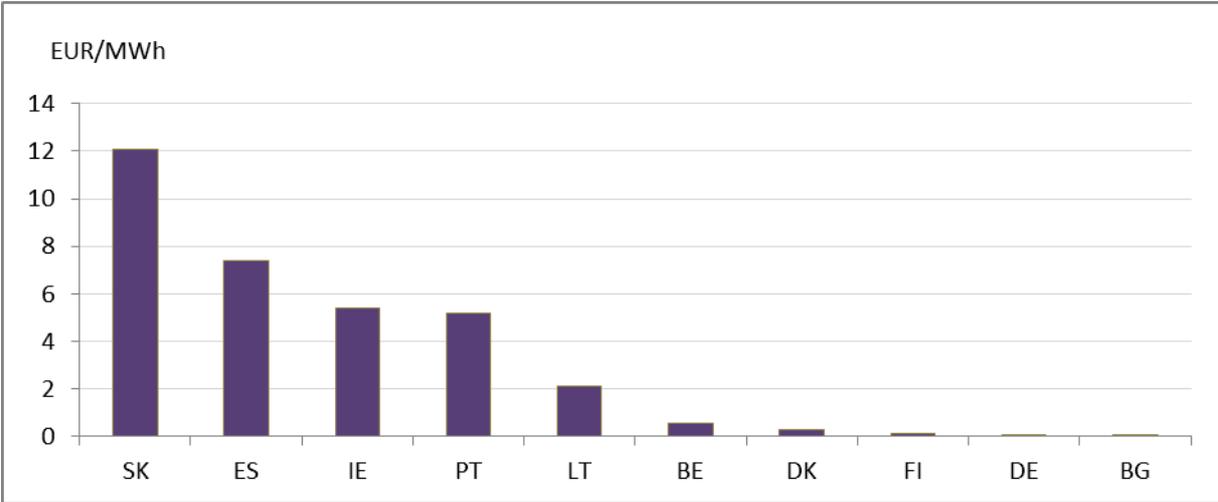
Source: European Commission, Member States

In 2015 Slovakia reported the highest nominal level of security of supply related charges accounting for 12 €/MWh. In Portugal the charge manifested as a rebate and was negative for households. For industrial consumers the cost element was positive.

Other energy policy relevant charges

The explicit impact of other energy policy relevant charges remained limited. Cost elements imposed to support energy efficiency, nuclear sector, concession fees and market operation, each accounted for 1% or less of the average EU price. Charges for the financing of the National Regulatory Agency or a market operator are levied in 6 Member States (BE, CZ, PT, SK, SI, ES). Nuclear sector related levies are imposed by four Member States (BE, IT, SK, ES). Energy efficiency measures are explicitly levied in 4 Member States (BE, IT, SI, UK) whereas in the United Kingdom ECO and CERT costs could not be separately reported in the course of the current study.

1.2.3 Small vs. Large Industrial Consumer Prices

The following chapter compares the evolution and composition of electricity prices paid by small and large industrial consumers. The annual consumption of small industrial consumers falls in the range of 20 MWh to 500 MWh. This consumption band is defined by Eurostat as IB. The consumption of large industrial consumers falls in the range 70 000 MWh to 150 000 MWh. This consumption band is defined by Eurostat as IF.

Prices for small industrial consumers were reported by 27 EU member States, Norway and Turkey. Lithuania reported an average industrial price across all bands, which was analysed as the medium industrial price (ID). Prices for large industrial consumers were reported by 26 EU Member States. In Luxembourg large industrial prices are confidential due to the small number consumers in the consumption band.

1.2.3.1 Price evolution – Total prices

The average small industrial price was 146 EUR/MWh in 2015 while large industrial consumers paid 84 EUR/MWh on average. The average price for small industrial consumers increased at the annual rate of 3.1% while the average price for large industrial consumers increased at a slower pace of 0.8%. The average annual inflation rate accounted for 0.5% during the same period.[34]

Figure 53 - **Evolution of weighted EU average prices for small and large industrial consumers**
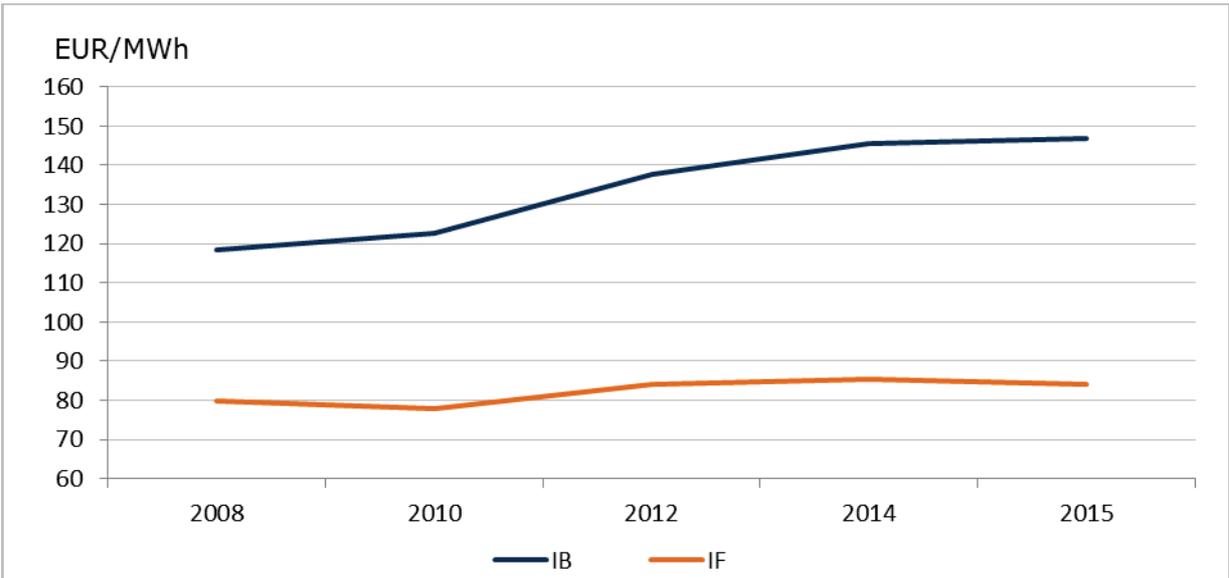
Source: European Commission, Member States

In 2015 prices for small industrial consumers ranged from 70 EUR/MWh in Norway and 72 EUR/MWh in Sweden to 188 EUR/MWh in Italy. Also Sweden recorded the lowest price of 41 EUR/MWh for large industrial consumers, while the highest price of 131 EUR/MWh was paid by large consumers in the United Kingdom. The highest large industrial price was more than three- fold of the smallest, while this ratio was 2.6 for small industrial prices. The variation coefficient for large industrial prices equalled to 0.27. The same figure for small industrial consumers was 0.26, indicating slightly more concentrated prices across the EU.

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[34] Producer Price Index, Eurostat sts_inpp_a

Figure 54 **- Small and large industrial prices by country in 2015**
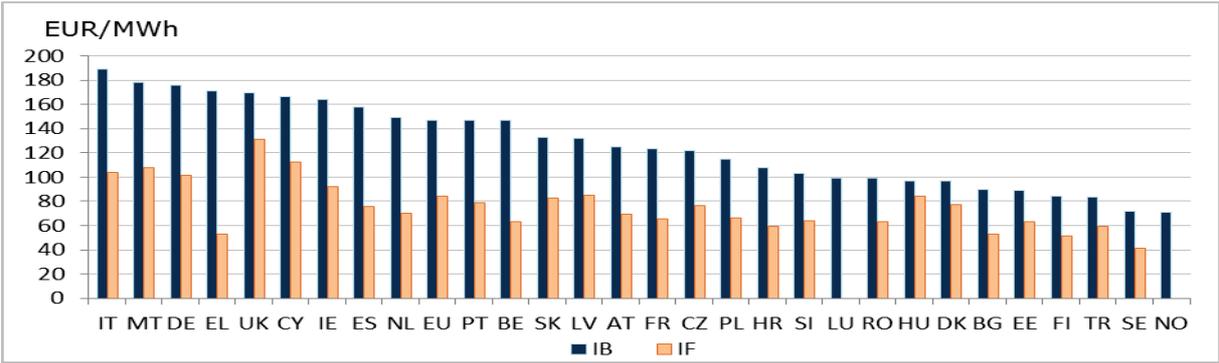
Source: European Commission, Member States

Figure 55 - Price changes & prices relative to EU av. in 2015 for small industrial consumers (IB)
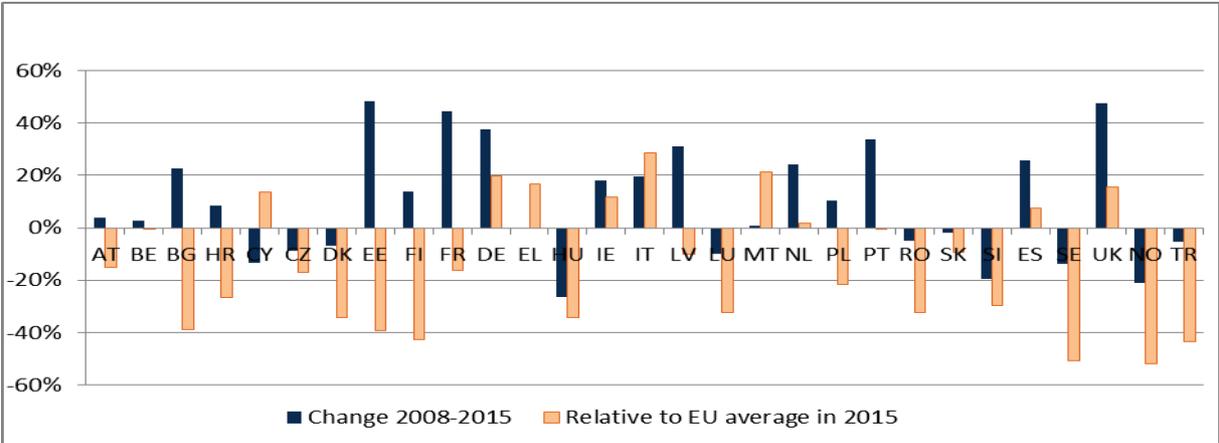
Source: European Commission, Member States

The evolution of small industrial prices in nominal terms is highly divergent across the EU, ranging from 48% increase in Estonia to 26% decrease in Hungary. Nominal prices for small industrial consumers decreased from 2008 to 2015 in 11 reporting countries.

Figure 56 - **Price changes & prices relative to EU av. in 2015 for large industrial consumers (IF)**
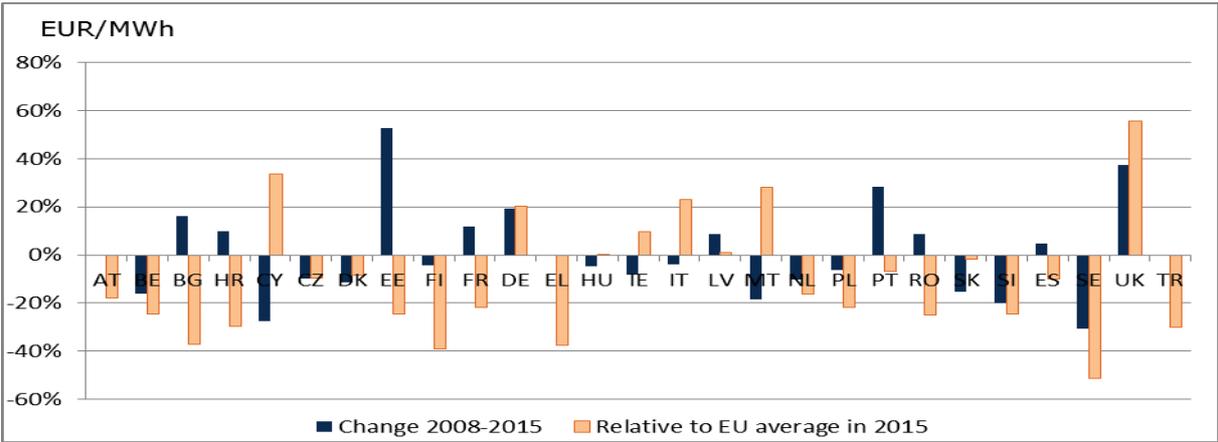
Source: European Commission, Member States

Nominal prices decreased in 14 reporting countries from 2008 to 2015 (whereas Austria, Greece and Turkey could not report prices for 2008). National prices in most Member States were below the EU average, which was impacted by higher prices in countries accounting for larger consumption volumes.

1.2.3.2 Price drivers – Main components

For a detailed description, please consult the section on the **three main components.**

Figure 57 - **EU weighted average components for small and large industrial consumers**
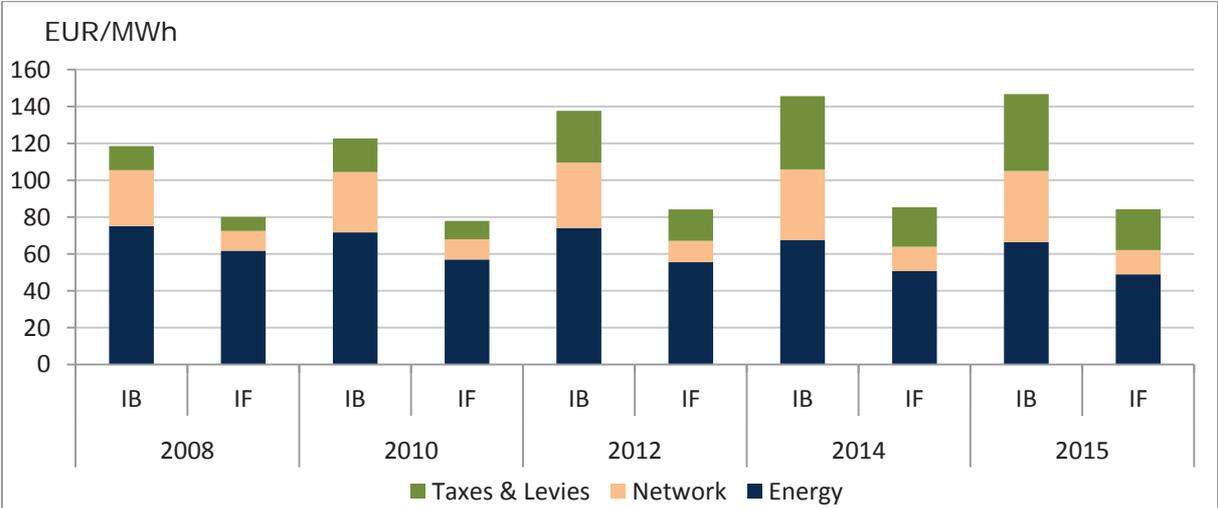
Source: European Commission, Member States

The EU average energy component decreased at the rate of -1.75% for small industrial consumers, while the energy component of large industrial prices experienced an even faster decrease of 3.2%. The energy component on average accounted for 66 EUR/MWH (small industrial) and 41 EUR/MWh (large industrial) in 2015. For small industrial consumers the energy component remained the largest of the three components in all but 4 reporting countries. In The Netherlands Taxes & Levies cost marginally more than the energy component, while in Estonia and the Czech Republic it was out weighted by network costs. In Slovakia both network costs and taxes and levies exceeded the energy component. For large industrial consumers the energy component remained the largest of the three components in

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all but two reporting countries. In Germany and Slovakia taxes and levies exceeded the energy component.

The decrease in energy costs can be linked to EU energy policies: increased competition resulting from market coupling, the unbundling of electricity generation from system operation, the fall in EU ETS carbon prices8 and the growth of power generation capacity with low operating costs (such as wind and solar power, in addition to existing nuclear and hydro power).

In a quarter of the reporting countries, the nominal level of energy costs increased from 2008 to 2015 for small industrial consumers. In these countries the fall in wholesale prices has not translated into a reduction in the energy component of retail prices despite the fact that this is the part of the energy bill where energy suppliers should be able to compete. Such results may imply that price competition in a number of retail markets is weak, allowing suppliers to avoid passing on wholesale price reductions to retail prices.

The average network component increased at the annual rate of 3% both for small and large industrial consumers. The network component on average accounted for 38 EUR/MWH (small industrial) and 13 EUR/MWh (large industrial) in 2015. The almost three- fold difference is due to the fact that large industrial consumers are often connected only to the transmission grid while small industrial consumers are connected both to the transmission and distribution grids and therefore have to pay network tariffs for both.

The taxes & levies component grew at the annual rate of 18% for small and at 16% for large industrial consumers, accounting for 41 and 22 EUR/MWh respectively. The average taxes and levies component for large industrial consumers was half of what small industrial consumers pay. This highlights the fact that large industrial consumers are often exempted or pay reduced tax rates and policy support costs. From 2014 to 2015 the increase of taxes and levies slowed down for both consumer types. Taxes and levies for small industrial consumers decreased in all but 5 reporting countries (DE, EL, IT, SE, TR) from 2014 to 2015. Taxes and levies for large industrial consumers decreased in 5 countries (BE, IT, PT, SE, TR).

In 2015 the average sum of costs related to energy policies equalled to 35 €/MWh and 20 €/MWh for small and large industrial consumers respectively. Taxes cost the average EU household considerably less, namely 6 €/MWh and 1.7 €/MWh .

Figure 58 - **Weighted av. of taxes and levies for small and large industrial consumers**
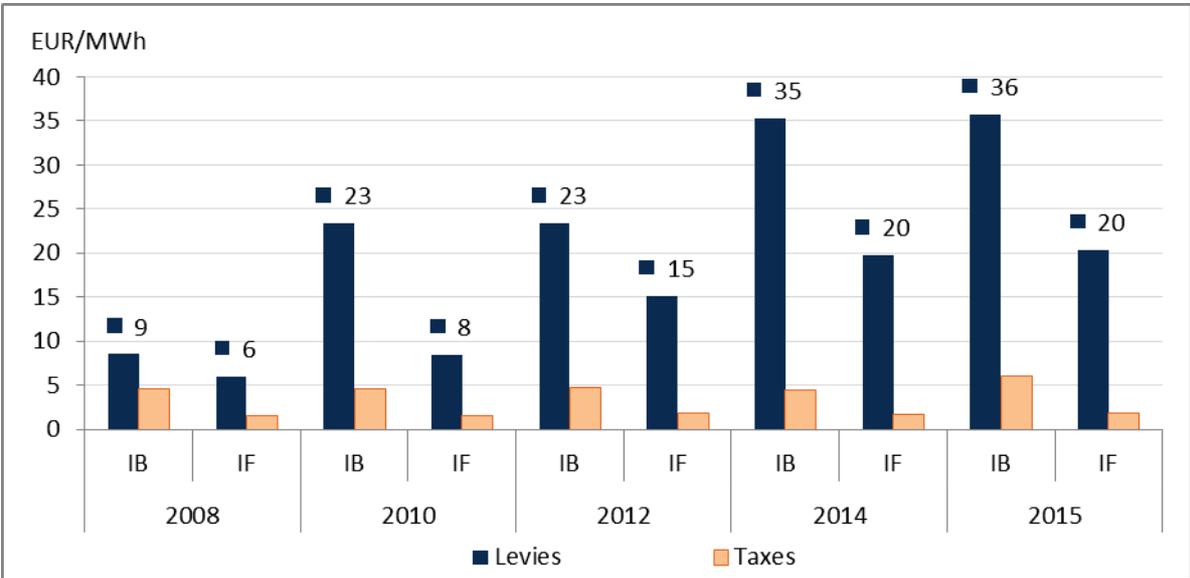
Figure 59 **- Share of (EU weighted av.) components for small and large industrial consumers**
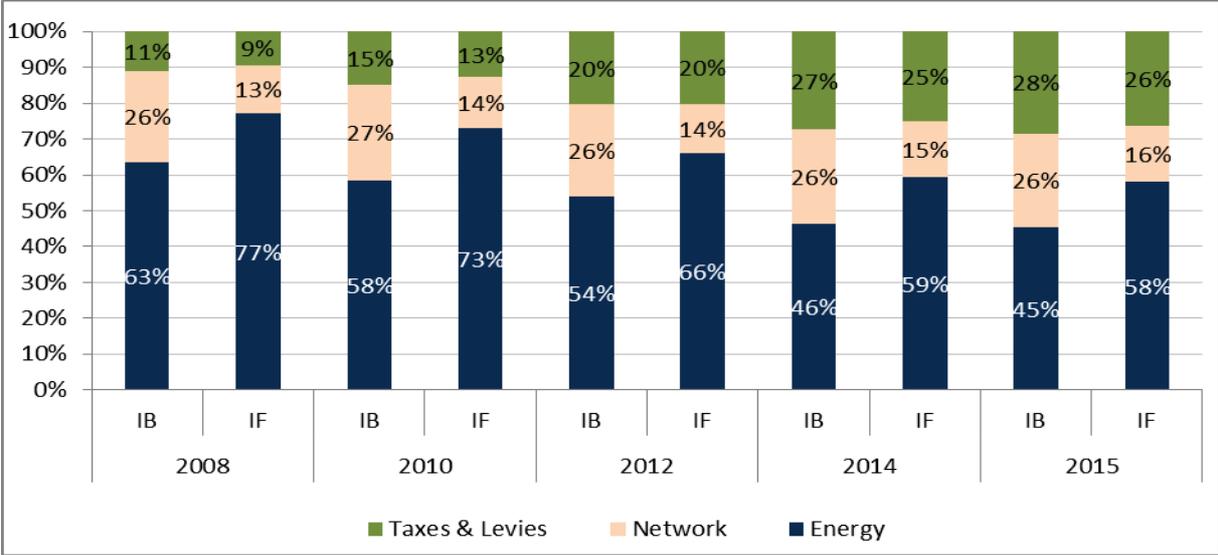
The relative share of the energy component in the total price gradually diminished. It decreased by 18 percentage points from 63% to 45% for small industrial consumers. The relative share of the energy component in the total price for large industrial consumers experienced a similar decrease of 19 percentage points.

The share of the network component in the total price remained constant at 26% for small industrial consumers and experienced only moderate increase for large industrial consumers, growing by 3 p.p.to account for 16% of the total price in 2015.

The share of taxes and levies in the total price increased by 15 p.p. for both consumer types and accounted for 28% and 26% for small and large industrial consumers respectively. Albeit the absolute level of the taxes and levies component is much higher for small industrial consumers, the relative share of the component is almost equal for the two consumer types.

Figure 60 **- Price components by country in 2015 for small and large industrial consumers**
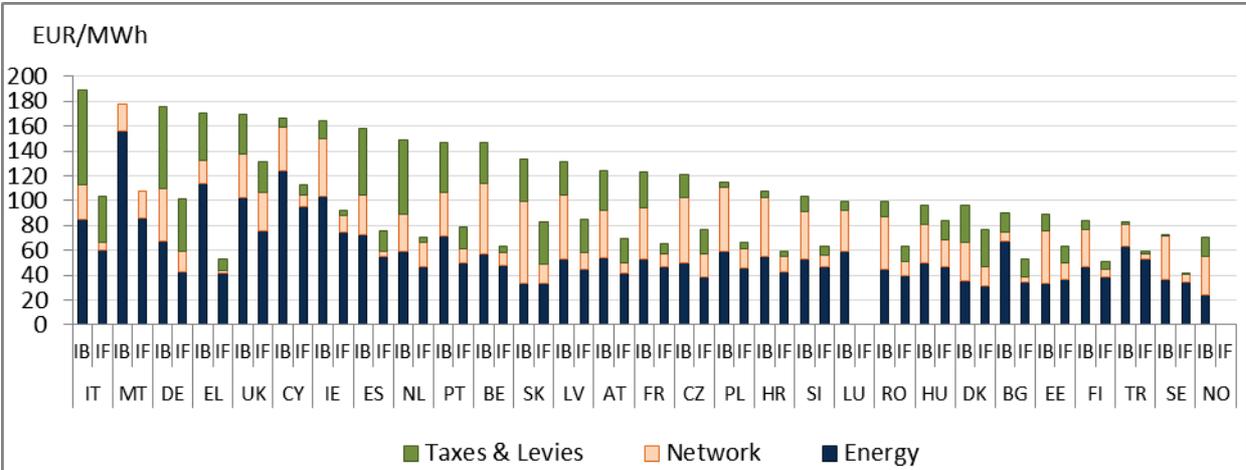
Figure 61 - **Share of price components by country in 2015 for small and large industrial consumers**
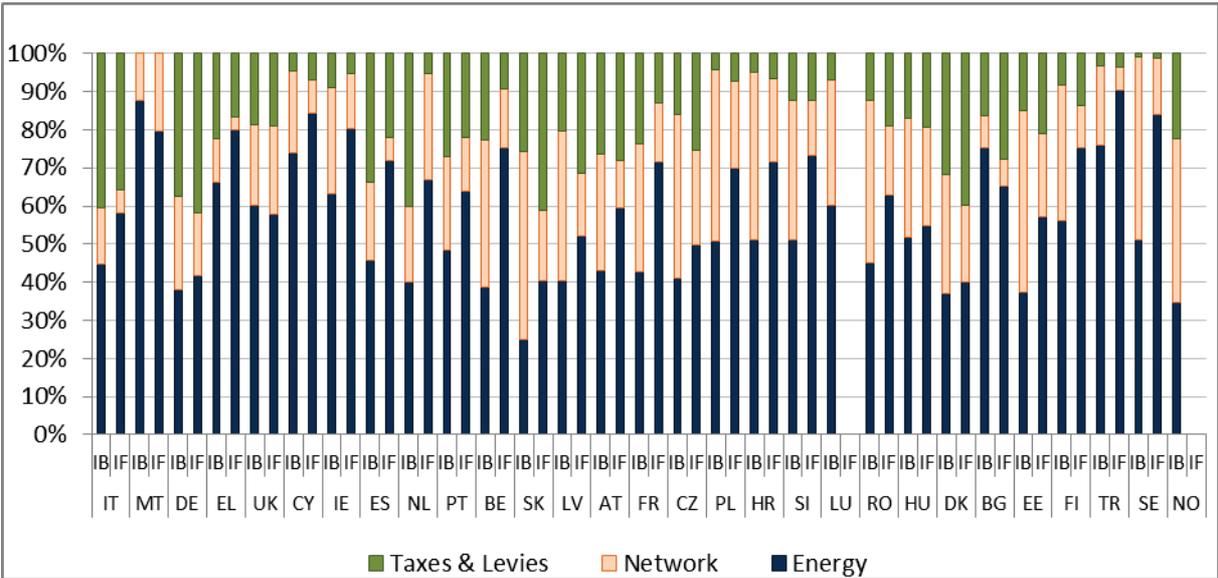
Source: European Commission, Member States

Developments within components

It is to be noted, that only explicitly reported cost elements could be allocated to specific policies and consequently taken into account for the analysis. For example, RES or nuclear decommissioning costs exist in several countries which could not report such costs explicitly.

For a detailed description, please consult the section on the three main components.

Energy component

EU ETS costs are included in the energy component for all consumption bands. A 2014 study by DG ECFIN found that EU ETS costs had no significant impact on electricity prices. As the price of ETS allowances only moderately increased since, it can be stated that ETS costs further remain insignificant in terms of price increases.

Only one of the three price components, the energy component is determined by the market. Increasing competition contributes to decreasing energy components. The share of the energy component decreased by 19 percentage points and accounted for 58% of the average large industrial price in 2015. The levels of the network and taxes & levies components are set by divergent national laws and regulations. Their joint share in the average large industrial price increased from 23% to 42%. As the part of the price which is set by market forces has been gradually decreasing, total prices are imperfect indicators for the measurement of price dispersion. The dispersion of the energy component however adequately reflects to progress towards an internal energy market. The energy component of the average large industrial price became 17% less dispersed since 2008.

Network component

The Network component is broken down into two sub- components, namely transmission and distribution. Both transmission and distribution tariffs are regulated in all EU Member States as well as in Norway and Turkey. The allocation of cost elements (for example costs of infrastructure, losses, ancillary services and re-dispatching) to the two sub- components might

differ from country to country. Therefore, cross- country comparisons are to be considered with caution. Household consumers are typically supplied with electricity by being connected to the distribution grid, therefore have to pay both transmission and distribution fees.

17 out of 30 reporting countries submitted the split between transmission and distribution costs for the consumption band IB and 17 countries for the consumption band IF.

Figure 62 – **Shares of transmission & distribution charges in 2015[35] -for small and large industry**
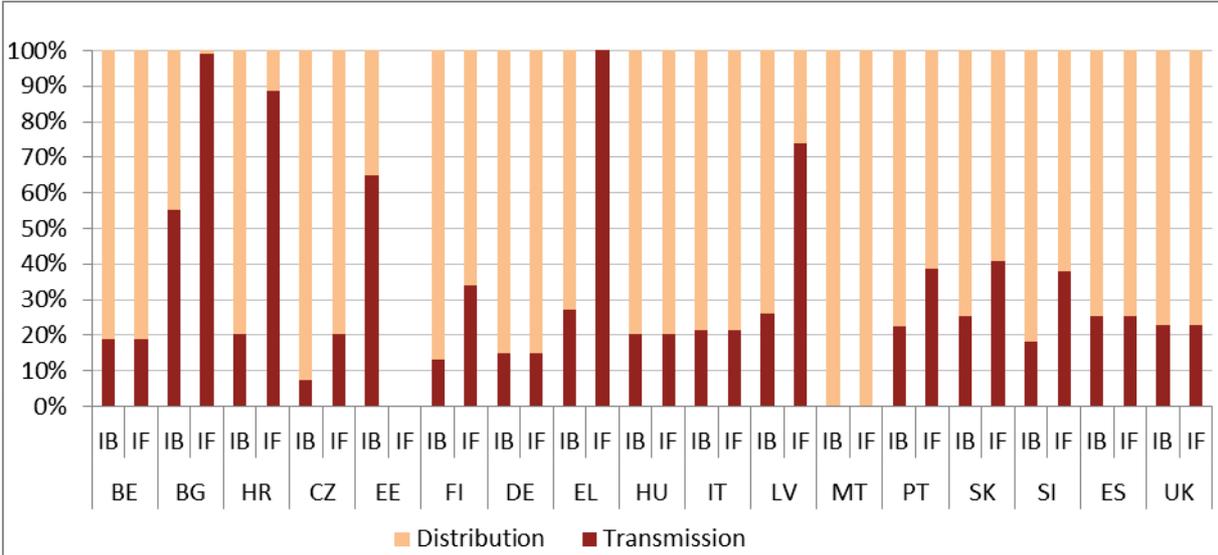
Source: European Commission, Member States

Data within the network component remains un- comparable due to different methods of calculations across Member States. It is however visible, that large industrial consumers are often connected only to the transmission grid. Therefore, the share of distribution costs is much lower for the band IF in several reporting countries.

Taxes and Levies component

For a detailed description, please consult the section on Taxes and levies sub- components.

1.2.3.3   Price drivers – Sub- components

It is to be noted, that only explicitly reported cost elements could be allocated to specific policies and consequently taken into account for the analysis.

RES support costs for small and large industrial consumers

Explicit RES & CHP support costs were reported by 22[36] countries for small industrial consumers and by 21 countries for large industrial consumers.[37]   It is visible from the below

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[35] There is no transmission system operator on Malta, therefore all costs are accounted for as distribution costs.

[36] 6 EU countries did not report explicit RES or CHP cost elements. They are: Finland, Malta, Netherlands Poland, Sweden and the United Kingdom. Norway and Turkey also did not report explicit RES or CHP support costs. It is important to note that consumers in these countries are paying RES support costs despite the fact that such costs are not explicitly levied on electricity bills. RES and CHP support costs are captured either in the energy component or are financed through general fiscal measures. The Netherlands introduced a Sustainable Energy Levy in 2013 as part of the SDE+ mechanism. This levy could not be calculated separately for the current study. In the United Kingdom RES support costs are part of the Climate Change Levy which could not be further disaggregated. As the Climate Change Levy could not be decomposed into designated RES, energy efficiency, social etc. elements, as it was de- composed in the case of households it was entirely assigned to the sub- component "Other taxes". For this reason, on the sub- component level, industrial and household data are not comparable for EU averages and for the United Kingdom. Comparison is feasible across different industrial bands.

figures that in no reporting country are large industrial consumers completely exempted from paying RES and CHP support costs.

The EU weighted average cost of RES support increased from 4.9 EUR/MWh in 2008 to 27.1 EUR/MWh in 2015 for small industrial consumers and from 3.6 EUR/MWh to 15.9 EUR/MWh in 2015 for large industrial consumers. Support costs for the two consumer groups were initially similar however over time they became more differentiated as supports costs grew annually by 28% for small and by 24% for large industrial consumers.

Figure 63 **- Evolution of average RES & CHP support costs**
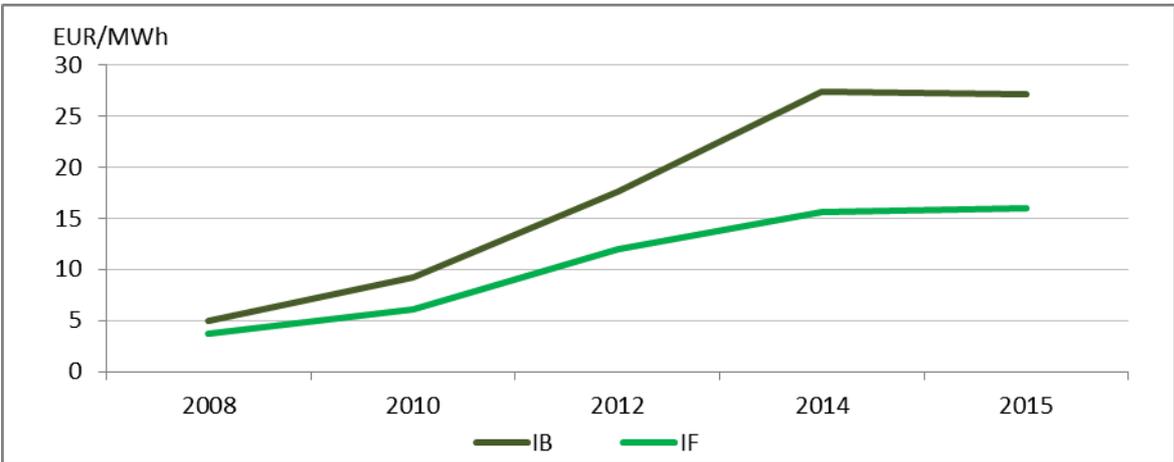
Source: European Commission, Member States

The share of average RES and CHP support costs in the total average price grew for both consumer groups by 15 percentage points from 4% to 19%.

Figure 64 **– Share of RES and CHP support costs in the average EU price over time**
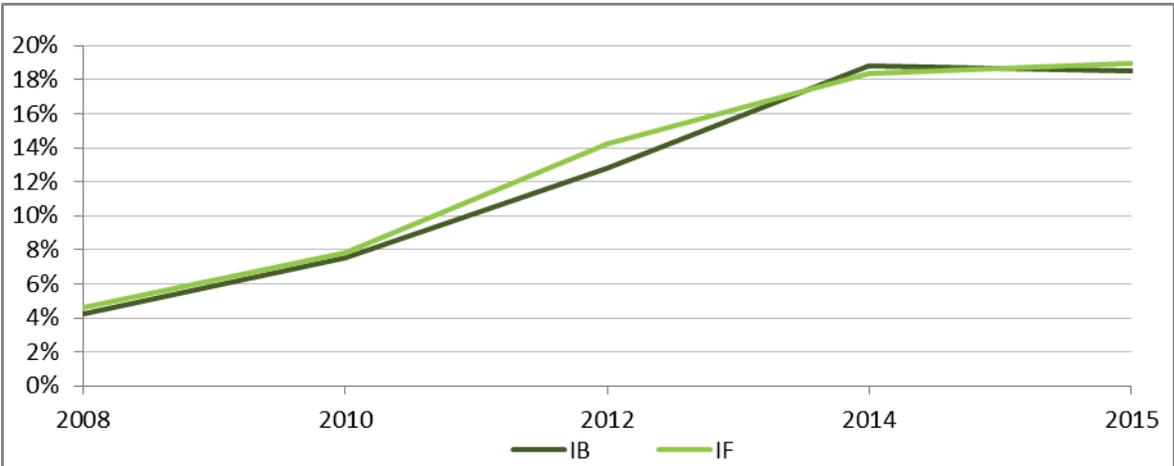
Source: European Commission, Member States

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[37] Luxembourgish data for large industrial consumers is confidential

Figure 65 - **RES & CHP support costs by country in 2015**
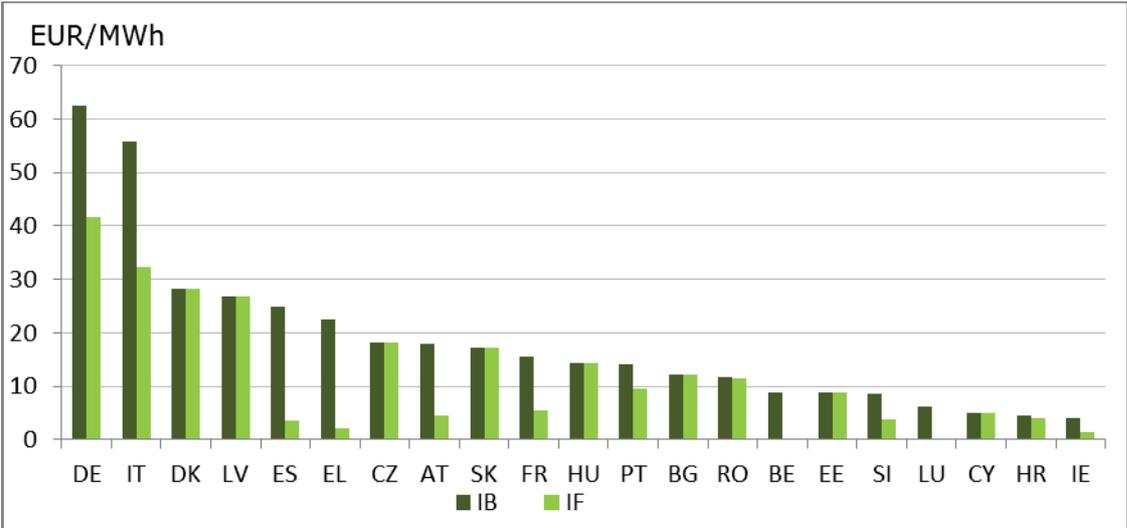
Source: European Commission, Member States

It is visible that in certain countries small industrial consumers pay significantly more than large industrial consumers. The difference in relative terms is the biggest in Belgium (15-fold), Greece (9- fold) and Spain (6- fold). In absolute terms Italy (23 EUR/MWh difference), Spain (21 EUR/MWh), Germany (20 EUR/MWh) and Greece (20 EUR/MWh) recorded the biggest differences

Figure 66 – **Share of RES and CHP supports costs in 2015 by country**
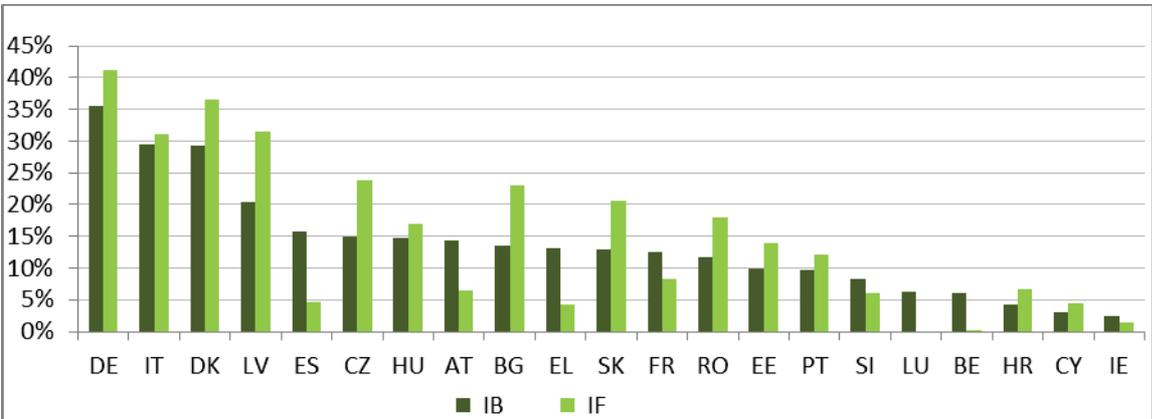
Source: European Commission, Member States

The share of RES & CHP support costs in respective national prices ranged from 36% in Germany to 3% in Ireland for small industrial consumers and from 41% in Germany to 1% in Ireland for large industrial consumers. Albeit RES & CHP support costs for small industrial consumers are higher or equal to the support costs paid by large industrial consumers in all reporting countries, the share of such support costs in the total national price was higher in 13 reporting countries for large industrial consumers.

Table 3. Overview of taxes and levies sub- components for small industrial electricity consumers (IB)

Sub- Component	Number of Countries	List of Countries
RES & CHP	21	AT, BE, BG, HR, CY, CZ, DK, EE, FR, DE, EL, HU, IE, IT, LV, LU, PT, RO, SK, SI, ES
Nuclear	4	BE, IT, SK, ES
Social	9	BE. BG, CY, FR, EL, HU, IT, PT, ES
Security of supply	9	BE, BG, DK, FI, DE, IE, PT, SK. ES
Concession fees	3	BE ,DE, PT
Regulation	6	BE, CZ, PT, SK, SI, ES
Energy efficiency	3	BE, IT, SI
Other Levies	7	BE, BG, DK, IT, ES, UK, TR
Other Taxes	25	AT, BG, HR, CY, CZ, DK, EE, FI, FR, EL, HU, IE, IT, LU, NL, PL, PT, RO, SK, SI, ES, SE, UK, NO, TR

Table 4. Overview of taxes and levies sub- components for large industrial electricity consumers (IF)

Sub- Component	Number of Countries	List of Countries
RES & CHP	20	AT, BE, BG, HR, CY, CZ, DK, EE, FR, DE, EL, HU, IE, IT, LV, PT, RO, SK, SI, ES
Nuclear	4	BE, IT, SK, ES
Social	9	BE. BG, CY, FR, EL, HU, IT, PT, ES
Security of supply	9	BE, BG, DK, FI, DE, IE, PT, SK. ES
Concession fees	3	BE ,DE, PT
Regulation	6	BE, CZ, PT, SK, SI, ES
Energy efficiency	3	BE, IT, SI
Other Levies	7	BE, BG, DK, IT, ES, UK, TR
Other Taxes	25	AT, BG, CY, CZ, DK, EE, FI, FR, EL, HU, IE, IT, NL, PL, PT, RO, SK, SI, ES, SE, UK, NO, TR

COMMISSION STAFF WORKING DOCUMENT
Accompanying the document

**REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE
COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE
COMMITTEE OF THE REGIONS**

Energy prices and costs in Europe

{COM(2016) 769 final}

EN   **EN**

Contents

2   Gas prices

2.1 Wholesale gas prices

In this chapter, the evolution of wholesale gas prices between 2008 and mid-2016 and the main price drivers are analysed.

Main findings

- European wholesale gas prices plummeted in the wake of the 2008-2009 financial crises but recovered by 2011-2013, helped by the economic recovery and the Fukushima accident which increased global LNG demand. Since 2014, prices are on a declining trajectory as low oil prices and increasing global LNG supplies, coupled with weak demand are putting pressure on European gas prices.

- While there seems to be a long-term correlation between gas, oil and coal prices, in shorter periods price trends can diverge.

- Regional price differences persist in Europe, mainly driven by the level of competition although falling oil prices contributed to a convergence of prices in 2015-2016. In general, markets with higher levels of competition show a lower price level than markets with only one supply source.

- Northwest Europe is characterised by developed and liquid wholesale gas markets which are supplied by a diverse range of supply sources, resulting in relatively low prices compared to other regions. Prices in more peripheral markets (Austria, Southern France, Italy) are generally higher, mainly because of infrastructure bottlenecks and lower liquidity.

- In a large part of the EU, gas hubs are non-existent or are at an initial stage of development. In such cases, the analysis of estimated border prices allows us to see whether import prices in a given Member State are based on hub prices or are oil-indexed (or, possibly, a combination of the two).

- Oil-indexed prices have a diminishing role in the European market but continue to be the dominant pricing mechanism in certain regions, in particular in Southeast Europe and the Baltics. On the other hand, hub prices gained significant ground in Central Europe: wholesale prices in this region are more and more aligned with Northwest European hub prices, rather than with oil-indexed prices.

- Econometric analysis confirmed that the influence of crude oil price on wholesale gas prices is divergent across different regions: the impact is moderate in Northwest Europe while oil prices remained an important price driver in the Mediterranean, the Baltics and Southeast Europe. In case of Central Europe, crude oil prices had a markedly weaker impact in 2013-2015 than in 2009-2012. Other factors like the weather (heating degree days) and the US Henry Hub price were also found to have an impact on wholesale gas prices.

2.1.1 Price development

There have been significant fluctuations in European wholesale gas prices since 2008.

European gas prices peaked in mid-2008, with the spot (day-ahead) price at the NBP, the UK gas hub, reaching 30 €/MWh in September. Practically all commodities (including oil and coal) reached record levels in 2008, driven by the growing demand of the Asian emerging economies.

In the wake of the 2008-2009 financial crisis, the NBP price plummeted below 10 €/MWh in the third quarter of 2009. This was followed by years of increase, with the price gradually recovering to pre-crisis levels: in 2013, the annual average price exceeded 27 €/MWh. In addition to the economic recovery, the price rise was supported by the Fukushima accident in 2011: in the wake of the accident, Japan closed its nuclear power stations and replaced them with gas-fired power plants. The resulting increase in Japanese LNG imports raised Asian LNG prices and the decreasing availability of LNG cargoes also put pressure on European markets.

Since 2014, the price is again on a declining trajectory: in August 2016, the average price was just above 12 €/MWh, the lowest level since the end of 2009. Lowering oil prices and increasing global LNG supplies, coupled with weak demand are putting pressure on European gas prices in recent years.

As it can be seen on the below graph, over the long term, one can observe a clear correlation between the prices of the main fossil fuels, oil, gas and coal. The correlation between oil and gas prices is to a significant extent explained by the prevalence of the so-called oil-indexation used in many gas contracts (see below). In shorter periods, such a correlation does not necessarily exist, especially in the most recent years. For example, in the second part of 2014, when oil prices started their recent fall, NBP was moving in the opposite direction.

Figure 1 **- Comparison of gas, oil and coal prices in Europe**

Source: Platts

72
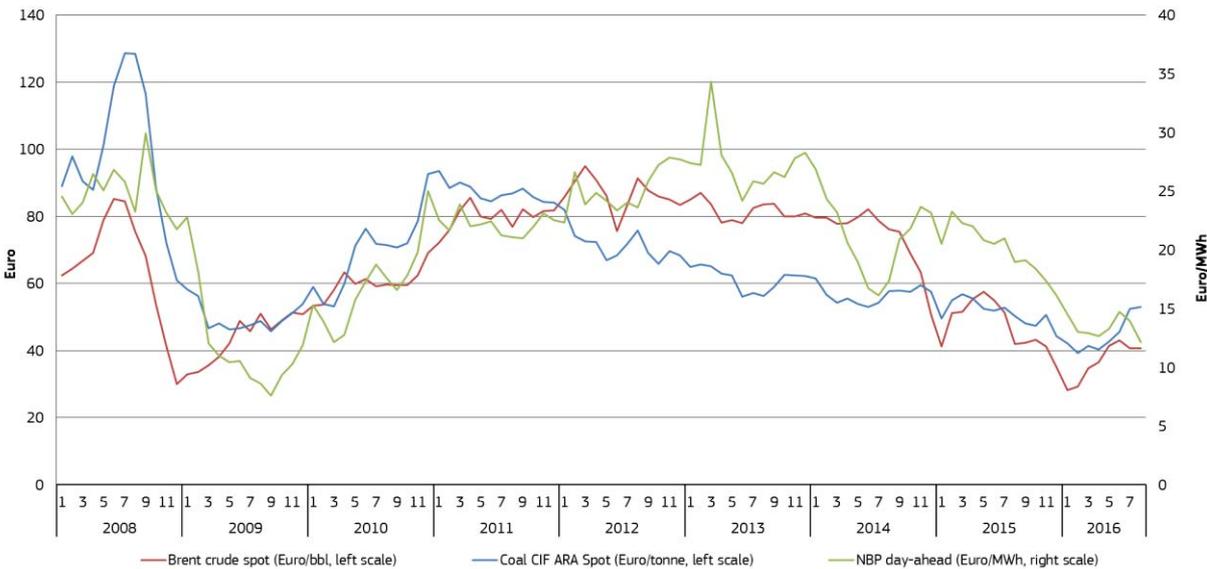
2.1.2 Regional differences

While NBP is often considered as the main gas price benchmark in Europe, it is not representative for the whole EU. In fact, there can be significant price differences between different Member States, depending on – inter alia – the type of contracts used (spot or long-term), the way of pricing (hub-based or oil-indexed) and, crucially, the level of competition. In general, markets with higher levels of competition show a lower price level than markets with only one supply source.

The three factors mentioned above are closely interlinked: long-term contracts are the most prevalent in Member States with limited supply sources (i.e. no or limited competition) and often apply oil-indexed prices.

In 2008, hub prices existed in the UK, the Netherlands, Belgium, Germany, the Netherlands and Italy. Subsequently, Austria and France also established gas hubs.

Northwest Europe is characterised by developed and liquid wholesale gas markets which are supplied by a diverse range of supply sources (indigenous gas in the Netherlands and the UK, supplies from storage facilities, pipeline imports from Norway and Russia and LNG imports from around the world). These well-connected and integrated markets show a significant convergence of prices, with price differences between the main hubs (NBP in the UK, TTF in the Netherlands, Zeebrugge in Belgium, Gaspool and NCG in Germany, PEG Nord in France) rarely increasing above 1 €/MWh. In terms of liquidity, the Dutch and the UK hub have a dominant role in the region.

More peripheral markets like Austria, Southern France and Italy also have established hubs but prices are generally higher than in Northwest Europe, mainly because of infrastructure bottlenecks and lower liquidity. Nevertheless, the price premia of these markets show a decreasing trend. More recently, Denmark, Finland and Poland have also established national hubs and corresponding marker prices (but are not depicted in the below graph).

Figure 2 **- Gas hub prices in Europe**
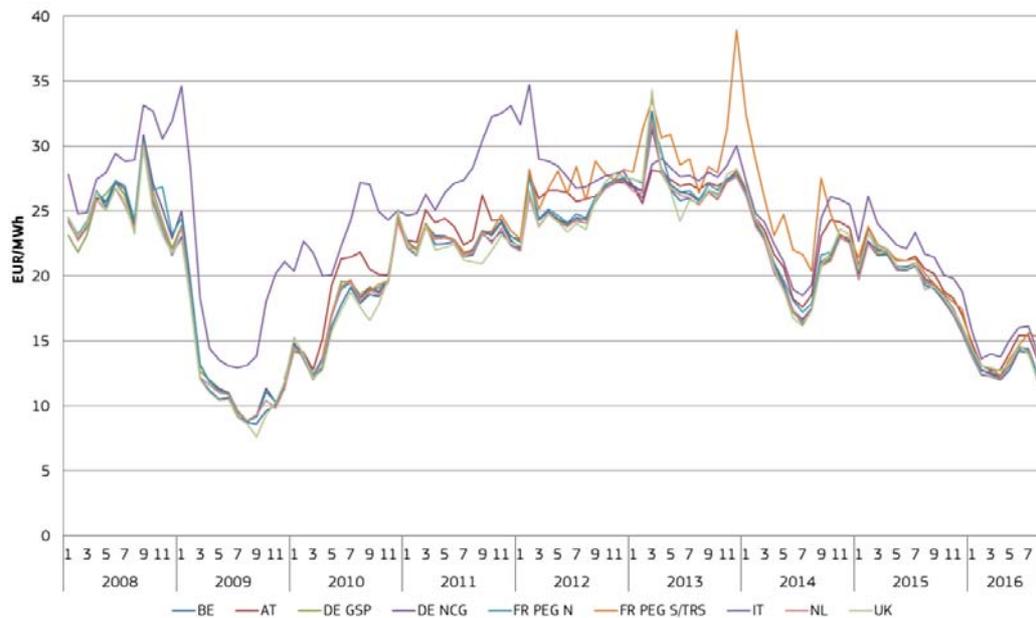
Source: Platts

The considerable impact of infrastructure constraints is well represented by the price difference between Northern and Southern France. Northern France has access to the diverse supply sources available in Northwest Europe while Southern France is largely relying on the LNG terminals on its Mediterranean coast. Constraints on the North-South link within France mean that prices can be quite divergent. For example, the premium of PEG Sud over PEG Nord averaged 4 Euro/MWh in January-October 2014; in December 2013 the difference exceeded 10 €/MWh. However, the price difference has almost disappeared during the 2014/2015 winter as a result of falling LNG prices and the high volume of incoming LNG to the southern terminals at Fos. In addition to the increasing LNG flows, high storage levels and relatively weak demand also helped to reduce congestion of the North-South link.

Figure 3 - **Comparison of gas hub prices in Northern and Southern France**
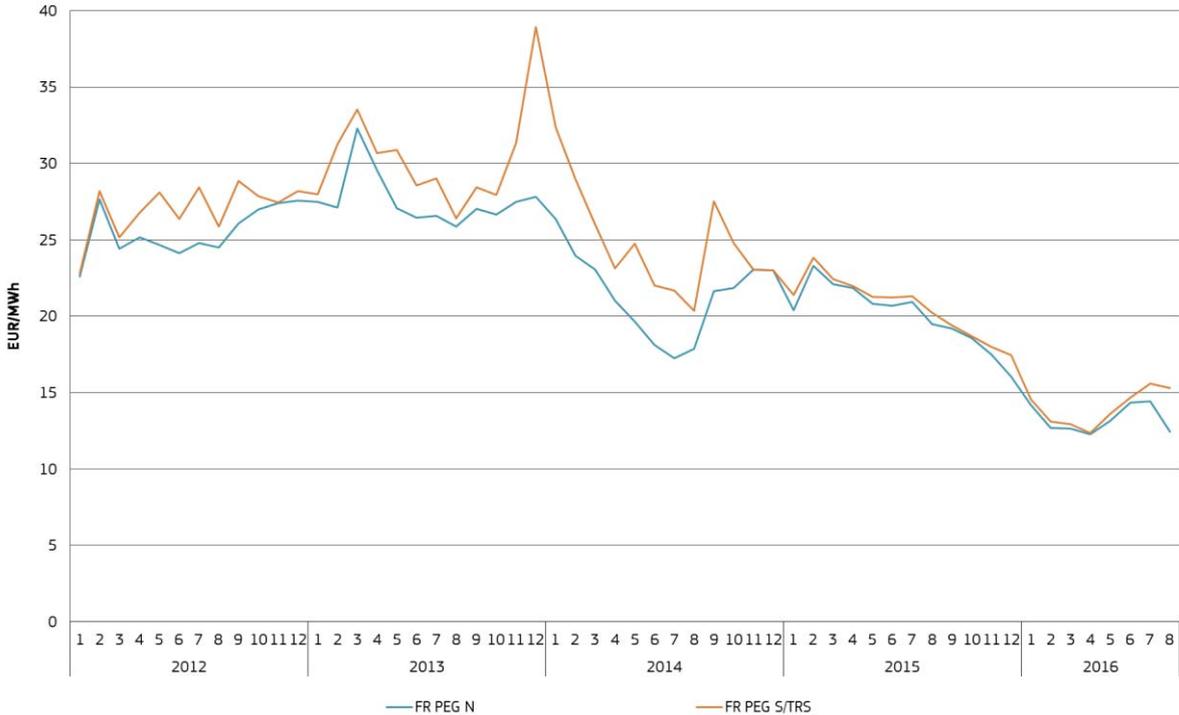
Source: Platts

In other parts of Europe we cannot really speak of gas hubs, accordingly there are no public hub prices. The exact price formulas of long-term contracts are not known either. As a proxy for wholesale prices, for these countries we are using the estimated border prices, i.e. the average price of imports. These countries generally rely on a low number of suppliers, often a single one. The import price is often based on the price of oil products (usually gas oil and/or fuel oil), applying a 6-9 month time lag.

Platt's North West Europe Gas Contract Indicator (GCI), reported since May 2009 and depicted in the below graph, is a theoretical index showing what a gas price linked 100% to oil would be. Of course not all contracts use the same price formula but this indicator gives a good idea about the development of oil-indeed prices. Such "oil-indexed" prices show less volatility than hub prices but their absolute level is considerably higher. Falling oil prices contributed to a convergence of hub-based and oil-indexed prices in 2015-2016: the premium of oil-indexed prices has significantly decreased and practically disappeared in the summer of 2016.

Figure 4 - Comparison of the UK gas hub (NBP) price with a theoretical oil-indexed price
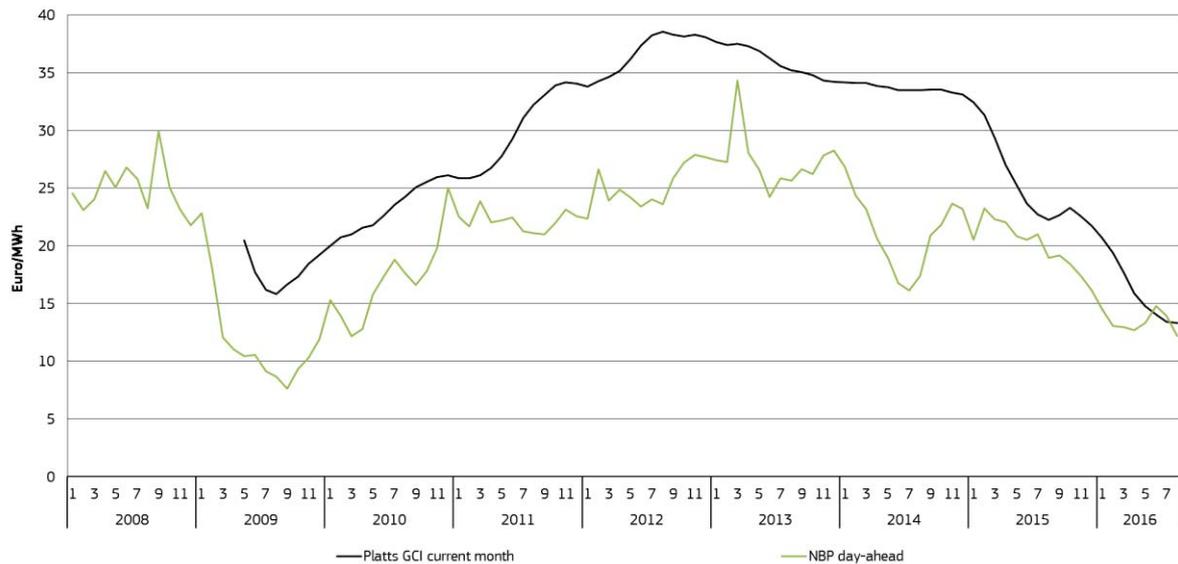
Oil-indexed prices have an important but diminishing role in the European market: according to a report of the International Gas Union[1], oil-indexation accounted for 39% of gas imports in 2014, down from 78% in 2009.

There are important regional differences within Europe. In Northwest Europe, the share of oil-indexed-contracts from imports was only 13% in 2014. This represents a very significant decrease from 2009 when it was still 62%. Considering the increasing role of bub pricing in this region, hub prices well represent wholesale prices in these countries.

The role of oil-indexation also decreased significantly in Central Europe (from 90% of imports in 2009 to 38% in 2014), reflecting increased imports of spot gas, but remain dominant in other parts of Europe, in particular the Mediterranean and the Baltics/Scandinavia where gas-indexed components haven't been introduced to the major share of long term contracts yet.

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[1] Wholesale Gas Price Survey - 2015 Edition

Figure 5 - Gas imports by pricing mechanisms

Total imports of natural gas by pricing mechanism
Europe, bcm — Source: IGU, Nexant

Total imports of natural gas by pricing mechanism
Northwest Europe, bcm — Source: IGU, Nexant

Total imports of natural gas by pricing mechanism
Scandinavia & Baltics, bcm — Source: IGU, Nexant

Total imports of natural gas by pricing mechanism
Central Europe, bcm — Source: IGU, Nexant

Total imports of natural gas by pricing mechanism
Mediterranean, bcm — Source: IGU, Nexant

Total imports of natural gas by pricing mechanism
Southeast Europe, bcm — Source: IGU, Nexant

Source: IGU, Nexant
Northwest Europe: Belgium, Denmark, France, Germany, Ireland, Netherlands, UK
Central Europe: Austria, Czech Republic, Hungary, Poland, Slovakia, Switzerland
Scandinavia & Baltics: Estonia, Finland, Latvia, Lithuania, Norway, Sweden
Mediterranean: Greece, Italy, Portugal, Spain, Turkey
Southeast Europe: Bosnia, Bulgaria, Croatia, FYROM, Romania, Serbia, Slovenia

As mentioned above, in case of Member States with no established gas hubs, we use estimated border prices as a proxy. Border prices are estimated based on customs data (value and quantity of gas imports) which is available in Eurostat trade statistics (COMEXT database). This data is publicly available on Eurostat's website but for confidentiality reasons certain Member States are missing, in particular Austria, Germany and Poland. In case of Germany, we can use the average border price reported by the Federal Office for Economic Affairs and Export Control (BAFA). BAFA does not report the import price by supplier; the reported price is the weighted average of all gas imports.

When comparing the curve of the estimated border price with those of the NBP and the GCI, one can infer whether import prices in the given Member State are based on hub prices or are oil-indexed (or, possibly, a combination of the two).

Looking at estimated border prices of gas imports from Russia, by 2012 these seem to follow the GCI, i.e. the oil-indexed price indicator, suggesting that the pricing formula used in the contracts was based on oil product prices. On the other hand, there have been significant variations in the absolute values of the prices, suggesting that the exact price formulas were different.

From 2013, however, estimated border prices seem to follow different trajectories; this is most visible in mid-2014 when the NBP fell to 16 €/MWh while GCI remained above 30 €/MWh. Prices in the Baltic States and Southeast Europe continued to follow the trend of GCI but in Central Europe (Czech Republic, Hungary, Slovakia) and Italy they moved closer to the NBP price, indicating that these contract now has a significant hub pricing element and are no longer (purely) indexed on oil products. This finding confirms the result of the IGU analysis mentioned above, according to which hub prices gained significant ground in Central Europe but have only a minimal role in the Baltics and Southeast Europe. The average German border price (reflecting all imported gas, not only Russian) also seems to follow the trend of the NBP from 2013.

Apparently, in the years of high oil prices and decreasing European demand, several buyers of Russian gas managed to renegotiate their contracts with Gazprom, resulting in lower prices. This happened in countries having access to alternative supply sources and/or routes, proving the importance of competition as a price driver.

Figure 6 - **Estimated border prices of gas imports from Russia**
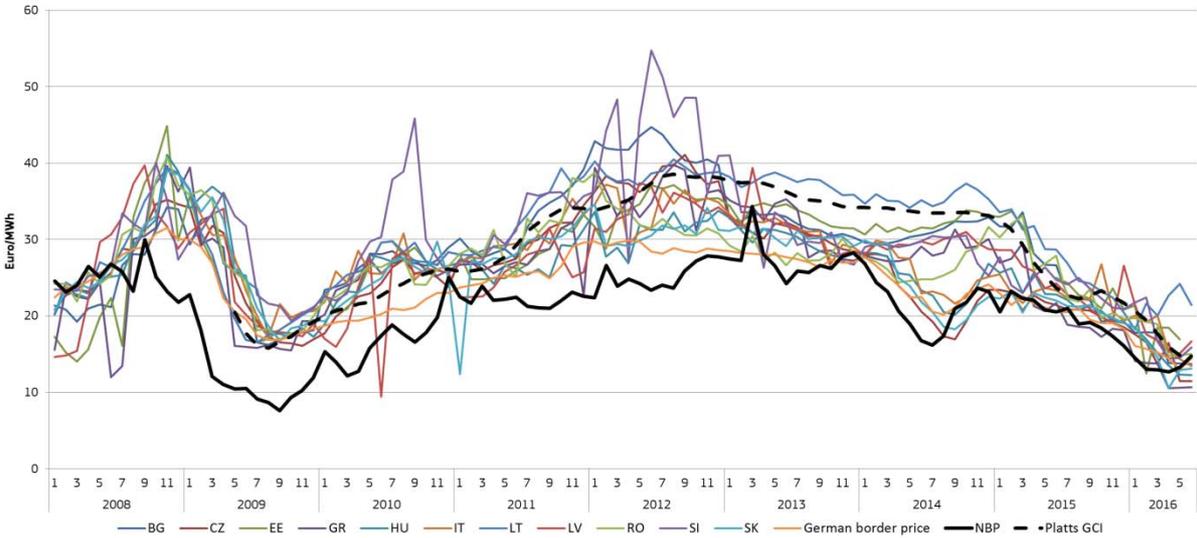
Source: Platts, BAFA, Eurostat COMEXT

When it comes to Norwegian imports, estimated border prices show that the switch from oil-indexation to hub-based pricing happened earlier. In case of Belgium and the UK, already in 2008 the border price seems to follow the NBP curve. In case of Spain, the switch happened later, around 2010 while in case of Italy only in 2014, reflected by a prominent fall of the estimated border price between March to May (by 15 €/MWh).

Figure 7 **- Estimated border prices of gas imports from Norway**

Finally, in case of pipeline imports from North Africa, the estimated border prices provide no real evidence of a shift to hub-based pricing. Prices seem to follow the trend of the GCI indicator, suggesting a continuation of oil-indexation, although in recent years the absolute level of the prices has been considerably lower than the GCI, especially in 2014.

Figure 8 **- Estimated border prices of (pipeline) gas imports from North Africa**
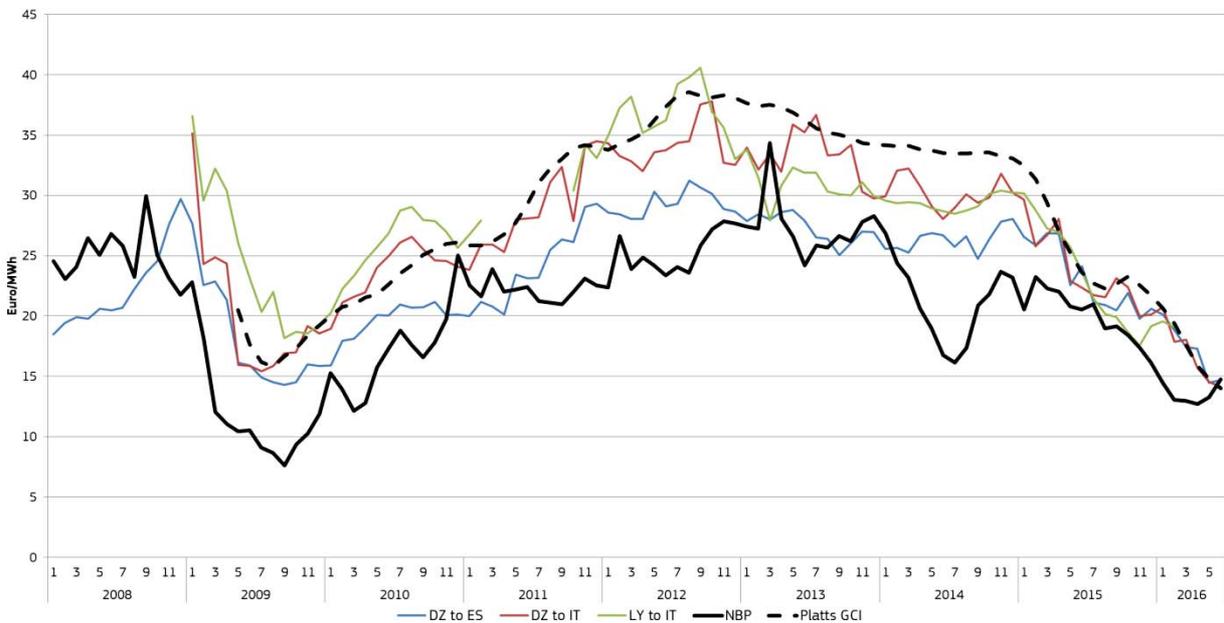
2.1.3Drivers of wholesale gas prices

In the report on *Prices and costs of EU energy*[2], an econometric analysis has been presented in order to assess the influence of different factors (including heating degree days, crude oil prices, the US Henry Hub price, domestic gas production and the availability of gas storage capacity) on wholesale gas prices in different regions of the EU.

Gas is often used for space heating and, as a result, gas demand often shows a high degree of seasonality which can have an impact on prices, in particular if temperatures deviate from the normal seasonal pattern (e.g. unusually mild winters vs. cold spells). The econometric analysis indeed found that heating degree days have a significant positive impact on prices, with the strongest impact seen in the UK. However, during the past (2015/2016) winter, hub prices in Northwest Europe have hardly shown any seasonality; in fact, prices showed a continuous decreasing trend since early 2015. Heating degree days were also found to have an impact on LNG prices.

In addition, hub prices are also influenced by the oil-indexed prices of long-term contracts. Econometric analysis indeed found that crude oil prices influence Northwest European hub prices although this impact is moderate and declining with time. (Hub prices in Northwest Europe had been strongly coupled to the oil-indexed prices of long-term contracts before 2009; afterwards, they started to deviate from the oil-indexed prices.) The impact is stronger if a lag is applied; this is consistent with the fact that oil-indexed prices are based on the oil product prices of 6-9 months ago. In case of decreasing oil prices for example, as seen in the last 2 years, falling oil-indexed prices put downward pressure on hub prices.

In case of Central Europe, crude oil prices had a markedly stronger impact on the border prices in the first part of the study period (2009-2012); in 2013-2015, as the pricing shifted away from oil indexation, this impact significantly decreased. In turn, the impact of Northwest European hub prices has significantly increased. In 2013-2015, there has been a very strong correlation between NBP and the border prices in Central Europe. The increasing share of hub-based pricing clearly had a negative impact on prices in the region,

In the Baltics and Southeast Europe, oil-indexed prices continue to have a dominant role. This was confirmed by the econometric analysis which found only a small decrease in the impact of crude oil prices in 2013-2015 compared to 2009-2012. In this region, crude oil price remained an important price driver while the role of the NBP price proved to be minimal.

In the Mediterranean, in particular Spain, LNG imports play an important role. In this region, LNG prices show a modest correlation with oil prices, suggesting that most contracts still use some oil-indexation. (In turn, LNG prices in Northwest Europe closely follow the local hub prices)

It was found that the evolution of the US wholesale price (Henry Hub) also has an impact on European hub prices and in fact this impact proved to be stronger than that of the crude oil price.

The hypothesis that a higher share of domestically produced gas would result in lower prices was refuted in case of Northwest Europe: it was found that this factor has no significant impact on the hub prices. On the other hand, in the Baltics and Southeast Europe (where Romania is an important gas producer) the share of domestic production proved to be a driver, having a significant negative impact on border prices.

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[2] Report on Prices and costs of EU done by Ecofys for the European Commission

According to the analysis, the availability of gas storage capacity has no significant impact on prices.

2.2 Retail gas prices

The composition and drivers of natural gas retail prices are analysed based on a data collection designed and conducted by DG Energy of the European Commission. The gathered data set has distinct features:

- Cost elements are allocated to harmonized main components, facilitating the targeted identification of price increase drivers on EU and national levels.
- The component "taxes & levies" is further disaggregated into 10 sub- components, facilitating the quantification of the impact of specific policies and fiscal measures.
- The component "network" is further decomposed into transmission and distribution costs.
- Energy policy relevant levies and not- earmarked taxes are distinguished.

Summary

Natural gas retail prices for households increased at the annual rate of 1.7%. Prices for median industrial consumers marginally decreased while prices for large industrial consumers decreased at the annual rate of 0.5%.

Natural gas prices, unlike their electricity counterparts, remain largely determined by international commodity prices as the energy component of natural gas bills ranges up to 84%. Falling wholesale prices counterweighted and in the case of large industrial consumers even reversed the impact of increasing taxes and levies. The impact of energy policy relevant charges remained limited as such charges accounted for less than 10% of the weighted EU average price in 2015.

Highly varying national taxes and levies have only a moderate impact on natural gas prices, therefore they are more convergent across Europe than their electricity counterparts. Prices became on average 25% less dispersed for all consumer types from 2008 to 2015, mirroring the progress towards a single EU energy market. Impacts of the internal market are also underlined by 36% and 58% less dispersed energy components for households and median industrial consumers respectively.

Natural gas retail prices decreased for all consumer types from 2014 to 2015[3]. Such price evolution might hamper energy efficiency investments by households in more efficient equipment and by industry in more efficient production processes.

Slightly increasing or even decreasing retail prices reflect natural gas market conditions which have considerably changed over the past few years. The fall in oil prices, which started in 2014 significantly impacted the mostly oil indexed gas prices. The decrease in gas prices in turn changed the favourable investment climate leading to lower gas production on the medium term. Such supply reduction combined with increasing demand would normally lead to increasing prices on the short term. Demand for natural gas is however hampered by slow economic growth in Europe and tough competition by US coal. The slow recovery of EU economies comes with stagnating electricity demand. Demand levels, which in 2015 have not reached pre- crisis levels, are not sufficient to create supply shortages which in turn could

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[3] Latest data of the evolution of gas prices for households in EU capitals (April 2016, source: VaasaETT Ltd) shows significant monthly drops in prices in various capitals which could be reflecting the recent decreases in the wholesale prices.

increase price levels. Gas fired power generation more than halved from 468 TWh in 2008 to 201 TWh in 2014 despite decreasing commodity prices.

The shale gas boom in the United States has not directly impacted European gas prices by increasing supply. However, it indirectly contributed to decreasing prices. On the domestic US markets coal was crowded out by shale gas. Relatively low transport costs of excess coal from the United States, made the commodity a feasible option in Europe. Coal imports from the United States to the EU have increased 12 fold from 2300 kilotons in 2008 to 31500 kilotons in 2014[4]. The increased use of US coal for power generation in Europe lowered the demand for natural gas and thus contributed to sustained lower prices.

For large industrial consumers the weighted EU average of both the energy and network components decreased. This is a unique development across all analysed electricity and natural gas bands. The largest part of the bill - energy supply costs - decreased at the annual rate of 0.8% while network tariffs decreased by 1.9% annually. Taxes and levies increased at the annual rate of 4.4%.

For median industrial consumers decreasing energy costs (annual -1.9%) were counterweighted by increasing network tariffs (annual 6.2%) and growing taxes and levies (annual 11%). The combined impact of a moderate decrease in the largest component and faster increases in the smaller components led to almost net zero change in total prices from 2008 to 2015.

For households all three components increased over the observation period. The energy component accounted for the largest part of the household gas bill (53%). Its moderate annual increase of 0.3%, combined with respective annual increases of 2.5% and 4.2% of network tariffs and of taxes and levies led to a total annual price increase of 1.7%.

The composition of total prices remained almost constant for all households and large industrial consumers. The share of energy costs in the total price became slightly less prominent while the shares of the two other components slightly increased.

Figure 9 – **Natural gas components for different consumer types**
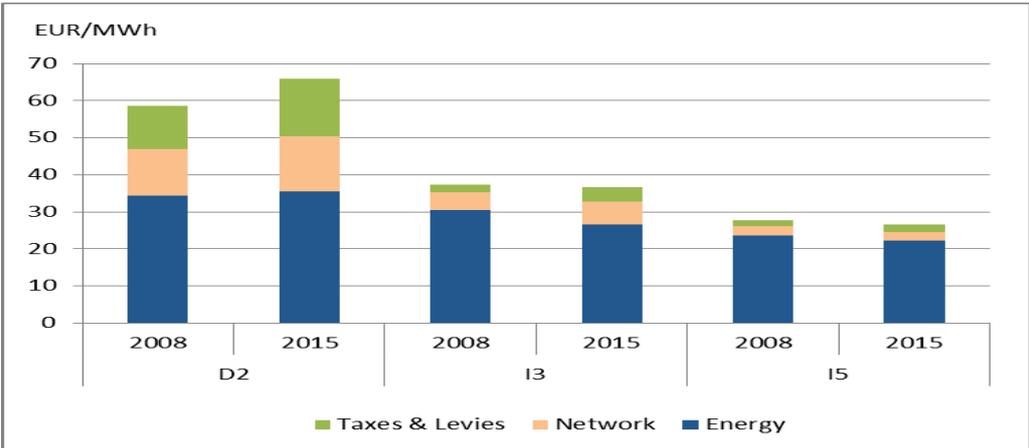
Source: European Commission, Member States

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[4] Excludes coking coal, Eurostat nrg_122a.

The following table summarizes the evolution of the three components as well as the evolution of their relative shares.

Table 1. Evolution of price components by type of consumer

Consumer Type	Household			Median industrial			Large industrial		
Component	Annual growth	Share 2015	Δ share	Annual growth	Share 2015	Δ share	Annual growth	Share 2015	Δ share
Energy	0.3%	53%	-5pp	-1.9%	73%	-9pp	-0.8%	84%	-1pp
Network	2.5%	23%	+1pp	3.6%	17%	+4pp	-1.9%	8%	-1pp
Taxes & Levies	4.2%	24%	+4pp	8.3%	10%	+5pp	4.4%	8%	+2pp
Total price	1.7%	-	-	-0.3%	-	-	- 0.5%	-	-

Source: European Commission, Member States

Natural gas retail prices are less spread out across Europe than their electricity counterparts. This is largely due to the fact that they are less impacted by highly divergent national policies and fiscal measures. Various energy policy related levies, fees and charges imposed on natural gas bills are limited both in their value and variety. The following table displays natural gas price dispersion for various consumer types at the beginning and at the end of the observation period. Prices for all consumer types became more convergent over time.

Table 2. Price dispersion by type of consumer

Type of Consumer	Band	Year	Max/ Min	Δ Total price dispersion 2008-2015	Δ Energy component dispersion 200-2015
Household	D2	2008	3.54	-14%	-36%
		2015	3.11		
Median industrial	I3	2008	1.8	-39%	-58%
		2015	0.63		
Large industrial	I5	2008	2.24	-26%	-30%
		2015	1.99		

Source: European Commission, Member States

2.2.1 Household Natural Gas Prices

The following chapter analyses natural gas retail prices paid by household consumers whose annual consumption falls in the range of 20 to 200 GJ. This consumption band is defined by Eurostat terminology as D2. It is the most representative consumption band in all but one reporting country. Disaggregated natural gas prices for this consumption band were reported by 23 EU member States and Turkey. Natural gas is not used on Cyprus and Malta and its household share in total primary energy supply is below 1% in Finland. Therefore, these three countries do not report prices.[5] Disaggregated prices could not be reported by Ireland, Latvia and Norway in the course of the current study.[6]

Summary

Natural gas prices for households grew at the annual rate of 1.7% from 2008 to 2015. While nominal price levels are largely determined by the energy component, price increases were driven by growth in taxes, levies and network tariffs.

With over 50% share in the weighted EU average price, the energy component remained the most dominant component. It was the largest of the three components in 20 reporting countries in 2015. In two of the three remaining, countries taxes and levies was the largest component (DK, SE) while Portugal was the only country reporting the highest share of network tariffs. These three countries, where the energy component was out weighted by another component, recorded the highest prices in 2015.

Progress towards a single energy market is mirrored by the increased convergence of household natural gas prices as such became 14% less dispersed from 2008 to 2015.This trend is underlined by the evolution of national energy components which became 37% less dispersed.

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[5] Finland reported industrial natural gas prices.
[6] Total prices for Ireland and Latvia are available in the Eurostat data base.

COMPARING PRICE CHANGES: NATURAL GAS VS GENERAL PRICE LEVEL

Gas prices for median household consumers (5.56 MWh < Consumption < 55.56 MWh) all taxes included

2008 - 2015 % change
All prices in national currency

Indicators are displayed for countries that submitted data for DG Energy's ad- hoc data collection. Data submission was open to all countries reporting to Eurostat in the European Statistical System.

Benelux

🔵 +1%
💶 +14%

🔵 -15%
💶 +16%

🔵 0%
💶 +17%

Legend

- Price change gas smaller than price change HICP
- Price change gas bigger than price change HICP
- No data on gas price change
- No gas used
- 🔵 Gas price change
- 💶 HICP change

HICP stands for "harmonised index on consumer prices" and measures the general price level in a given Member State

🔵 +13%
💶 +10%

🔵 +28%
💶 +22%

🔵 +1%
💶 +17%

🔵 -21%
💶 +12%

🔵 +33%
💶 +20%

🔵 +14%
💶 +4%

🔵 +29%
💶 +22%

Cyprus

🔵 +10%
💶 +18%

🔵 -4%
💶 +10%

🔵 +10%
💶 +11%

🔵 +16%
💶 +13%

🔵 +22%
💶 +16%

🔵 -3%
💶 +25%

🔵 +1%
💶 +31%

🔵 +29%
💶 +10%

🔵 -30%
💶 +13%

🔵 +72%
💶 +15%

🔵 +22%
💶 +14%

🔵 +66%
💶 +14%

🔵 +58%
💶 +10%

🔵 +28%
💶 +12%

🔵 -14%
💶 +77%

Malta

Source: Eurostat Energy Statistics
© Eurogeographic for the administrative boundaries;   © DG ENER - September 2016

0   500   1,000 Kilometers

Energy
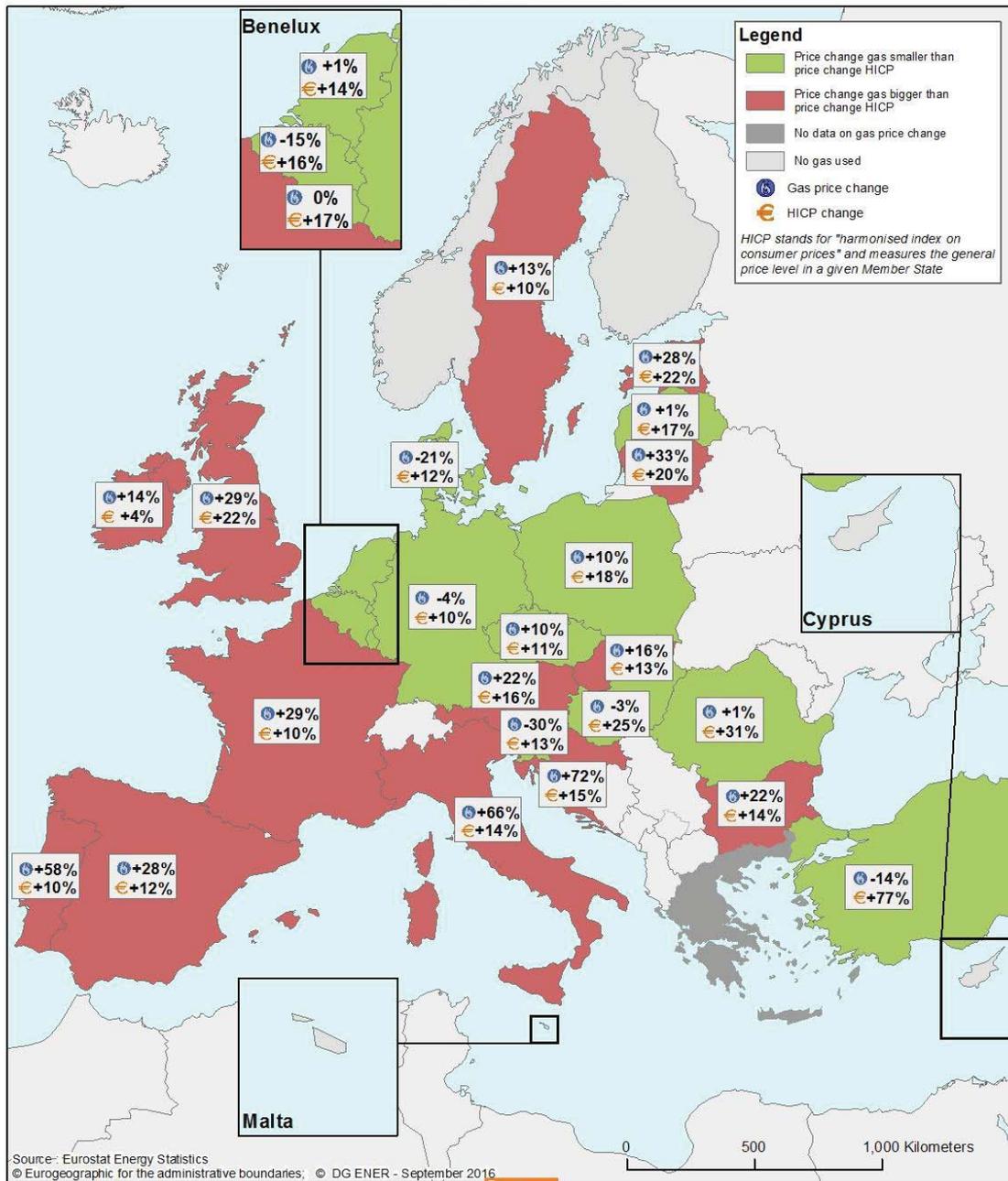
2.1.1.1 Price evolution – Total prices

The average[7] household natural gas price was 6.60 Eurocent/kWh in 2015. This average price increased at the annual rate of 1.7% from 5.86 €c/kWh in 2008. This growth closely resembles overall average inflation[8] of 1.5% during the same period. The average price decreased by almost 6% in the period 2008 - 2010 reflecting decreasing demand trends, partly due to the ongoing financial and economic crisis. From 2011 to 2014 prices increased at a faster pace of almost 15%. From 2014 to 2015 the average EU price, in line with the evolution of international commodity prices, decreased by 4%.

Figure 10 **- Evolution of the weighted EU average natural gas price for households (D2)**
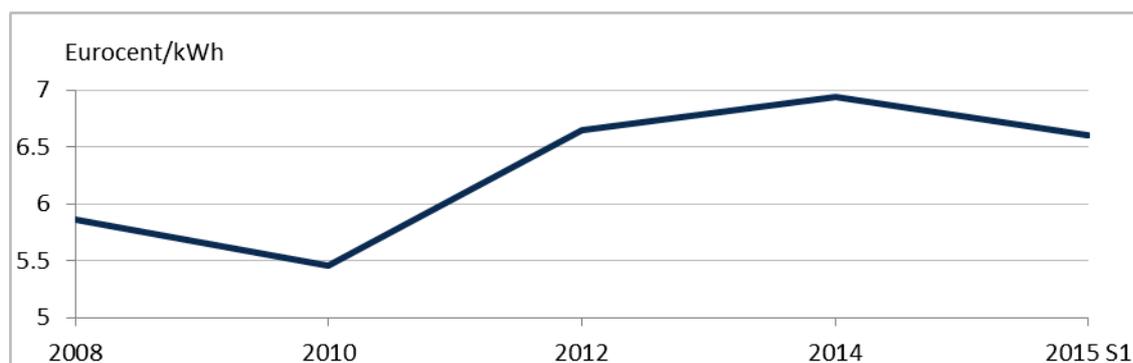
Source: European Commission, Member States

The highest reported price was almost four- fold of the lowest in 2015 as household prices ranged from 3.11 Eurocent/kWh in Romania to 11.31 Eurocent/kWh in Sweden.

Figure 11 **- Household (D2) natural gas prices by country in 2015**
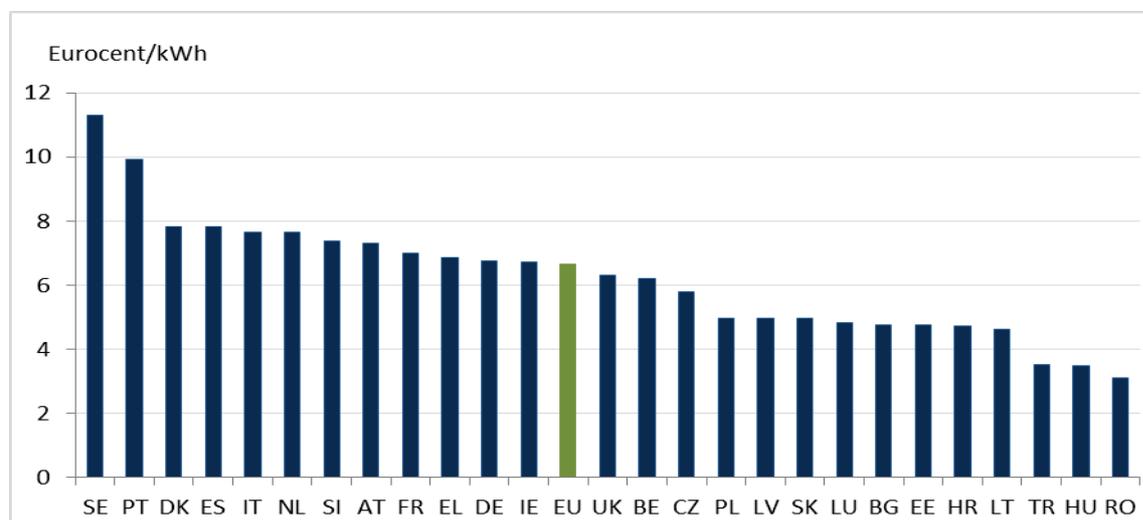
Source: European Commission, Member States

Significant differences in international price convergence are observed for different energy products. Electricity household prices are considerably more spread out than their natural gas counterparts. This is mostly due to the fact that household electricity prices are more impacted by various taxes and levies that highly differ from country to country.

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[7] All average prices refer to weighted Total EU 25 average prices.
[8] Harmonized Consumer Price Index (HCPI), Eurostat prc_hicp_aind

The following graph displays nominal price increases and decreases from 2008 to 2015 and national prices in 2015 relative to the 2015 average EU price[9].

Figure 12 - **Price increases and national prices relative to EU average in 2015 for households (D2)**
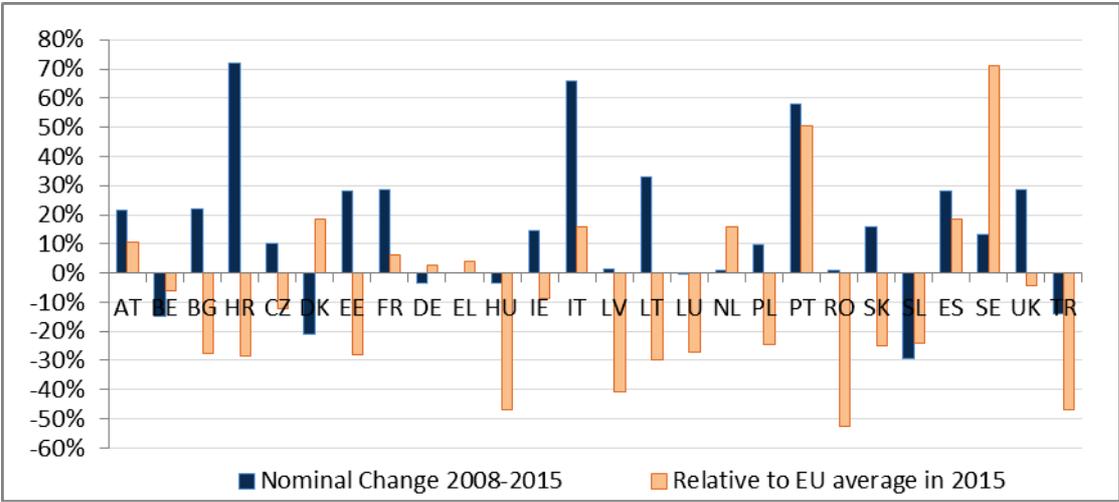
Source: European Commission, Member States

Figure 13 -**Household (D2) natural gas prices by country and observation period**
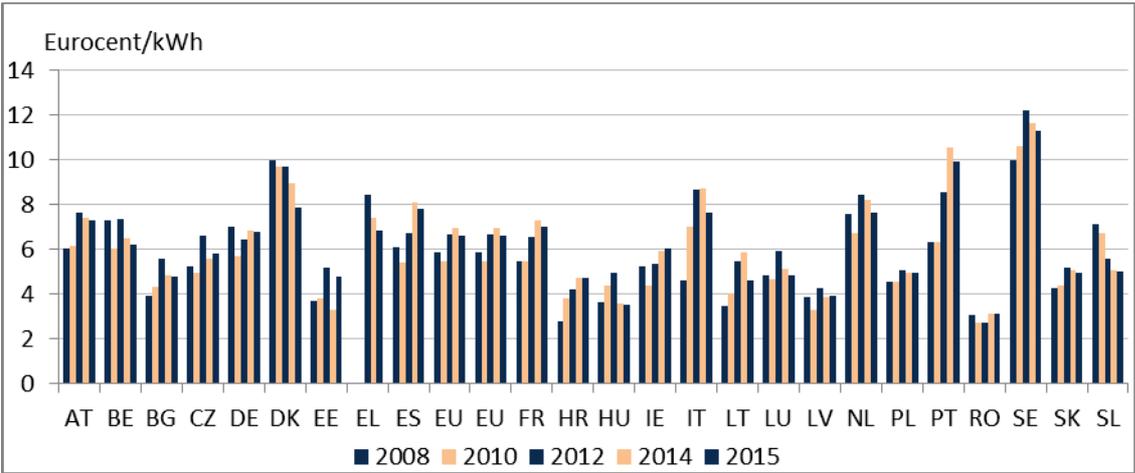
Source: European Commission, Member States

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[9] 2010-2015 value for Austria

2.2.1.2 Price drivers – Main components

For a detailed description please consult the section on the main components.

Figure 14 - Weighted EU average price components for households (D2)
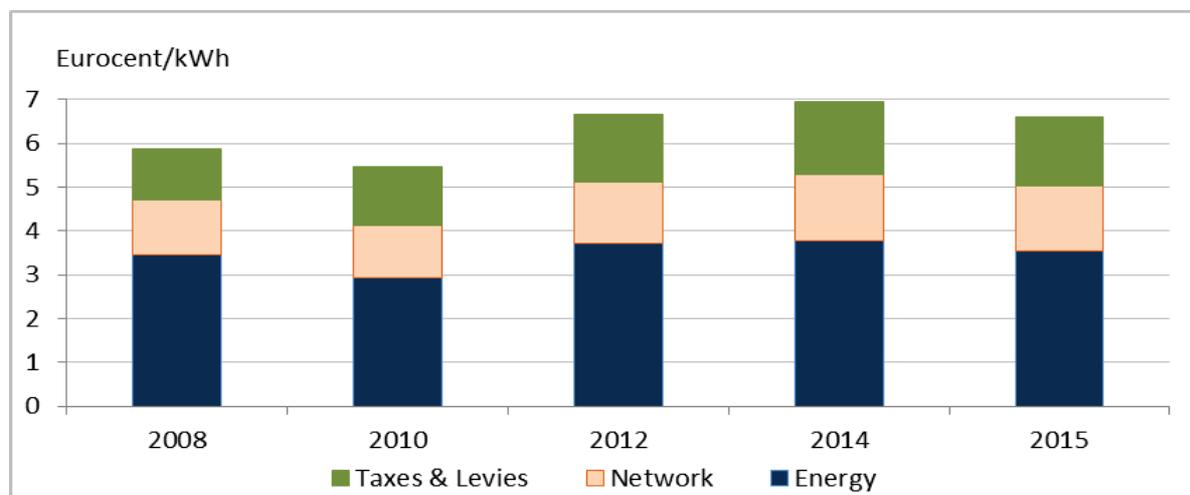
Source: European Commission, Member States

The average energy component increased marginally by at the annual rate of 0.3% from 2008 to 2015 and accounted for 3.54 Eurocent/kWh in 2015. The evolution of the energy component closely resembles the evolution of the total price. It was the largest of the three components in all but three (DK, SE, PT) reporting countries. These three countries recorded the highest prices in 2015. In Denmark and Sweden taxes and levies and in Portugal network costs out weighted the energy component.

Box - Pass through effect on gas

The main results of the analysis on the drivers of the energy component of gas retail prices are well aligned with theoretical expectations. *Wholesale gas prices are the main driver of the retail prices' energy component* and have a strong impact on the energy price component, particularly in the countries with more liberalised markets *(one Euro of wholesale gas prices affects the retail prices' energy and supply component by about €0.4 in general and by €0.7 in the energy component of households prices in NL, UK, BE)* Countries with *regulated retail markets* show a lower impact of wholesale prices (about €0.2) and markets with higher level of competition (CR3 equal or below 80%) show a slightly stronger impact of wholesale prices on the energy supply component. Finally, countries with liberalised markets seem to have lower prices, but limited data availability allows no further analysis.

There are regional differences in prices, which could be explained by different market characteristics (e.g. retailer concentration, number of suppliers, number of households switching, etc.) but analysis on that could not been carried out because sufficient time series data for market characteristics were not identified.

Overall, wholesale prices affect retail prices, but how strongly and quickly wholesale prices are passed through to retail prices (supply component) also depend on retail market structures, of which no appropriate data have been available yet to fully explain price developments.

Source: Ecofys study sections 3.2.2.1 & 3.2.2.2 and related Annex 2

The average network component increased at the annual rate of 2.5% and cost the average EU household 1.49 Eurocent/kWh in 2015. The taxes & levies component increased at the annual rate of 4.2% from 2008 to 2015 and accounted for 1.56 Eurocent/kWh in 2015. The increase in taxes and levies is the most relevant contributor to overall natural gas price increases for households.

Figure 15 **- Share of price components in the weighted EU average price for households (D2)**
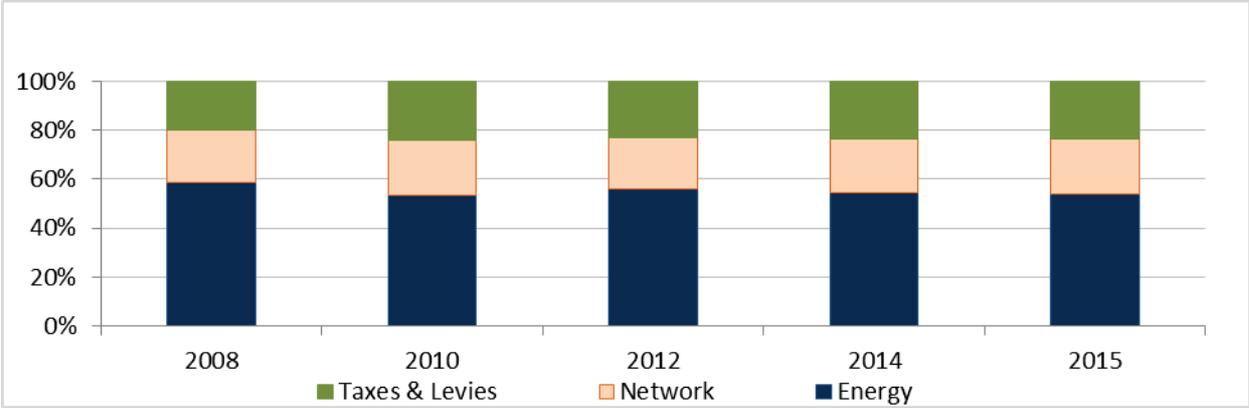
Source: European Commission, Member States

The share of the energy component in the total price decreased by 5 percentage points from 59% to 54%. The share of the Network component marginally increased from 21% to 22%.

The share of the Taxes& Levies component in the total price increased by 4 percentage points from 20% to 24%.

Figure 16 **- Household (D2) natural gas price components by country in 2015**
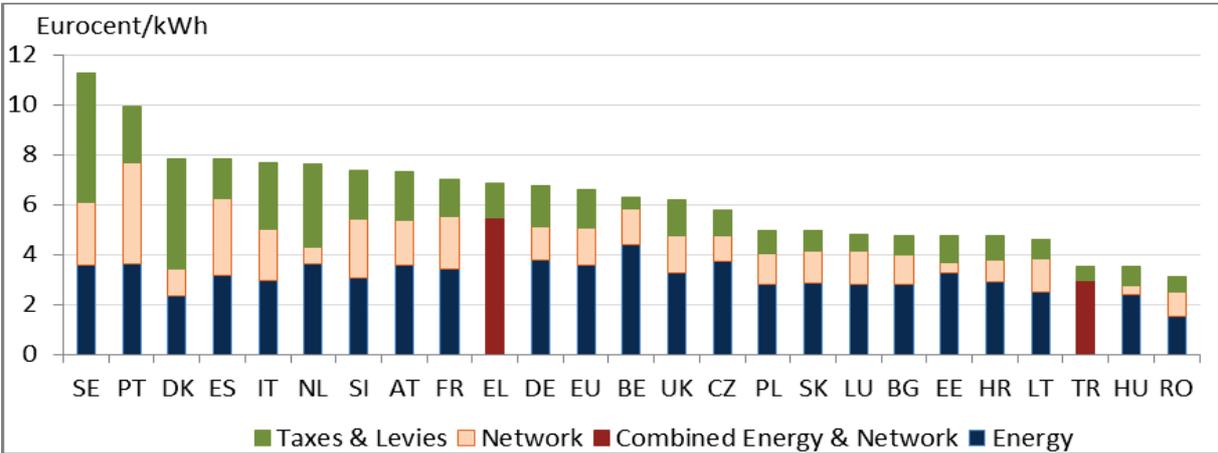
Source: European Commission, Member States

Figure 17 - **Share of price components in the household natural gas (D2) price in 2015**
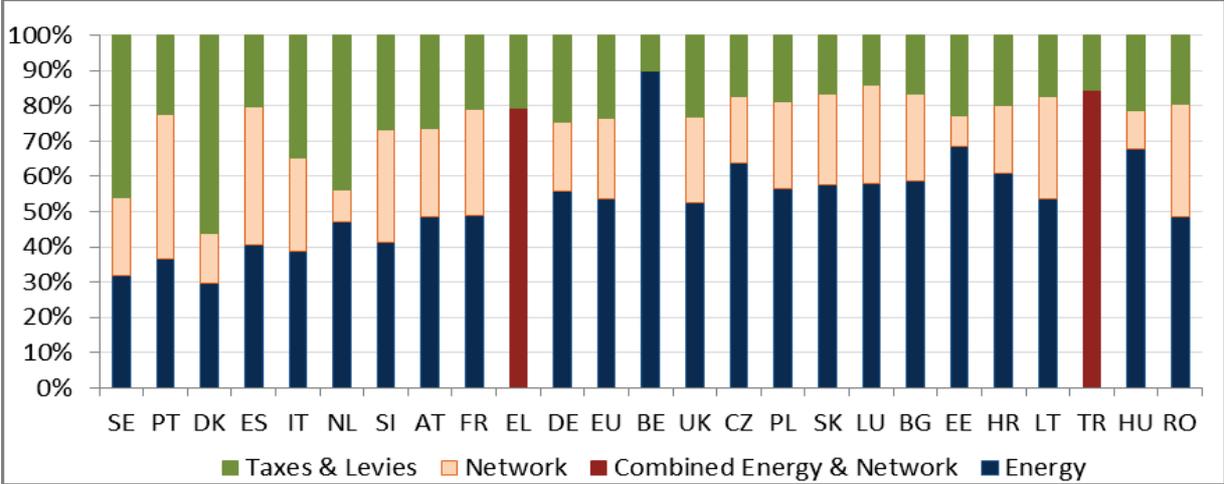
Source: European Commission, Member States

Energy component

Only one of the three price components, the energy component is determined by the market. Increasing competition contributes to decreasing energy components. The share of the energy component decreased by 5 percentage points and accounted for 53% of the average household price in 2015. The level of the network and taxes & levies components are set by divergent national laws and regulations. Their joint share in the average household price increased from 37% to 42%. As the part of the price which is set by market forces has been gradually decreasing, total prices are imperfect indicators for the measurement of price dispersion. The dispersion of the energy component however adequately reflects the progress towards an internal energy market. The energy component of the average median industrial price became 37% less dispersed since 2008.

Network component

The Network component is broken down into two sub- components, namely transmission and distribution. Both transmission and distribution tariffs are regulated in all EU Member States as well as in Norway and Turkey. The allocation of cost elements (for example costs of infrastructure, losses, ancillary services) to the two sub- components might differ from country to country. Therefore, cross- country comparisons are to be undertaken with caution.

13 reporting countries provided the split between transmission and distribution tariffs[10].

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[10] 2014 data for Spain and the United Kingdom

Figure 18 – **Shares of transmission and distribution costs for households (D2) in 2015 by country**
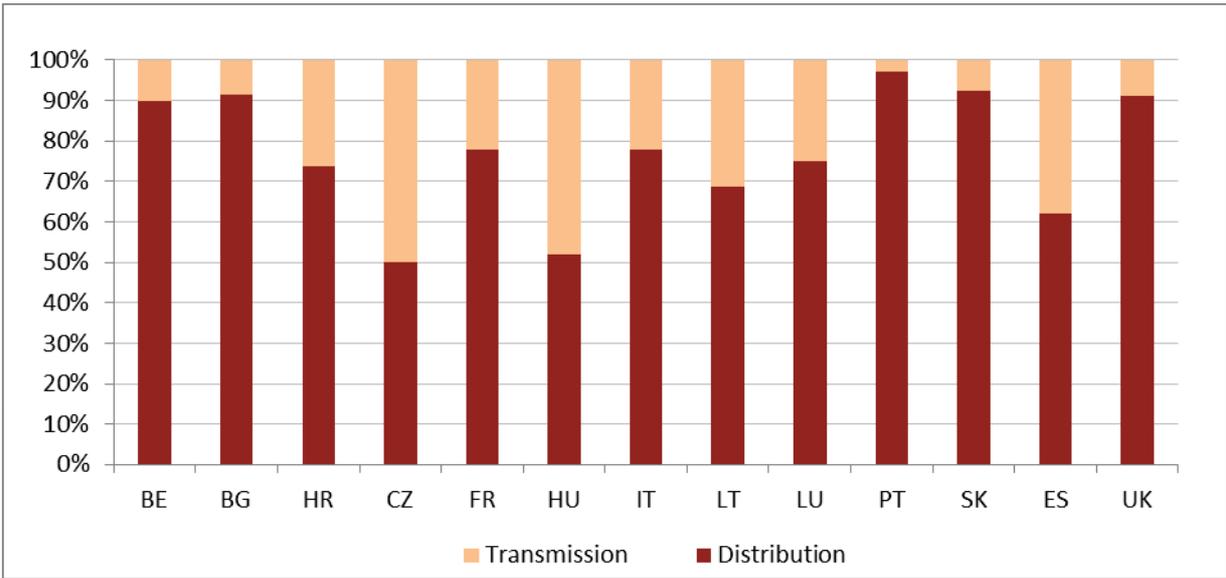
Source: European Commission, Member States

Taxes & Levies component

It is to be noted, that only explicitly reported cost elements could be allocated to specific policies and consequently taken into account for the analysis. For example, RES or nuclear decommissioning costs exist in several countries which could not report such costs explicitly.

VAT is paid by household consumers in all reporting countries. Natural gas VAT rates ranged from 5% in the United Kingdom to 27% in Hungary in 2016.[11] The share of taxes and levies in the EU average price is less than a quarter. Not- earmarked taxes (VAT, excise tax and other taxes) accounted for 93% of the total taxes and levies component. Energy policy relevant levies were rather insignificant and accounted for only 7% of the total taxes & levies component.[12]

During the whole reporting period, 12 countries have not imposed any energy policy relevant levies, fees or charges on household natural gas prices. 11 countries imposed levies in at least one year (not necessarily in all years). While 24 EU Member States impose explicit renewable energy support levies[13] on household electricity consumption, only two (Italy and Slovenia) do so on natural gas bills.

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[11] Source: DG TAXUD: Excise Duty Tables, Part II- Energy products and Electricity at: http://ec.europa.eu/taxation_customs/taxation/excise_duties/energy_products/rates/index_en.htm
[12] includes tax data from Greece and Ireland
[13] RES support costs occur in all 28 Member States regardless if they are levied explicitly or not

Table 3. Overview of taxes and levies sub- components for household natural gas consumers

Sub- Component	Number of Countries	List of Countries
RES & CHP	2	IT, SI
Nuclear	0	
Social	3	BE, FR, UK
Security of Supply	2	GR, HU
Concession fees	3	AT, BE ,DE, PT
Market operation	2	BE, CZ
Energy Efficiency	3	BE, SI, UK

Concession fees for the occupation of public land, imposed by 4 Member States represented the most commonly applied levy on natural gas bills.

2.2.2 Industrial Natural Gas Prices

The following chapter analyses natural gas retail prices paid by industrial consumers whose annual consumption falls in the range of 10 000 to 100 000 GJ. This consumption band is defined by Eurostat terminology as I3 and is the most representative consumption band in the majority of the reporting countries. Disaggregated natural gas prices were reported by 24 EU member States and Turkey. Natural gas is not used on Cyprus and Malta, therefore these countries do not report such prices.[14] Disaggregated prices could not be reported by Ireland, Latvia and Norway in the course of the current study.[15]

Summary

Nominal natural gas prices for median industrial consumers remained stable from 2008 to 2015 when the average price accounted for 36.5 EUR/MWh.

The energy component, with its almost three- quarter share in the total price, remained the most dominant component. Its moderate decrease counterweighted higher increases in the two smaller components. The impact of taxes and levies on the total price remained limited, therefore the evolution of the total price is mostly correlated to the evolution of the energy component. Natural gas prices are determined by international commodity prices rather, than divergent national taxes and levies, therefore they are more convergent across Europe than their electricity counterparts.

VAT is recoverable for most industrial[16] consumers in all reporting countries. Therefore the current study analyses industrial prices excluding VAT and other recoverable taxes.

Progress towards a single energy market is mirrored by the increased convergence of industrial natural gas prices as such became 39% less dispersed from 2008 to 2015.This trend is underlined by the evolution of national energy components which became 58% less spread out.

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[14] Finland reported industrial natural gas prices and Ireland reported VAT and excise tax for all bands.

[15] Total prices of Ireland and Latvia are available in the Eurostat data base.

[16] According to Directive 2008/92/EC of the European Parliament and of the Council : Industrial end-user may include other non-residential user.

COMPARING PRICE CHANGES: NATURAL GAS VS PRODUCER PRICE LEVEL

Gas prices for median industrial consumers (2.78 GWh < Consumption < 27.78 GWh) net of VAT and other recoverable taxes and levies

2008 - 2015 % change
All prices in national currency

Indicators are displayed for countries that submitted data for DG Energy's ad- hoc data collection. Data submission was open to all countries reporting to Eurostat in the European Statistical System.

Benelux

-11%
+2%

+1%
+10%

-28%
+2%

+6%
+4%

-17%
+2%

-4%
+7%

+26%
+13%

+34%
+20%

+16%
+5%

-3%
+8%

+45%
+11%

-27%
+8%

Cyprus

+38%
+6%

-6%
+14%

-22%
+5%

-11%
-6%

-7%
+5%

-22%
+20%

-6%
+28%

+52%
+4%

-11%
+8%

-1%
+12%

+4%
+18%

+11%
+4%

+26%
no data

+9%
+12%

+2%
-5%

Malta

Legend

Price change gas smaller than price change PPI

Price change gas bigger than price change PPI

No data on gas price change

No gas used

Gas price change

PPI change

PPI stands for "producer prices in industry". It measures the average price level of goods and related services resulting from all industrial activities except construction, sewerage, waste management and remediation.

0   500   1,000 Kilometers

Source: Eurostat Energy Statistics
© Eurogeographic for the administrative boundaries;   © DG ENER - September 2016

Energy

2.2.2.1 Price evolution – Total prices

The average[17] median industrial natural gas consumer paid 36.5 €/MWh in 2015. The average price has decreased at the annual rate of 0.3% from 2008 to 2010. The annual average inflation rate accounted for 0.5% during the same period.[18]

Figure 19 - **Evolution of the average EU natural gas price for industrial consumers (I3)**
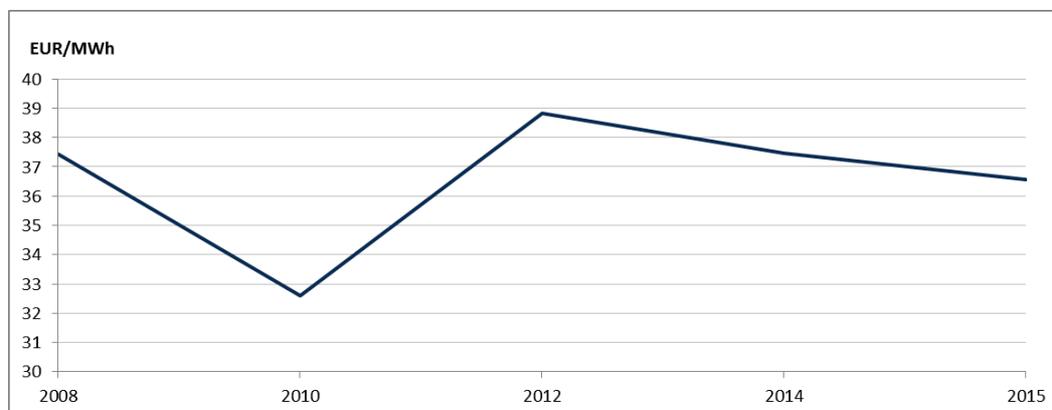
Source: European Commission, Member States

The highest observed price was less than two fold of the lowest observed price in the EU. Prices for median industrial consumers ranged from 28.72 €/MWh in Lithuania and 26.40 €/MWh in Turkey to 45.72 €/MWh in Finland in 2015.

Figure 20 - **Natural gas prices for industrial (I3) consumers in 2015 by country**
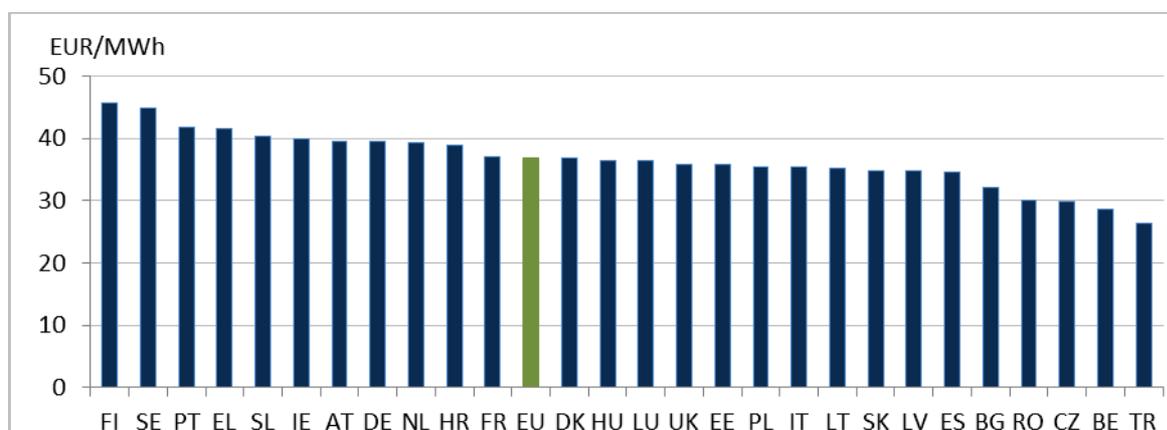
Source: European Commission, Member States

The following graph displays nominal price increases or decreases from 2008 to 2015 and national prices in 2015 relative to the 2015 average EU price[19].

---

[17] All average prices refer to weighted EU average prices.
[18] Producer Price Index, Eurostat sts_inpp_a
[19] 2010-2015 value for Austria

Figure 21 - **Gas price increases for industry (I3) and national prices relative to EU price in 2015**
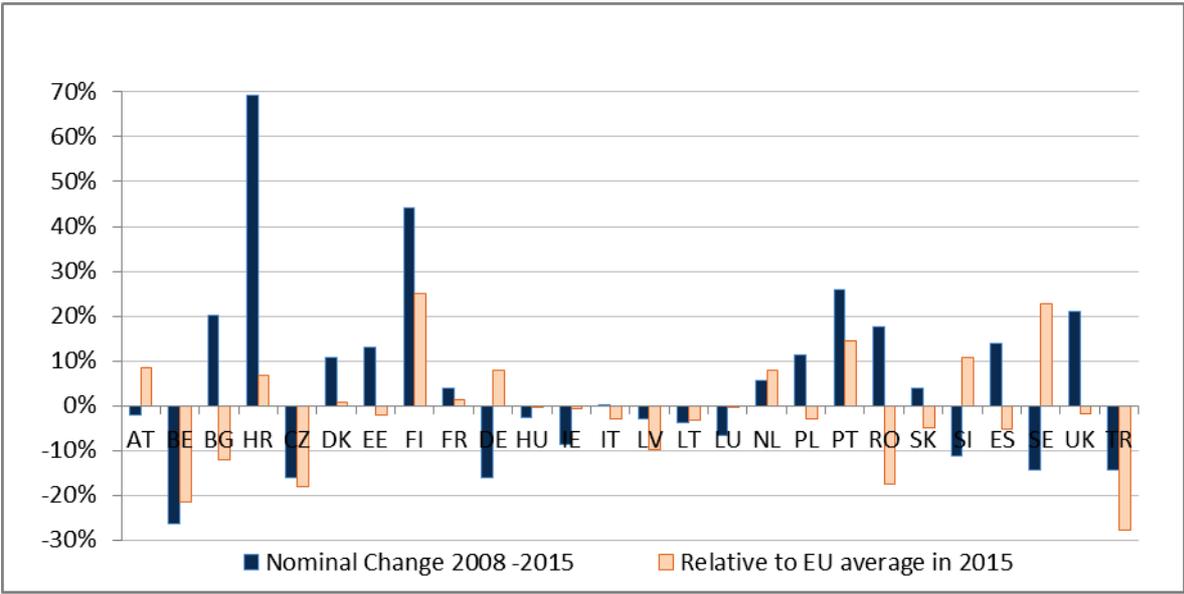
Source: European Commission, Member States

Figure 22 **- Gas price for industry (I3) by observation period and country**
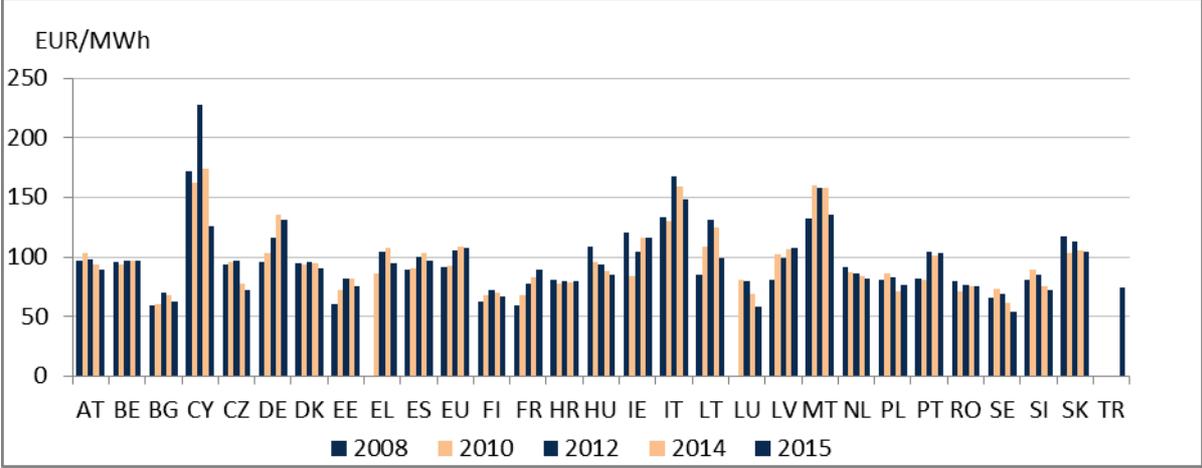
Source: European Commission, Member States

2.2.2.2 Price drivers – Main components

For a detailed description, please consult the section on the main components.

Figure 23 **- Gas price components (EU weighted av.) by observation period for industry (I3)**
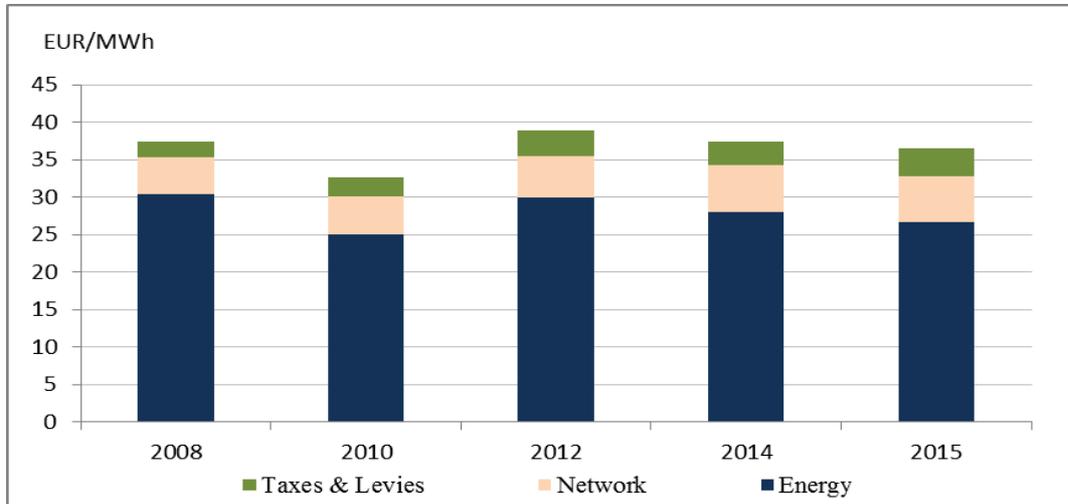
Source: European Commission, Member States

The average energy component decreased at the annual rate of 0.5% since 2008 and accounted for 26.5 €/MWh in 2015. For median industrial consumers the energy component was the largest of the three components in all reporting countries. The average network component increased at the annual rate of 3% and cost the average median industrial consumer 6.1 €/MWh in 2015.

The taxes & levies component experienced a faster increase of annual 11% but still remained the smallest component accounting only for 3.8 €/MWh in 2015.

Figure 24 **– Shares of gas price components for industry (I3)**
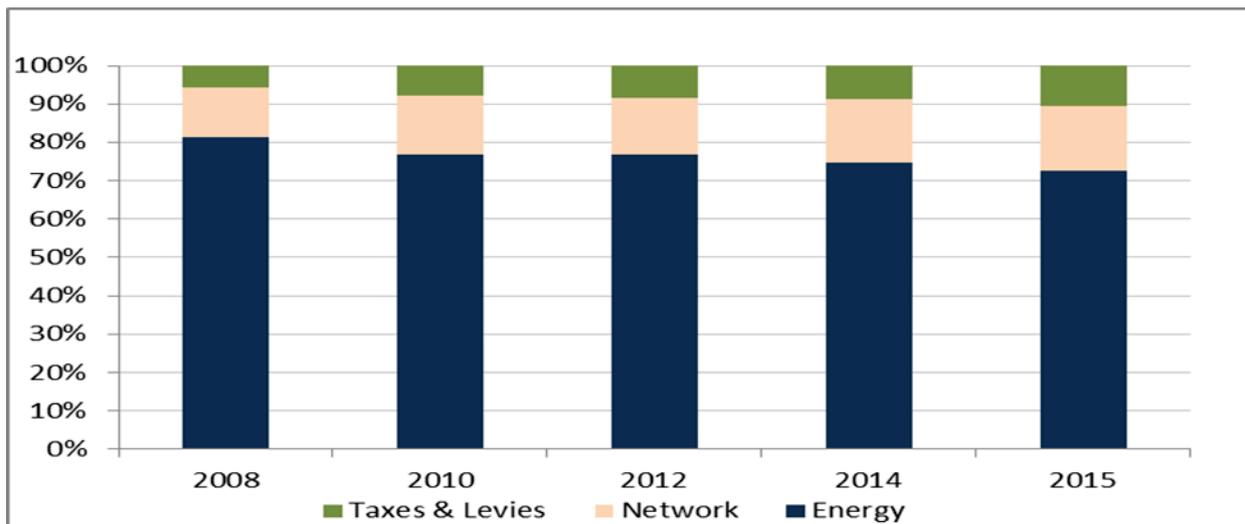
Source: European Commission, Member States

The share of the energy component in the total price decreased by 9 percentage points but it remained to make up two thirds of the total price in 2015.

The share of the network component slightly increased from 12% to 16%.

The share of the taxes& levies component in the total price increased by 5 percentage points from 5% to 10%.

Figure 25 **- Price components for industrial (I3) gas consumers in 2015 by country**
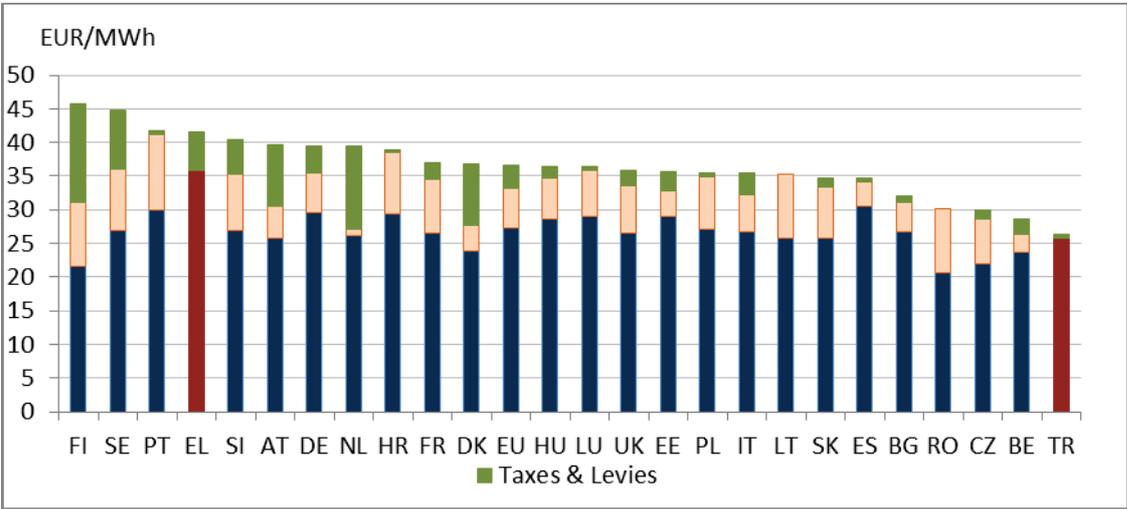
Source: European Commission, Member States

Figure 26 **- Price components for industrial (I3) natural gas consumers in 2015**
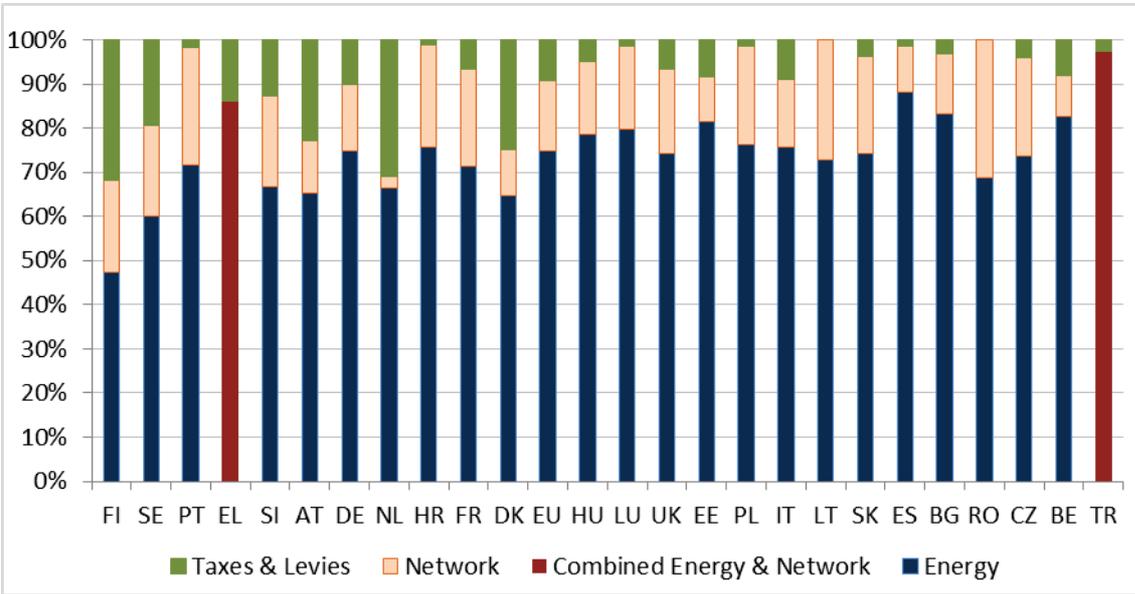
Source: European Commission, Member States

Developments within components for industrial gas consumers

The current edition of the Energy Prices and Costs study introduces sub- components within the network and taxes & levies components.

Energy component

Only one of the three price components, the energy component is determined by the market. Increasing competition contributes to decreasing energy components. The share of the energy component decreased by 8 percentage points and accounted for 73% of the average median industrial price in 2015. The levels of the network and taxes & levies components are set by divergent national laws and regulations. Their joint share in the average median household price increased from 19% to 27%. As the part of the price which is set by market forces has been gradually decreasing, total prices are imperfect indicators for the measurement of price dispersion. The dispersion of the energy component however adequately reflects the progress towards an internal energy market. The energy component of the average median industrial price became 58% less dispersed since 2008.

Network component

The Network component is broken down into two sub- components, namely transmission and distribution. Both transmission and distribution tariffs are regulated in all EU Member States as well as in Norway and Turkey. The allocation of cost elements (for example costs of infrastructure, losses, ancillary services) to the two sub- components might differ from country to country. Therefore, cross- country comparisons are to be undertaken with caution.

14 reporting countries provided the split between transmission and distribution tariffs[20].

Figure 27 – **Shares of transmission & distribution charges in 2015 for industrial gas (I3) consumers[21]**
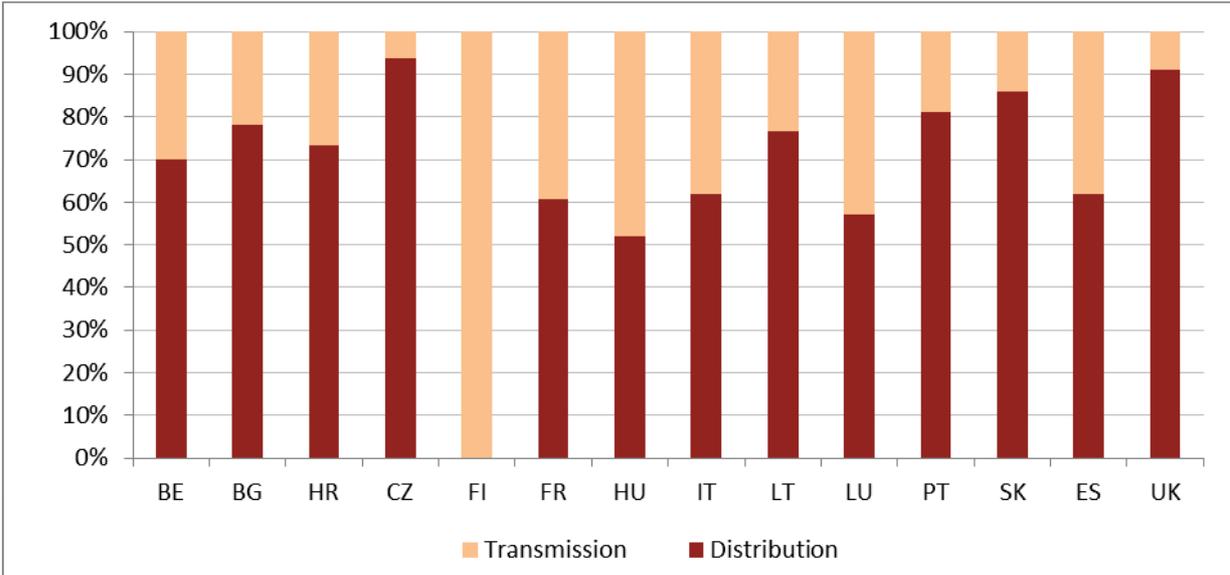
Source: European Commission, Member States

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[20] 2014 data for Portugal, Spain and the United Kingdom
[21] Data from 17 Member States were available. The graph displays 2014 shares for Estonia and the United Kingdom. There is no transmission grid on Malta, therefore all costs are attributed to the distribution system.

Taxes & Levies component

It is to be noted, that only explicitly reported cost elements could be allocated to specific policies and consequently taken into account for the analysis. For example, RES support costs exist in several countries which could not report such costs explicitly.

VAT is recoverable for most industrial consumers in all reporting countries, therefore the current study analyses prices excluding VAT and other recoverable taxes.

Non- recoverable, not- earmarked taxes (for instance excise tax) accounted for 75% of the total average taxes and levies component.[22]

In Lithuania and Romania median industrial natural gas consumers do not pay any taxes or levies.

In the period 2008-2015 altogether 14 reporting countries have not imposed any energy policy relevant levies, fees or charges on median industrial natural gas prices. 10 countries imposed levies in at least one year (not necessarily in all years). While 25 EU Member States impose explicit renewable energy support levies[23] on industrial electricity consumption, only Italy does so, on natural gas bills.

Figure 28 **- Overview of sub- components on natural gas bills for median industrial consumers**

Sub- Component	Number of Countries	List of Countries
RES & CHP	1	IT
Nuclear	0	
Social	3	BE, FR, IT
Security of Supply	3	FI, GR, HU
Concession fees	3	AT, BE ,PT
Market operation	2	BE, CZ
Energy Efficiency	1	SI

Source: European Commission, Member States

Concession fees for the occupation of public land, imposed by 3 Member States represented the most commonly applied levy on natural gas bills. Also 3 countries applied levies related to security of supply and social policies.

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[22] includes tax data from Greece and Ireland
[23] RES support costs occur in all 28 Member States regardless if they are levied explicitly or not

2.2.3 Large Industrial Natural Gas Prices

The following chapter analyses natural gas retail prices paid by industrial consumers whose annual consumption falls in the range of 1 million to 4 million GJ. This consumption band is defined by Eurostat terminology as I5. The chapter does not only reflect on developments of large industrial prices but analyses them in comparison to median industrial prices. Disaggregated natural gas prices were reported by 20 EU Member States. Natural gas is not used on Cyprus and Malta, therefore these countries do not report such prices.[24] In Croatia, Greece, Ireland, Luxembourg, Latvia and Slovenia there is either no consumer in this consumption band or data is confidential.

Summary

The average natural gas price of 26.6 EUR/MWh for large industrial consumers in 2015 was below that of 2008. The energy component with its share of 84% in the total price remained by far the largest component and thus the most prominent driver of the price evolution. The impact of taxes and levies on the total price is limited, as such made up only 8% of the bill.

Industrial gas prices are determined by international commodity prices rather than highly divergent national taxes and levies, therefore prices for large industrial consumers show relatively small variation across Europe. The composition of large industrial prices remained remarkably stable over time.

Progress towards a single energy market is mirrored by the increased convergence of large industrial natural gas prices as such became 26% less dispersed since 2008. This trend is underlined by the evolution of national energy components which became 30% less spread out across the EU.

2.2.3.1 Price evolution – Total prices

The average natural gas price for large industrial consumers was 26.6 EUR/MWh in 2015. This average price decreased since 2008 at the annual rate of half a percent. The average annual inflation rate accounted for the same figure, 0.5% during the period.[25]

Figure 29 - **Weighted EU average natural gas price for large industrial consumers (I5)**
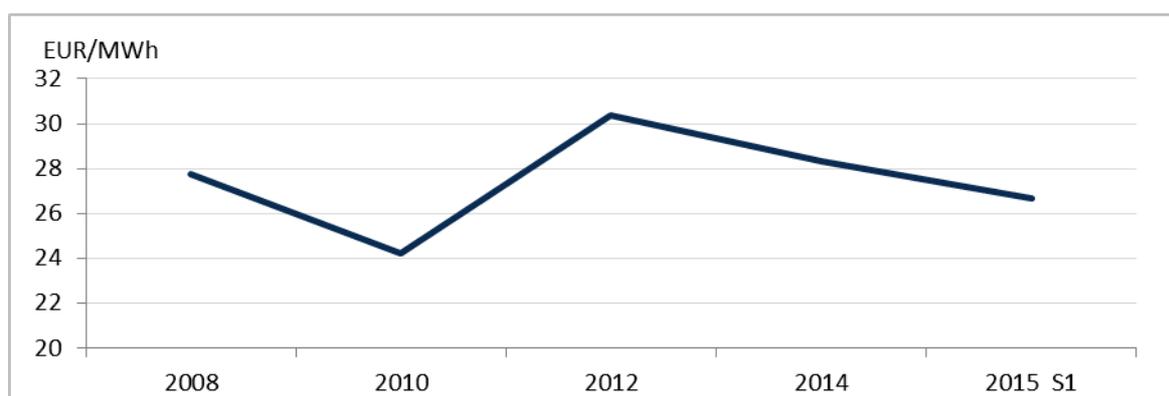
Source: European Commission, Member States

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[24] Finland reported industrial natural gas prices and Ireland reported VAT and excise tax for all bands.
[25] Producer Price Index, Eurostat sts_inpp_a

Prices for large industrial consumers ranged from 22.91 €/MWh in Belgium to 41.40 €/MWh in Finland[26] in 2015.

Figure 30 **- Natural gas prices for industry in 2015 - large (I5) vs median (I3) consumers**
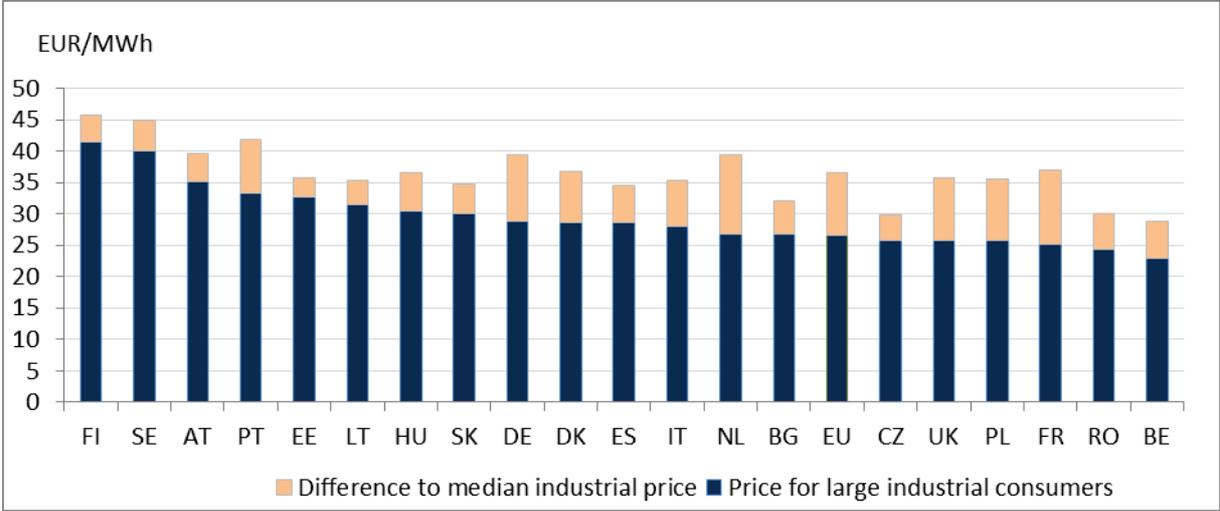
Source: European Commission, Member States

In some countries large industrial consumers pay considerably less than median[27] industrial consumers, in other countries price differences are smaller. This highlights the fact that despite efforts towards the creation of a single EU energy market, retail price conditions remain persistently different across Member States. Such differences are in sharp contrast with developments on wholesale markets where major benchmarks are broadly aligned.

Figure 31 **- Difference of median and large industrial price as % of large industrial price**
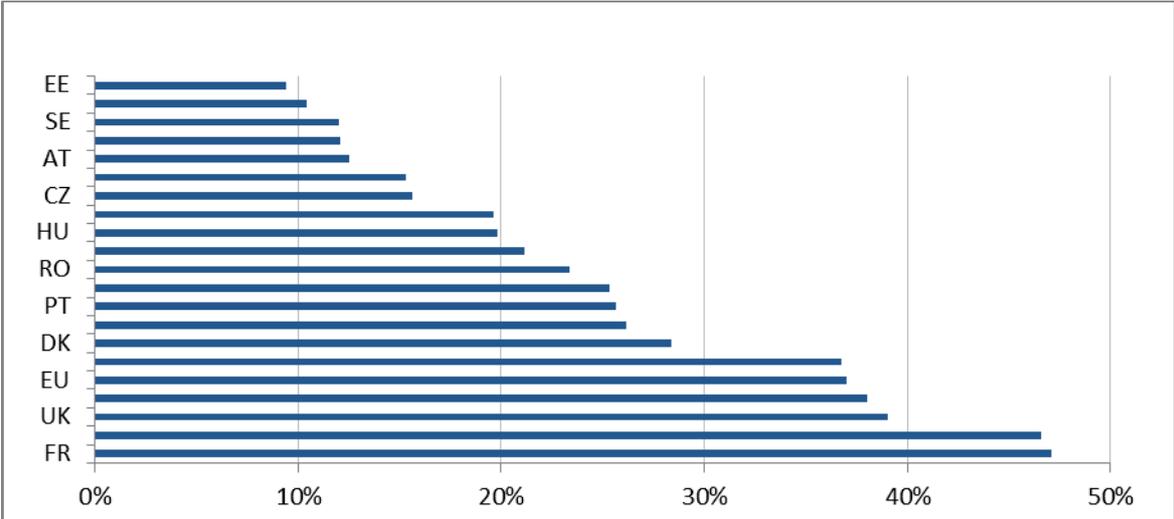
Source: European Commission, Member States

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[26] It is to be noted that according to total prices formed as the aggregation of price elements reported for the ad-hoc data collection, Finland has the highest industrial natural gas price of 0.0457 €/MWh followed by the Swedish price of 0.0448 €/MWh.
[27] Eurostat consumption band I3

In absolute terms the Netherlands recorded the biggest difference of 12 EUR/MW between the median and the large industrial price, followed by France, the United Kingdom and Germany (differences above 10 EUR/MWh). In relative terms France and the United Kingdom reported the highest price differences of 47% while in Estonia the difference was only 9%.

Figure 32 **- Price changes and national price relative to (weighted av.) EU price in 2015 for large industrial consumers (I5)** [28]
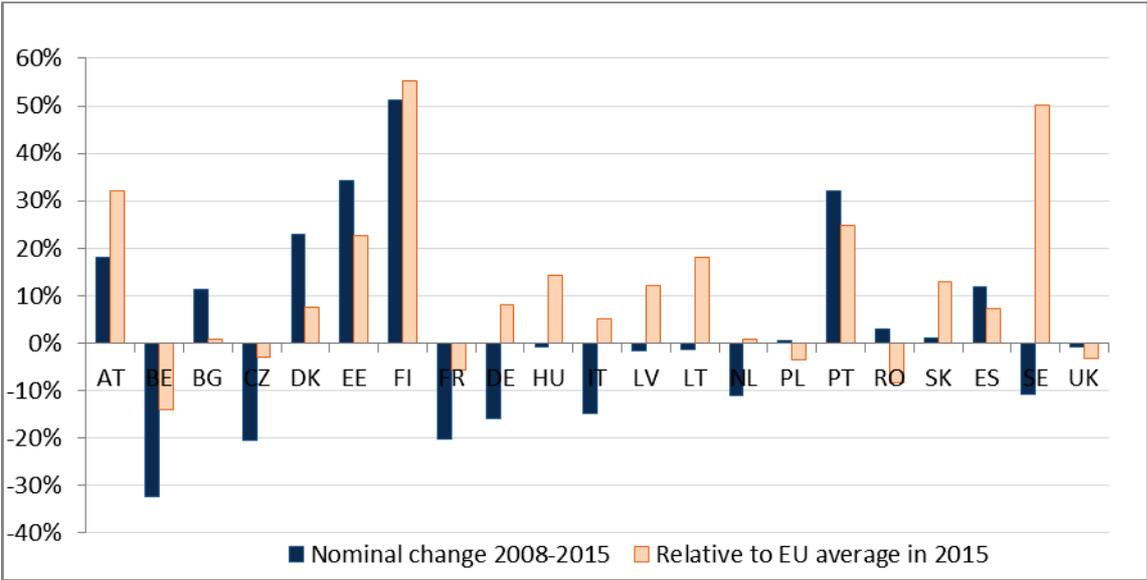
Source: European Commission, Member States

Figure 33 - **Natural gas prices for large industrial consumers (I5) by country**
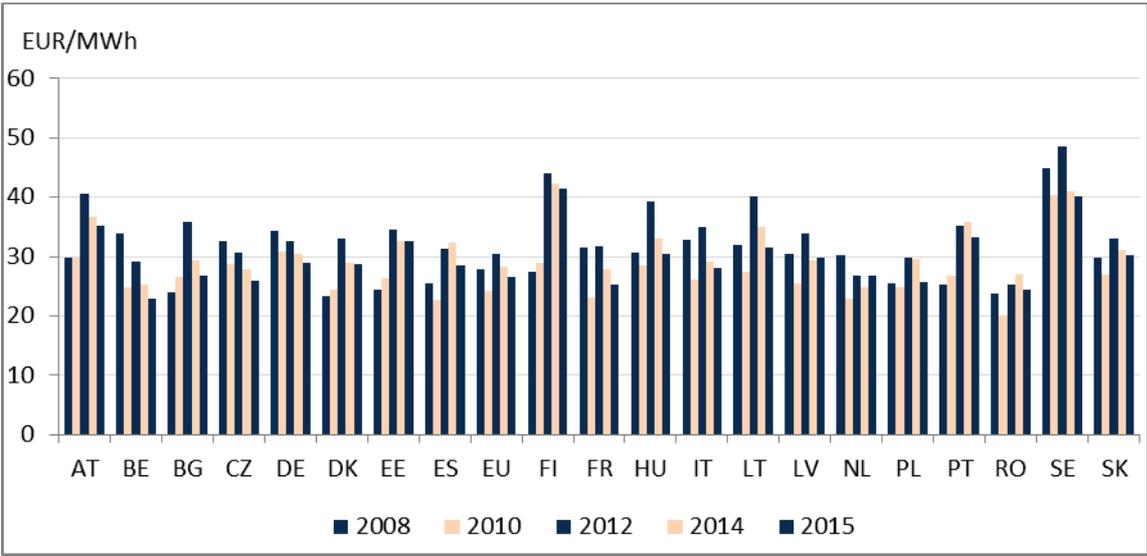
Source: European Commission, Member States

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[28] 2010-2015 value for Austria

2.2.3.2 Price drivers – Main components

For a detailed description, please consult the section on the main components.

Figure 34 - EU average price components for large industrial natural gas consumers (I5)
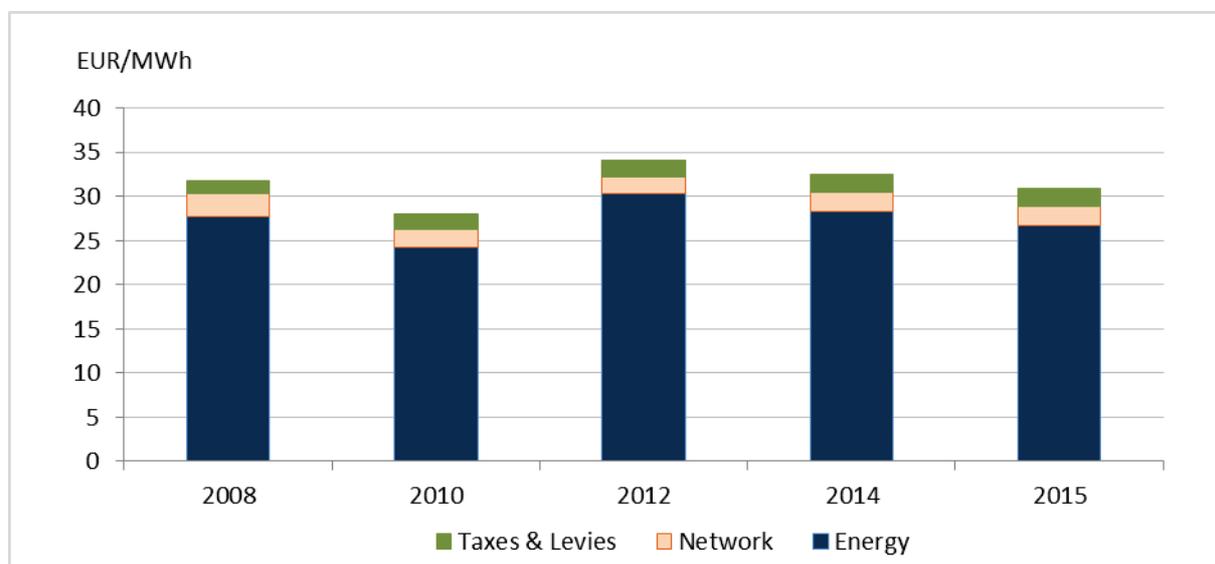
Source: European Commission, Member States

The average Energy component decreased at the annual rate of 0.8% since 2008 and accounted for 22.37 €/MWh in 2015.

The average Network component decreased at the annual rate of 1.9% and accounted for 2.21 €/MWh in 2015.

The Taxes & Levies component increased at the annual rate of 4.4% and accounted for 2.08 €/MWh in 2015.

Figure 35 - Share of price components in the EU average price for large industrial gas consumers(I5)
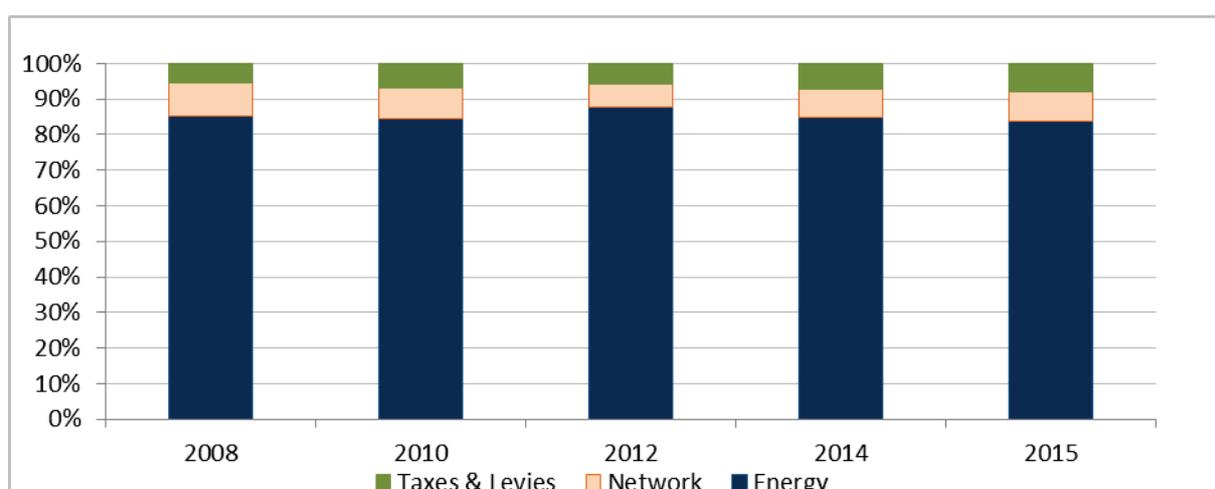
Source: European Commission, Member States

The share of the Energy component in the total price decreased by 1 percentage point and accounted for 84% of the total price in 2015. The energy component remained the largest of the three components in all reporting countries.

The share of the Network component remained constant at 8%.

The share of the Taxes& Levies component in the total price increased by 3 percentage points from 5% to 8%.

Figure 36 - **Price components by country in 2015 for large industrial gas consumers (I5)** [29]
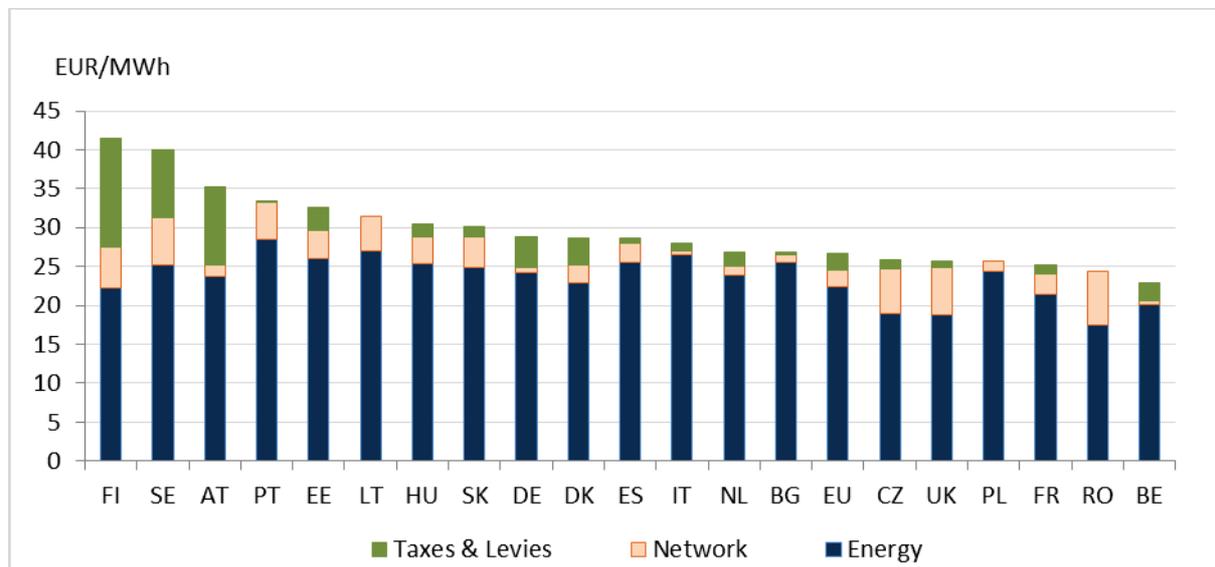
Source: European Commission, Member States

Figure 37 - **Share of price components in 2015 by country for large industrial gas consumers (I5)**
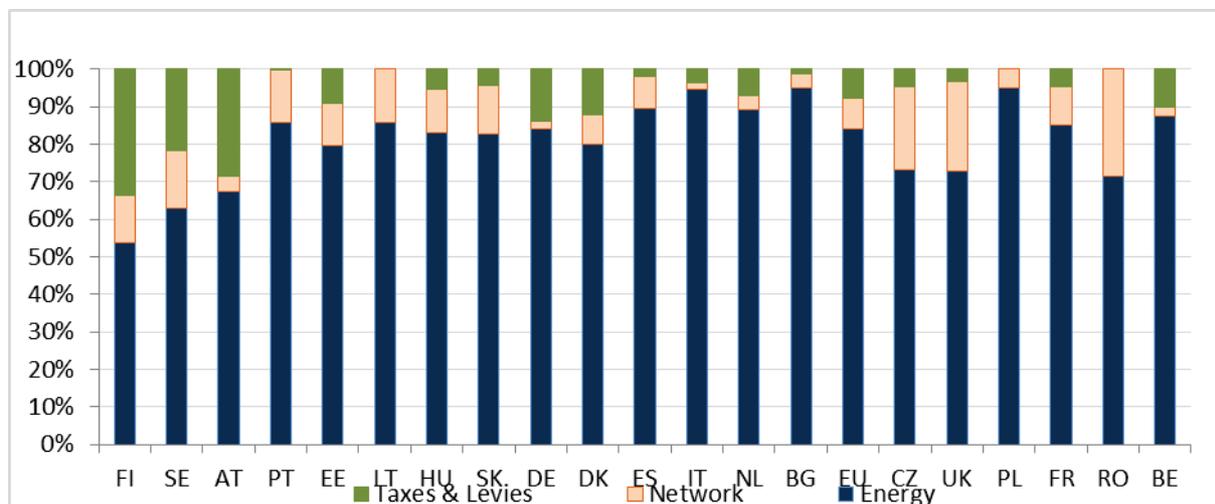
Source: European Commission, Member States

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[29] It is to be noted that according to Eurostat (nrg_pc_203) data Sweden has higher industrial prices than Finland.

Developments within components for large industrial consumers

It is to be noted, that only explicitly reported cost elements could be allocated to specific policies and consequently taken into account for the analysis. For example, RES or nuclear decommissioning costs exist in several countries which could not report such costs explicitly.

Energy component

Only one of the three price components, the energy component is determined by the market. Increasing competition contributes to decreasing energy components. The share of the energy component decreased by 1 percentage points and accounted for 84% of the average large industrial price in 2015. The level of the network and taxes & levies components are set by divergent national laws and regulations. Their joint share in the average large industrial price increased from 5% to 6%. As the part of the price which is set by market forces has been moderately decreasing, total prices are imperfect indicators for the measurement of price dispersion. The dispersion of the energy component however adequately reflects the progress towards an internal energy market. The energy component of the average industrial price became 17% less dispersed since 2008.

Network component

The Network component is broken down into two sub- components, namely Transmission and Distribution. Both transmission and distribution tariffs are regulated in all EU Member States as well as in Norway and Turkey. The allocation of cost elements (for example costs of infrastructure, losses, ancillary services) to the two sub- components might differ from country to country. Therefore, cross- country comparisons are to be undertaken with caution.

12 reporting countries provided the split between transmission and distribution tariffs[30].

Figure 38 **- Transmission & distribution shares in 2015 for large industrial consumers (I5)** [31]
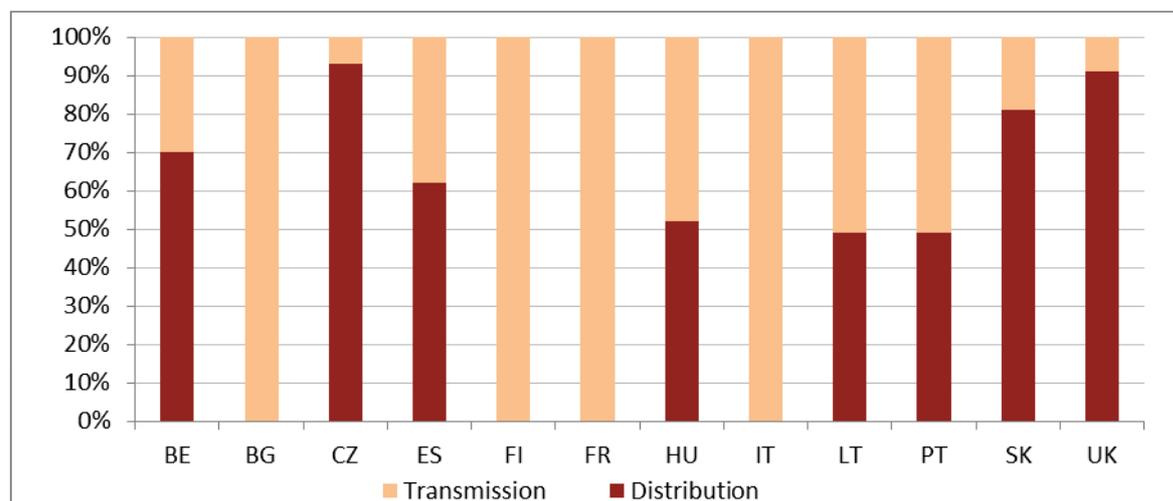
Source: European Commission, Member States

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[30] 2014 data for Spain, Portugal and the United Kingdom.
[31] Data from 17 Member States were available. The graph displays 2014 shares for Estonia and the United Kingdom. There is no transmission grid on Malta, therefore all costs are attributed to the distribution system.

Transmission shares ranged from 6% in the Czech Republic to 100% in Bulgaria, Finland and Italy, highlighting the lack of harmonization of the definitions for transmission and distribution.

Taxes & Levies component

VAT is recoverable for industrial consumers, therefore the current study analyses prices excluding VAT and other recoverable taxes.

The share of taxes and levies in the EU average price is 8%. The impact of energy policy relevant levies is the least significant for this type of consumer. In Lithuania and Romania industrial natural gas consumers do not pay any taxes or levies.

Table 4. Overview of sub- components on natural gas prices for large industrial consumers

Sub- Component	Number of Countries	List of Countries
RES & CHP	1	IT
Nuclear	0	
Social	3	BE, FR, IT
Security of Supply	2	FI, HU
Concession fees	3	AT, BE ,PT
Market operation	2	BE, CZ
Energy Efficiency	0	

Concession fees for the occupation of public land, imposed by 3 Member States represented the most commonly applied levy on natural gas bills.

EUROPEAN
COMMISSION

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PART 3/13

COMMISSION STAFF WORKING DOCUMENT
Accompanying the document

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE
COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE
COMMITTEE OF THE REGIONS

Energy prices and costs in Europe

{COM(2016) 769 final}

EN   **EN**

Contents

3 Oil product prices

Main findings

- After three and a half years of relative stability, crude oil prices started to fall in mid-2014, driven by robust supply growth and relatively weak demand. At the beginning of 2016, Brent dropped to 26 USD/bbl, the lowest level since 2003. Since then, prices recovered and since June 2016 Brent has been trading in the 40-50 USD/bbl range.

- Expectations of the global oil market reaching a balance have been pushed back to 2017, although the agreement of OPEC countries reached in September 2016 to cut output may hasten rebalancing. In any case, high stock levels suggest that prices will remain subdued throughout 2016 and 2017. In the longer run, a shortfall in investment is likely to lead to tighter markets and higher prices.

- The crude oil price is the main driver for the development of the wholesale prices of oil products although other factors, like the supply-demand situation in the specific oil product market, refinery maintenance or seasonality can also influence the prices.

- In addition to the crude oil price, the retail price of oil products is also influenced by the costs of refining and distribution, variations in exchange rates (crude oil is traded in US dollar but the finished products are sold at the pump in euros or other national currencies) and tax rates. In fact, the share of crude oil in the final price can be as low as 25% and, therefore, variations in the price of crude oil have a limited impact on the price at the pump.

- In 2014-2015, the high share of taxes, the weakening of the euro and – in part of the Member States – the increasing excise duty rates moderated the pass-through of falling oil prices to the retail prices of oil products in Europe. In 2015, the tax component of the average gasoline and diesel price was 63% and 57%, respectively.

3.1 Crude oil prices

Crude oil prices reached unprecedented levels in 2008, exceeding 140 USD/bbl at the height of the "commodity super cycle" which was driven by the rising demand from emerging markets, particularly China. The price increase was interrupted by the financial crisis, with a sharp downturn in the second half of 2008. However, as demand recovered, prices began to rise again and crossed the 100 USD/bbl level again in early 2011. This was followed by three and a half years of remarkable price stability, with Brent rarely leaving the 100-120 USD/bbl range.

Crude oil prices have been on a declining trajectory since mid-2014, driven by weak demand and robust supply growth. In the first half of 2015, prices bounced back as the falling number of active rigs in the US and the news about oil companies cutting upstream spending have raised expectations that supply growth could soon ease. However, as the global market remained oversupplied, prices continued to decrease. From a 115 USD/bbl peak in June 2014,

Brent dropped to 26 USD/bbl on 20 January 2016, its lowest level since 2003. This means the price decreased by 77% in 19 months. By June, prices recovered to around 50 USD/bbl and, since, then, have been trading in the 40-50 USD/bbl range.

Figure 105 - **The Brent crude oil price from 2008**
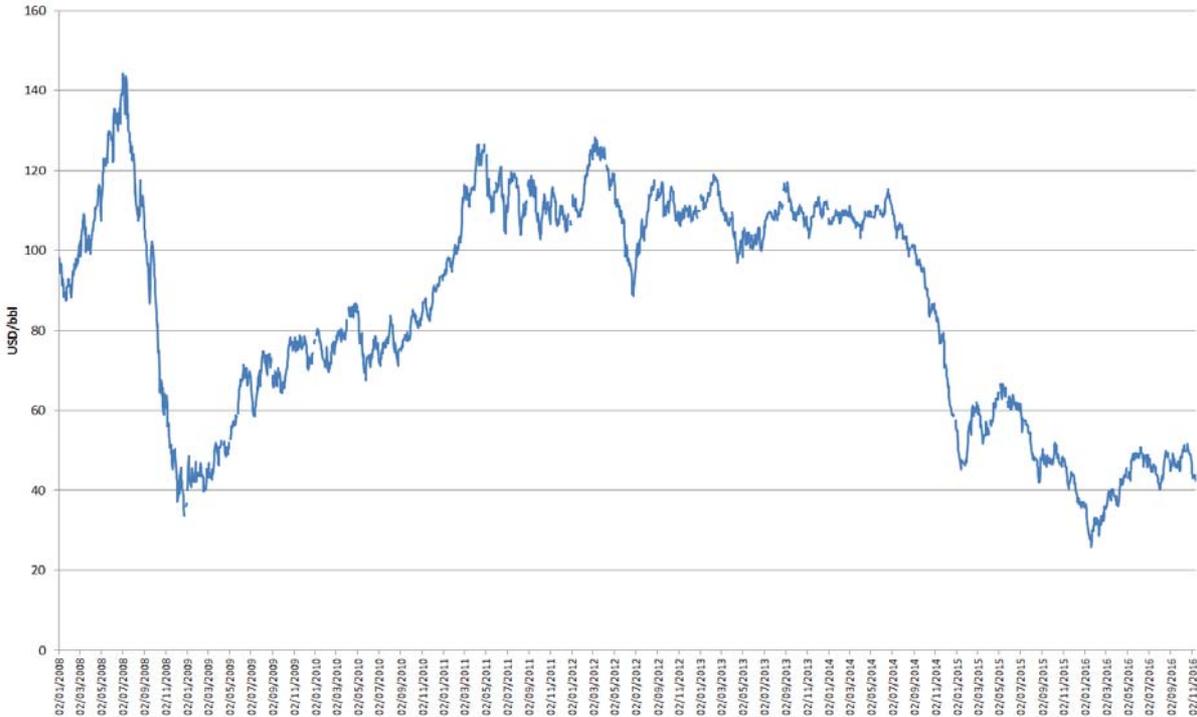
Source: Platts

Weak demand growth

Global oil demand growth has significantly weakened in 2014, mainly because of lower than expected global economic growth and mild winter temperatures. In addition to these cyclical and one-off factors, we can also see deeper underlying changes in oil demand: energy efficiency measures such as CO_2 standards for cars are increasingly implemented throughout the world and are starting to have an effect on global demand.[1] The high oil prices of the past decade have also supported a switch to other sources of energy and structural changes in the economic activities.

China remains the main contributor of global demand growth but its demand growth has noticeably slowed down as the country is entering a less oil-intensive stage of development. Concerns over China's growth prospects – in the wake of the stock market turmoil, followed by the devaluation of the yuan in August 2015 – also contributed to the falling oil prices.

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[1] According to the IEA's 2015 World Energy Outlook, the coverage of mandatory energy efficiency regulation expanded to 27% of global energy consumption in 2014.

Global demand growth gained momentum and reached a five-year high in 2015 (+1.8 mb/d according to the IEA), helped by economic growth and the lower prices. 30% of the growth was coming from OECD countries and, unusually, even Europe registered a demand growth.

Although the macroeconomic backdrop is expected to improve in 2016 (the IMF, in its January 2016 World Economic Outlook, cited global economic growth rising to 3.4% in 2016 and 3.6% in 2017, from 3.1% in 2015), the IEA forecasts global oil demand growth to slow down to 1.2 mb/d. Almost all of this growth will come from the non-OECD countries. The support provided by low oil prices to demand in 2015 seems to fade away. In fact, several countries wisely used this opportunity to cut or reduce subsidies which curbs their demand outlook.

Robust non-OPEC supply growth

According to the IEA, non-OPEC output grew by a robust 2.5 mb/d in 2014, well above the increase of global demand. The better part of this growth, 1.9 mb/d, came from OECD countries, driven by increasing unconventional oil production in North America. In the last few years, US light tight oil and Canadian oil sands created an important new source of supply. (Production of light tight oil picked up well before 2014, but this additional supply was largely offset by supply disruptions and outages, mainly in Libya and Iran.)

Low oil prices undeniably have an impact on supply: they have prompted the oil industry to slash investment spending and delay or cancel projects. However, it takes time for today's investment decisions to translate into lowered physical supply. In fact, in spite of the falling prices and the investment cuts, non-OPEC supply continued to grow in 2015, although the increase eased to 1.5 mb/d in 2015 which is still a significant growth compared with historical trends.

Even US light tight oil production proved to be rather resilient to low prices. Light tight oil basically requires continuous investments to sustain production, more than conventional oil. Accordingly, analysts expected that low prices would trigger faster supply side reductions. Although drilling activity decreased significantly, this was at least partly offset by improving efficiency and cost reductions. For most of the time, prices remained high enough to support drilling in core areas of major light tight oil plays.

In 2016, lower prices and spending cuts are finally expected to bring non-OPEC supply growth to a halt: according to the IEA, non-OPEC supply is set to decrease by 0.9 mb/d in 2016.

OPEC output policy

In spite of the falling prices, OPEC countries chose not to cut production in an attempt to maintain market share and to squeeze out high-cost producers. This was a fundamental change from OPEC's traditional policy of adjusting supply to balance markets and stabilise prices. In an effort to retain market share, OPEC continues to produce at near-record levels.

Furthermore, the lifting of the Iranian sanctions in January 2016 allowed Iran to increase its oil exports, adding to an already high OPEC output and further delaying the market rebalancing.

On 16 February 2016, three OPEC members – Saudi Arabia, Qatar and Venezuela – plus Russia said they are ready to freeze crude production at January 2016 levels, if other oil producers join this initiative. However, in their meeting on 17 April, producers failed to reach an agreement.

In late September 2016, OPEC ministers tentatively agreed in Algiers to limit their production to between 32.5 and 33 mb/d[2], in order to accelerate the drawdown of the stock overhang and bring the rebalancing forward. The organization's next formal meeting on 30 November is scheduled to decide on each country's allocation and the date for the ceiling to take effect. In the meantime, OPEC will consult key non-OPEC producers about the possibility of reducing their production.

Outlook

Continued stock builds indicate that the global market remains oversupplied. According to the IEA, the "call on OPEC" (the level of OPEC crude oil production needed to balance global demand and supply) will remain below the current level of OPEC production in 2017.[3] This implies that – if OPEC won't change output – the global oil market will not find balance in 2017. The implementation of the OPEC agreement of September 2016 to cut output can potentially bring the rebalancing forward. In any case, the high level of stocks accumulated over the last two years will limit the potential for a significant price rise in the short term. Accordingly, oil prices are expected to remain subdued throughout 2016 and 2017. On the other hand, geopolitical risks remain high and possible supply disruptions can tighten the global oil market.

Sustained low prices are not likely to trigger the necessary supply side investments; upstream investments in the oil sector have indeed dropped sharply. In the longer run, a shortfall in investment will probably lead to tighter markets and higher prices, although the extent and pace at which oil prices will bounce back to higher levels remains to be seen.

On the demand side, efficiency policies and the climate change agreement reached at COP21 are likely to restrain demand for oil, translating in less likely prospects for a high oil price environment in the future.

3.2 Wholesale prices of oil products

Crude oil is the main feedstock to produce oil products and, not surprisingly, oil product prices closely follow the development of the crude oil price. This is clearly visible if we compare the Brent oil price with the representative wholesale prices of the main oil products in Western Europe.

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[2] According to the IEA, OPEC output was 33.83 mb/d in October 2016.
[3] Oil Market Report, 10 November 2016

Figure 106 - **Crude oil (Brent) vs wholesale gasoline, diesel and heating oil prices (2008-2015)**
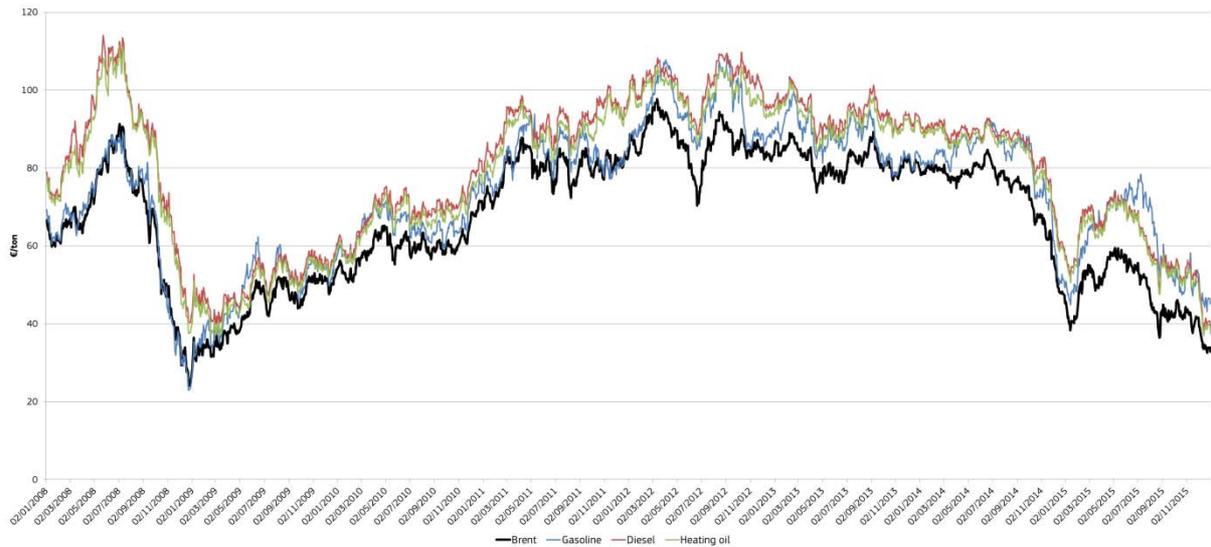
Source: Platts, ECB
The following oil product prices were used: Gasoline Prem Unleaded 10ppmS FOB AR Barge (gasoline), ULSD 10ppmS FOB ARA Barge (diesel) and Gasoil 0.1%S FOB ARA Barge (heating oil)
Crude oil prices are reported in USD/bbl while product prices in USD/ton. The following conversion rates were used to convert product prices: gasoline 8.5 bbl/ton, diesel and heating oil 7.5 bbl/ton.

Nevertheless, there is no clear one-to-one relationship between crude oil prices and oil product prices. Looking at the crack spreads, i.e. the differential between the price of oil products and crude oil, one can see that these are rather volatile and often follow different paths for different products.

Figure 107 - **Crack spreads of gasoline, diesel and heating oil in 2008-2015**
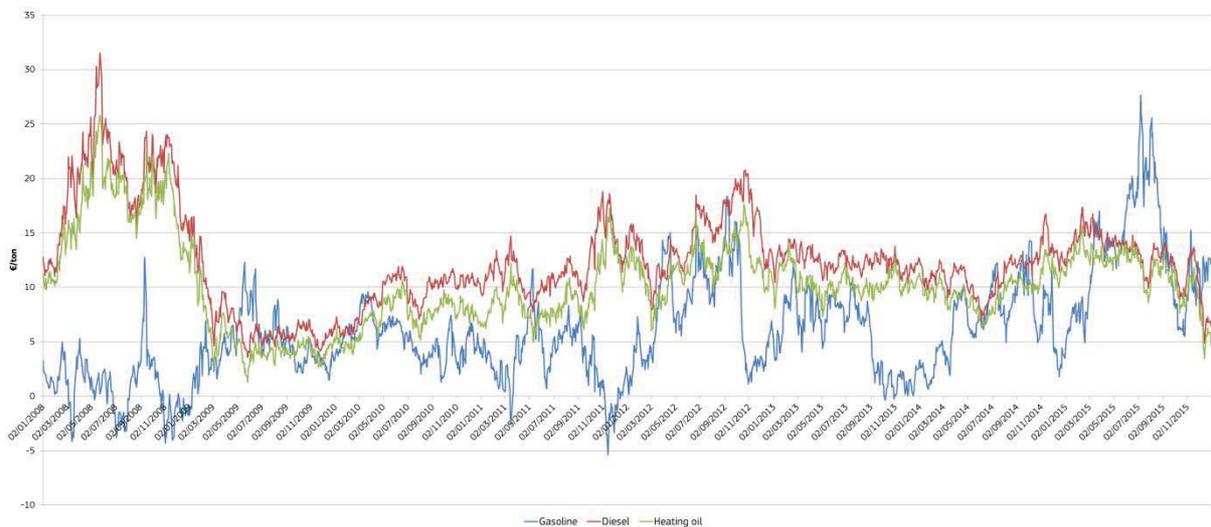
Source: Platts, ECB
Crack spreads are calculated as the difference between the Brent crude oil price and the price of the following products: Gasoline Prem Unleaded 10ppmS FOB AR Barge (gasoline), ULSD 10ppmS FOB ARA Barge (diesel) and Gasoil 0.1%S FOB ARA Barge (heating oil)

The supply-demand conditions of the different products are divergent (both from crude oil and from each other) which will affect their crack spreads. For example, the 2008 oil price rise was very much driven by industrial growth in China, leading to a big increase in the demand of middle distillates which is reflected in the high crack spreads of these products. There are also seasonal differences in demand, for example, gasoline demand is higher in the summer, typically resulting in a relatively high crack spread during that period while in times of low demand crack spreads can even turn negative (implying the gasoline is cheaper than crude oil). Oil product supply can also fluctuate, for example as a result of refinery maintenance; this will also affect crack spreads.

On the above figure one can see that European crack spreads have been relatively high in 2015 (averaging 13 €/bbl for both gasoline and diesel) which – in addition to exchange rate developments and high taxes (elaborated in the next subchapter) – limited the pass-through of falling oil prices to retail prices.

3.2.1 Impact of oil prices

Falling oil prices also influence the price of other energy sources, in particular gas. Falling oil prices directly affect the oil-indexed contracts (the role of which is gradually decreasing in Europe) and also put pressure on hub prices. In the last few years, European gas prices have indeed decreased substantially.

In principle, lower gas prices could make gas more competitive to coal and reverse the trend observed in recent years that coal fired generation was cheaper than gas fired. However, coal prices are also on the decline because of the global oversupply so the relative competitiveness of gas has not improved substantially. In fact, since late 2014, the development of European spot prices of coal and gas show a remarkable similarity, suggesting that the relative competitiveness of the two fuels has stabilized. In the second half of 2016, however, coal prices started to increase, thereby improving the relative competitiveness of gas.

3.3 Retail prices of oil products

In addition to electricity and gas, oil products constitute an important part of the energy costs of both households and industry. Oil products have a dominant role in transport where they have limited alternatives, particularly in road freight, maritime and air transport. In case of space heating, the share of oil products is on a declining trend but in certain Member States they still have an important role in this sector.

The retail price of oil products depends on several factors.

Variations in the price of crude oil will obviously have an impact on retail prices but crude oil costs constitute just a part, often a relatively small part, of the final price paid by the consumer. Crude oil is traded in US dollar but the finished products are sold at the pump in euros or other national currencies. Therefore, variations in exchange rates will also influence the crude oil component.

Crude oil has to be refined to produce fuels which can be used in transportation, heating or other uses. After refining, the finished products have to be distributed and sold, typically at

petrol stations. Refining and distribution costs are relatively stable and are not proportional to the crude oil price.

A significant part of the price goes to taxes: excise duties, other indirect taxes and VAT. These taxes make an important contribution to the tax revenue of Member States (see Chapter 8). In case of motor fuels (gasoline and diesel), taxes typically cover more than half of the final price.

Excise duties are generally a fixed amount per quantity (usually litre or kg), i.e. not influenced by the price of crude oil. VAT, on the other hand, is set as a percentage of the price of the product (including the excise duty) and therefore changes in the crude oil price will have an impact on the absolute value of the VAT component.

Rates of both the excise duty and VAT vary by product and by Member State, resulting in significant price differences across Europe. Nevertheless, Member States have no complete freedom when setting the tax rates. The Energy Tax Directive (2003/96/EC) sets minimum excise duty rates for gasoline, gasoil, kerosene, LPG and heavy fuel oil. New Member States were often granted a transition period to reach the minimum level; today, all Member States comply with minimum level.

In case of VAT, the VAT Directive (2006/112/EC) requires that the standard VAT rate must be at least 15%; currently the standard VAT rates applied by Member States range from 17% (in Luxembourg) to 27% (in Hungary). In case of oil products, Member States typically apply the standard VAT rate.[4]

As the share of crude oil in the final price can be as low as 25%, variations in the price of crude oil will have a limited impact on the price at the pump. In fact, the high share of fixed taxes in the price acts as a buffer: fluctuations in the retail price of oil products (particularly motor fuels) are significantly lower than the fluctuation of the crude oil price. Variations in the exchange rate have a similar effect: the oil price and the value of the US dollar usually move in the opposite direction: a strengthening dollar typically coincides with decreasing oil prices and vice versa. This means that changes in the oil price, whether upwards or downwards, are mitigated by the exchange rate and the volatility of the oil price expressed in euros is smaller than the volatility of the price expressed in dollar.

During the recent drop of crude oil prices, the above factors moderated the pass-through to oil product prices in the EU: while crude oil prices fell by 77% between mid-2014 and early 2016, in the same period[5] the average EU consumer price of gasoline and diesel decreased by 24% and 28%, respectively. In case of heating oil, where the tax component is smaller, the decrease was 45%.

Methodology

The analysis in this section is based on the data of the weekly Oil Bulletin. Pursuant to the Council Decision on Crude Oil Supply Costs and the Consumer Prices of Petroleum Products (1999/280/EC), Member States have to report to the Commission the retail prices of the main petroleum products on a weekly basis. Member States also have to report any changes in the tax rates (VAT, excise duty, other indirect taxes) applicable to these products, allowing us to

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[4] Under certain conditions, Member States can set a lower VAT rate for specific products and services; for example, a few Member States apply a reduced rate for heating oil
[5] Between 30 June 2014 and 15 February 2016

break down the final price to three main components: the net price, excise duty[6] and VAT. The reported data are published on the website of DG Energy.[7]

The analysis covers the three main petroleum products sold in the retail sector: gasoline (Euro-super 95), diesel (automotive gas oil) and heating oil (heating gas oil). The time horizon is 2008-2015. All Member States are covered but data for Croatia is available only from 2013. In case of heating oil, Slovakia does not report prices since October 2011 while Greece has not reported from May 2015 to mid-October 2015.

Prices reported in currencies other than the euro were converted into euro, using the ECB exchange rate of the day for which the price applies.

For each year and each Member State an average price was calculated as an arithmetic average of the weekly prices and an EU average price was calculated as the weighted average of these. In the absence of 2015 consumption figures, for 2015 we used the 2014 consumption data as the weight.

Development of oil products prices

While the absolute level of the prices of the three oil products are different, their development over the last 8 years is very similar and basically reflects the evolution of the crude oil price in the same period. The price of all three products decreased significantly in 2009 when oil prices plummeted in the wake of the financial crisis. This was followed by years of gradual increase, with prices peaking in 2012. Since then, average product prices have been on the decline, with the price fall accelerating in 2015.

Figure 108 - **Average retail price of oil products in the EU**
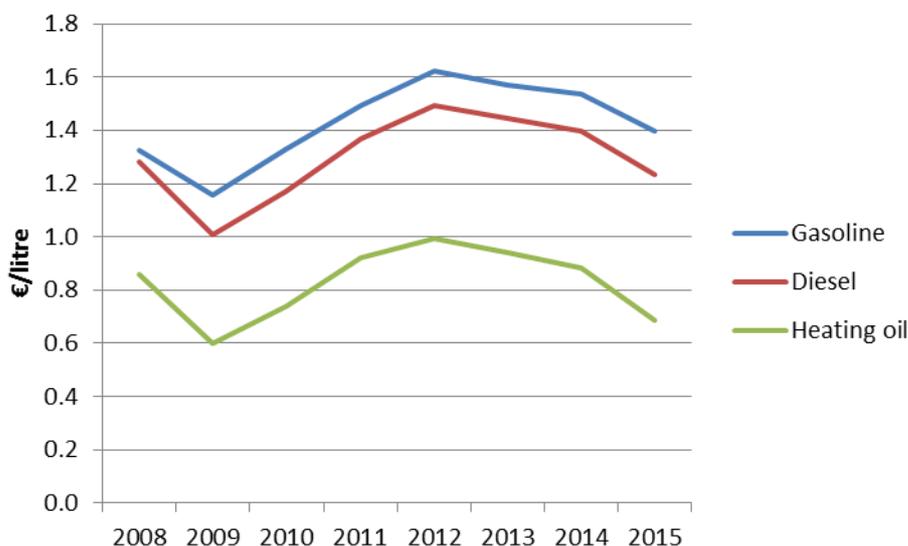
Source: Oil Bulletin, DG Energy

The difference in the absolute price of the three products can be mostly attributed to the diverging tax rates. In practically all Member States, the excise duty rate of gasoline is higher than that of diesel. The Energy Tax Directive also sets a higher minimum rate for gasoline (0.359 €/litre) compared to diesel (0.33 €/litre). The UK is the only Member State where the two motor fuels are taxed at the same level.

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[6] In this section, other indirect taxes are reported in the excise duty component
[7] https://ec.europa.eu/energy/en/statistics/weekly-oil-bulletin

In case of heating oil, a few Member States (Bulgaria, Hungary, the Netherlands and Romania) apply the same excise duty rates than for diesel. In most Member States, however, heating oil is taxed at a lower level. The minimum rate established by the Energy Tax Directive (0.021 €/litre) is much lower than those for motor fuels. Ireland, Luxembourg, Portugal and the UK also apply a reduced VAT rate for heating oil.

Although excise duty rates are set in absolute values, i.e. as a fixed amount per quantity of the product, several Member States increased the tax rates over the period, resulting in a gradually increasing (weighted) average tax rate. According to the Energy Tax Directive, the minimum excise duty rate for diesel increased from 0.302 €/litre to 0.33 €/litre on 1 January 2010, requiring some Member States to adjust their rates.

Figure 109 - **Average excise duty rates for oil products in the EU**

Source: Oil Bulletin, DG Energy

If the net price of the three different products is compared, the difference is significantly lower. In fact, during the whole period the net price of diesel is slightly higher than that of gasoline.[8] The below figure also depicts the evolution of the Brent crude oil price (recalculated into €/litre), showing that crude oil is clearly the main component of the net price.

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[8] Different net prices between oil products reflect the specific characteristics and particular dynamics of the each oil product market

Figure 110 - **Average retail price of oil products in the EU, without taxes**
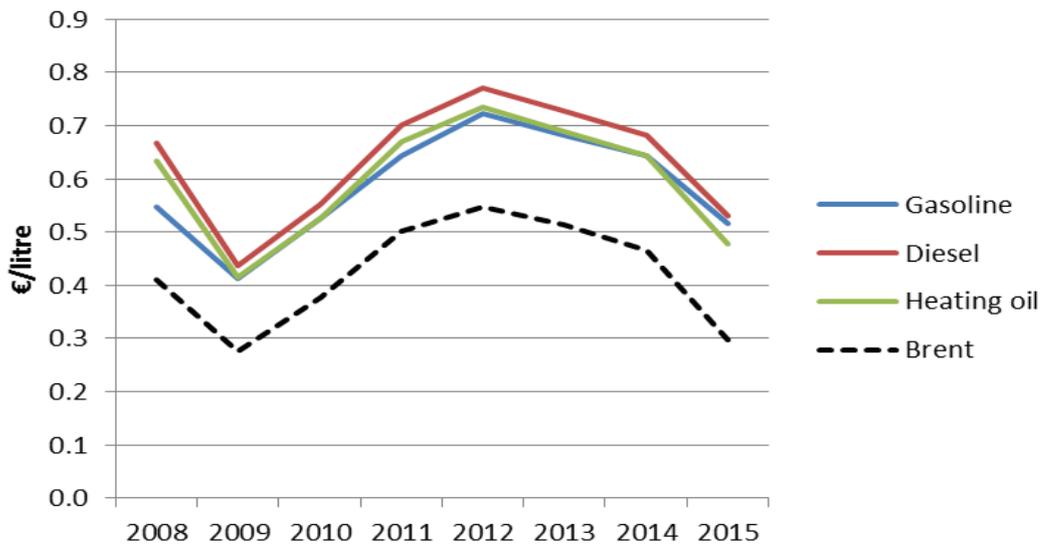
Source: Oil Bulletin, DG Energy, Platts

Over the period, crude oil price represented on average about 70% of the net price but in 2015, as crude oil prices dropped significantly, this share decreased to about 60%. The difference between the net price of the products and the crude oil price, which is supposed to cover transport, refining and distribution costs and any profits, have been volatile in 2008-2011 but relatively stable in 2012-2015, except a bigger increase in case of gasoline in 2015.

Figure 111 **- Crude oil price as a percentage of average retail prices without taxes and the difference between average retail prices without taxes and the crude oil price**
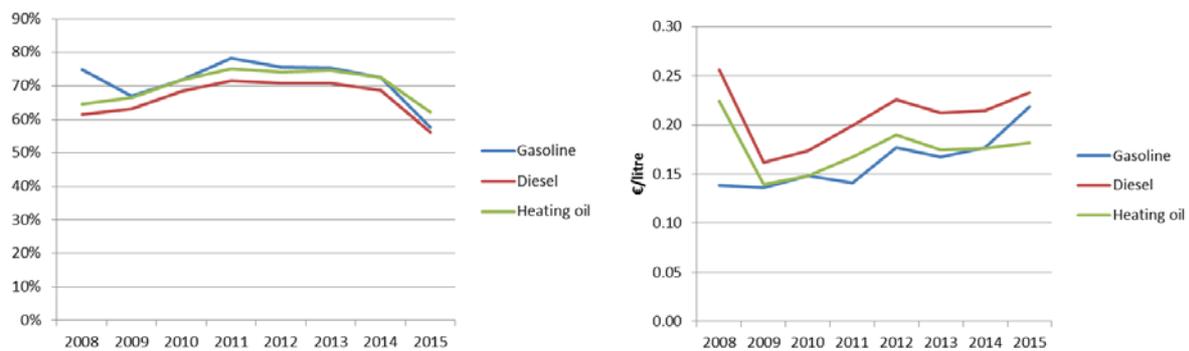
Source: Oil Bulletin, DG Energy, Platts

In the following subsections the average retail price of the individual fuels will be also compared to the corresponding wholesale prices of the products.

3.3.1 Gasoline

In most Member States, the evolution of gasoline prices clearly followed the trend of the crude oil price but there have been considerable differences in the absolute level, mainly explained by the diverging excise duty and VAT rates. Average prices moved in a relatively wide range, with the difference between the highest and lowest price being about 0.5 €/litre. This range has slightly narrowed over the period, from 0.52 €/litre in 2008 to 0.46 €/litre in 2015, indicating some degree of price convergence.

Figure 112 - **Average retail price of gasoline by Member State**
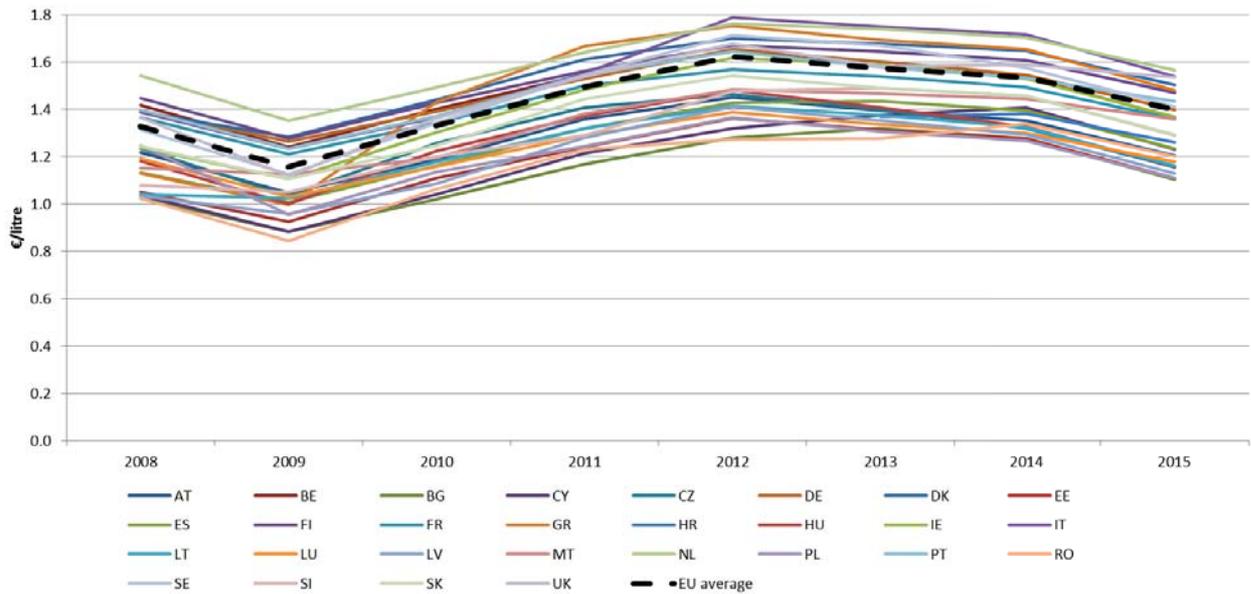
Source: Oil Bulletin, DG Energy

Greece showcased the biggest relative increase in gasoline prices: while in 2008-2009 Greek prices were well below the EU average, since 2011 they are among the highest, mainly as a result of the sharp increase of the excise duty rate. In 2015, EU average gasoline prices were 5% higher than in 2008; in case of Greece, the increase was 31%. At the other end of the spectrum, prices in Poland decreased by 11%, mainly because of the depreciation of the national currency (measured in Polish zloty, the average price increased).

Figure 113 - **Average retail price of gasoline by Member State, 2008=100**
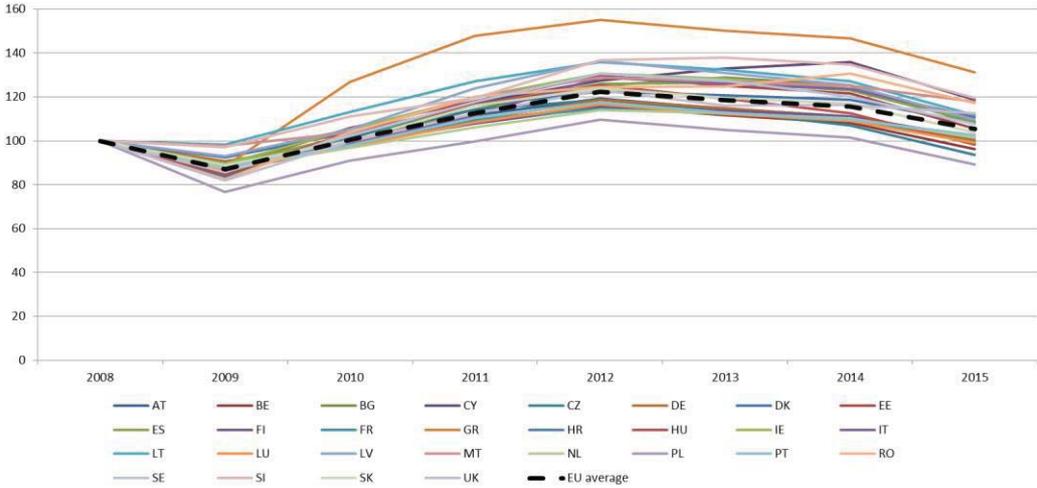
Source: Oil Bulletin, DG Energy

Looking at net prices, the dispersion is smaller, the difference between the highest and the lowest price is usually 0.10-0.15 €/litre. The net price depends on a number of factors, including the source of supply (local refinery or import), industry structure and competition. In 2015, the highest net price was reported by Malta while the lowest by the UK. (Yet, because of the high excise duty, the UK has one of the highest gasoline prices in the EU.) Comparing the average net price with a representative wholesale price (Platts Gasoline Prem Unleaded 10ppmS FOB AR Barge), the difference is relatively stable, amounting to 0.13 €/litre in each of the last four years.

Figure 114 - **Average retail price of gasoline by Member State, without taxes**
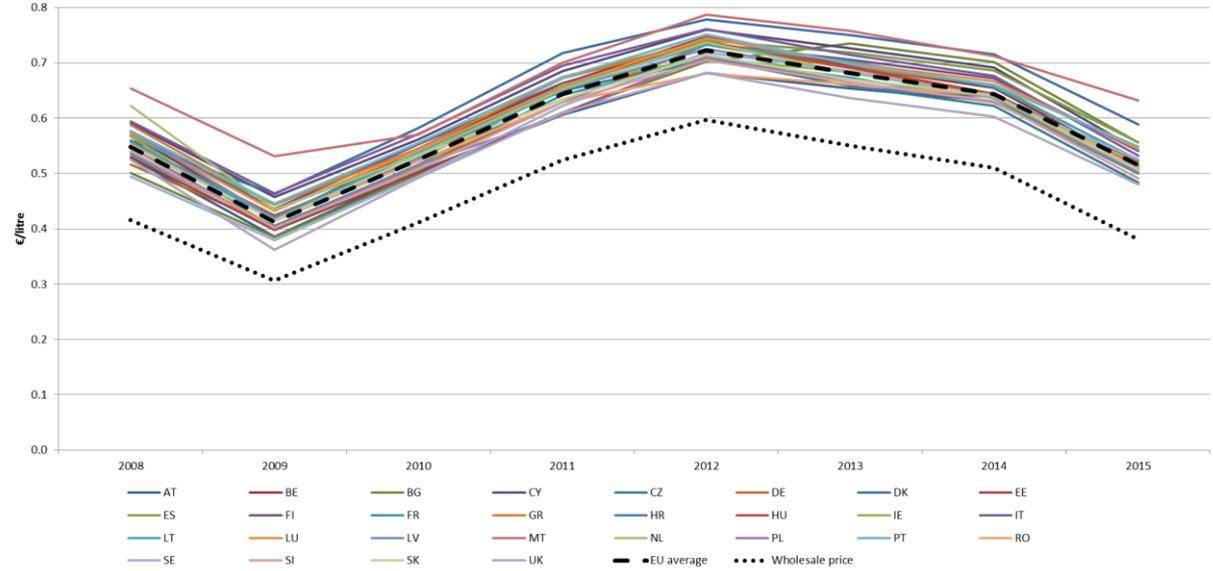
Source: Oil Bulletin, DG Energy, Platts
The wholesale price is Gasoline Prem Unleaded 10ppmS FOB AR Barge reported by Platts

Excise duty is an important component of the retail gasoline price; in 2015, in half of the Member State it exceeded the net price. Over the years, we see a gradual increase of the average excise duty rate. While in 2008 this was 56 eurocent/litre, by 2015 it increased to 64 eurocent/litre (an increase of 14% in 7 years). The average VAT rate also increased during this period, from 19.3% in 2005 to 21.0% in 2015. In most Member States, excise duty rates increased between 2008 and 2015, with the biggest increases in Greece (89%), Malta (60%), Cyprus (58%) and Slovenia (58%). Germany and Luxembourg are notable exceptions: in these countries, the excise duty rate for gasoline has not changed since 2003 and 2007, respectively. In three Member States, the Czech Republic, Hungary and Poland the excise duty rate measured in euro was lower in 2015 than in 2008, mainly because of exchange rate developments (in national currencies, the excise duty rates increased). The UK and the Netherlands apply the highest excise duty for gasoline; Bulgaria has the lowest rate, just above the minimum level.

Figure 115 - **Average exercise duty rate of gasoline by Member State**
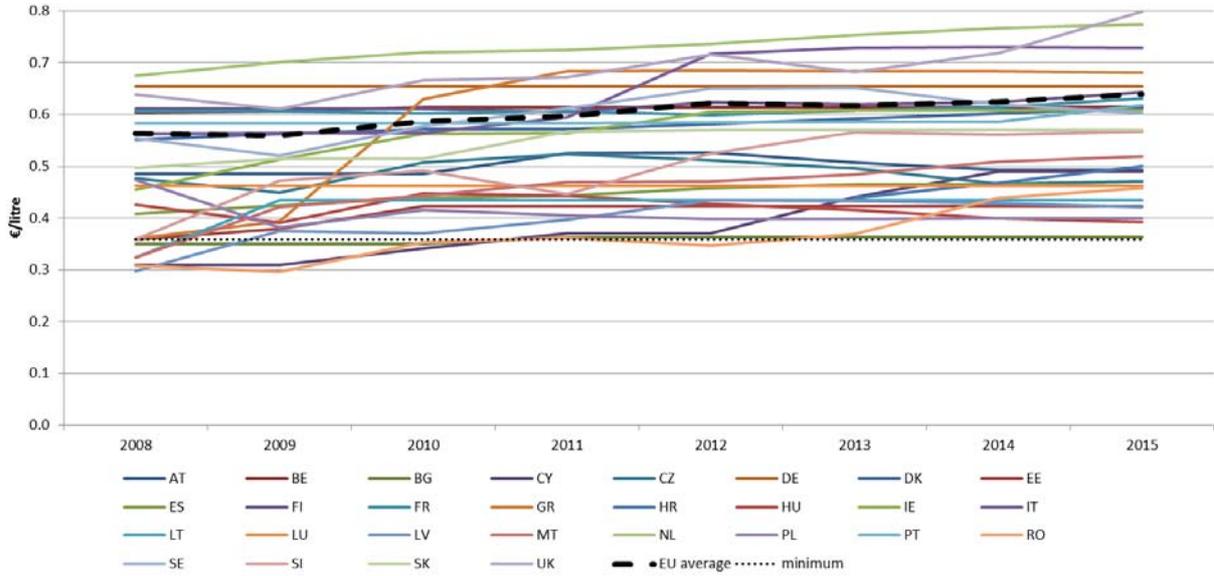
Source: Oil Bulletin, DG Energy

In the last few years, in line with the decreasing oil prices, the average retail price of gasoline decreased. However, because of the fixed (or, in case of several member States, increasing) excise duty rates, the share of the tax component gradually increased, from 55% in 2012 to 63% in 2015. In absolute terms, the tax component decreased, but only marginally, from 0.90 €/litre in 2012 to 0.88 €/litre in 2015.

Figure 116 - **Average retail price of gasoline in the EU by price component**
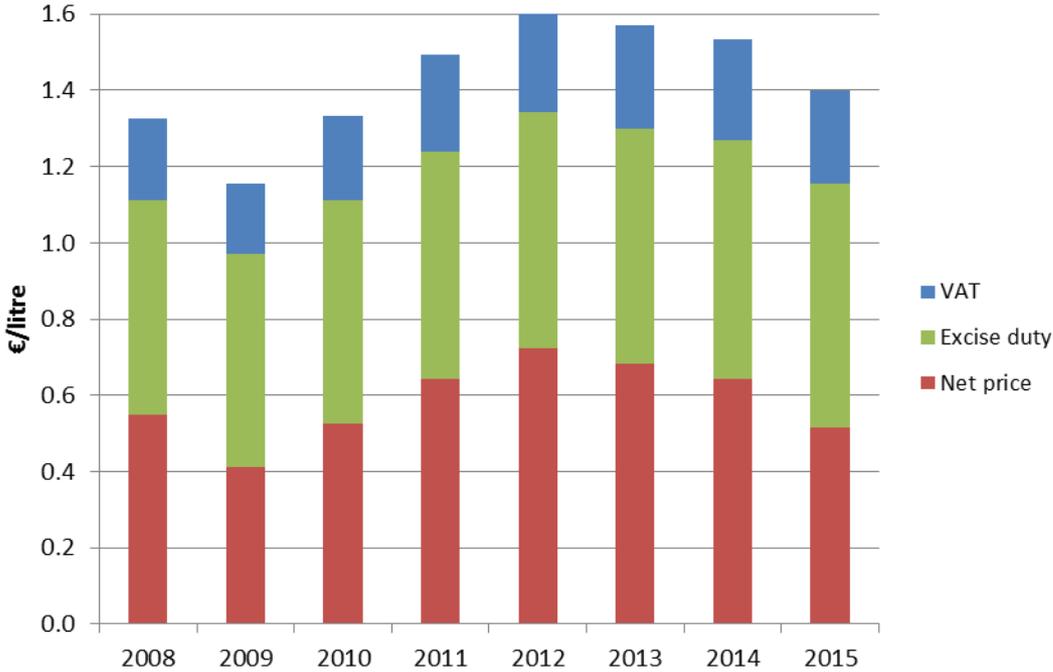
Source: Oil Bulletin, DG Energy

The below graph show the composition of the average gasoline price by Member State in 2015.

Figure 117 - **Average retail price of gasoline in 2015 by Member State and price component**
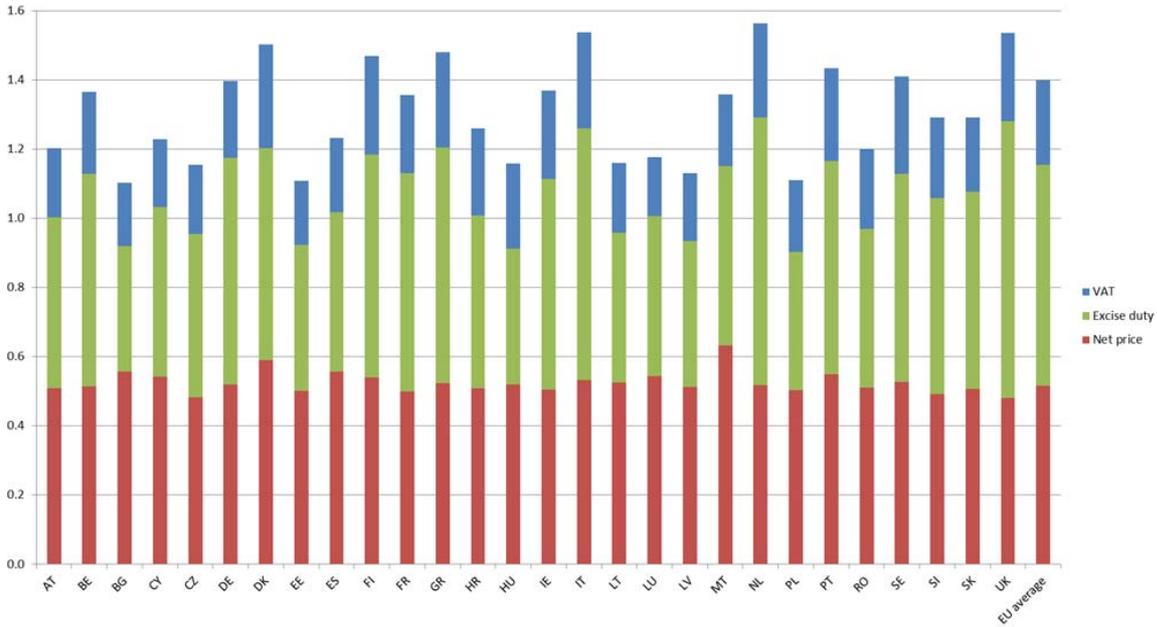
Source: Oil Bulletin, DG Energy

3.3.2 Diesel

Similarly to gasoline, the evolution of diesel prices clearly followed the trend of the crude oil price, with considerable differences in the absolute level, mainly explained by the diverging excise duty and VAT rates. Average prices moved in a relatively wide range and, contrary to gasoline, this range has widened over the years: it was 0.40 €/litre in 2008 but grow to 0.56 €/litre in 2015. If the three most expensive countries are disregarded, the range is considerably narrower. In 2015, the UK was by far the most expensive, 0.18 €/litre above the second most expensive country, Italy.

Figure 118 - **Average retail price of diesel by Member State**
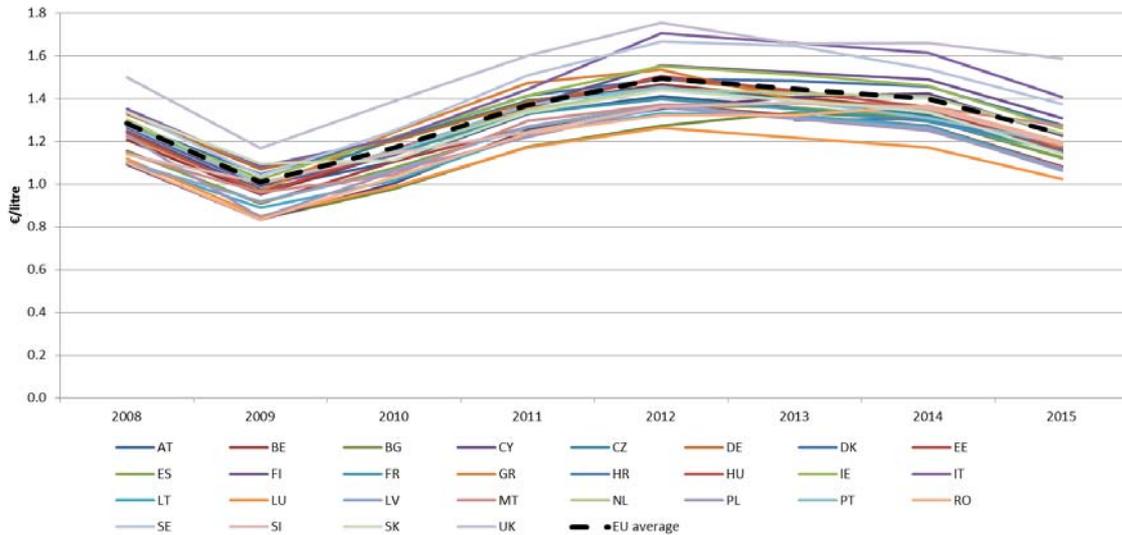
Source: Oil Bulletin, DG Energy

Cyprus experienced the biggest relative increase in diesel prices: in 2008 it had the lowest price in the EU but after significant increases in the excise duty rate the price reached the EU average by 2013. In 2015, EU average diesel prices were 4% lower than in 2008; in case of Cyprus, the price increased by 12%. In Slovakia, in turn, the price fell by 15% between 2008 and 2015, helped by a reduction of the excise duty rate introduced in 2010.

Figure 119 - **Average retail price of diesel by Member State, 2008=100**
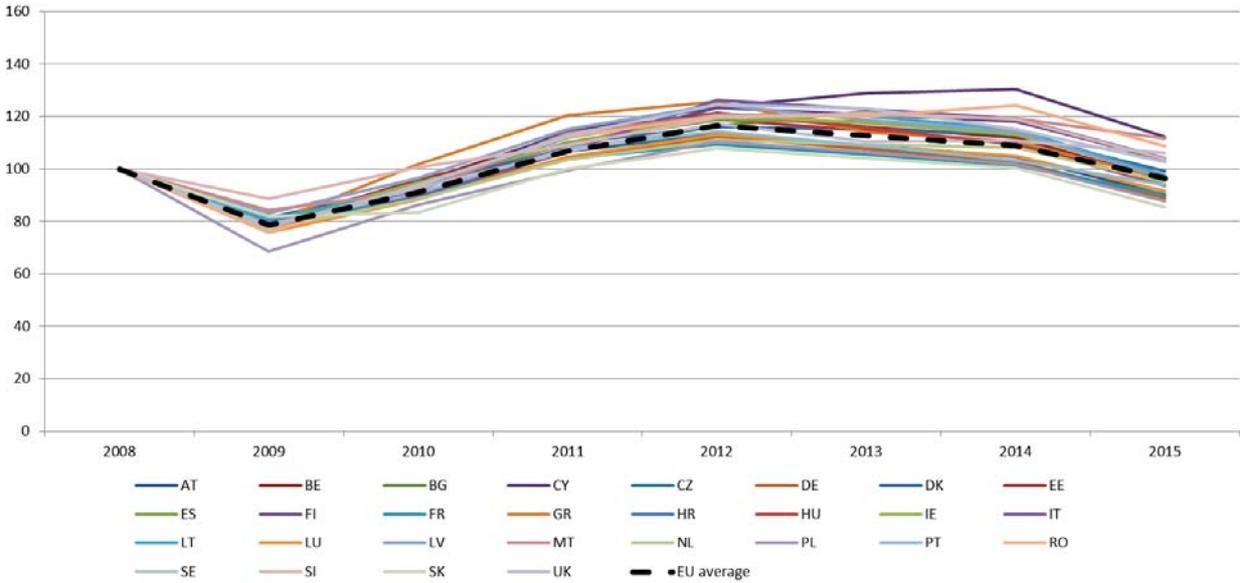
Source: Oil Bulletin, DG Energy

In case of net prices, the difference between the highest and the lowest price has been 0.10-0.12 €/litre but increased to 0.16 €/litre in 2015. Similarly to gasoline, Malta had the highest net price of diesel in 2015; the lowest net price was reported in France. Comparing the EU average net price with a representative wholesale price (Platts ULSD 10ppmS FOB ARA Barge), the difference has increased from 0.11 €/litre in 2010 to 0.15 €/litre in 2015.

Figure 120 - **Average retail price of diesel by Member State, without taxes**
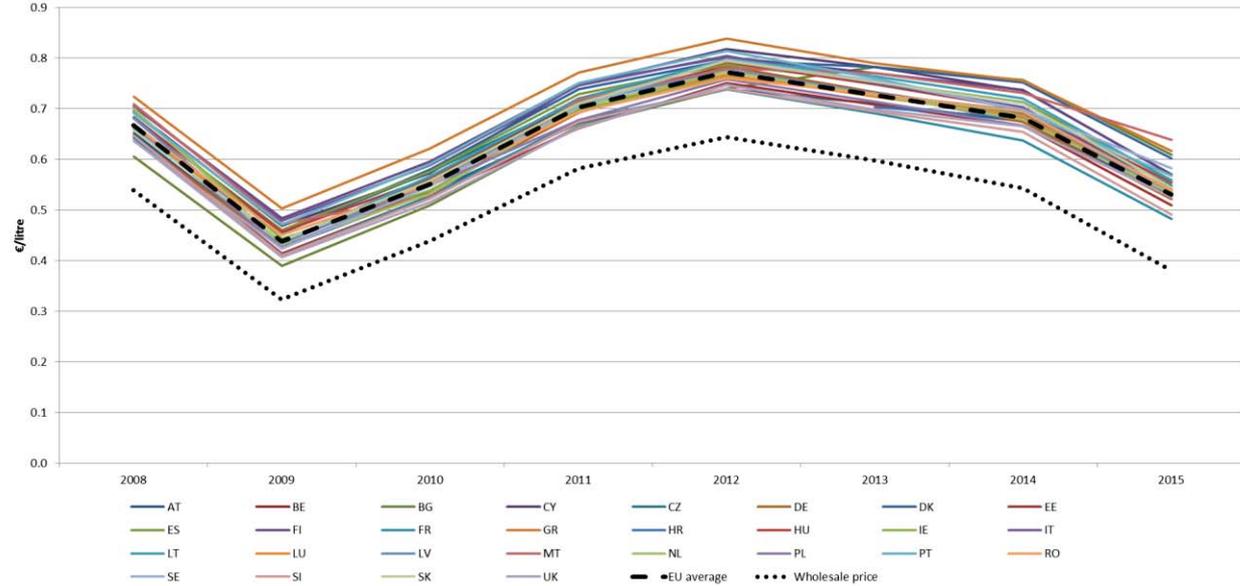
Source: Oil Bulletin, DG Energy, Platts
The wholesale price is ULSD 10ppmS FOB ARA Barge reported by Platts

The average excise duty rate of diesel increased from 0.41 €/litre in 2008 to 0.49 €/litre in 2015 (an increase of 20% in 7 years). Although this increase is faster than in case of gasoline, the difference between average excise duty rate of gasoline and diesel remained stable at 0.15

€/litre throughout 2008-2015. The average VAT rate of diesel also increased during this period, from 19.1% to 20.9%. With two exceptions, excise duty rates increased in all Member States between 2008 and 2015, with the biggest increases in Cyprus (80%), Malta (71%), Romania (66%) and Slovenia (58%). In Germany, the excise duty rate for diesel has not changed since 2003 (similarly to the excise duty of gasoline). Slovakia is the only country where the excise duty was lower in 2015 than in 2008, as a result of a cut in the rate in 2010. The excise duty rate applied by the UK and Italy is significantly higher than in the rest of the countries. In contrast, several Member States (Bulgaria, Greece, Latvia, Lithuania and Luxembourg) impose a rate at or just above the minimum level.

Figure 121 - **Average excise duty rate of diesel by Member State**
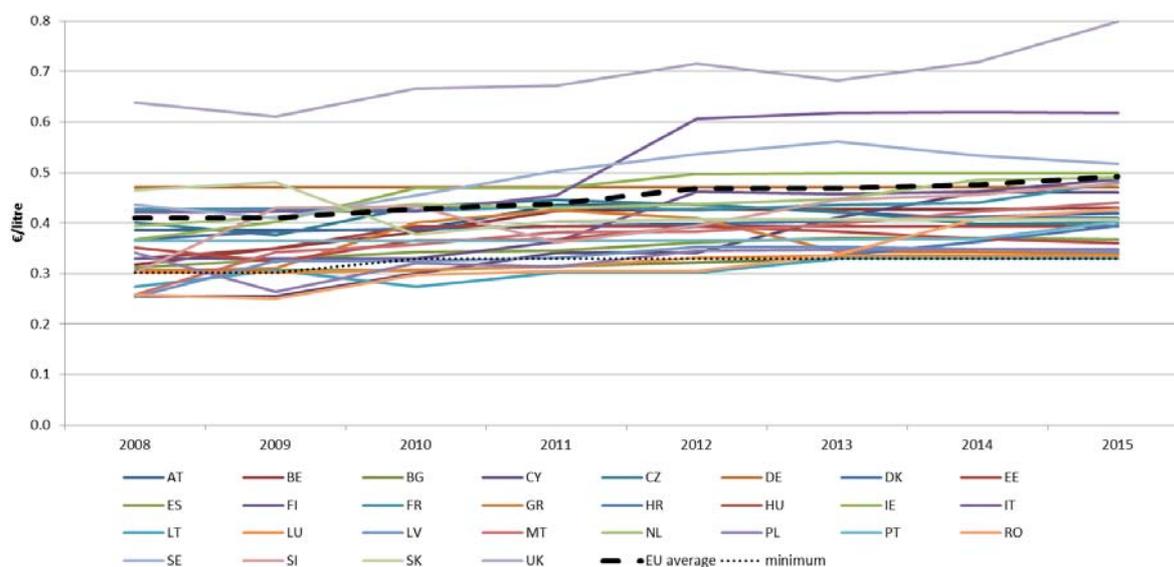
Source: Oil Bulletin, DG Energy

Since 2012, the average retail price of diesel decreased, with the share of the tax component increasing from 48% in 2012 to 57% in 2015. In absolute terms, the tax component decreased marginally, from 0.72 €/litre in 2012 to 0.71 €/litre in 2015.

Figure 122 - **Average retail price of diesel in the EU by price component**
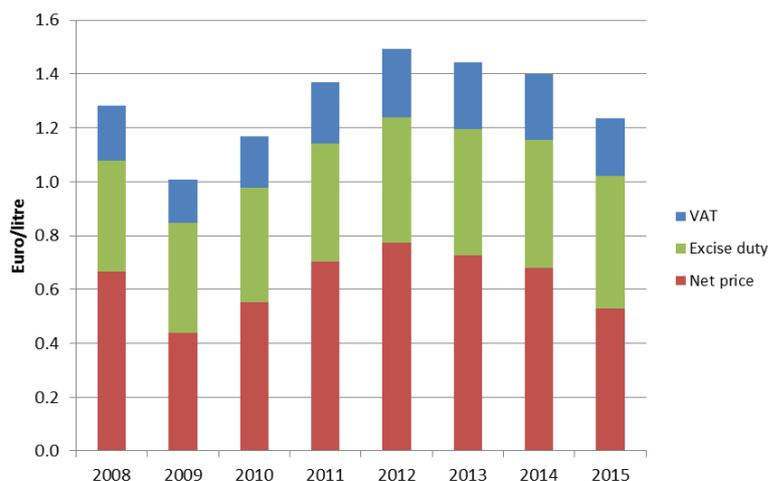
Source: Oil Bulletin, DG Energy

The below graph show the composition of the average diesel price by Member State in 2015.

Figure 123 - **Average retail price of diesel in 2015 by Member State and price component**
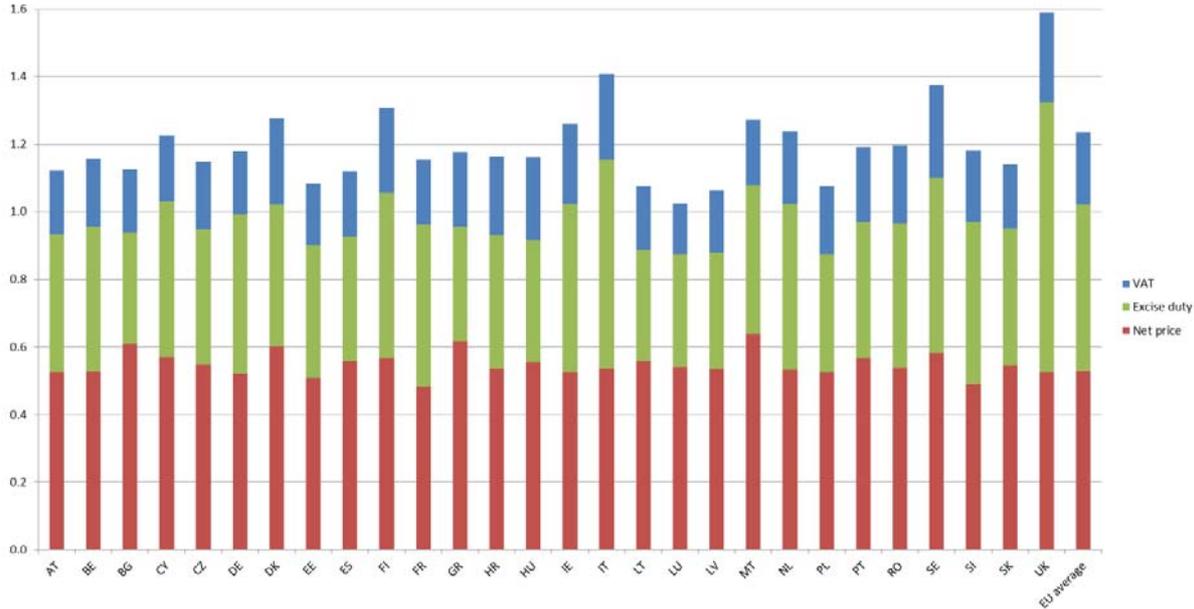
Source: Oil Bulletin, DG Energy

3.3.3 Heating oil

The big differences in the excise duty rates result in a wide dispersion of heating oil prices across the EU. The difference between the highest and lowest price increased from 0.60 €/litre in 2008 to 0.79 €/litre in 2014 but decreased to 0.69 €/litre in 2015. In the most expensive Member State, Denmark, the price in 2015 was 126% higher than in the cheapest Member State, Luxembourg. Many of the most expensive countries have a rather low level of heating oil consumption. Germany is by far the biggest consumer of heating oil in the EU and its price is below the EU average.

Figure 124 - **Average retail price of heating oil by Member State**
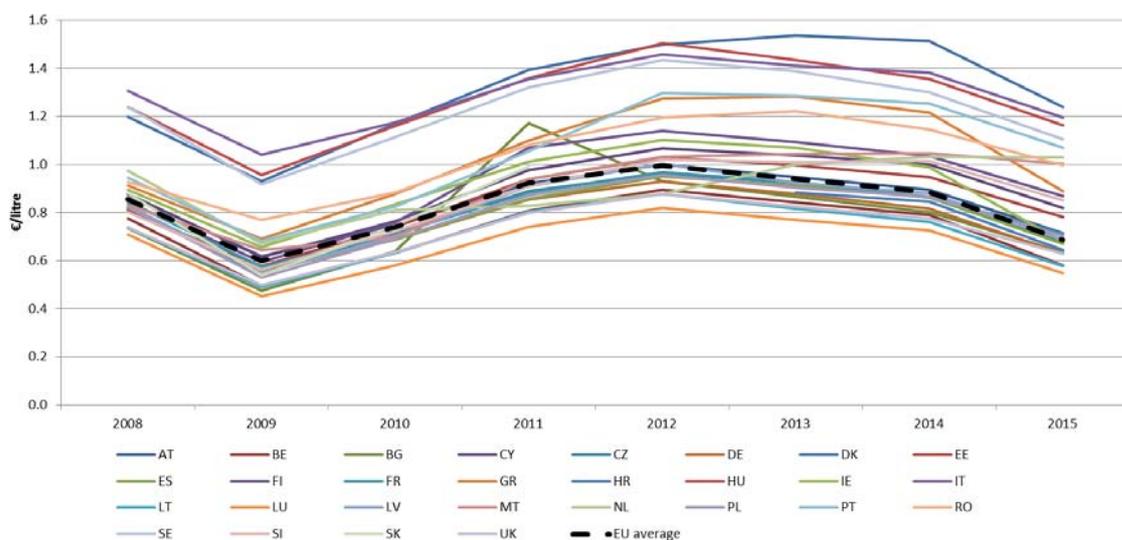
Malta experienced the biggest relative increase in heating oil prices: in 2008 its price was around the EU average but today it is considerably higher. In 2015, EU average heating oil prices were 20% lower than in 2008; in case of Malta, the price increased by 21%. Belgium experienced the biggest price drop between 2008 and 2015, 25%.

Figure 125 - **Average retail price of heating oil by Member State, 2008=100**
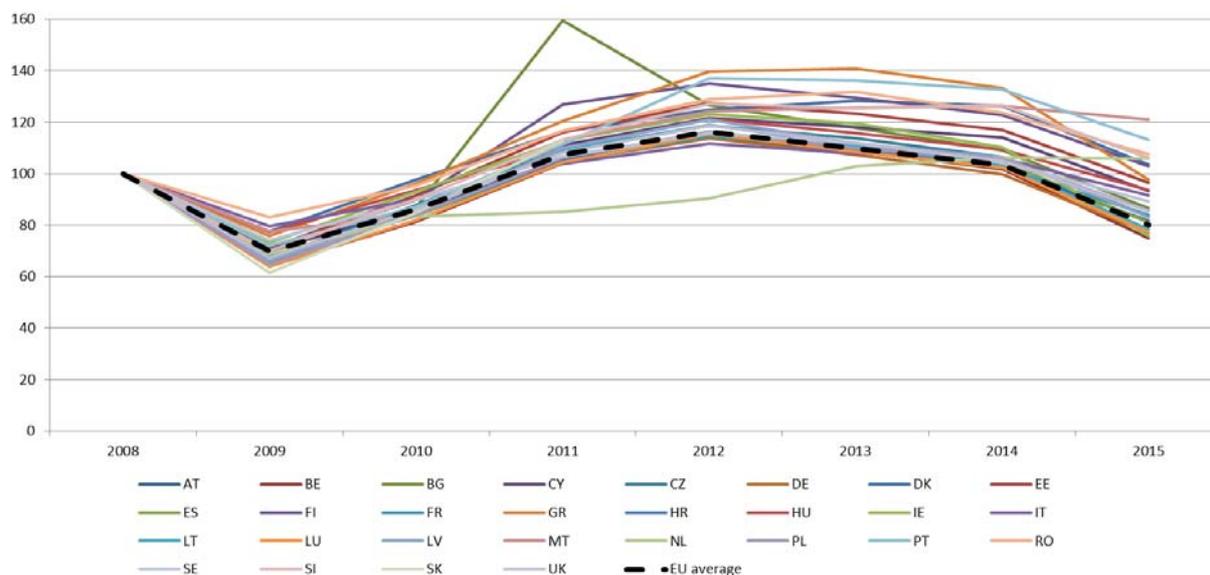
Also in case of net prices, the difference between the highest and the lowest price is rather high (0.21-0.43 €/litre), significantly higher than for motor fuels. Denmark had the highest net price of heating oil in 2015; the lowest net price was reported in the Netherlands. Comparing the EU average net price with a representative wholesale price (Platts Gasoil 0.1%S FOB ARA Barge), the difference has been stable in the 0.10-0.11 €/litre range. Curiously, the Dutch price is lower than the wholesale price while the Romanian price is more or less equal to it.

Figure 126 - **Average retail price of heating oil by Member State, without taxes**
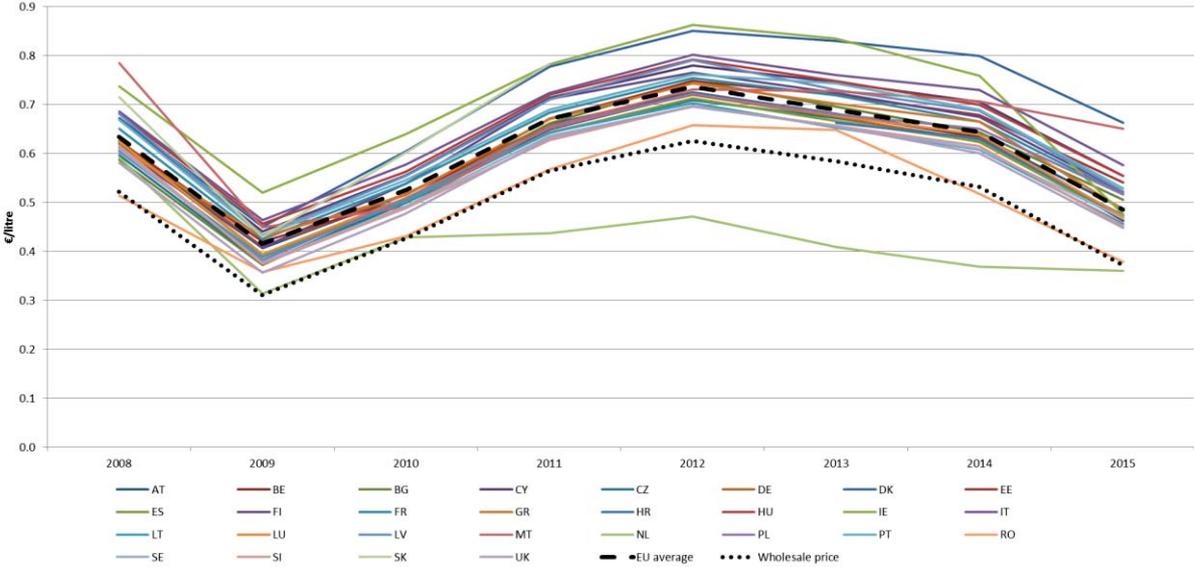
The average excise duty rate of heating oil increased from 0.08 €/litre in 2008 to 0.10 €/litre in 2015 (an increase of 13% in 7 years). Although most Member States apply a higher rate, the main consumer of heating oil, Germany, has an excise duty of only 0.06 €/litre. The average VAT rate of heating oil also increased during this period, from 19.3% to 20.2%. Several Member States increased the excise duty rate between 2008 and 2015, but in a couple of countries (Austria, Germany, Italy, Lithuania, Luxembourg, Spain) it remained unchanged. Bulgaria significantly increased the excise duty rate in 2011 but returned to the previous, lower rate the following year. The Netherlands has the highest excise duty rate (0.49 €/litre in 2015) while Luxembourg's tax rate is only 0.01 €/litre. The rates applied by Belgium and Luxembourg are lower than the minimum level set by the Energy Tax Directive (0.021 €/litre); Lithuania uses the minimum level.

Figure 127 - **Average excise duty rate of heating oil by Member State**
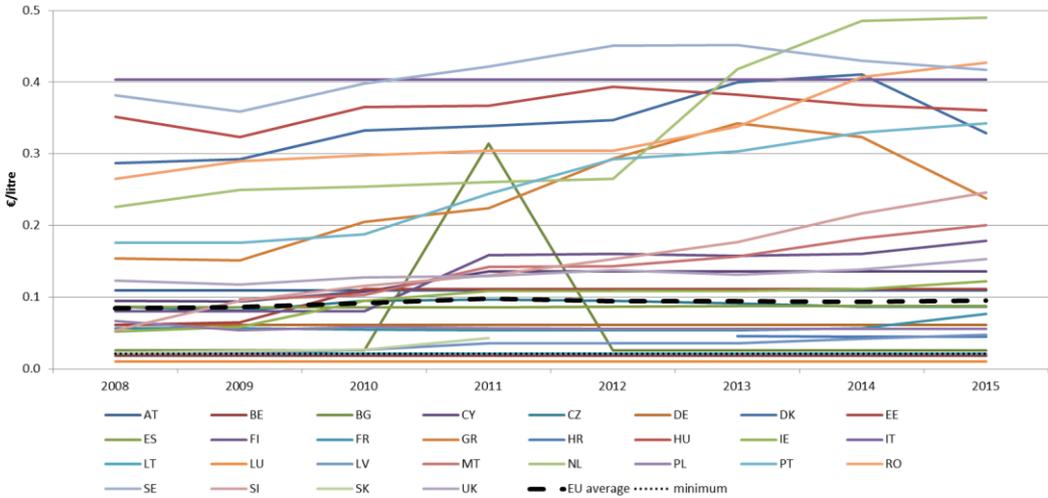
The average retail price of heating oil significantly decreased since 2012, with the tax component increasing from 26% in 2012 to 31% in 2015. In absolute terms, the tax component decreased from 0.26 €/litre in 2012 to 0.21 €/litre in 2015.

Figure 128 - **Average retail price of heating oil in the EU by price component**
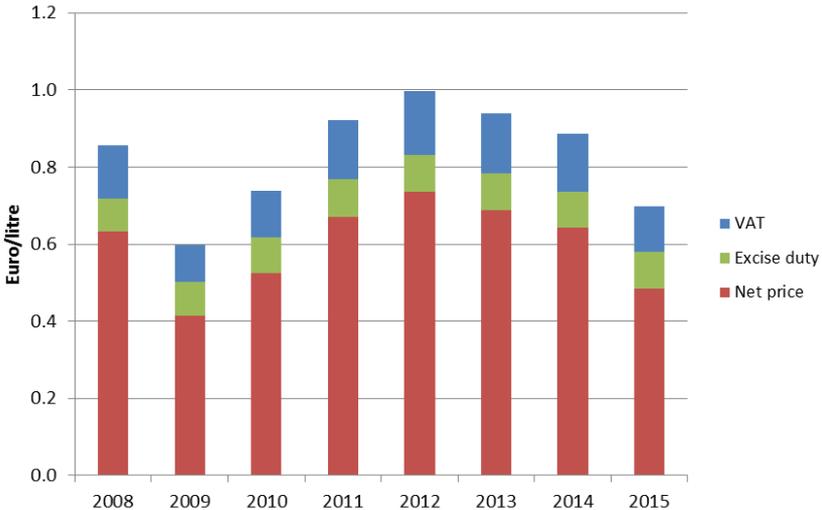
The below graph show the composition of the average heating oil price by Member State in 2015.

Figure 129 **- Average retail price of heating oil in 2015 by Member State and price component**
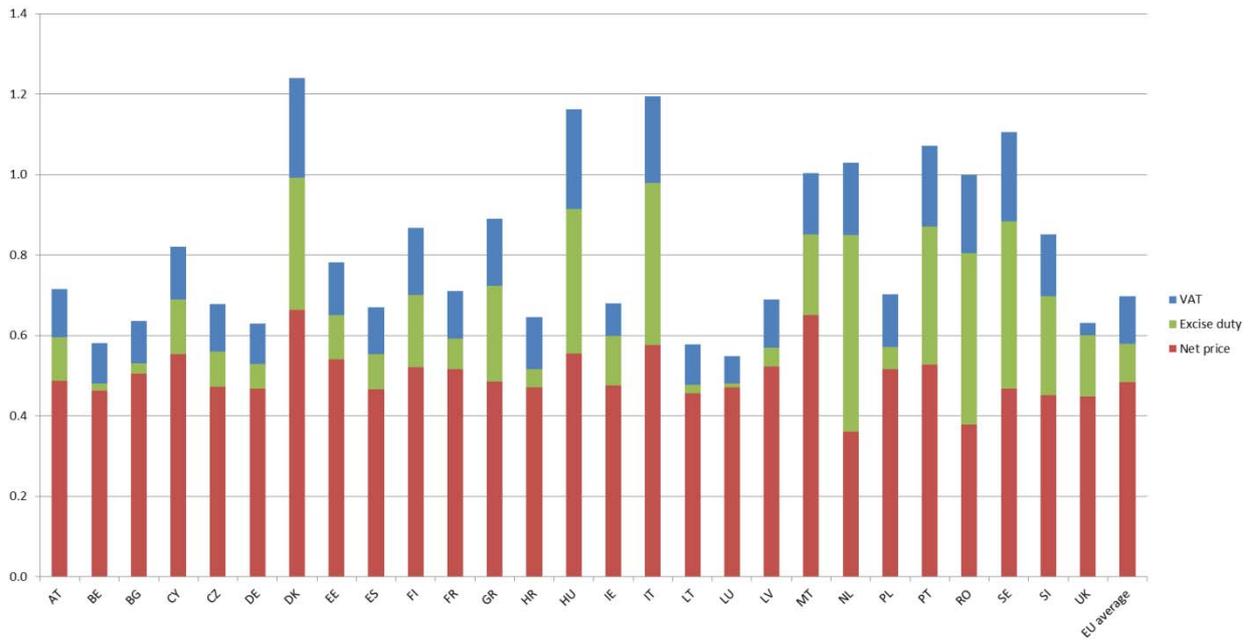
Source: Oil Bulletin, DG Energy

Energy costs

4 The EU energy bill

Main findings

- High import dependency means that the EU faces an important energy import bill.

- In 2013, the EU's estimated import bill reached EUR 400 billion. Since then, falling energy prices allowed the import bill to fall significantly, although the weakening of the euro has partly offset this effect.

- In 2015, the estimated import bill amounted to EUR 261 billion, 35% less than in 2013. In 2 years, the import bill decreased by EUR 142 billion, about 1% of EU GDP, thereby giving a significant boost to the economy.

- Crude oil is by far the main component of the import bill, making up 68% of the total in 2015. The share of gas and hard coal was 28% and 4%, respectively.

- Russia is the main supplier of all three fossil fuels: crude oil, natural gas and hard coal. In 2015, 34% of the import bill went to Russia. Russia was followed by Norway (19%) and Nigeria (7%).

Introduction

The EU is a net importer of energy: in 2014, the import dependency[9] stood at 53.5%, i.e. the EU needed to import just over half of the energy it consumed. Import dependency is particularly high in case of fossil fuels: in 2014, it was 88% for crude oil, 67% for natural gas and 46% for solid fuels (from which 68% for hard coal).

EU energy import dependency seems to have stabilised in recent years: since 2005, it has been fluctuating between 52% and 55%. While the import dependency of fossil fuels continues an increasing trend, their share within the energy mix is gradually decreasing. The share of renewables, on the other hand, is steadily growing and these are typically produced within the EU.

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[9] Import dependency is calculated as net imports divided by gross inland consumption

Figure 130 - **EU import dependency by fuel**
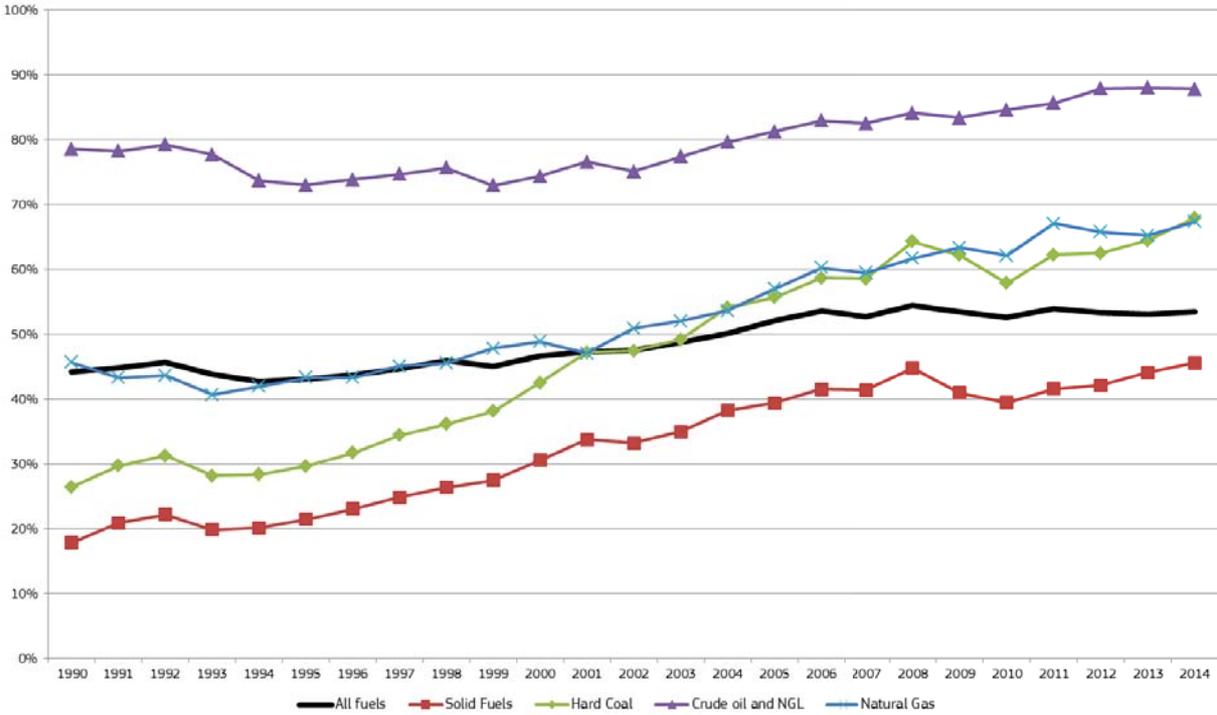
Source: Eurostat

The high import dependency poses significant challenges in terms of energy security and the diversification of suppliers and supply routes but, in addition, it also means that the EU is facing an important energy import bill.

In this chapter we outline the main drivers of the import bill and estimate its size in the last couple of years.

Scope

In this analysis, we focus on the import bill of the EU as a whole, therefore only extra-EU imports are considered. (When the import bill of an individual Member State is looked at, it is of course reasonable to take all imports into account, including those coming from other Member States.)

The analysis covers the main fossil fuels: crude oil, natural gas and solid fuels. These fuels cover nearly three-quarters of the EU's gross inland energy consumption and the overwhelming majority (96% in 2014) of net energy imports. Crude oil alone makes up more than half of the EU's net energy imports.

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Figure 131 - **EU net imports of energy in 2014 (mtoe)**

- Crude oil and NGL
- Natural Gas
- Solid Fuels
- Other
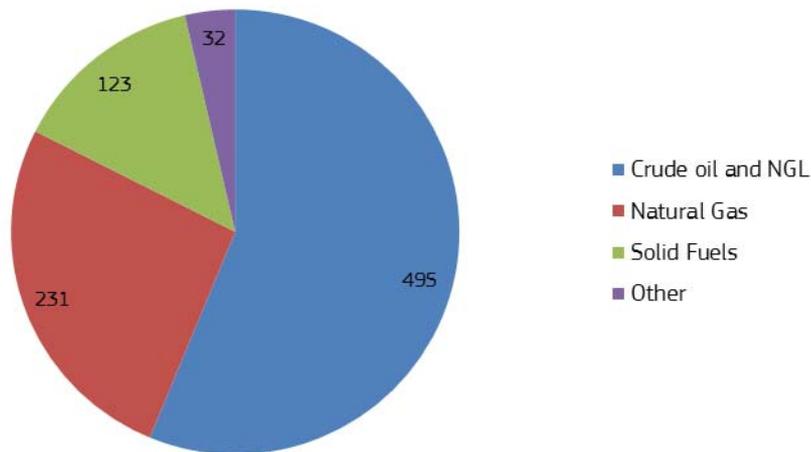
Source: Eurostat

In addition to crude oil, the EU is also an importer of petroleum products. However, considering the practical difficulties of finding reliable volume and price data for a multitude of products with different specifications and the fact that the EU is also exporting petroleum products and exports and imports are of a similar magnitude (the EU typically exports motor gasoline and imports middle distillates), petroleum products were not included in the calculation of the import bill.

Lignite/brown coal is typically not traded internationally and the imports arriving to the EU are negligible. Therefore, the analysis of solid fuels was restricted to hard coal.

In terms of time horizon, we provide import bill estimates for the period 2013-2015.

4.1 Drivers

The import bill basically depends on the volume and the average price of imports. Like most commodities, energy sources are typically traded in US dollars and therefore the development of the USD/EUR exchange rate will also influence the import bill (if expressed in euros).

Volumes

Import volumes will depend mainly on the level of consumption. In addition, the development of indigenous production (falling production results in increasing import dependency even if consumption is unchanged) and, to a smaller extent, stock changes can also affect import volumes. In principle, exports can also influence import volumes (higher exports has to be offset by higher imports) but extra-EU exports of crude oil, natural gas and coal are negligible.

In this section, we give short overview of the long-term trends of EU imports, based on Eurostat annual statistics (available until 2014).

EU imports of fossil fuels showed a marked increasing trend during the 1990s and for most of the 2000s. Since then, the tendencies of the different fuels are diverging.

EU consumption of crude oil peaked in 1998 and since 2005 it has been in a structural decline: between 2005 and 2014 it decreased by 19%. Energy efficiency improvements in the transport sector have contributed to this decline, as well as the gradual replacement of oil in other sectors (e.g. power generation, heating) with alternative fuels. Indigenous oil production has been also in decline, already since 1999, as the fields in the main producing region, the North Sea, are depleting. In the last 7-8 years, the fall in consumption exceeded the fall in production and, as a result, imports have been also decreasing. In 2014, net imports of crude oil were at the same level as in 2002.

Figure 132 - **Production, consumption and net imports of crude oil and NGL**
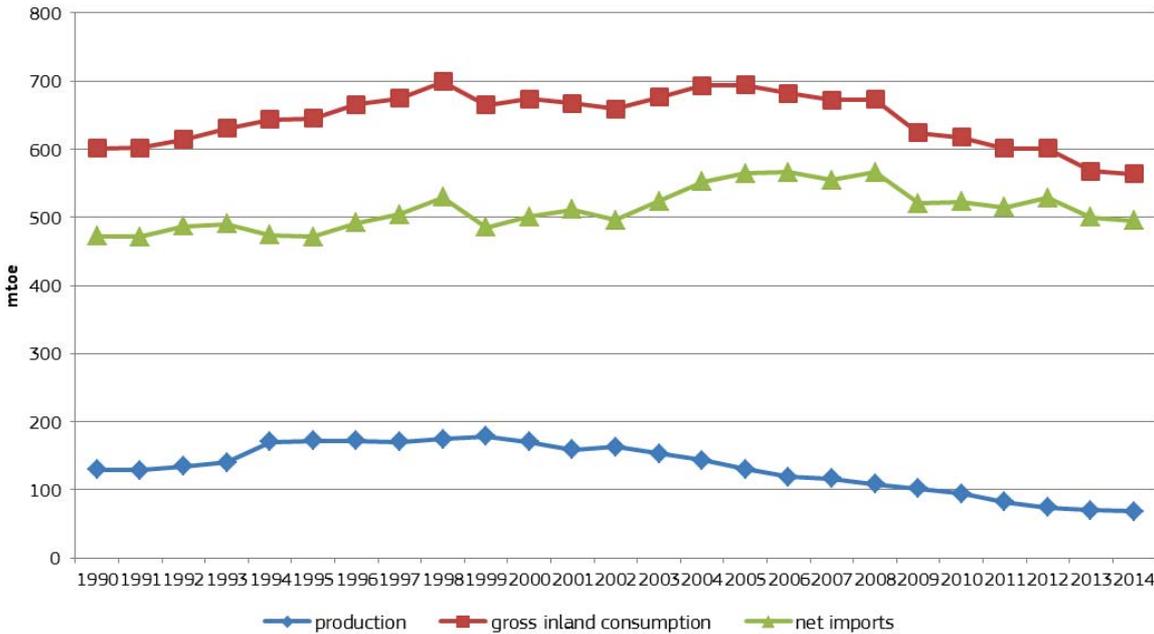
Gas consumption peaked later, in 2010. Since then, gas lost ground, especially in the electricity sector where it had to face increasing competition from renewables and coal. As gas is also used in space heating, its consumption is also driven by the weather: the strong decline in 2014 is can be largely explained by the relatively mild winter at the beginning of that year. Gas production plateaued in 1996-2004 and has been in decline since that, driven by depleting reserves. However, because of the strong decrease of consumption in the last few years, net imports decreased since 2010.

Figure 133 - **Production, consumption and net imports of natural gas**
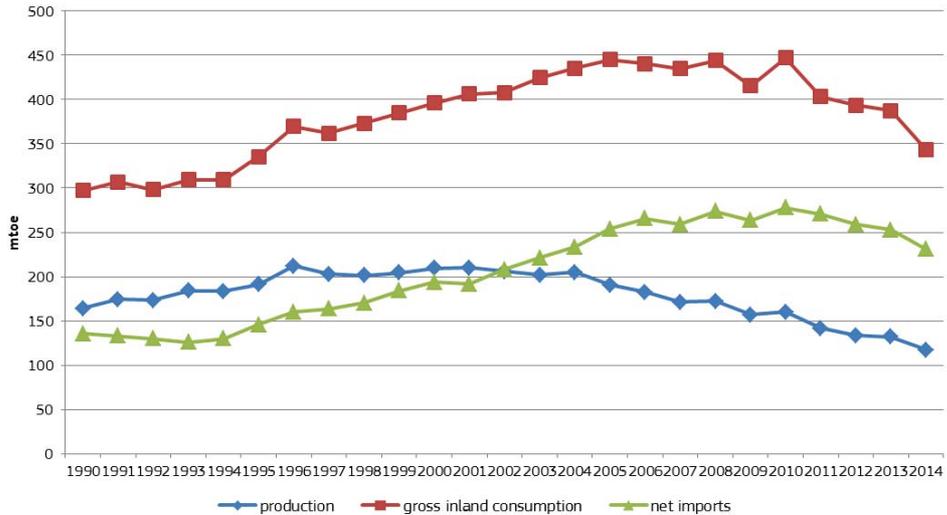
Source: Eurostat

In case of hard coal, consumption was falling in the 1990 but stabilised in the 2000s. As indigenous production showed a relentless decline, imports were growing. After a steep drop in 2008-2009, consumption and net imports started to rise again. This was helped by increasing US coal exports as cheap shale gas squeezed out the fuel from the US power sector. Cheap imported coal, coupled with the low carbon prices, made the fuel competitive in the European power sector compared to other fuels, in particular gas. In 2013-2014, the trend reversed and coal consumption and imports started to fall again.

Figure 134 - **Production, consumption and net imports of hard coal**
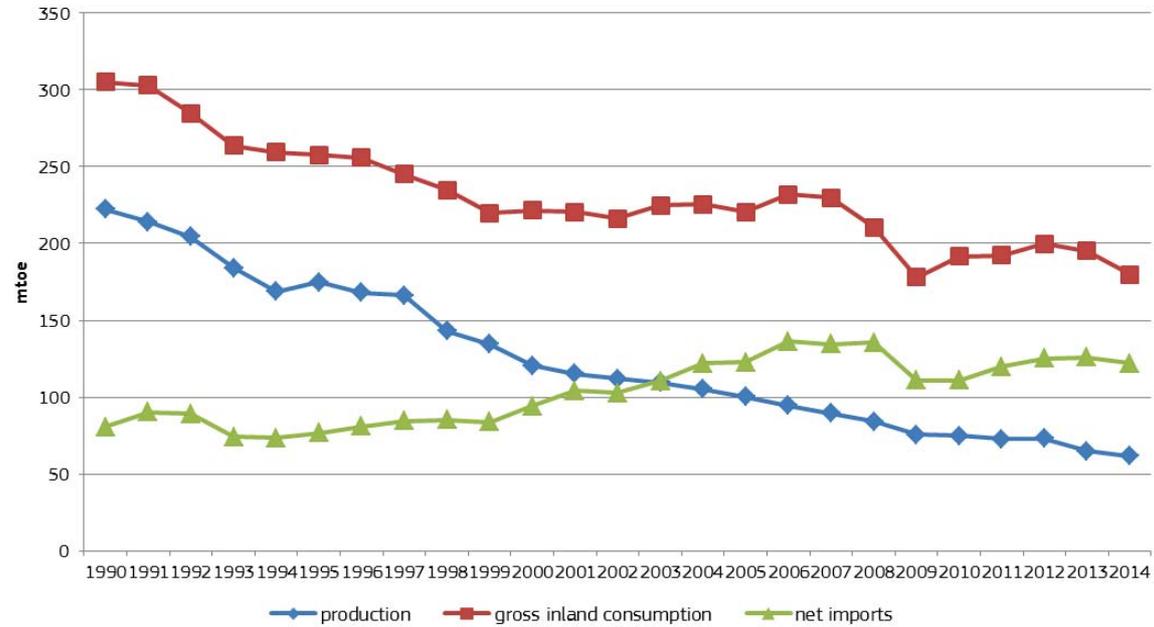
Source: Eurostat

Prices

Oil is traded in the global market, hence its price is driven by global demand and supply conditions. Other factors including exchange trade developments and geopolitical risks can influence the price as well. As oil is easy to transport and transport costs are relatively low, price differences across the different regions of the world are limited. Crude oil comes in different qualities (grades), the price of which is typically pegged to a benchmark, e.g. Brent, West Texas Intermediate or Dubai, taking the characteristics (density, sulphur content, etc.) into account. Brent is the main benchmark used in Europe.

Gas is more difficult and expensive to transport and, as a result, markets are more regional in nature than in the case of oil and there are no globally used and accepted price benchmarks. That said, the progressive development of LNG markets means that regional markets are better and better connected and in recent years, particularly from 2015, one can see an increasing convergence of regional prices. Nevertheless, even within Europe there can be significant price differences between different markets, depending on – inter alia – the type of contracts (spot or long-term), the way of pricing (hub-based or oil-indexed) and, crucially, the level of competition. In general, markets with higher levels of competition show a lower price level than markets with only one supply source.

Like oil, coal is also traded in the global market. Price differences are basically explained by the (relatively low) transportation costs. China has a dominant role in the market: it is the biggest producer, the biggest consumer and the biggest importer of coal in the world although both consumption and imports decreased recently.

In the short run, changes in the import volumes are usually moderate but prices can be rather volatile. For example, the price of oil fell by more than 70% between mid-2014 and early 2016, whereas the price of gas and coal has also decreased significantly in recent years.

Figure 135 **- Comparison of European oil, gas and coal prices**
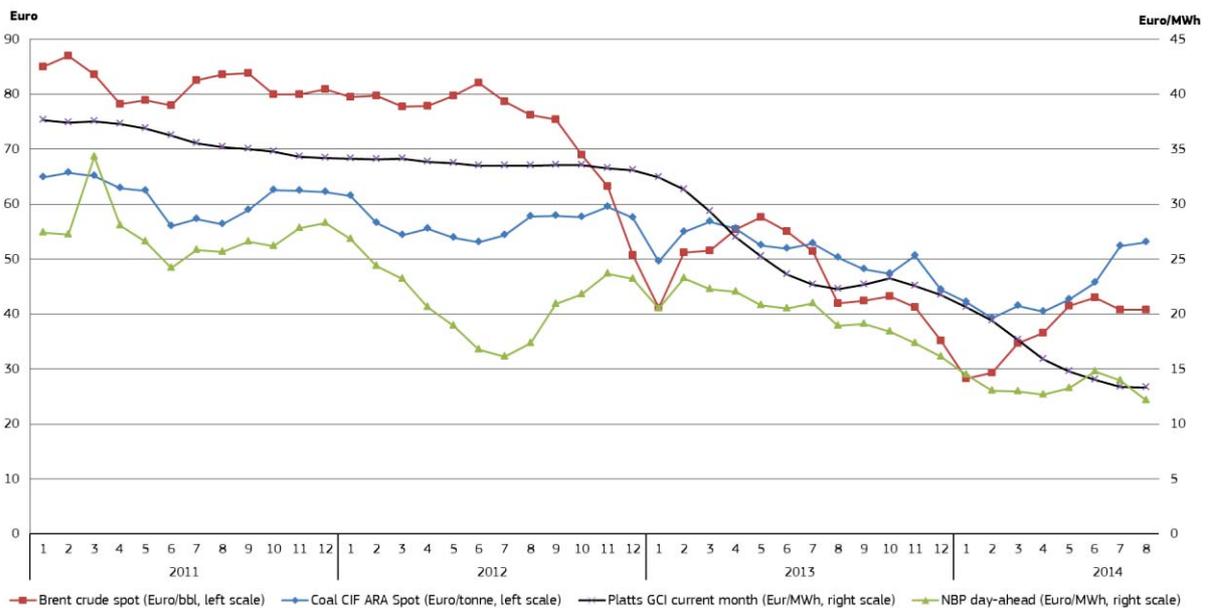
Source: Platts; GCI is the North West Europe Gas Contract Indicator, a theoretical index showing what a gas price linked 100% to oil would be

Exchange rates

Most energy is traded in US dollars. Accordingly, the fluctuations of the USD/EUR exchange rate can directly affect the prices and the import bill when these are measured in euros.

Historically, there has been a consistently negative correlation between oil prices and the US dollar, although recently, with the decline of US oil imports, the relationship has weakened. In other words, it can be observed that the price of oil and the value of the US dollar generally move in an opposite direction: a strengthening dollar typically coincides with decreasing oil prices and vice versa.[10] This means that changes in the oil price, whether upwards or downwards, are mitigated by the exchange rate and the volatility of the oil price expressed in euros is smaller than the volatility of the price expressed in dollar. In view of the correlation between oil, gas and coal prices, to a certain extent this is true for coal and gas prices, too.

The euro has considerably weakened compared to the US dollar in the second half of 2014: the exchange rate went down from nearly 1.40 USD/EUR in early May 2014 to 1.06 in March 2015, a depreciation of 24% in 10 months. The depreciation of the euro occurred against the background of increasingly diverging monetary policy stances and a continuously declining outlook for growth and inflation in the euro area. Since early 2015, the exchange rate has been fluctuating between 1.06 and 1.16.

In spite of the weakening of the euro in the second half of 2014, the 2014 average exchange rate was practically the same as in 2013, 1.33, but in 2015 it decreased to 1.11.

Figure 136 - **The USD/EUR exchange rate since 2013**

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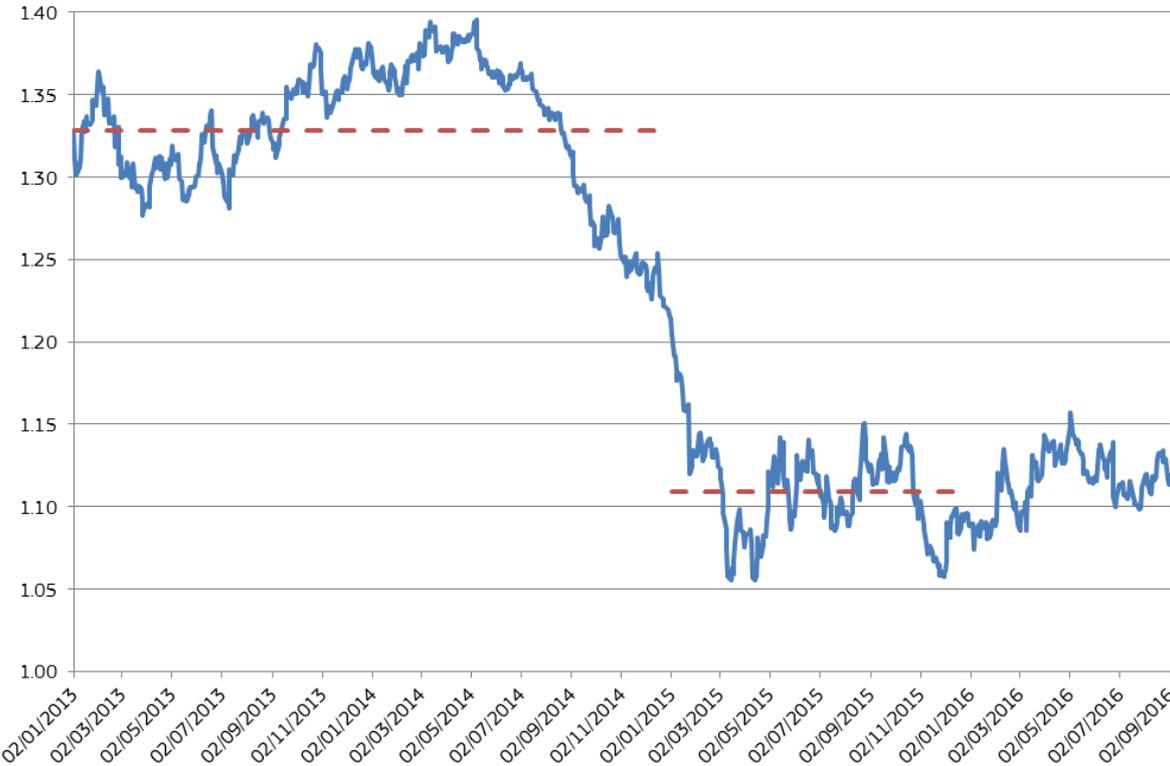
[10] One explanation is that a stronger dollar makes oil and other commodities priced in dollars more expensive for buyers using other currencies, which can dampen demand and thereby contribute to decreasing prices.

Source: ECB
The red dotted lines represent the annual average in 2013, 2014 and 2015

Methodology

In case of oil, we are in comfortable position as Member States report on a monthly basis the volume and the average CIF price[11] of imported oil under Regulation (EC) No 2964/95 of 20 December 1995 introducing registration for crude oil imports and deliveries in the Community.[12] Every year, the collected and aggregated information is published on the website of DG Energy.[13]

For gas, the import volumes used are from the Transparency Platform of the European Network of Transmission System Operators for Gas (ENTSO-G) which is based on the gas flows reported by gas transmission system operators. Gas imports arrive to the EU from Russia, Norway, Algeria and Libya through several pipelines while, in 2015, LNG was arriving from 7 supplying countries to 20 terminals in 10 Member States.[14] Volumes were calculated by adding the gas flows at the relevant entry points to the EU gas network.

Gas import prices can vary across Member States depending on the supplier, the supply route, the type of contracts (spot or long-term), the way of pricing (hub-based or oil-indexed) and the level of competition. Based on available sources, including customs data, national agencies (e.g. BAFA in Germany) and commercial data providers, for each supplier (Russia, Norway, Algeria, Libya and LNG) and for each year an estimated average €/MWh price was established.

Table 9. Estimated average gas import prices by supplier (€/MWh)

Year	Russia	Norway	Algeria	Libya	LNG
2013	30.0	25.0	30.0	31.0	28.5
2014	25.5	20.0	27.5	29.5	25.5
2015	22.0	19.5	23.5	23.5	20.5

In case of LNG, the estimation is based on the price reported by ThomsonReuters (covering Belgium, France, Spain and the UK). While in 2012-2013 prices in the Mediterranean have been markedly higher than those in Northwest Europe, in 2015 this premium has largely disappeared.

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[11] The CIF price includes the FOB price (the price actually invoiced at the port of loading), the cost of transport, insurance and certain charges linked to crude oil transfer operations.
[12] http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:31995R2964
[13] https://ec.europa.eu/energy/en/statistics/eu-crude-oil-imports
[14] Including Poland (the Świnoujście terminal received its first cargo in December) but without small-scale, off-grid terminals

Figure 137 - **Spot LNG prices in Europe**
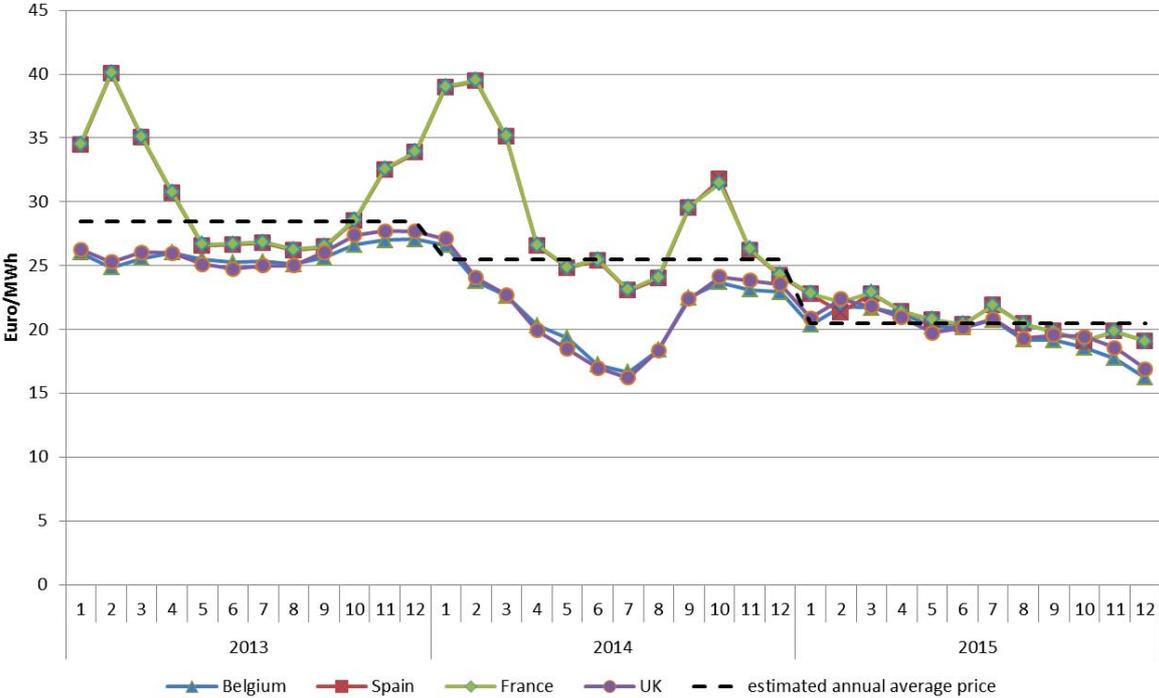
Source: ThomsonReuters

In case of pipeline imports the estimation is mostly based on customs data[15] and the border prices reported by the German Federal Office for Economic Affairs and Export Control (BAFA)[16].

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[15] Eurostat COMEXT database
[16] http://www.bafa.de/bafa/de/energie/erdgas/ausgewaehlte_statistiken/egasmon_xls.xls

Figure 138 - **Estimated border prices of gas imports from Russia**
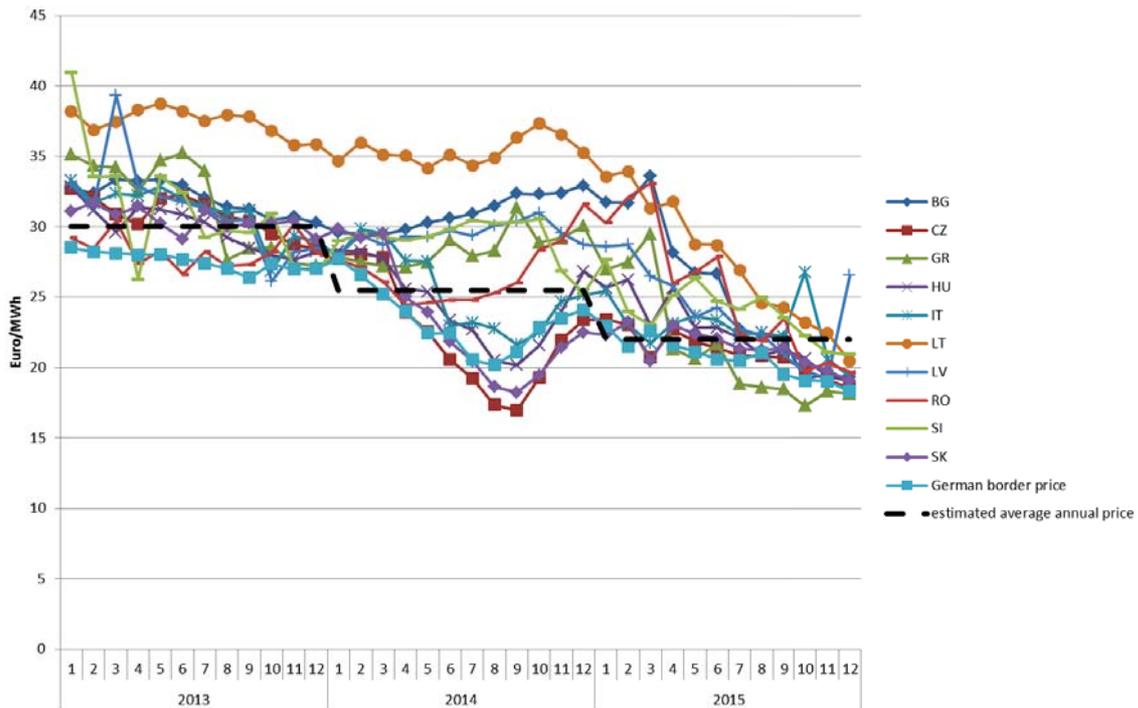
Source: Eurostat COMEXT, BAFA; the German border price reported by BAFA relates to all imports, not only Russian

Figure 139 - **Estimated border prices of gas imports from Norway**
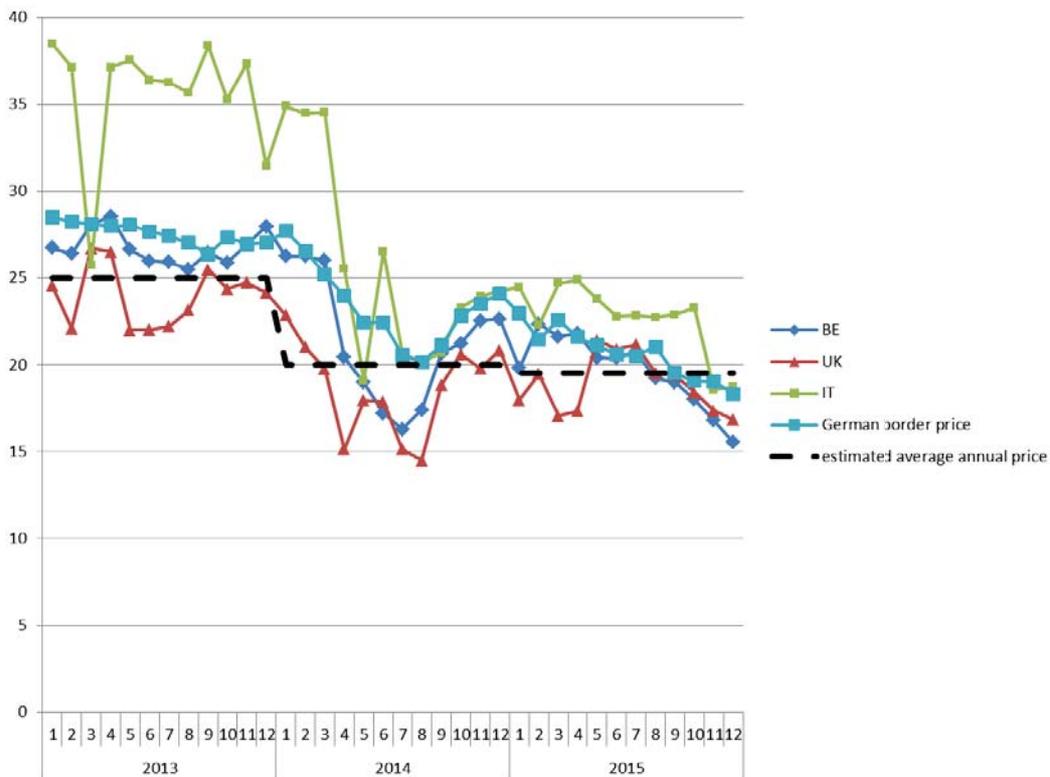
Source: Eurostat COMEXT, BAFA; the German border price reported by BAFA relates to all imports, not only Norwegian

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Figure 140 **- Estimated border prices of gas imports from Algeria**
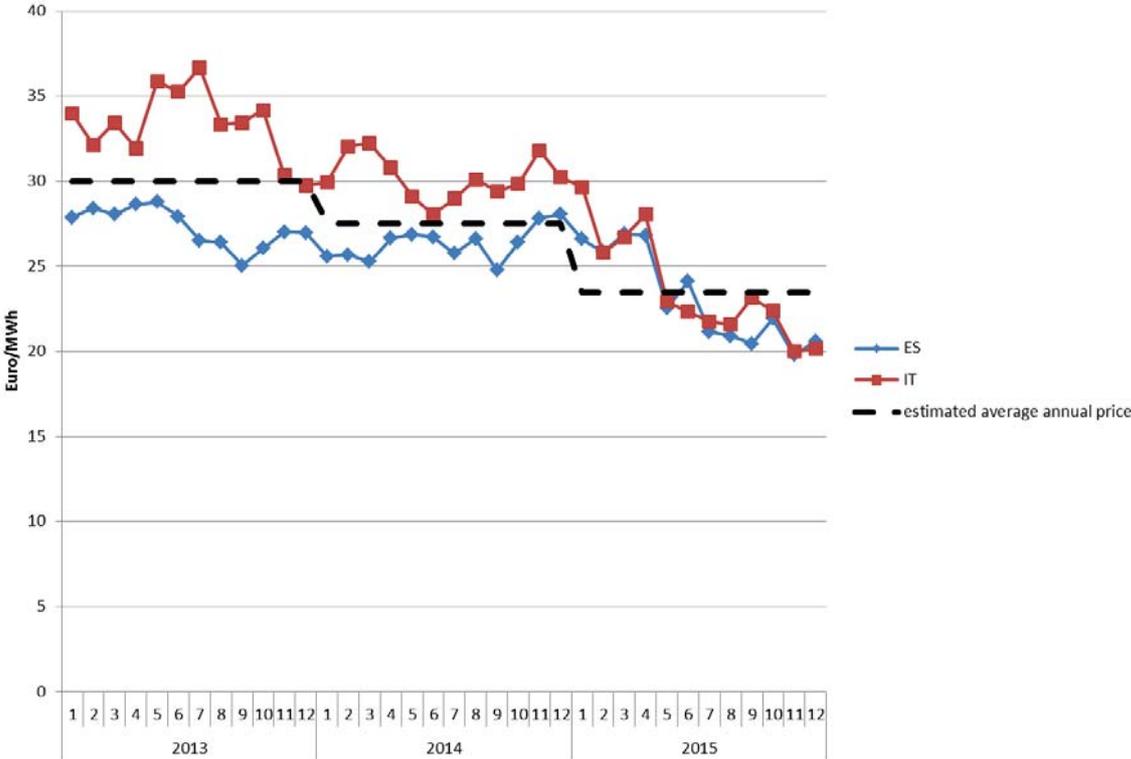
Source: Eurostat COMEXT

Figure 141 **- Estimated border prices of gas imports from Libya**
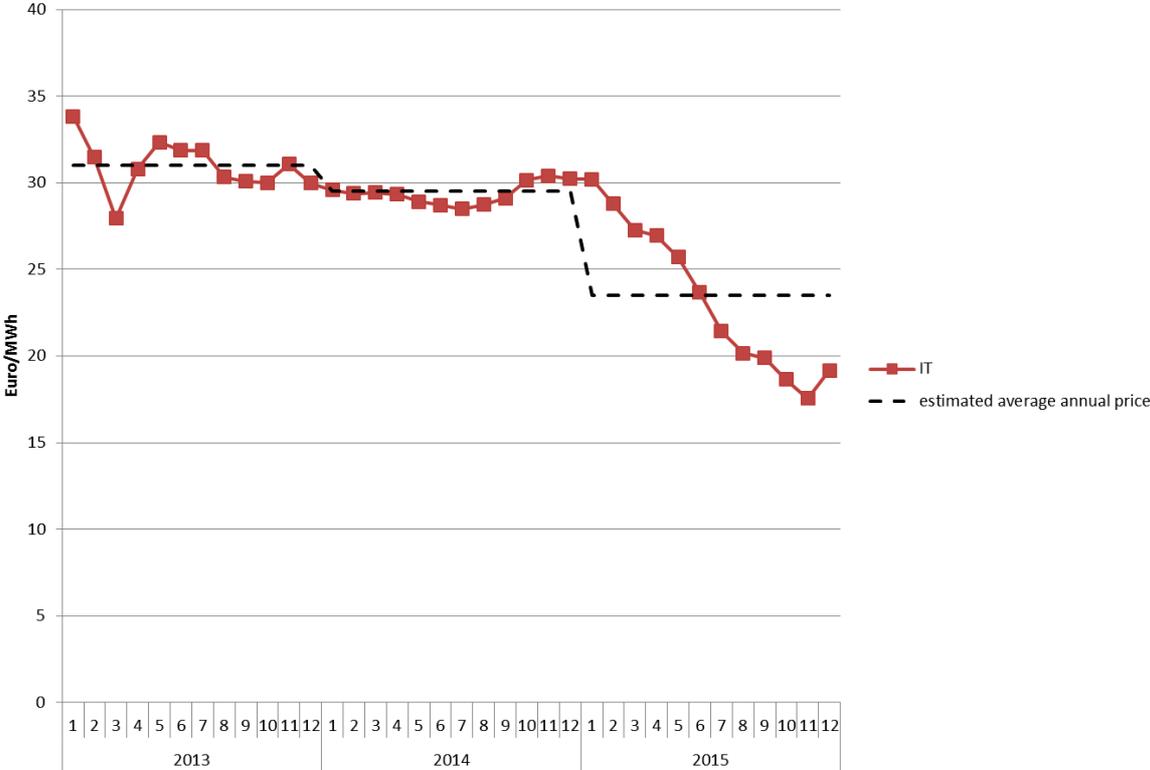
Source: Eurostat COMEXT

In case of coal, volumes are the imports of hard coal[17], reported in Eurostat annual (2013 and 2014) and monthly (2015) statistics. For price, the CIF ARA spot price reported by Platts was used; this is deemed to be representative for most of the hard coal imports arriving to the EU.

Figure 142 - **CIF ARA spot coal price**
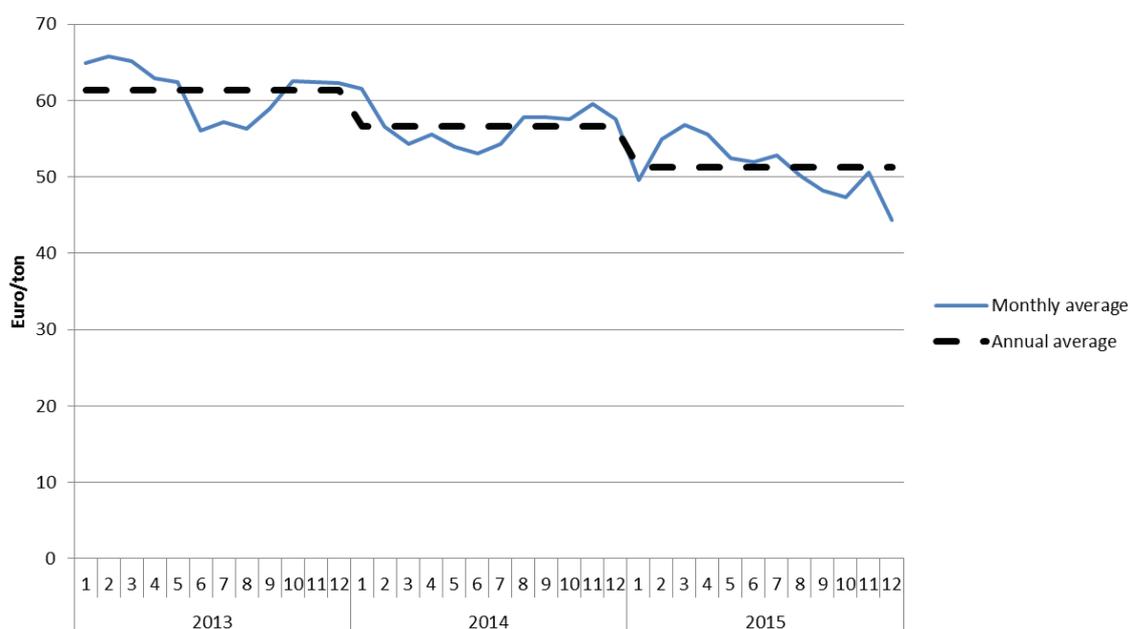
Source: Platts

For the conversion from US dollars to euros, we use the annual average of the daily official exchange rates published by the European Central Bank[18]: 1.3281 in 2013, 1.3285 in 2014 and 1.1095 in 2015.

4.2 Import bill calculation

The price of all three fuels decreased significantly in 2014-2015, resulting in a decreasing import bill.

Oil

Table 10. EU crude oil import bill in 2013-2015

	2013	2014	2015*
Volume (million bbl/day)	9.83	10.01	10.48
Average Brent price (USD/bbl)	108.66	98.95	52.39
Average CIF import price (USD/bbl)	108.83	98.65	51.72
EUR/USD exchange rate	1.3281	1.3285	1.1095
Import bill (bn USD)	390.6	360.4	197.8
Import bill (bn EUR)	294.1	271.3	178.3

Source: DG Energy, based on Member State reports under Regulation (EC) No 2964/95, Platts, ECB

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[17] This includes anthracite, coking coal, other bituminous coal and sub-bituminous coal
[18] http://www.ecb.europa.eu/stats/exchange/eurofxref/html/index.en.html

While crude oil imports show a decreasing trend since 2008, imports bounced back in 2014 and especially in 2015, driven by a combination of factors. After years of gradual decline, the consumption of oil products increased in 2015, helped by low oil prices, the economic recovery and weather impacts (relatively cold 2014-2015 winter after a mild winter in the previous year). Better refinery margins also allowed refiners to increase throughput, leading to higher crude oil imports (and an increasing net export of products). Furthermore, low oil prices provided an incentive for operators to raise stock levels which also contributed to the increase of crude oil imports.

As a result of the oversupply in the global market, oil prices decreased by more than 70% between mid-2014 and the beginning of 2016. In January 2016, the price of Brent dropped below 30 USD/bbl for the first time since 2004. In spite of the price drop, the average Brent price was almost 100 USD/bbl in 2014 (only 10 USD/bbl below the 2013 average) but it decreased to about 52 USD/bbl in 2015. Section 3.1 contains detailed information on the causes of the oil price drop.

While the annual average Brent price decreased by 52% between 2013 and 2015, when measured in euro, the decrease was "only" 42%.

Figure 143 - **The Brent spot oil price since 2013**
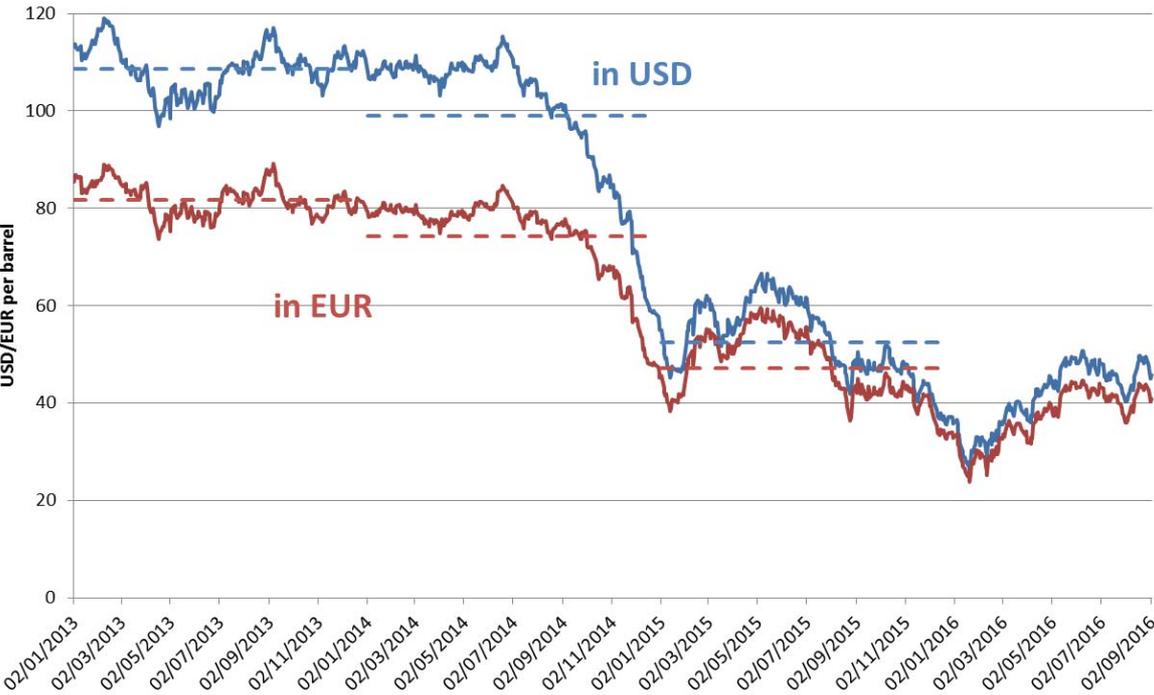
Source: Platts
The dotted lines represent the annual average in 2013, 2014 and 2015

Brent is a very good proxy for the average EU oil import price, the difference between the two is usually less than 1 USD/bbl. The average EU import price is usually slightly lower, reflecting the fact that a large part of imports is made up by heavy and/or sour crudes which are typically cheaper than the light and sweet crudes like Brent.

Figure 144 - **The Brent price and the average EU import price**
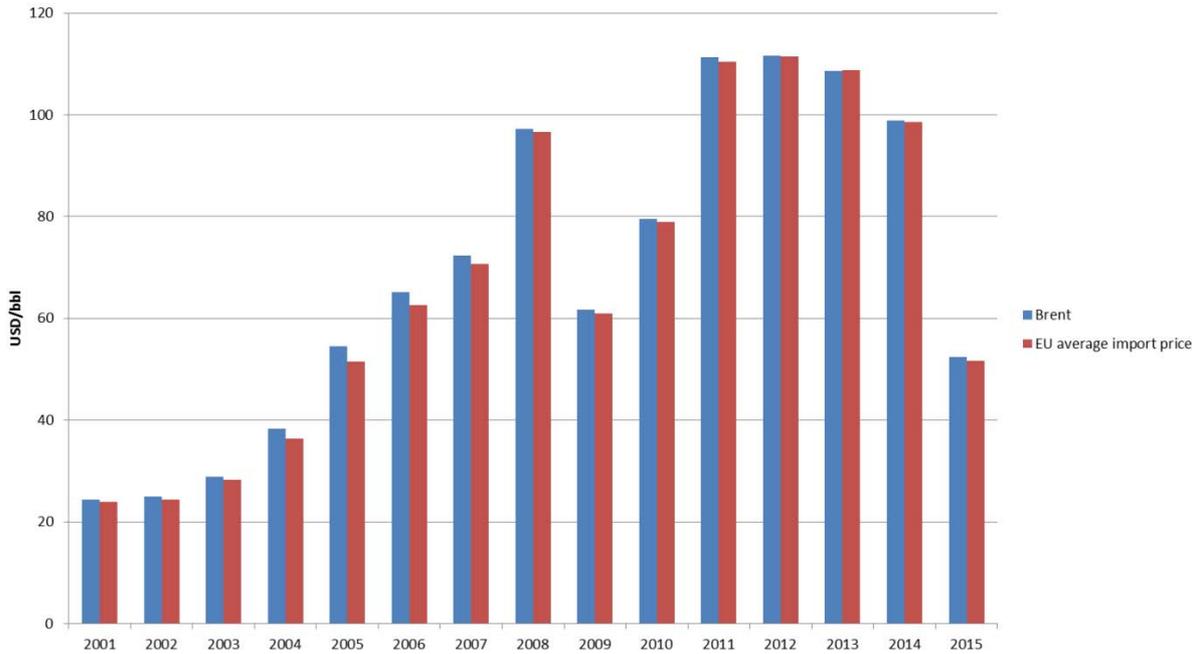
Source: Platts (Brent), DG Energy (average EU import price)

In spite of the growing import volumes, the EU oil import bill significantly decreased in 2014 and 2015 as a result of the oil price fall. While in 2013 the oil import bill was close to USD 400 billion, in 2015 it dropped below USD 200 billion, a decrease of 49% within two years. The depreciation of the euro in the same period mitigated this trend: measured in euro, the import bill decreased from EUR 294 billion in 2013 to EUR 178 billion euros in 2015, a decrease of 39%.

Gas

Table 11. EU gas import bill in 2013-2015

	2013	2014	2015
Volume (TWh)	3 390	3 115	3 449
Estimated average import price (€/MWh)	28.1	23.6	21.0
Import bill (bn EUR)	95.4	73.5	72.5

Source: ENTSO-G, DG Energy estimations

Gas import volumes have been rather volatile in the last few years, mainly driven by the weather. In 2014, higher-than-average winter temperatures reduced gas consumption but in 2015, a colder winter, coupled with the significant decrease of Dutch production, meant that imports bounced back.

During this period, gas prices have shown a decreasing trend as falling oil prices and steady LNG supplies put downward pressure on import prices. The price of an important, but diminishing part of supply contracts is linked to the price of oil products (typically gasoil and/or fuel oil) and therefore falling oil prices directly affect such "oil-indexed" gas prices, albeit with a 6-9 month lag. In 2014-2015, growing supply and limited demand growth led to a sharp fall of global LNG prices, thereby also contributing to the decreasing import price in the EU.

In spite of the fluctuation of the import volumes, the estimated import bill decreased in both 2014 and 2015 as a result of the falling prices. Between 2013 and 2015, the estimated gas import bill decreased by 24%, from EUR 95.4 billion to EUR 71.6 billion.

Coal

Table 12. EU hard coal import bill in 2013-2015

	2013	2014	2015
Volume (million tons)	227.8	225.8	194.3
CIF ARA spot price (USD/ton)	81.57	75.20	56.84
EUR/USD exchange rate	1.3281	1.3285	1.1095
CIF ARA spot price (EUR/ton)	61.41	56.63	51.25
Import bill (bn USD)	18.6	17.0	11.0
Import bill (bn EUR)	14.0	12.8	10.0

Source: Eurostat, Platts, ECB

Hard coal imports increased in 2013 but decreased in 2014 and 2015. During the period, prices gradually decreased, driven by the oversupply in the global market.

Similarly to oil and gas, the import bill is also decreasing although the absolute values are significantly lower. Between 2013 and 2015, the estimated coal import bill decreased by 29%, from EUR 14.0 billion to EUR 10.0 billion.

Total

In 2013, the total import bill was about EUR 400 billion, more than EUR 1 billion per day. Falling prices allowed the EU to decrease its estimated import bill to EUR 358 billion in 2014 (-11%) and to EUR 261 billion in 2015 (-27%). The cumulative decrease between 2013 and 2015 was 35%. The decrease of the import bill is more than EUR 140 billion, equivalent to about 1% of EU GDP.

Figure 145 **- The estimated EU import bill**

Source: DG Energy calculation

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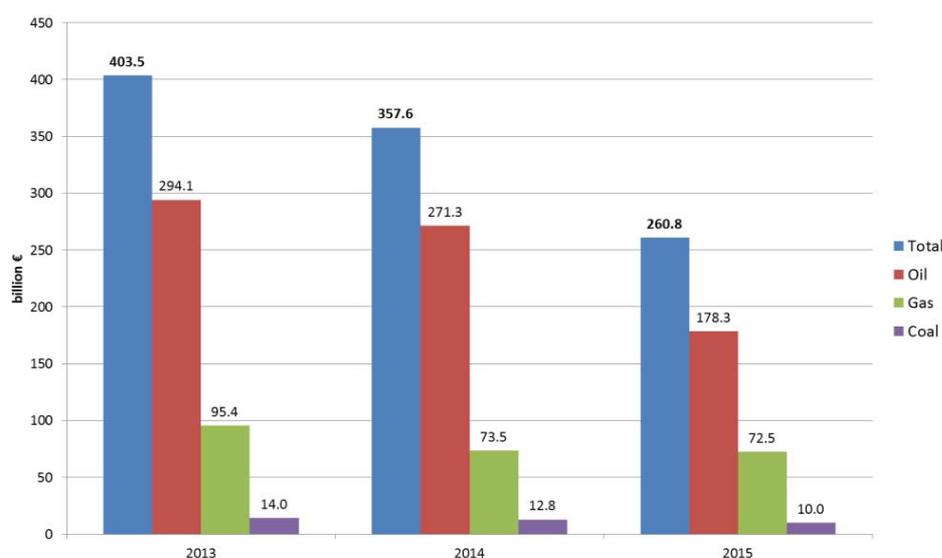
These estimates were verified by looking at the value of imports reported in international trade statistics. While the value of imports of individual Member States is often confidential, Eurostat is able to calculate import values for the EU as a whole. The product coverage of Eurostat's import bill calculation is wider, it also includes NGLs, lignite, peat and coke but compared to the main products (oil, gas and coal), the quantity and the value of these are negligible. According to Eurostat's calculations, the EU energy import bill was EUR 406.1 billion in 2013, EUR 357.8 billion in 2014 and EUR 262.2 billion in 2015.[19] Our estimates are well in line with these figures.

Looking at the import bill by supplying country, Russia is clearly the main energy supplier of the EU; in fact, it is the top supplier of all three fuels. In 2015, about 34% of the import bill went to Russia. Russia was followed by Norway (19%) and Nigeria (7%).

Table 13. Estimated import bill by fuel and supplier in 2015 (billion €)

Supplier	Oil	Gaseous gas	LNG	Coal	Total
Russia	55.6	30.5		3.0	89.1
Norway	24.0	24.9	0.6		49.5
Nigeria	17.6		1.2		18.8
Algeria	9.1	5.8	1.8		16.7
Saudi Arabia	16.1				16.1
Kazakhstan	12.9			0.1	13.0
Iraq	12.8				12.8
Azerbaijan	10.2				10.2
Angola	8.2				8.2
Libya	5.6	1.8			7.4
Qatar	0.0		5.2		5.2
Other	6.2		0.7	6.9	13.8
Total	178.3	63.0	9.5	10.0	260.8

Source: DG Energy calculation

4.3 Putting the import bill in context

The per capita import bill decreased from around 800 euros in 2013 to around 500 euros in 2015.

When expressed as a percentage of EU GDP (at current prices), the share of the estimated import bill decreased from 3.0% in 2013 to 1.8% in 2015. This saving gave a significant boost to GDP growth in 2015: lower energy prices meant more disposable income for households, lower energy costs for businesses and increasing activity of oil intensive sectors (e.g. transport, refining and chemicals).

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[19] http://ec.europa.eu/eurostat/statistics-explained/index.php/EU_imports_of_energy_products_%E2%80%94_recent_developments

Energy products constitute a significant part of total EU imports; it is the second most important product group after machinery and transport equipment. When compared to total extra-EU imports, the share of the energy imports was about 24% in 2013 but it decreased to 15% in 2015.

Table 14. The energy import bill as percentage of GDP and total imports

	2013	2014	2015
Energy import bill as %age of GDP	3.0%	2.6%	1.8%
Energy import bill as %age of total imports	23.9%	21.1%	15.1%

Source: DG Energy calculation

The estimated import bill in 2013 (EUR 403 billion) was more or less equivalent to the GDP of Belgium or Poland. The estimated import bill in 2015 (EUR 261 billion) was more or less equivalent to the GDP of Denmark.

The decrease of the import bill between 2013 and 2015 (EUR 142 billion) is more or less equivalent to the combined 2015 GDP of the six smallest economies of the EU: Slovenia, Lithuania, Latvia, Estonia, Cyprus and Malta.

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Accompanying the document

**REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE
COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE
COMMITTEE OF THE REGIONS**

Energy prices and costs in Europe

{COM(2016) 769 final}

Contents

5   Household energy expenditure

Energy costs in this report are basically defined as the amount of energy consumed, expressed in energy units (e.g. per kWh), multiplied by the actually paid energy unit price (e.g.: €cent/kWh). In this chapter of the report we are going to focus on the household energy expenditure excluding transport (expenditure in motor fuels) and the impact of such energy costs on the budget of the households, otherwise saying we look at the affordability aspect of energy costs[1] in the case of households.

Energy consumption and energy costs in households depend on several factors. Energy prices fundamentally impact energy expenditures and may also give incentives to the households in order to find solutions to reduce their energy bills, for example by improving energy efficiency via refurbishment of the building they live in or by purchasing more energy efficient household appliances. Improving energy efficiency has also beneficial repercussion on household energy expenditures. However, decreasing energy consumption over time does not necessarily mean improving energy efficiency; the decrease in energy use in the households often indicates financial constraints and inability to pay for sufficient energy consumption, enabling comfortable living conditions.

Energy consumption, especially heating and cooling related consumption can largely depend on the climate conditions of a given country that varies across the EU Member States. Of course, the aforementioned energy efficiency factor, regarding the building stock, the fuel type and the household appliances used for heating and cooking, can largely mitigate the impact of the climate and can largely influence household energy expenditures.

The income of households also appears to be an important factor in determining how much burden it does imply on households to pay their energy bills, or otherwise saying, how affordable it is for the households to sufficiently consume energy products to ensure comfortable living conditions.

In this chapter an analysis is provided on how household energy expenditures evolved over the last decade (between 2004 and 2014) and how different Member States energy related household expenditures compare to each other and to the EU average. There are twenty-eight Member states in the EU, facing different retail energy prices, climate conditions, energy intensity of their homes and different income levels.

As a novelty of the current report, the analysis on energy expenditure has been enhanced with differentiation between households in different income quintiles (low income, middle income, etc.) in most of the EU Member States. Energy related expenditures are compared to both the disposable income and the total consumption expenditure of households in order to provide information on how different income levels may influence energy affordability.

There are five different energy products taken into account for analysing energy related expenditure of households[2]: electricity, gas, liquid fuels (mainly heating oil), solid fuels and

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[1] In this chapter energy costs are defined as domestic energy services such as heating, cooling, lighting, water heating, cooking and electrical appliances. Unless otherwise stated, energy costs exclude energy consumption in transport, however, in a subchapter estimation is also made on transport related household energy expenditures.

[2] Following the logic of the Classification of Individual Consumption According to Purpose - COICOP nomenclature, used in household budget statistics (HBS)

heat energy (primarily meaning district heating). The primary data source for the analysis is an ad-hoc data collection[3] from the National Statistical Institutes of the Member States, based on standard questionnaires and classification used by Eurostat for the Household Budget Survey (HBS).

HBS data have also been complemented by the preliminary results of a new data collection on the final household energy consumption data, showing the use of energy by purposes (e.g.: lighting, heating, cooking, etc.) and by the aforementioned five energy products. Further data on households' energy consumption and efficiency have been taken from the ODYSSEE-MURE database[4]. On case study basis data on energy consumption is also included from the report[5] done by the external contractor, providing input for the current chapter.

Besides presenting the evolution of household expenditures on energy, it is also important to provide information on how the underlying factors, for example, energy prices, household income and the quantity of energy consumed change over time; an estimation method developed by the contractor provides information in each Member State for different energy products.

The impact of energy policy measures (e.g.: renewable surcharges, energy efficiency subsidies, other policy measures, etc.) on the expenditure of households has also been analysed in details, given that energy expenditure of households has been increasingly impacted by these policy measures over the last few years in many EU member States.

A short analysis has been provided on estimated energy related transport expenditures (mainly fuels and lubricants for personal transport vehicles). Finally, as an Annex to this chapter, there is a chart for each Member States, showing the share of energy products (excluding transport fuels) in total household expenditures in the five different income quintiles for the most recent period with available data and for periods of five and ten years earlier.

Main findings

- In 2014 households spent almost 6% of their total expenditure on energy products in the EU on average, ranging from 3% in Malta to 14.5% in Slovakia. The share of energy expenditure within housing costs was generally higher in Member States with lower overall purchasing power. Housing costs is an important part of the total household expenditure in almost all Member States, besides services and food products.

- Although households with higher income tend to spend more on energy products, if we look at the share of energy in total household expenditures in different income quintiles we see an inversely proportional relation between the share of energy expenditure and income level; implying that households with low income spend proportionally more on energy products than the average. This gives a good reason to focus our attention on low and middle income households while analysing expenditures on energy from affordability aspect.

- The importance of energy products measurably increased in the total consumption expenditure of households in the EU: on average, the share of energy rose from 5.7% to

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[3] Directorate General for Energy and Eurostat have implemented together this data collection and validation, at the beginning of 2016

[4] http://www.odyssee-mure.eu/

[5] Energy prices and costs in the EU, 2016. (report prepared by Ecofys for the European Commission)

8.6% in the total household expenditure in the lowest income quintile between 2004 and 2014, resulting in a nearly 3 percentage point increase within a decade.

- In 2014 the share of energy in total household expenditure in the lowest income quintile (8.6%) was significantly higher[6] than the share of energy for the entirety of households on EU average (5.8%). In 2004 this difference was smaller (5.7% for households with low income vs. 4.1% for households as a whole).

- Most of this increase was due to electricity and gas. On EU average, in 2014 households in the lowest income quintile spent 160€ more on electricity and 140€ more on natural gas than in 2004. The overall EU average expenditure on energy products per household rose from 625€ to 960€ during the same period, implying a 24% increase in real terms after correcting by the inflation[7].

- In 2014 there was an almost eightfold difference across the EU Member States in average annual household expenditure on energy products in the lowest income quintile: while in Romania households with low income spent 294€ on energy, in Denmark energy related spending s amounted to 2,320€. In Sweden and Finland households spent less than 4% of their total expenditure on energy, while in Slovakia this share was more than 21%.

- After purchasing power correction, eliminating the differences in household incomes across the EU, the difference in energy expenditures was still more than threefold in 2014 in the lowest income quintile. Households spent the largest part of their energy bills on electricity, followed by natural gas. In some Member States district heating[8] or heating oil[9] (liquid fuels) had of particular importance.

- Households with middle income have not been as strongly impacted by the increase in energy costs as households with low income. On EU average the total energy costs went up between 2004 and 2014 from 885€ to 1,295€, implying an 18% increase after correcting by the inflation. Expressed as percentage of total consumption expenditure, the share of energy rose from 4.3% to 6.2% in the same period.

- Increasing electricity costs added 150€ to the energy bill of households with middle income while in the case of gas the additional expenditure was 190€, implying that energy costs other than electricity and gas practically remained the same in this period.

- Comparing energy expenditures to disposable income besides the total consumption expenditure reveals important differences both across Member States and different income quintiles. In the lowest income quintile the share of energy expenditures in disposable income went up from 7.8% to 12% between 2004 and 2014, while in the same time the share of energy in households with middle disposable income went up from 4.3% to 6.2%.

- The share of energy expenditure in the disposable income shows a higher dispersion both across income quintiles and Member States than the share of energy within the total household expenditure. It seems that in the lowest income quintile disposable income is

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[6] Energy expenditure shares for households in the lowest income quintile might be underestimated if we take into account that many of these households does not have sufficient financial means to heat their homes to an adequately warm level

[7] The overall EU inflation rate (measured by the Harmonised Index of Consumer Prices – HICP) was 23.6% between 2004 and 2014

[8] For example: Denmark, Slovakia, Estonia, Latvia and Lithuania

[9] For example: Belgium, Luxembourg, Slovenia, Greece, Ireland

underestimated by household budget statistics, as some elements, such as social transfers, debt, etc. are not included in disposable income. In the case of households with middle and higher income these elements have less important role.

- It seems that in some Member States households reacted on increasing energy prices and costs by reducing their energy consumption. In many cases reduction in energy consumption was the result of improving residential energy efficiency. On the other hand, in some countries purchasing power constraints might rather be suspected behind dramatic decreases in energy consumption.

- Contrarily to household energy use in basic housing activities, (e.g.: heating, cooking, lighting, etc.) energy expenditures related to transport activities (e.g.: purchase of fuels for personal vehicles) are proportionally higher in the case of households with high income than for households with lower purchasing power. Consequently, energy expenditures related to transport activities are normally not taken into account for energy affordability considerations.

5.1 Energy products in household budgets

In order to assess the importance of energy products in household expenditures in different EU Member States, it is useful to look at how the share of energy compares to expenditures related to the consumption of other goods and services, such as food, services, housing, transport (which includes expenditure in transport fuels), etc.

Figure 146 shows the decomposition of consumption expenditure of households in 2014in the EU Member States, ranking them in descending order according to the share of energy in their total expenditures.

Looking at energy expenditures in each country, households in Slovakia spent proportionally the most on energy products (14.5% of their total expenditures), while households in Malta spent only 3% of their total budget. On EU average, households spent almost 6% of their total expenditure on energy products in 2014.

The share of energy related expenditures were higher in Member States with lower GDP per capita (mainly Central and Eastern European countries), while housing related expenditures[10] were generally higher and energy expenditures were lower than the EU average in Member States having higher GDP per capita. Services, and food and non-alcoholic beverages had the two biggest shares in household's expenditures in almost all Member States in 2014 (food products had higher shares in countries with lower purchasing power per capita, while in the case of services it was the other way around). Transport related energy expenditures (mainly motor fuels) were also significant in most of the Member States; ranging between 6% measured in Romania and 17% in France, if expressed as the share of total consumption expenditure.

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[10] It is important to recall that HBS data are not fully harmonised at EU level, implying that numbers are not always fully comparable across countries, even if the same nomenclature (COICOP) used for the data collection. For example, the distinction between housing and energy products is not the same across different countries, making sometimes the comparison on related expenditures difficult.

Figure 146 - **Shares of consumer goods groups in household expenditure in Member States, 2014**
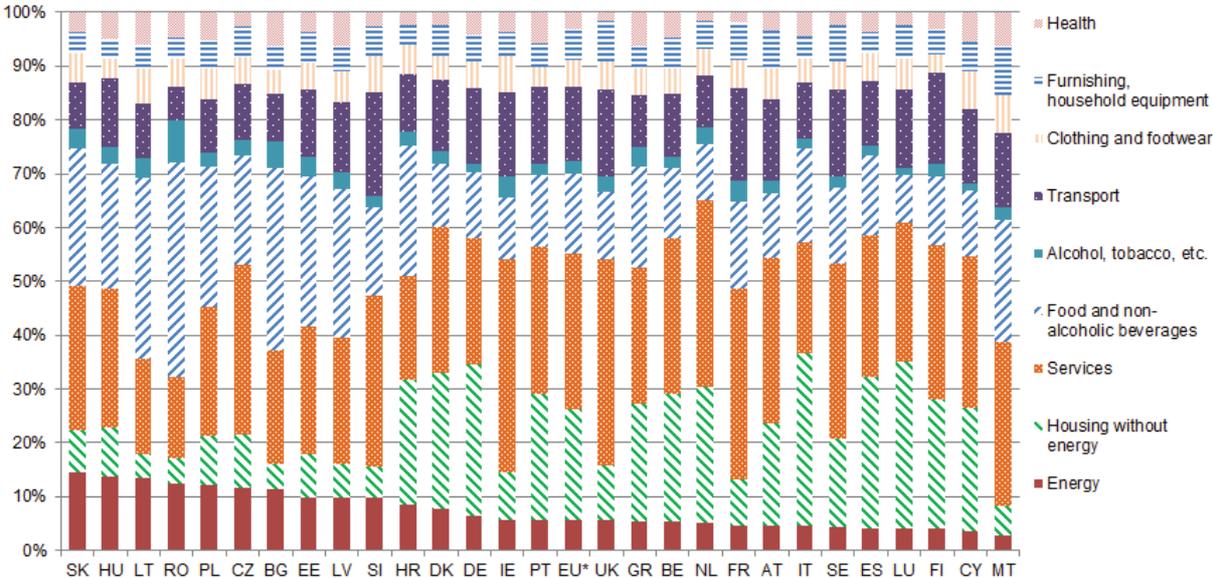
Source: Directorate General for Energy and Eurostat common data collection from National Statistical Institutes and own computations.

After looking the overall picture on consumption of goods and services in the household sector, from this point the analysis will concentrate on household expenditures on energy products. Given that all of the twenty-eight EU Member States have submitted detailed data on the final household consumption expenditures in the five different income quintiles for the last ten years, we have detailed data on how much households spent on energy and on other products as well. Each income quintile represents 20% of the population regarding the income of households; hereinafter the lowest income quintile is called Quintile 1, while the highest is Quintile 5. Households in different quintiles, representing different purchasing power, normally spend different shares of their financial resources on energy products, as **Figure 147** shows. As it is presented on this chart, there were significant differences across EU Member States in spending on energy products in 2014 in all income quintiles (showing five-to-eight-fold differences between Bulgaria and Romania on the low end of the scale and Luxembourg, Denmark on the high end). Spending on energy products tends to increase with income, implying that households in higher income quintiles spend more on energy products.

Figure 147 **Households energy expenditures in Member States across income quintiles, 2014**
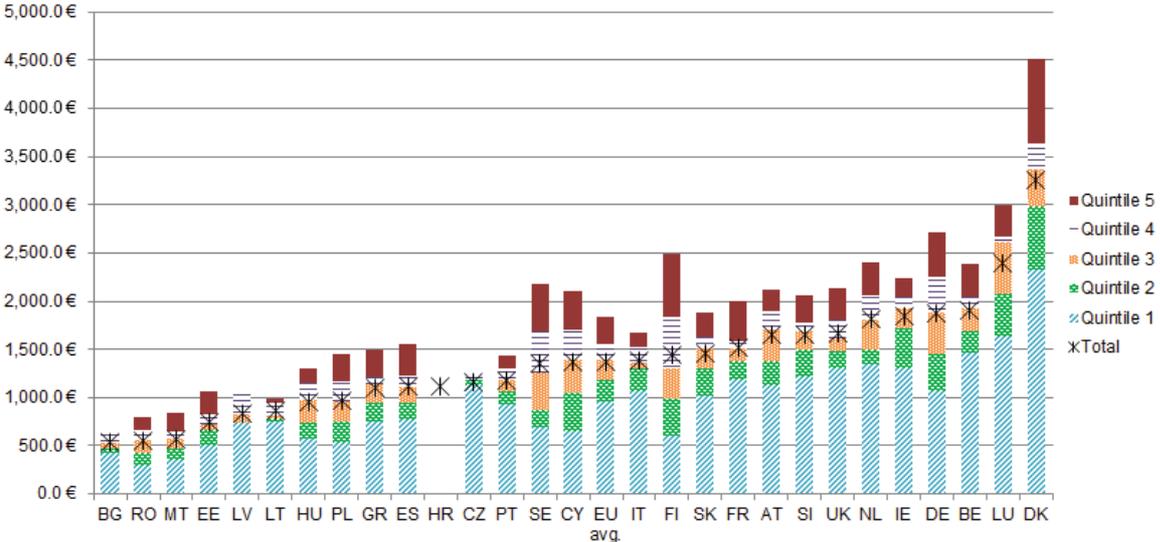
Source: Directorate General for Energy and Eurostat common data collection from National Statistical Institutes and own computations
Note: Expenditure data on the chart must be read in cumulative way; e.g.: expenditure in the third quintile is the sum of the first three bars from the bottom in each country. Total stands for the average of all households.

However, if we look at the share of energy products within the total household expenditure, also showing significant differences in all income quintiles across EU Member States, we can see that the share of total expenditure on energy products is inversely proportional with income, implying that poorer and middle-income households spend proportionally more on energy products than households with high income, as **Figure 148** shows.

This fact has important social implications, as sudden increase in energy costs may impact more intensively households having low income. Subsequently, in the remaining part of this chapter the analysis on energy expenditures will mainly focus on households with low and middle income.

Figure 148 **- Energy products share in the total households consumption by income quintile (2014)**

Source: Directorate General for Energy and Eurostat common data collection from National Statistical Institutes and own computations

5.1.1 Energy expenditure in households with low income

As Figure 149 shows, the importance of energy products (their share in the total household consumption expenditure) increased measurably in the case of households being in the lowest income quintile between 2004 and 2014: the share of energy went up from 5.7% to 8.6% in the EU[11] over this ten year period. This increase was predominantly due to the rising share of electricity and natural gas, while the other three components remained more or less stable. If consumption expenditures are expressed as the share of disposable income[12], the share of energy rose from 7.8% to 12% between 2004 and 2014.

Over the ten year period represented on Figure 148 the average EU household expenditure on energy products rose from 625€ to 960€, representing a bigger increase than the overall inflation in the EU-28 (23.6%, as measured by the Harmonised Index of Consumer Prices – HICP) in the same period.

While in 2004[13] household expenditure on electricity was 300€ in the lowest income quintile on EU average, in 2014 it reached 460€. The same data for expenditure on natural gas: 200€ in 2004 and 340€ in 2014. Expenditures related to the other three energy products presented on the charts altogether did not show significant changes over this ten year period.

Figure 149 – **Households in the lowest quintile - EU average energy expenditure (€) and share of total household expenditure over time**

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[11] It is important to note that there are missing countries in each year from the EU sample, as Household Budget Survey data collection are not harmonised across Member States and hence the EU average represents an average of the actually available data. Therefore changes in the EU average from one year to another might also represent changes in composition of countries.

[12] It must be noted that there is a risk that Household Budget Statistics underestimates disposable income of households, especially in the lowest income quintile. See more on the caveats of HBS in subchapter ' Comparing energy expenditures to total household consumption vs. disposable income'

[13] Comparing average expenditures over consecutive years might be biased by the composition effect mentioned in the previous footnote at the computation of the EU average
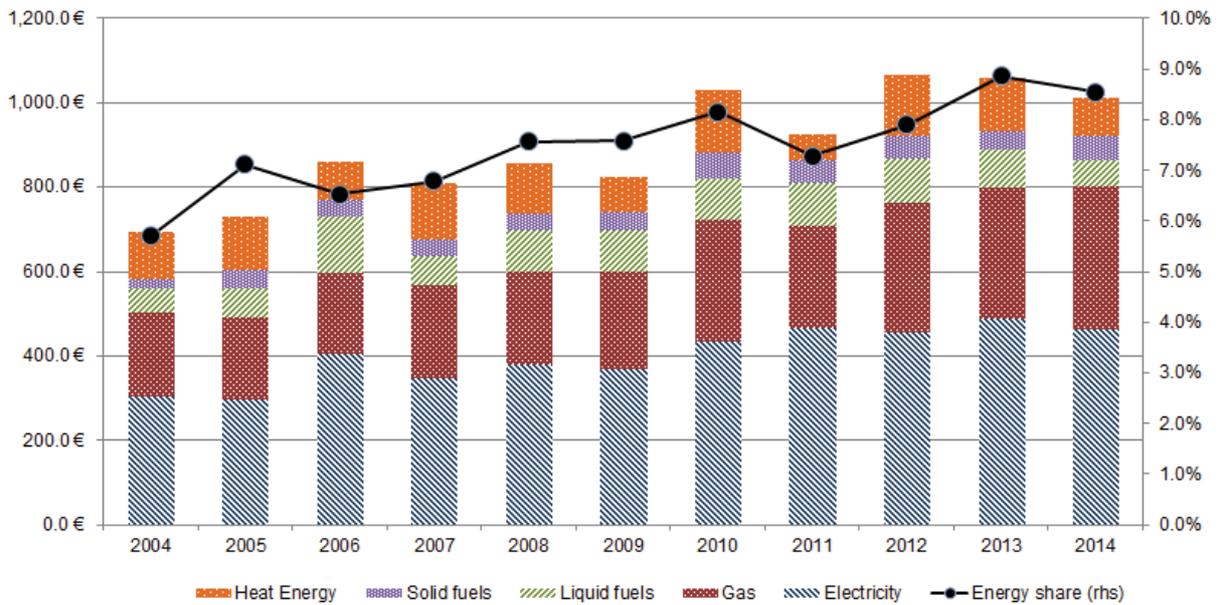
Source: Directorate General for Energy and Eurostat common data collection from National Statistical Institutes and own computations

Besides analysing the evolution of energy related expenditures over time, it is also important to provide a cross-country analysis, revealing the differences in the structure of energy related expenditures across EU Member States. Figure 150 shows the average amount spent on electricity, gas, liquid fuels, solid fuels and heat energy in each EU Member State in 2014 in the lowest income quintile of households. Diamonds in the chart show the share of energy in the total household consumption expenditure in each country (on the right hand scale).

Figure 150 - **Households with the lowest income - Energy expenditures (€) and share of energy in total consumption, by EU Member State (2014)**
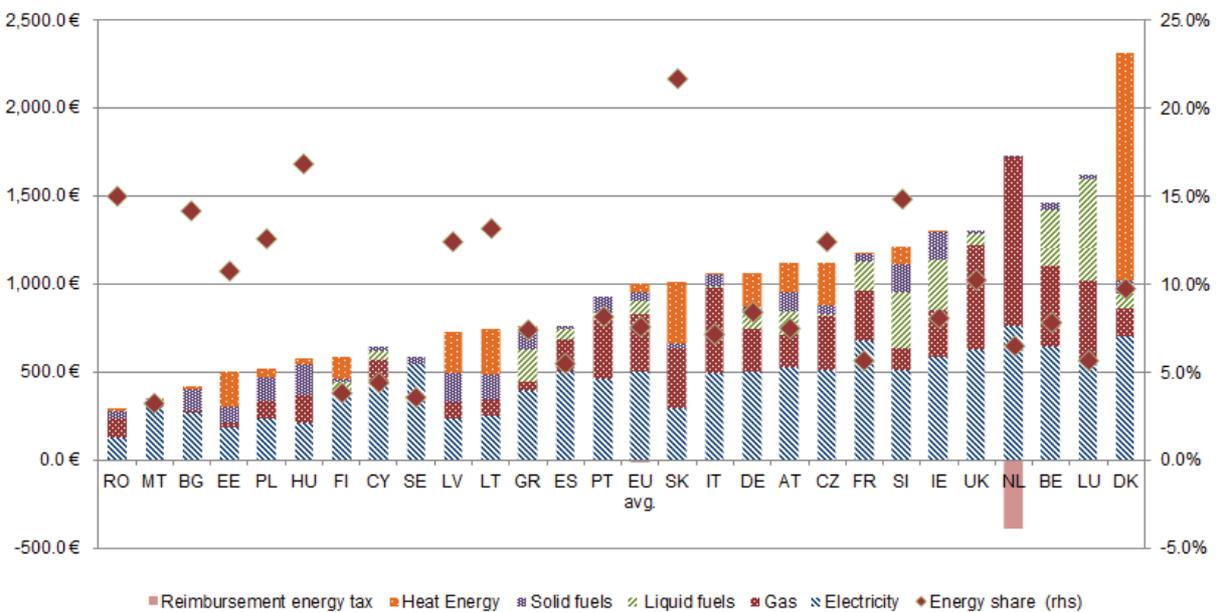
Source: Directorate General for Energy and Eurostat common data collection from National Statistical Institutes and own computations. No quintile data for Croatia.

On EU average, households being in the lowest income quintile spent 960 € on energy products in 2014, however, this average masks significant differences across Member States:

While in Romania the average energy expenditure was below 300€, in Denmark it exceeded 2,300€, providing for a more than eightfold difference in energy related spending across the EU.

However, while in Romania this amount of 300€ represented 15% of the total household expenditure in 2014 in the lowest income quintile, the amount paid in Denmark (2,320€) represented only 5.6%. Energy expenditures expressed in euros were normally lower than the EU average in the Central and Eastern European countries[14] (with the exception of Slovakia, the Czech Republic, and Slovenia), as well as in Finland, Sweden, Greece and Spain, while in the other Member States households spent more on energy than the EU average.

Looking at the share of energy expenditures in the total consumption expenditure, households in the Central Eastern European countries, the UK and Denmark spent proportionally more on energy than the EU average in 2014 (8.6%), while German households spent nearly the same share of household's expenditure on energy as the EU average. In the EU households spent the lowest share of their consumption expenditure on energy in Malta, Finland and Sweden (below 4%), while in Slovakia this share was the highest (almost 22%).

In the overall majority of the EU Member States electricity had the highest share in energy expenditures in 2014, followed by natural gas. In the Netherlands however, the most important energy product in household expenditure was natural gas. In this country there is a specific item (reimbursement of energy taxes, amounting to 386€ in recent years), having a decreasing impact on the overall energy bills for all households.

Liquid fuels (mainly heating oil) has significant share in some countries (Luxembourg, Belgium, Slovenia and Greece). In Bulgaria, Estonia, Hungary, Latvia, Poland, and Romania solid fuels (mainly coal and wood) also has a measurable share. In these countries the share of solid fuels has been significantly higher in households with low income than in households with middle and higher income, which may point to the lack of infrastructure to connect some of these households to the electricity and gas grids or to the cost advantages of solid fuels to other alternatives (e.g.: heating oil).

Heat energy is especially important in Denmark, where significant investments in the heating sector have made heat as primary source within energy-related expenditures of households, outnumbering even electricity. Heat energy (mainly in the form of district heating in practice) also has an important share in the Baltic States[15], Slovakia, Germany, Czech Republic, Austria and Finland.

The next map shows the numbers of **Figure 150** on energy expenditure and share of energy in total consumption expenditure in 2014, for households with the lowest income.

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[14] Poland, Czech Republic, Slovakia, Hungary, Slovenia, Croatia, Romania, Bulgaria, Estonia, Latvia, Lithuania
[15] Estonia, Latvia and Lithuania

Figure 151 – **Households with lowest income – Map with Energy expenditures and the share of energy in total consumption in EU Member States in 2014**

Energy expenditures
and the share of energy in total consumption in EU Member States

Households with the lowest income
EUR, 2014

NL: 1,339€ (6.5%)
BE: 1,465€ (7.8%)
LU: 1,623€ (5.6%)

CZ: 1.124€ (12.4%)
SK: 1.018€ (21.7%)
AT: 1.121€ (7.5%)
HU: 579€ (16.9%)
SI: 1.214€ (14.9%)

FI: 594€ (3.9%)
SE: 697€ (3.6%)
DK: 2,320€ (9.7%)

EE: 503€ (10.7%)
LV: 733€ (12.4%)
LT: 752€ (13.2%)

IE: 1,298€ (8.1%)
UK: 1,304€ (10.2%)
PL: 527€ (12.5%)
DE: 1,068€ (8.4%)

RO: 295€ (15.0%)

FR: 1,179€ (5.7%)

HR: N/A

BG: 422€ (14.2%)

PT: 932€ (8.2%)

IT: 1,061€ (7.1%)

ES: 768€ (5.5%)

CY: 647€ (4.4%)

EL: 755€ (7.4%)

MT: 346€ (3.3%)

LEGEND

Total consumption expenditure (€)

Share of energy (%)

Other expenditures

The size of the pie chart represents the average household expenditure on energy. The red portion of the chart represents the share of energy in total household expenditure

Source : © EUrogeographic for the administrative boundaries; © DG ENER, May 2016

0   500   1.000 Kilometers

Energy

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As **Figure 152** shows, purchasing power parity correction significantly changes the country ranking order of expenditures on energy, providing for a better picture on how household incomes in different countries impact the share of energy within the total household expenditure. The dispersion of average energy expenditure across the EU was lower than before purchasing power correction (in 2014 households in the Czech Republic spent three and a half times more on energy than in Sweden calculated on purchasing power parity, as opposed to the aforementioned eightfold difference between Denmark and Romania before purchasing power parity correction).

Figure 152 **- Households with the lowest income - Energy expenditures and the share of energy in total consumption in EU Member States (actually paid PPS EUR, 2014)**
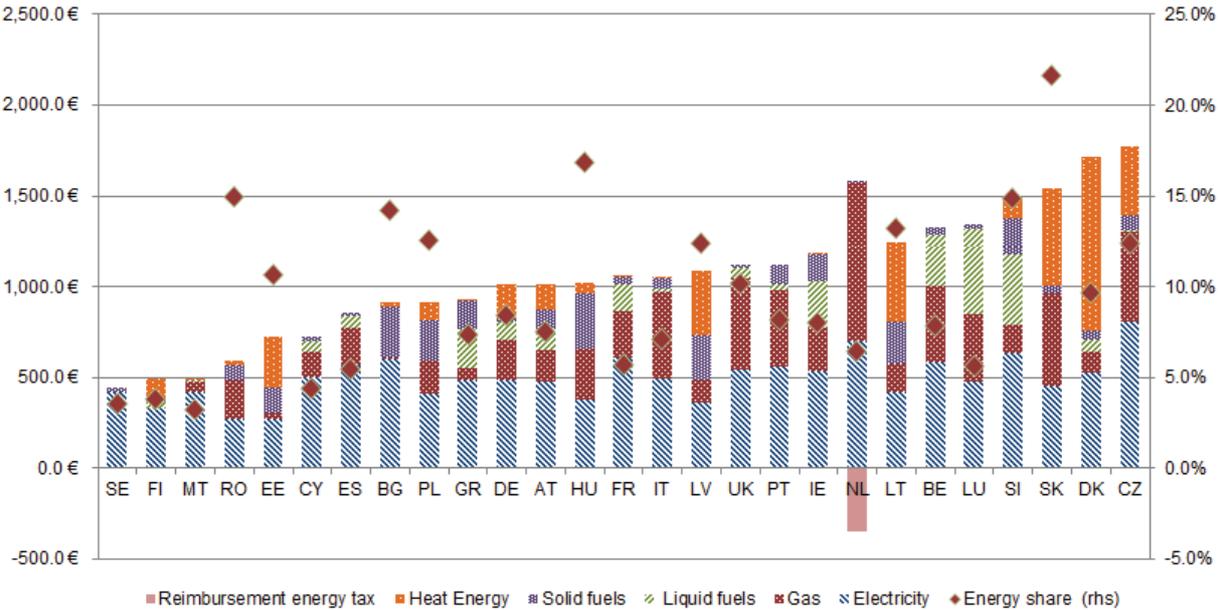
Source: Directorate General for Energy and Eurostat common data collection from National Statistical Institutes and own computations. No quintile data for Croatia.

5.1.2 Energy expenditure in households with middle income

After analysing energy expenditures of households having the lowest income, the next step is to take a look at households with middle income, which practically means the third income quintile (40% of the total population has lower income and 40% of the total population has higher income than households in the middle income quintile).

As **Figure 153** shows, the evolution of both household energy expenditure and its share in total consumption expenditure on EU average basically followed the same pattern in the case of households with middle income as it was presented before for households with low income.
However, the rise in energy expenditure was less steep: between 2004 and 2014 the average household expenditure rose from 885€ to 1,295€, or, expressed as a share of total expenditure, from 4.3% to 6.2%. This can be interpreted as increasing energy costs had weaker impact on households with middle income than on households with low income. Expressed in real terms (after correcting by inflation) energy costs went up by 18% for households with middle income during this ten year period. Increasing electricity costs added 150€ to the energy bill of households with middle income while in the case of gas this additional amount was 190€, implying that energy costs other than electricity and gas slightly decreased in this period.

Figure 153- **Households in the middle income quintile - EU average energy related expenditure in euros and in the percentage of total expenditure.**
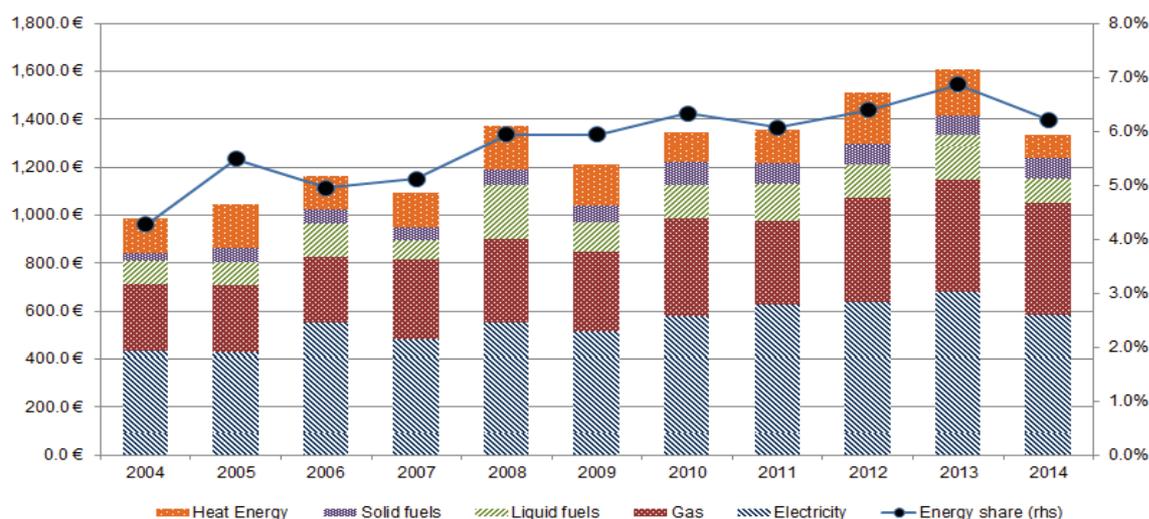
Source: Directorate General for Energy and Eurostat common data collection from National Statistical Institutes and own computations

A significant, fivefold difference in energy expenditures exists across the EU Member States in the case of households with middle income. As **Figure 154** shows, in 2014 the EU average household energy expenditure was 1,295€, representing 6.2% of the total consumption expenditure. In Bulgaria the annual expenditure amounted to 530€ (13.2% of the total consumption expenditure) while in Denmark it was 3,360€ (though this amounted only to 7.9% of the total consumption expenditure). Households in Malta, Sweden and Cyprus spent less than 4% of their total expenditure on energy, while in Hungary and Slovakia this share was around 15%.

Similarly to the households with lowest income, middle-income households also spent the biggest part of their energy bills on electricity in most of the EU Member States. Households with middle income however, spent more on natural gas in Italy and the UK, on liquid fuels in

Slovenia and Greece and on heat energy in Denmark than households with low income in these countries in 2014.

Figure 154 - Households with middle income - Energy expenditures and the share of energy in total consumption in EU Member States (actually paid EUR, 2014)

Source: Directorate General for Energy and Eurostat common data collection from National Statistical Institutes and own computations. In the lack of quintile data, number for Croatia represents the national average of households as a whole

The same numbers in map format (see next figure)

Figure 155 - Households with middle income – Map with Energy expenditures and the share of energy in total consumption in EU Member States in 2014.

Energy expenditures
and the share of energy in total consumption in EU Member States

Households with middle income

EUR, 2014

NL: 1,810€
(5.5%)

BE: 1,924€
(5.7%)

LU: 2,612€
(4.8%)

CZ: 1.149€
(12.7%)

SK: 1.507€
(14.8%)

AT: 1.705€
(5.1%)

HU: 966€
(15.4%)

SI: 1,693€
(10.9%)

HR: 1.124€
(8.6%)

FI: 1,298€
(4.1%)

SE: 1,261€
(3.9%)

EE: 726€
(10.5%)

LV: 819€
(11.7%)

LT: 815€
(13.9%)

DK: 3,363€
(7.9%)

IE: 1,926€
(6.5%)

UK: 1,615€
(5.9%)

DE: 1,874€
(7.0%)

PL: 957€ (13.4%)

FR: 1,501€
(4.9%)

AT: 1,705€
(5.1%)

RO: 556€
(13.7%)

PT: 1,184€
(6.7%)

IT: 1,359€
(5.1%)

BG: 529€
(13.2%)

ES: 1,100€
(4.3%)

EL: 1,136€
(6.8%)

CY: 1,383€
(3.8%)

MT: 565€
(2.7%)

LEGEND

Total consumption
expenditure (€)

Share of energy (%)

Other expenditures

The size of the pie chart represents the average household expenditure on energy. The red portion of the chart represents the share of energy in total household expenditure

Source : © EUrogeographic for the administrative boundaries; © DG ENER – May 2016

Energy

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Purchasing power correction, as it is shown on **Figure 156** reduces the difference in household energy expenditures across the EU to a factor of 3.

Figure 156 **- Households with middle income - Energy expenditures and the share of energy in total consumption in EU Member States (PPS EUR, 2014)**
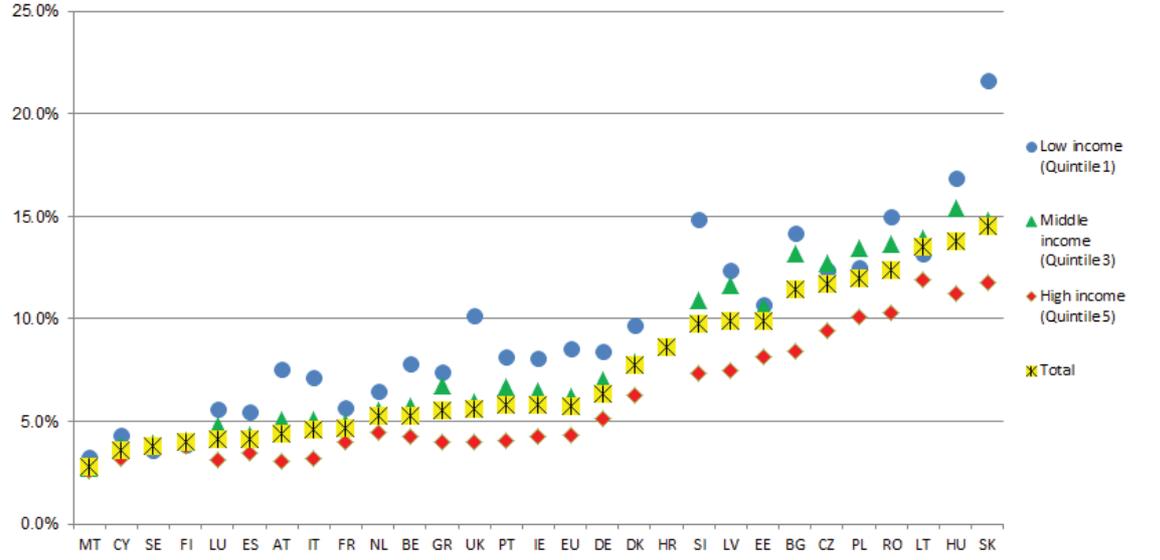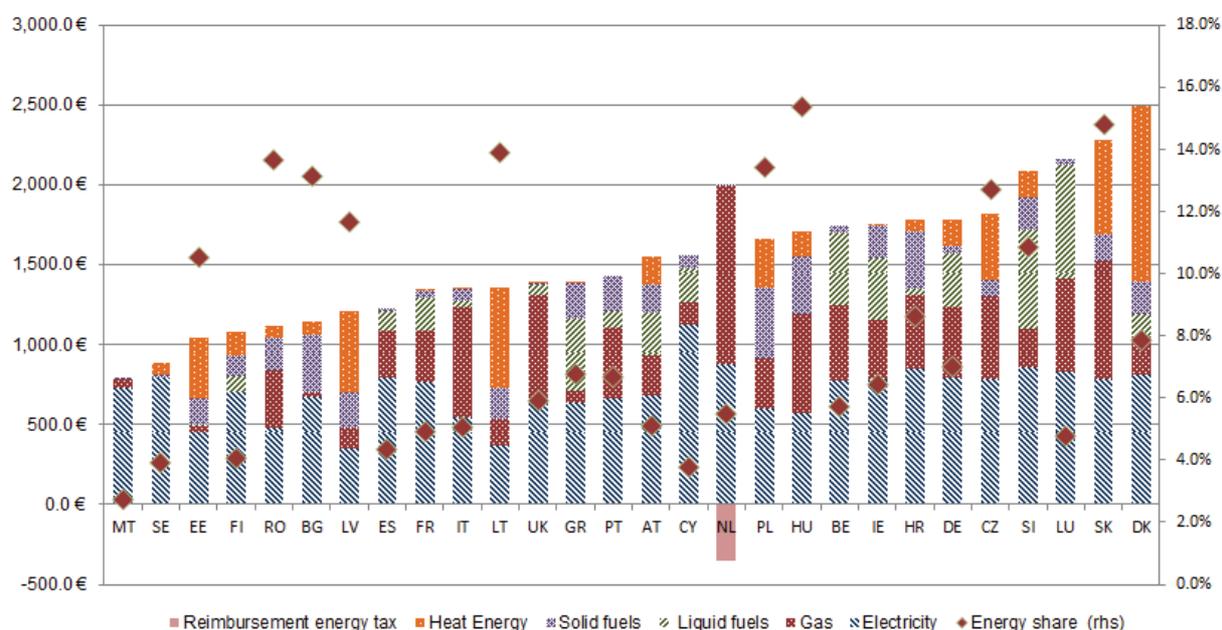

Source: Directorate General for Energy and Eurostat common data collection from National Statistical Institutes and own computations. In the lack of quintile data, number for Croatia represents the national average of households as a whole.

5.1.3 Energy expenditures in household consumption and disposable income

If household energy expenditure is also compared to disposable income besides the total consumption expenditure, important differences can be discovered in some Member States regarding how incomes and expenditures relate to each other and how does this difference might impact energy affordability.

As Figure 157 shows, in the case of households in the lowest income quintile the share of energy expenditure in the disposable income is higher in most of the Member States than its share in total consumption expenditure. While the share of energy in total expenditure was 8.6% on EU average in 2014, comparing to the disposable income it was higher, 12%. In Spain, Greece, Estonia and Slovenia the difference between the two shares was more than 5 percentage points in recent years, revealing that in these countries the disposable income might be underestimated in the Household Budget Statistics[16] and there are some factors that might confirm the divergence with total household expenditure, namely:

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[16] Household Budget Statistics primarily concentrate on the structure of household expenditures and statistics on disposable income is not the key focus of the data collection, it is only an auxiliary indicator in HBS.

- The lowest income group might also include households with negative income (e.g. self-employed people) in some Member States.

- The lowest income group might also consist of households whose consumption is mainly financed by wealth components (savings), for example pensioners.

- Consumption can be financed by loans (not included in disposable income)

- Consumption can be also financed by income from undeclared work.

- Finally, in some countries, the share of the so-called owner occupied dwellings (share of households being owner of apartments and flats they live in) is substantial and the underlying imputed rental (a non-monetary item estimating the amount of rent that would be paid if the given household were not the owner of the residence) can be a significant item in the total household expenditure. Consequently, the share of energy is underestimated in the total monetary consumption expenditure, implying that from affordability aspect the energy share within the disposable income might be closer to the reality.

The difference between disposable income and total expenditure also reveals the role of social transfers in the lowest income quintile, implying that any reduction in social transfers (for example in order to help to restore the balance of national budgets) might have significantly impact the energy affordability of households with low income.

In the case of households with middle income (third quintile) the difference between the share of energy expenditures in the total consumption expenditure and in the disposable income seems to be less important, as **Figure 158** shows. In contrast to low income households, the share of energy is lower in the disposable income, showing that middle income households can still manage saving a part of their incomes and need less social transfers to cover their indispensable consumption expenditures, such as energy.

Figure 157 - **Households in the lowest income - Share of energy expenditures in the total consumption and disposable income of, 2014**
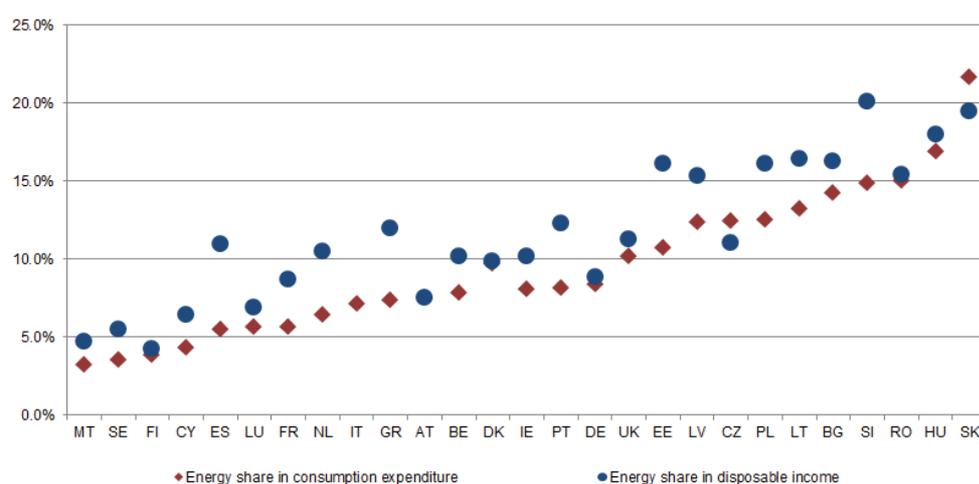
Source: Directorate General for Energy and Eurostat common data collection from National Statistical Institutes and own computations. No quintile data for Croatia.

Figure 158 - **Households with the middle income - Share of energy expenditures in the total consumption and disposable income in 2014**
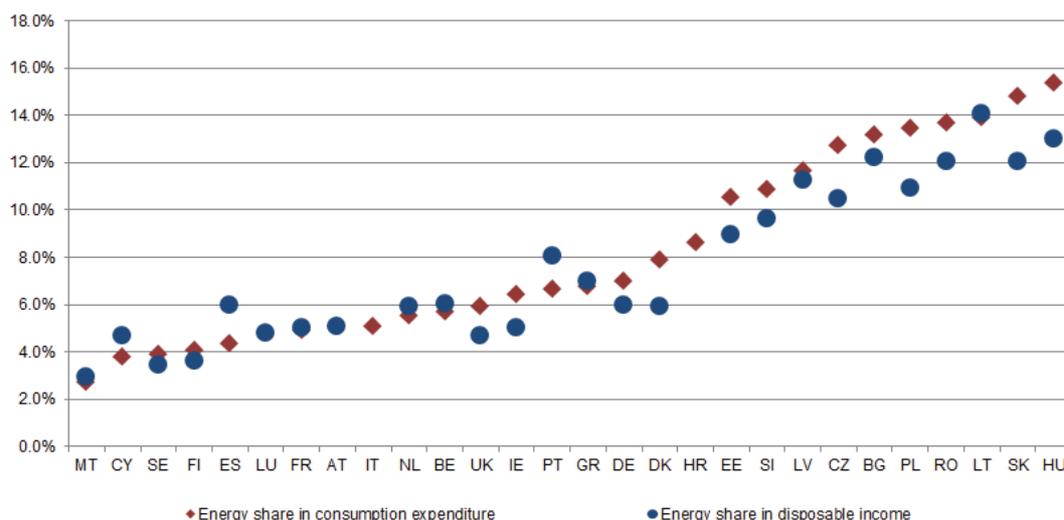
169

Source: Directorate General for Energy and Eurostat common data collection from National Statistical Institutes and own computations. In the lack of quintile data, number for Croatia represents the national average of households as a whole.

5.1.4 Change in energy expenditures in the Member States (2004-2014)

The next chart (**Figure 159**) shows how the share of energy in the final household consumption expenditure changed between 2004 and 2014[17]. The red bars represent the share of energy in the first income quintile (households with the lowest income – 1st, on the left), while the green bars represents households with middle income (third quintile – 3rd, on the right) in each Member State. In most of the Member States the relative share of energy in the final household expenditure grew measurably; significant decreases in both observed quintiles could only be observed in Slovakia[18], where the share of energy in household expenditure still represented the highest across the EU in 2014.

In most of the presented countries the share of energy in the total expenditure grew faster in the first income quintile than in the third quintile, implying that increasing energy costs impacted poorer households more significantly than those with middle income.

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[17] Due to unavailability of data in few Member States in 2014, the year used for comparison might change across countries (e.g.: 2012, 2013, etc.), however, in most cases the timespan used for depicting the evolution of the share of energy is ten years.

[18] In Slovakia, due to the improving purchasing power, total household consumption expenditure grew much faster than expenditure on energy products, resulting in a decreasing share of energy within total consumption expenditure between 2004 and2014

Figure 159 – **Households with lowest income (1ˢᵗ quintile) vs Households with middle income (3ʳᵈ quintile) - Share of energy in household expenditure over the last decade**
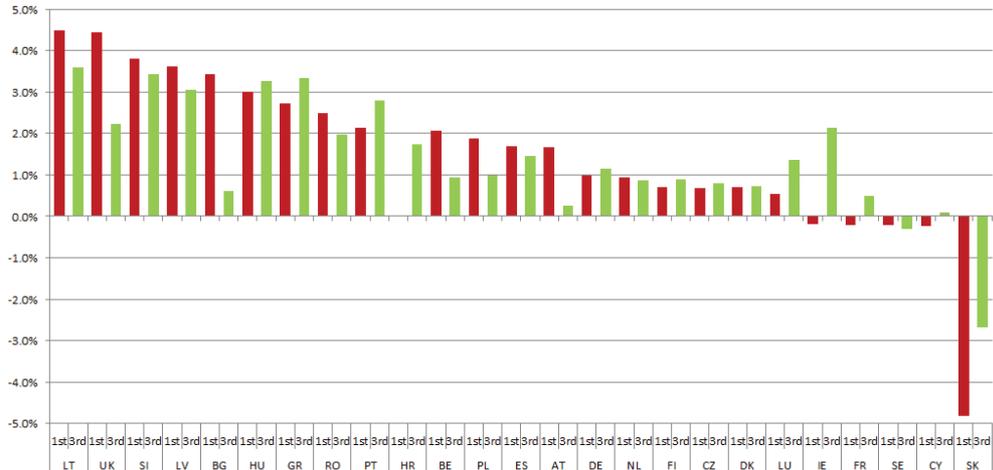
Source: Directorate General for Energy and Eurostat common data collection from National Statistical Institutes and own computations

On **Figure 160** changes in energy expenditures can be followed, measured in euros between 2004 and 2014. Expenditures for households being in the lowest income quintile increased by the most in the United Kingdom, Slovenia, Portugal and Denmark, by more than 500€ in each case. On the other hand, energy expenditures for the poorest households increased by less than 100€ in Slovakia, Hungary and Luxembourg between 2004 and 2014[19]. As it was mentioned before, the share of energy in the total household expenditure increased faster for households in the lowest income quintile than for households with middle income. Looking at the absolute expenditures, this was the other way around, nevertheless, bigger increases in energy expenditures in households with middle income was overcompensated by increasing purchasing power and total consumption expenditure, leading to proportionally lower increase in energy expenditures than in the case of the poorest households.

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[19] Looking at the increase in expenditures between two time periods (see the previous footnote as well) it has to be borne in mind that changes expressed in euros might be significantly impacted by changes in currency conversion rates for countries outside the-eurozone.

Figure 160 - **Households with lowest income (1ˢᵗ quintile) vs Households with middle income (3ʳᵈ quintile) - Expenditure on energy in € over the last decade**
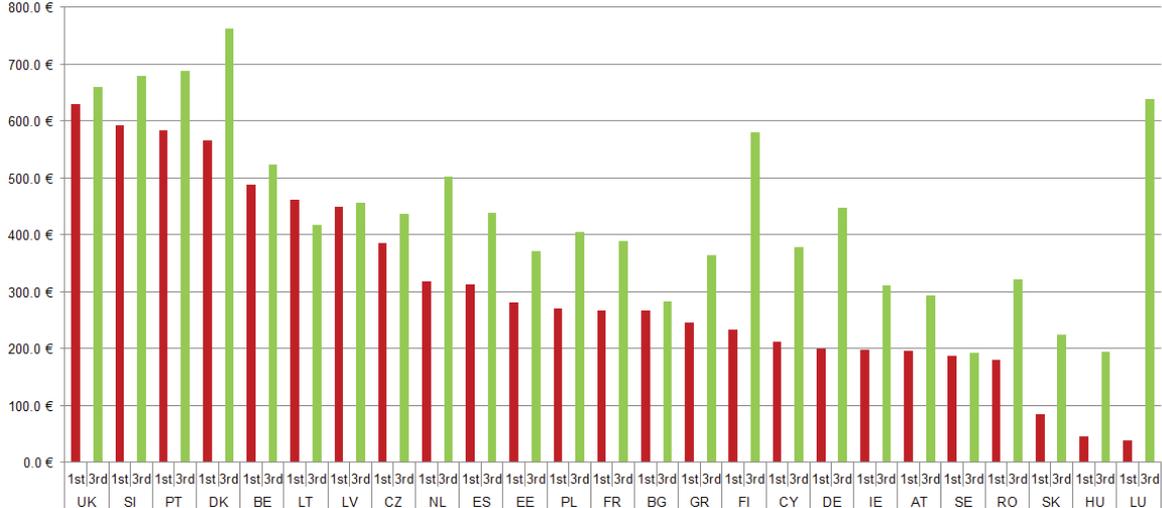
Source: Directorate General for Energy and Eurostat common data collection from National Statistical Institutes and own computations

5.2 Share of energy in the household expenditure by income and region

The following charts show the share of energy in final household consumption expenditure in the five different income quintiles in most of the EU Member States. In order to be able to present all available information, a regional approach has been followed, also enabling comparisons for the Member States with their neighbouring peers[20].

As the next chart (**Figure 161**) shows[21], these six North Western European countries spent slightly less than the EU average on energy products in the most recent years. In the lowest income quintile households spent 5-8% of their total expenditure on energy, while in the highest income quintile this share varied between 3% and 5%. In these countries households have high household expenditures in EU comparison and this must be a principal reason why the share of energy is less than the EU average.

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[20] In Annex I a comparison of the timely evolution of share of energy in total consumption in each the five quintiles can be found for each EU Member States

[21] In this chapter figures always show the most recent available data for each country. As the reporting periods for Household Budget Surveys are not harmonised across the EU countries, data might stem from different years.

Figure 161 - **Germany, France, Belgium, Netherlands and Luxembourg - Share of energy in final household consumption expenditure per income quintiles**
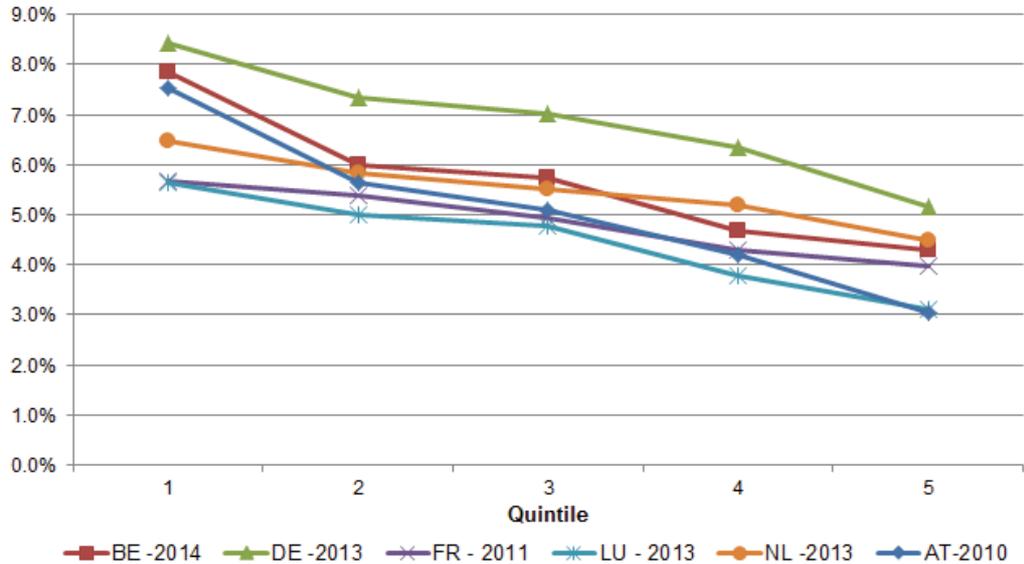
Source: Directorate General for Energy and Eurostat common data collection from National Statistical Institutes and own computations

In the South European countries presented on Figure 162 the share of energy within total household expenditures was also lower than the EU average during the last few years, though the dispersion in shares of energy within the total expenditure in different countries was quite significant[22]. Given the favourable climate conditions, heating needs are lower in these countries compared to other regions of Europe; this might also contribute to lower than EU average shares on energy within the total household expenditure.

Figure 162 – **South European countries (Spain, Portugal, Italy, Greece, Malta and Cyprus) - Share of energy in final household consumption expenditure in different income quintiles**
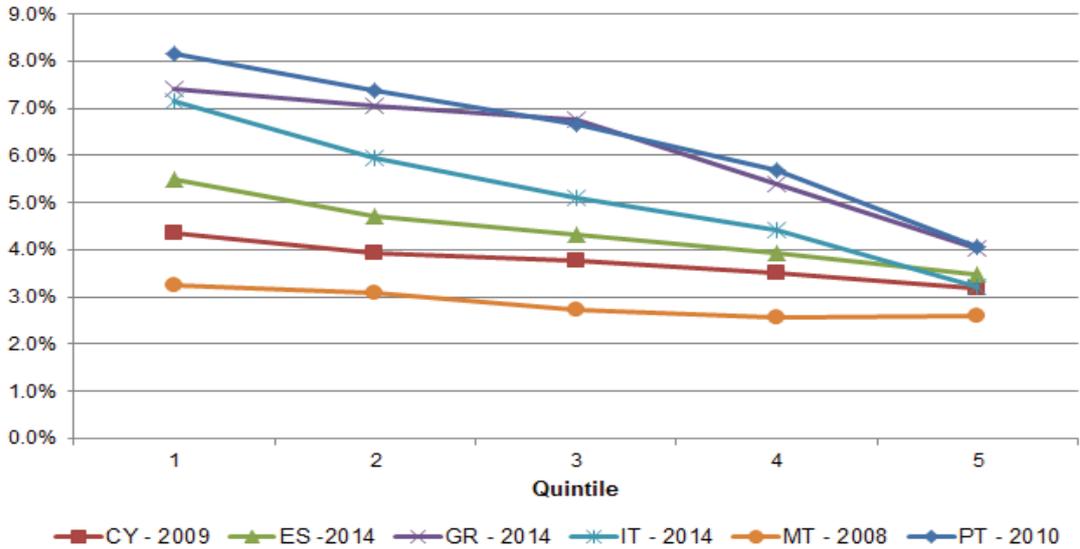
Source: Directorate General for Energy and Eurostat common data collection from National Statistical Institutes and own computations

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[22] It is worth noting here that the curves for different countries represent substantially different time periods, pending on the last available data, which makes cross country comparisons less reliable.

Although retail energy prices in the four Central and Eastern European countries presented on the next chart (Figure 163) were comparable or were even below the EU average in 2014, the share of energy in total household expenditures were higher than the EU average, ranging from 12% to 21% in the lowest income quintile, while in the highest income quintile it varied between 10% and 13%. Higher-than-EU average share of energy in the total household expenditure reflects the relatively low purchasing power and total consumption expenditure in these countries and might hint on the potential of improvements in energy efficiency of residential buildings.

Figure 163 **- Poland, Czech Republic, Slovakia and Hungary - Share of energy in final household consumption expenditure in different income quintiles**
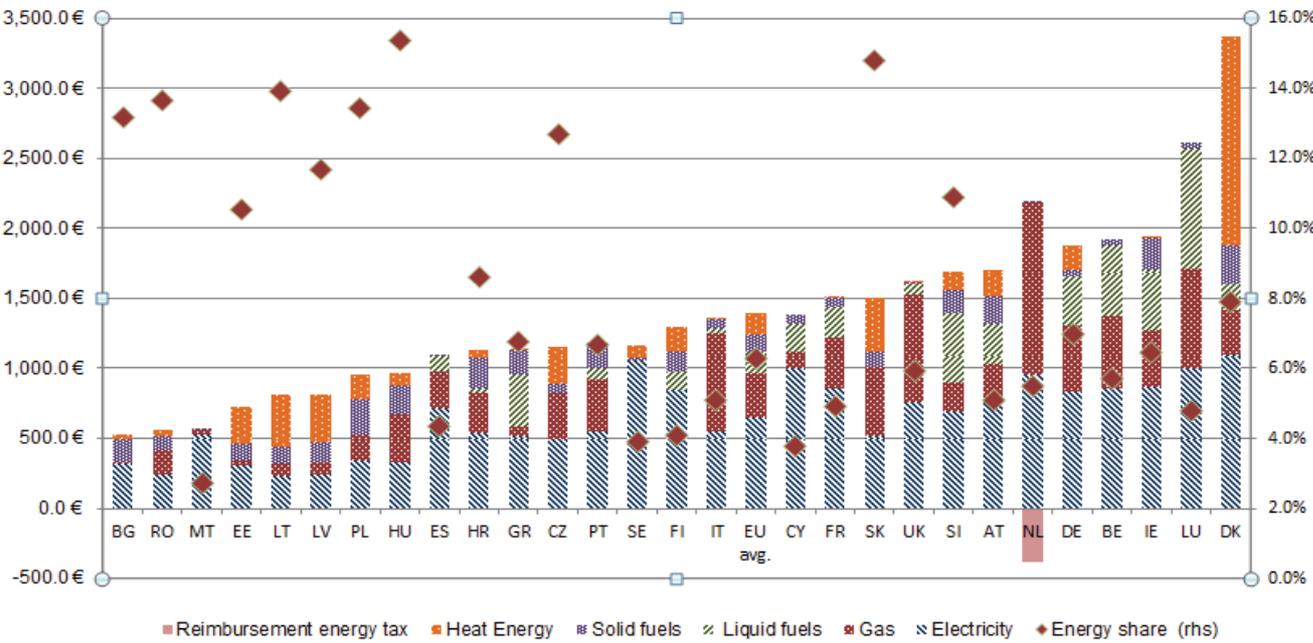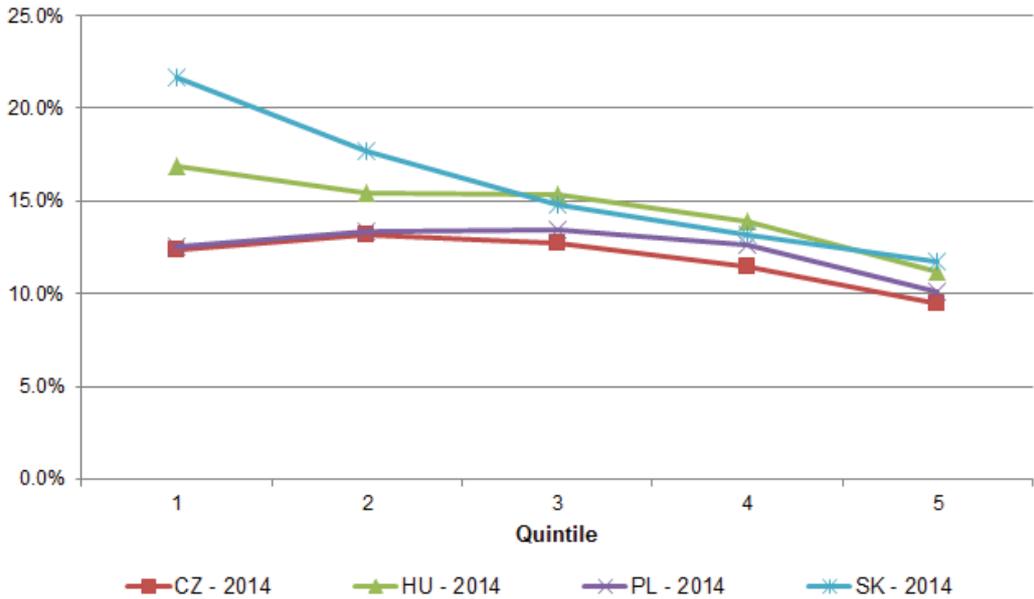

Source: Directorate General for Energy and Eurostat common data collection from National Statistical Institutes and own computations

In the United Kingdom the share of energy in total household expenditures in the lowest income quintile was above 10% in 2014, while in Ireland this share was 8%. In the highest income quintile the share of energy in total expenditures was around 4% in both countries. It must be noted that energy products (especially electricity) are relatively expensive in these two countries in EU comparison; this might contribute to significant shares of energy within total household expenditures, especially in the case of households with low income.

Figure 164 - **United Kingdom and Ireland - Share of energy in final household consumption expenditure in different income quintiles**
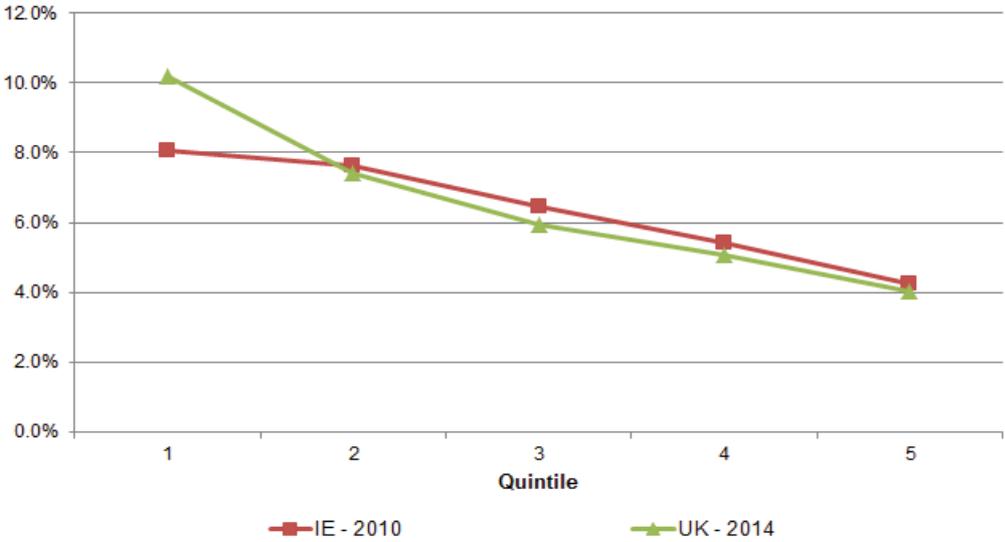
Source: Directorate General for Energy and Eurostat common data collection from National Statistical Institutes and own computations

In Sweden and Finland, though climate conditions imply significant heating needs in EU comparison, the share of energy in total household expenditures are among the lowest in the EU, reflecting high purchasing power and consumption expenditures of households in the two countries and high energy efficiency standards of residential buildings. Low retail electricity prices in EU comparison also contribute to low energy expenditures in these two countries as electricity makes up the bulk of energy expenditures.

In contrast, the share of energy expenditures in the three Baltic States, where purchasing power is low in EU comparison, is significantly higher than in Sweden and Finland, in spite of the similar climate conditions and low retail electricity and gas prices in EU comparison.

In Denmark, primarily owing to high domestic energy prices, the importance of energy in total household expenditures is higher than in Sweden and Finland.

Figure 165 - **Nordic and Baltic countries: Sweden, Finland, Denmark, Estonia, Latvia, Lithuania - Share of energy in final household consumption expenditure in different income quintiles**
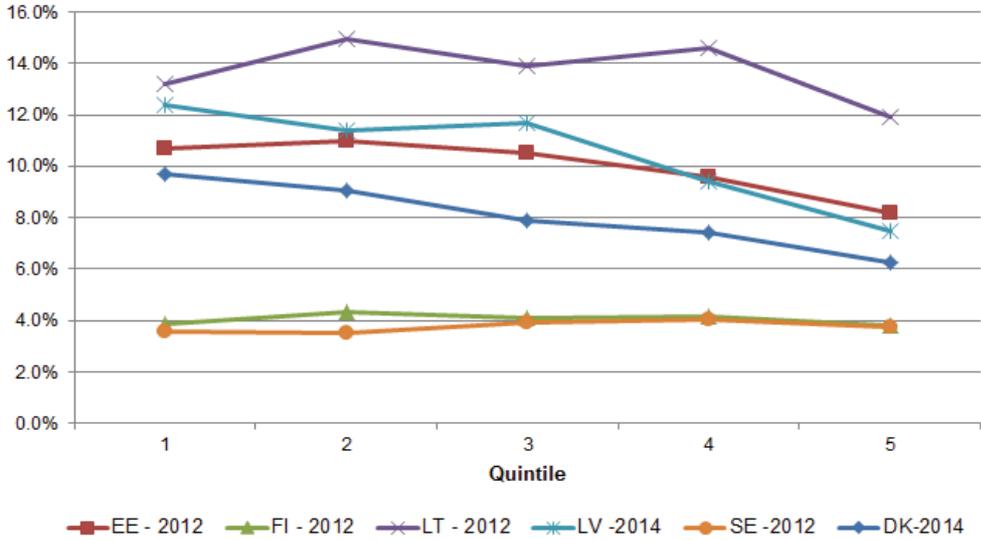
In Bulgaria, Croatia, Romania, and Slovenia the share of energy expenditures was higher than the EU average during the last few years, primarily owing to low purchasing power and consumption expenditure of households and low energy efficiency of residential buildings, in spite of having low retail energy prices in these four countries in EU comparison. In the case of Croatia we only have data on the share of energy in the total expenditure of households as a whole, without having information on different income quintiles.

Figure 166 - **South East Europe: Croatia, Slovenia, Romania and Bulgaria - Share of energy in final household consumption expenditure in different income quintiles**
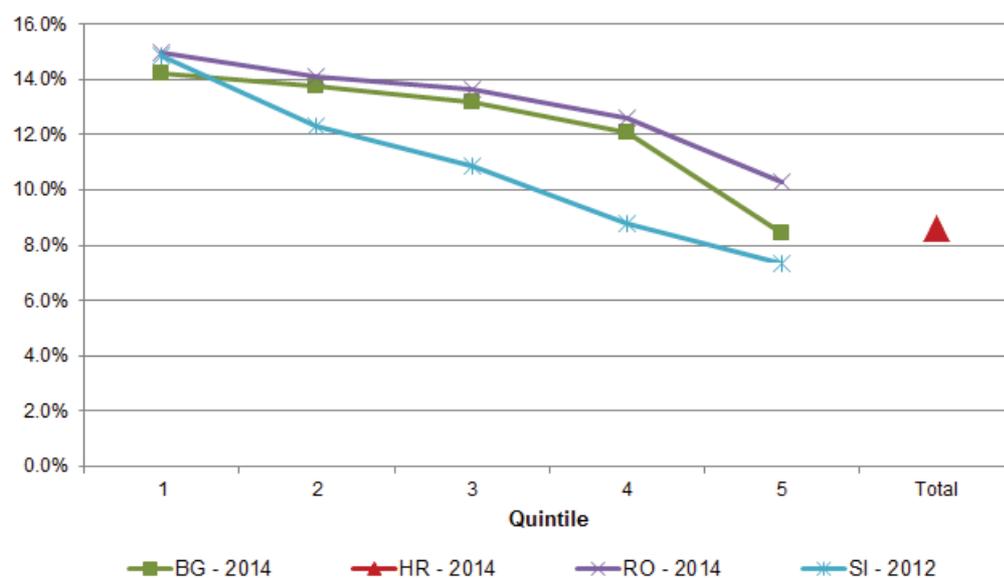
The charts presented above reflect different climate conditions, energy prices, incomes and purchasing power and different energy efficiency of residential buildings across the EU Member States. As climate conditions are given and energy prices are in many cases depend on external factors in most of the EU Member States (though the implementation of the internal energy market should lead to more competition and better infrastructure, having beneficial impacts on energy prices), the key factors for enhancing energy affordability are to improve energy efficiency of buildings and household appliances and to increase the income and purchasing power of households on the longer run.

5.3 Decomposition of changes in the energy expenditure – (prices, consumption and income effects)

It is possible to analyse in each country the impact of changes in energy prices, the amount of energy consumed and household incomes for a given period in order to identify the main driving factors behind the evolution of household expenditures on energy products. In the aforementioned report on *Energy prices and costs in the EU* method is applied that enables a pure decomposition of both the change in energy expenditures expressed in euros and the change in energy expenditures as a share of household income. The estimation has been provided for the 2008-2013 period for the household sector as a whole (without details on

income quintiles) for electricity, gas, heating oil, coal and wood products. As in most EU Member States the bulk of household energy expenditures are related to electricity and gas, in the following the results on these two energy products are analysed in details[23].

Figure 167 shows the decomposition of the changes in expenditures for electricity between 2008 and 2013 for the EU Member States. For example, an increase in the price of electricity (holding electricity consumption constant) increases the electricity expenditure share as reflected by a positive bar in **Figure 167**.

Figure 167 – **Decomposition of household expenditures on electricity– changes between 2008 and 2013**
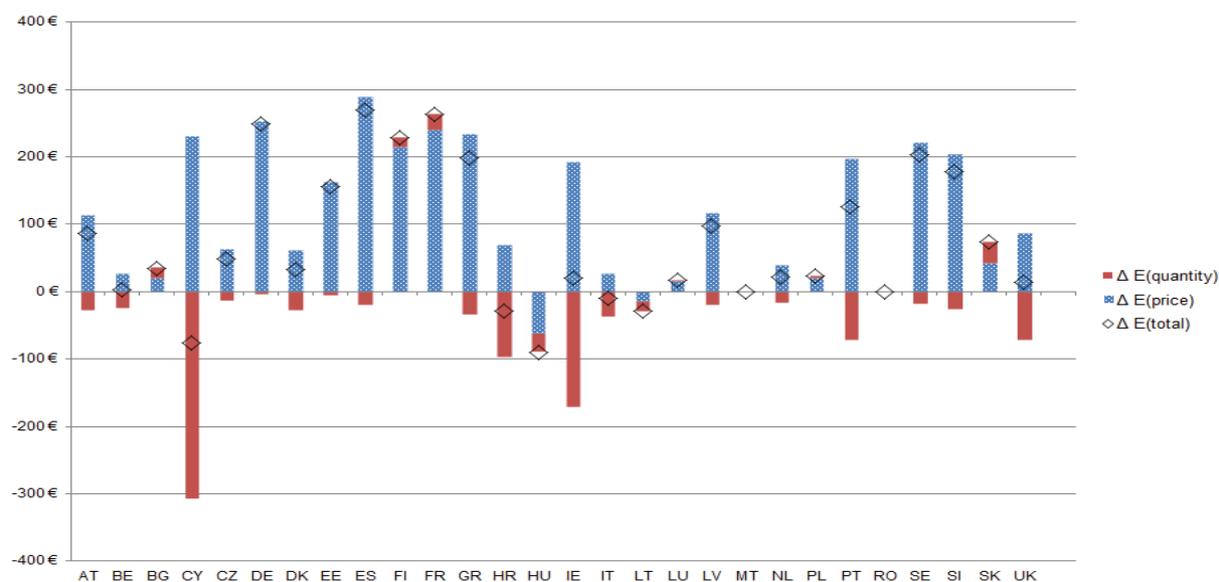
Source: Ecofys report on energy prices and costs in the EU, 2016

The net effect on total energy expenditures is the sum of both bars. For example, if a positive price effect exceeds a negative quantity effect, total expenditures increase. The key insights from the decomposition are:

- *Price effect*: for almost all countries the electricity price increased between 2008 and 2013, thus leading to an increase in the electricity expenditures, but the magnitude of the price effects differs across countries, and was particularly strong (in absolute terms) in Cyprus, Germany, Spain, Finland, France, Greece and Sweden. Only minor price effects could be observed for Belgium, Bulgaria or Poland, for example.

- *Demand effect*: the direction of effect is more heterogeneous than for the price effect; for most countries this effect is somewhat smaller in magnitude than the price effect; in most countries the demand effect is negative, i.e. electricity consumption has decreased after 2008. The largest decreases, in absolute terms, are observed in Cyprus, Ireland and Croatia.

The net effect in most countries is positive, i.e. total expenditures increased over time. The numbers can be interpreted as real average changes in the household expenditures on electricity. Exceptions, in which expenditures decreased, in absolute terms, substantially are Cyprus, where the negative demand effect was stronger than the positive price effect, and Hungary, where price and quantity effects were negative.

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[23] For the other mentioned fuels see the results in the Ecofys report: Energy prices and costs in the EU, 2016.

Figure 168 shows the decomposition of the changes in expenditures for natural gas for 2013 compared to 2008 for those EU Member States where data were available. The key insights are:

- *Price effect*: in all countries with the exception of Germany and Hungary, the gas price increased between 2008 and 2013, thus leading to an increase in the expenditures for gas consumption, but the magnitude of the price effects differs across countries, and was strongest (in absolute values) in the United Kingdom, Italy, and the Netherlands, reflecting the relatively large share of natural gas in total household energy consumption in these countries. Relatively small price effects could be observed for Belgium, Bulgaria, Slovenia, or Denmark.

- *Demand effect*: the direction of the demand effect is more heterogeneous than for the price effect; a few countries – including Austria, Belgium, or Poland - exhibit small positive effects, i.e. increases in gas consumption; but most countries saw gas consumption decline, with the strongest negative effects occurring in Lithuania, Hungary, and the United Kingdom.

- Since the positive price effect tends to dominate in countries where the quantity effect was negative, expenditures for gas increased in most countries. In Lithuania, the negative quantity effect dominated the positive price effect, leading to lower gas expenditures. Conversely, in Germany, the negative price effect dominated the positive demand effect, thus leading to lower gas expenditures in 2013 compared to the base year.

Figure 168 **- Decomposition of household expenditures on natural gas– changes between 2008 and 2013**
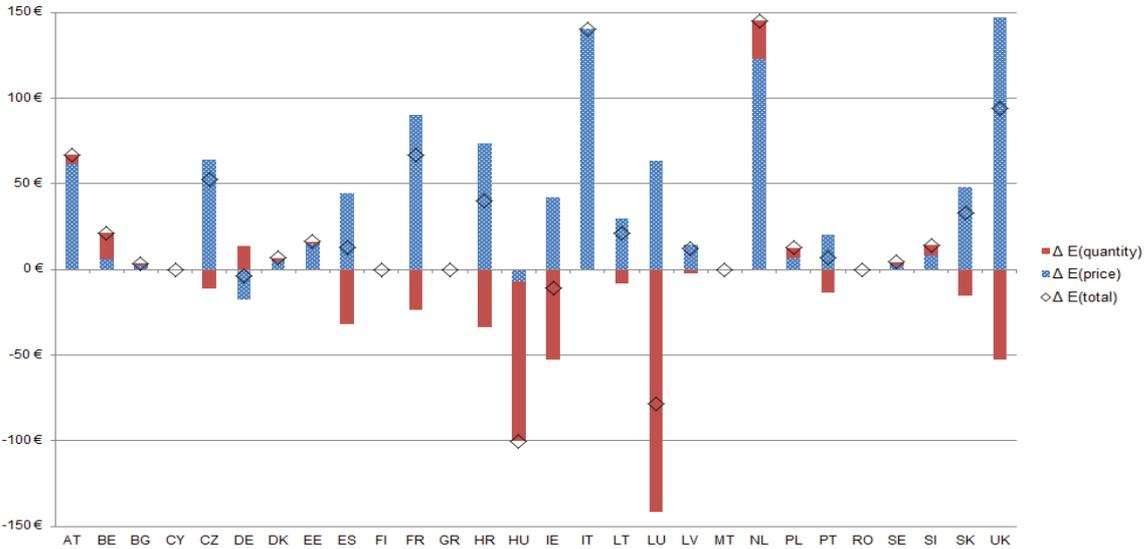
Source: Ecofys report on energy prices and costs in the EU, 2016

As the share of energy expenditure in the income of households can be considered as an indicator for energy affordability, analysing the effects of changes in the individual factors on this share provides insights into what is actually driving observed changes in the share of energy expenditures within the income. For example, energy prices and energy consumption may have increased over time, but if income has increased even more, the income share of energy expenditures will have declined, suggesting an increase in affordability.

The bars in **Figure 169** show the relative impact for each of the factors (price, consumption, income) on electricity expenditure share. For example, an increase in income lowers the

electricity expenditure share, leading to a negative bar in **Figure 169** (ΔS(Income)<0). The net effect is depicted by the change in total (ΔS(Total)). The value of this bar corresponds to the real change in the expenditure share.

- *Price effect*: for most countries, electricity price increased, thus leading to an increase in the electricity income share, but the magnitude of effects differs across countries. In most countries, the increase in electricity price is the dominating effect (but not for Bulgaria or in the Czech Republic), leading to an increase in the income share of electricity expenditures;

- *Demand effect*: the direction of effect is more heterogeneous than for the price effect; for most countries the output effect is smaller in magnitude than the price effect or the income effects;

- *Income effect*: for most countries, an increase in income led to a decrease in the electricity income expenditure share (but not the United Kingdom for example, which experiences a decline in real GDP over that time frame); for several countries, in particular new Member States like Bulgaria, the Czech Republic and Slovakia, the income effect is dominating the other effects, thus leading to a substantial decrease in the electricity income share.

Figure 169 – **Decomposition of changes in the share of expenditures on electricity in household income, 2008-2013**
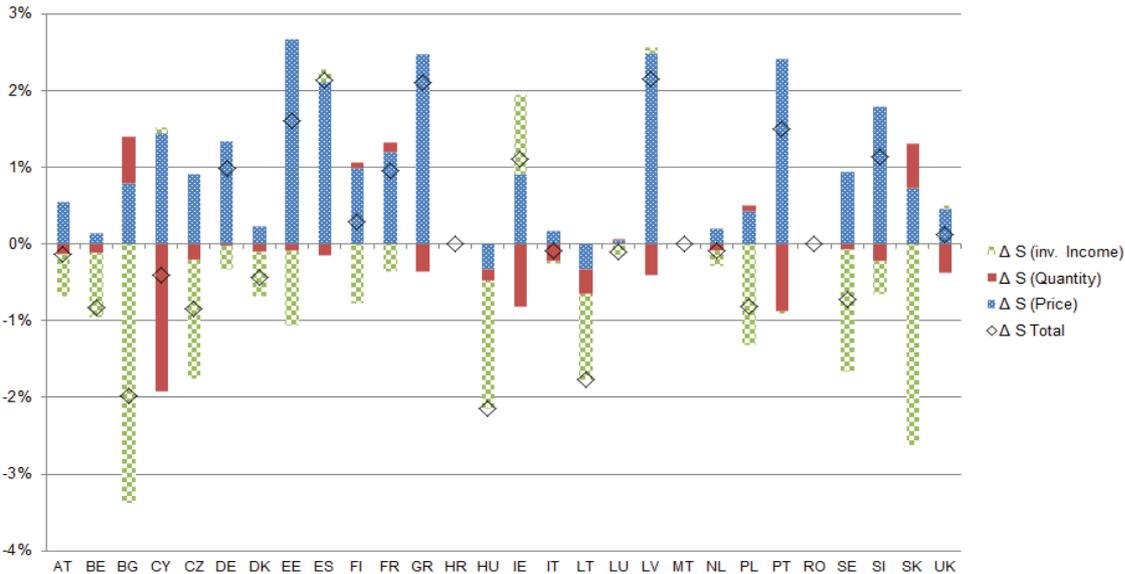
Source: Ecofys report on energy prices and costs in the EU, 2016

After doing the same for decomposing of natural gas expenditure income share, we observe the following:

- *Price effect*: for most countries, the natural gas price increased from 2008 to 2013. This leads to an increase in the income share of gas expenditures, but the magnitude of effects differs substantially across countries and is particularly high for the Czech Republic, for Slovakia and for United Kingdom. The increase in the gas price is the dominating effect in many countries, including Austria, Italy, Croatia and Lithuania, leading to an increase in the income share of gas expenditures;

- *Demand effect*: similar to the electricity price the direction of the output effect for gas is more heterogeneous than for the price effect; for most countries the output effect is smaller in magnitude than the price effect or the income effects;

- *Income effect*: for most countries (but not United Kingdom and Ireland), an increase in income led to a decrease in the income share of gas expenditures; for a few countries, in particular the Czech Republic and Slovakia, the income effect is dominating the other effects, thus leading to a substantial decrease in the gas expenditure share of income.

Figure 170 - **Decomposition of changes in the share of expenditures on natural gas in household income, 2008-2013**
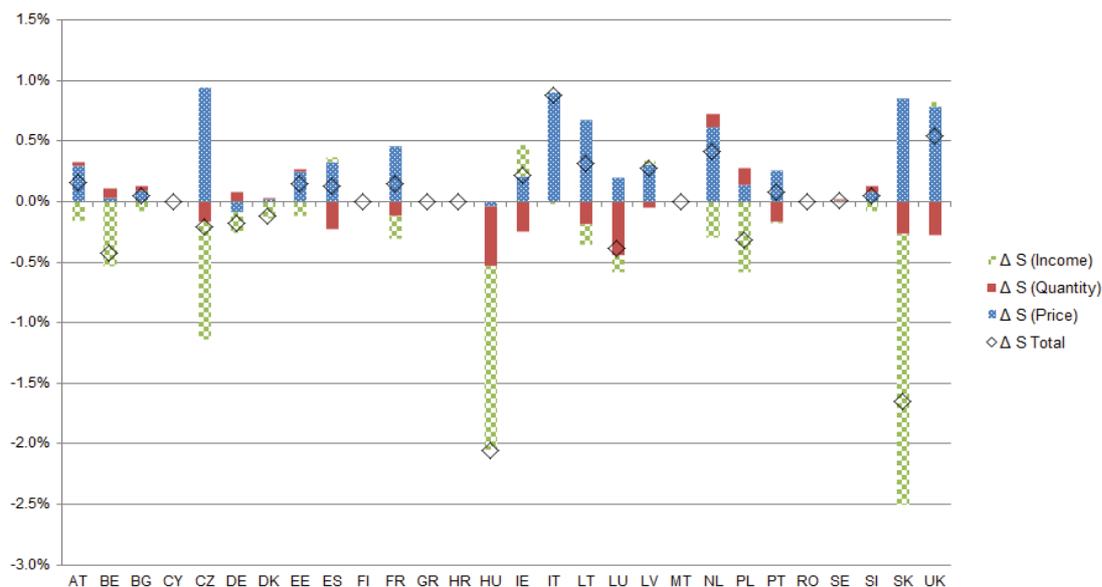
Source: Ecofys report on energy prices and costs in the EU, 2016

5.3.1 Impact of cost components and energy policy measures

As it has already been demonstrated in the retail price chapter of this report, energy prices might often be driven by non-market elements, such as network charges and taxes and levies, being not closely related to the evolution of the energy and supply component of the retail price. As we saw in the previous part, retail energy price is an important factor in the evolution of energy expenditures for households. As in most Member States expenditures on electricity has the highest importance among energy products and most of energy policy measures are related to electricity, in the following we are going to demonstrate how expenditures on different final retail price components impact the final electricity bill households pay.

Figure 171 – **Impact of energy supply cost, network charges and energy policy elements on household expenditure on electricity (in Euro per household, 2015)**
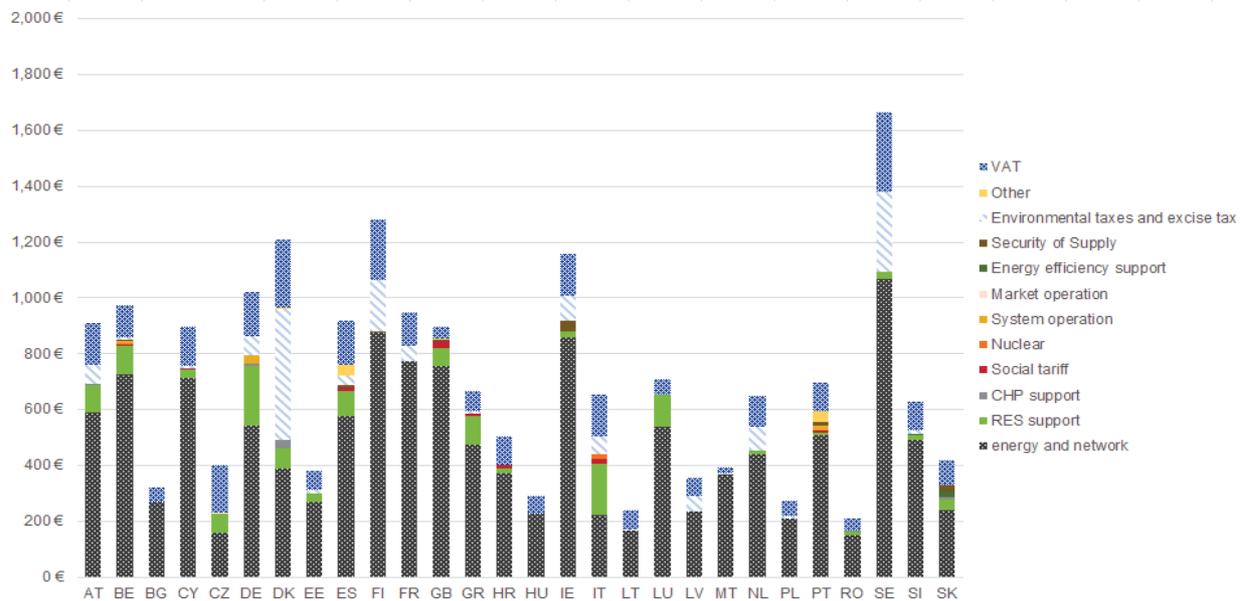
Source: Ecofys report on energy prices and costs in the EU, 2016

In most of the Member States energy supply costs make a significant part of the final household electricity bill, as **Figure 171** shows. Looking at expenditure terms in euros, the electricity supply costs were the highest in Cyprus, Ireland, Malta and Sweden in 2013. Expenditures on the network charge component were the highest in Czech Republic, Belgium and Sweden. It is apparent that among taxes and levies VAT is the most prominent element of the household expenditures; its absolute amount was the highest in Sweden in 2013. Excise taxes were particularly high in Sweden and Denmark. Renewable support schemes had significant impact on household's electricity expenditures in Germany and Italy, however, in Spain, Austria, Belgium, Denmark and the Czech Republic they also had a measurable impact on energy bills. Other policy support elements (energy efficiency support, market and system operation, CHP support, nuclear support and social tariffs) had apparently less impact in 2013 on energy bills in the EU Member States.

5.4 Reaction of households on increasing energy costs

In many Member States energy prices paid by households, as it has already been mentioned, have undergone a significant increase over the last ten years, and this resulted in decrease in household energy consumption[24]. However, decreasing energy consumption can only be interpreted favourably if most of the decrease is related to improvement in energy efficiency in the household sector. If the buildings and household appliances consume less energy, it

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[24] As in previous sections the analysis excludes transport fuels

might favourably impact energy affordability. However, in many cases households do not have other choice than reducing their energy consumption, and this does not result from improving energy efficiency.

As Figure **172** shows, energy consumption in the residential sector as a whole decreased between 2004 and 2013 in many EU Member States, and in many cases this was largely due to improvements in energy efficiency. However, in some countries (e.g.: Greece, Spain) the role of energy efficiency improvements was limited, and households had to change their consumption habits, which in many cases practically meant a financial constraint relating to energy expenditures.

Figure 172 **- Factors behind changes in energy consumption in some EU Member States (2004-2013)**
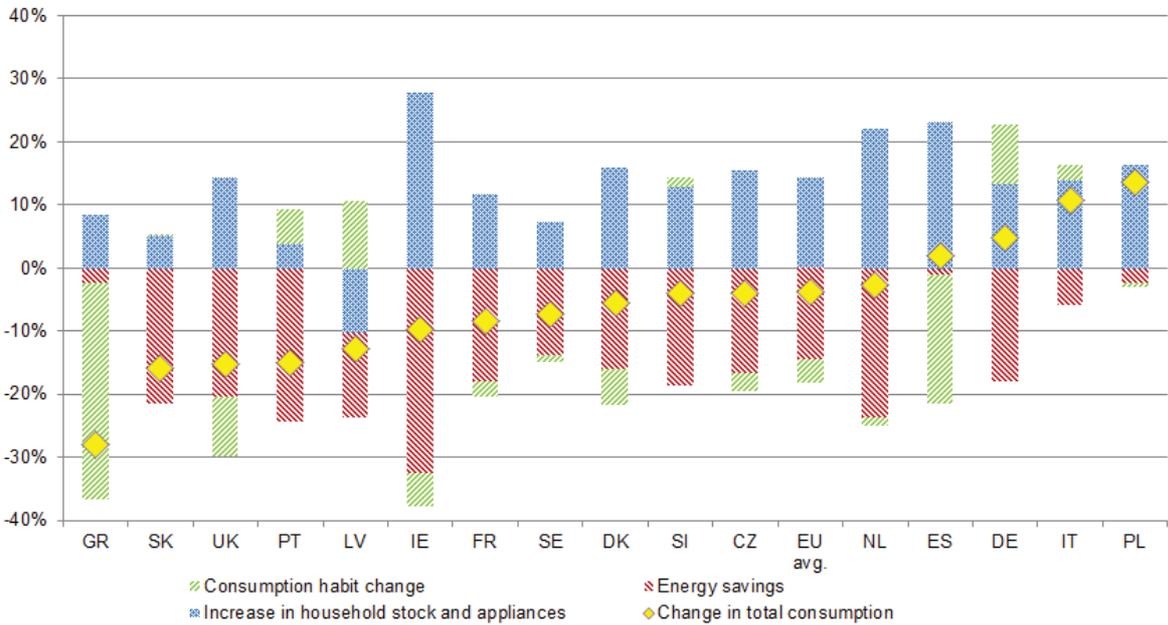
Source: ODYSSEE database

Note: The analysis does not cover consumption on transport fuels

5.4.1 Household energy use for different purposes

Besides looking at how much electricity, gas and other energy products households consume in a given period, and how consumption and monetary expenditures on energy products change over a given period of time in households with different income levels, it is also meaningful to analyse the purposes of energy consumption in the residential sector.

Eurostat, the Statistical Office of the European Union has started to publish the first results of a new data survey on final energy consumption of households. The objective of the new data collection is to provide information on what kind of consumption purposes household use

different energy products and carriers for. There were nine EU Member States who voluntarily submitted their 2013 data[25] to Eurostat, and from this dataset some conclusions can be drawn on a case study basis.

Figure 173 shows the distribution of household electricity consumption in percentages in the nine Member States where data are already available. In most of the countries the biggest share of electricity consumption is related to lighting and electric appliances, while water heating (e.g.: in Bulgaria and Slovenia) and cooking (e.g.: in Portugal) also have important shares. Space heating also has a significant share in France and the UK.

Figure 173 – **Household electricity consumption – Shares of uses in some EU Member States, 2013**
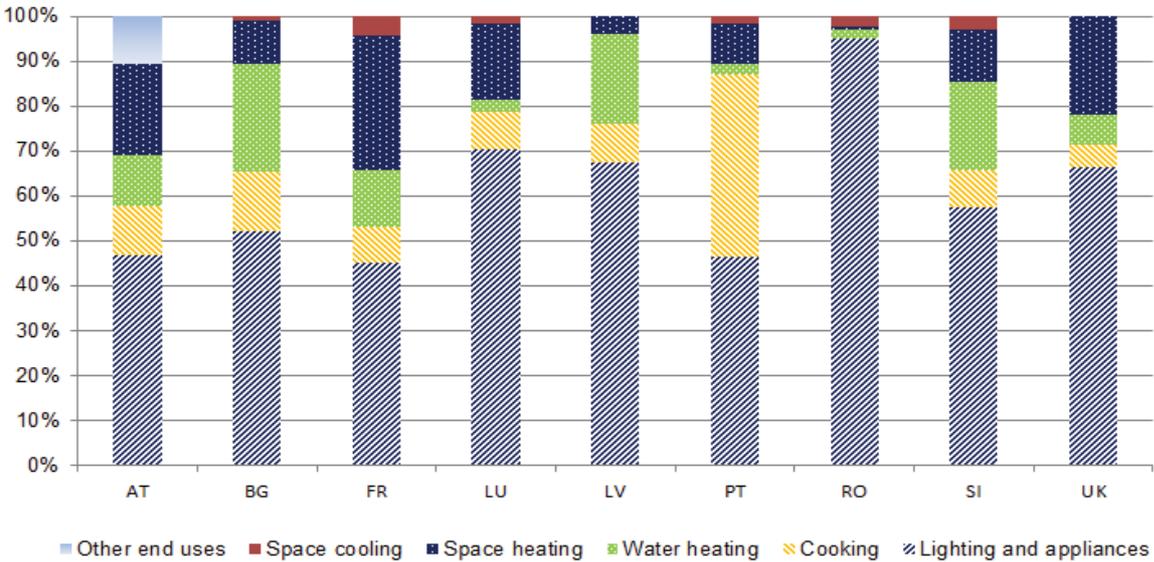
Source: Eurostat voluntary data collection on final energy consumption in households from National Statistical Institutes

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[25] Commission Regulation (EU) No 431/2014, as regards the implementation of annual statistics on energy consumption in households, serves as a legal basis for the data provision

As Figure 174 shows, with the exception of Portugal, where gas is principally used for water heating and cooking purposes, natural gas is mostly used for space heating in the Member States with available data. Besides Portugal cooking has an important share in Latvia and Romania, while water heating has more or less equal share within the total gas consumption in the remaining countries.

Figure 174 - **Household gas consumption – Share of uses in some EU Member States, 2013**
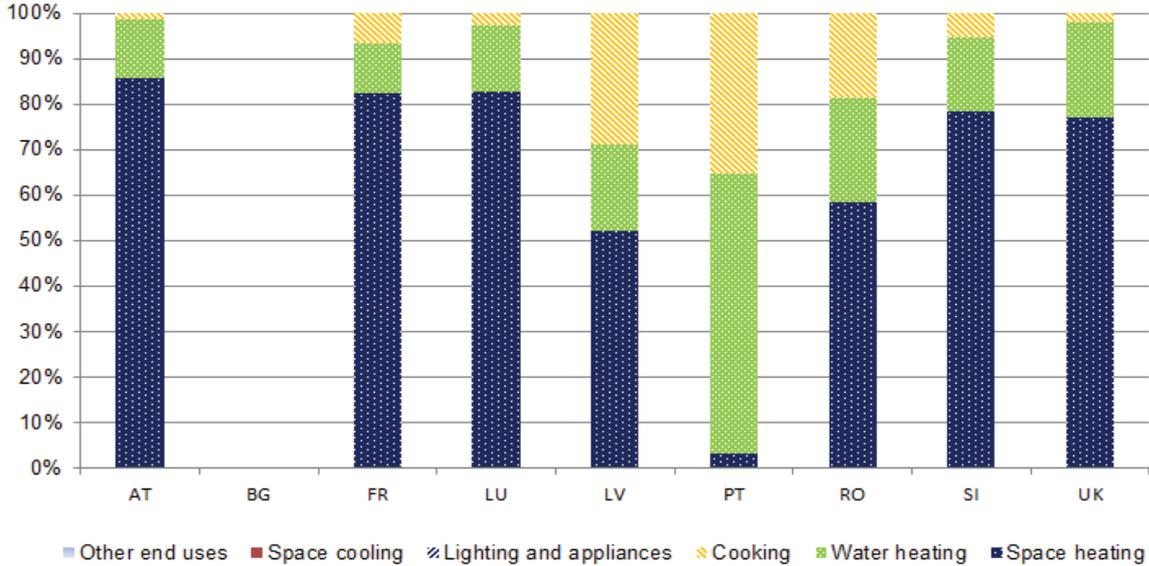
Source: Eurostat voluntary data collection on final energy consumption in households from National Statistical Institutes

From affordability perspective space and water heating and lighting purposes are of particular importance, as increasing electricity and gas expenditures fundamentally influence the satisfaction of these basic needs and the quality of living of households. Other energy sources, such as district heating might play important role in some Member States, basically in space and water heating purposes.

As keeping homes adequately warm is essential for proper living conditions, it is meaningful to see in each Member State the share of households that cannot afford to cover this elementary need. EU Member States show a great diversity regarding the share of those low income households (being below 60% of the median of the national income) that cannot afford to keep their homes adequately warm, as Figure 175 shows. In 2014 the share of such households was 23% on EU average, ranging from 2% in Luxembourg and 66% in Bulgaria.

However, over the last ten years there were significant changes in many Member States in the share of such households. There were six Member States (Belgium, Bulgaria, Latvia, Lithuania, Poland and Portugal), where the share of low income households being unable to keep their homes adequately warm fell by more than ten percentage points between 2005 and 2014. On the other hand, in Greece, Italy and Malta the ratio of such households increased by more than ten percentage points, and in Slovenia and the United Kingdom the increase amounted to nine percentage points over the same period.

Figure 175 - **Percentage of households below 60% of the median national income being unable to keep their home adequately warm**
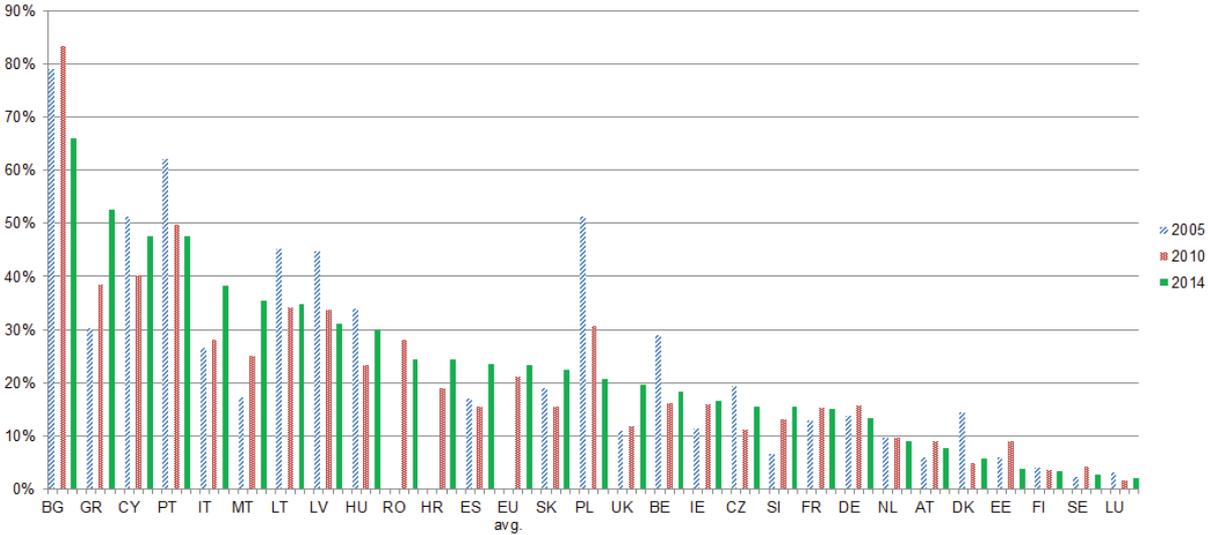
Source: Eurostat database 'Survey on Income and Living Conditions' (SILC)

5.5 Energy related expenditures in the transport sector

Households spend on energy products in order to satisfy their heating, cooking, lighting and other basic needs, being closely related to their living conditions. However, households also spend a significant amount of their total expenditures on transport goods and services, including buying fuels and lubricants for their personal transport vehicles. It is thus also meaningful to provide a cross country comparison on how much households in different income quintiles spend on this purpose.

The next chart (Figure 176) shows the estimated expenditures on fuels and lubricants for personal transport equipment[26] in each Member State in 2014 or in the most recent year with available data. In this year the average energy related transport expenditure was 1,020€ per household in the EU on average, ranging between 104€ in Romania and 3,770€ in Luxembourg[27]. It seems that there is a positive correlation between the income level and energy related transport expenditures; households with high income tend to spend more on transport fuels than households with lower income.

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[26] COICOP heading "07.22 Fuels and lubricants for personal transport equipment". For the estimation of energy related expenditures in transport, we use the ratio of the weight of this heading and that of Transport (COICOP 07) as a whole in the HICP index, which is multiplied by the actual expenditures for transport purposes. It must be noted that this estimation might be biased by different share of transport expenditures on passenger cars, fuels and lubricants and other transport services in the different income quintiles. For example, this method might overstate the importance of fuel expenditures in households with high income, as they probably spend a larger proportion of their transport related expenditures on purchase of vehicles (and thus a lower share on fuels) than households with average or low income.

[27] The energy related transport expenditure data for Luxembourg might be overestimated, as compared to the population of the country there are many commuters living in neighbouring countries, who purchase transport fuels in Luxembourg, given its favourable price in the region.

Figure 176 – **Estimated household expenditures on energy products in transport of income quintiles, 2014**
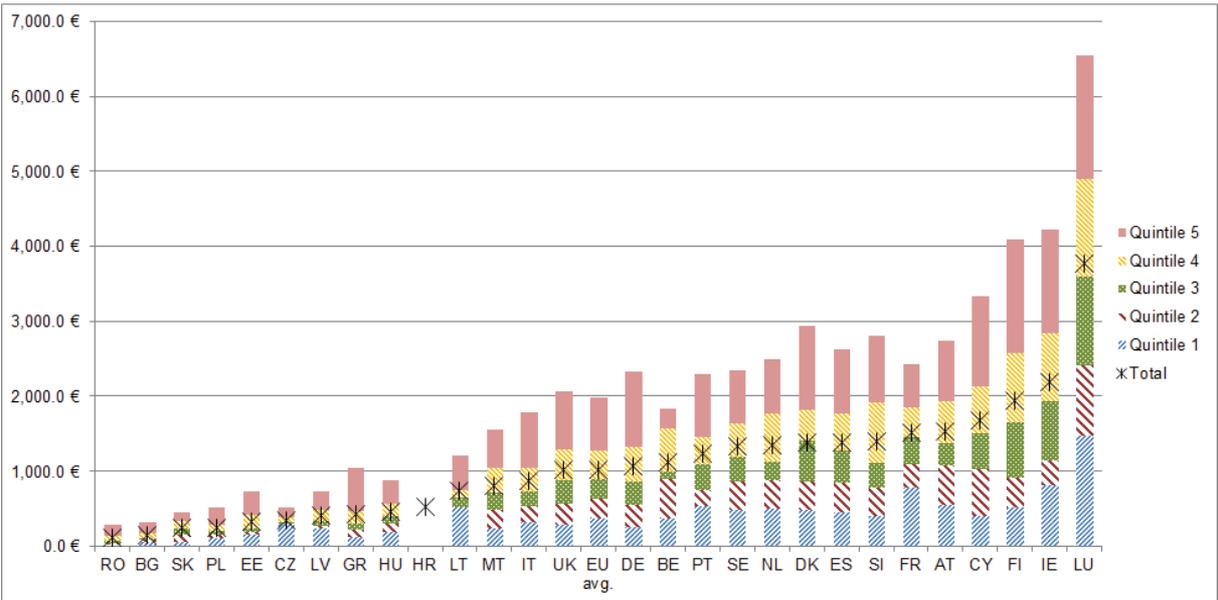
Source: Directorate General for Energy and Eurostat common data collection from National Statistical Institutes and own computations
Note: Expenditure data on the chart must be read in cumulative way; e.g.: expenditure in the third quintile is the sum of the first three bars from the bottom in each country. Total stands for the average of all households.

Looking at the share of energy related transport goods in total household expenditure (**Figure 177**), it is reasonable to say that in almost all Member States households in higher income quintiles spend proportionally more on transport fuels than households in lower income quintiles. This is a substantial difference compared to what we've seen in the case of energy products used for domestic energy services (e.g.: heating, cooking, lighting, etc.), where richer households normally spend proportionally less to energy products compared to their total expenditure than households with lower purchasing power.

Figure 177 – **Share of energy expenditure on transport in household expenditure by income quintiles, 2014**
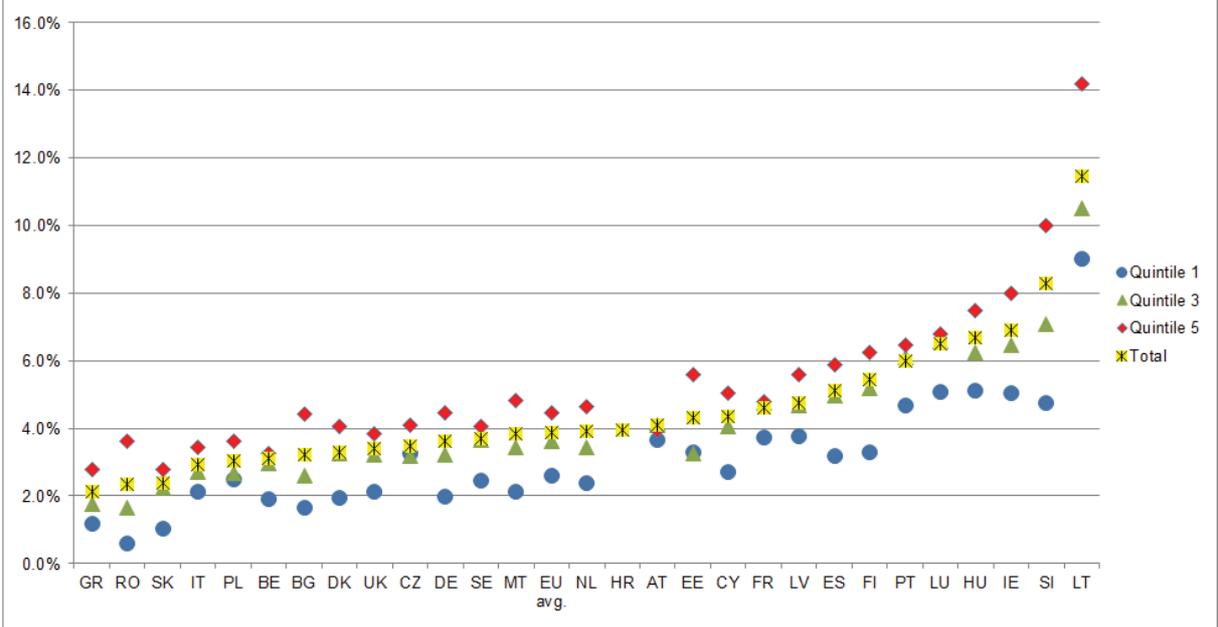
Source: Directorate General for Energy and Eurostat common data collection from National Statistical Institutes and own computations
Note: Total stands for the average of all households.

Brussels, 30.11.2016
SWD(2016) 420 final

PART 5/13

COMMISSION STAFF WORKING DOCUMENT
Accompanying the document

**REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE
COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE
COMMITTEE OF THE REGIONS**

Energy prices and costs in Europe

{COM(2016) 769 final}

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Contents

6 Industry energy costs

This chapter looks at the effects of energy prices on the structure and the competitive position of the European economy, both at a broad macro-economic level and at sectors of selected energy intensive industries.

Main findings:

Compared with other factors of production, energy plays a relatively modest role in the formation of the gross value added in the economy. On EU level, its share is estimated at roughly 2% of the total production value for all businesses. For manufacturing that energy share stood slightly above 2% in 2013. The share of energy purchases to production value is even smaller for the services sector.

Yet, energy is at the very fabric of almost all products and services used in everyday life. In addition, several important manufacturing sectors also rely on energy as the biggest or the most critical factor of production.

Based on recent global metrics it appears that the economic performance and the overall competitiveness of the EU MS has remained stable compared to that of our main trading partners, despite the turbulent events that marked 2008 – 2015.

The full macroeconomic effects of the wide variations of the global energy commodity prices in recent years are yet to unravel. It seems that up to 2013 the impact on the overall competitiveness of the EU economy was limited as the real unit energy costs of large industrial subsectors remained stable.

With regards to the energy intensive sectors,

— Firms are confronted with different electricity and gas prices depending on their <u>energy supply strategies, consumption level and patterns, connection type to grids</u> as well as <u>price and tax exemptions and reductions</u>. This makes that price differences between firms may vary widely (estimated up to 50% in the same sector in the same country).

Looking at general analysis of sectors at high level of aggregation (at NACE 3 level) and the analysis of the case studies (NACE 4 level), some observations can be made on the role of energy costs and competitiveness in the Energy intensive sectors studied:

Between 2008-2013:

— EU **electricity prices** for industry, with a wide range of variation across the EU Member States, are in line with global competitors, higher than prices in the US but lower than most of Asian prices. The evolution of the exchange rate can play a very significant role. This was the case of China, with prices increase mainly driven by the appreciation of the Yuan.

— EU **gas prices** for industry are higher than most of the competitors examined, only lower than Asian gas prices.

In the 14 **energy intensive sectors studied in the Ecofys report (NACE 3 level):**

— **Energy costs shares** in the EU decreased in most of the Energy Intensive Industry sectors studied (11 sectors out of 14) while total absolute decreased in all. At the end of the period

under study, between 2011 and 2013, energy costs shares increased in half of the sectors studied (7 sectors out of 14). Despite the higher prices in the EU compared to the US, energy cost shares were lower in the EU than in the US. Conversely, energy cost shares in the EU were higher than in Japan despite the higher prices in Japan. Energy cost shares are falling in both EU and US, but they are in general falling more rapidly in the US and by 2013 approaching similar levels for many sectors. **Profit margins** (Gross operating surplus as percentage of production costs) are smaller in EU than in Japan and the US.

— For the few EU Member States for which data was available, **energy intensity** in the most intensive sectors (pulp and paper, basic chemicals, cement, lime and plaster and iron and steel) has increased driven primarily by downward pressure on Gross Value Added, which could be associated with decreasing profits and / or increasing production costs..

— **Energy efficiency** for most EU sectors has improved historically helping to reduce the impact of energy price rises. Between 2008-2014, energy efficiency improvements could have stalled in some energy intensive sectors probably due to lack of capital for investment.

Case studies from energy intensive sectors (five sectors studied in CEPS et altri) show that:

— **Electricity** prices: operators in (sub-) sectors with relatively lower energy consumption pay a much higher price than operators in (sub-) sectors with higher consumption levels. The same correlation could not be observed in **natural gas** prices most likely due to the lower weight of non-energy components (network costs, taxes and levies) in final prices, which reduces the impact of tax and price exemptions/reductions.

— For electricity in 6 out of 9 countries, the price in 2015 is higher than in 2008. For natural gas, prices were lower in 7 out of 11 countries. Although with some differences[1] these results are overall in line with the trends observed in retail prices chapters of this report (1.2.2 & 2.2.2). As described in previous chapters the overall trend is also largely due to decreases in the energy price component and increases in network costs and taxes and levies.

Other points to be highlighted from case studies (five energy intensive sectors studied in the Ecofys report at NACE level 4: Iron and Steel, Non -ferrous metals, paper, hollow glass and basic chemicals) are that:

— The main (net) imports come from China and Russia. For steel, South Africa but also Iran, Ukraine, South Korea and Turkey are very relevant. For paper, India and, for aluminium and glass, Turkey is a growing import origin. The USA is the major destination of net exports. The EU lost market share particularly to China in certain sectors, including steel, paper and aluminium. Production in the glass sector has remained relatively stable.

— Despite relatively higher energy prices in the EU than in some G20 competitors, particularly the US, Europe is a net exporter of many products, for example finished steel.

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[1] In the industries assessed by *CEPS et altri* both electricity and gas prices peaked in 2012-2013 and then declined

— Some of the sectors under study are suffering from overcapacities and associated market consolidation and this can trigger increased competition from emerging economies

— Commodity products typically face strong international competitive pressure. However, competitiveness depends not only on energy prices, personnel and raw material costs but on many other factors such as proximity to the upstream and downstream markets, economic growth (global and regional) and institutional environment, including the conditions for research and development.

6.1 Competitiveness and the energy costs of industry

Defining competitiveness

The economic decision to invest and the willingness to do business in a given location are influenced by many factors that go beyond prices, costs and factor productivity. The country risk, the political stability, the regulatory environment and the investment climate (among others) are weighing heavily on such decisions and impacting directly the competitive position of each area of the world.

Several renowned international institutes and organisations have developed methodologies combining hard statistical data and surveys of experts' opinions to measure the factors that influence the competitiveness of a given economy.

The Global Competitiveness Indicator of the World Economic Forum (WEF) [2] and the World Competitiveness Scoreboard of the International Institute for Management Development (IMD)[3] are using similar bottom-up approaches to estimate economic performance. A wide range of parameters influencing the competitiveness of a given economy are first collected and quantified, to be later regrouped in main themes which will then feed into the global indices.

Energy costs and competitiveness

WEF defines the competitiveness on a national level "*the set of institutions, policies, and factors that determine the level of productivity of an economy, which in turn sets the level of prosperity that the country can earn*".

Drivers of competitiveness in the general economy

The following (Figures & Figure 179) illustrate the evolution of several indictors measuring the competitiveness of the European Union Member States against our main trading partners, defined as the non-EU members of the group of G20 of major world economies.

A similar message is emerging from the competitiveness indicators of the World Economic Forum (WEF) and: the economic performance of the EU has followed a pathway which is broadly comparable to that of the non-EU G20 major economies.

Based on the most recent data from WEF and IMD, the EU competitiveness vis-a-vis non-EU G20 members is actually slightly improving since 2014. This finding holds when economic performance is measured by actual score or by the ranking position of the countries that are being analysed.

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[2] World Economic Forum; Global Competitiveness Report 2015-2016. The Global Competitiveness Indicator of the World Economic Forum (WEF) http://reports.weforum.org/global-competitiveness-report-2015-2016/
[3] The World Competitiveness Scoreboard of the International Institute for Management Development (IMD), http://www.imd.org/wcc/

Figure 178 – **Competitiveness of the EU according to IMD competitiveness indicator**

Figure 179 – **Competitiveness of the EU according to IMD competitiveness indicator**
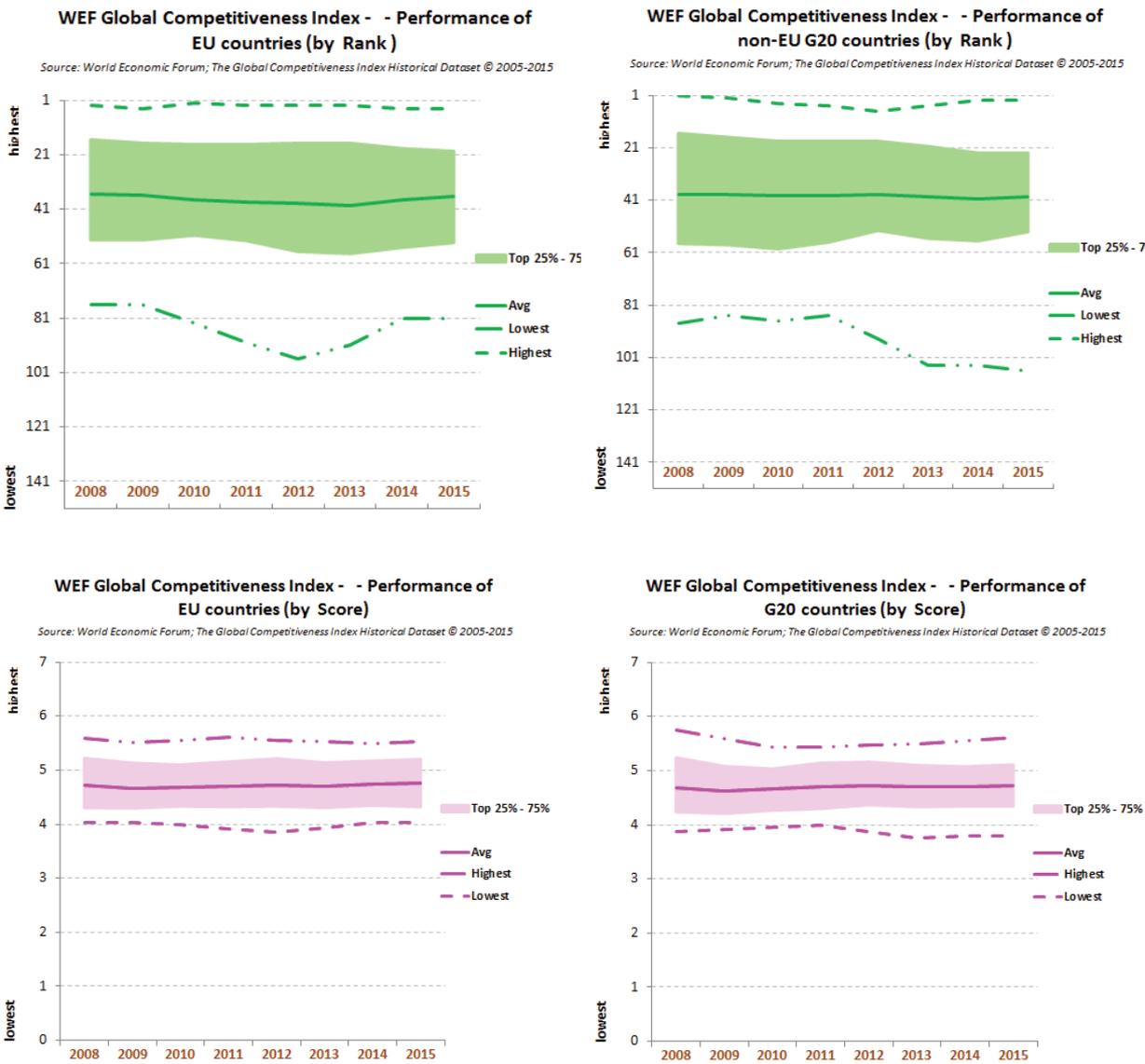
The next Figures (**Figure 180** & **Figure 181**) report on factors for competitiveness where the EU Member States and the non-EU G20 countries show relatively big differences in terms of performance – be it as a ranking or as a score. Those factors could also explain possible divergences of the level of macroeconomic competitiveness of the two groups of countries.

The WEF and IMD indices produce similar results indicating that the EU group seems to enjoy a clear competitive advantage over the non-EU G20 group in the following areas: **international trade; infrastructure – including electricity supply; health and primary education and ICT use**. On the other hand, the relatively **small size of EU economies** (taken separately), **the employment and flexibility of the labour market and fiscal policies** seem to be pushing down the economic performance of the EU group compared to the group of non-EU G20 countries.

Figure 180 - **Results for selected favourable factors of competitiveness**

IMD World Competitiveness Database; ranking of EU countries by International Trade

Source: IMD World Competitiveness Online

IMD World Competitiveness Database; ranking of non-EU G20 countries by International Trade

Source: IMD World Competitiveness Online

WEF Global Competitiveness Index - 4th pillar: Health and primary education - Performance of EU countries (by Rank)

Source: World Economic Forum; The Global Competitiveness Index Historical Dataset © 2005-2015

WEF Global Competitiveness Index - 4th pillar: Health and primary education - Performance of non-EU G20 countries (by Rank)

Source: World Economic Forum; The Global Competitiveness Index Historical Dataset © 2005-2015

WEF Global Competitiveness Index - Electricity and telephony infrastructure - Performance of EU countries (by Score)

Source: World Economic Forum; The Global Competitiveness Index Historical Dataset © 2005-2015

WEF Global Competitiveness Index - Electricity and telephony infrastructure - Performance of G20 countries (by Score)

Source: World Economic Forum; The Global Competitiveness Index Historical Dataset © 2005-2015

WEF Global Competitiveness Index - ICT use - Performance of EU countries (by Score)

Source: World Economic Forum; The Global Competitiveness Index Historical Dataset © 2005-2015

WEF Global Competitiveness Index - ICT use - Performance of G20 countries (by Score)

Source: World Economic Forum; The Global Competitiveness Index Historical Dataset © 2005-2015

Figure 181 - Results for selected less favourable factors of competitiveness
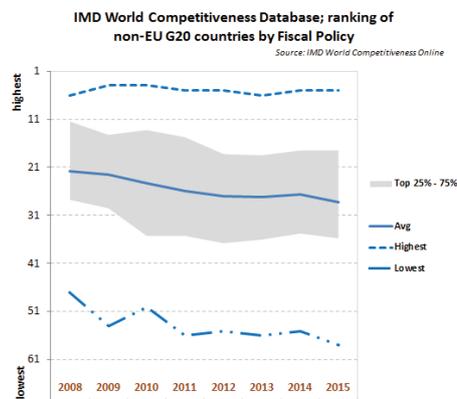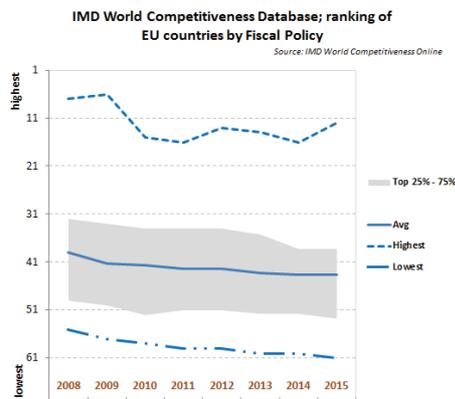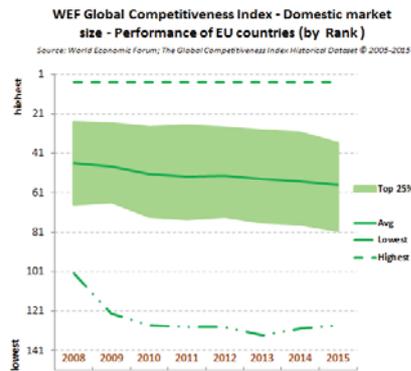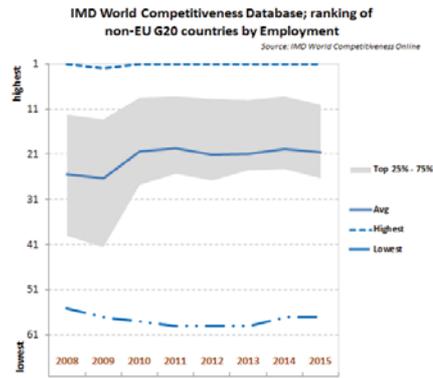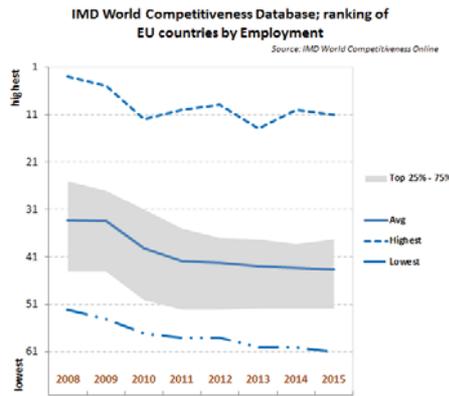
The recent improvement of EU economic performance is also confirmed by the European Commission report on Single Market Integration and Competitiveness[4].

Figure 182 – **Productivity in the EU and G20**

Overall productivity in EU and G20 (2013, GDP/person emplyed, USD)

Source: IMD IMD World Competitiveness Yearbook 2014, OECD 2014 Main Economic Indicators, National Sources
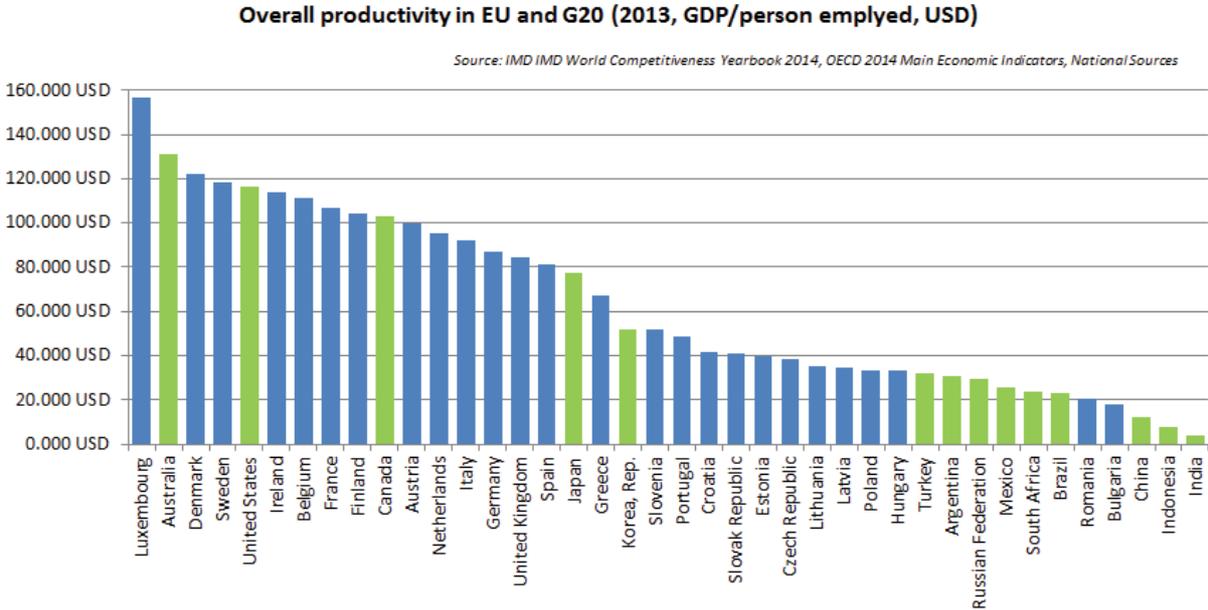
Notes:
1. Overall productivity is defined as the ratio of GDP over employment; employment data are estimates and are provisional for the most recent period;
2. Data for Cyprus, Malta and Saudi Arabia is not available

In terms of overall productivity, the majority of EU Member States are competing with the high-income members of the non-EU G20, as shown in the Figure above (**Figure 182**).

Over the recent years, the dispersion of productivity and efficiency rates across G20 economies has increased, with high income countries enjoying stronger growth rates than the low-income and less diversified economies of the non-EU G20. Whereas the group of EU countries perform better over the group on non-EU G20 (see **Figure 183** and Footnote 109) the 2015 Single Market Integration and Competitiveness report mentioned above (see footnote 105) points out that through the years many EU Member States have accumulated important productivity gaps with the United States and other high income G20 countries and that reforms enhancing the labour and total factor productivity of EU companies should be introduced at both national and EU level. The EU and national reforms are further discussed in separate reports of the European Commission[5]

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[4] Report on Single Market Integration and Competitiveness in the EU and its Member States, 2015 DG GROW,
http://ec.europa.eu/growth/industry/competitiveness/reports/single-market-integration-competitiveness/index_en.htm
[5] These include the European Competitiveness Report, 2014 DG GROW http://ec.europa.eu/growth/industry/competitiveness/reports/eu-competitiveness-report/index_en.htm
and the Member States' Competitiveness Report, 2014 DG GROW http://ec.europa.eu/growth/industry/competitiveness/reports/ms-competitiveness-report/index_en.htm

Figure 183- **Competitiveness of the EU by Productivity and Efficiency**
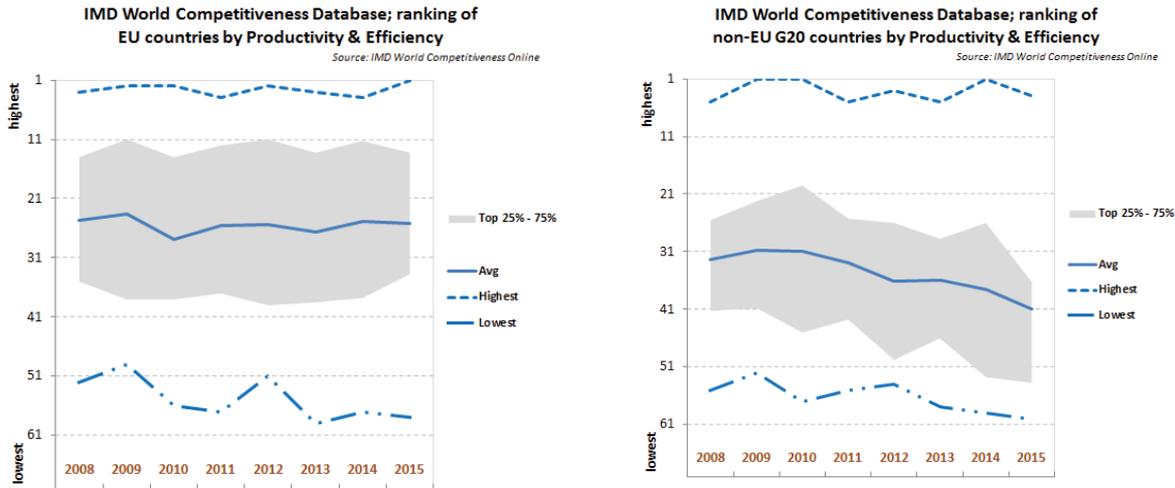
The productivity spread across high- and low- income countries is less relevant when the monetary value used is switched to Purchasing Power Parities[6] instead of US Dollars and if the focus shifts to the manufacturing sectors only, as shown below in **Figure 184**.

Figure 184 – **Industrial productivity in the EU and G20**
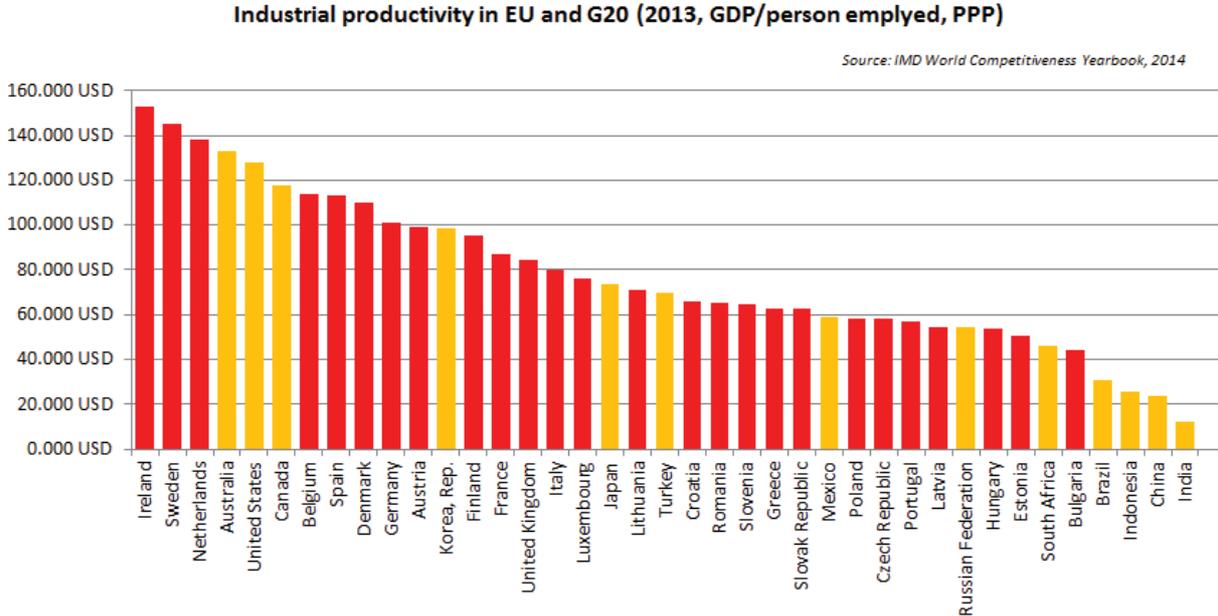
Notes:
1. Industrial productivity is defined as the ratio of related GDP (PPP) per person employed in industry; employment data are estimates and are provisional for the most recent period
2. Data for Cyprus, Malta, Argentina and Saudi Arabia is not available

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[6] Purchasing Power Parities (PPP) are the currency exchange rates that equalize the purchasing power of different currencies. This means that a given sum of money, when converted into different currencies using the PPP exchange rate, will by the same basket of goods. PPP are currency conversion rates that eliminate the differences in price level across countries.

6.3.2. Energy's impact on competitiveness

Looking at the most recent prices for electricity for industrial users, the non-EU G20 countries appears again as a heterogeneous group. The G20 countries are rather split with regards to their endowment of energy resources as well as other factors that influence electricity prices. See **Figure 185**.

Figure 185– **Electricity costs for industrial clients in the EU and G20**

Electricity costs for industrial client in EU and G20 (2013, USD per kWh)

Source: IMD IMD World Competitiveness Yearbook 2014, IEA Energy Prices and taxes, Eurostat (data for Italy), National Sources
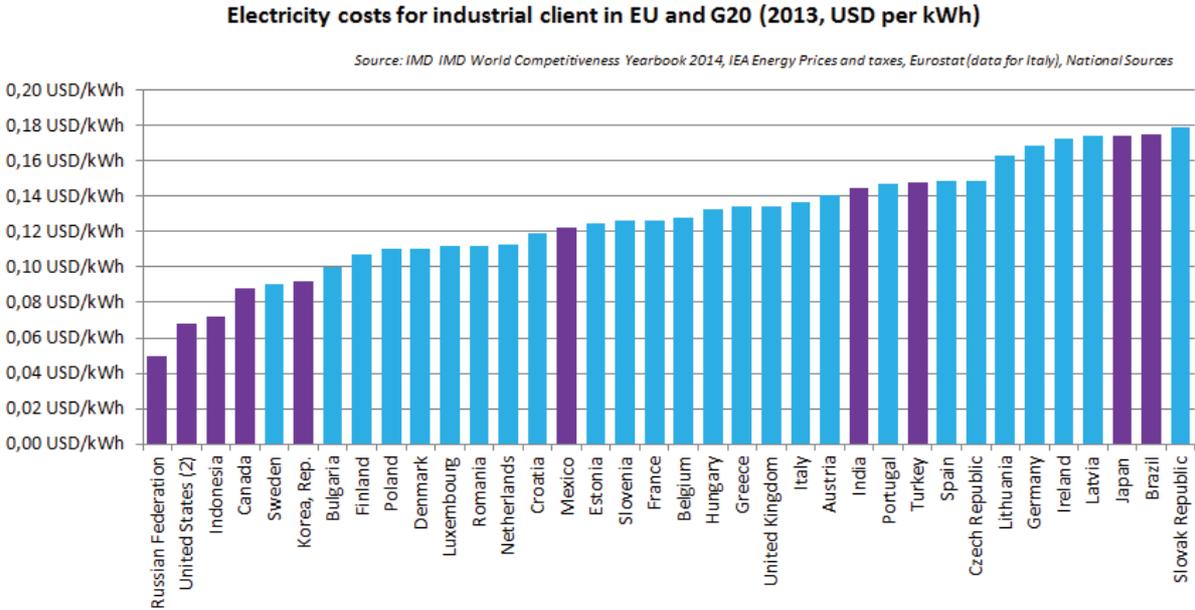
Notes:
1. Prices refer to the simple average of the domestic monthly reference with tax for electricity for industry;
2. US prices are net of taxes;
3. Data for Cyprus, Malta, Argentina, Australia, China, South Africa and Saudi Arabia is not available

Assessing the importance of energy as a production factor on the global macroeconomic level, and comparing the performance of EU countries against our main trading partners is not straightforward, with serious data availability and methodological issues.

In terms of the **absolute value of energy costs**, a recent report[7] from the European Commission estimates that the EU manufacturing sector has enjoyed some of the lowest **Real Unit Energy Costs**[8] together with Japan and similarly to the US. The improvements of the EU industry in terms of energy intensity have helped to offset the increase in real energy prices. Despite the already low starting point the EU manufacturers have steadily improved their energy intensity. Reasons for the improvements on energy intensity could be due to improvements of energy efficiency, the increasing specialisation in the EU manufacturing on less energy intensive industries and the trend of Value Added of the production between the period covered by the above mentioned study (1995-2011). Real unit energy costs across the European industrial clusters have remained broadly stable during the period 2010-2014.

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[7]   Energy   Economic   Developments   in   Europe,   2014,   DG   ECFIN,
http://ec.europa.eu/economy_finance/publications/european_economy/2014/pdf/ee1_en.pdf
[8] The Real Unit Energy Cost (RUEC) is defined as the ratio of energy costs in current prices over value added in current prices. RUEC can be represented as the product of real energy price and energy intensity.

The **relative share of energy in total factor production costs** can be proxied by the share of energy products in total production value, as reported by the Structural Business Statistics (SBS) tables in Eurostat. This approach has **several important limitations**, listed in Textbox below, but remains the only viable one in terms of harmonised and publically available data.

The next **Figure 186** represents factor production cost across the EU Member States and for the Manufacturing sector. During the 2008 – 2013 period and where data is available, the energy share stood slightly above 2% of total production value in EU 28. Member States with relatively smaller size would typically present a higher than average share; probably pointing to the fact that these economies have a relatively less diversified portfolio of Manufacturing industries.

Figure 186 – **Purchase of energy products as a share of total production value in Manufacturing**
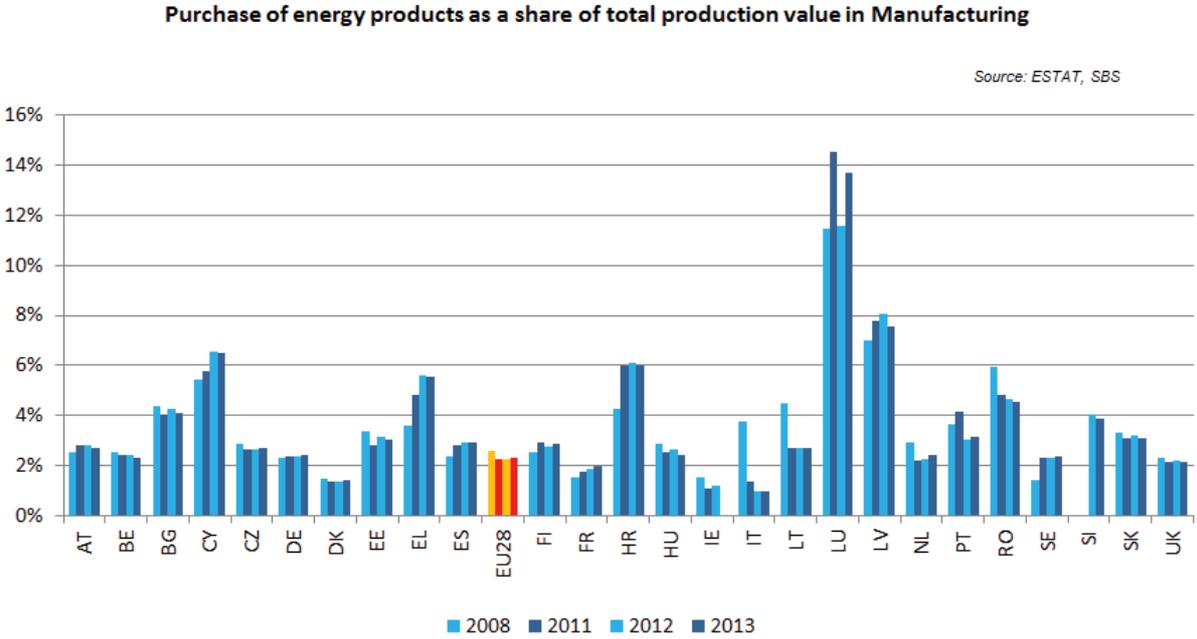
Source: Eurostat SBS

Notes:
1. Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available;

The energy use of Refining is not accounted in the above **Figure 186** (see also Textbox below for more explanations). Its share of the refining sector in total production value of manufacturing stood in the range of 7% - 9% for the EU from 2012 to 2014. The relative share of refining is quite dispersed among the 11 Member States declare the production value of refining as non-confidential, ranging from above 30% in Greece to around 20% in Belgium to less than 1% in Luxembourg, Slovenia and Latvia.

Box – Limitations of SBS statistics to analyse the energy share in total production costs

— There is no one-on-one mapping between the economic indicators of SBS and the profit and loss account of real companies;

— Capital expenditure (CAPEX) is difficult to collect in SBS, forcing the estimation of the energy component to rely solely on operating expenditure (OPEX); as a result the provided estimation is not assessing the long term investment and cannot determine the relative share of investment in improved energy performance tools over the total stock of investment;

— The purchases of energy product data is available only for NACE Rev. 2 sections B (Mining and quarrying), C (Manufacturing), D (Electricity, gas, steam and air conditioning supply) and E (Water supply, sewerage, waste management and remediation activities). It is not available for important industrial energy intensive sections such as Section F (Construction) and H (Transportation and storage) and, more importantly, it is not available for all services sectors. According to the 2015 Commission report (footnote 120), the relative share of the services sector in the 2014 Total Value Added in the EU 28 stood at almost 75%, as opposed to 15% for Manufacturing.

— Based on the definition of the Commission Regulation (EC) No 250/2009, the structural business statistics (SBS) code "20 11 0 Purchases of energy products" includes only energy products which are purchased to be used as a fuel. Energy products purchased as a raw material or for resale without transformation are excluded. As such, the energy products purchased by companies belonging to NACE Rev.4 Group 19.2 (Manufacture of petroleum products) are not included.

— The annual data for 2009 and 2010 is incomplete for the majority of EU Member States and thus not reported

6.2 Energy costs in energy intensive sectors

This chapter mainly relies on the presentation of the main findings of three studies. Two studies were commissioned by the Commission to external consultants: The study '*Prices and costs of EU energy*' by Ecofys BV and the study '*Composition and drivers of energy prices and costs: case studies in selected energy intensive industries*' by CEPS[9]. The third study '*Production costs from energy intensive industries in the EU and third countries*' was conducted by the JRC[10].

The Ecofys study looks at selected Energy Intensive Industries (14 sectors at NACE 3 level) and 5 case studies of less aggregated sectors (NACE-4 level) following a *top down* approach in which statistical information is used to understand the role of energy prices and costs in the competitiveness of these sectors. The studies by JRC and CEPS also cover case studies but follow a *bottom up* approach. In the study by CEPS calculated averages are based on direct collection of price and costs data at plant level via a questionnaire which allows to analyse samples of varying representativeness. The JRC study uses the latter approach for the aluminium sector. For the other sectors analysed in the JRC study, information provided by commercial data providers (that contained information for a representative sample of facilities) is used. The *bottom up* and *top down* approaches are complementary and provide a broader vision of the energy prices and energy costs paid by European industries.

In this Chapter we will first briefly discuss the conditions which make energy costs become a factor for competitiveness. We will also look at the various factors that affect the final prices paid by companies. On the basis of the analyses of the some selected energy intensive industries at relatively high level of aggregation (NACE 3 level) we will provide an overview of the evolution of energy costs in these sectors as well as of other indicators of competitiveness (like profit margins or energy intensity). International comparisons will then be made to see effects on energy competitiveness. Finally we include the main results from the various *case studies* at more disaggregated level which allows seeing in more detail the role of energy prices and costs in their competitiveness.

Factors of competitiveness

Firms compete offering products differentiated in terms of both price and quality. Prices are thus an essential element to compete which becomes increasingly important when the products in the market are more homogenous[11].

Prices are the result of production costs (labour costs, energy costs, capital costs) and profit margins. Differences in production costs and profit margins may stem from various competitive advantages from natural resources, geography, human capital, organisational structures, etc. In this document we will mainly look at the evolution of *energy costs* in some selected EU energy intensive sectors. We also look at how these energy costs have affected production costs and thereby influenced the competitiveness of such sectors

Energy costs as determinant of industrial competitiveness

On average energy costs represent a rather small share of the total production cost of manufacturing firms and therefore have a rather limited influence on the general competitiveness. As we have seen in section 6.3.2. at EU level it would be difficult to say that energy costs cause a problem of competitiveness at the economy-wide level..

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[9] Consortium composed of CEPS, ECOFYS and Economisti Associati - led by CEPS

[10] http://publications.jrc.ec.europa.eu/repository/bitstream/JRC100101/ldna27729enn.pdf

[11] The more a product is commoditized, and thus presents the same quality features, the more producers compete on price, especially when price is fixed on the global market by commodities exchange

However, energy costs vary considerable across sectors reflecting different conditions and circumstances. For some of them energy is a factor for competitiveness. This may happen when i) energy costs have a very significant share in the cost structure ii) energy costs per unit of production value are higher than international competitors and iii) there is international trade exposure.

This is why we focus our analysis in this document on Energy Intensive Industries (where energy costs represent a significant share of total production costs) and in particular in those sectors with internationally traded products. Naturally, as indicated above, the overall competitiveness of firms in such industries will also depend on other production factors (e.g. labour costs, use of raw materials, etc.) which can influence profit margins.

Energy costs

Energy costs of a firm depend on the energy prices paid by the firm and its energy consumption.

Energy consumption can be improved by higher energy efficiency in the production process.

Energy prices usually attract attention as they are very volatile and can rapidly escalate increasing energy costs in a significant way. A general energy price escalation would allegedly affect all firms most of which are energy price takers. However, what counts for determining the competitive position of firms (which is a relative position with regard to other firms) would be the energy prices they actually pay. The price paid may vary a lot depending upon numerous factors. These factors include energy supply strategies (e.g. use of CHP, self-production using cheaper energy sources, common purchasing strategies, long term contracts of energy supply, etc.), the amount of energy consumed (different tariffs of consumption bands), connection to the transmission or distribution grids and the firm consumption patterns derived from the specific industrial process (e.g. during the day tariffs are usually cheaper when energy demand is low, like during the night hours).

The actual amount paid for energy also depends on price and tax exemptions and reductions[12] which can be granted by specific regulations that vary across member states (e.g. lower network tariffs for firms exceeding certain level of energy intensity, firms of sectors exposed to international competition, reduced taxes or levies for firms applying energy efficiency measures, etc.)

Summing up, depending on many characteristics, each industrial firm in Europe is confronted with a different price of energy. The price difference between companies of the same sector for the same energy carrier in the same country can exceed 50%[13]. See below **Figure 187** & **Figure 188** as well as **Figure 190** & **Figure 191**.

These price differences may have also evolved over time depending on issues such as the magnitude of taxes and levies or due to the introduction of changes in the regulation for price reductions and exemptions in each country (see Figure 188 and Figure 191)

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[12] A detailed description of the criteria used by MS for applying price reductions and tax exemptions for gas and electricity prices can be found in Error! Reference source not found. and Error! Reference source not found.

[13] For the various reasons already explained in the text above, large industrial consumers (of bands IF and I5, for electricity and gas, respectively) compared to medium consumers (of bands IB and I2, for electricity and gas) normally pay less for their energy component and the network component. In addition, industrial consumers can also be granted reductions and exemptions in the taxes and levies component. To calculate the maximum possible differences in prices in each Member State, it is then assumed that all possible reductions and exemptions available in a MS for taxes and levies (due to various reasons, see Error! Reference source not found. and Error! Reference source not found. are applied to the large consumers (maximum price) and no exemptions and reductions are applied (as it is usually the case) to medium consumers (minimum prices).

Range in ELECTRICITY prices due reduced tariffs and exemptions

Figure 187 **- Electricity retail prices in 2015 for companies not eligible for any compensation (Consumption band IB)**

Source: Ecofys study
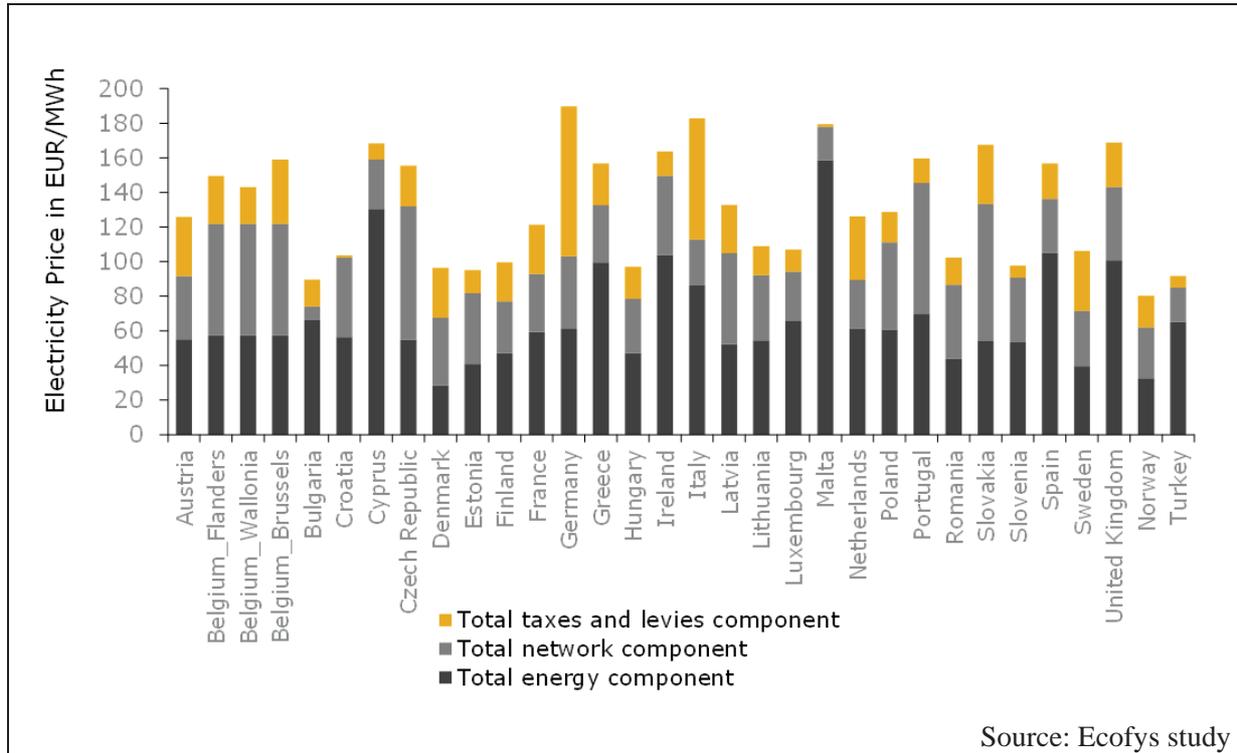
Figure 188 **- Electricity retail prices for industrial consumers eligible for all reduced tariffs and compensations in 2015 (Consumption band IF)**

Source: Ecofys study, EC data collection
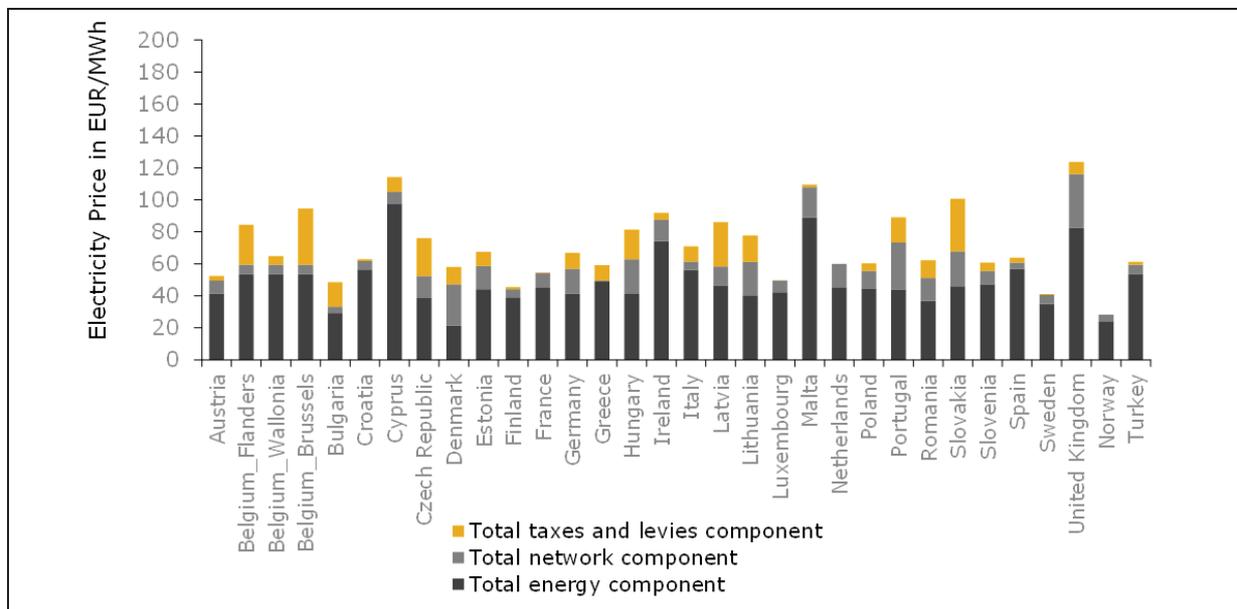
Figure 189 - **Maximum differences in total taxes and levies on electricity prices for industrial consumers**

Source: Ecofys, Frauhofer ISI, CASE

Range in GAS prices due to reduced tariffs and exemptions

Figure 190 **- Natural gas retail prices in 2015 for companies that are not eligible for any compensation (Consumption band I3)**

Source: Ecofys study
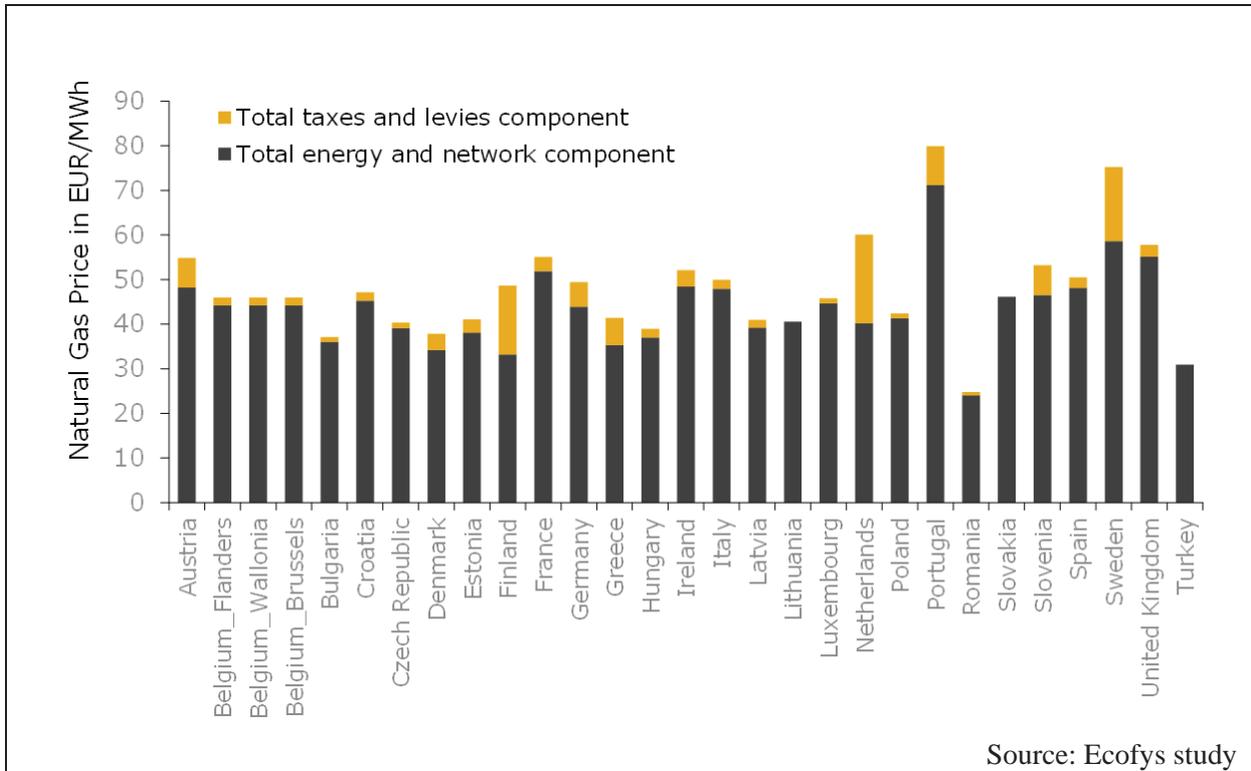
Figure 191 **- Natural gas retail prices for industrial consumers eligible for all reduced tariffs and compensations (Consumption band I5)**

Source: Ecofys study, EC data collection
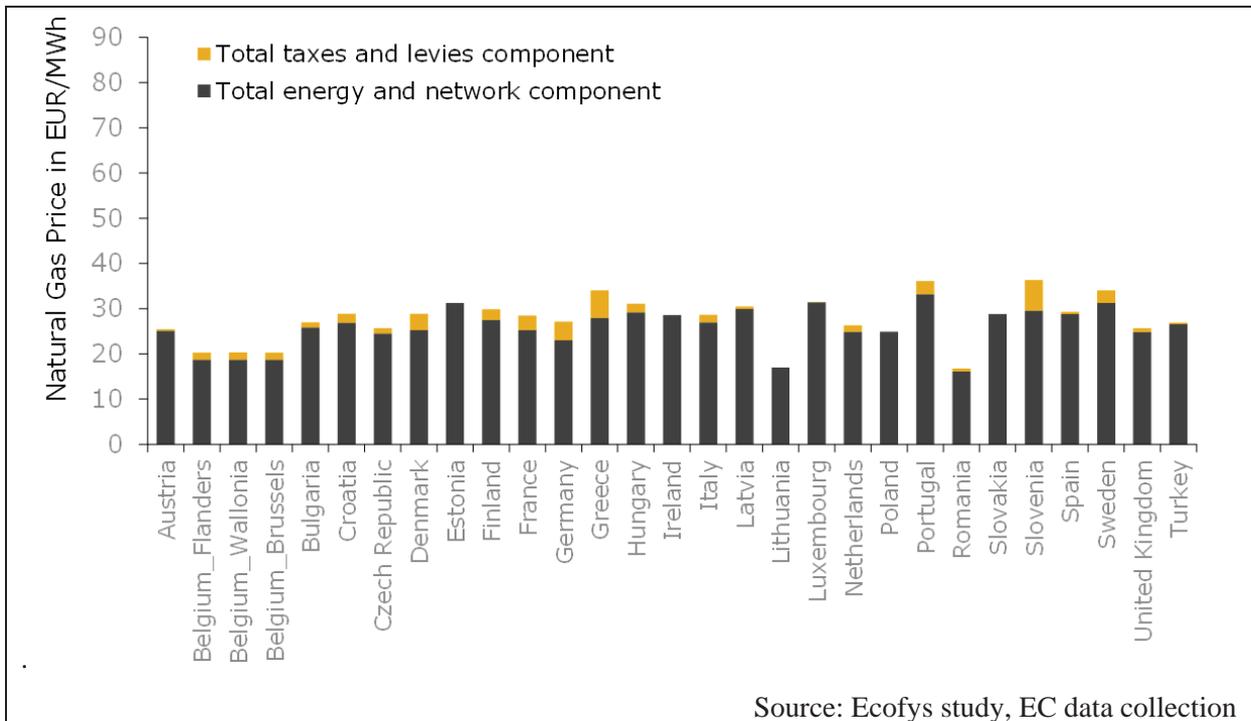
Figure 192 - **Maximum differences in total taxes and levies on natural gas prices for industrial consumers**
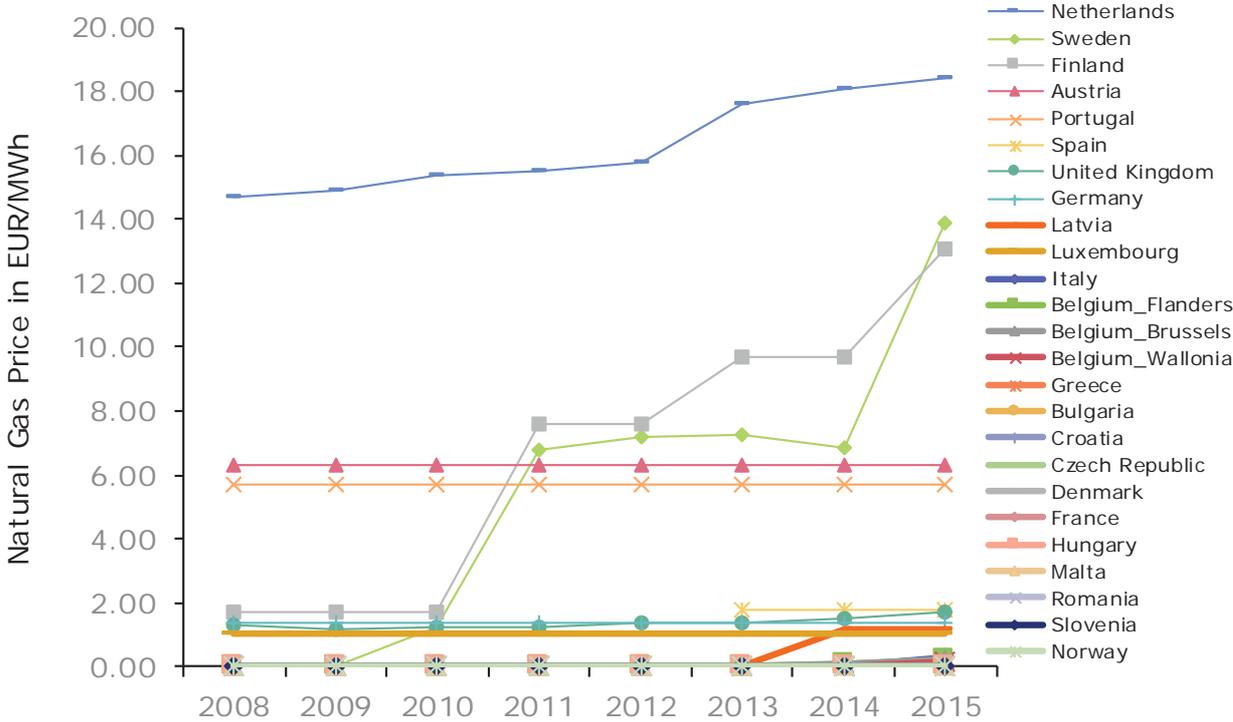
Source: Ecofys, Fraunhofer ISI, CASE

6.2.1 Energy costs analysis

Analysis of energy costs in selected Energy Intensive sectors

In the following sections we draw on the results of the sectorial analysis based on a study commissioned by the European Commission to Ecofys which analyses energy costs and other indicators across fifteen *NACE 3* sectors. Methodological details can be found in the Ecofys study. The main data source was Eurostat SBS. Energy cost shares are calculated by dividing the purchases of energy by total production costs, where total production costs are equal to total purchases of goods and services (including energy)[14] plus personnel costs.

Selection of sectors

The selection of sectors took account of energy intensity, added value and trade exposure of sectors. It therefore gives us a good overview of the industry sectors where energy may have a bigger impact on competitiveness.

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[14] Total purchases of goods and services represents the value of all goods and services purchased during the accounting period for resale or consumption in the production process, excluding capital goods (the consumption of which is registered as consumption of fixed capital). This therefore, includes the costs of materials that enter directly into the goods produced (raw materials, intermediary products, components), non-capitalised small tools and equipment and the value of ancillary materials. Service costs, such as repairs and maintenance, transport and logistics, communication, insurance, legal and accountancy fees, are also included in this total.

Table 15. Coverage of the sectors (15 NACE 3 and 5 NACE-4)

Code	Description	Case study
C106	Manufacture of grain mill products, starches and starch products	
C132	Weaving of textiles	
C161	Sawmilling and planing of wood	
C171	Manufacture of pulp, paper and paperboard	C1712 - Manufacture of paper and paperboard
C192	Manufacture of refined petroleum products	
C201	Manufacture of basic chemicals, fertilisers and nitrogen compounds, plastics and synthetic rubber in primary forms	C2013 - Manufacture of other inorganic basic chemicals, focus chlorine
C206	Manufacture of man-made fibres	
C231	Manufacture of glass and glass products	C2313 – Hollow glass, focus container glass
C232	Manufacture of refractory products	
C233	Manufacture of clay building materials	
C234	Manufacture of other porcelain and ceramic products	
C235	Manufacture of cement, lime and plaster	
C237	Cutting, shaping and finishing of stone	
C241	Manufacture of basic iron and steel and of ferro-alloys	C2410 - Manufacture of basic iron and steel and of ferro-alloys, focus crude steel
C244	Manufacture of basic precious and other non-ferrous metals	C2442 - Aluminium production, focus primary aluminium

Source: Ecofys study

Table 16. Energy intensity, share of GDP and trade intensity of NACE4 sectors

NACE4 category	Energy Intensity	Share of GDP	Trade intensity
C1712 - Manufacture of paper and paperboard	11.19%	0.09%	23.10%
C2013 - Manufacture of other inorganic basic chemicals	9.70%	0.05%	40.62%
C2313 - Manufacture of hollow glass	13.34%	0.04%	20.46%
C2410 - Manufacture of basic iron and steel and of ferro-alloys[15]	7.83%	0.16%	25%
C2442 - Aluminium production[16]	7.19%	0.05%	34.64%

Source: Ecofys study, calculations based on Eurostat data

Note: The criteria used to select five *NACE-4* sectors were energy intensity above 7%, trade intensity of more than 10% and a share of GDP greater than 0.02%

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[15] NACE 2410 includes firms producing steel products with different value added and following different production processes (e.g. BF or EAF). The averages of the sector represent the industry as a whole and might not be fully representative of concrete processes in the sector, which may have different sensitiveness to energy costs.

[16] NACE 2442 includes both primary and secondary aluminium production. Primary aluminium is 20 times more energy intensive than secondary aluminium. The energy intensity in the production of primary aluminium is around 35% percent. Secondary (Recycled) aluminium's energy intensity is a few percentage points. Therefore, conclusions on averages of NACE 2442 have to be taken with prudence as high energy prices have a high impact on primary aluminium, but far lower on secondary aluminium.

Evolution of energy costs in Energy Intensive sectors

Table 17. Countries and sectors covered

	C106: Grain products	C132: Textiles	C161: Sawmills	C171: Pulp and paper	C192: Refineries	C201: Basic chemicals	C206: Man-made fibres	C231: Glass	C232: Refractory products	C233: Building materials	C234: Porcelain, ceramics	C235: Cement, lime, plaster	C237: Stone	C241: Iron and steel	C244: Non-ferrous metals
Austria	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
Belgium	1	1	1	1	0	1	0	1	0	1	0	0	0	1	1
Bulgaria	1	1	1	1	0	1	0	1	0	1	1	1	0	0	1
Croatia	1	0	1	0	0	0	0	1	0	1	0	1	1	0	0
Cyprus	1	0	0	1	0	0	1	1	0	1	0	0	1	1	0
Czech Republic	1	1	0	1	0	1	0	1	1	1	1	1	1	1	1
Denmark	0	0	1	1	0	1	0	1	0	1	1	0	1	0	1
Estonia	0	0	1	0	1	1	0	1	0	0	1	0	1	1	0
Finland	1	0	1	1	0	0	0	1	0	1	0	0	1	0	0
France	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0
Germany	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
Greece	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Hungary	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Ireland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Italy	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
Latvia	0	0	1	0	0	1	0	1	0	0	1	0	1	0	0
Lithuania	1	1	1	1	0	1	0	1	0	1	1	0	1	0	0
Luxembourg	0	1	0	0	1	0	0	0	0	1	0	0	1	0	0
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	1	0	1	0	0	0	1	1	0	0	0	0	1	0	1
Poland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portugal	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
Romania	1	1	1	1	0	1	0	1	1	1	1	1	1	1	1
Slovakia	0	1	1	1	0	1	1	1	1	1	1	1	1	0	1
Slovenia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spain	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
Sweden	1	1	1	1	0	1	0	1	1	0	1	1	0	1	1
UK	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
Total data points included	19	17	21	19	4	19	12	23	13	20	18	15	21	15	16
Coverage of EU28 sector GVA of included data points [%]	93	92	93	93	14	85	83	94	90	91	91	73	90	77	85

Note: The sectors and countries for which a full time series 2008-2013 was available for the energy cost as a share of total production cost calculation are indicated with "1"(i.e. all data available) A "0" indicates that at least one year of one data point missing, therefore not included in the EU aggregate calculation

Table 18. Energy costs share of total production costs- Aggregated results at sector level

Sector	Average energy cost share: 2008-2013	Data points	Minimum value	Maximum value	Change 2008-2013 [%]	Change 2011-2013 [%]
C106 - Manufacture of grain mill products, starches and starch products	3.7%	19	1.3%	17.9%	-10.5%	-0.2%
C132 - Weaving of textiles	3.5%	17	0.5%	12.1%	-38.5%	-10.6%
C161 - Sawmilling and planing of wood	3.6%	21	0.6%	10.5%	2.1%	-11.4%
C171 - Manufacture of pulp, paper and paperboard	11.3%	19	2.8%	42.0%	-16.2%	-9.8%
C201 - Manufacture of basic chemicals, fertilisers and nitrogen compounds, plastics and synthetic rubber in primary forms	6.7%	19	0.0%	6.7%	-1.8%	-1.3%
C206 - Manufacture of man-made fibres	8.4%	12	0.0%	20.4%	-1.9%	18.9%
C231 - Manufacture of glass and glass products	9.2%	23	1.9%	24.2%	2.3%	14.0%
C232 - Manufacture of refractory products	6.1%	13	1.1%	33.1%	-0.9%	11.8%
C233 - Manufacture of clay building materials	13.0%	20	3.2%	42.4%	-18.3%	11.7%
C234 - Manufacture of other porcelain and ceramic products	5.3%	18	0.9%	17.4%	-1.8%	4.3%
C235 - Manufacture of cement, lime and plaster	19.6%	15	12.7%	35.6%	-8.7%	-8.3%
C237 - Cutting, shaping and finishing of stone	4.0%	21	0.6%	24.8%	7.9%	21.6%
C241 - Manufacture of basic iron and steel and of ferro-alloys	8.5%	15	2.1%	26.8%	-2.9%	10.0%
C244 - Manufacture of basic precious and other non-ferrous metals	4.2%	16	0.7%	29.8%	-7.7%	-3.4%

Source: Ecofys study

Note: Energy costs and production costs are aggregated per sector only for Member States where all data inputs are present across all years for the relevant sector so that a consistent basis of comparison is applied to all years. For France the personnel costs were estimated in 2009.

This somewhat limits the total number of data points and can lead to differences in results compared to analysis of a single year, where other Member States may be included. The refinery sector has been excluded as the energy cost data does not accurately reflect (significantly underestimates) the actual cost to the sector.

The exclusion of the manufacture of refined petroleum products sector

The refinery sector was selected as one of the focus sectors but is excluded from many of the following figures and analysis. This is because the Eurostat SBS dataset is the basis for the energy costs analyses made by the Ecofys study. The fact is that energy products, i.e. crude oil, are purchased and consumed by the refinery sector, but as a feedstock rather than for energy generation. However the SBS *energy purchases* does not include crude oil thereby excluding the largest part of energy costs for the refinery sector. This results in a calculated EU average energy cost share for the refinery sector of 3% of total costs. Clearly this does not accurately reflect the actual energy costs of the sector which will be much higher. The European Competitiveness Report (2014) estimated energy costs at 62% of production value (gross output) for the Coke, refined petroleum and nuclear fuel sector in 2011. Analysis by Solomon Associates (2016) suggests that the average energy costs per barrel of oil for EU28 has increased slightly between 2008-2012 but decreased again by 2014. In the same period, US energy costs have decreased to below those in EU28 along with Russia and Middle East. Korea/Singapore and India have higher average energy costs than the EU in 2014. In terms of net cash margin, the US and Korea/Singapore have higher average margins than the EU28 while the other competitors are close to or below the EU28.

Energy costs for most of the selected sectors are ~3-10% of total production costs, only for the manufacture of pulp and paper, clay building materials and cement, lime and plaster do energy costs appear to be more than 10% of production costs[17].

The results of the analysis showed that *between 2008-2013 energy costs shares in almost every sector under study (except sawmills, glass, stone cutting) and total absolute energy costs have fallen in all the studied sectors.*

Between 2011-2013, there is a change in the trend in some sectors. *Energy cost shares increased in half of the sectors studied* (man-made fibres, glass, refractory products, clay building materials, stonecutting and iron and steel with increases between 4-22%) and in three of these cases (sawmills, glass and stonecutting) this happened due to energy costs decreasing less than other production costs.

Between 2008-2013 total production costs decreased across almost all sectors, by 0-30% and *increased in only two sectors* (grain and pulp and paper, by 8% and 1% respectively).

Figure 193 – **Energy costs shares of selected Energy Intensive sectors**
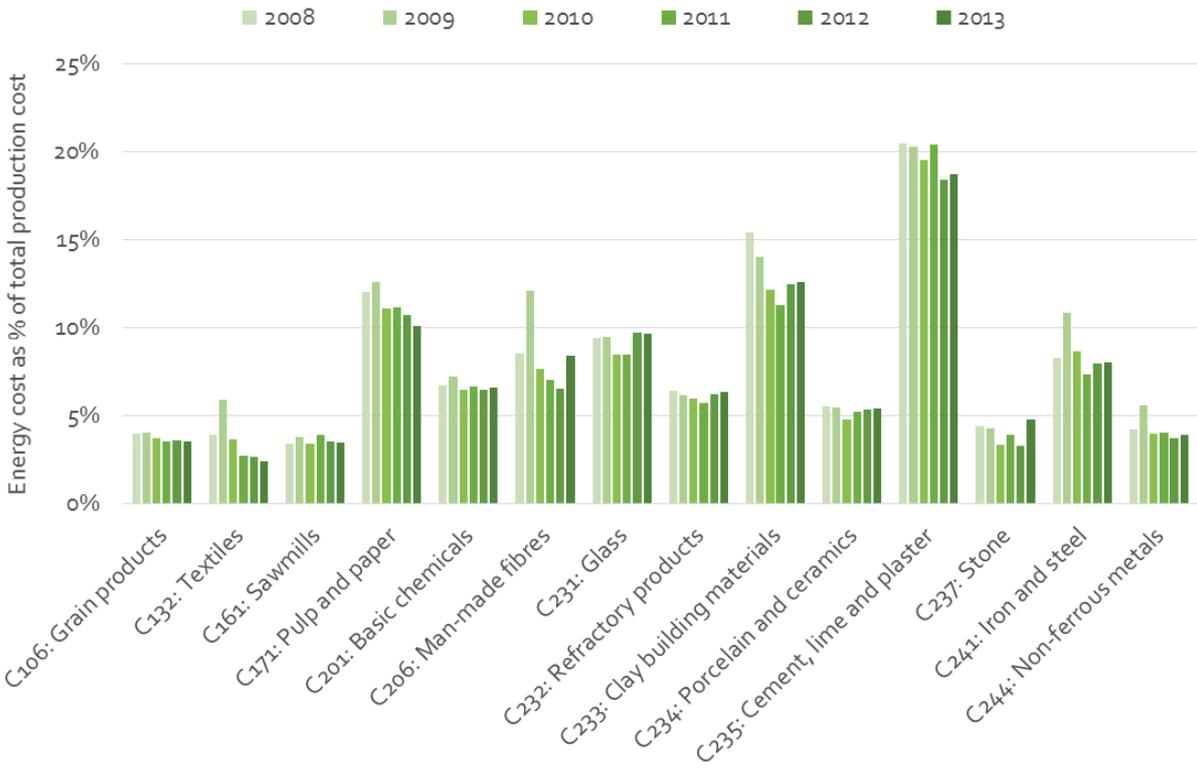
Source: Ecofys study, Eurostat SBS.

On average between 2008-2013 total energy costs have changed more favourably, i.e. increased by less, decreased by more, than other production costs in absolute terms, and therefore have reduced their share in total costs. Energy costs typically scale very closely with

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[17] Note that refineries were excluded from the analysis for the reasons presented in the box above. It is also important however to remind the level of aggregation considered, e.g. under code C2442 - Aluminium production includes both primary production (with energy costs equal to a third of the total) and secondary production, which a share of only 5%.

production volumes, yet other costs, i.e. personnel, rent, rates, services, may not be so flexible. In times of declining production, energy costs could fall quickly while other costs must still be paid or are difficult to reduce. The evolution of the costs from non-energy purchases of goods and services depends on many factors and can also affect energy costs shares in total production costs. E.g. The non-energy purchases of goods and services cost can be driven up by price spikes in some commodities (e.g. commodity boom over the period 2008-2011) or dragged down by falling production volumes. See examples below where the non-energy purchases have opposite behaviour.

Figure 194 - Absolute and relative changes in main production cost components for the paper and pulp and iron and steel sectors, 2008-2013 and 2011-2013,
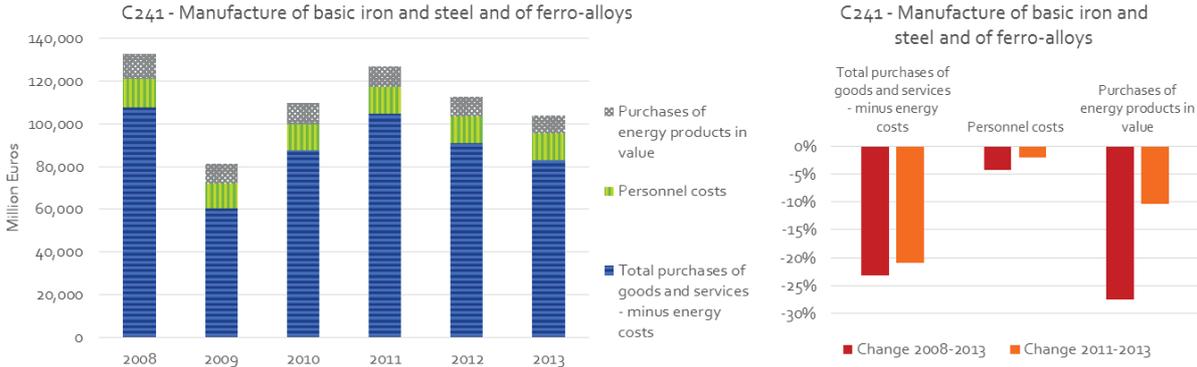
Source: Ecofys study

Note: EU aggregates based on data points in Table 17
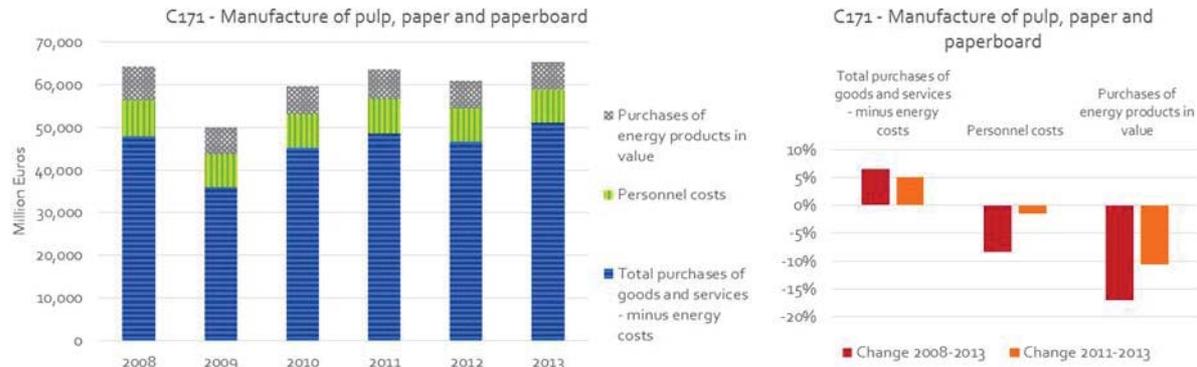
Source: Ecofys study

Note: EU aggregates based on data points in Table 17

With regard to Member States, the analysis of the sectors shows that: i) **the energy cost shares within a sector vary considerably,** from Member States where the energy cost share is only a small percentage of the total production cost, to Member States where the energy cost share is many times the average, and more than 40% of total production costs in some years. ii) A **cluster of countries (BG, HR, CY, EL, HU, LT, LV, PT, RO, SK) typically have higher than average energy cost shares within total production costs,** which is

consistent with average wages being lower in these countries and therefore personnel costs contributing a lower share of total costs than elsewhere.

Box -Gross operating surplus (profit margins) in Selected Energy Intensive Industries

Profit margins together with production costs do determine the final prices. The evolution of profits can therefore also play an important role in the competitiveness of firms.

On the basis of SBS statistics (Ecofys study) the level and evolution of Gross operating surplus[18] (GOS, which broadly correspond to profits) of the selected Energy Intensive Industries are presented in this box. GOS is expressed as a % of total production costs. This analysis will also be useful when we make international comparisons of GOS in the next section.

With regard to *Member States*, the result of the analysis of the sectors **over the period 2008-2013** shows that at **EU level** the average gross operating surplus is generally **in the range of 8-10%** per annum and **declined across all but four Member States (BG, DK, IT, SI)** particularly since 2011. This could be that average margins are under significant pressure in the EU. However, in **some Member States in some years (CY, EE, LV, LU, PL)** the average gross operating surplus **exceeds 20-30%.**

Figure 195 **- Gross operating surplus as % of total production costs, average across sectors, at EU28 and Member State level, 2008-2013.**
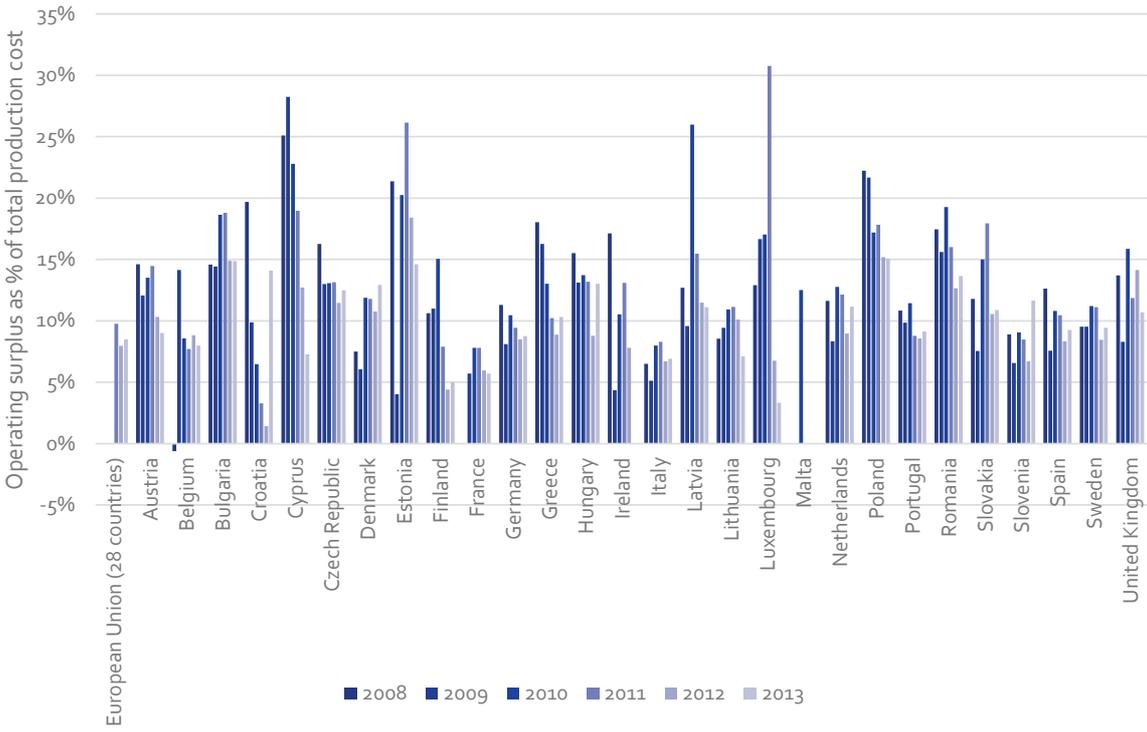
Source: Ecofys study

From a *sector* **perspective** (see main report and Annex 4 of Ecofys study for all results regarding sectors) it can be highlighted that average gross operating surplus **increased in more than half of the available Member States in the** *sawmill*, *paper and pulp* sectors and were **significantly lower than average in** *non-ferrous metals* and **especially in the** *iron and steel* sector.

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[18] Gross operating surplus presented are the result of subtracting personnel costs from value added using Eurostat SBS statistics

Figure 196 - EU average gross operating surplus as % of production costs, aggregate of MS for which total production cost and gross operating surplus data available for all years.
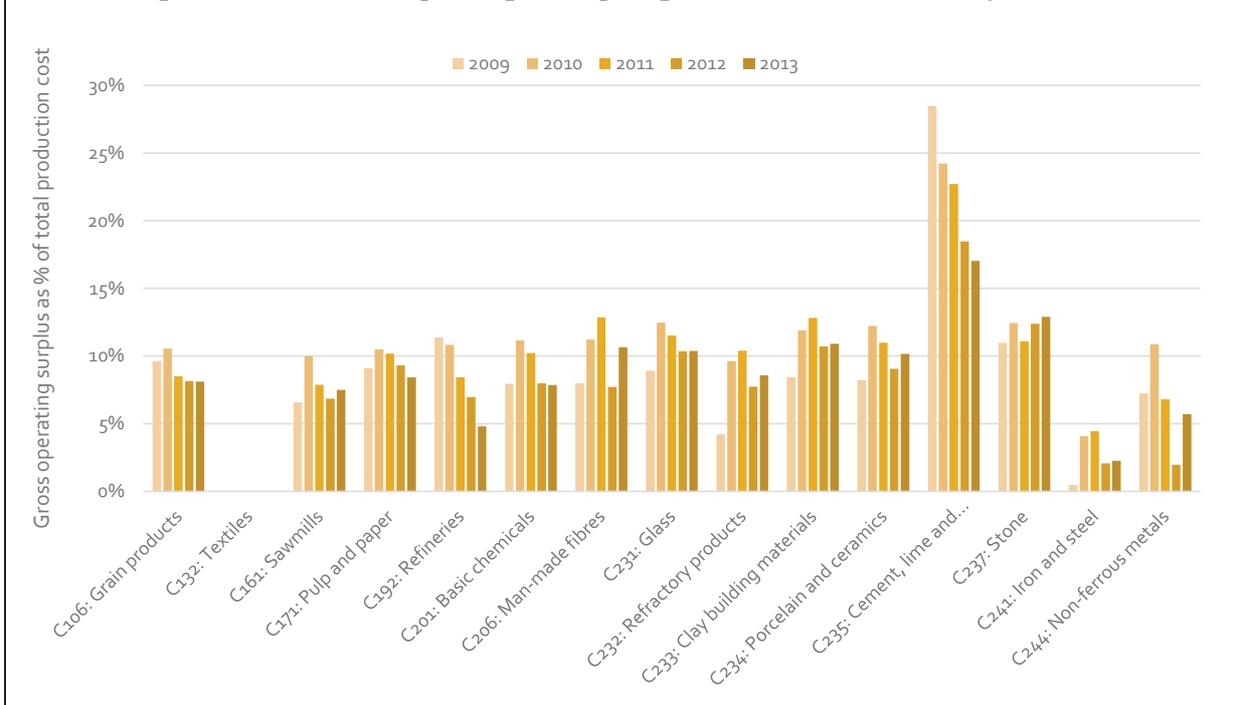
Source: Ecofys study

6.2.2 Exploring energy intensities and energy costs sensitiveness to prices

The efficiency of energy use has a crucial bearing on the energy costs of a sector.

Energy efficiency trends in industry (NACE 2 Level) seem to have evolved positively. **Figure 197**. In many sectors energy efficiency has improved over 2000-2013, especially in the chemical sector. As from 2008, energy efficiency improvements in the cement and iron and steel sectors seem to have come to a halt. The rate of energy efficiency improvement is driven by a number of factors including state of energy efficiency at the beginning of the reference period, technical possibilities for improvement, capacity utilisation rates and availability of capital to invest. Obviously; the financial situation since 2008 could have had implications for investments generally; including in energy efficiency. In addition our analysis on the evolution of retail prices in the previous chapters shows that electricity and gas price increases for industry were slowing down during the last years and even declining in the last year under study (2014-2015). Wholesale prices have also declined sharply in recent times (See Chapters 1 and 2). This fall in energy prices could also be reducing incentives for investment in energy efficiency in industry inter alia in more energy efficient industrial processes.

Figure 197 **- Energy efficiency index in EU industry, figure 18 from IEE (2015) Energy efficiency trends and policies in industry**
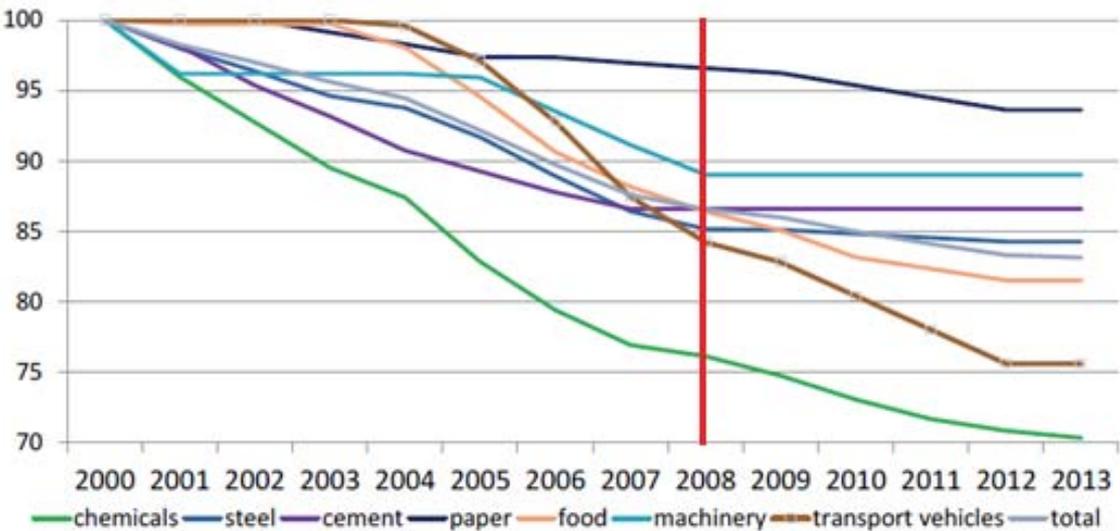
Data on the energy consumption and physical units of production of sectors at a high level of disaggregation is however rather limited and energy efficiency is difficult to estimate.

In this section we look at the *energy intensity* of selected (NACE-3) Energy Intensive sectors in the EU. Energy intensity of a sector measures the energy required to generate a unit of value added (VA). This indicator contains valuable economic information and indirectly contains information of the energy efficiency of the sector.

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Interpretation of energy intensity

Energy intensity has to be clearly distinguished from energy efficiency. It measures the energy required to generate a unit of value added (VA). Intensities across sectors cannot be compared to provide insight into the energy efficiency of a sector. Energy use can be dictated simply by the required processes. For example the energy intensity of the iron and steel sector could be high, but the sector can be (relatively) highly efficient for the energy required to manufacture these products. Indeed, it can be argued that sectors with relatively high energy intensities are more highly incentivised to pursue energy efficiency measures to reduce costs.

A further complexity of the energy intensity measure is the role of value added. Value added is the sum of returns to labour and capital, which is effectively the sum of personnel costs and gross operating surplus, the latter being a proxy for profit. Obviously many different factors such as salary costs, other personnel costs, pricing strategies, health of domestic markets, etc., can have an important bearing on the amount of value added generated. Therefore energy consumption is not the only important variable in this ratio. To more closely understand trends in efficiency in a sector a production volume at a sufficient level of disaggregation rather than value based measure would be preferred e.g. kWh/tonne of cement. Given that these data are not available across the range of sectors and for the Member States analysed, we use energy intensities to track trends over time in a particular sector. We also compare the same sectors across countries, although in neither case can we disaggregate the effect of different or changing product mix from energy efficiency.

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The *results of the analyses presented in this section are based on a small share of the value added of sectors [Value Added covered by sectors ranges from 6% to 24%] and a rather limited coverage of EU Member States.* (Table 19)- This is due to limitation on energy consumption data at sector level, with energy consumption breakdown per fuel. The breakdown per fuel is necessary to be able to perform price sensitivity analysis. Gross Value Added was sourced from the Eurostat SBS statistics (value added at factor cost).

Table 19. Coverage of sectors for which energy consumption data per carrier was obtained

Code	Description	Countries	Coverage of GVA
C106	Manufacture of grain mill products, starches and starch products	DE	7%
C132	Weaving of textiles	DE	6%
C161	Sawmilling and planing of wood	DE	7%
C171	Manufacture of pulp, paper and paperboard	DE, SE, FI	25%
C192	Manufacture of refined petroleum products		#N/A
C201	Manufacture of basic chemicals, fertilisers and nitrogen compounds, plastics and synthetic rubber in primary forms	DE	17%
C206	Manufacture of man-made fibres	DE	22%
C231	Manufacture of glass and glass products	DE, FR	20%
C232	Manufacture of refractory products	DE	14%
C233	Manufacture of clay building materials	DE	8%
C234	Manufacture of other porcelain and ceramic products	DE	17%
C235	Manufacture of cement, lime and plaster	DE, UK, FR	15%
C237	Cutting, shaping and finishing of stone[19]	DE, ES	16%
C241	Manufacture of basic iron and steel and of ferro-alloys	DE, AT, IT, FR	14%
C244	Manufacture of basic precious and other non-ferrous metals	DE, UK, FR	24%

The results on energy intensity cover 13 sectors (See Table 19) **and show a mixed picture** The sectors that appear as the most energy intensive are *Pulp and paper; Cement, lime and*

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[19] Not covered by the energy intensity analysis

plaster; Iron and steel[20] (>20 kWh per Euro of GVA) followed by *Basic chemicals* (a bit less than 15 KWh per Euro of GVA).

Between 2008 and 2013 energy intensity increased mainly in the most energy intensive sectors in a general context of declining consumptions[21] and added value:

— **Energy intensity increased in 6 of the 13 sectors:** *Pulp and paper; Cement, lime and plaster; Iron and steel; Basic chemicals* (i.e. the four most energy intensive sectors) plus *sawmills* and *man-made fibres*.

— **Gross Value Added was constant or decreasing in 10 of the 13 sectors**. This is consistent with falling margins (and therefore GVA) in recent years which could be due to an increase in intensity of global competition. GVA only increased in *grain products* (+15%), *basic chemicals* (+5%) and *clay building materials* (+23%).

— **Energy consumption declined in 9 of the 13 sectors** (**Figure 199** based on limited data points as per Table 19). The four sectors with increasing energy consumption were *grain products* (+9%), *sawmills* (+118%), *basic chemicals* (+20%) and *man-made fibres* (+28%). Of these four, only the *grain products* sector saw an energy intensity decrease due to a higher increase in GVA than in consumption.

Figure 198 **- Energy intensity of selected EU Energy intensive sectors 2008-2013 [kWh energy consumed per Euro of GVA]**

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[20] Normally we would also expect to see the refineries sector also included in this group of sectors. But there is a problem with the source statistics. Namely that although energy products are consumed by the sector, they are not consumed for the purposes of energy generation and therefore are not included in the energy consumption statistics, this leads to a significant underestimate of refinery sector energy consumption, to the point where it does not make sense to include the sector in many of the analyses below.

[21] The energy intensity of Basic chemicals also increased over the period but followed a different dynamic, ie +20% of energy consumption and 5% increase in Gross Added Value
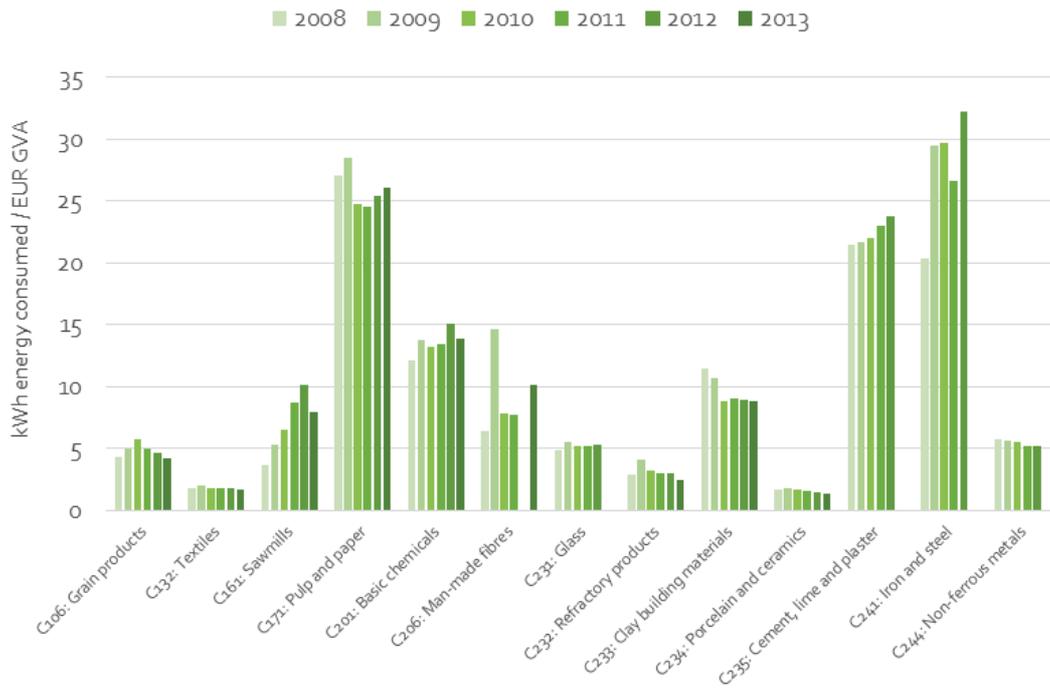
Source: Ecofys study

Note: Data based on limited number of EU Member States (see Table 19 for coverage)

Figure 199 - Total energy consumption per sector 2008-2013 [TWh] aggregate of countries with available data for all years
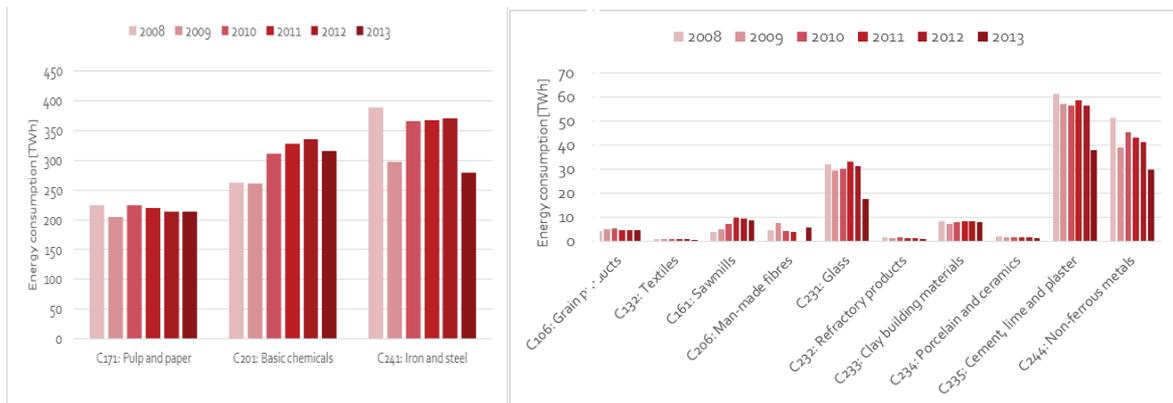
Source: Ecofys study

Note: Data based on limited number of EU Member States (see Table 19 for coverage

Energy carriers and price sensitivity

In this subsection we first present the results of the analysis of the importance of some energy carriers in consumption of sectors over the period 2008-2013. Then the results of the sensitivity analysis of total energy costs to price changes in energy carriers are presented.

As for the energy intensity *the analyses presented in this section are based on a small share of the value added of sectors [Value Added covered by sectors ranges from 6% to 24%] and a rather limited coverage of EU Member States.*- See **Table 19.**

In addition to that the analysis of energy costs only covers *electricity, gas, coal*, and *oil products* and excludes other carriers like biomass or heat for which prices were not available. This is most relevant for the sawmills (84% of energy consumption), pulp and paper (43%), basic chemicals (35%) and cement, lime and plaster sectors (38%). In all other sectors other energy consumption was less than 5% of the total.

Data on consumption of energy carriers per sector comes from National statistics and the Odyssey-Mure dataset. Prices for gas and electricity are typical prices for firms in the sectors derived as indicated in box (#).Price data for oil (petroleum products) was sourced from Eurostat: prices for Heating Oil without taxes. Price data from coal is based on the monthly prices reported in the Platts CIF ARA 6,000 NAR.22

The results of the analysis are presented as averages of available data points and give a rough indication of the importance of fuels per sector. This shows that overall electricity has the biggest influence on total energy costs followed by gas while oil (petroleum products) and especially coal have a relatively small influence even if consumption is high. This seems to indicate that energy costs in the sectors studied could be driven by price element of the energy carrier (electricity is usually expensive and coal cheap) rather than the consumption. See Figure **200** and Figure **201**

Figure 200 **- Average energy consumption shares per sector – based on available data points, split by energy carrier, 2008-2013 averages, excluding other energy carriers.**

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[22] The Platts CIF ARA 6,000 NAR is a daily 15-60 day forward price assessment for thermal coal shipped from Colombia, Russia, South Africa, Poland, Australia or the US to the northwest European trading hub of Amsterdam, Rotterdam and Antwerp. The term '6,000 NAR' refers to the net calorific value (heating value) of the coal in kilocalories per kilogram.
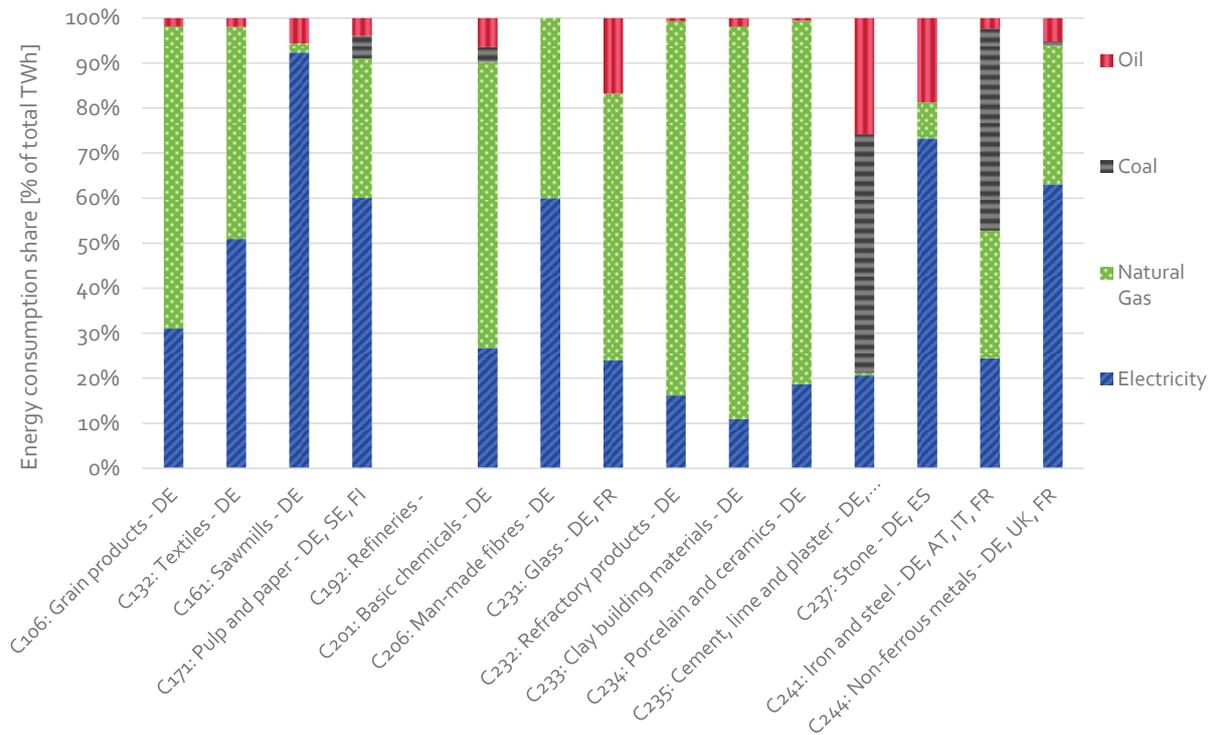
Figure 201 - **Average energy cost shares per sector – based on available data points, split by energy carrier, 2008-2013 averages**
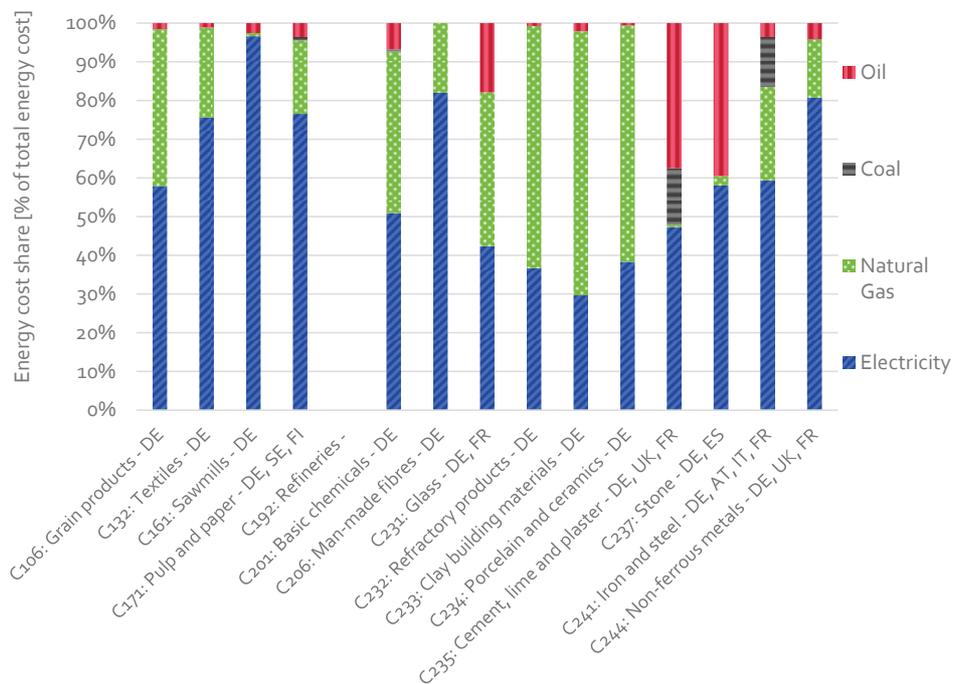
The average figures per sector presented above have to be taken with precaution not only due to the limited available data but also because averages do not show national specificities. Two examples below illustrate this.

C171 – manufacture of paper, pulp and paperboard (**Figure 202**)– In the sector in Germany there is significant consumption and costs due to natural gas. Natural gas is not used in either Sweden or Finland. Natural gas prices in Germany are therefore important for this sector, while electricity prices are crucial in

Sweden and Finland, with the costs of other energy carriers (heat, biomass) also of particular importance in Sweden.

Figure 202 **- Energy cost structure for the paper and pulp sector**
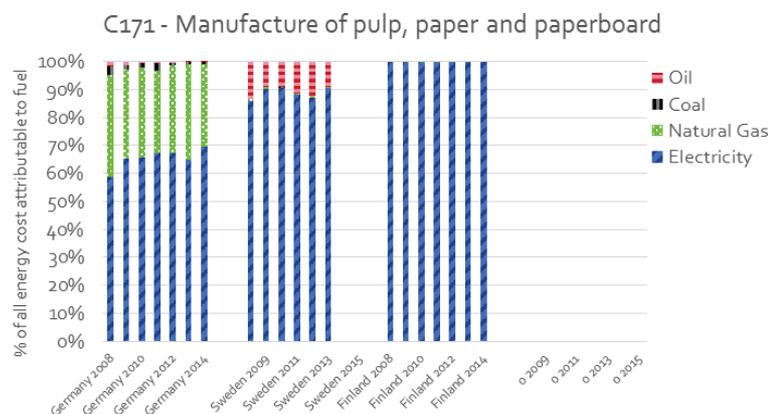
Source: Ecofys study

C235 – Manufacture of cement, lime and plaster (**Figure 203**)– a divergence in energy costs can be observed between each of the three Member States, Germany and UK both incurring around 60% of their energy costs from electricity, despite its share in consumption being relatively low (10-15%) in each. Part of this is explained by other (non quantified) energy consumption increasing the relative importance of each energy carrier including electricity. It also exemplifies the role of relatively high electricity prices and especially the role of relatively low coal prices. The cost share for electricity in France is much lower as electricity prices for the sector are around 30-40% lower than in Germany and the UK.

Figure 203 **- Energy cost structure for the manufacture of cement, lime and plaster)**
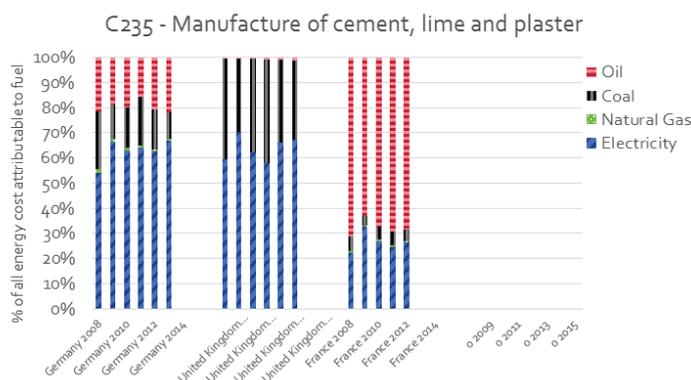
Source: Ecofys study

Sensitivity of energy costs to price changes

In this section we present an analysis of how the changes in prices of different energy carriers could affect the energy costs as a share of total productions costs in different sectors. The results of this sensitivity analysis have to be taken with even more precaution that the previous results. In addition to the limitations in the data coverage and information of relevant energy carriers for some sectors, additional assumptions are needed to undertake the analysis which limits even further any generalisation of the results. Namely:

—   The energy carrier split is based on only a limited number of data points.

—   The energy carrier split is assumed to remain constant over time, no fuel switching.

—   The other production costs are also assumed to remain constant over time.

The assumptions on energy price changes for 2008-2013 were based on the changes on the EU averages of electricity and gas prices per sector, calculated on the basis of the estimated prices after applying exemptions of Member State for a typical firm in a sector with an estimated typical electricity and gas consumption (between 2008-2013 calculated electricity prices increased from 5-25% and gas prices varied from -3.5% to 16%, depending on the sector)[23].-. Oil (petroleum products) prices were calculated to have increased by 9% in all sectors, and coal, on the basis of the Platts CIF ARA prices were calculated to have decreased by 38% across all sectors.(details on approach on Ecofys study section 5.6.2)

The analysis shows - by sector, **over the period 2018-2013 -** the impact of the change in the price of energy carriers on the share of energy in total production costs (**Figure 204**).

This shows that: **the net effect on total production costs of energy price changes is relatively small (increase between 0.2 and 1.2% per sector) and that sectors which use coal may have benefitted from price changes, or at least offset the impact of increasing prices of other energy carriers.**

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[23] See Section 5.6.3 of Ecofys study for a detailed methodological description of the calculations

Figure 204 - **Estimated EU average impact of changes in price of energy carriers 2008-2013 on total production cost of sector**
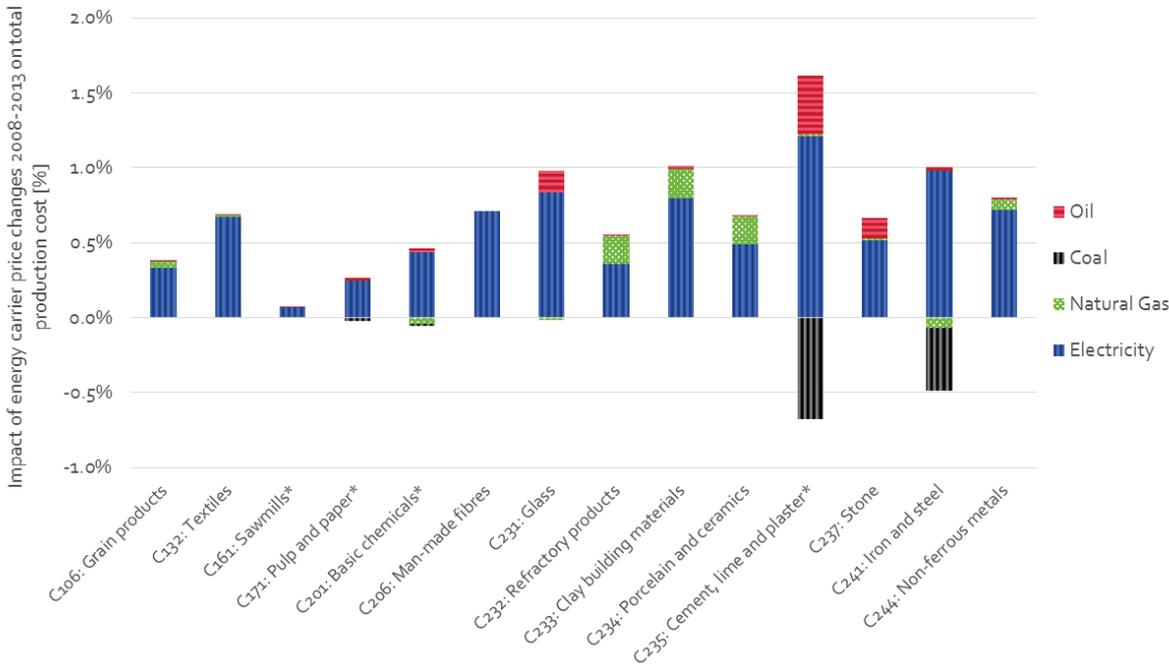
Note: Analysis based on energy cost shares calculated in section 6.2 *=sectors where other energy carriers, whose costs were unquantifiable play a significant role and for which greater uncertainty in the results exists.

6.3.3 International comparisons

6.3.3.1 Energy costs in the EU vs the US and Japan

Although the analysis of industrial competitiveness involves many more factors than only energy, here we concentrate on the differences in energy costs between countries. It is difficult to draw general conclusions as there is a lack of comparable data at a sufficient level of detail for competitor countries. The energy prices used for international comparison do not account for individual industries exemptions or reductions. On consumption and energy costs shares, data is only available at a relatively high level of sector aggregation.

Some general observations on energy prices and costs trends can nevertheless be provided. The case studies on specific sectors and products (Annex 4 and 5 of Ecofys Study) do not allow considerations at company level.

EU energy cost shares in the sectors analysed have to be compared against trading partners to understand their impact on competitiveness.

The results of comparison with data available for US and Japan[24] indicate that (

Figure **205**) **EU energy cost shares were on average higher than the Japanese across all the analysed sectors** (in some cases EU cost shares were more than double Japanese levels)

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[24] Data available only for some years and some sectors

and **lower than the US in 6 out of 9 sectors** (significantly lower in textiles, pulp and paper, glass and porcelain and ceramics although higher in basic chemicals, iron and steel and non-ferrous metals)

Figure 205 **- Comparison of [%] average energy cost shares per sector, 2008-2013 averages for available years and sectors**
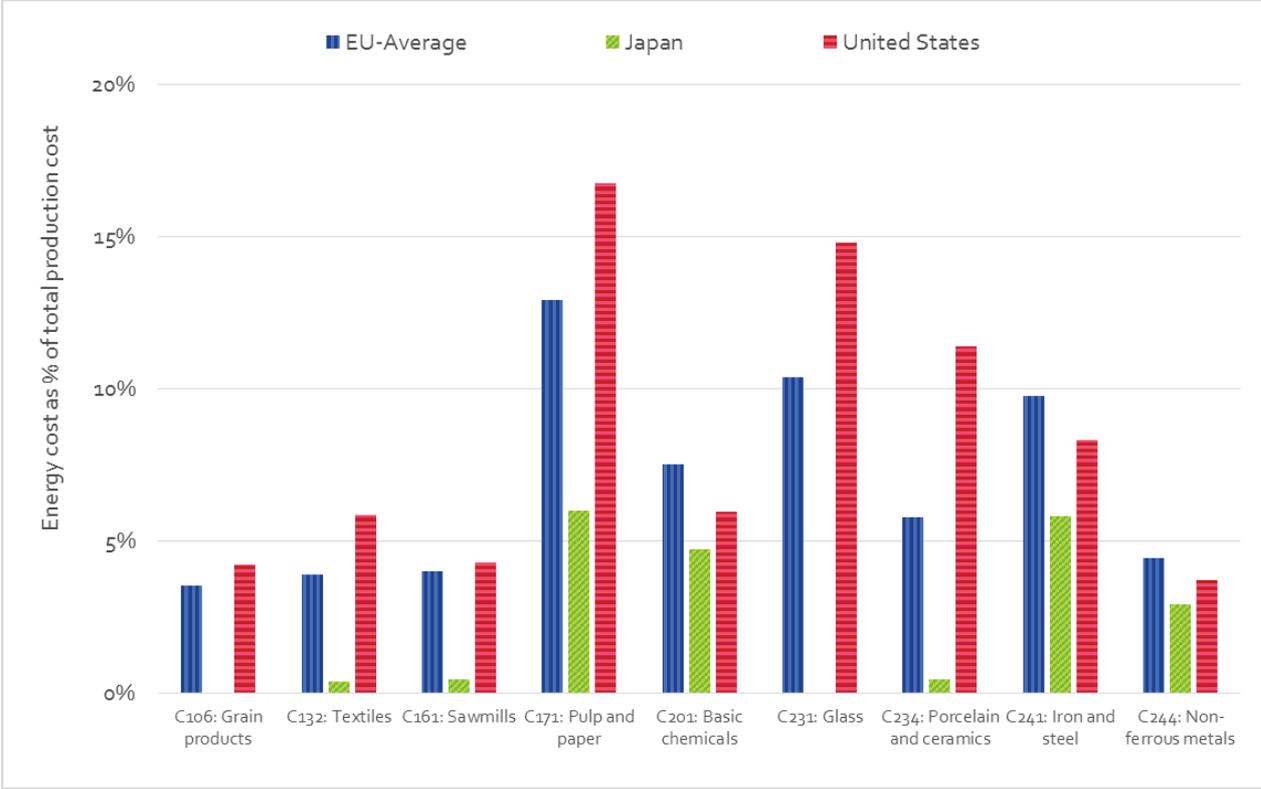
Source: Ecofys study

Note: Available data is for all years for the EU, 2008-2010 for Japan, 2008-2011 and 2013 for the US.

Between 2008-2013 energy cost shares have fallen in both the EU and US, but faster in the US in most of the sectors analysed (8 of the 11 sectors in which comparisons could be made). The following examples illustrate this trend.

Figure 206 **- Energy cost shares as a % of cost for selected sectors**

227

Manufacture of grain mill products, starches and starch products

Manufacture of glass and glass products
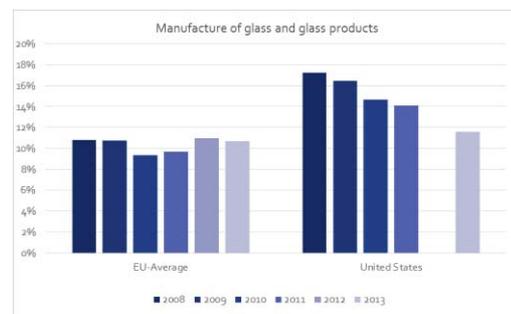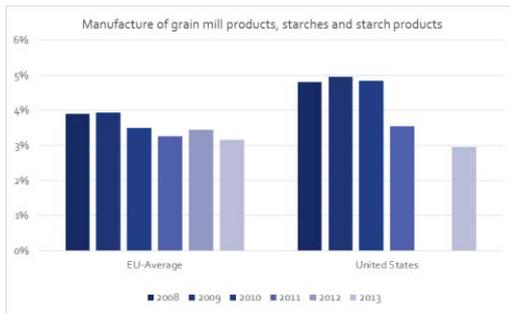
In the following sections we examine the key price and efficiency (intensity) drivers of these trends.

Industrial energy prices

The price paid for energy is a key driver of energy costs. In this section we look at data on electricity and gas prices (excluding VAT and recoverable taxes and levies) for industrial consumers in the EU and EU trading partners[25]. By comparing the prices paid internationally we can provide insight into the relative role of energy prices in energy costs.

Data are however scarce, particularly for gas and the price data used come from different sources and cannot always be easily compared (for G20 countries, excluding the EU Member States, IEA and private sources (CEIC) databases were used; EIA was also a source for US; Details in Annex 4 and Ecofys report)

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[25] Please note that the prices only exclude VAT and other recoverable taxes and levies. Other price and tax reductions or exemptions that could be granted to companies in the EU and trading partners are not accounted for in these prices

6.3.3.2 Electricity prices

Figure 207 - **Average electricity prices paid by industrial consumers in EU major trading partners**
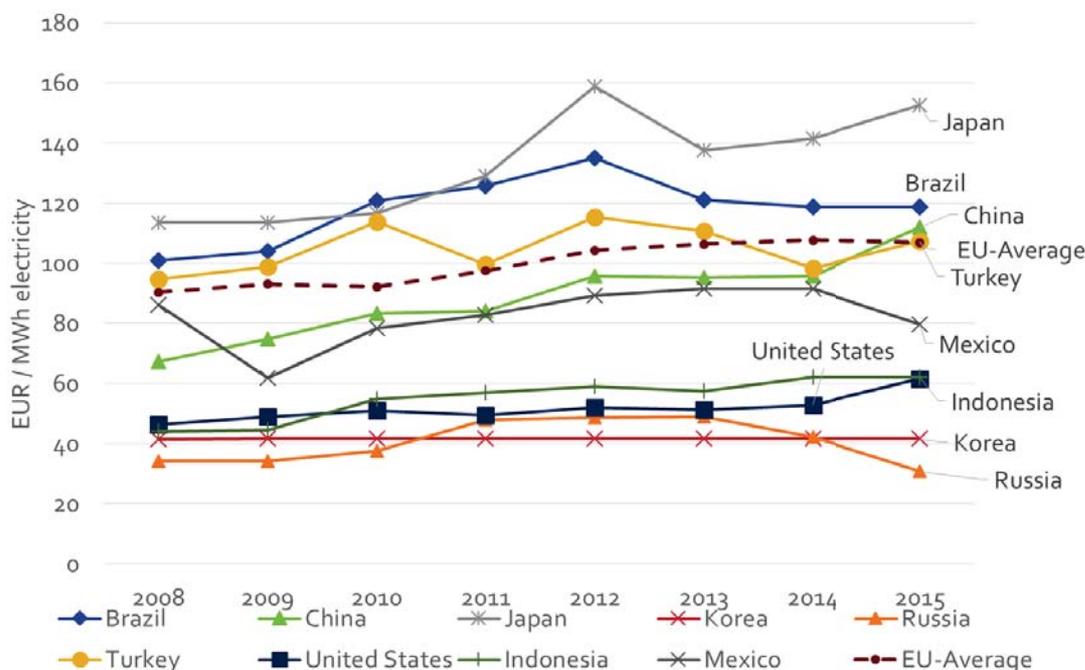
Source: Brazilian Ministry of Mining and Energy, Chinese Price Monitoring Center, NDRC, Indonesian State Electricity Company, Russian Federal State Statistics Service, and for Turkey, Korea, Japan, US and Mexico EIA data have been used. WB and ECB.

Within the EU, prices paid for electricity can vary significantly across Member States. In some sectors and countries electricity prices will be considerably higher than the average, in others considerably lower and comparable with the lowest prices paid internationally..

The analysis of this data shows that average **EU industrial electricity prices[26] are around the average paid internationally** (around €110/MWh), *higher than* **those paid in Russia, Indonesia, the US and Mexico,** *slightly lower than* **those paid in Turkey, China, Brazil and** *clearly lower* **than those paid Japan**

Over 2008-2015 the EU average was relatively **stable** while prices were increasing in many trading partners. **Japan and China prices have markedly increased** (34% and 66%, respectively, making **Chinese prices** now higher than the EU average prices). **US** (+32%) and **Indonesia** (+41%) prices have also significantly **increased but remain well below the EU average.**. In other countries prices did not change much (between €10-20/MWh).

Indeed, the appreciation of the US$ and the Chinese Yuan with respect to the Euro have significantly amplified price increase trends in China and the United States. Conversely, the depreciation of the Russian rouble, the Turkish lira and the Brazilian real has mitigated or even reverted the domestic price increases in national currencies (e.g. prices in Russia increased by 30% in the national currency terms but decreased by 10% in Euro terms). See **Figure 208** , which describes the evolution of prices in national currencies, in conjunction with **Figure 209**, which describes the evolution of exchange rates.

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[26] These prices refer to those paid by the general industry (i.e. by the industry with medium energy consumption (Eurostat Band ID) and not Energy Intensive Industries which usually are large energy consumers)

Figure 208 **- Industrial electricity prices in national currencies 2008-2013, indexed to year 2008=100**
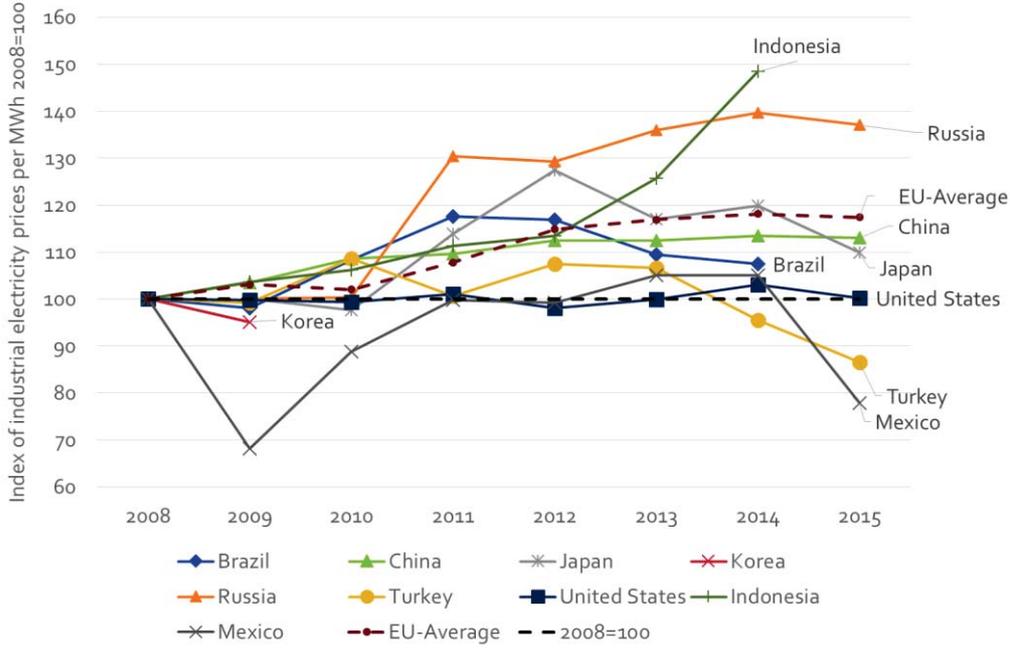
Source: Ecofys study calculations on the basis of data from Brazilian National Petroleum Agency, Chinese Price Monitoring Center, NDRC, Russian Federal State Statistics Service, American Energy Information Administration, and IEA for Turkey and Canada

Note: In the case of Japan and Russia prices are indexed to 2009=100 as no 2008 values are available

Role of exchange rates in international price comparisons

Comparing international prices requires conversion to a common currency, this introduces an exchange rate effect when analysed over time, in addition to any changes in price in the original currency. Exchange rates can move for a variety of reasons unrelated to the energy sector. Therefore, it is also important to consider these movements and the impact they have on the energy prices presented here.

Energy prices are analysed and converted to euros using exchange rates from the European Central Bank. The following figure provides an illustration of the currency movements with respect to the Euro over the period 2008-2015, indexed to the exchange rate in 2008=100. This shows that over the period 2008-2015 the Russian rouble depreciated significantly against the Euro, as did the Turkish Lira and the Brazilian Real. The Indonesian Rupiah, Mexican Peso, Japanese Yen and Canadian Dollar remained relatively stable to the euro, a fluctuation of around +/-10% either compared to 2008. The Korean Won, US dollar and Chinese Yuan appreciated by 20-40% against the Euro between 2008-2015.

These trends can mask or accentuate the actual trends in national energy prices, for example an increase in Russian, Turkish or Brazilian energy prices would not necessarily be reflected in euros, due to the exchange rate movements, and vice-versa.

Figure 209 **- Exchange rate movements indexed to Euro exchange rate in 2008=100.**
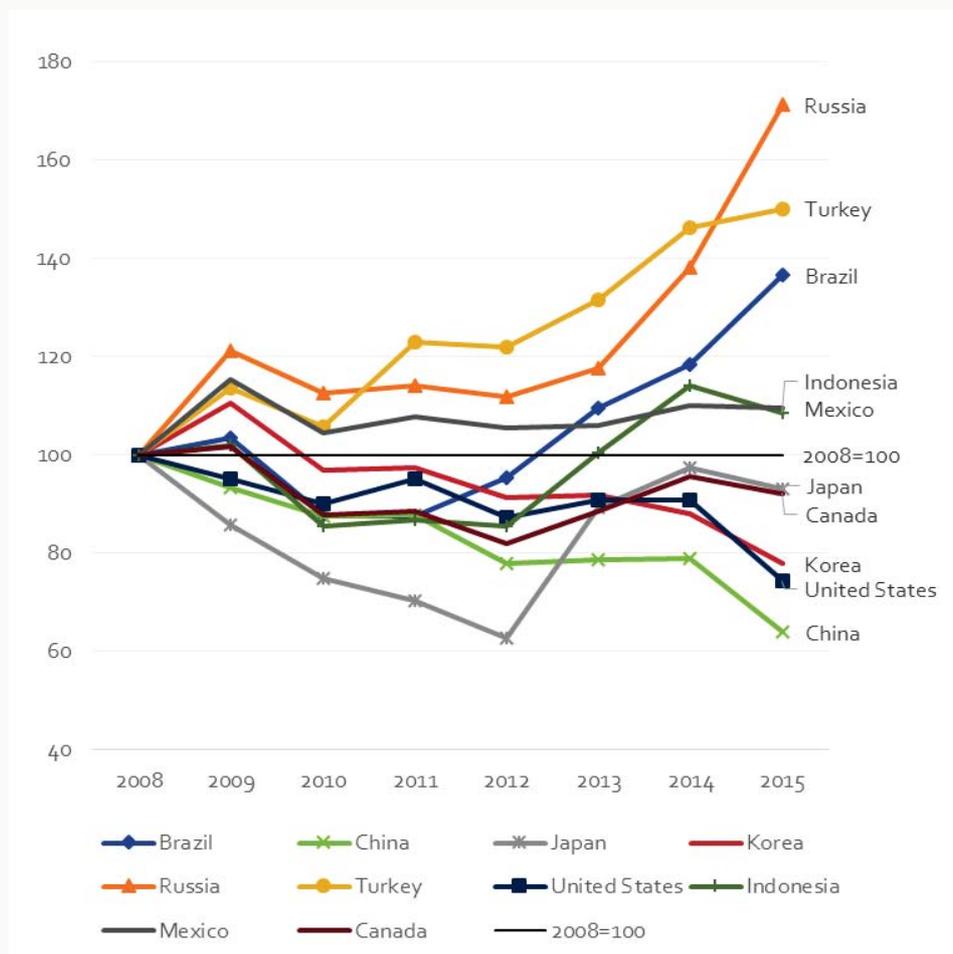
It is important to note also that these types of currency movement can also have an effect within the EU for the countries outside the Eurozone.

6.3.3.3 Gas prices

Figure 210 - **Average natural gas prices paid by industrial consumers in EU major trading partners.**
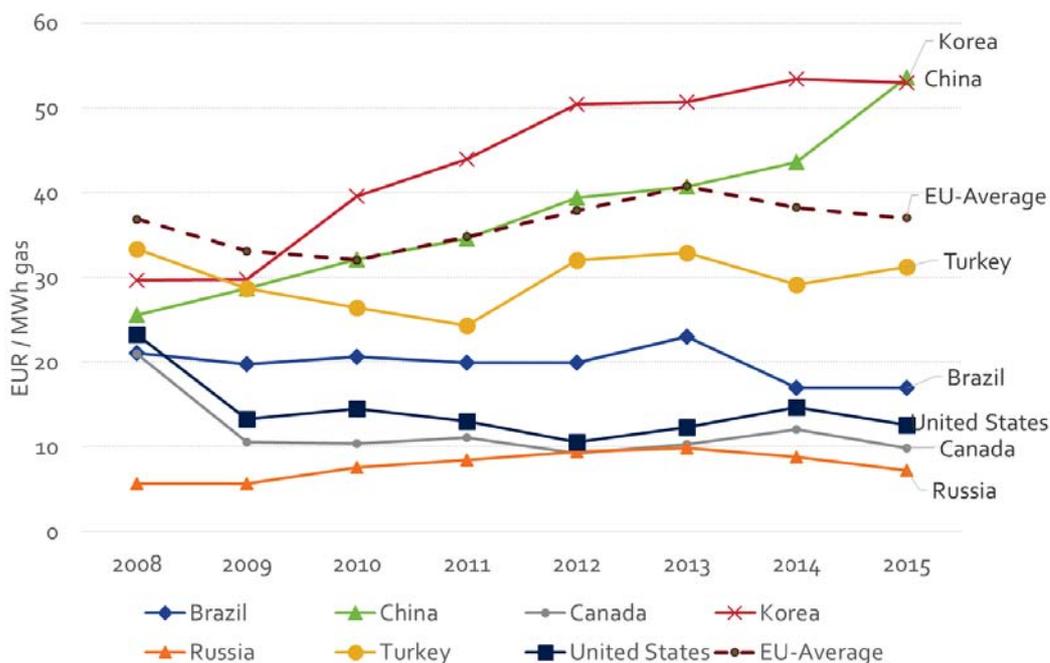
Source: IEA, Brazilian National Petroleum Agency, Chinese Price Monitoring Center, NDRC, Russian Federal State Statistics Service, American Energy Information Administration, and for Turkey and Canada EIA. WB and ECB.

As for electricity, EU prices for natural gas can vary significantly across Member States and sectors within Member States.

The analysis of gas prices show that average **EU industrial natural gas prices are relatively high** compared to those paid internationally (€37/MWh), *higher than* **prices paid in Russia, the United States, Canada, Brazil and Turkey** and *lower than* **prices paid in Korea and China**.

Over 2008-2015 gas prices fluctuated importantly (declining from 2008-2010; increasing in 2010-2012, and (mostly) decreasing since 2012). The EU average has however not changed significantly. Prices in China (+109%) and Korea (+79%) have considerably increased, becoming much higher than the EU average. Prices in the US (-46%) and Canada (-53%) declined mainly due to the US shale gas boom.

The appreciation of the Chinese Yuan and the Korean Won with respect to the Euro has accentuated the price increases in Euro terms of China and Korea gas prices. The depreciation of the Brazilian real and Russian rouble mitigated the gas prices increases in Euro terms (prices increased in Russia by more than 65%, but only 27% in Euro terms. For Brazil, a 35% increase became a 16% increase in EUR terms). The depreciation of the Turkish lira is hiding completely the increase in gas prices in Turkey (by more than 40% in lira terms that become a decrease of 7% in EUR terms). Finally the appreciation of the US dollar is mitigating the strong decrease in gas prices in the US (where gas prices fell by more than 70% but only by 45% in EUR terms). See **Figure** 209 which describes the evolution of exchange rates in conjunction with **Figure 211**; which describes the evolution of prices in national currencies

Figure 211 - **Industrial natural gas prices in national currencies 2008-2013, indexed to year 2008=100.**
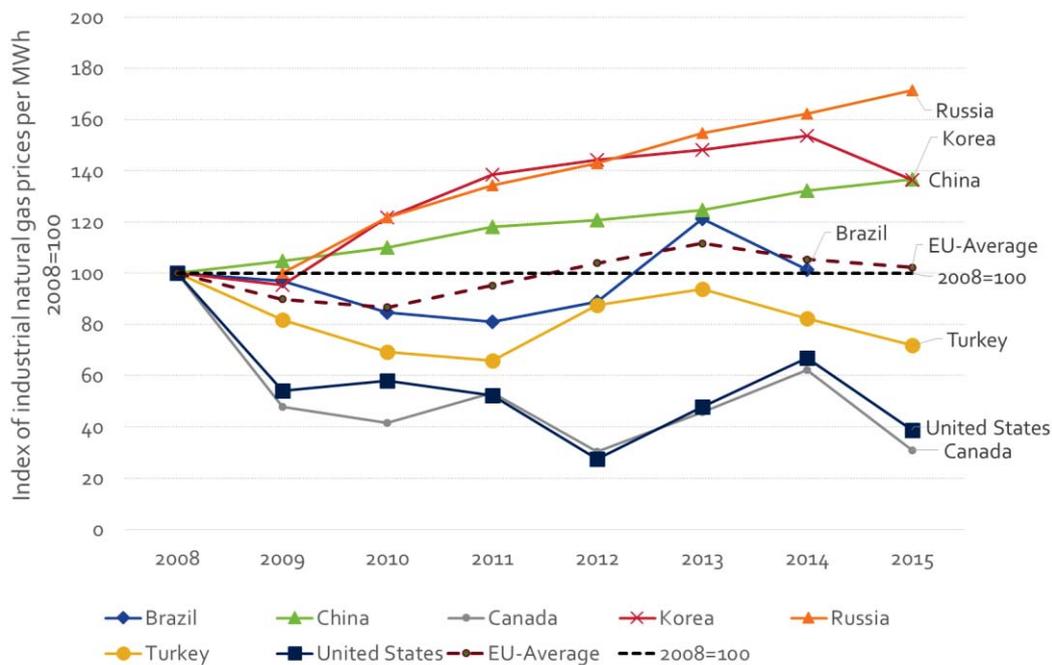
Source: Ecofys study calculations on the basis of data from Brazilian National Petroleum Agency, Chinese Price Monitoring Center, NDRC, Russian Federal State Statistics Service, American Energy Information Administration, and IEA for Turkey and Canada

Note: In the case of Russia prices are indexed to 2009=100 as no 2008 values are available.

6.3.3.4 Exploring energy intensities differences with trading partners

The analysis of energy intensities of EU selected sectors was based on a rather restricted data set over the period 2008-2013. Data on energy intensity for the United States and Japan is available but only for some years and some sectors. Limitations when interpreting these findings are thus important also due to potential differences in sector definitions, the heterogeneity of products and differences in statistical methods.

In addition the role of exchange rates is important. As highlighted in the 2014 European Competitiveness report this is particularly relevant for China where exchange rates are understood to be significantly undervalued in the reference period. This impacts by lowering the value added expressed in Euros and makes the energy intensity in China look higher, although as noted in the 2014 ECR that value added is generally lower in China. This makes that rather likely that the energy intensity of China expressed in the national currency is lower than presented in **Figure 212**

China is by far the most energy intensive of all of four economies over this period. While this is likely to be partly driven by relative energy inefficiency, it is also subject to the data limitation of an undervalued exchange rate noted above, statistical errors and relatively low value added.

Figure 212 **- Energy intensity [kWh energy consumption per Euro of GVA generated] per sector**
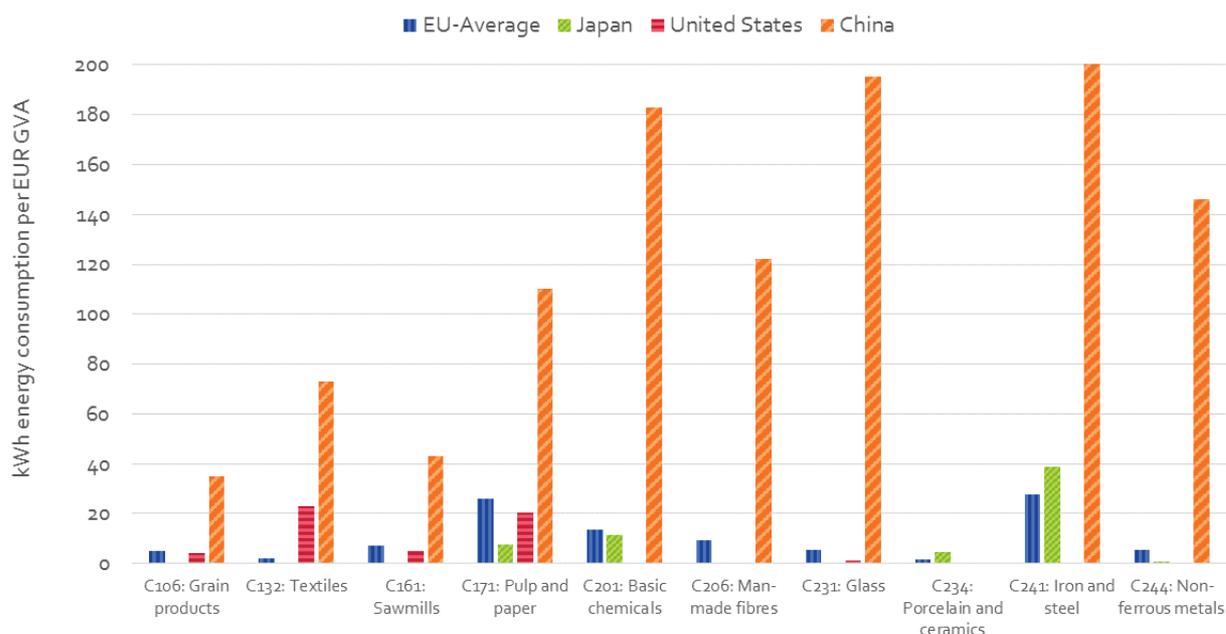
Source: Ecofys study, Eurostat

Note: The Figure presents average values for 2008-2013, for EU and Japan typically all years (2008-2013), for US only for 2010, for China 2008-2011

Comparing the EU and the US **Figure 213** shows that **the EU is more energy intensive than the US in four out of five sectors.**

This is not in line with the findings of the Commission 2014 Energy Competitiveness Report (2014 ECR), which showed that the EU had the lowest energy intensity compared to the US, China and Japan in 2009 (EU has the lowest energy intensity followed by Japan, then the US, then China). According to the 2014 ECR Energy intensity decreased in all economies between 1995-2009. However the results of these studies are hardly comparable. The differences on the results from the Ecofys study and 2014 ECR may stem from the different methodologies used as well as the periods covered (1995-2009 in 2014 ECR vs 2008-2013 in the Ecofys study) and the level of sectoral aggregation (NACE 3 level sectors in the Ecofys study vs NACE 2 in the 2014 ECR)[27].

Also comparing the EU and Japan, the outcomes vary by sector and need to be interpreted carefully because of potential differences in sector definitions. For pulp and paper, basic chemicals and non-ferrous metals the EU is more energy intensive[28]. For porcelain and ceramics and iron and steel the EU is less energy intensive than Japan.

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[27] See Ecofys study (section 5.7.3, Table 19) for more detailed explanations and comparisons of the results of these two studies.

[28] For non-ferrous metals, the large EU-China difference can be partly explained by the higher share of highly energy intensive primary production in China.

Figure 213 - **Energy intensity [kWh energy consumption per Euro of GVA generated] per sector**

Note: The Figure presents average values for 2008-2013, for EU and Japan typically all years (2008-2013), for US only for 2010

Looking at sector trends over time **energy intensity in China rapidly declined in almost every sector 2008-2011**(**Figure 214**) - yet it remains far above the energy intensities of the EU, US and Japan. If an undervalued exchange rate and relatively low value added were able to be factored in then we would expect China to be much more comparable, although still more intense, than the other countries.

Figure 214 - **Energy intensity trends in Chinese industry 2008-2011**
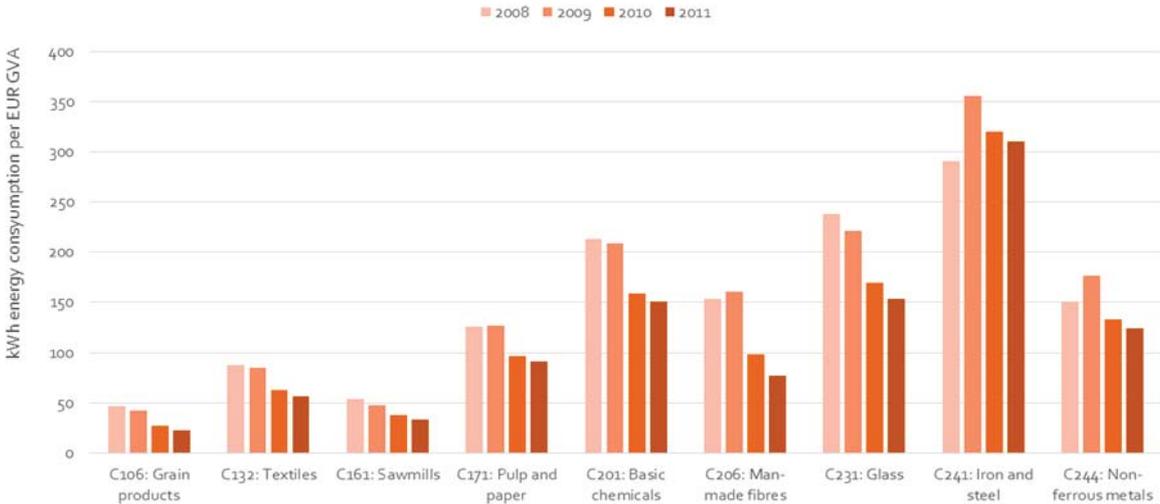
Energy intensity in the iron and steel sector for EU and Japan has increased over the period 2008-2013 (**Figure 215**), driven by declining GVA, which is declining faster than energy consumption. No time series data is available for the US.

Figure 215 **- Trends in the energy intensity of the iron and steel sector, kWh energy consumption per Euro of GVA.**

Manufacture of basic iron and steel and of ferro-alloys
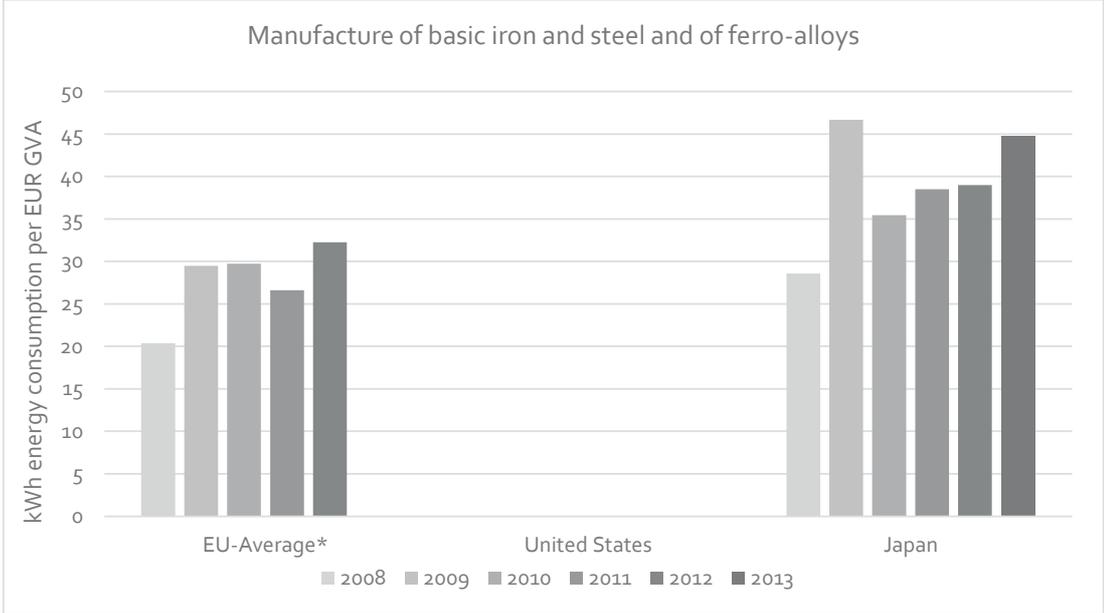
Note: Comparison of EU-average (limited number) data points and Japan, 2008-2013

Operating surplus

Comparison of gross operating surplus

It is interesting to see if international competitors are also facing similar competitive pressures on margins. Unfortunately the data analysed faces similar limitations as the ones described in the analysis of energy intensities and the results have to be taken with precaution. The data seem to indicate that the ***on average gross operating surplus for United States and Japan are higher than those in the EU*** (**Figure 216**), in the range of 12-17% in the US and 24-28% in Japan compared to 8-10% in the EU. US margins were declining but remain more than 4 percentage points higher than those in the EU. Japan margins were stable over the period but could be overestimated because labour costs are underestimated (may not include social contributions).

Figure 216 - **Gross operating surplus as % of total production costs, average across all sectors for the EU28, United States and Japan, 2008-2013**
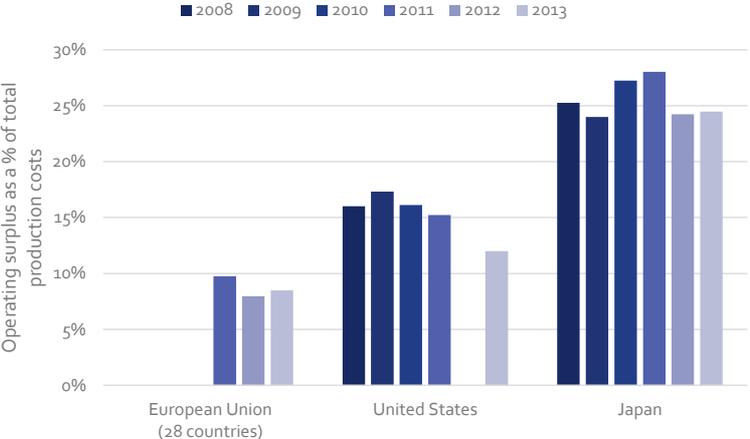
Source: Ecofys study

At the sector level (See Ecofys study Annex 4) there some exceptions:

- Grain products: where the EU has higher average surplus than the US, 8-9% compared to 5-7%.
- Sawmills and basic chemicals: where EU and US surpluses at 6-7% and 8-10% respectively are broadly the same.
- Glass and Cement, lime and plaster: where US surpluses are around double EU levels, although the gap has closed over time.
- Porcelain and ceramic products: where surpluses at 35-45% in Japan are significantly higher than the EU (and US) figures.
- Iron and steel: gross operating surpluses are lower than average for all countries but those for the EU remain lowest (**Figure 217**)

Figure 217 - **Average industrial gross operating surplus [as % of total production cost] for the EU28, United States and Japan, 2008-2013**
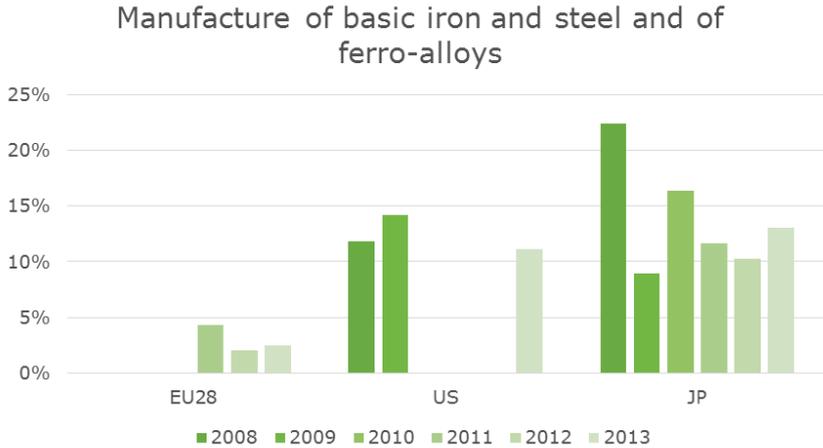
Source: Ecofys study

6.4 Case Studies

In this section we will look at energy prices and costs in some selected Energy Intensive sectors at a more disaggregated level and the role they can play in their competitiveness.

The results presented here are mainly based on the three studies referred to in section 6.4. These studies are characterized by very different methodologies and scope. Despite some overlaps, they also have a different coverage in terms of industrial sectors assessed (see **Table 20**). However, the conclusions of these studies together aims at providing an as complete as possible overview of the situation in these sectors. This approach is also justified by the lack of a single, readily-accessible and comprehensive data sources for analyses on energy prices, consumption and costs, which represent strategic (often confidential) information.

Where appropriate and possible the results of this subsection are put into perspective with more general results in this chapter and with the general trends observed in energy price and costs as described in other parts of this report.

Table 20. Coverage of sectors and product markets by various studies

Ecofys study	*CEPs study*	*JRC study*
Paper and paperboard (C1712)	**---**	**---**
Other inorganic basic chemicals (C2013)	**---**	Chemicals: ***Ammonia, methanol, ethylene and propylene***
Hollow glass (C2313) -	**---**	**---**
Basic iron and steel and of ferro-alloys (C2410) -	***Steel***	***Steel*** *(hot rolled coil and wire rod)*
Aluminium production (C2442)	*Primary **Aluminium***	Non-ferrous metals: *Primary **Aluminium** (hot rolled coil and wire rod)**, copper and zinc***
---	**---**	***Cement***
---	***Tiles*** *(Wall & floor tiles)*	**---**
---	***Bricks*** *(Bricks & roof tiles)*	**---**
---	***Refineries***	**---**

6.4.1 Cross-Sectorial comparisons

Cross-sectorial comparisons and conclusions on Energy Intensive Industries were made in the previous sections of this chapter on the basis of a top down approach analysing statistical information of prices at a rather aggregated level (NACE 3).

It is also interesting to zoom in and look at more disaggregated sectors/subsectors and at data on price and consumption resulting from collecting information from individual companies (bottom up approach). The main reason for this is that estimations based on a top-down approach may not be always fully capturing the specificities of sectors/subsectors where energy costs are most relevant and may affect competitiveness. It is thus interesting to look at the results from the specific case studies, see if trends appear and how they fit with the results of other sections.

The *CEPS et altri* study follows a bottom-up approach and looks at five energy intensive sectors. The combination of plant-level data allows for sectoral comparisons regarding the relation between the price paid and energy consumption as well as across Member States.

For the cross-sectorial comparisons CEPS analysed price and consumption data from 116 plants (electricity) and 108 plants (natural gas)[29]. The plants surveyed represented different shares of their respective EU sector capacity: 13.7% of the steel (EAF) sector, 11.4% of steel (BOF) sector, 93% of primary aluminium, 10% of tiles, 10.5% of bricks and 24.5% of the refinery rector.

Case studies: Prices versus level of consumption

Focussing on the EU average **electricity** price (weighted by consumption) paid in each (sub-)sector assessed, it can be observed that *operators in (sub-)sectors with relatively lower energy consumption pay a much higher price than operators in (sub-)sectors with higher consumption levels*.

The sector averages are associated in most cases with high price spreads, which reflect the high variability of conditions in different Member States. Still the correlation seems robust and can be explained by various reasons like the fact that larger industrial consumers can have stronger bargaining power when concluding energy supply contracts - including the possibility of long-term contracts [30]– as well as the fact that larger consumers may be granted partial or full exemptions from certain taxes and levies or benefit from these exemptions being progressive. It should be underlined that all data assessed in the case studies are 'net' of possible exemptions and reductions in different Member States and across sectors, giving therefore indication of the real prices paid and costs faced by respondents.

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[29] The selected plants were distributed between the five studied sectors as follows: for electricity, 60 plants from Bricks, 22 from Tiles, 14 Refineries, 22 from Steel, 10 from Primary Aluminium and 17 from Secondary Aluminium; for gas, 60 plants from Bricks, 22 from Tiles, 14 Refineries, 22 from Steel, 7 from Primary Aluminium and 14 from Secondary Aluminium

[30] Bilateral contracts are still possible, although they need the clearance from the EC

Figure 218 **- Electricity consumption & price variations by sector (116 facilities) weighted average, 2008 – 2015**
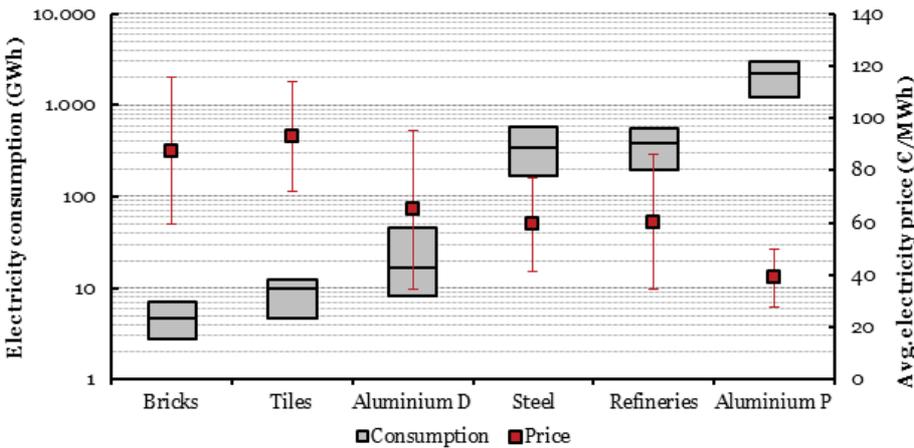
Note: *Aluminium P*:primary aluminium / *Aluminium D*: secondary aluminium

The same clear correlation cannot be observed when looking at **natural gas** prices. This may be explained by a lower disparity in natural gas consumption levels across the five sectors assessed and mainly by the much lower weight of non-energy components (network costs, taxes and levies) in final natural gas prices, which reduces the impact of possible governments' interventions, including via exemptions and reductions granted.

Figure 219 **- Natural gas consumption and price variations by sector (108 plants), weighted average, 2008 – 2015**
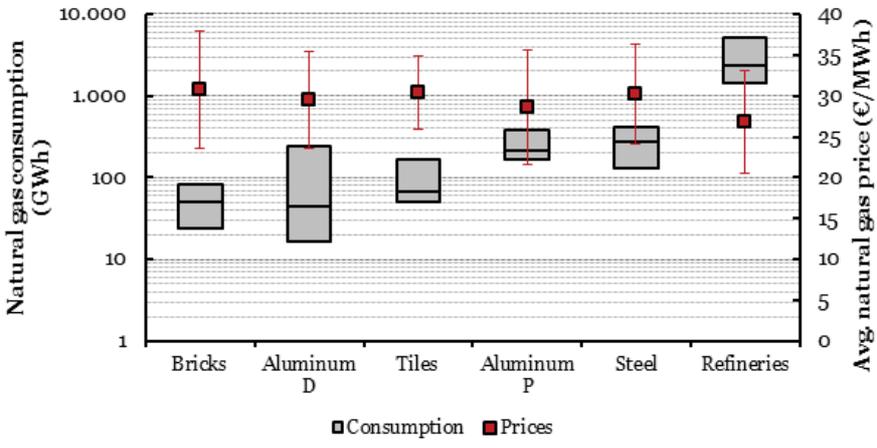
Note: *Aluminium P*:primary aluminium / *Aluminium D*: secondary aluminium

The impact of consumption levels on energy prices paid both for electricity and – although to a lesser extent – natural gas is clearly visible also when looking at different consumption bands – without differentiation between sectors.

Figure 220 - **Electricity consumption and price variations by plant consumption (116 plants)**
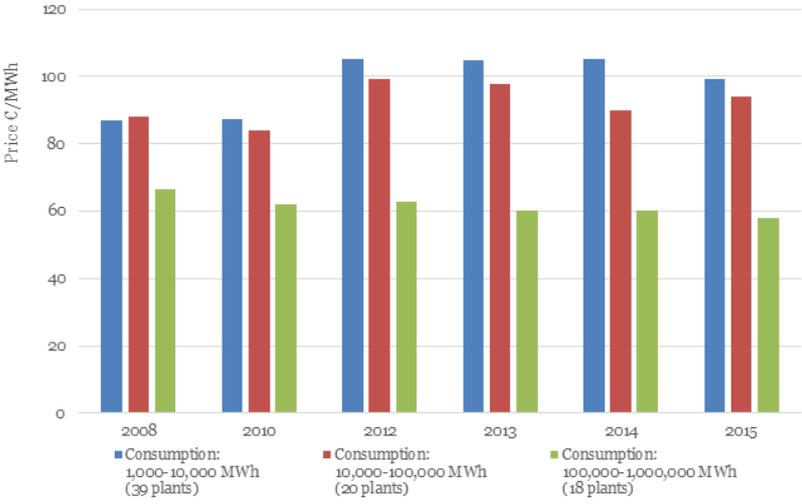
Source: CEPS et al.

Figure 221 - **Natural gas consumption and price variations by consumption level (108 facilities)**
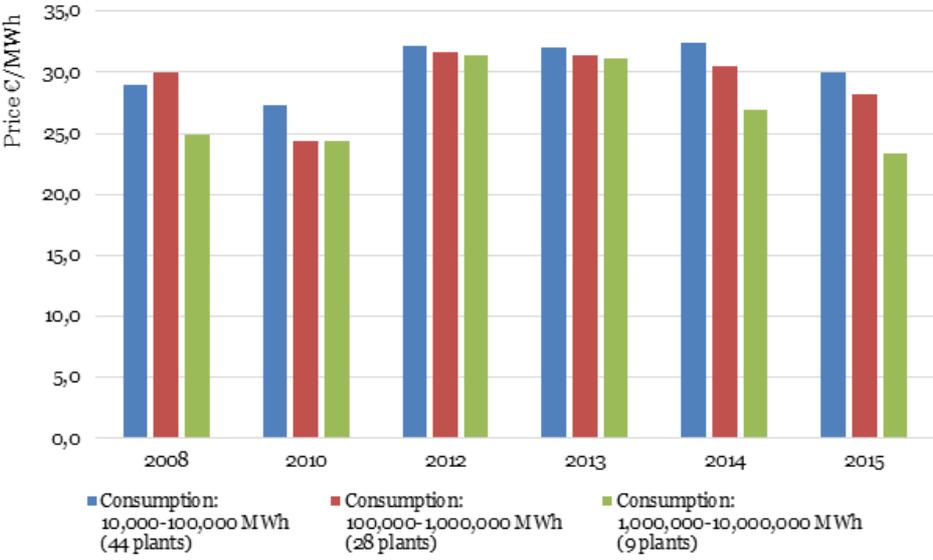
Source: CEPS et al.

Prices at different sector aggregation levels

We proceed now to shortly compare estimated energy prices of Energy Intensive sectors-(NACE 3 level, Ecofys study) with average prices calculated from case specific studies (CEPS et altri study). The available data allow for comparison in only two sectors: steel and aluminium. First we introduce the methodology and estimated prices from the Ecofys study (top down approach) and then we compare them with the average prices calculated in the CEPS et altri study (bottom up approach)

Estimated prices in Ecofys study (NACE 3 level)

In the Ecofys study electricity and natural gas prices per sector were derived taking into account information of exemptions in Member States. To do so an assumed consumption band for the typical firm in a given sector was estimated on the basis of energy consumption data available from a limited number of countries (Table 19) divided by the number of firms active in the sector in those countries (see Table 21).

Table 21. Assumed consumption and resulting consumption bands per sector for electricity and natural gas

Sector	Assumed average firm electricity consumption [GWh]	Eurostat electricity consumption band	Assumed average firm natural gas consumption [GWh]	Eurostat natural gas consumption band
C106: Grain products	14.0	ID	26.9	I3
C132: Textiles	4.4	ID	3.7	I3
C161: Sawmills	3.2	ID	0.0	I2
C171: Pulp and paper	87.4	IF	127.1	I4
C201: Basic chemicals	75.0	IF	177.2	I4
C206: Man-made fibres	31.1	IE	58.9	I4
C231: Glass	10.3	ID	33.3	I4
C232: Refractory products	3.5	ID	15.8	I3
C233: Clay building materials	6.3	ID	47.1	I4
C234: Porcelain and ceramics	3.0	ID	11.1	I3
C235: Cement, lime and plaster	46.7	IE	19.5	I3
C237: Stone	2.2	ID	0.3	I2
C241: Iron and steel	222.2	IF	663.4	I5
C244: Non-ferrous metals	51.5	IE	32.1	I4

Source: Ecofys study

The price corresponding to that consumption band in each MS was derived taking into account available information on price and tax exemptions. EU averages price were then calculated using as weights the Member State share in total EU production costs. Only Member States and sectors for which data is available for all years were used. The resulting weighted average prices per sector are presented below:

Table 22. EU production cost weighted average industrial electricity prices (including exemptions) per sector 2008-2013 [EUR/MWh]

Sector	2008	2009	2010	2011	2012	2013	2008-2013 Change	2014	2015
C106: Grain products	97.20	95.48	94.24	101.57	108.25	112.62	**15.9%**	113.28	114.84
C132: Textiles	107.66	108.82	106.20	115.26	128.89	134.76	**25.2%**	132.55	130.86
C161: Sawmills*	87.52	90.32	91.15	94.17	96.87	98.50	**12.5%**	96.56	97.20
C171: Pulp and paper*	78.29	74.88	79.75	82.82	83.36	82.19	**5.0%**	81.35	78.54
C201: Basic chemicals*	82.45	79.61	82.14	90.44	93.01	98.87	**19.9%**	101.10	98.69
C206: Man-made fibres	102.18	97.66	96.38	104.14	111.34	112.76	**10.4%**	113.00	109.34
C231: Glass	91.57	93.00	91.94	99.12	105.11	111.70	**22.0%**	111.29	111.54
C232: Refractory products	100.07	102.13	101.72	107.28	113.50	115.96	**15.9%**	115.12	116.01
C233: Clay building materials	105.27	105.93	103.40	111.58	122.64	128.22	**21.8%**	126.14	123.16
C234: Porcelain and ceramics	93.01	94.03	93.32	102.62	108.39	116.23	**25.0%**	115.83	116.78
C235: Cement, lime and plaster*	85.57	85.84	85.05	93.54	99.44	103.52	**21.0%**	102.61	100.00
C237: Stone	106.38	107.77	105.43	112.73	125.81	129.88	**22.1%**	128.29	126.88
C241: Iron and steel	78.46	76.90	81.79	86.23	87.80	93.86	**19.6%**	92.37	88.96
C244: Non-ferrous metals	87.41	85.77	85.14	95.42	98.96	105.92	**21.2%**	105.91	102.79

Source: Ecofys study

Table 23. EU production cost weighted average industrial natural gas prices (including exemptions) per sector 2008-2013 [EUR/MWh]

Sector	2008	2009	2010	2011	2012	2013	2008-2013 Change	2014	2015
C106: Grain products	38.17	29.77	31.08	34.59	38.37	39.46	**3.4%**	36.47	36.10
C132: Textiles	38.86	29.00	31.49	34.82	38.50	39.35	**1.3%**	36.05	35.83
C161: Sawmills*	47.72	45.94	46.56	51.92	57.15	55.31	**15.9%**	52.23	51.57
C171: Pulp and paper*	36.84	31.38	31.12	35.35	36.37	36.85	**0.0%**	32.97	32.00
C201: Basic chemicals*	36.21	29.01	29.32	32.30	34.06	35.33	**-2.4%**	31.32	30.77
C206: Man-made fibres	34.48	27.20	28.84	32.00	33.89	34.37	**-0.3%**	30.62	30.35
C231: Glass	34.86	27.74	28.83	31.80	34.03	34.71	**-0.4%**	31.37	30.81
C232: Refractory products	39.31	31.37	33.87	36.90	38.53	41.25	**4.9%**	37.48	36.98
C233: Clay building materials	33.98	25.74	27.60	31.22	34.61	34.76	**2.3%**	31.86	31.07
C234: Porcelain and ceramics	39.44	30.30	32.89	36.49	39.01	41.83	**6.1%**	38.02	37.64
C235: Cement, lime and plaster*	36.43	28.77	31.56	35.03	39.26	40.92	**12.3%**	37.74	36.88
C237: Stone	41.25	34.25	36.58	41.54	46.48	47.98	**16.3%**	45.21	43.81
C241: Iron and steel	34.54	26.97	27.95	31.42	33.61	33.35	**-3.5%**	30.29	29.44
C244: Non-ferrous metals	30.49	22.76	27.98	30.91	33.34	33.91	**11.2%**	29.10	29.06

Source: Ecofys study

Comparison of estimated prices

The estimated prices in the Ecofys study correspond to highly aggregated sectors (NACE 3 level) which include subsectors with different processes or products having different energy consumption patterns, trade exposure, etc. As indicated in section 6.4 the price paid by firm depends on many factors (e.g. energy supplies strategies of the firm, consumption pattern, tax/price reductions) which can appear diluted or not fully captured in the statistical information on prices for larger aggregated group.

The comparison, with evidence collected bottom up, shows significant differences in average price levels for electricity which, beyond the methodological differences of the approaches considered, is in line with the fact that bottom up evidence better captures the impact of tax/price exemptions and reductions. For gas, the taxes and levies are less important which translates into much more aligned price levels. The analysis shows similar trends in price levels over time for both electricity and natural gas.

Figure 222 – **Electricity and gas prices for Steel and Aluminium by levels of aggregation**

Electricity prices - Steel

Gas prices - Steel

Electricity prices - Aluminium vs Non-ferrous metals

Gas prices - Aluminium vs Non-ferrous metals
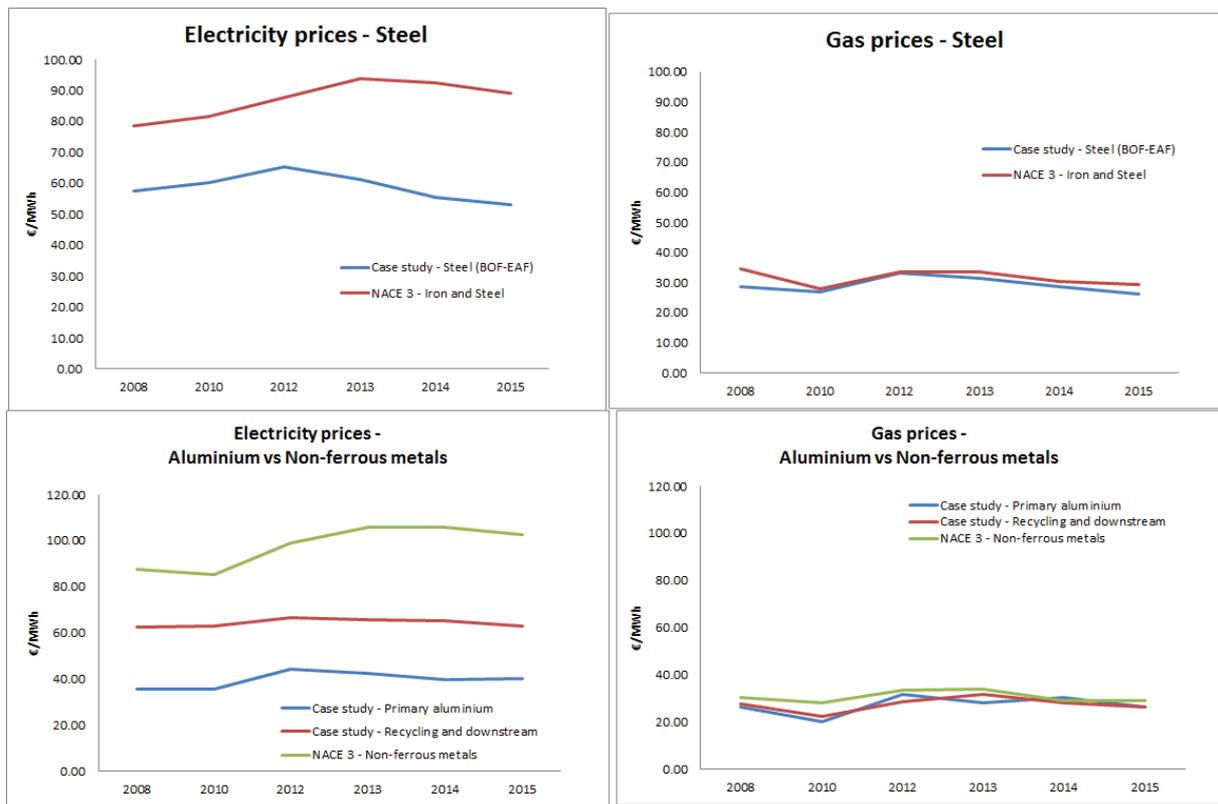
Source: EC on the basis of CEPS and Ecofys studies

Prices of surveyed plants across Member States

Data collected bottom up in the CEPS study also allowed comparisons of calculated average prices at national level. Overall, considering all five sectors studied together, both *electricity and natural gas prices have been declining in most of the Member States assessed after peaking in 2012-2013*.

For electricity in 6 out of 9 countries, the price level in 2015 is higher than in 2008. Conversely, for natural gas, prices were lower in 7 out of 11 countries. These results are overall in line with the trends observed in retail prices chapters of this report (1.2.2 & 2.2.2)

The overall trend is largely due to a generalized decrease in the energy supply component of prices, rising network costs and rising taxes and levies.

Focussing on electricity, still considering all five sectors assessed, only in the UK, the energy supply component has been increasing - although gradually -. This, associated with the increase in other components, implied an overall increase of the average electricity price observed.

As expected the highest differences in average electricity prices across Member States are observed with regard to the regulatory price components (i.e. network costs, taxes and levies like those related to RES support). In most cases the shares of such components in total price, in particular network costs and renewable support, have been increasing.

As indicated above, the data collected represent 'net' prices after possible reductions and exemptions are applied. This highlights the high variability of operating conditions and regulatory frameworks across countries.

Looking at some examples, RES support payment for surveyed Italian plants increased from 19.2 €/MWh in 2008 to 42.5 €/MWh in 2015 (down from 44.6 €/MWh in 2014, and after RES exemptions were introduced in the country). In the UK, RES support has increased from 2.6 €/MWh in 2010 to 19 €/MWh in 2015 while network costs have decreased from 13 €/MWh in 2010 to 8.9 €/MWh in 2015.

Electricity prices in Germany confirm the impact of exemptions and reductions for renewable support which - although fluctuating in the reference period – represent in 2015 less than 5% of the total price. This contrasts with the 41% that renewable support represents in the industrial price for large energy consumers[31] (not necessarily Energy Intensive Industries) in Germany and 19% in EU as a whole.

For other Member States such as Spain, Portugal and the Netherlands, RES support is not explicit in electricity bills and is included under other price components.

Figure 223 - **Structure of electricity prices in the surveyed plants in Italy, UK, Germany, Romania and Czech Republic in absolute terms (€/MWh)**

	IT (8 plants)						UK (21 plants)						DE (9 plants)						RO (7 plants)						CZ (6 plants)					
	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015
RES support payment	19,2	20,8	35,9	43,5	44,6	42,5	0,0	2,6	16,0	16,1	10,9	19,0	1,3	7,3	3,5	1,8	4,7	2,1	0,1	0,9	10,9	14,7	9,1	8,0	1,4	5,8	14,6	20,1	16,2	16,3
Other taxes and levies (excl. VAT)	6,7	6,7	7,8	9,5	10,4	10,7	0,0	1,2	1,9	1,4	2,2	3,8	3,0	4,5	3,8	2,8	2,8	3,1	0,0	0,0	0,0	0,0	0,0	0,0	0,4	1,0	2,3	2,6	2,0	2,1
Network costs	14,7	13,8	17,6	20,2	18,3	16,5	0,0	13,0	6,3	7,0	6,2	8,9	2,7	2,8	1,7	1,9	2,3	2,5	7,5	6,8	4,6	5,3	5,8	6,4	12,9	13,1	12,9	12,6	10,7	10,4
Energy supply costs	71,3	63,1	74,9	64,1	58,2	58,9	0,0	52,4	59,6	60,1	67,0	70,5	45,8	44,9	52,6	50,1	45,7	39,8	29,4	29,0	43,7	41,5	39,8	37,5	55,5	50,8	55,8	49,6	41,9	39,1

Source: CEPS et al.

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[31] Eurostat consumption band IF

Figure 224 - **Structure of electricity prices in the surveyed plants in Spain, France, the Netherlands and Portugal in absolute terms (€/MWh)**

	ES (12 plants) 2008	2010	2012	2013	2014	2015	FR (12 plants) 2008	2010	2012	2013	2014	2015	NL (3 plants) 2008	2010	2012	2013	2014	2015	PT (3 plants) 2008	2010	2012	2013	2014	2015
RES support payment	0,0	0,0	0,0	0,0	0,0	0,0	2,4	2,8	0,9	0,5	0,4	0,6	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Other taxes and levies (excl. VAT)	3,6	4,8	5,5	5,4	5,3	5,2	0,0	0,0	0,5	0,3	0,3	0,2	0,0	0,2	0,3	0,3	0,3	0,4	6,0	12,5	14,5	16,6	15,7	14,6
Network costs	3,5	10,0	7,5	8,3	9,4	9,5	5,6	5,8	6,3	3,4	3,3	4,5	0,0	9,2	14,7	13,6	8,9	11,2	18,4	6,4	19,7	17,1	18,7	20,1
Energy supply costs	66,2	54,2	60,8	58,9	57,9	67,3	36,1	45,0	43,5	33,6	31,9	34,5	0,0	34,2	26,4	21,1	21,7	18,5	61,0	55,0	72,4	74,4	70,4	69,2

Source: CEPS et al.

Compared to electricity, average prices across Member States show much less variation in the case of natural **gas**. This can likely be attributed to the lower impact of regulated price components. Across the countries assessed only Portugal shows higher prices since 2012

Figure 225 - **Structure of gas prices in the surveyed plants in Italy, UK, Germany, Romania, Portugal and Hungary in absolute terms (€/MWh)**

	IT (9 plants) 2008	2010	2012	2013	2014	2015	UK (21 plants) 2008	2010	2012	2013	2014	2015	DE (4 plants) 2008	2010	2012	2013	2014	2015	RO (6 plants) 2008	2010	2012	2013	2014	2015	PT (3 plants) 2008	2010	2012	2013	2014	2015	HU (3 plants) 2008	2010	2012	2013	2014	2015
Taxes and levies (excl. VAT)	0,6	0,4	0,2	0,2	0,1	0,1	0,0	0,1	0,3	0,3	0,1	0,0	4,7	4,4	4,0	2,7	2,8	3,0	0,0	0,0	0,5	0,4	0,4	0,0	0,0	0,0	0,0	1,2	1,0	1,1	0,3	0,7	0,9	0,8	0,8	0,9
Network costs	2,0	1,3	0,9	1,2	0,9	1,0	0,0	0,7	0,9	0,7	0,7	0,8	0,0	0,0	0,1	0,0	0,2	0,2	0,0	1,7	1,7	1,6	1,9	1,9	2,1	3,3	4,2	4,7	5,7	7,1	0,7	3,3	3,1	2,5	2,4	2,7
Energy supply costs	26,5	26,0	31,4	29,6	26,7	25,8	0,0	17,7	25,7	27,0	26,3	26,3	25,3	21,6	23,2	27,4	21,7	19,9	0,0	13,9	19,8	19,4	21,4	20,6	26,5	27,7	36,9	35,2	35,6	29,5	29,2	25,4	30,0	28,9	25,7	23,8

Source: CEPS et al.

Figure 226 - **Structure of gas prices in the surveyed plants in France, Spain, Czech Republic, Belgium and the Netherlands in absolute terms (€/MWh)**

	FR (10 plants)						ES (11 plants)						CZ (6 plants)						BE (5 plants)						NL (3 plants)					
	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015
■Taxes and levies (excl. VAT)	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,2	0,0	0,1	0,1	0,1	0,1	0,1	0,0	0,1	0,0	0,0	0,0	0,0	0,9	0,2	0,2	0,3	0,4	0,3
■Network costs	0,0	0,0	0,1	0,1	0,1	0,1	0,7	0,4	0,3	0,3	0,3	0,3	2,4	2,4	2,0	2,2	1,8	2,0	0,0	0,2	0,3	0,2	0,2	0,4	0,3	0,1	0,1	0,1	0,1	0,1
■Energy supply costs	0,0	19,0	24,0	28,1	23,4	22,3	28,2	25,4	33,8	33,2	33,5	27,8	27,5	23,4	26,1	26,5	24,8	23,3	0,0	23,3	26,9	25,2	25,2	23,2	26,3	17,6	19,6	30,3	29,9	26,0

Source: CEPS et al.

6.4.2 Overview of results of specific case studies

This report also looks at the main features on production cost structures and international competitiveness of various energy intensive sectors/subsectors combining the results from the case studies in the three studies mentioned in section 6.4. The three studies have different methodological approaches and sectoral scope. Some sectors are covered by the 3 studies and some only by one (see **Table 20**). When we look at each sector we highlight the *energy prices* paid, the *energy costs* and *production structures* and when possible we make *international comparisons*. Technical descriptions of production processes and technologies in each sector and detailed trade analyses are not reported here. The heterogeneity of sources and sector coverage is reflected by the different detail of the presented results.

The relative competitive position of European sectors ranges from the comfortable position of the highly productive European copper and zinc smelters to other sectors like the aluminium, steel and refinery going through difficult situations due to various reasons. The case studies show the energy costs plays a significant role in determining the costs of the industries looked at. However, they also show that other non-energy productions costs are very relevant and also play a very significant role in the competitiveness of these sectors. In some cases, transport costs are sufficiently high to 'protect' the European industry from their relatively higher (energy) costs. (e.g. paper, cement industries where transport costs per added value of the product are high). The reality of the sectors studied is rather diverse and big differences in costs and energy costs appear even between subsectors of the same sector (e.g. primary and recyclers/downstream producers in the Aluminium sector or in the steel sector between the Electrical Arc Furnace route (recycling) and the Blast Furnace-Basic Oxygen Furnace route). The analysis covers energy feedstock in some cases and is particularly useful to show the importance of energy costs for the refinery sector which could not be captured by the Ecofys study alone.

The details of the sector analysis are presented in **Annex 2**.

Brussels, 30.11.2016
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PART 6/13

COMMISSION STAFF WORKING DOCUMENT
Accompanying the document

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

Energy prices and costs in Europe

{COM(2016) 769 final}

Contents

7   Energy subsidies

Subsidies in the energy market may fundamentally impact energy prices and costs for both household and business customers, and therefore they impact energy affordability for households and the competitiveness of the economy as a whole. Fossil fuel subsidies make the energy transition more difficult, as they reduce the effectiveness of price signals of emission trading and crowd-out investments from low-carbon innovative technologies In order to understand the nature of government interventions (otherwise calling, government subsidies) in the energy market the European Commission initiated a study on energy costs and subsidies[1] in 2014 to explore the relationship between pure energy generation costs, external costs of the energy sector and existing subsidies in the EU-28.

In the current report on energy prices and costs in the EU we intend to touch upon subsidies primarily from the point of view of their impact on energy prices and costs for households and different economic sectors, and for this reason we intend to use the results of the 2014 study on energy costs and subsidies, other studies or reports in this domain and the results of the data collection on tax and levy reductions or exemptions impacting energy retail prices in the EU Member States.

Main findings[2]

- Energy subsidies significantly impact the EU energy sector and markets; a study prepared in 2014 on energy costs and subsidies in the EU estimated the annual amount of energy subsidies[3] at €113 bn.

- Renewable energy sources had a significant share in energy production subsidies (€41 bn in 2012), followed by direct fossil fuel subsidies (€17.2 bn) and nuclear energy (€ 14bn). Subsidies to energy consumption, in the form of energy demand and savings subsidies amounted to € 36bn (€27 bn for energy demand and €9 bn for energy savings) in 2012.

- However, if external costs in the energy sector are also taken into account, the total subsidy to the energy sector in the EU amounted to € 328[4] bn in the EU. The bulk of this difference can primarily be attributed to fossil fuels: (€161 bn with external costs vs. €17.2 bn without external costs), as compared to €50 bn for RES, €28 bn to nuclear and €36bn for demand side subsidies.

- Looking at the types of different subsidies, production subsidies have the highest share in the energy sector, followed by support to energy demand, investments and energy savings, while R&D related support has only a minor share.

- Different studies follow diverse methods and give different estimations on subsidies for fossil fuels; global subsidy numbers show that fossil fuel subsidies in the EU have

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[1]
https://ec.europa.eu/energy/sites/ener/files/documents/ECOFYS%202014%20Subsidies%20and%20costs%20of%20EU%20energy_11_Nov.pdf

[2] Unless otherwise stated, numbers and results in this chapter are coming from the 2014 Energy costs and subsidies in the EU report

[3] This number refers to 2012 (as this was the latest period covered in the study). If subsidies from the legacy of historical investments are also included this increases total subsidies to €122 bn. These legacy subsidies are also included in the technology subsidy estimates below.

[4] On top of the aforementioned subsidies this total amount includes the external costs of industrial fuels (€38 bn) and direct historic subsidies (€9 bn)

less importance than in other parts of the world, mainly in the emerging economies, and/or oil-producing countries.

- In the EU energy sector many forms of fossil fuel subsidy exist, including mining related subsidies, fuel tax exemptions for electricity and heat generation, priority dispatch to electricity generated from indigenous fuel sources or capacity payment mechanisms.

- In 2012 subsidies to coal and gas amounted to €17 bn, including €5.7 bn in investment grants, €3 bn in fuel tax exemptions, €3 bn in feed-in tariffs and €1.5 bn in support to electricity production, €1.3 bn to decommissioning and waste disposal and subsidies came from the legacy of historical investment subsidies (€0.9 bn). If energy demand subsidies (the combined share of coal and gas in electricity and heat generation[5]) are proportionally assigned to fossil fuel subsidies, approximately an additional €12 bn could be allocated to fossil fuels in 2012.

- Although the 2014 study on energy costs and subsidies did not analyse the transport sector, a reference is made to an OECD study[6], suggesting that fossil fuel subsidies in the transport sector amounted to € 24.7 bn. Taking the transport sector into account, fossil fuel subsidies amounted to €41.9 bn in 2012 in the EU.

- In 2012 subsidies in the form of free emission allowances (ETS) to the energy sector amounted to €13.7 bn[7].

- In order to preserve the competitiveness of different industrial sectors, EU Member States may provide reductions and exemptions from paying applicable energy taxes and levies, differing by economic sector, by applied process, by total energy consumption, by the level of grid connection, by energy (cost) intensity and by geographical location within each country, as the brief overview on electricity taxes and levies proves at the end of this chapter.

7.1 Categories of subsidies in the energy sector

The aforementioned 2014 study on energy costs and subsidies in the EU applied a broad definition of subsidies, following the logic of other international institutions, such as OECD or IMF, being active in analysing and quantifying subsidies in the energy sector. Subsidies have been classified under the following five categories:

Direct transfer of funds, also referred to as direct subsidies: Direct transfer of funds includes direct government payments such as capital grants, production support, etc. These are the most transparent and straightforward types of subsidy and refer to what people commonly understand by the term 'subsidy'. These direct subsidies are most often 'visible', they can be easily quantified and can usually be found in public accounts.

Government tax and other government revenue foregone: Revenue foregone refers to (tax) expenditures, i.e. revenue foregone due to a reduction in the (tax) liabilities of particular groups or of specific activities. It requires a benchmark tax structure, which is applied in order

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[5] See more in footnote14.

[6] http://www.oecd-ilibrary.org/docserver/download/2215011e.pdf?expires=1479466742&id=id&accname=oid031827&checksum=9A9FEFF81BF6B6EE9B7C8CFCAA41D2FD

[7] Since 2013, as Phase 3 of the ETS system was introduced, resulting in decreasing free emission allowances to the energy sector, this type of subsidy has decreased.

to evaluate the value of tax and duty exemptions, tax allowances and investment tax deductions[8].

Transfer of risk to Government: This refers to the transfer of risk from market players (e.g. energy producers) to governments, for example, loan guarantees, government participation in the equity of a project or company, government acting as an insurer of the last resort -.in case of accidents or environmental disasters, etc.

Income or price support (induced transfer of funds). Induced transfers refer to government support that is (indirectly) provided to consumers or producers to keep the end-price of an energy good or service lower or higher than its actual market price, often through some sort of price support or price regulation.

Non-financial measures: Non-financial support measures relate to mandates, obligations and (voluntary) agreements that have been settled between the government and producers and consumers of energy. These measures, although not directly involving a transfer of money, will have an effect on energy prices as they usually result in financial decisions that they might not otherwise have made.

7.1.1 Subsidies at EU level

The aim of the energy costs and subsidies study was to provide an overview of energy subsidies in all the twenty-eight EU Member States, covering all major generation technologies in the energy sector for the most recent years and in historic perspective as well. It is important to remember that this study has only covered the energy sector, and other sectors where the consumption of energy carriers is significant, such as transport, have been excluded, which has implication on comparing the main findings of the study with other sources (e.g.: studies of other international institutions, including numbers on crude oil and petroleum product subsidies).

The study has estimated government interventions at €113.1 bn in 2012 in the EU as a whole. If historical subsidies (support in the past still impacting the current energy markets) are also taken into account, the amount of the annual energy subsidy for the energy market was €122 bn in 2012.

Some international institutions, such as the IMF, make distinction between *pre-tax subsidies*, and *post-tax subsidies*, also including estimated external costs in the energy sector as well.

If the external costs of energy production are also considered as subsidies, the numbers grow enormously; by an *additional €86.2 bn for coal, €53.8 bn for gas, €14.9 bn for nuclear and €8.8 bn for renewables*, topping up the post-tax subsidies in the EU energy sector to € 328 bn in 2012 (see footnote 152). These figures point to similar conclusions as IMF's findings, which estimate post tax subsidies at around €300 bn in the EU.

The study attempted to quantify both subsidies for energy supply (which can be attributed to different electricity and heat generation technologies) and subsidies for energy demand (where technology attribution was not possible[9]). If we look at subsidies at the supply side of the energy industry, they amounted to €62.1 bn[10] in 2012. Renewables (solar, wind, biomass

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[8] The definition of as benchmark tax structure is important for the overall result and is not straight forward as differential tax provisions be based on e.g. social, competitive, environmental or other motives
[9] However, in general support to energy demand tends to support individual fuels in proportion to their place in the fuel mix
[10] These numbers do not include the impact of historic subsidies, as for the production side subsidy ananlysis they are not relevant

and hydro) had the largest chunk, €39.2 bn, followed by direct fossil fuel subsidies (€17.2 bn) and nuclear energy (€6.5 bn).

As Figure 227 shows, between 2008 and 2012 the *increase in overall supply side subsidies in the EU-28 was primarily owing to increasing subsidising of renewable energy sources*, while fossil and nuclear subsidies did not change significantly[11].

Figure 227 – **Evolution of production side subsidies relating to different energy generation sources (2012 prices, in million EUR)**
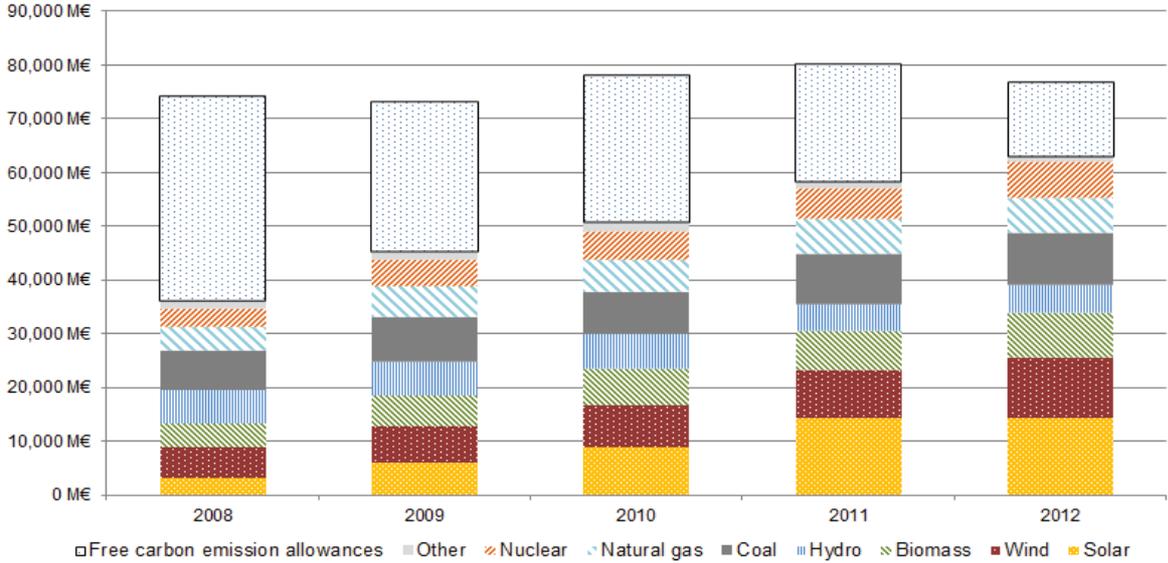
Source: Subsidies and costs of EU energy- Ecofys

Looking at the demand side energy subsidies (**Figure 228**), it seems that the combined volume of *energy demand and energy savings subsidies* showed a *gradual increase between 2008 and 2012, growing from less than €30 bn to slightly more than €36 bn*. The bulk of consumption side subsidies related to support to energy demand, while energy savings had lower share, though they showed measurable increase over this period.

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[11] If decreasing subsidies for free emission allowances, albeit as a result of decreasing carbon market prices, are completely allocated to fossil fuel subsidies, as renewables and nuclear generation did not have significance in emissions, subsidies to fossil fuel based electricity and heat generation decreased between 2008 and 2012.

Figure 228 - Evolution of energy demand and savings subsidies (2012 prices, in million EUR)
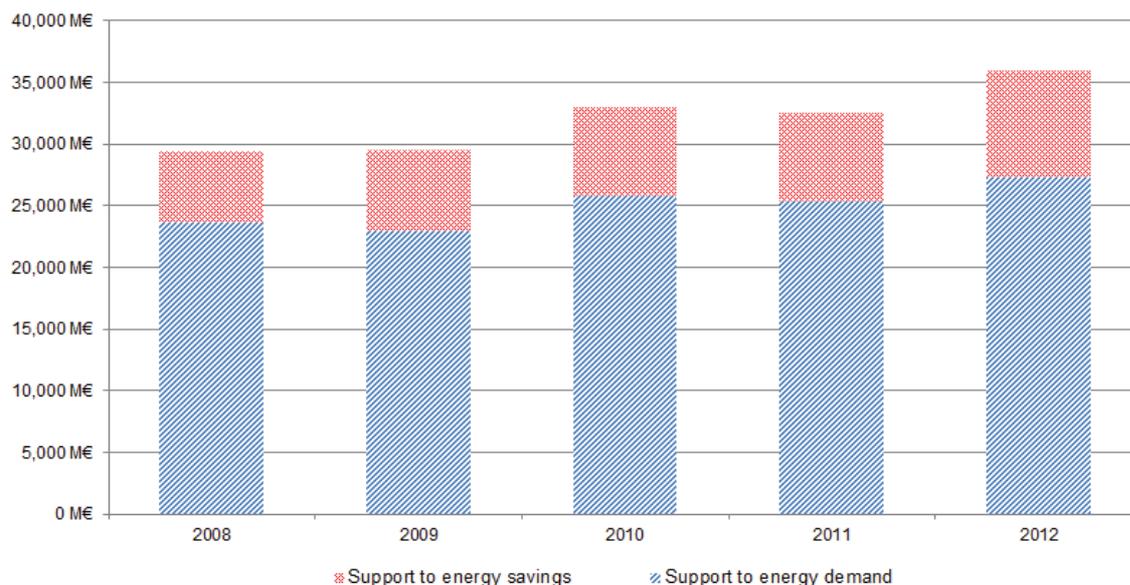
Source: Subsidies and costs of EU energy- Ecofys

Figure 229 shows how subsidies have been spent on different activities in the energy sector in 2012. As it is presented on the chart, the biggest chunk of overall energy subsidies related *to support for energy production* (€48.1 bn in 2012), mainly in the form of *feed-in tariffs, feed-in premiums and renewable energy quotas with tradable certificates,* all of them primarily relating to renewable electricity and heat generation. Support to *decommissioning and waste* was primarily linked to fossil fuels and nuclear, while *fuel tax exemptions* could be linked to electricity generation from all energy sources[12].

The second biggest group, *energy demand subsidy* forms, amounting to €27.3 bn altogether, mainly comprised of energy consumption support measures in the form of *exemptions from energy taxes, levies and VAT*. Interruptible load schemes also belong to this category group.

Investments in the energy sector were mainly subsidised in the form of *investment grants* and *investment tax allowances*, amounting to €14.7 bn in 2012 altogether. *Energy saving supports* (€8.6 bn in 2012) appeared in the form of *grants and subsidies and energy efficiency obligation*. Support for energy *research and development (R&D)* only amounted to €0.7 bn[13] in 2012, mainly in the form of grants and tax credits.

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[12] Tax exemptions to fuels used as inputs to produce electricity are applied in line with the principle of avoiding double taxation (as electricity taxes are imposed on electricity, the final product).
[13] R&D subsidies include national level and EU Framework Programme (FP7) subsidies

Figure 229 – **Different forms of subsidies for different activities in the energy sector in 2012 (million EUR)**
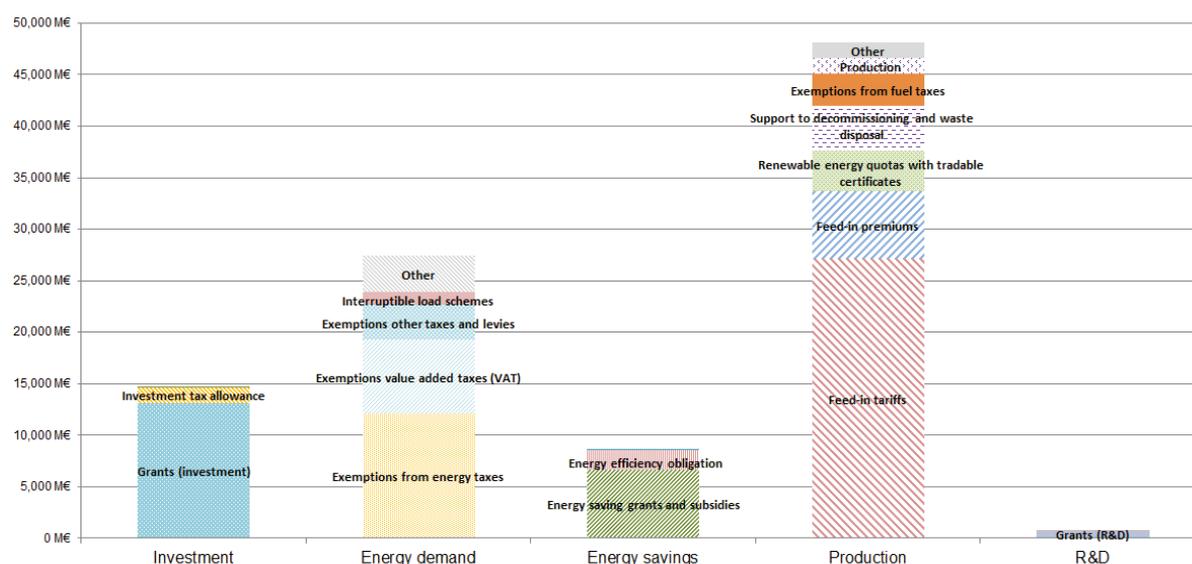
Source: Subsidies and costs of EU energy- Ecofys

7.1.2 Focus on direct fossil fuel subsidies in the EU

During the last few years, on the top of various EU policy strategies, documents and ongoing initiatives, including several Council conclusions, many international institutions (e.g.: G7, G20, OECD, IMF, etc.) identified phasing out fossil fuel subsidies as key issue in the global energy markets. Fossil fuel subsidies fall under environmentally harmful subsidies, as they hamper to attain global climate objectives and they result in distortions in energy markets having negative implications on environment and sustainable economic development. In particular, fossil fuel subsidies have a negative impact on the innovation in clean energy technologies.

In the study on energy costs and subsidies ordered by the European Commission in 2014 fossil fuel subsidies refer to all subsidies, either on the supply or demand side, for electricity and heat generation from solid fuels (including coal, lignite, anthracite, peat, etc.), crude oil and petroleum products, and natural gas. It is important to note that the transport sector was not in the scope of the study, implying that subsidies to crude oil and petroleum products may substantially differ from the numbers in other studies also covering this domain.

In the EU direct or indirect fossil fuel subsidies *excluding the transport sector* are still significant and might take various forms:

- Energy demand subsidies (as it has already been mentioned, in 2012 they were estimated at €27bn[14]), in the form of *(fuel) tax exemptions and reductions*, *preferential VAT rates*, *regulated fuel/electricity prices (below cost)* for both households and for industries), power generation subsidised through investment grants, feed in tariffs and premiums and fuel tax exemptions, colliery decontamination grants.

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[14] It must be noted that not all energy demand subsidies can be linked to fossil fuels, however, as in the energy costs and subsidies study energy demand subsidies have not been broken down to generation technologies, it can be assumed that the share of fossil fuel subsidies within energy demand measures is similar to the share of fossil fuels in the generation mix. In 2014 the combined share of fossil fuels (practically coal and gas) in electricity and heat generation was 45%, and the total energy demand subsidy was €27 billion, which gives a proportional amount of €12.1 bn to fossil fuel subsidies from the energy demand side.

- Adding together financial subsidies, direct historic subsidies and external costs (post-tax subsidy approach) results in a *total of €161 bn for fossil fuel subsidies in the EU in 2012*.

- Under the Energy Taxation Directive (2003/96/EC), *some fuels when used for heating* are permitted zero minimum levels of taxation. Furthermore, the rates for energy products not only vary largely between Members States but also benefit from diverse reductions or exemptions with little degree of harmonisation across the EU.

- *Mining related coal subsidies* are permitted by Council Decision 2010/787/EU[15] in order to address the regional and social consequences of mines closure. Under this regulation, closure aid (operating aid to cover losses) may be provided to uncompetitive coal production units due to close by the end of 2018 and related "exceptional costs" arising or having arisen from the closure of coal production..

- *Indirect subsidy of providing priority dispatch for electricity generated from "indigenous primary energy fuel sources"*[16] on grounds of security of supply.

- *Capacity mechanisms often provide subsidies to fossil fuel power plants* to ensure generation adequacy[17].The up-front costs of capacity mechanisms may be offset to some extent by a reduction in average wholesale prices if the capacity mechanisms imply that there are fewer occasions of scarcity with high electricity prices than would have been the case in the absence of the capacity mechanisms, but this effect is difficult to calculate.

7.2 International comparison of fossil fuel subsidies

As there were a number of studies prepared during the last few years on fossil fuel subsidies, it is reasonable to compare the results of the 2014 energy costs and subsidies study with these other sources, bearing in mind the comparison limitations, owing to different methodologies and/or different geographical and energy products coverage.

- A European Commission study[18] only examining fossil fuel tax related subsidies but *including the transport sector* found subsidies amounting to €40 bn annually.

- The IMF[19] estimated *global pre-tax energy subsidies* (including petroleum, natural gas, coal and electricity) in 2015 at $333 bn (€300 bn – amounting to around 0.4% of the global GDP) after reaching $490 bn (€369 bn) in 2013. Lower subsidies in 2015 are in strong correlation with decreasing the international energy prices.

- If the external costs of energy production are taken into account, we arrive at *post-tax* subsidies, at a number being higher by several magnitudes, an estimated $5.3 trillion (€4.8 trillion) in 2015, equalling 6.5% of the global GDP.

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[15] Council Decision 2010/787/EU on State aid to facilitate the closure of uncompetitive coal mines.

[16] Up to 15% of the primary energy necessary to produce the electricity consumed in the Member State concerned (Art.15(4) of Directive 2009/72/EC).

[17] In the EC Generation Adequacy guidance document an estimation of the sum of annual expenditure in some EU Member States (Greece, Ireland, Italy, Spain, Sweden and Finland) is provided amounting to € 1.3 bn a year.

[18] http://ec.europa.eu/environment/enveco/taxation/pdf/201412ffs_final_report.pdf Including Direct budgetary support to energy users less than €1bn per year, direct support to producers less than €5bn, tax expenditure in excise taxes of almost €28bn, VAT reductions include €4bn in the UK and €1bn in Italy.

[19] https://www.imf.org/external/pubs/ft/wp/2015/wp15105.pdf

- Fossil fuel subsidies in the aforementioned IMF study, including external costs, reach an estimated €300 bn in the EU and Russia, €250 bn in India, €630 bn in the United States and €2,050 bn in China.

- The IEA estimated global fossil fuel subsidies[20] at $548 bn (€412 bn) in 2013 for 40 countries included in its 2014 edition of the World Energy Outlook. The top twenty-five countries in subsidising fossil fuels are all outside the EU[21].

- In turn, the OECD estimated fossil fuel subsidies (for the OECD member countries) at between $160-200 bn (€115-125 bn) annually over the period 2010-2014[22].

- Although developing countries are responsible for the lion's share of global fossil fuel subsidies, the advanced economies account for about one-quarter of the IMF's estimate (the €4.8 trillion), out of which the European Union for some €300 bn.

- This amount is relatively modest compared to the continent's economic weight and energy consumption and can be explained by relatively efficient taxation which tends to better take into account the negative effects of fossil fuel combustion and the fact that European economies have almost completely phased out generalised fossil fuel subsidies. However, to putting it in another context, this amount is roughly as much as the worldwide clean energy investment in 2015[23].

- As energy poverty is rather a social issue, it could be more efficiently addressed with targeted social measures (instead of subsidies through reduced retail prices or taxes for households) while maintaining the right price signals and incentives for energy efficiency.

- In conclusion, while there are many uncertainties and controversies about measuring fossil fuel subsidies and the results strongly depend on the valuation method, there is ample evidence that European support for fossil fuels is still sizeable that does not give incentives to transition to low-carbon competitive economy.

7.3 Ad-hoc data on reductions and exemptions of electricity and gas taxes and levies

EU Member States' governments seek to maintain the competitiveness of their national industries by limiting the burden of taxes and levies on industrial energy retail prices.. Taxes and levies differ by sector, by applied process, by *total consumption*, by *level of grid connection*, by *energy (cost) intensity.* In the case of some countries (e.g.: federal states) the *geographical location (regions) within the country* can also play a role[24].

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[20] http://www.oecd-library.org/docserver/download/6114031ec011.pdf?expires=1461084656&id=id&accname=oid031827&checksum=12F571270E33482CF12EF7226D88CE98

[21] This analysis focuses solely on countries with fixed price regimes that set fossil fuel prices below international market levels. This is then not representative of OECD countries.

[22] OECD Companion to the Inventory of Support measures for Fossil Fuel 2015

[23] Bloomberg New Energy Finance, January 2016; available at: http://about.bnef.com/content/uploads/sites/4/2016/01/Clean_Energy_Investment_Factpack.pdf

[24] The data on state interventions seeking to limit taxes and levies is presented in this section for informative purposes without any prejudice of the compatibility of these interventions with competition rules

Table 24 provides an overview of criteria by which EU Member States differentiate taxes and levies on electricity. Table 25 shows the criteria for taxes and levies on natural gas[25].

Table 24. Criteria for reductions and exemptions in taxes and levies on electricity

Country	Defined process	Consumption level	Capacity (peak load)	Level of grid connection
Austria	Electricity tax RES			CHP support RES support
Belgium	RES support (W)	Federal contribution surcharge green certificates RES and CHP support (F) Grid connection fee (W)		Electricity tax RES and CHP support (F) Rational use of energy (F) RES support (W) Occupation of public domain (W)
Denmark	Electricity tax CO_2 tax	Electricity tax CO_2 tax Electricity distribution contribution		
Estonia	Electricity tax			
Finland	Excise duty		Excise duty	
France		Regional and municipality taxes	National, regional and municipality taxes	Social tariff payments
Germany	Electricity tax	Offshore levy Grid fee compensation levy CHP support RES support Concession fee		
Greece	PSO	RES support Public Service Obligation		Electricity tax RES support Public Service Obligation
Ireland	Electricity tax		PSO	
Italy	All levies	All levies Excise duty	All levies	All levies
Lithuania	Excise duty			
Luxembourg	Energy tax	Energy consumption tax		Compensation
Netherlands		RES support Excise duty		
Poland		Security of Supply		Security of Supply
Portugal		Access tariff		Access tariff
Slovakia	Excise duty			
Slovenia	RES and CHP support		RES / CHP support	RES / CHP support
Spain	Electricity tax		Access tariff	Access tariff
Sweden	RES certificates Electricity tax			
United Kingdom		Climate Change Levy		

Source: Ad-hoc data collection done by Ecofys, 2016. In the case of Belgium W refers to the Wallonia region while F stands for the Flemish region

Energy consumption for defined *energy-intensive processes can be exempt from taxes and levies in several countries*, i.e. consumption in metallurgical, mineralogical or specific chemical processes. Reasons for these exemptions include *protecting competitiveness, due to the limited potential for further energy efficiency gains* or changes in energy carriers.

The rates of many state-regulated energy price elements are graded, stepped or contain fixed base amounts. Thus companies with high consumption levels pay, on average, less per unit of energy. Graded tariffs are often provided for levies, e.g. to support renewable energy sources. In these schemes, *consumers pay high tariffs for the first units of electricity consumption and lower tariffs for electricity units exceeding defined thresholds*. Austria and France additionally introduced caps in their policies. In this case, payments for energy policy support are fixed to a maximum amount in Euro per company.

Some European Member States apply the same logic to units of capacity. In this case, rates of *state-regulated price elements depend on connected capacity or peak load* of a year or month. In general, companies with large capacities pay less per unit of energy.

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[25]. It must be noted here that the results in this and the next table are based on an ad-hoc data collection, implying that the list of measures presented here might not be complete.

In several European countries, costs for policies are added to the grid fees with differences for consumers connected to the transmission and distribution grids. In Spain and in Portugal, for example, *"access tariffs" in electricity include not only the costs for managing the network, but also costs for renewable energy support, and capacity payments.* Several other countries, like Italy, Slovenia, Belgium, Greece, and Poland apply specific policy financing tariffs depending on the grid level of connection in electricity.

Table 25. Criteria for reductions and exemptions in taxes and levies on gas

Country	Defined process	Consumption level	Level of grid connection
Austria	Gas tax		
Belgium	Gas tax	Federal contribution Grid connection fee (W)	
Bulgaria	Excise duty		
Croatia	Excise duty		
Cyprus			
Czech Republic	Natural gas tax		
Denmark	Natural gas tax NOx tax		
Estonia	Natural gas tax		
Finland			
France	Natural gas tax		Social tariff payments
Germany	Natural gas tax	Concession fee	
Greece	Natural gas tax	Customs tax	
Hungary	Natural gas tax		
Ireland	Carbon tax		
Italy	Excise duty	Excise duty	
Latvia	Excise duty		
Lithuania	Excise duty		
Luxembourg	Excise duty	Energy consumption tax	
Malta	Excise duty		
Netherlands		RES support Excise duty	
Poland	Excise duty		
Portugal	Special tax	Subsoil occupation tax	
Romania	Excise duty		
Slovakia	Excise duty		
Slovenia	Excise duty		
Spain	Hydrocarbons tax		
Sweden	RES certificates Electricity tax Natural gas tax		
United Kingdom	Fuel duty	Smart metering Climate Change Levy	

Source: Ad-hoc data collection done by Ecofys, 2016. In the case of Belgium W refers to the Wallonian region while F stands for the Flemish region

7.4 Data on state aid expenditures (2008-2014)

From the database of Directorate General for Competition of the European Commission detailed data can be drawn on tax and fiscal measures related state aid expenditures in energy and environmental protection for most of the EU Member States. This data can serve to complement the discussion on subsidies in the energy sector in this report. It must also be noted that these data on state aid expenditures do not purely refer to the energy sector and the dataset is not complete at EU level, as there are several Member States having not reported any cases, therefore it is not possible to provide EU aggregate data.

As the next chart (Figure 230) shows, between 2008 and 2014 there were many forms of energy and environmental protection related state-aid expenditures applied in the EU Member States[26].

The largest share of state aid expenditures could be attributed to *tax allowances*, mainly comprising of tax reductions or tax exemptions, for example for renewable energy generation or energy savings measures.

Other forms of tax advantage (e.g.: fuel purchase tax returns, biofuel tax reductions, climate change levy, etc.) was the second largest group of state-aid related energy expenditures between 2008 and 2014.

Figure 230 – **Distribution of state aid related expenditures between 2008 and 2014 in the EU**
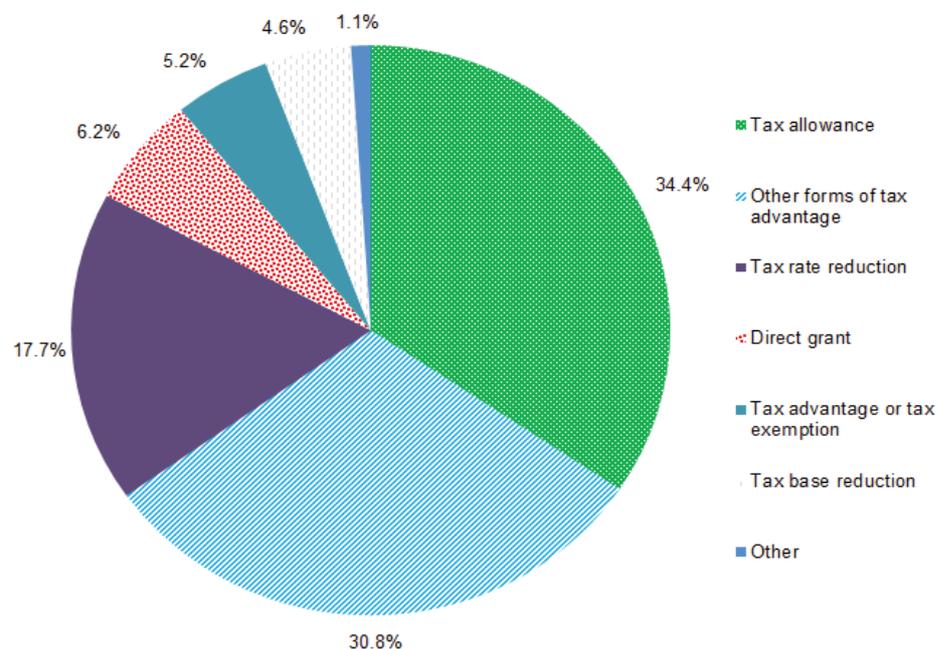
Source: European Commission own calculations - No data available for FR, GR, HR, LU and MT

Tax rate reductions (e.g.: reduced taxes on combined heat and electricity generation, relief from waste water tax or modification or CO_2 tax for some industries) were the third biggest

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[26] The chart shows the distribution of cumulative state aid expenditures, as measured in € 2015. From the point of view of this report there would not be too much value added of differentiation between energy state aids under General Block Exemption Rules and of those that did not fall in this category, so each chart in this subchapter represent state aids, irrespective of the notification practice.

group of state-aid related energy expenditures. Most of the tax rate reductions related to individual notification basis to the Commission.

Direct grants were given mainly in the form of support for energy intensive industries. *Tax advantages or exemptions* were also given for various energy intensive industries in order to preserve their competitiveness in the EU single market. *Tax base reductions* were given in the form of, for example, energy savings allowances or non-application of lower depreciation rates for renewable assets.

Figure 231 shows the cumulative state-aid expenditure in each Member State for the period of 2008-20014, expressed in million euros at 2015 prices. Most of the registered state-aid were given in Germany (in the form of tax allowances, tax advantages, direct grants and tax base or rate reductions), Sweden (tax allowances, tax advantages or tax rate reductions), the UK (tax rate reductions), Finland (mainly tax advantages) and Spain (mainly in the form of tax rate reductions).The amount of state-aid expenditures was lower in the Netherlands, Austria, Belgium, Poland and Romania. In the other remaining Member States, presented on **Figure 231** the amount of state-aid expenditures was of less significance**.**

Figure 231 **- Cumulative sum of state-aid related expenditures in energy in the EU Member States, for the period of 2008-2014, measured in €2015**
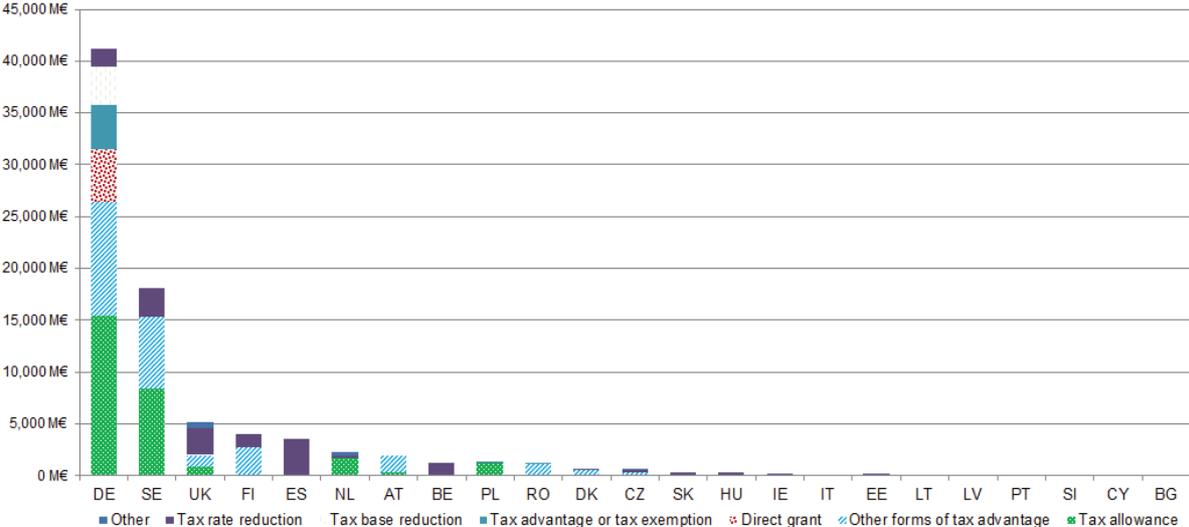
Source: European Commission – own calculations - No data available for FR, GR, HR, LU and MT

Looking at the evolution of the overall actual state-aid expenditures between 2008 and 2014 on **Figure 232**, we can see that given the importance of individual Commission decisions in some cases, the amount of state-aid expenditures can vary significantly from one year to another.

In Germany the annual state aid expenditure varied between €4.1 bn and €9.8 bn between 2008 and 2014, however this latter number in 2014 represented an outstandingly high value. In other Member States the annual variation in state-aid expenditures was much lower. In Sweden the annual amount of expenditures varied around €2.5bn, while in the UK it showed a decreasing trend (from €950 million in 2008 to €140 million in 2014). In Finland and Spain the annual average of state-aid expenditures was around €500-600 million, while in the remaining countries presented on **Figure 232** this was even lower.

Figure 232 - **Annual state aid related expenditures in energy and environmental protection in the EU Member States, between 2008 and 2014**
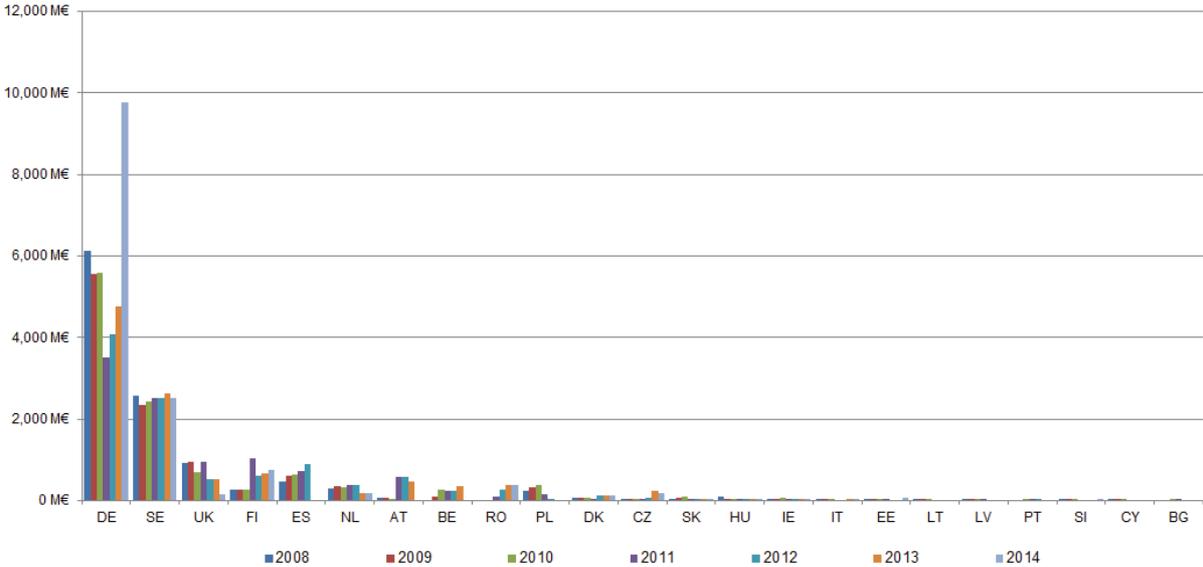
Source: European Commission- own calculations - No data available for FR, GR, HR, LU and MT

8 The role of energy for government revenues and inflation

8.1 Government revenues from the energy sector

Main findings

- In 2014, energy taxes collected by EU Member States amounted to EUR 263 billion, equivalent to 1.88% of EU GDP. As a percentage of GDP, energy tax revenue has been relatively stable in the last 5 years. Member States with a lower GDP/capita typically have a higher share of energy taxes from both total tax revenue and from GDP.
- Excise duties constitute the largest part of energy taxes, amounting to around EUR 227 billion in 2015. In real terms, excise duty revenues slightly decreased between 2008 and 2015. In 2015, 86% of this revenue was coming from excise duty imposed on petroleum products.
- For the main petroleum products, the nominal excise duty revenue is gradually growing, driven by increasing excise duty rates. However, in the last few years this was offset by lower VAT revenue driven by falling oil and oil product prices. As a result, the nominal tax revenue from petroleum products has been relatively stable but in real terms the tax revenue decreased.

Energy taxes

Taxes and duties imposed on energy products are an important source of government revenue in EU Member States. In 2014, energy taxes[27] collected by EU Member States amounted to 263 billion euros. This was equivalent to 1.88% of EU GDP and 4.71% of total revenues from taxes and social contributions (including imputed social contributions).

While nominal energy tax revenues increased by 20% between 2009 and 2014 (on average by 3.7%/year), as a percentage of GDP and tax revenue they remained relatively stable, showing only a slight increase in this period.

Figure 233 **- Energy taxes in the EU**
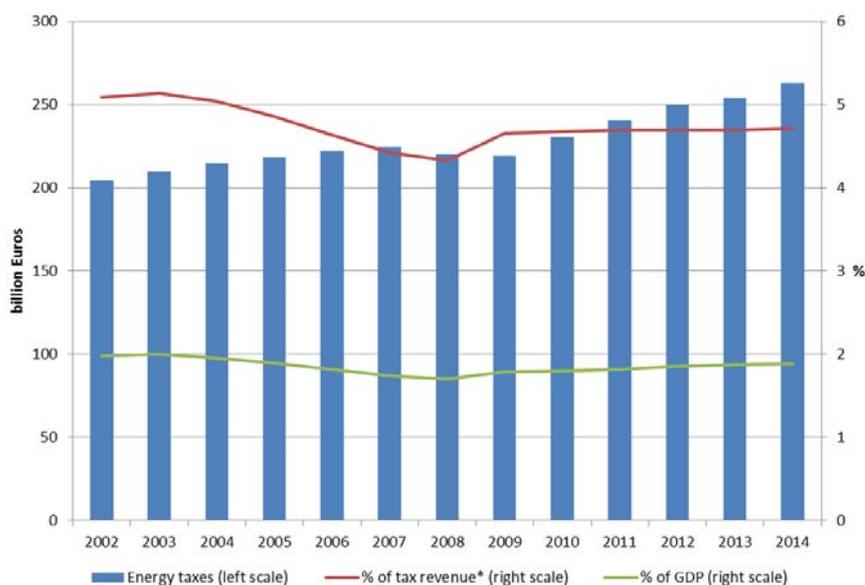
Source: Eurostat (data series env_ac_tax)
*percentage of total revenues from taxes and social contributions (including imputed social contributions)

Looking at individual Member States, the role of energy taxes in government revenues shows a significant variety: in 2014, energy taxes in Bulgaria made up 9.5% of total revenues from taxes and social contributions (including imputed social contributions) while this share was only 2.5% in Belgium. Typically, Member States with a lower GDP/capita have a higher share of energy taxes from both total tax revenue and from GDP.

Figure 234 **- Energy taxes as a percentage of tax revenue and of GDP in 2014**

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[27] Energy-related environmental taxes as defined by Regulation (EU) N° 691/2011 on European environmental economic accounts; does not include VAT imposed on energy products
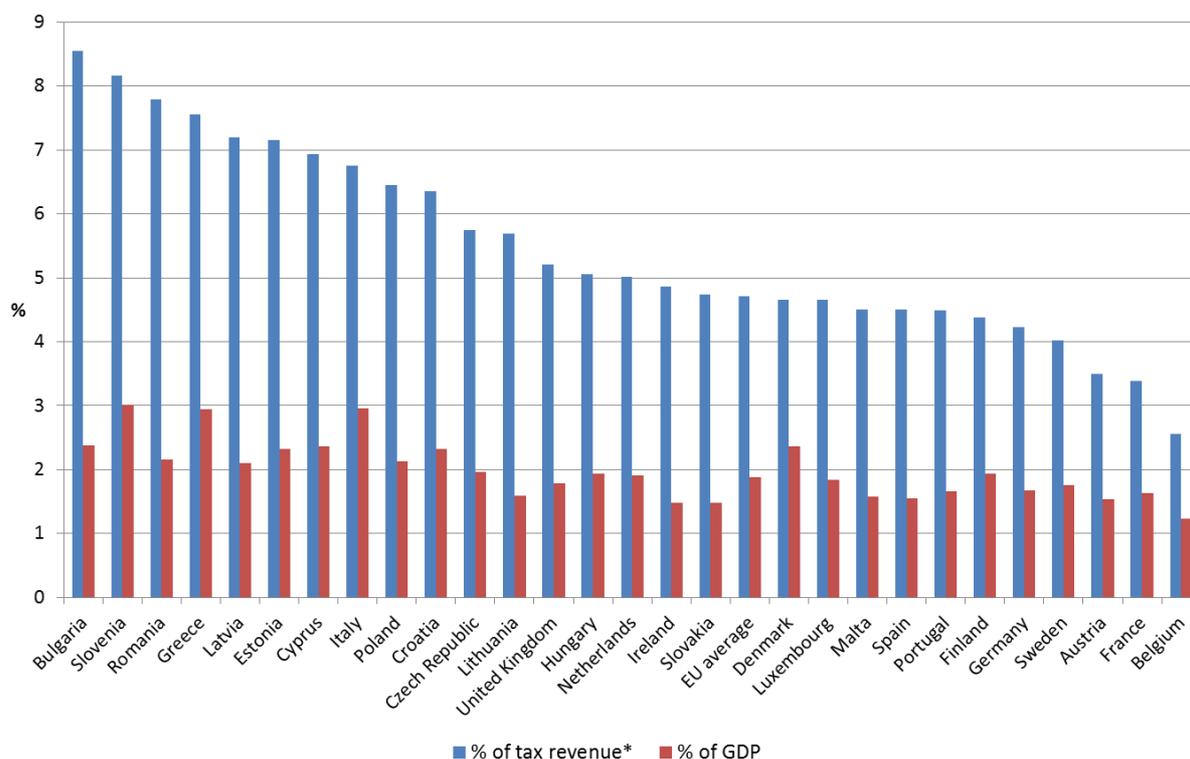
% of tax revenue*   % of GDP

Source: Eurostat (data series env_ac_tax)
*percentage of total revenues from taxes and social contributions (including imputed social contributions)

Excise duties

Excise duties constitute the largest part of energy taxes.

Excise duties are indirect taxes imposed on the sale or use of specific products, typically alcohol, tobacco and energy products. All revenue from excise duties goes to the budgets of Member States. Excise duties are set in absolute values, i.e. as a fixed amount per quantity of the product (e.g. per litre/kg/GJ/MWh). Accordingly, assuming that the rates don't change, the revenue will depend on the consumption of the specific product. In contrast, price changes should not impact revenues (at least not directly).

Current EU rules for taxing energy products are laid down in Council Directive 2003/96/EC[28] (the Energy Tax Directive), which entered into force on 1 January 2004. The Directive covers petroleum products (gasoline, gasoil, kerosene, LPG, heavy fuel oil), natural gas, coal, coke and electricity. In addition to establishing a common EU framework for taxing energy products, the Directive sets minimum excise duty rates.

The Commission's Taxation and Customs Union Directorate-General (TAXUD) regularly publishes the excise duty rates applicable in EU Member States[29] and the revenue from excise duties[30].

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[28] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:283:0051:0070:EN:PDF

[29] http://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/taxation/excise_duties/energy_products/rates/excise_duties-part_ii_energy_products_en.pdf includes the excise duty rates for energy products applicable on 1 July 2016

As far as revenues are concerned, the latest available data relate to 2015. According to these data, excise duty revenues amounted to EUR 227 billion in 2015.[31] From 2009, total revenue shows an increasing trend (with a minimal decrease in 2013) but the growth falls short of inflation.

Figure 235 **-** Excise duty revenues from energy consumption
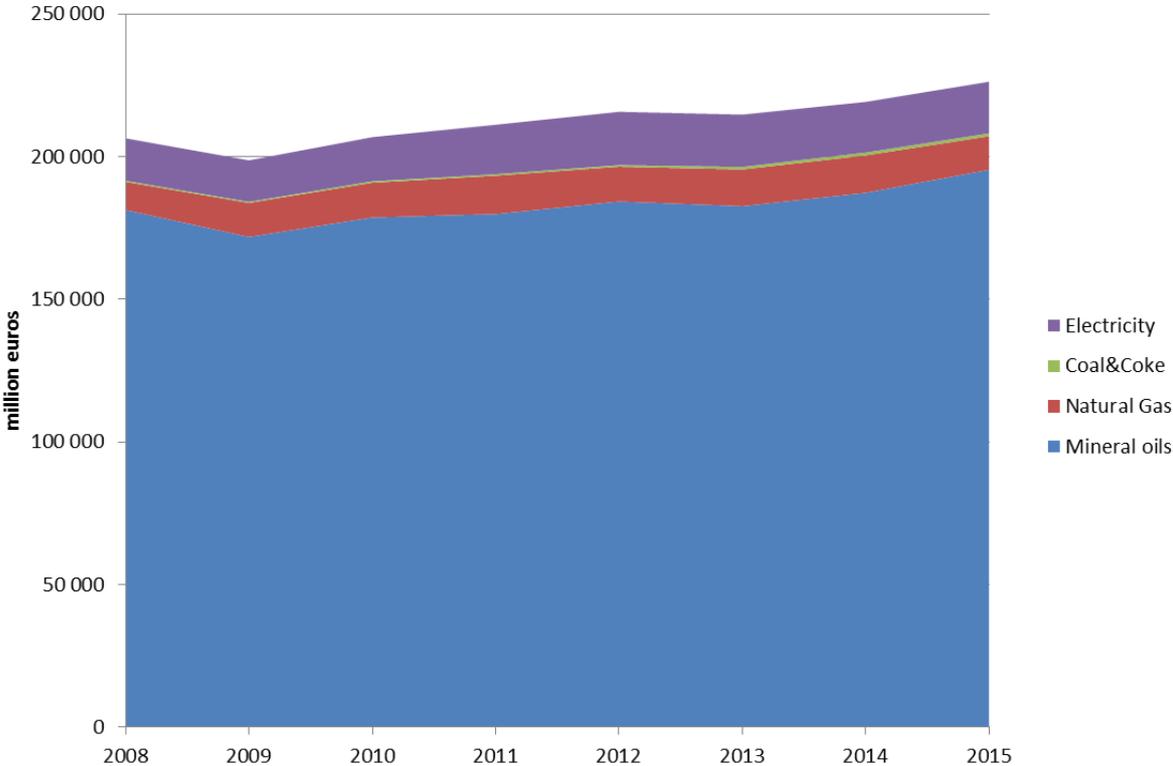
Source: DG Taxation and Customs Union
2015 data is not available for Latvia and the Netherlands; for these countries, 2014 figures were used.

If adjusted for inflation, excise duty revenues have slightly decreased between 2008 and 2014: measured in 2015 euros, they amounted to EUR 230 billion in 2008 and EUR 227 billion in 2015. In the last 2 years, however, there has been an increase.

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[30]http://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/taxation/excise_duties/energy_products/rates/excise_duties_energy_products_en.pdf includes the revenue by Member State and by energy product in the period 2008-2015.

[31] 2015 data is not available for Latvia and the Netherlands; for these countries, 2014 figures were used.

Figure 236 - **Exercise duty revenues from energy consumption, adjusted for inflation (in 2015 Euros)**
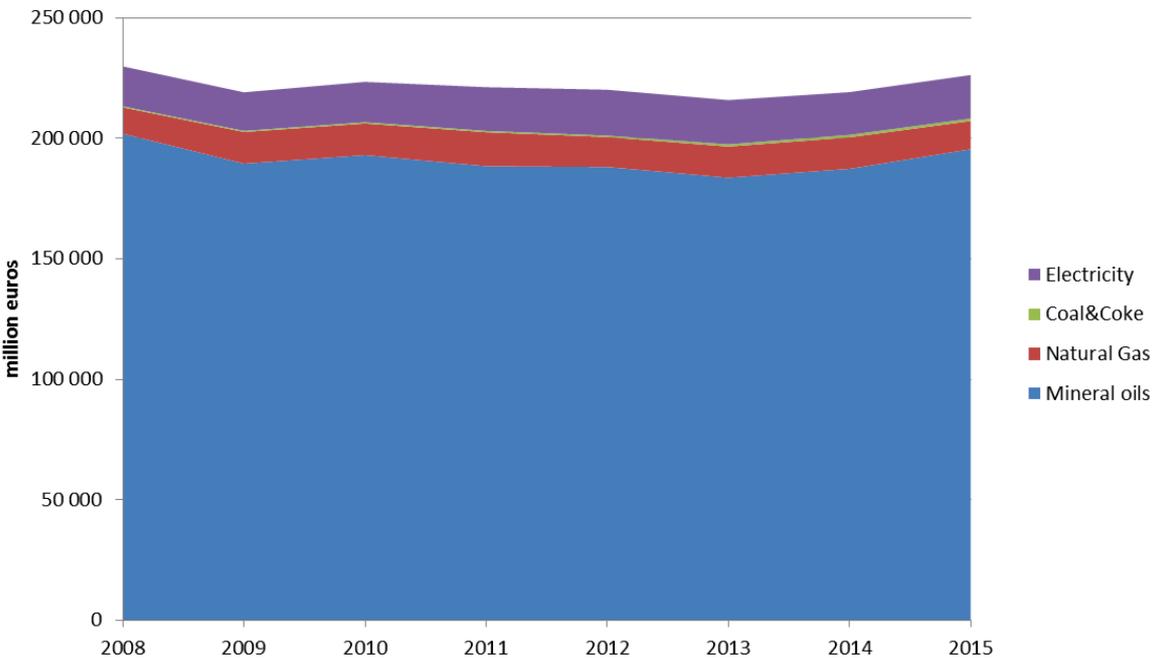
Source: DG Taxation and Customs Union, adjusted by HICP
2015 data is not available for Latvia and the Netherlands; for these countries, 2014 figures were used.

Petroleum products make up by far the largest share of the tax revenues: 86.4% in 2015, followed by electricity (8.0%), gas (5.2%) and coal (0.5%). Petroleum products make up more than 60% of the excise duty revenue in all Member States except Denmark; in 20 Member States they make up more than 90%.

Figure 237 - **The share of excise duty revenues based on energy source, 2015**
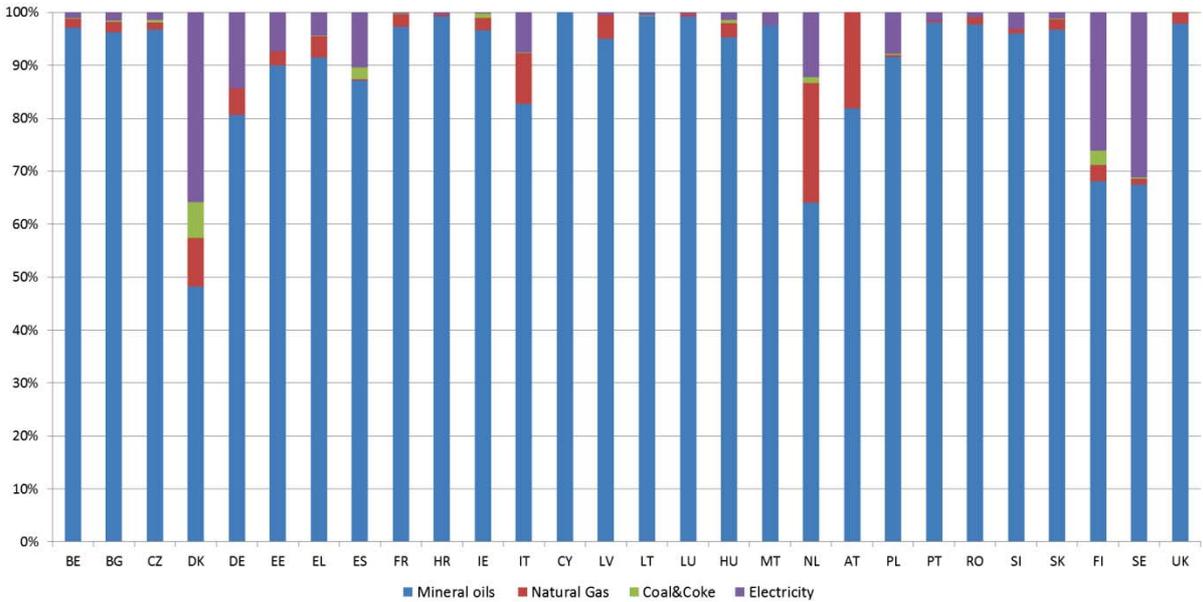
Source: DG Taxation and Customs Union
2015 data is not available for Latvia and the Netherlands; for these countries, 2014 figures were used.

The share of oil products from total revenues is slightly decreasing (from 87.8% in 2008 to 86.4% in 2014) while the share of other fuels increase. Between 2009 and 2015, revenues from taxes on oil products increased by 7.8%, on gas by 19.5%, on electricity by 21.6% and on coal by 143.4%. In this 6-year period, inflation measured by the Harmonised Index of Consumer Prices (HICP) was 11.3%.

Figure 238 - **The share of excise duty revenues from energy consumption**
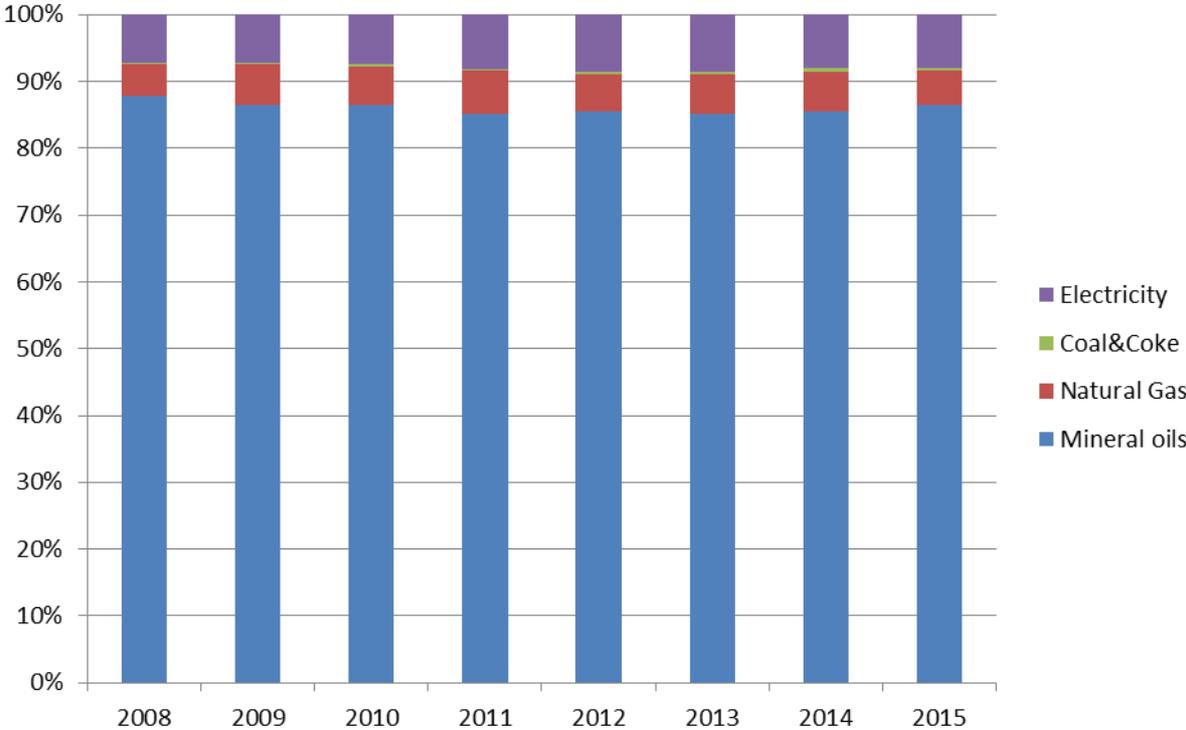
Source: DG Taxation and Customs Union
2015 data is not available for Latvia and the Netherlands; for these countries, 2014 figures were used.

In case of oil products, all Member States impose high excise duty rates which is not surprising, given that the energy tax directive sets relatively high minimum levels. In case of the other fuels, however, minimum tax rates set by the directive are relatively low and there seems to be big differences across Member States. Germany collects the most taxes on petroleum products and electricity, Italy on gas and Denmark on coal.

Value added tax (VAT)

The VAT is a general consumption tax assessed on the value added to goods and services. It applies to practically all goods and services (including energy products) that are bought and sold for use or consumption in the EU. The VAT is borne ultimately by the final consumer; companies can reclaim the VAT they pay on the products and services they use as an input. VAT is charged as a percentage of the price which means that an increase of the price will entail an increase in the tax revenue and vice versa.

The VAT Directive (2006/112/EC) requires that the standard VAT rate must be at least 15% and Member States can apply one or two reduced rates of at least 5% but only to goods or services listed in Annex III of the Directive (energy products are not in the list). In addition, there are multiple exceptions to the basic rules (usually with conditions/deadlines), including

- possibility of reduced rates for goods and services other than those listed in the directive (e.g. Article 102 allows the use of reduced rate to the supply of natural gas, electricity and district heating, "provided that no risk of distortion of competition thereby arises");

- several country-specific exceptions, including the permission to use "super reduced" rates under 5% (including zero rates).

Several Member States apply reduced VAT rates for certain energy products, mainly for electricity, gas, heating oil, district heating and firewood. DG TAXUD regularly publishes the VAT rates applied by Member States for different product groups/services.[32]

Unlike for excise duties, there is no publicly available data for VAT revenues by product group.

Tax revenues from petroleum products

Petroleum products, especially motor fuels, are the main source of tax revenue from the energy sector for government budgets: taxes on fuels (including VAT) make up on average 7% of Member States' tax revenue.[33] Therefore, we look in more detail into the development of excise duty and VAT revenue from the main petroleum products. This analysis is facilitated by Council Decision on Crude Oil Supply Costs and the Consumer Prices of Petroleum Products (1999/280/EC)[34] which requires Member States to report to the Commission the retail prices of petroleum products on a weekly basis. Member States also have to report any changes in the tax rates (VAT, excise duty, other indirect taxes) applicable to these products. The reported data are published on the website of DG Energy.[35]

Our analysis covers the three main petroleum products sold in the retail sector: gasoline (Euro-super 95), diesel (automotive gas oil) and heating oil (heating gas oil). For most Member States, the analysis covers the years 2005-2015, except Bulgaria (2008-2015), Croatia (2013-2015) and Romania (2008-2013).

For each year and each Member State, an average price was calculated as an arithmetic average of the weekly prices. The EU average price was then calculated as the weighted average of these. In the absence of 2015 annual consumption figures, for 2015 we used the 2014 consumption data as the weight.

In case of gasoline, we see a gradual increase of the average excise duty rate but this increase stayed below inflation: in 2005 the average rate was 57 eurocent/litre, by 2015 it increased to 64 eurocent/litre (an increase of 13% in 10 years). The average VAT rate also increased during this period, from 18.8% in 2005 to 21.0% in 2015.

In the last few years, in line with the decreasing oil prices, the average retail price of gasoline decreased. However, because of the fixed (or, in case of several member States, increasing) excise duty rates, the tax component gradually increased, from 55% in 2012 to 63% in 2015. In absolute terms, the tax component decreased, but only marginally, from 90 eurocent/litre in 2012 to 88 eurocent/litre in 2015.

Figure 239 - **Gasoline price components in the EU**

In case of diesel, the trends are similar. The main difference is that for most Member States the excise duty rates are lower than for gasoline although there is some approximation. Between 2005 and 2015, the average excise duty rate increased from 41 eurocent/litre to 49 eurocent/litre (an increase of 21% which is in line with the inflation in this period). In the same period, the average VAT rate increased from 18.6% in 2005 to 20.9% in 2015.[36]

The average retail price of diesel also decreased since 2012, with the tax component increasing from 48% in 2012 to 57% in 2015. In absolute terms, the tax component decreased marginally, from 72 eurocent/litre in 2012 to 71 eurocent/litre in 2015.

Figure 240 - **Diesel price components in the EU**
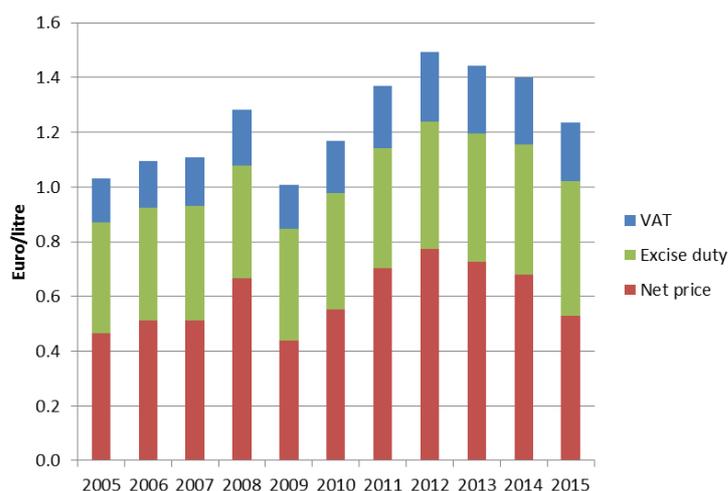
For heating oil, most Member States impose significantly lower excise duty rates than for motor fuels. (Ireland, Luxembourg, Portugal and the UK also apply a lower VAT rate). This results in a lower tax component and a bigger volatility of the final consumer price.

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[36] All Member States use the same VAT rate for gasoline and diesel; the difference average tax rate stems from the different weights used.

Between 2005 and 2015, the average excise duty rate for heating oil increased from 9.0 eurocent/litre to 9.6 eurocent/litre (an increase of 7%, well below inflation). In the same period, the average VAT rate increased from 18.6% in 2005 to 20.2% in 2015.

The average retail price of heating oil significantly decreased since 2012, with the tax component increasing from 26% in 2012 to 31% in 2015. In absolute terms, the tax component decreased from 26 eurocent/litre in 2012 to 21 eurocent/litre in 2015.

Figure 241 - **Heating oil price components in the EU**
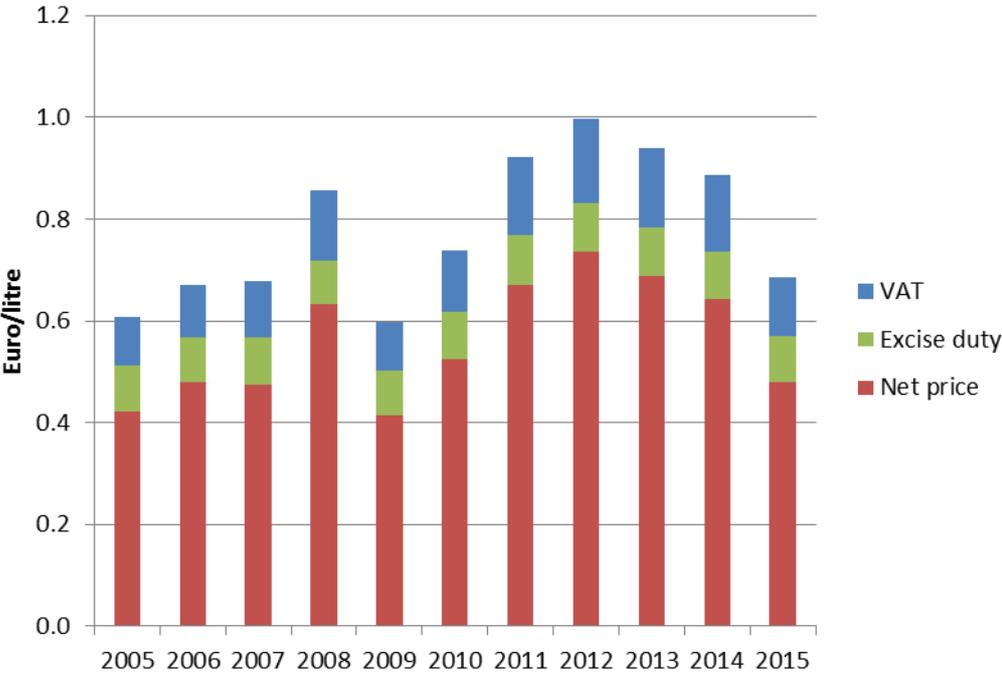
Source: DG Energy calculation

Based on the development of consumption, consumer prices and their components, we estimated the tax revenues collected by Member States. It is important to underline that most enterprises can reclaim the VAT they pay, so the calculated VAT revenue is a theoretical maximum; the actual VAT revenue collected by Member States must me significantly lower.

The estimated revenue from excise duties gradually increased between 2005 and 2015. Although the combined consumption of the three product groups show a declining trend since 2008, this was largely offset by the increase of the average excise duty rates. If adjusted for inflation, however, excise duty revenues slightly decreased in this period.

As the VAT is an ad valorem tax, the estimated (theoretical) VAT revenue is fluctuating in line with the net price. Accordingly, it decreased in recent years, from 98 billion euros in 2012 to 81 billion euros in 2015 (a decrease of 17%). In the same period, the estimated excise duty revenue increased from 180 billion euros to 187 billion euros (an increase of 4%).

Assuming that roughly half of the VAT is reclaimed (i.e. the actual VAT revenue is half of the theoretical value depicted on the below graph), the increase of excise duty more or less offsets the decrease of the VAT revenue in recent years, resulting in a relatively stable tax revenue from petroleum products. Of course, when adjusted for inflation, this means the value of the tax revenue has slightly decreased.

Figure 242 - **Estimated tax revenue from gasoline, diesel and heating oil**
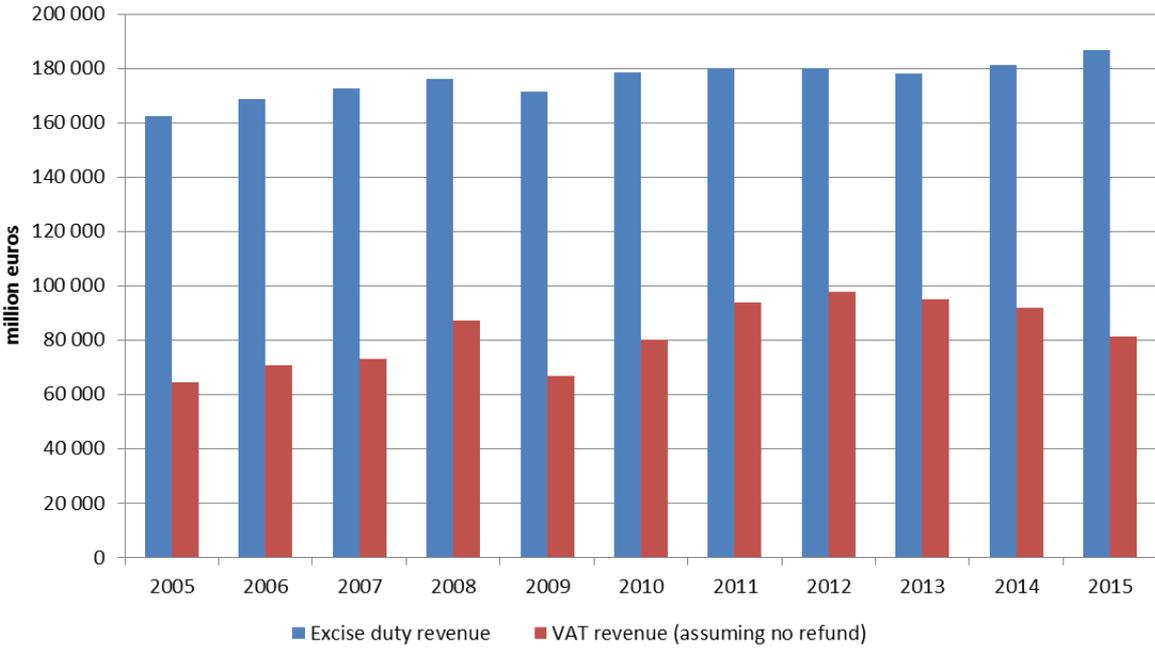
Source: DG Energy calculation

8.2 Energy and inflation

Retail energy prices might significantly impact the evolution of the overall inflation rate in many EU Member States and at EU level as well, as energy has important share in the consumer prices indices and energy prices show a high degree of volatility over time. The next chart (Figure 243) shows the evolution of the Harmonised Index of Consumer Prices (HICP), the energy component of the HICP index, and HICP without energy in the EU-28.

Figure 243 – **Monthly evolution of the HICP index, its energy component and the HICP without energy, average of 2008=100**
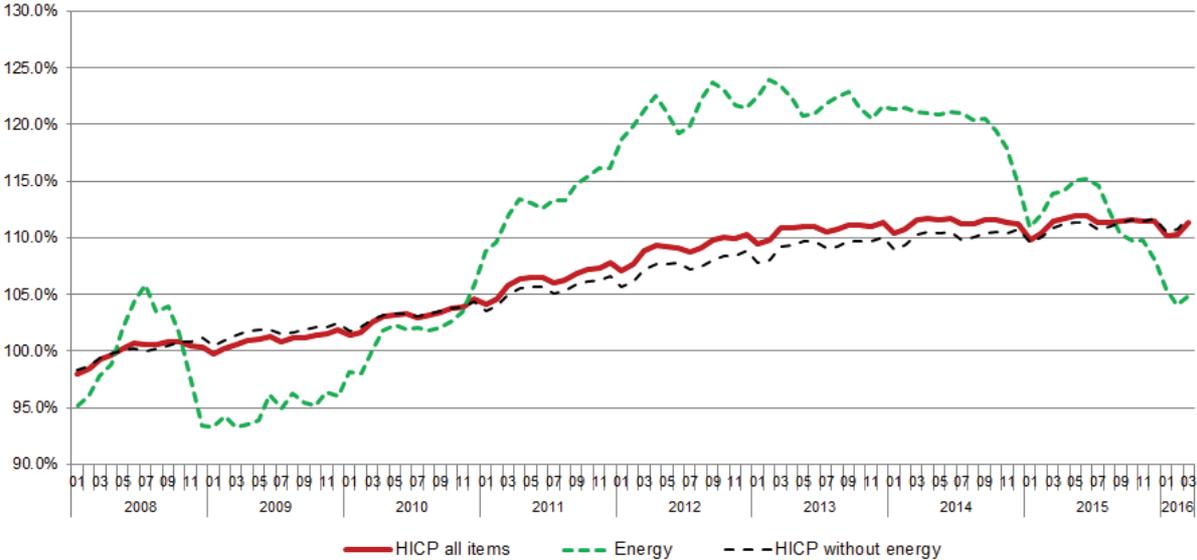
Source: Eurostat

At EU level energy prices (Eurostat's *Energy* category includes *electricity, gas, solid and liquid fuels for heating, heat energy and fuels and lubricants for passenger cars*) showed higher volatility than the headline inflation. In parallel with the developments on fossil fuel markets (crude oil and petroleum products, coal and natural gas), after the peak in mid-2008 a steep fall occurred in the EU energy price index during the first months of the 2008/2009 economic crisis. As of the second half of 2009, as energy commodities recovered in the international markets, the EU energy price index also started to rise, and in 2012/2013 it was about 20% higher than the 2008 average. As of the second half of 2014, the energy price index started to fall and by the first quarter of 2016 it went back to the ranges seen for the last time at the end of 2010.

Meanwhile, the headline EU-28 HICP inflation rate evolved with low volatility over the last eight years, and in the first quarter of 2016 consumer prices in the EU stood 10% higher than in 2008 on average; implying a quite moderate (1.5%) average annual inflation rate for the 2008-2016 Q1 period.

The consumer price index excluding energy products (HICP without energy) followed closely the evolution of the HICP headline index, if we look at a fix-based (taking the average of 2008 as index base) indices. However, if we look in each month at how energy products impacted the year-on-year price variations, we can see significant differences over time, as Figure 244 shows.

In mid-2008 and in 2011 there were a few months, when increase in energy price added more than one percentage point to the overall (year-on-year) inflation rate at EU level. On the other hand, in mid-2009 and in 2015 there were some months, when decrease in energy price resulted in a one percentage point lowering impact on the HICP at EU level.

Consequently, we can say that though energy prices follow closely the HICP consumer price index on longer term, they can significantly impact the evolution of year-on-year inflation rates, and in some short time periods the evolution of energy prices can explain a significant part of the actual inflation rate at EU level.

Figure 244 – **Impact of energy prices on the year-on year inflation rate in the EU**

Source: Eurostat
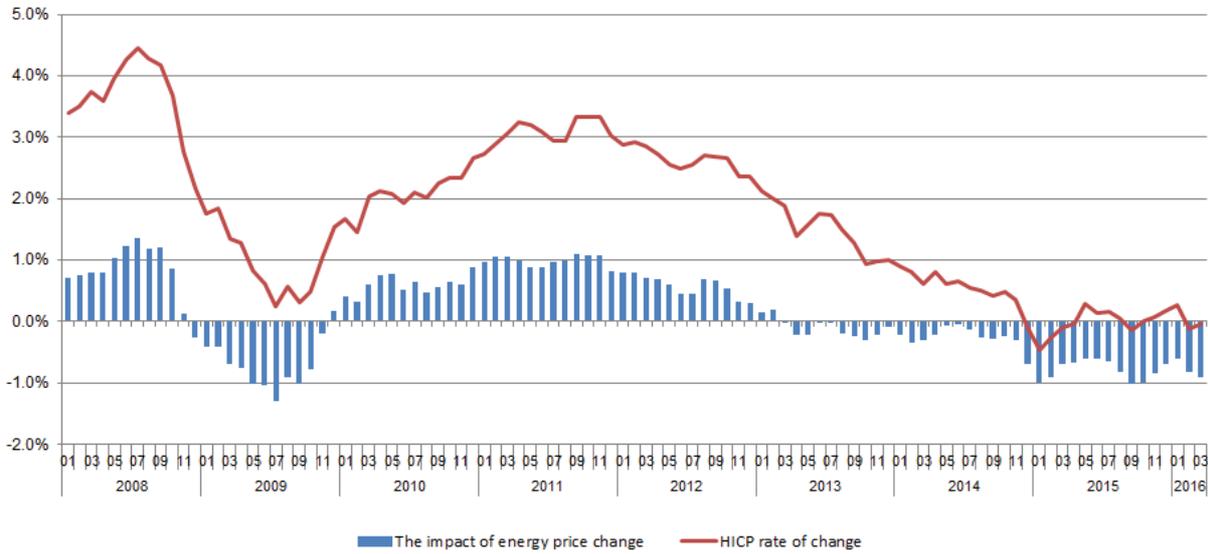
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PART 7/13

COMMISSION STAFF WORKING DOCUMENT
Accompanying the document

**REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE
COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE
COMMITTEE OF THE REGIONS**

Energy prices and costs in Europe

{COM(2016) 769 final}

EN **EN**

Contents

Annex 1 – Energy share of household expenditure[1] by income level in Member States

By income quintiles and EU Member States

Austria
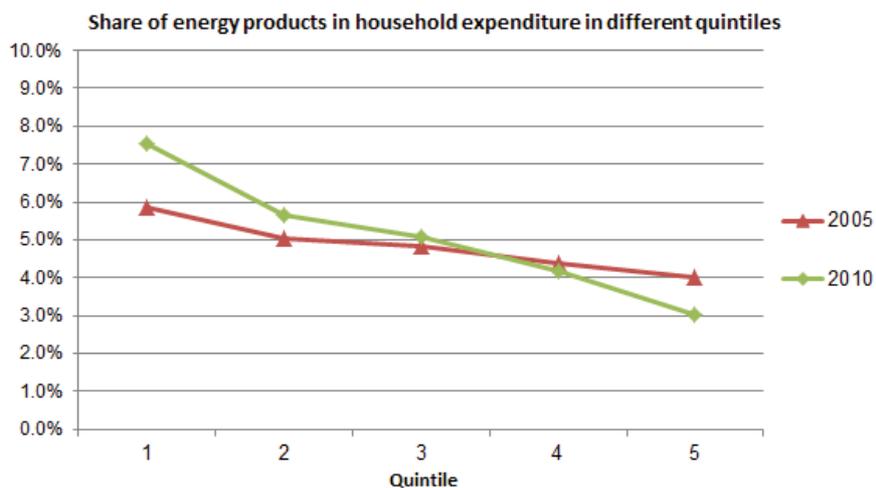
Belgium

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[1] Excluding energy expenditure on transport.

Bulgaria

Share of energy products in household expenditure in different quintiles

Cyprus

Share of energy products in household expenditure in different quintiles

Czech Republic

Share of energy products in household expenditure in different quintiles

Legend: 2004, 2009, 2014

Germany

Share of energy products in household expenditure in different quintiles

Legend: 2003, 2008, 2013

Denmark

Share of energy products in household expenditure in different quintiles

Estonia

Share of energy products in household expenditure in different quintiles

Spain

Share of energy products in household expenditure in different quintiles

Legend: 2004, 2009, 2014

Finland

Share of energy products in household expenditure in different quintiles

Legend: 2006, 2012

France

Share of energy products in household expenditure in different quintiles

Legend: 2001, 2006, 2011

Greece

Share of energy products in household expenditure in different quintiles

Legend: 2004, 2009, 2014

Croatia

Share of energy products in household expenditure in different quintiles

Legend: 2004, 2009, 2014

Hungary

Share of energy products in household expenditure in different quintiles

Legend: 2005, 2009, 2014

Ireland

Share of energy products in household expenditure in different quintiles

Italy

Share of energy products in household expenditure in different quintiles

Lithuania

Share of energy products in household expenditure in different quintiles

Luxembourg

Share of energy products in household expenditure in different quintiles

286

Latvia

Share of energy products in household expenditure in different quintiles

Malta

Share of energy products in household expenditure in different quintiles

Netherlands

Share of energy products in household expenditure in different quintiles

Poland

Share of energy products in household expenditure in different quintiles

Portugal

Share of energy products in household expenditure in different quintiles

Romania

Share of energy products in household expenditure in different quintiles

Sweden

Share of energy products in household expenditure in different quintiles

Slovenia

Share of energy products in household expenditure in different quintiles

Slovakia

Share of energy products in household expenditure in different quintiles

United Kingdom

Share of energy products in household expenditure in different quintiles

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Energy prices and costs in Europe

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Contents

Annex 2 – Summaries of sectorial case studies

2.1 Iron and Steel

Sources: Ecofys, CEPS et altri and JRC

EU28 is a net exporter of steel products to the United States and Turkey and a net importer of Chinese and Russian steel products. Until 2014 the EU28 were still net exporters of semi-finished and finished steel products. While long and flat products have been net-exported on average between 2008 and 2014, simple steel products like ingots and semis have been net-imported. Facing global overcapacities, pressure on the European steel industry, especially in the commodity steel sector, has risen. Countries like China, where the steel industry has been subsidised and overcapacities exist, enter the market with very low prices. The excess capacity and increased exports from third countries (notably from China) gave also rise to an unprecedented wave of unfair trading practices affecting the profitability of the EU's steel industry.

The JRC study shows that, concerning *the steel* industry, in almost all cases analysed, the country with the highest costs, Japan, is not far higher than the position of the EU, while Russia is one of the countries with the lowest costs. ***The variability in energy costs observed does not affect the production costs as much as the variability in other components of the costs***. For the products, both flat and long, and almost for all countries studied, the total cost in 2013 for the Electrical Arc Furnace (EAF) route (recycling route) was higher than for the Blast Furnace-Basic Oxygen Furnace (BF-BOF) route (integrated route). This is mainly due to the raw materials costs (scrap) rather than the energy costs.

The Ecofys study also provides a perspective of the energy costs related to other production costs in three EU Member States (Germany, Austria and Italy) which represent 48% of the EU total value added in the sector (Germany 31%, Italy 9%, Austria 8%).

Figure 245 – **Steel (NACE 2410) - Production cost structure (total goods & services, personnel costs, energy products), production value, and value added in Germany and Italy**

Germany (BOF)
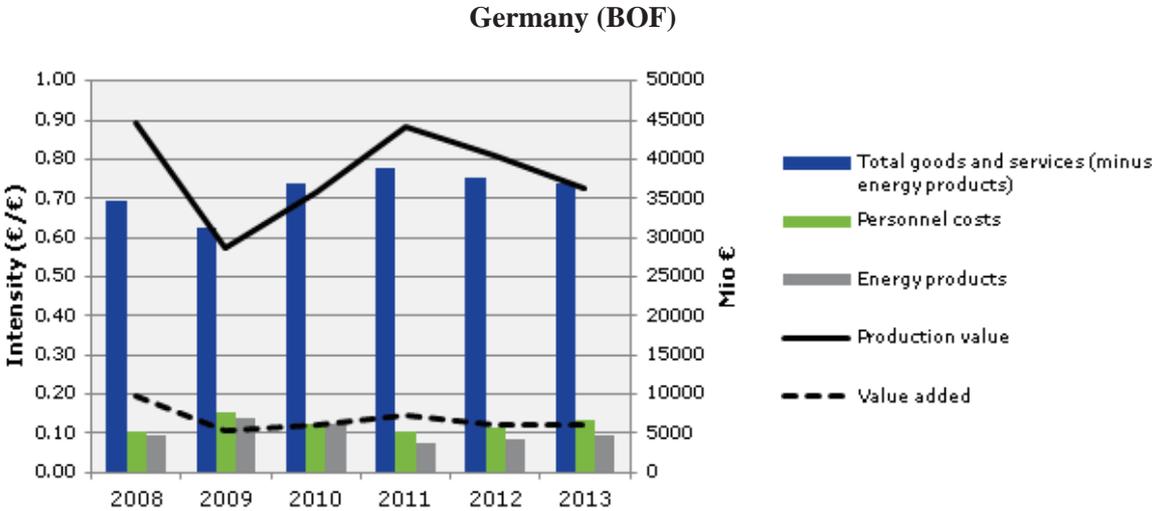
Italy (EAF)
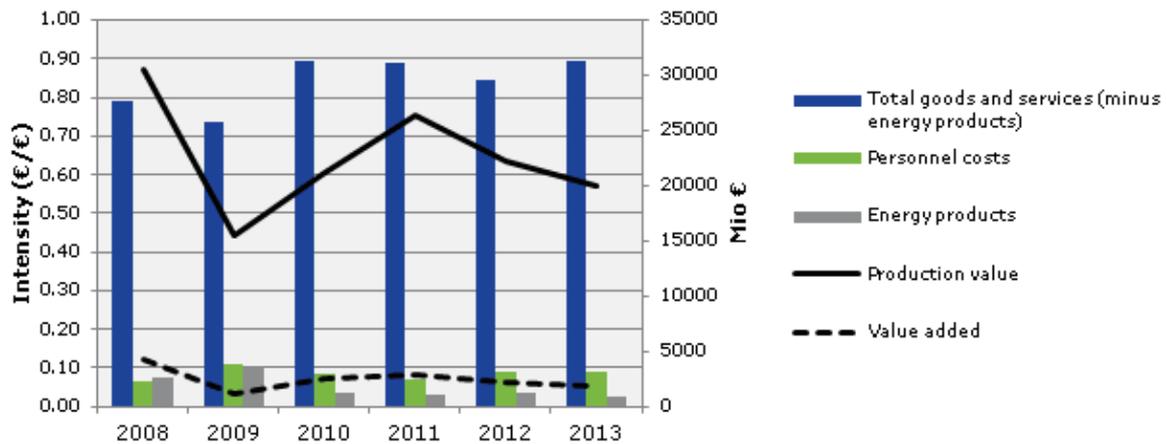
Source: Ecofys study, Eurostat SBS

Between 2008 and 2015 Germany has a higher intensity of energy product costs to production value (0.10 €/€ German average) than Italy (0.05 €/€). This difference is mainly due to the fact that Italy has a much higher share of the less energy intensive EAF-production route.

International price comparison in steel sector

The CEPS study et altri, makes an analysis of the international prices using the CRU database. In 2010, the EU producers paid less for their **natural gas** (26.89 €/MWh) than producers in Japan and South Korea, but significantly more than producers in the United States (12.99 €/MWh). By 2015, the EU prices decreased slightly by 3% to a level of 26.11 €/MWh. Natural gas prices in China increased significantly (54.59 €/MWh), making China the highest priced country in the international comparison conducted by the research team. Prices in the United States decreased by 16%, in contrast.

In 2010, the EU with €60.21/MWh had a lower **electricity price** than China (65.19 €/MWh) but higher than the United States (43.70 €/MWh) and South Korea (49.26 €/MWh). Producers in Turkey and Japan faced the highest electricity price with 92.62 €/MWh and 82.06 €/MWh, respectively. In 2015 the EU with 53.03 €/MWh saw a substantial decrease of prices. Japan (124.54 €/MWh) and China (90.39 €/MWh) displayed the highest prices among the surveyed countries. Prices in the United States (56.77 €/MWh) and South Korea (68.04 €/MWh) also showed a significant increase. Electricity prices in the EU and Turkey decreased the most by 12% and 15% respectively, whereas the prices in Japan (51.8%) and China (38.7%) increased the most.

Figure 246 – **Steel -Prices of natural gas - EU vs. international (€/MWh) 2010 - 2015**

	2010	2011	2012	2013	2014	2015
■ EU	26,89		33,16	31,38	28,71	26,11
■ China	26,76	35,54	34,85	37,47	48,71	54,59
■ Japan	35,29	48,44	53,00	48,21	57,12	39,70
■ India	4,05	9,79	9,97	9,11	10,62	11,12
■ United States	12,99	12,21	8,67	10,51	14,02	10,97
■ Russia	5,58	7,52	7,44	8,64	7,98	5,54
■ South Korea	27,55	35,44	40,27	38,91	44,95	29,33
■ Brazil	11,35	12,28	12,19	11,78	13,56	13,46
■ Turkey	20,29	15,67	14,30	14,84	12,95	13,97
■ Canada	18,73	17,47	14,34	14,67	17,62	9,00
■ South Africa	9,20	9,88	10,51	10,44	12,30	11,50
■ Australia	10,06	11,44	13,44	15,98	18,93	15,56

Source: CEPS et al. - elaboration based on CRU (2015)

Figure 247 **- Indexed prices of natural gas - EU vs. international 2010 - 2015 (2010=1)**

	2010	2011	2012	2013	2014	2015
◆ EU	1,00		1,23	1,17	1,07	0,97
■ China	1,00	1,33	1,30	1,40	1,82	2,04
▲ Japan	1,00	1,37	1,50	1,37	1,62	1,13
✕ India	1,00	2,42	2,46	2,25	2,62	2,75
✳ United States	1,00	0,94	0,67	0,81	1,08	0,84
● Russia	1,00	1,35	1,33	1,55	1,43	0,99
＋ South Korea	1,00	1,29	1,46	1,41	1,63	1,06
━ Brazil	1,00	1,08	1,07	1,04	1,19	1,19
━ Turkey	1,00	0,77	0,70	0,73	0,64	0,69
◆ Canada	1,00	0,93	0,77	0,78	0,94	0,48
■ South Africa	1,00	1,07	1,14	1,13	1,34	1,25
▲ Australia	1,00	1,14	1,34	1,59	1,88	1,55
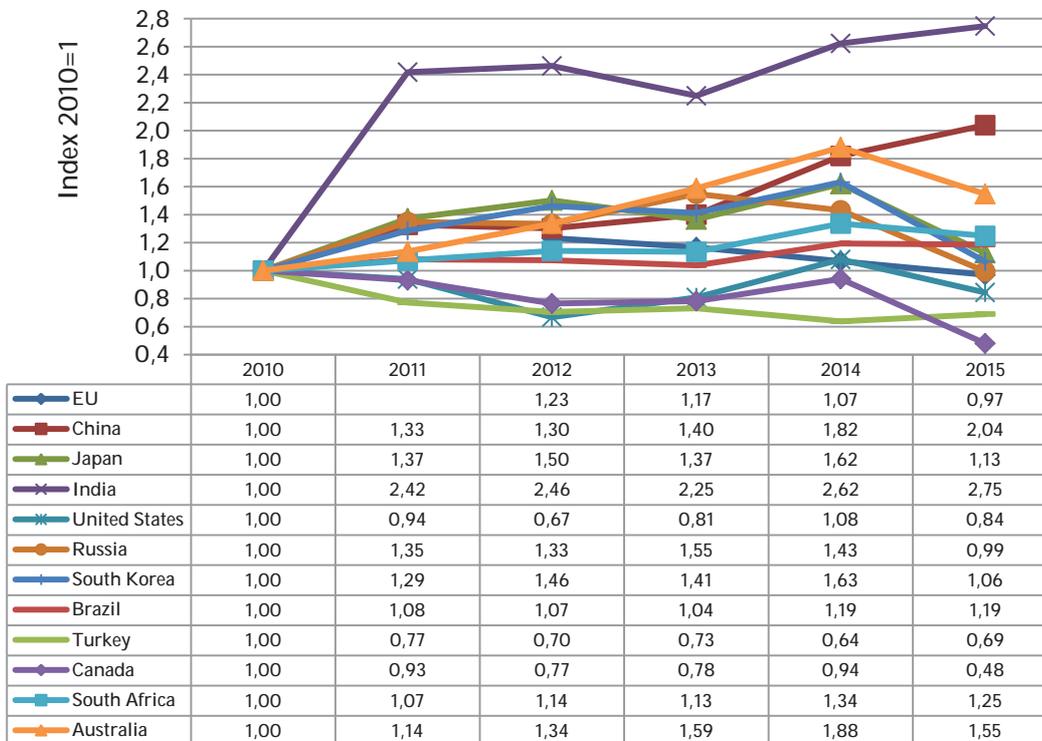
Source: CEPS et al. - elaboration based on CRU (2015)

Figure 248 – **Steel - Prices of electricity - EU vs. international (€/MWh) 2010 - 2015**

	2010	2011	2012	2013	2014	2015
■ EU	60,21		65,53	61,18	55,59	53,03
■ China	65,19	71,17	73,54	72,70	84,20	90,39
■ Japan	82,06	105,01	114,48	104,83	123,13	124,55
■ India	44,69	45,14	42,35	44,47	55,03	60,93
■ United States	43,70	46,40	44,90	44,00	51,90	56,77
■ Russia	34,19	48,13	51,87	50,35	51,43	38,14
■ South Korea	49,26	56,02	57,94	60,15	74,69	68,04
■ Brazil	75,52	87,71	78,99	60,55	71,56	77,49
■ Turkey	92,62	83,09	85,13	81,15	82,77	79,17
■ Canada	39,78	47,95	51,73	54,44	59,05	57,73
■ South Africa	33,45	43,38	44,04	38,53	41,86	38,26
■ Australia	37,44	46,57	50,40	51,87	49,87	48,83

Source: CEPS et al. - elaboration based on CRU (2015)

Figure 249 – **Steel - Indexed prices of electricity - EU vs. international 2010 - 2015**

	2010	2011	2012	2013	2014	2015
◆ EU	1,00		1,09	1,02	0,92	0,88
■ China	1,00	1,09	1,13	1,12	1,29	1,39
▲ Japan	1,00	1,28	1,40	1,28	1,50	1,52
✕ India	1,00	1,01	0,95	1,00	1,23	1,36
✱ United States	1,00	1,06	1,03	1,01	1,19	1,30
● Russia	1,00	1,41	1,52	1,47	1,50	1,12
╋ South Korea	1,00	1,14	1,18	1,22	1,52	1,38
▬ Brazil	1,00	1,16	1,05	0,80	0,95	1,03
▬ Turkey	1,00	0,90	0,92	0,88	0,89	0,85
◆ Canada	1,00	1,21	1,30	1,37	1,48	1,45
■ South Africa	1,00	1,30	1,32	1,15	1,25	1,14
▲ Australia	1,00	1,24	1,35	1,39	1,33	1,30
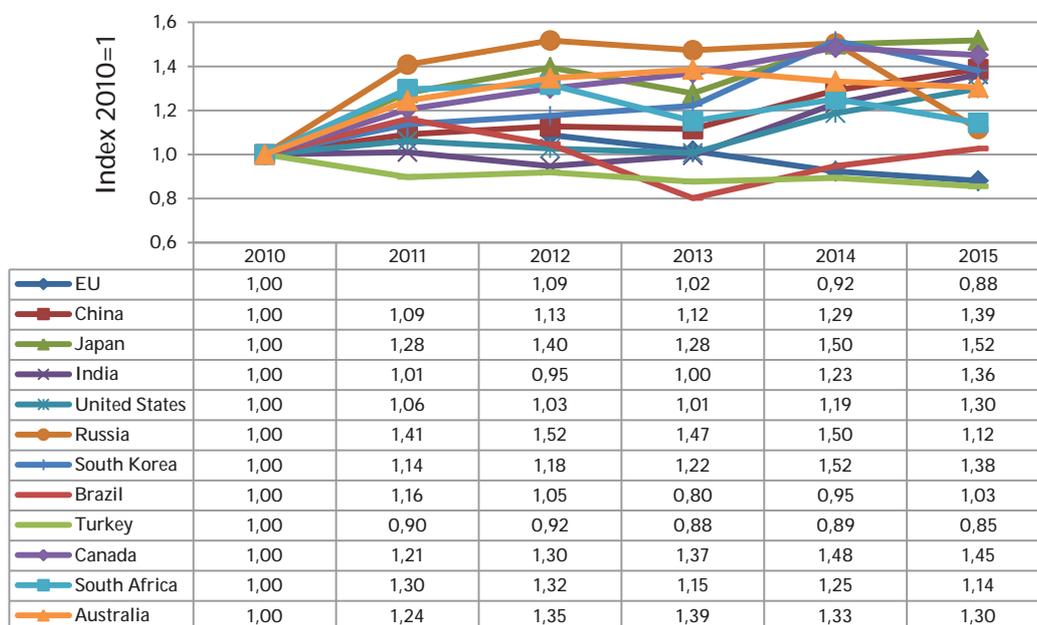
Source: CEPS et al. - elaboration based on CRU (2015)

Performance indicators and impact of energy costs in the steel sector

According to the CEPS study, both the turnover and production costs per tonne of output have steadily decreased over 2008-2015, in particular after 2012 This was associated with a significant

decrease profit margins. The share of EBITDA in turnover fell by two thirds between 2008 and 2015 (from 15.6% to 5.3%), despite a slight recovery since 2013,

No clear trends can be identified in the electricity cost share of production costs which ranged between 4.9% and 6.8% over the study period. The share of natural gas costs in production costs was for all years observed considerably lower than the share of electricity, and ranged between 2.5% (2015) and 3.6% (2010).

The share of regulated electricity costs in EBITDA shows an increasing trend from 2008 to 2015. Within the years 2012 to 2015, the share increased from 13.9% to 35.4%. The share of regulated natural gas costs in EBITDA from shows a less pronounced increase and is considerably lower.

Overall, the assessment by CEPS indicates the sensitivity of profitability to energy prices trends. Should energy prices reach 2012 levels again without having higher steel prices and thus turnover, European still plant might face further competitive issues.

Energy prices paid by the Steel industry

The CEPS et altri study reveals **t**hat **a**verage natural gas prices paid by respondent plants decreased in 2015 after peaking in 2012 (26.11 €/MWh and 33.16 €/MWh, respectively) and reached a level almost 9% below the 2008 average. No significant price differences could be identified between BOF and EAF plant sites. Yet, the spread between the minimum and maximum price observed remained high, in 2015 the maximum price paid was much higher than in 2008 and more than double the lowest one.

Table 26. Steel - Statistics for natural gas prices paid by sampled producers (€/MWh)

	2008	**2010**	**2012**	**2013**	**2014**	**2015**
Plant sites/total sample	14/22	16/22	20/22	20/22	20/22	17/22
EU (weighted average)	28.57	26.89	33.16	31.38	28.71	26.11
EU (median)	29.45	26.33	31.19	31.32	30.04	27.47
EU (relative standard deviation)	19.3%	16.0%	17.9%	16.8%	16.7%	21.4%
EU (IQR)	14.16	7.25	10.21	8.80	11.48	6.00
EU (minimum)	21.12	19.40	24.35	21.16	24.20	21.86
EU (maximum)	36.67	35.42	49.91	44.59	40.74	44.84
CEE EU (weighted average)	29.83	28.06	30.52	29.50	28.64	--
SE EU (weighted average)	--	--	--	--	--	--
NWE EU (weighted average)	27.09	25.50	34.04	32.11	27.78	26.92
BOF (weighted average)	31.08	29.24	31.52	30.55	28.52	27.13
EAF (weighted average)	26.48	24.84	34.23	31.98	28.86	25.51

Source: CEPS et al.

The *energy supply component* in 2015 fell by 24% and 13% compared to 2012 and 2008, respectively. *Network costs* remained mostly stable or slightly decreased while *Taxes and Levies* showed an increasing trend. Still both components represent a very low share of total price (together less than 10%).

Figure 250 – **Steel - Components of the natural gas bills paid by sampled producers in the EU (€/MWh), 2008-2015**

	EU average						North-Western Europe					
	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015
■ Other taxes, fees, levies and charges (excl. VAT)	0,20	0,09	0,47	0,45	0,49	0,46	0,34	0,16	0,54	0,50	0,59	0,52
■ Network costs	1,92	1,91	1,75	1,61	1,64	1,78	0,81	0,96	1,29	1,19	1,18	1,07
■ Energy supply costs	27,18	23,41	31,10	29,12	25,81	23,74	25,48	22,44	31,81	29,57	25,09	25,26
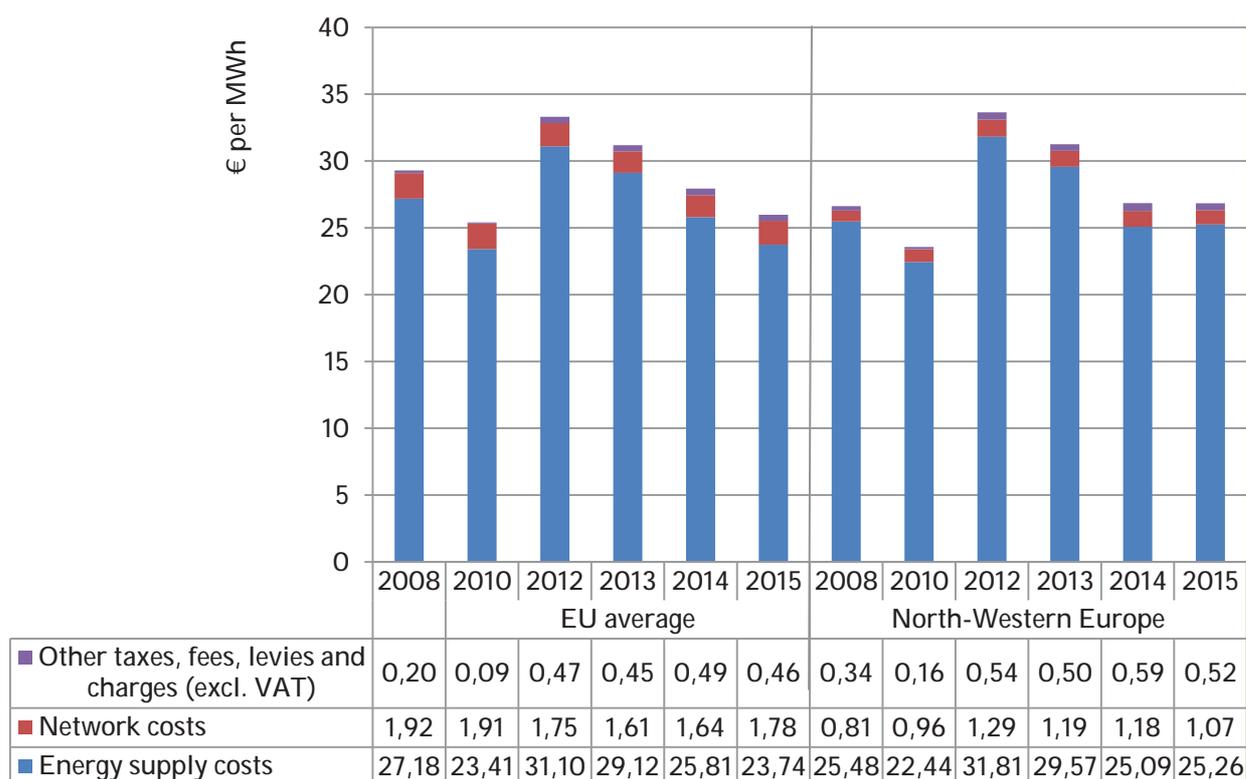
Source: CEPS et al.

Also average *electricity prices* decreased between 2012 and 2015 (from 65.5 €/MWh to 53 €/MWh, 8% down from the 57.7 €/MWh calculated for 2008. The spread between minimum and maximum price paid in 2015 remained significant, with the latter being almost three times higher than the former and also higher than in 2008.

Table 27. Steel - Statistics for electricity prices paid by sampled producers (€/MWh)

	2008	**2010**	**2012**	**2013**	**2014**	**2015**
Plant sites/total sample	15/22	18/22	22/22	22/22	22/22	18/22
EU (weighted average)	57.65	60.21	65.53	61.18	55.59	53.03
EU (median)	57.30	62.58	62.82	59.48	56.10	53.87
EU (relative standard deviation)	30.4%	21.4%	29.3%	34.5%	27.7%	33.0%
EU (IQR)	39.86	21.90	36.34	30.50	17.73	22.59
EU (minimum)	33.60	42.17	41.24	42.63	33.63	33.42
EU (maximum)	92.27	89.55	111.95	122.80	100.43	101.73
CEE EU (weighted average)	84.75	72.43	86.58	70.16	68.80	--
SE EU (weighted average)	--	--	--	--	--	--
NWE EU (weighted average)	50.47	55.68	58.57	58.13	50.51	49.83
BOF (weighted average)	56.02	62.71	72.86	59.45	56.33	52.12
EAF (weighted average)	58.55	57.35	60.12	62.46	55.03	53.55

Source: CEPS et al.

In terms of components, the energy supply component fell by 19% and 12% compared to 2012 and 2008, respectively. While network costs remained fairly stable, taxes and levies showed a significant percentage increase (more than four times 2008 levels) representing in 2015 6.5% of total price versus

1.2% in 2008. RES support also increased and almost doubled compared to 2008 but still representing less than 3% of total price.

Figure 251 – **Steel - Components of the electricity bills paid by sampled producers in the EU (€/MWh), 2008-2015**

	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015
	EU average						North-Western Europe					
■ Other taxes, fees, levies and charges (excl. VAT)	0,63	1,60	2,82	3,05	3,19	3,43	0,30	0,93	1,51	1,46	1,48	1,63
■ Renewable support	0,83	1,01	1,71	1,92	1,20	1,47	0,95	1,14	1,85	2,09	1,31	1,62
■ Network costs	6,16	6,41	6,96	7,92	7,45	6,63	4,36	4,94	5,60	6,39	6,12	5,88
■ Energy supply costs	46,84	49,57	51,10	49,68	42,80	41,26	43,03	48,56	49,48	48,19	41,42	40,55
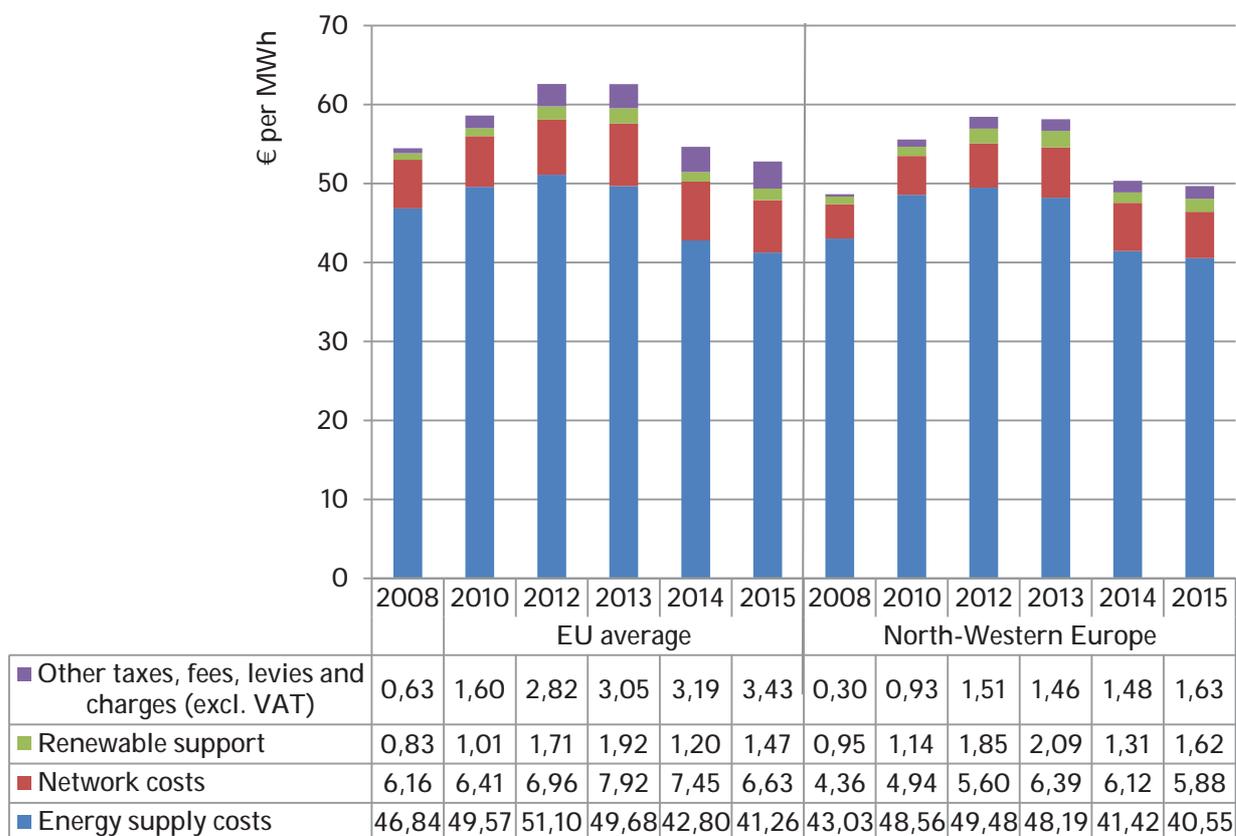
Source: CEPS et al.

Figure 252 – **Steel - Components of the electricity bills paid by sampled producers in the EU (%), 2008 - 2015**

	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015
	EU average						North-Western Europe					
■ Other taxes, fees, levies and charges (excl. VAT)	1,2%	2,7%	4,5%	4,9%	5,8%	6,5%	0,5%	1,7%	2,6%	2,5%	2,9%	3,3%
■ Renewable support	1,5%	1,7%	2,7%	3,1%	2,2%	2,8%	2,0%	2,0%	3,2%	3,6%	2,6%	3,3%
■ Network costs	11,3%	10,9%	11,1%	12,7%	13,6%	12,6%	9,0%	8,9%	9,6%	11,0%	12,2%	11,8%
■ Energy supply costs	86,0%	84,6%	81,6%	79,4%	78,3%	78,2%	88,5%	87,4%	84,7%	82,9%	82,3%	81,6%

Source: CEPS et al.
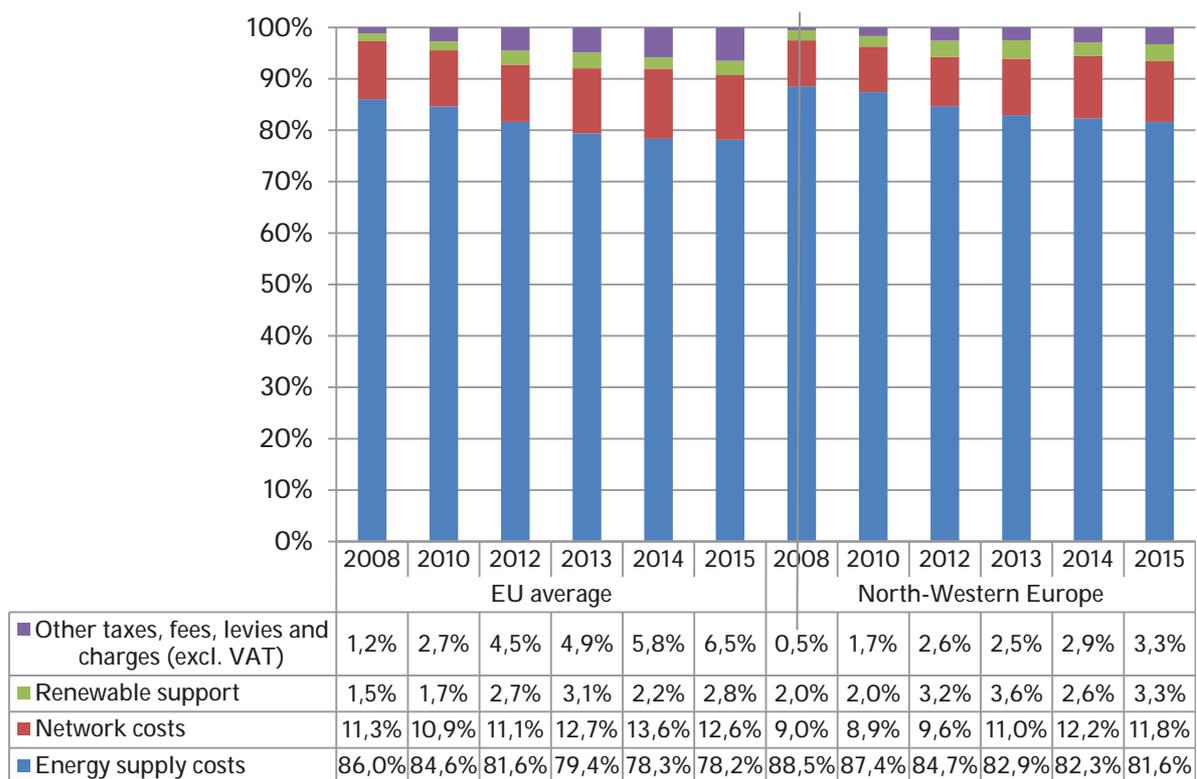
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REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE
COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE
COMMITTEE OF THE REGIONS

Energy prices and costs in Europe

{COM(2016) 769 final}

Contents

2.2 Paper

Source: Ecofys study

Europe produces roughly a quarter of worldwide paper and paperboard. The competitiveness position is different for different types of paper (paper grades). So far, the European paper industry has succeeded to be among the technological leaders which helped to maintain competitiveness with other regions of the world, despite comparably high production costs (JRC 2015)[1]. Beyond that consumption trends are different across paper grades by various reasons (e.g. graphic papers' consumption is declining replaced by electronic publications; while papers for packaging and hygienic grades are growing due to internet-based trade and demographics). Major actors in global competition come from Russia, China and other regions. These have invested substantially in new capacities and are playing an increasing role in reshaping raw material supply and demand for both wood and pulp. This is particularly true for China, where around 50 % of the total new capacities over the last five years has been built and were mills reportedly benefitted from subsidised energy prices.

The Ecofys study looks at the ***Paper making (NACE Rev 2 C1712)*** in three Member States which represent 53% of the EU added value in this sector (Germany (22%), Finland (16%), Sweden (15%)).The high level of aggregation studied does not allow taking into account the wide variation in cost structures (raw materials, energy and other costs) across different types of paper (grades) and countries[2]..

As regards the relevance of **energy costs** in the production value, it can be observed that in Sweden and in Germany, energy purchases are roughly 0.12€/€ of production value. In Sweden this value has been decreasing slightly to ca. 0.10€/€ over the past years. In Finland, energy purchases make up only around 0.08€/€ of production value. The different cost structure of the three focus countries is likely rooted in differences in energy inputs used (**Figure 202**), product portfolio and industry structure. In the Nordic countries, fine paper mills have often been built adjacent to pulp mills (JRC 2015) which allows synergies e.g. through the use of pulping residues (black liquors) as a fuel for processing energy, for example, for drying paper. For Sweden 60% of the energy used in papermaking is mainly from biomass (for Finland no data was available).

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[1] Best Available Techniques (BAT) Reference Document for the Production of Pulp, Paper and Board – linked to the Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control) - JRC Science and Policy reports

[2] E.g. Important paper producers like France, Spain, Portugal are not covered by the Ecofys study.

Figure 253 - **Paper and paperboard (NACE Rev. 2 1712)[3] - Production cost structure, production value and value added for Germany, Finland and Sweden**
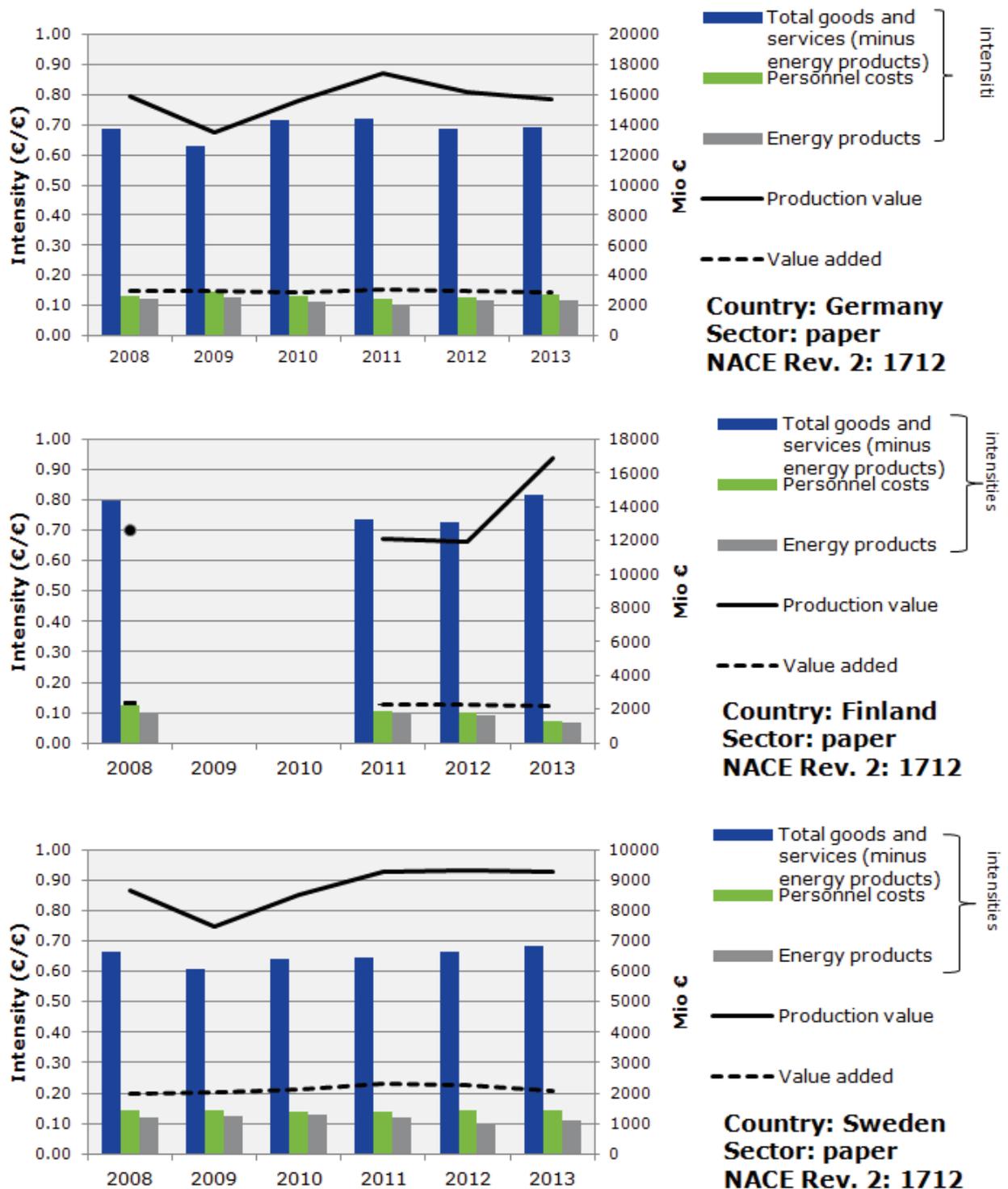
Source: Ecofys study, Eurostat

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[3] Ecofys study provides averages for all paper grades

The Ecofys study also provides international price comparisons on the basis of IEA data and prices estimated for the industry in the concerned EU Member States.

For gas prices, the data indicate that Russia and the USA have an advantage. However, that price gap might not be as important as the graph indicates. The annual report from Smurfit Kappa for the year 2015 indicates that realised prices of the European Paper industry may be lower than the one estimated by Ecofys: the reports states 22.8 €/MWh as peak price and give 17.5 €/MWh as the price for natural gas at the end of 2015 (Smurfit Kappa 2016)[4].

As to electricity prices, China and Brazil industry prices seem to be rather high prices compared to the prices paid by industry in the EU. However, it is not clear whether paper making firms actually pay these prices. Similar to European countries, tax/price reductions may apply that lead to lower prices for paper mills. For example in China, subsidized prices are discussed as one reason for the existing overcapacities (EUCCC 2016)

Figure 254 -– Paper and Board - Electricity and gas prices in selected European countries and industrial electricity and gas prices for selected G20 countries[5]
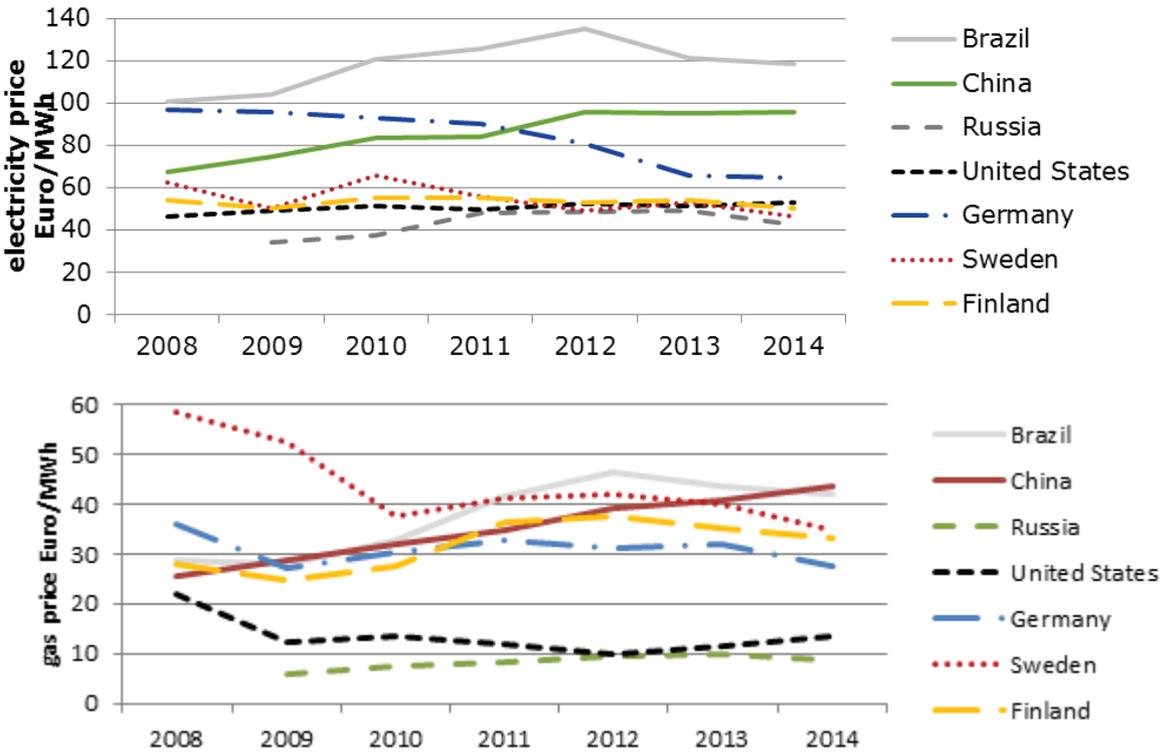
Source: Ecofys study

2.3 Non-ferrous metals and Aluminium-

Non-ferrous metals and Aluminium includes sectors with relatively healthy competitive situations like copper or zinc and other sectors, like primary aluminium, suffering from international competitive pressure.

Copper (source JRC study)

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[4] These prices might not be representative for the whole paper industry as the Smurfit Kappa Group mostly deals with (high-bulk, low-value) packaging papers, often made from recycled fibres which generally require a lower energy input than more refined paper grades made from fresh wood, especially those made in non-integrated mills.

[5] In many cases, e.g. integrated pulp & paper mills, much of the electricity is generated on site by burning wood waste and/or pulping residues (e.g. black liquors). This makes price comparisons difficult.

The JRC indicates that productivity of the EU **copper** industry is one of the highest in the world. In the case of copper smelters, the EU has similar production costs to South American countries which are the leaders in producing copper, because of their proximity to raw materials. China has low labour costs which reduces overall costs. In the case of copper refineries, the EU has among the lowest production costs. The higher recycling rate is an advantage for the EU as copper anodes can be produced by either the primary or the secondary route and be processed in the same copper refineries. The EU copper industry has the lowest treatment and refining charges compared to the rest of the countries studied. Based on a rough estimation of the copper concentrates price, the sum of EU copper concentrates costs and treatment and refining charges was about 10 % lower than the average copper price in the London Exchange Market in 2013

Zinc (source JRC study)

The JRC study EU *zinc* smelters have some of the lowest total average production costs among the countries studied. EU zinc smelters also have one of the highest productivities. European (EU and Norway) treatment charges are the second lowest of the analysed countries. The sum of zinc concentrates (roughly estimated) and treatment costs in the EU was about 16 % lower than the average zinc price in the London Exchange Market in 2013:

Aluminium *(mainly Primary Aluminium (sources: Ecofys, JRC and CEPS et altri studies)*

Primary aluminium is globally traded (London Metal Exchange) and consequently subject to high international competition. A large share of primary aluminium is imported to Europe. For the aggregate of primary aluminium production and aluminium products Europe's major trading partners are Russia, the United States, Turkey and China[6].

The JRC estimated that the average *production costs* for the EU for *primary aluminium* in 2012 and 2013 are lower than the aluminium prices those years (10% and 7% lower, respectively). However, it should be noted that capital costs are excluded from the analysis. In the EU, the presence of some long term energy contracts makes that some producers have similar production costs to Norwegian, Icelandic and some Russian competitors. Low electricity prices in Iceland, Norway and Russia, due to hydroelectric power, explain much of their cost advantage compared to the production costs in the EU, where energy costs account for around 40% of total production costs. These low power prices also reduce the estimated average production costs. Chinese producers' production costs are the highest (to a great extent due to higher energy costs) but they operate in markets dominated by state intervention.

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[6] Europe is a net importer especially of Russian and Turkish aluminium products while the United States, Saudi Arabia, Mexico and South Korea are the net importers of European aluminium products.

Figure 255 – **Primary Aluminium - Summary of total production costs per tonne of cast aluminium in 2012 and 2013**
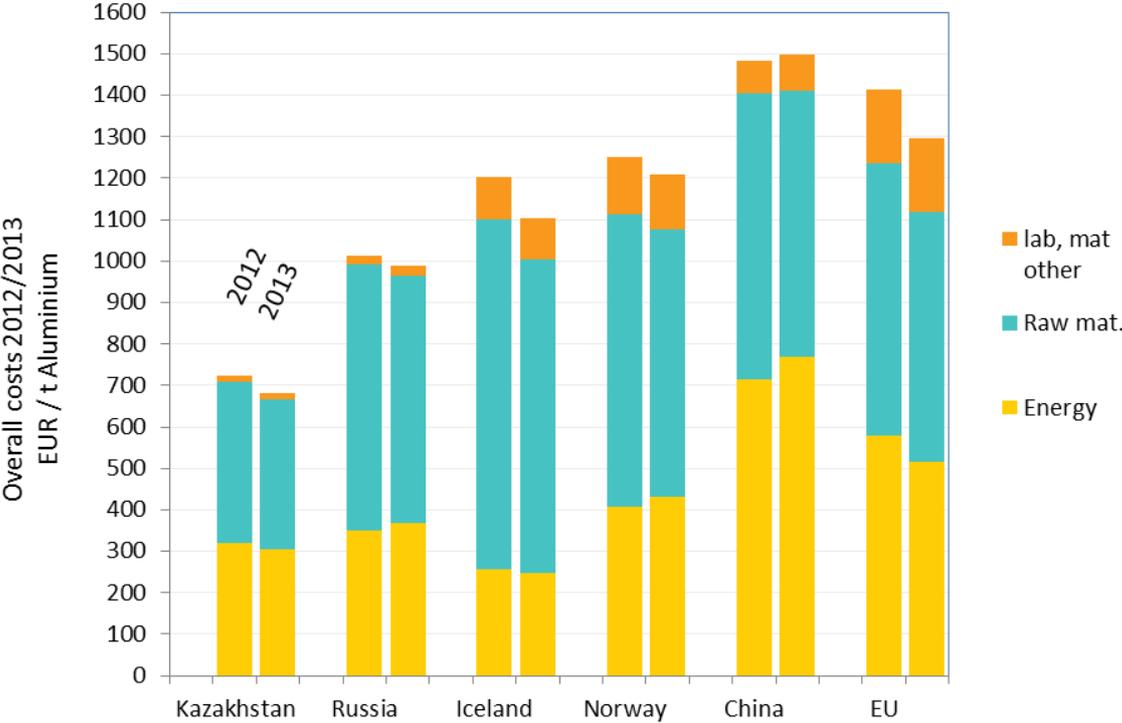
Source: JRC study

Energy includes electricity, natural gas, coke and coal

Capital costs (depreciation) not included

The Ecofys study looked at the **production cost structure** of the industry in three Member States which represent 51% of the European added value in the sector: Germany (34%) Greece (9%) and France (8%) Comparing the German, Greek and French (major value added contributors of the EU28) production cost structure shows that, between 2008 and 2015, Greece has an average of approximately 0.16 €/€ by product costs to production value which is significantly higher than in Germany (0.06 €/€) and France (0.05 €/€). Similar to the steel industry these intensities do reflect a country's specialisation.[7]

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[7] The underlying NACE class 2442 for the analysis includes several products among them semi-finished products as well as both primary and secondary alloyed aluminium (usually delivered as bulk as well). Alloyed aluminium up to customer requests usually creates a higher value added which may contribute to lower intensities e.g. in Germany and higher cost intensity in Greece with little downstream activity.

Figure 256 – **Aluminium (NACE 2442)- Production cost structure (total goods & services[8], personnel costs, energy products), production value and value added in Germany, Greece and France**

Germany

Greece

France
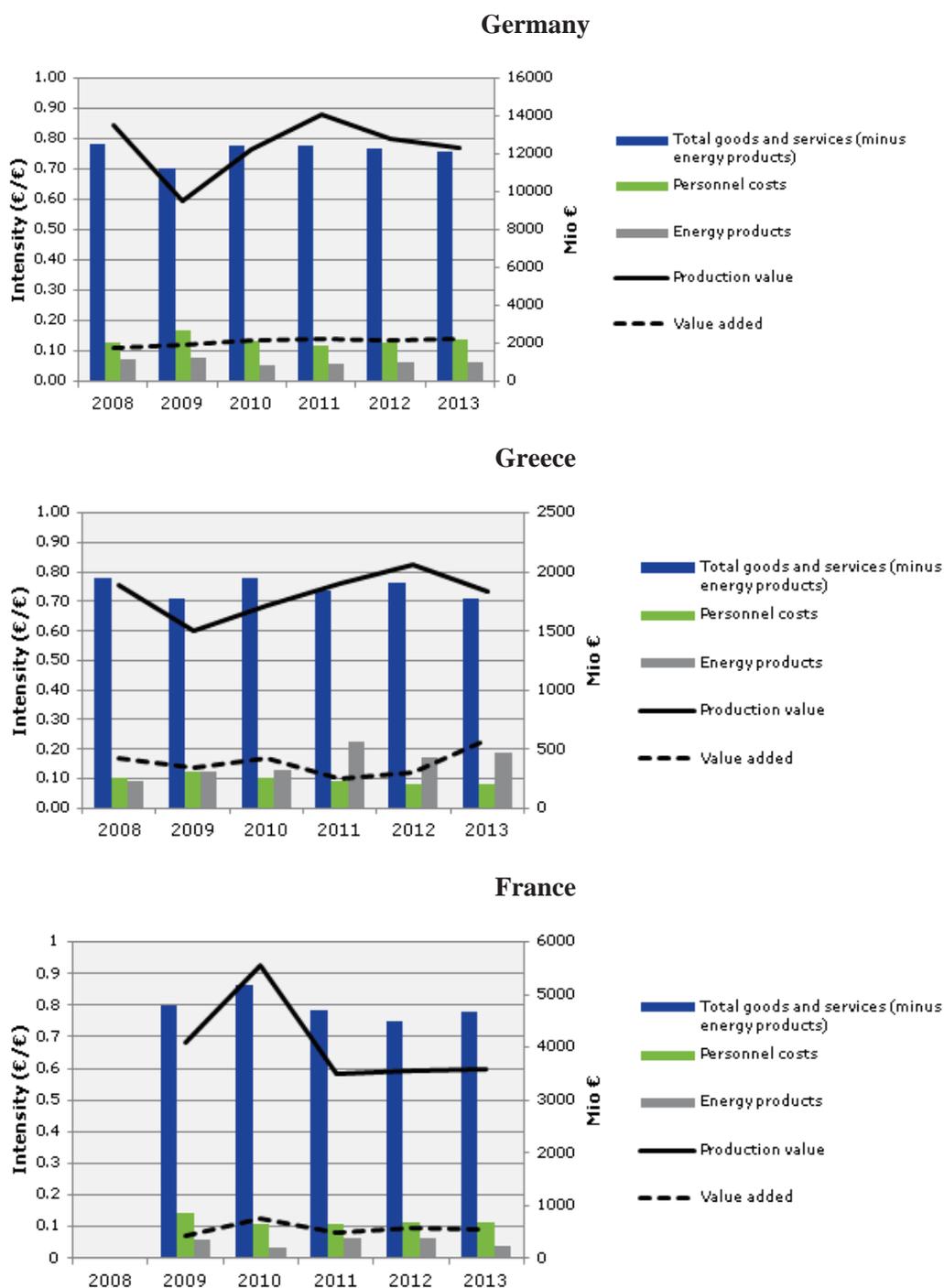
Source: Ecofys study, Eurostat SBS

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[8] Total goods and services have been calculated from Eurostat data. Eurostat total purchases of goods and services and contain by definition also energy purchases. To avoid double counting purchases of energy products in value were subtracted from total purchases of goods and services**.**

Energy prices paid by the Aluminium industry

The CEPS case study looked at the prices paid by **primary aluminium** as well as **aluminium recyclers and downstream products** [9].

That study indicates that average *electricity prices* for **primary aluminium** in 2015 (40 €/MWh) were higher than in 2008 (35 €/MWh) but 9% lower than the peak level reached in 2012. Yet the spread between minimum and maximum price paid increased over the entire period, with the latter being almost 2.5times higher (66 versus 26€/MWh).

The share of non-energy components in the electricity price (network costs, taxes and levies, RES support) remained stable between 10-13% from 2012 to 2015.

The assessment of energy price components – limited to the period 2012-2015 – indicates a clear reduction in absolute value of the energy supply component (from 44.8 €/MWh to around 31 €/MWh).

Other non-energy components (network costs, taxes and levies, RES support) altogether accounted for about 13% of the price in 2015, compared to 10% in 2012. The increase is mainly linked to increasing network costs while RES support, resulted in 2015 one third lower than in 2012, although they had a sudden peak in 2013.

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[9] The primary aluminium subsectors and the recyclers and downstream subsector have different products with very different production processes. The grouping in the CEPS study of **recyclers and downstream** products does not represent an ideal solution from an industrial perspective because of the very high variability still associated with activities covered (in terms of size, product, technology and geographic location) but it was found necessary in order to ensure a sufficient sample size and the possibility to present results in the respect of confidentiality concerns.

Table 28. Primary Aluminium - Descriptive statistics for electricity prices paid by sampled producers (€/MWh)

	2008	2010	2012	2013	2014	2015
Number of respondents	8	8	9	9	10	10
EU - Weighted Average (consumption)	34.97	35.93	43.38	40.24	38.35	39.62
EU - Weighted Average (production)	35.77	35.87	44.52	42.35	39.93	40.08
EU - Median	32.2	38.8	40.2	36.3	34.0	40.4
EU - Inter-Quartile Range	6.8	8.7	16.4	19.1	11.8	17.5
EU - Minimum	26.27	25.6	26.24	26.35	25.78	25.64
EU - Maximum	52.2	47.4	61.1	62.9	59.8	61.5
EU - Relative Standard Deviation (weighted average, consumption)	24.39%	19.61%	26.89%	34.93%	28.97%	30.78%
EU - Relative Standard Deviation (weighted average, production)	23.84%	19.65%	26.20%	33.19%	27.82%	30.43%

Source: CEPS et al.

Figure 257 – **Primary Aluminium - Components of the electricity bills paid by sampled producers in the EU (€), 2012 - 2015, annual averages, weighted by consumption**

	2012	2013	2014	2015
Other taxes, fees, levies and charges (excl. VAT)	0,73	0,56	0,29	0,25
Renewable support	2,60	3,69	1,92	1,63
Network costs	1,70	1,41	1,84	2,27
Energy supply costs	44,78	38,45	31,15	30,66
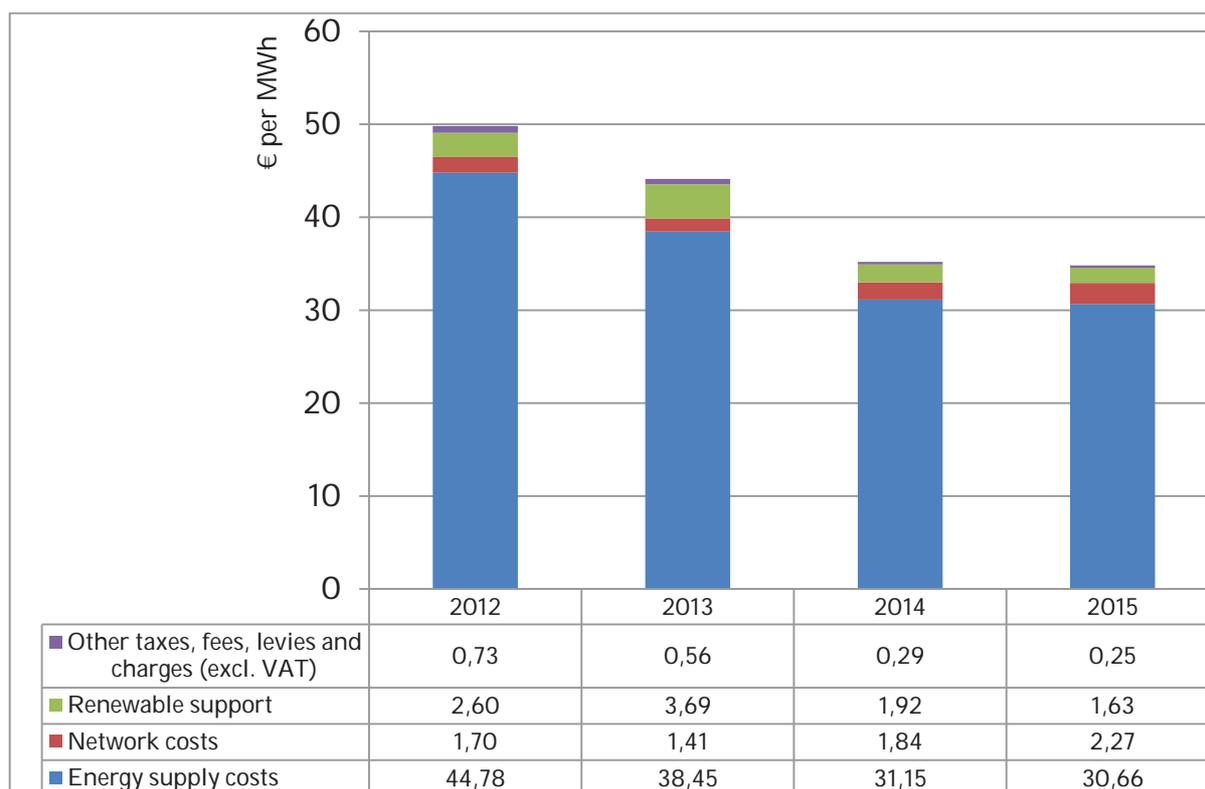
Source: *CEPS et al.*

Figure 258 – **Primary Aluminium - Components of the electricity bills paid by sampled producers in the EU (%), 2012 - 2015, annual averages, weighted by consumption**

	2012	2013	2014	2015
■ Other taxes, fees, levies and charges (excl. VAT)	1,5%	1,3%	0,8%	0,7%
■ Renewable support	5,2%	8,4%	5,5%	4,7%
■ Network costs	3,4%	3,2%	5,2%	6,5%
■ Energy supply costs	89,9%	87,2%	88,5%	88,1%
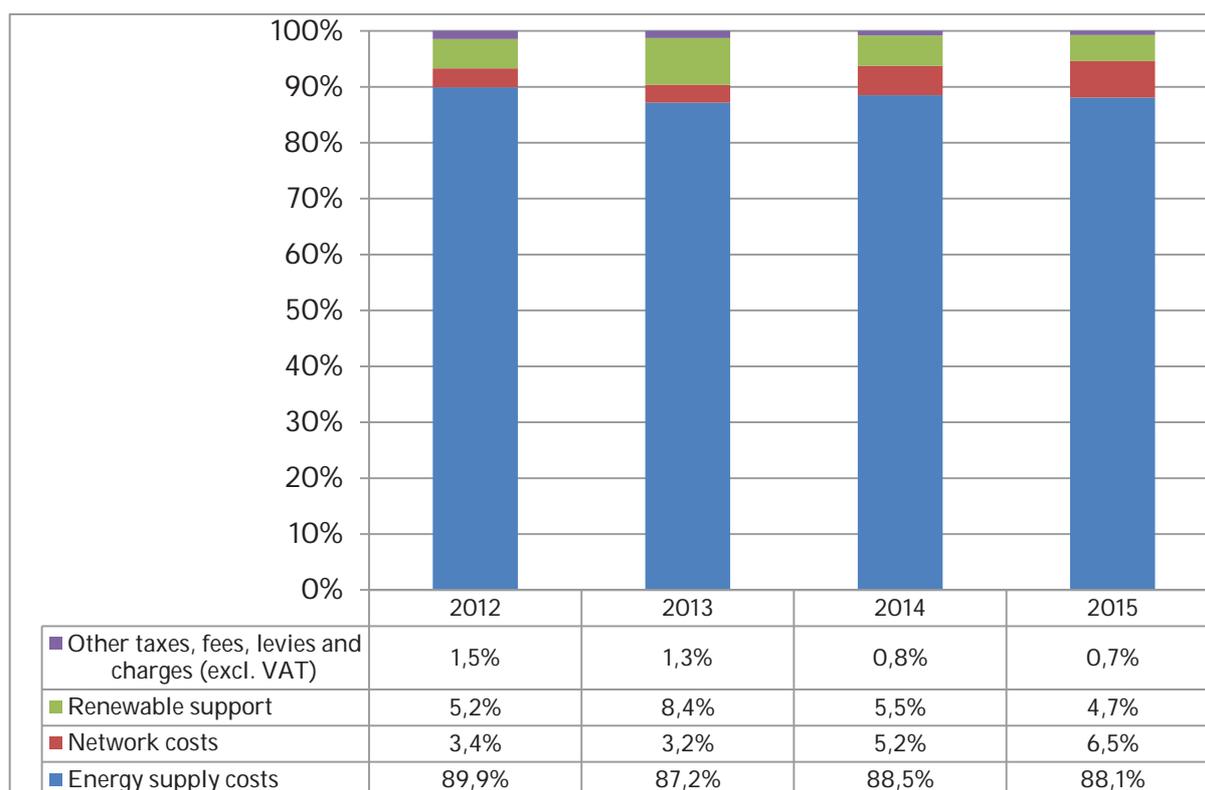
Source: *CEPS et al.*

The CEPS study also assessed recent trends in natural gas price paid by primary aluminium producers, although with a lower coverage in terms of respondents to the questionnaire, due to the fact that natural gas represents a less important energy carriers compared to electricity. Yet, available results indicate a stable to decreasing average price in 2015 compared to 2008, after a peak in 2012.

For **recyclers and downstream producers**, average electricity prices remain relatively stable over the period 2008-2015 (at around 62 €/MWh). However, the average calculated hides very high spreads (median price in 2015 was 104 €/MWh) due to the large variety of different activities included together in the sample (e.g. products, technologies, consumption levels)

Table 29. Recycling and downstream aluminium - Statistics for electricity prices paid by sampled producers (€/MWh)

	2008	2010	2012	2013	2014	2015
Number of respondents	12	15	15	14	15	15
EU - Weighted Average (consumption)	62.36	62.76	66.45	65.77	65.23	62.77
EU - Median	79.98	84.93	93.82	102.09	101.00	104.06
EU - Inter-Quartile Range	27.50	37.35	46.56	51.87	53.82	64.49
EU - Minimum	41.21	42.12	50.84	50.58	52.15	50.52
EU - Maximum	127.73	125.93	161.64	149.75	152.39	145.47
EU - Relative Standard Deviation (weighted average, consumption)	41.02%	41.61%	49.55%	49.79%	51.26%	55.37%

Source: CEPS et al.

Compared to primary aluminium, the non-energy components of the price paid by **aluminium recyclers and downstream producers** show a more pronounced increase both in absolute terms and as a share of total price (more than 30% in 2015 versus 15% in 2008). The energy supply component decreased on average from 51 €/MWh in 2008 to 42€/MWh in 2015.

This supports the consideration that primary smelters were to a larger degree exempted from network costs and renewable support measures compared to recyclers and downstream producers.

At the same time, the interpretation of results for recyclers and downstream producers must consider the high heterogeneity of products and process covered, which is also reflected by the considerable spread between the minimum and maximum price observed (146 €/MWh and 51 €/MWh, respectively in 2015).

Figure 259 – **Recycling and downstream aluminium - Components of the electricity bills paid by sampled producers in the EU (€), 2008-2015, annual averages, weighted by consumption**

	2008	2010	2012	2013	2014	2015
▪ Other taxes, fees, levies and charges (excl. VAT)	0,84	2,52	3,13	3,79	3,06	3,06
▪ Renewable support	1,91	1,44	3,32	4,02	5,42	6,50
▪ Network costs	5,77	6,37	7,64	8,97	9,01	9,60
▪ Energy supply costs	50,99	52,21	51,58	48,27	46,54	42,10
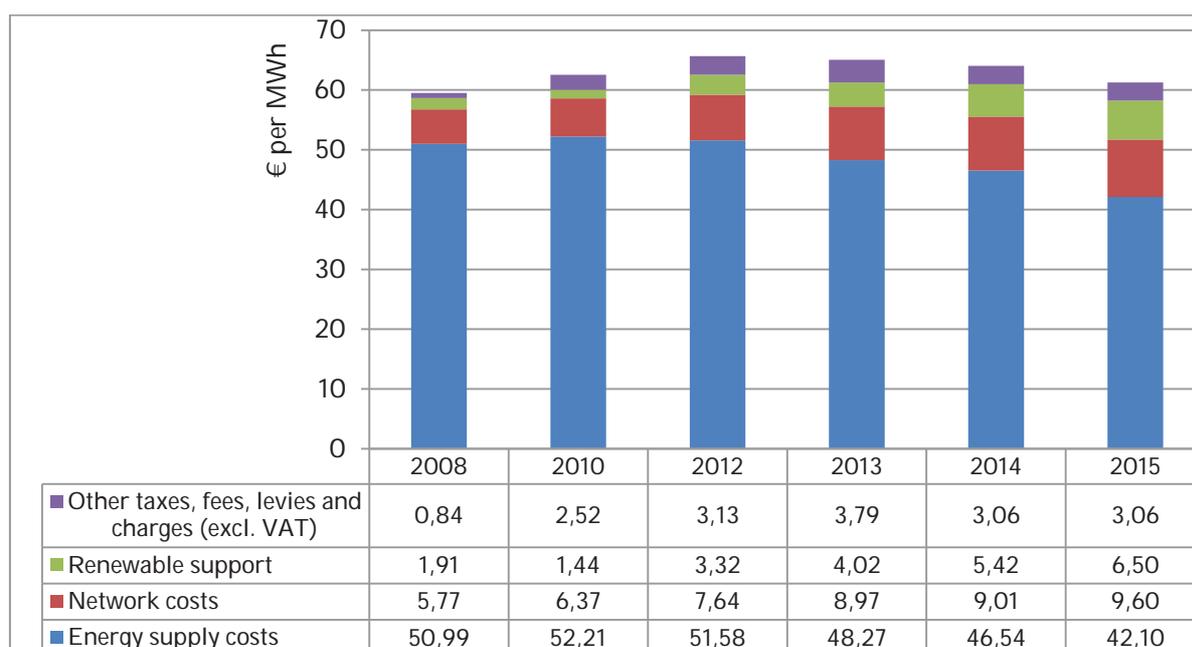
Source: CEPS et al, authors' own elaboration.

Figure 260 - **Recycling and downstream aluminium - Components of the electricity bills paid by sampled producers in the EU (%), 2008-2015, annual averages, weighted by consumption**

	2008	2010	2012	2013	2014	2015
■ Other taxes, fees, levies and charges (excl. VAT)	1,4%	4,0%	4,8%	5,8%	4,8%	5,0%
■ Renewable support	3,2%	2,3%	5,1%	6,2%	8,5%	10,6%
■ Network costs	9,7%	10,2%	11,6%	13,8%	14,1%	15,7%
■ Energy supply costs	85,7%	83,5%	78,5%	74,2%	72,7%	68,7%
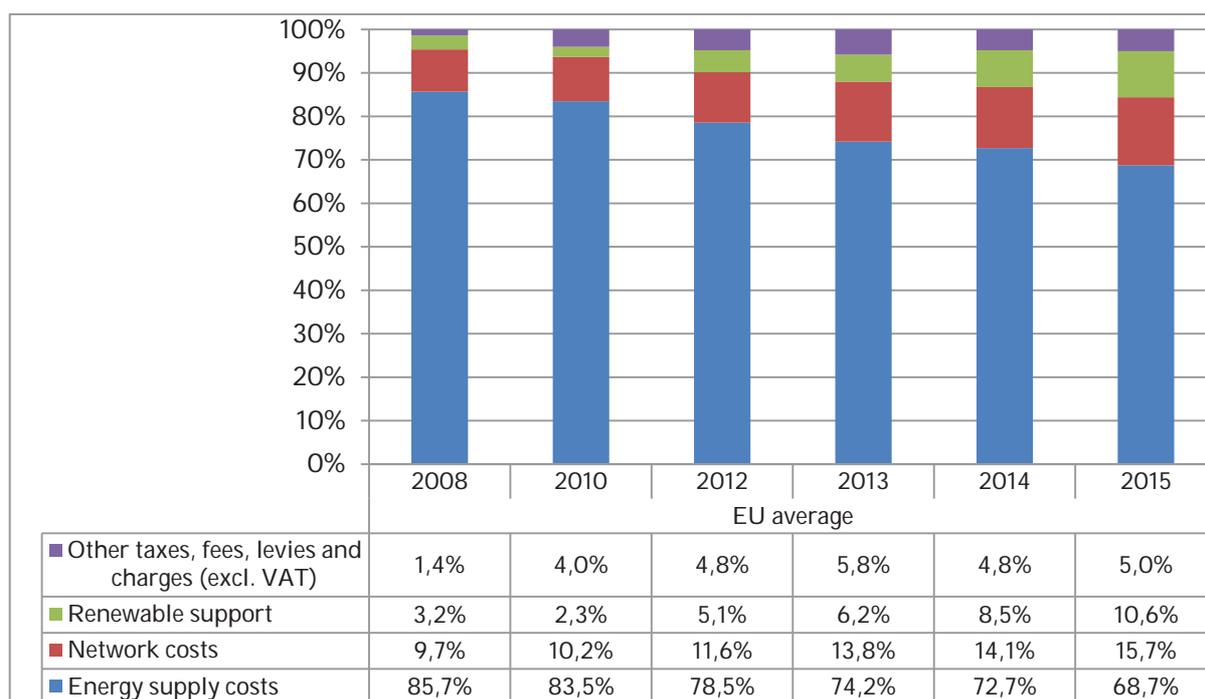
Source: CEPS et altri, authors' own elaboration

Natural gas prices for recyclers and downstream producers also increased from 27.8€/MWh in 2008 up to 31.9 €/MWh in 2013 and then decreased to 26.4 €/MWh in 2015.

Over the period the energy supply component maintained its relevance and in 2015 it accounted for 88% of total natural gas price paid by surveyed recyclers and down-stream producers.

Table 30. Recycling and downstream aluminium - Statistics for natural gas prices paid by sampled producers (€/MWh)

	2008	**2010**	**2012**	**2013**	**2014**	**2015**
Number of respondents	12	13	13	13	13	13
EU - Weighted Average (consumption)	27.75	22.38	28.52	31.89	28.20	26.38
EU - Median	28.55	23.74	30.99	31.50	28.99	28.73
EU - Inter-Quartile Range	10.27	7.65	9.33	7.45	7.91	6.55
EU - Minimum	20.59	15.10	20.51	20.05	22.61	22.23
EU - Maximum	35.31	35.73	38.62	40.81	44.95	44.00
EU - Standard Deviation (weighted average, consumption)	35.41%	29.75%	19.09%	16.52%	21.00%	22.91%

Source: CEPS et al.

As for steel, CEPS et altri compared recent trends in international energy prices for primary aluminium producers, integrating direct evidence collected via questionnaires with data gathered from the CRU database[10].

Differences in electricity prices paid by primary aluminium producers across the world are stark. EU producers in 2015 paid significantly more (42 €/MWh – simple average) than producers in some other regions such as Canada (13€/MWh), CIS (23€/MWh), Nordic region

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[10] The CRU database takes into account the impact of exchange rates when compiling international data.

(Norway and Iceland - 24€/MWh), the US (31€/MWh) and the Middle East (37€/MWh). While Nordic countries (Iceland and Norway) and Canada are characterised by significant hydro-electric power plants that are frequently owned or operated by the producers of primary aluminium - which enables acquiring electricity at production cost - CIS, the US and the Middle East are characterized by low electricity prices fuelled partially by an abundance of fossil fuels.

However, electricity price spreads between the EU and main competing regions have fallen between 2008 and 2015 (except when comparing to Canada). The sharpest convergence can be observed with the US, CIS and especially the Middle-East. In 2008 EU primary aluminium producers paid over 60% more for their electricity than plants in the Middle East, this difference fell to 15% in 2015.

China is characterized by consistently higher prices for electricity, though the picture is unclear as generally primary aluminium producers and electricity providers are (at least partially) both controlled by the state. Also, computing average prices by using production weights gives a significantly lower result for China (by about half) while levels for other competitors remain comparable to what described above.

Figure 261 – **Primary Aluminium * International comparison of electricity prices paid by producers[11] (2008-2015), in €/MWh[12]**

	2008	2010	2014	2015
■ EU	36,15	38,51	38,98	42,44
■ Australasia	35,00	44,00	40,00	45,00
■ Nordic region	22,02	24,44	24,31	24,23
■ Middle East	22,17	23,26	31,90	36,90
■ CIS	16,21	22,82	24,65	23,48
■ China	39,33	50,72	45,82	48,53
■ USA	21,04	28,88	28,68	30,62
■ Canada	14,31	17,27	13,58	13,13
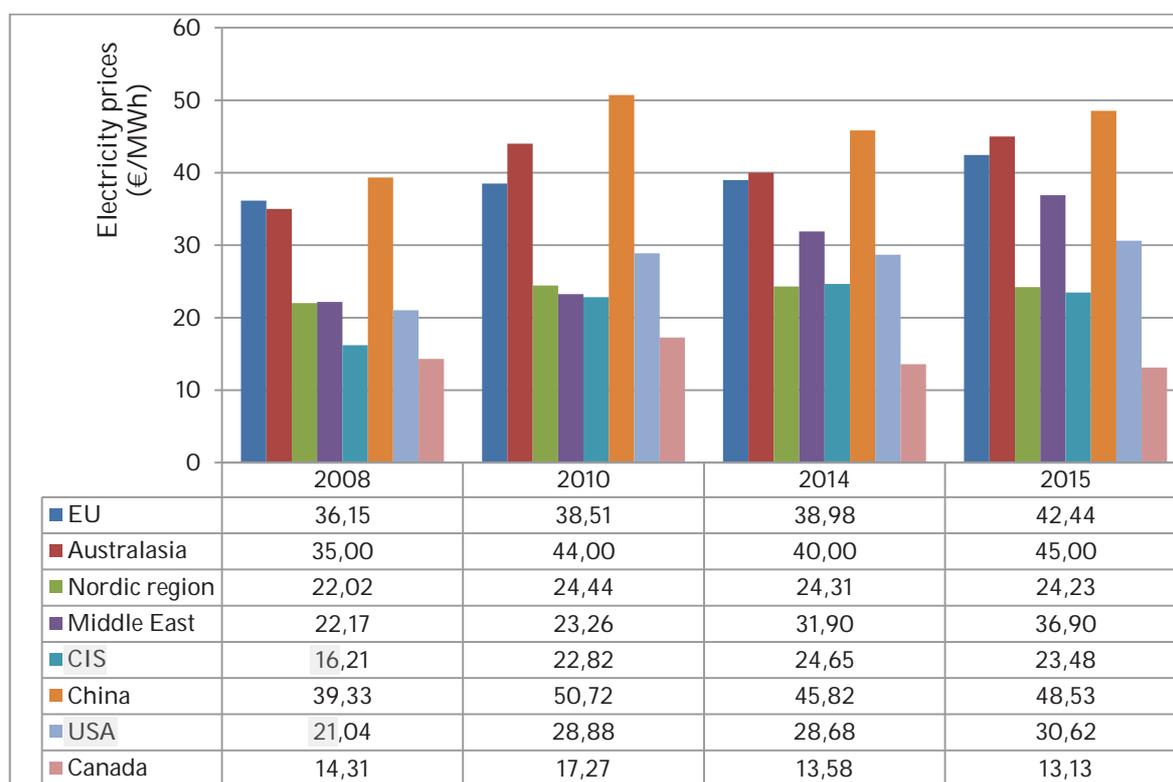
Source: CEPS and EA (2013) *Cumulative Cost Assessment for the Aluminium Industry,* and CEPS elaboration on CRU (2013 and 2016).

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[11] EU respondents: 8 (2008 -10), 10 (2014 -15), CIS: 8, China 47 (2008), 58 (2010), 93 (2014), 93 (2015), USA: 8, Canada: 9 (2008 -10), 10 (2014 -15), Australasia: 3 (2008-2010), 6 (2014-2015) Middle East: 2 (2008), 3 (2010 -15)
[12] Countries included in each of the regions: Australasia – Australia, Nordic region - Iceland, Norway, Middle East - Turkey, UAE, CIS - Azerbaijan, Kazakhstan, Russia, Tajikistan, Ukraine

Figure 262 – **Primary Aluminium - Prices of electricity - EU vs. international (€/MWh, weighted av. by production) - EU, CIS, US, China, Canada, Nordic region - 2014 -15**[13]

	2014	2015
■ EU	39.93	40.08
■ CIS	25.32	22.47
■ China	40.10	40.82
■ USA	29.12	31.63
■ Canada	16.33	16.58
■ Nordic region	23.07	23.35
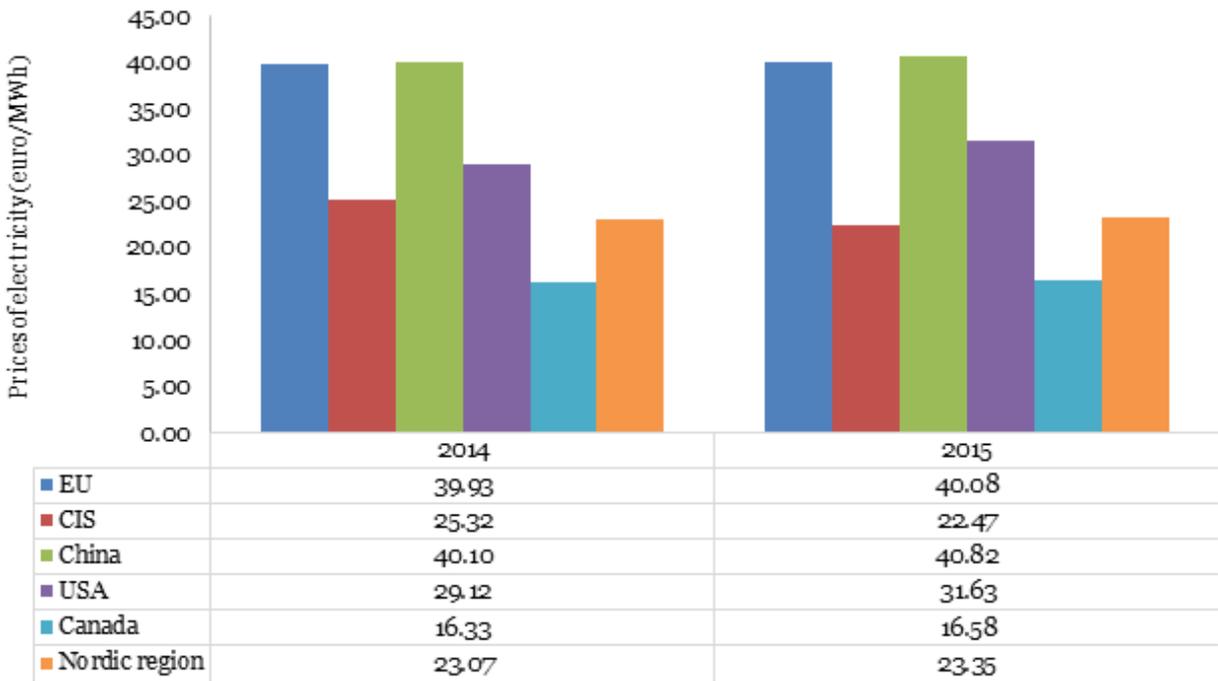
Source: CRU (2016) and CEPS elaboration.

CEPS et altri also give indication of recent trends in main performance indicators for primary aluminium producers.

While for individual responding plants in the period assessed energy costs varied between 12% and 46% of production costs weighted averages varied instead between 22% and 32%, almost entirely associated with electricity rather than natural gas.

In absolute terms, energy costs per tonne of production followed energy price trends, i.e. peaking in the 2012-2013 period, slowly declining until 2015, but remaining higher in than in 2008.

Energy costs also resulted to be significantly larger than the sampled plants' EBITDA but mainly due to the energy supply component. Non energy components (network costs, RES support, other taxes, fees, levies and charges) indeed only represented on average between 3%-4% of EBITDA over the whole period.

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[13] Number of observations: EU respondents: 8 (2008 -10), 10 (2014 -15), CIS: 8, China 47 (2008), 58 (2010), 93 (2014), 93 (2015), USA: 8, Canada: 9 (2008 -10), 10 (2014 -15)

Figure 257 – **Primary Aluminium - Impact of energy costs over production costs and EBITDA (2008-2015) of sampled plants, in €.**
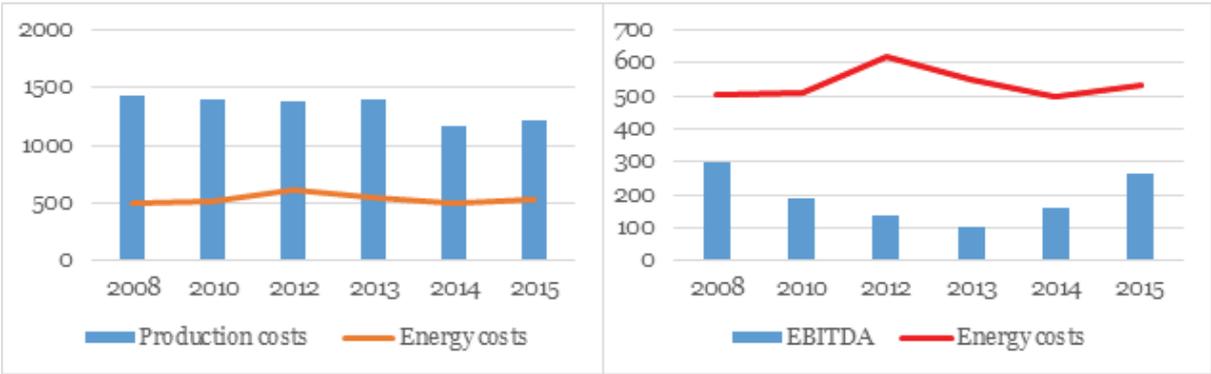
Source: *CEPS et al.*

2.4 Hollow Glass

Source: Ecofys study

Worldwide, Europe is the largest glass producer with roughly one-third of the total global market. Exports of European glass producers towards G20 countries represent roughly 8% of the production value. This indicates that a major share of production is traded within Europe which can be explained by transport costs generally being high in relation to the sales price[14]. The largest export destinations among the non-EU G20 for hollow glass (tableware) are the United States followed by Russia.

The Ecofys study looks at the glass industry (***Manufacture of hollow glass (NACE Rev 2. C2313)**.* in three Member States which represent close to 60% of the added value of the EU sector (France 25%, Germany 17% and Italy17 %)

The analysis of **cost production structures** reveals that purchases of energy products are around 0.10€/€ in France, and slightly higher with around 0.12€/€ in Germany. In Italy, energy purchases were only roughly 0.05€/€ from 2010 to 2012 and are still below 0.10€/€ after an increase in 2013. The lack of energy consumption data (available only for Germany) makes difficult to identify the main reasons for the difference.

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[14] For this reason, in the case of container glass - the most relevant sub-sector in NACE 2313 - plants are placed near clients

Figure 263 – **Hollow glass (NACE 2313) - Production cost structure of the sector, production value; value added for France, Germany and Italy**
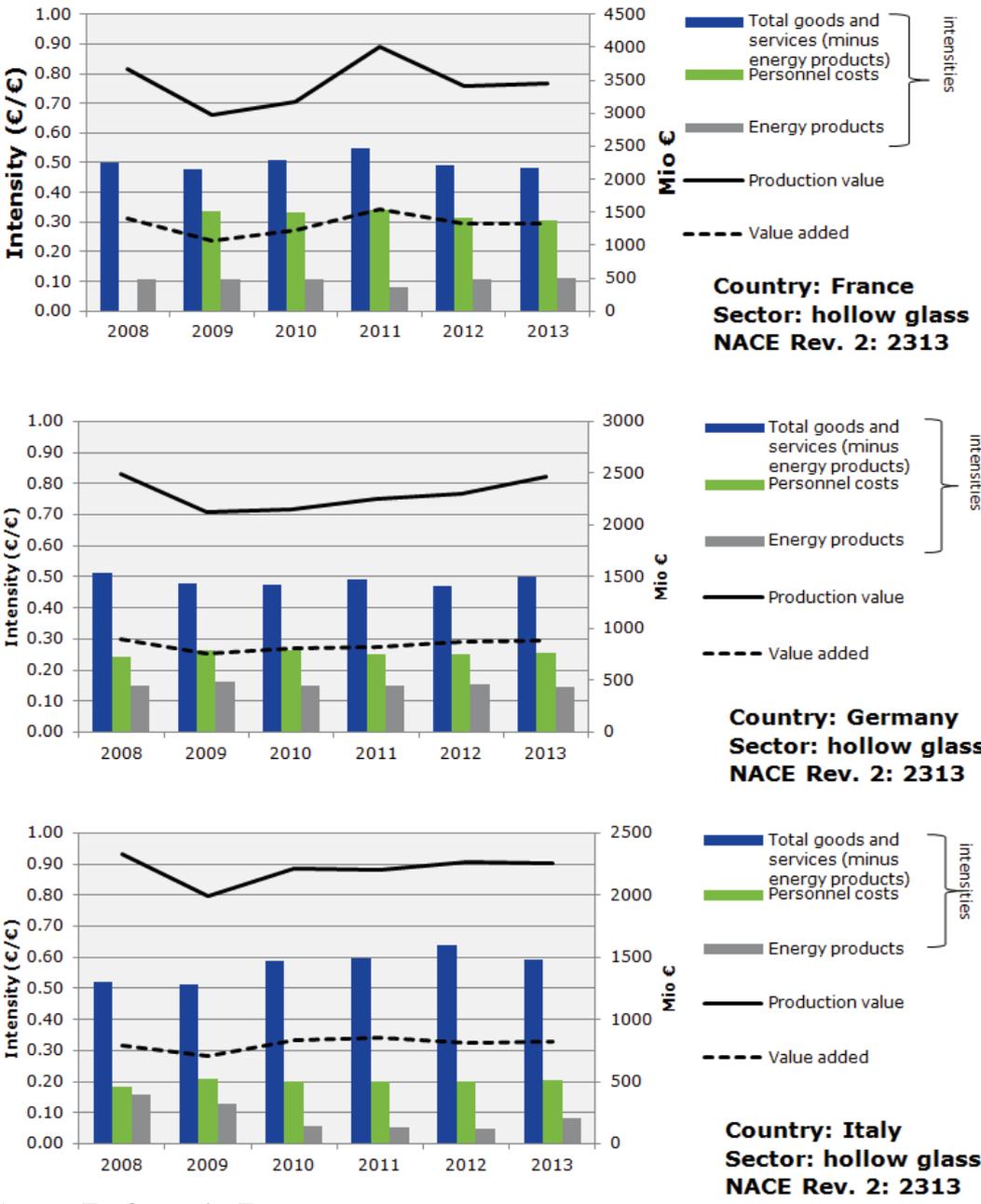
Source: Ecofys study, Eurostat

2.5 Basic chemicals

Manufacture of other inorganic basic chemicals (NACE Rev 2 C2013).- Comparing the French, German and UK (the major value added contributors of the EU28) production cost structure shows, that while Germany and UK have a higher magnitude of intensity of energy product costs to production value between 2008 and 2015 (0.11 €/€ German average and 0.11 €/€ United Kingdom average), the average French energy product costs intensities are significantly lower at 0.04 €/€. As shown in **Figure 187** and **Figure 188**, electricity prices in France are significantly lower than the UK and Germany which will contribute to the lower intensity. Several other factors will also play a part e.g. production process, integration with other chemical plants.

Europe's major trading partners are Russia, the United States, and China. Europe is a net importer especially of Russian **chlor-alkali** products while the United States are the major net importers of European chlor-alkali products.

International competitiveness assessment of other product markets(ammonia & methanol, ethylene & propylene)

The JRC study looks at the energy costs and production costs in the ammonia/methanol as well as in the ethylene/propylene sectors. It concludes that the decisive factor in ***ammonia and methanol*** production costs is feedstock availability. In the Middle East and in Russia where feedstock (mainly natural gas) is produced locally, production costs are much lower. The EU has higher costs for both products. Estimated average production costs for the EU ammonia industry in 2013 are about 14 % lower than the ammonia price in the western European market. Methanol production in the EU seems to have been facing strong competition. [Figure energy costs ammonia and methanol]

In *ethylene* and *propylene* production, feedstock is an important component of the costs, but as steam cracking is a multi-product process, the credits obtained thanks to co-products produced compensate for part of the costs. The higher the price of fuels in a country, the higher the feedstock costs and the credits obtained.

A major feature of steam cracking is the variety of feedstock that can be used. Different parts of the world have adopted the feedstock most easily available. North America and Saudi Arabian production is based on domestic natural gas liquids, primarily ethane and propane, while ethylene producers in Europe and Russia favour petroleum liquid feeds. Ethane-based industries in general have lower production costs than naphtha-based industries, but the total costs are comparable in all the countries analysed. The price of ethylene in 2013 in the EU was about 1 125 EUR/t, and the average total costs amounted to 748.4 EUR/t when considering ethylene as the main product or to 816.2 EUR/t when both olefins are considered as a product. In the case of propylene, almost all countries have comparable production costs, except Ukraine where propylene is produced only by steam cracking. Production costs are higher in Ukraine as steam cracking is not a process producing mainly propylene.

2.6 Cement
Source: JRC study

The JRC study concludes that the specific cost of thermal energy consumed by the EU cement industry is quite similar to that of the country with the lowest cost of thermal energy of those studied (China)[15]. When including estimated electricity costs, the EU energy costs per tonne of cement are well below those in Ukraine and Egypt and in the middle of the five countries looked at in the JRC study. The difference between average production costs in China and Algeria (36 EUR/t) and the EU average costs (48 EUR/t) is slightly lower than the transportation cost of crossing the Mediterranean Sea (15 EUR/t).

The JRC study provides insight on the different energy carriers used by the industry internationally and its implications for the energy cost structures. The Figure below summarises the energy costs of the fuel mix used in the countries looked at by the JRC

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[15] JRC study only considers Africa, the EU as well as Algeria, Egypt, CIS, Ukraine and China.

study[16]. The figure combines the effect of the fuels price and the performance of the industry in each country. For example, although the thermal performance in Algeria and Egypt is quite similar, their energy costs are however quite different due to the different fuels used: natural gas in Algeria and fuel oil in Egypt.

Figure 264 – **Cement - Energy costs in 2011/2012 by energy carrier**
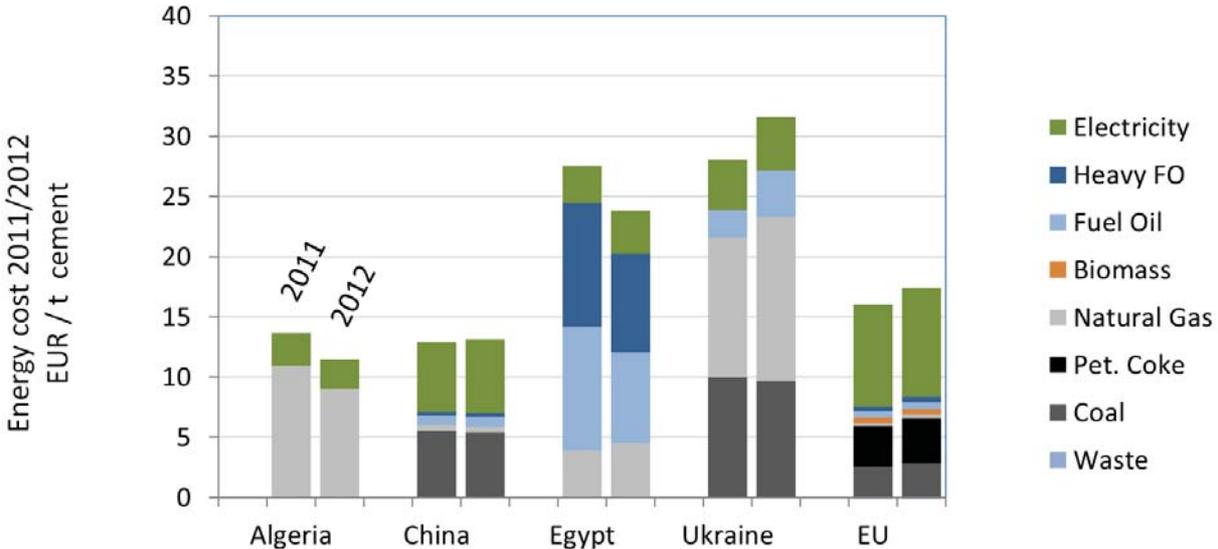
The JRC also puts the energy costs in perspective with other costs and observes that when adding the rest of the costs — raw materials, labour and other costs — the position of the EU industry worsens.

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[16] The JRC study uses 2011 and 2012 data. According to EU industrial associations the fuel mix of the EU cement could be changing. In particularly the electricity share could be decreasing due to efforts increase the use of alternative fuels, mainly biomass.

Figure 265 - Cement - Summary of the cement industry costs in 2011 and 2012
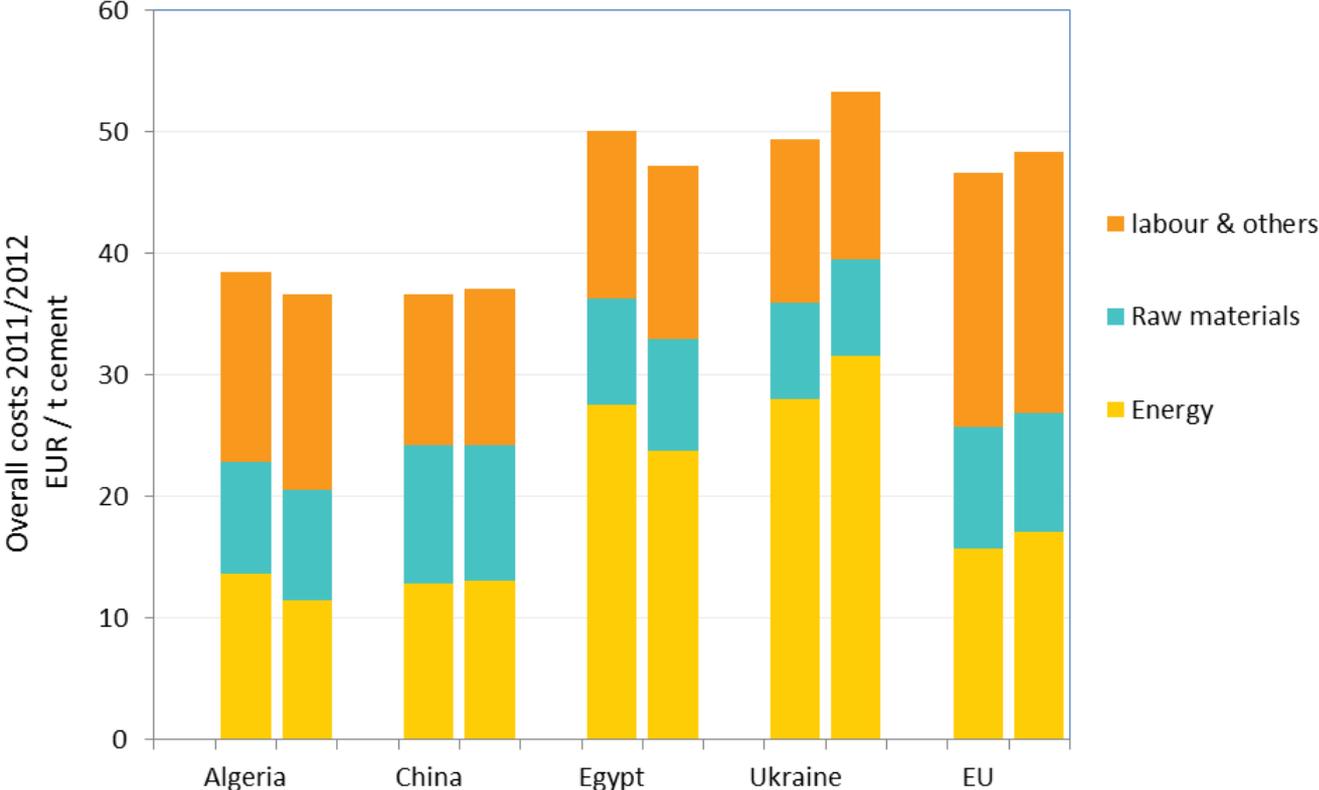
2.7 Wall and floor Tiles

Source: CEPS et altri study

The CEPS et altri study allows to get insight on the **energy prices** actually paid by the Wall and floor tiles industry

According to the study, average natural **gas prices** (weighted by respondents' consumption) fluctuated over the period 2008-2015 and in 2015 went down to 29.9 €/MWh, slightly below 2008 levels (30.6 €/MWh).

The comparison between simple and weighted averages indicates that plants with higher consumption levels normally reported lower prices.

The spread between minimum and maximum price paid remained fairly stable over the assessed period.

Table 31. Wall and floor tiles - Statistics for natural gas prices paid by sampled producers (2008-15, €/MWh)

	2008	**2010**	**2012**	**2013**	**2014**	**2015**
EU (average)[17]	29.8	25.8	33.9	33.8	34.2	30.6
EU (weighted average)[18]	30.6	24.1	32.8	32.5	32.6	29.9
EU (median)	29.7	25.9	33.1	32.4	31.1	29.0
EU (IQR)	0.6	4.0	6.5	5.9	8.7	3.7
EU - Relative standard deviation	4.7%	11.6%	11.9%	12.5%	16.9%	12.8%
EU (minimum)	27.6	20.9	27.4	25.1	26.4	25.0
EU (maximum)	33.6	31.1	40.4	40.8	41.8	39.1
Central Eastern Europe (simple average)	26.0	25.9	29.4	28.9	27.2	25.7
Southern Europe (simple average)	30.3	26.2	34.9	34.9	35.6	31.4
Central Eastern Europe (consumption weighted average)	29.8	25.0	29.1	28.4	27.5	26.1
Southern Europe (consumption weighted average)	30.9	24.3	33.6	33.4	33.6	30.6

Note: Observations from 22 plants in all years but in 2008 (20 plants)
Source: CEPS et al.

In terms of price components, network costs and taxes generally constitute a very limited share of gas prices, on average less than 10%.

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[17] This average is computed by aggregating the simple average in each region. Yet, as mentioned in the sampling strategy and sample statistics section above, a different weight is applied to each regional average to reflect the uneven distribution of production across the EU.

[18] Weighting factor: gas consumption. This average is computed by aggregating the weighted average in each region. Yet, as mentioned in the sampling strategy and sample statistics section above, a different weight is applied to each regional weighted average to reflect the uneven distribution of production across the EU.

Figure 266 - Wall and floor tiles - Components of the natural gas bills paid by sampled producers (€/MWh), weighted averages[19], 2008 - 2015
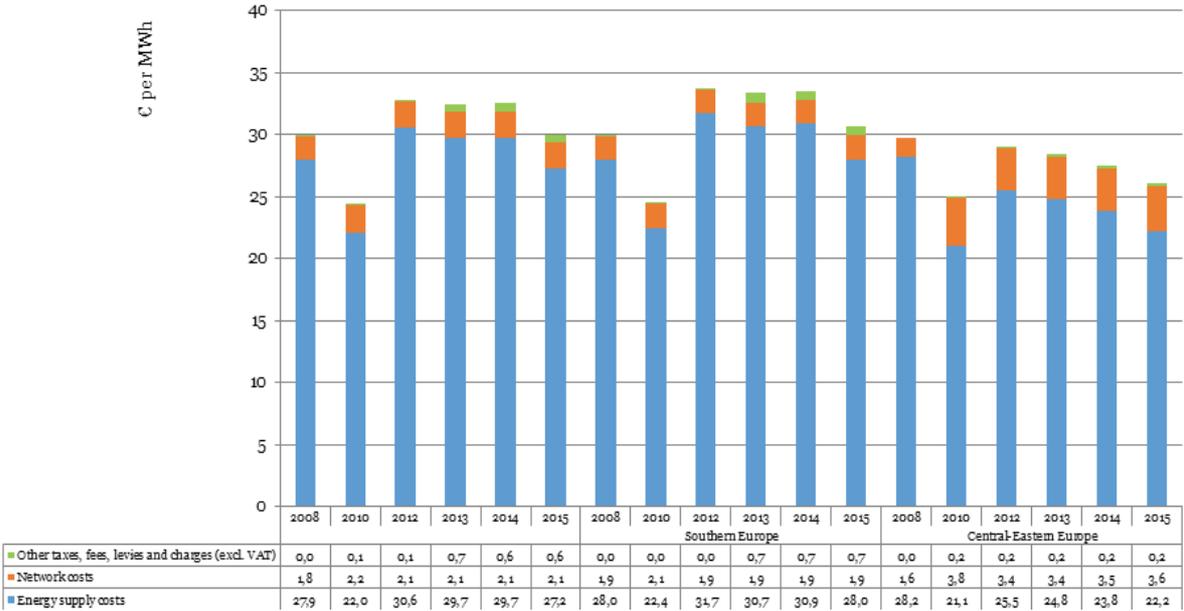
	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015
									Southern Europe						Central-Eastern Europe			
Other taxes, fees, levies and charges (excl. VAT)	0,0	0,1	0,1	0,7	0,6	0,6	0,0	0,0	0,0	0,7	0,7	0,7	0,0	0,2	0,2	0,2	0,2	0,2
Network costs	1,8	2,2	2,1	2,1	2,1	2,1	1,9	2,1	1,9	1,9	1,9	1,9	1,6	3,8	3,4	3,4	3,5	3,6
Energy supply costs	27,9	22,0	30,6	29,7	29,7	27,2	28,0	22,4	31,7	30,7	30,9	28,0	28,2	21,1	25,5	24,8	23,8	22,2

Note: Observations from 22 plants in all years but in 2008 (16 plants) and 2010 (18 plants).
Source: CEPS et al.

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[19] Weighting factor: gas consumption. The EU average is computed by aggregating the weighted average in each region. Yet, as mentioned in the sampling strategy and sample statistics section above, a different weight is applied to each regional weighted average to reflect the uneven distribution of production across the EU.

Figure 267 - **Wall and floor tiles - Components of the natural gas bills paid by sampled producers (%), weighted averages[20], 2008 - 2015**
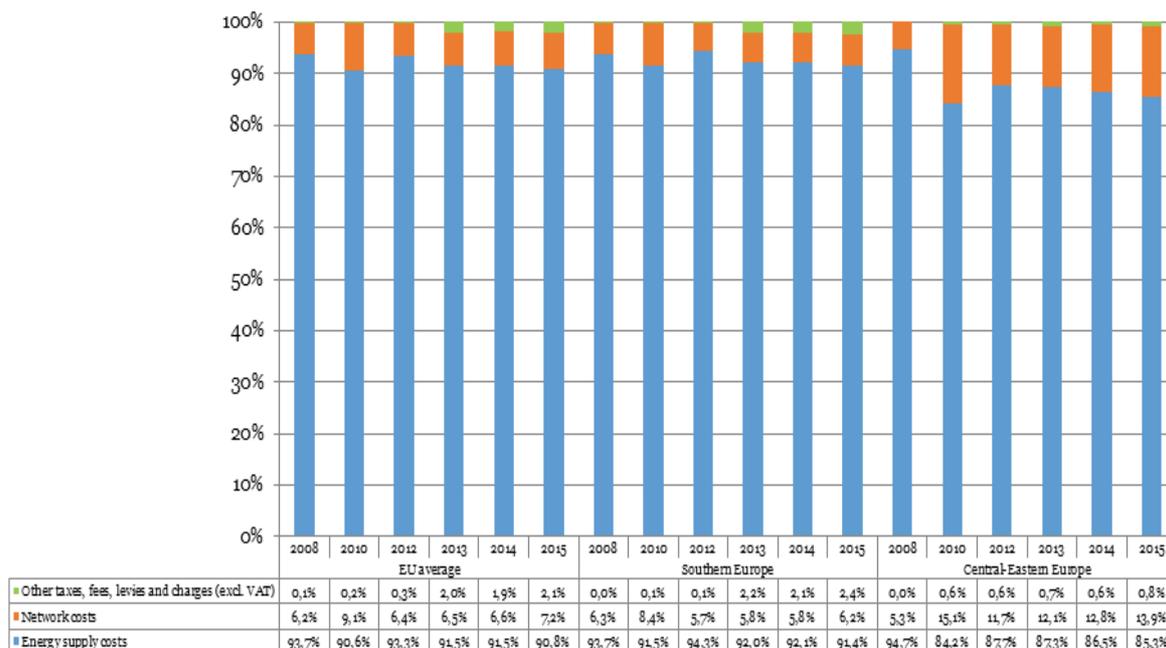
	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015
	EU average						Southern Europe						Central-Eastern Europe					
Other taxes, fees, levies and charges (excl. VAT)	0,1%	0,2%	0,3%	2,0%	1,9%	2,1%	0,0%	0,1%	0,1%	2,2%	2,1%	2,4%	0,0%	0,6%	0,6%	0,7%	0,6%	0,8%
Network costs	6,2%	9,1%	6,4%	6,5%	6,6%	7,2%	6,3%	8,4%	5,7%	5,8%	5,8%	6,2%	5,3%	15,1%	11,7%	12,1%	12,8%	13,9%
Energy supply costs	93,7%	90,6%	93,3%	91,5%	91,5%	90,8%	93,7%	91,5%	94,3%	92,0%	92,1%	91,4%	94,7%	84,2%	87,7%	87,3%	86,5%	85,3%

Note: Observations from 22 plants in all years but in 2008 (16 plants) and 2010 (18 plants).
Source: CEPS et al.

Differently from gas, electricity prices showed a general upward trend over the period both in their median (+14.7%) and weighted average value (+8.3%). The fact that EU simple averages are higher than consumption weighted averages confirms the indication that larger consumers purchased electricity at lower prices. The analysis also showed an increasing spread between minimum and maximum price paid, with the latter being more than double in almost all years.

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[20] Weighting factor: gas consumption. The EU average is computed by aggregating the weighted average in each region. Yet, as mentioned in the sampling strategy and sample statistics section above, a different weight is applied to each regional weighted average to reflect the uneven distribution of production across the EU.

Table 32. Wall and floor tiles - Statistics for electricity prices paid by sampled producers (2008-2015, €/MWh)

	2008	**2010**	**2012**	**2013**	**2014**	**2015**
EU (average)[21]	95.3	87.3	104.6	105.2	101.7	107.1
EU (weighted average)[22]	96.6	86.3	103.8	104.5	100.0	104.7
EU (median)	86.6	81.9	93.9	101.0	93.9	99.4
EU (IQR)	24.3	18.0	24.6	21.7	30.0	40.3
EU - Relative standard deviation	22.6%	15.9%	19.8%	19.8%	22.9%	27.4%
EU (minimum)	68.2	69.0	76.2	74.3	69.3	66.3
EU (maximum)	141.4	120.7	155.2	153.7	145.2	151.6
Central Eastern Europe (simple average)	75.6	72.4	83.9	83.2	72.3	69.0
Southern Europe (simple average)	96.3	90.3	108.1	108.8	105.9	111.6
Central Eastern Europe (consumption weighted average)	75.3	71.7	83.0	83.4	71.8	68.8
Southern Europe (consumption weighted average)	97.9	89.2	107.3	107.9	103.9	108.7

Note: Observations from 22 plants in all years but in 2008 (21 plants)
Source: CEPS et al.

CEPS et altri indicates that, as expected non-energy components (network costs, RES support, other taxes and fees) played a relevant role in the composition of total electricity prices paid by wall and floor tiles producers. Their share increased over the years and accounted for about 42% in 2015, almost double the share observed for 2008. While the increased importance was associated with a marked reduction of the energy component - down on average from 72€/MWh in 2008 to €61€/MWh in 2015 – it also results from a significant increase in absolute terms of both RES support and network costs which in 2015 resulted triple and double, respectively compared to 2008.

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[21] This average is computed by aggregating the simple average in each region. Yet, as mentioned in the sampling strategy and sample statistics section above, a different weight is applied to each regional average to reflect the uneven distribution of production across the EU.

[22] Weighting factor: electricity consumption. This average is computed by aggregating the weighted average in each region. Yet, as mentioned in the sampling strategy and sample statistics section above, a different weight is applied to each regional weighted average to reflect the uneven distribution of production across the EU

Figure 268 - **Wall and floor tiles - Components of the electricity bills paid by sampled producers (€/MWh), weighted averages[23], 2008 - 2015**
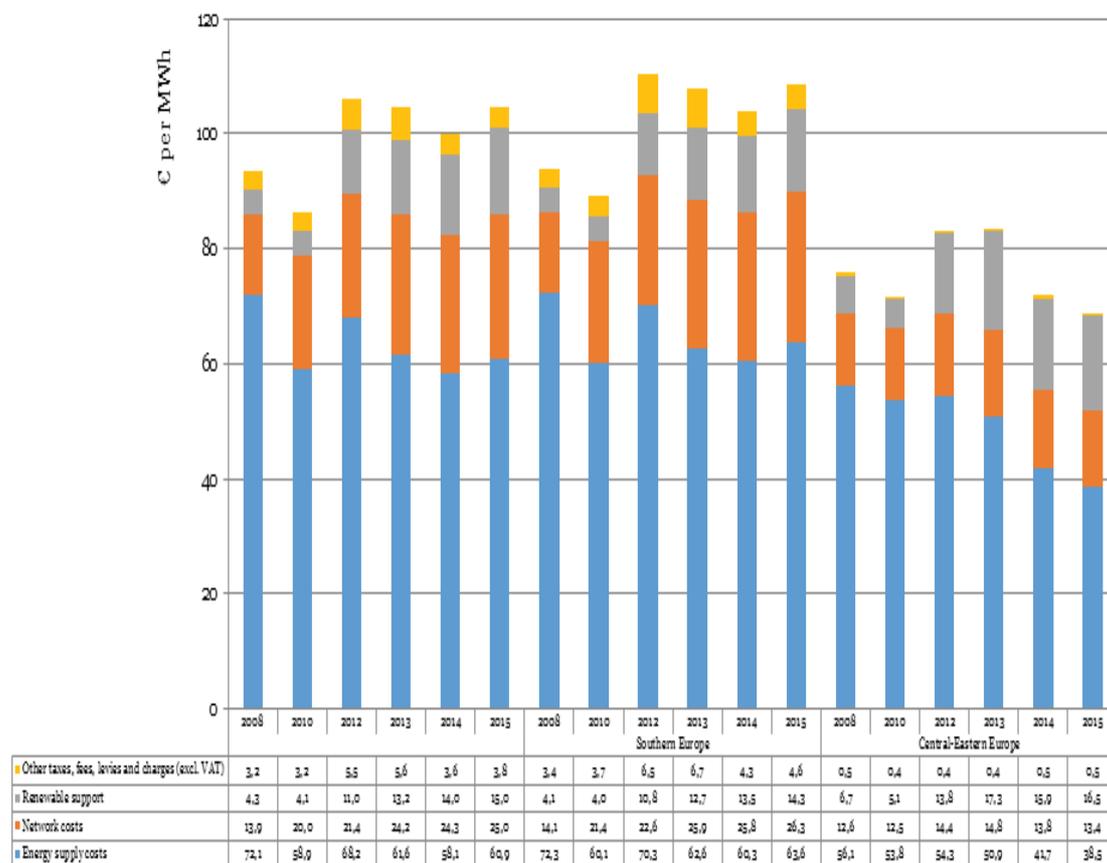
	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015
									Southern Europe						Central-Eastern Europe			
Other taxes, fees, levies and charges (excl. VAT)	3,2	3,2	5,5	5,6	3,6	3,8	3,4	3,7	6,5	6,7	4,3	4,6	0,5	0,4	0,4	0,4	0,5	0,5
Renewable support	4,3	4,1	11,0	13,2	14,0	15,0	4,1	4,0	10,8	12,7	13,5	14,3	6,7	5,1	13,8	17,3	15,0	16,5
Network costs	13,0	20,0	21,4	24,2	24,3	25,0	14,1	21,4	22,6	25,0	25,8	26,3	12,6	12,5	14,4	14,8	13,8	13,4
Energy supply costs	72,1	58,0	68,2	61,6	58,1	60,9	72,3	60,1	70,3	62,6	60,3	63,6	56,1	53,8	54,3	50,0	41,7	38,5

Note: Observations from 22 plants but in 2008 (18 plants), 2010 (20 plants) and 2012 (21 plants).
Source: *CEPS et al.*

Figure 269 **- Wall and floor tiles - Components of the electricity bills paid by sampled producers (%), weighted averages**[24]**, 2008 - 2015**

	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015
			EU average						Southern Europe						Central-Eastern Europe			
■ Other taxes, fees, levies and charges (excl. VAT)	3,4%	3,7%	5,2%	5,3%	3,6%	3,6%	3,6%	4,2%	5,9%	6,2%	4,1%	4,2%	0,7%	0,6%	0,5%	0,5%	0,7%	0,7%
■ Renewable support	4,6%	4,8%	10,4%	12,6%	14,0%	14,3%	4,4%	4,4%	9,8%	11,7%	13,0%	13,2%	8,8%	7,1%	16,6%	20,7%	22,1%	23,9%
■ Network costs	14,8%	23,2%	20,2%	23,2%	24,3%	23,8%	15,0%	24,0%	20,5%	24,0%	24,8%	24,2%	16,6%	17,4%	17,4%	17,8%	19,2%	19,4%
■ Energy supply costs	77,2%	68,3%	64,2%	58,9%	58,2%	58,2%	76,9%	67,4%	63,8%	58,0%	58,0%	58,5%	73,9%	75,0%	65,5%	61,0%	58,0%	55,9%

Note: Observations from 22 plants but in 2008 (18 plants), 2010 (20 plants) and 2012 (21 plants).
Source: *CEPS et al.*

International price comparison in clay building materials (NACE 23.3, including wall and floor tiles and bricks and roof tiles)

CEPS et altri tried also to assess recent trends in energy prices paid by ceramics producers in comparison to non-EU competitors. However, due to data limitations and the lack of any international database for the sector, information could be collected only from four extra-European plants - two bricks and tiles plants in Russia, one wall and floor tiles plant in Russia, and one bricks and tiles plant in the US - run by multinational European companies participating in the study. This limits of course the representativeness of findings which are only to be considered as indicative. Also, due to limited confidentiality reasons results are presented jointly for the bricks and tiles and the wall and floor tiles sub-sectors.

In 2015, Russian plants paid approximately 6 €/MWh, about 78% less than the calculated EU average, and 75% less than the Central-Eastern Europe average, their closest neighbours. In 2014 and 2015, reported US prices for natural gas were in between 14 and 19 €/MWh, that is 35% lower than those paid by their European peers. Given the high importance of natural gas costs in total production costs (about 20% for bricks and tiles and wall and floor tiles together), competiveness implications are clear. Compared to natural gas, the electricity price differential is also evident although less stark, in particular compared to the US.

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[24] Weighting factor: electricity consumption. The EU average is computed by aggregating the weighted average in each region. Yet, as mentioned in the sampling strategy and sample statistics section above, a different weight is applied to each regional weighted average to reflect the uneven distribution of production across the EU.

Figure 270 – Clay building materials - Prices of natural gas - EU vs. individual plants in third countries (€/MWh) (2008 - 2015)

	2010	2014	2015
RU	7,4	8,1	6,2
US		14,1	18,5
EU	25,2	31,1	28,5
CEE	23,4	27,1	25,0
NWE	19,6	29,4	27,0
SE	28,2	30,1	32,1
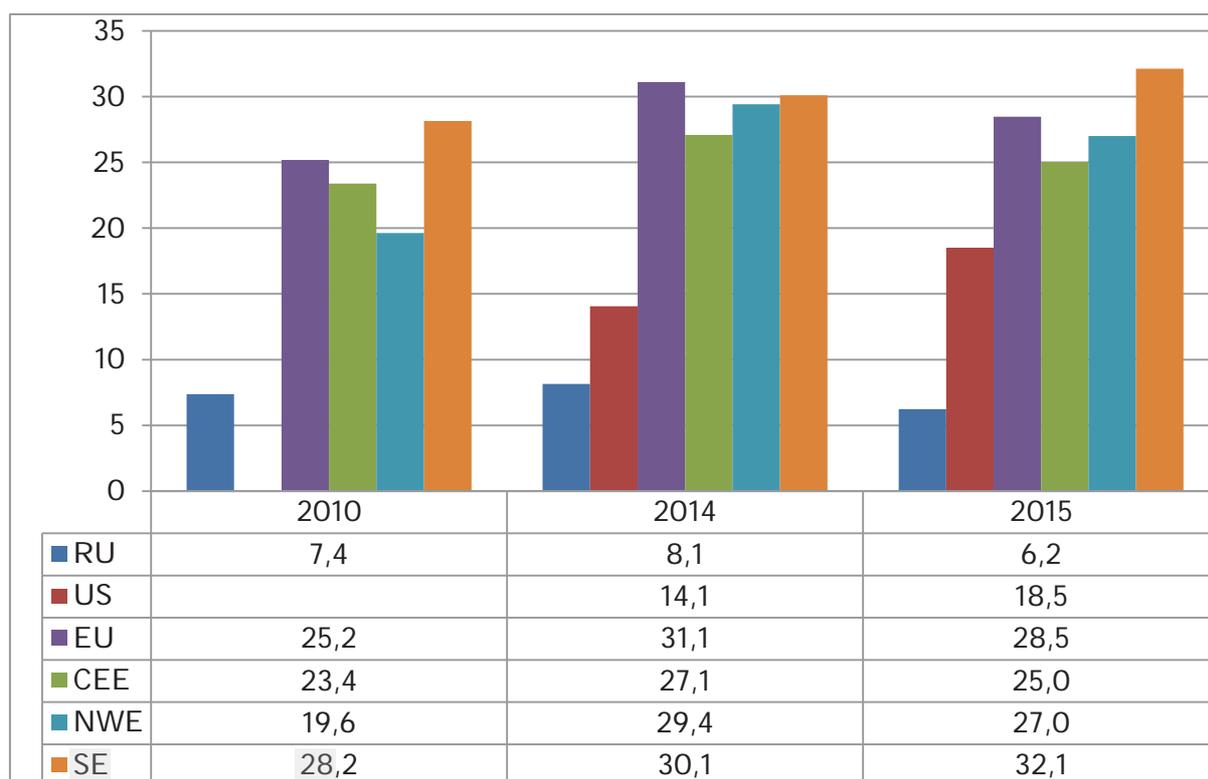
Source: *CEPS et al.*

Figure 266 – Clay building materials - Prices of electricity - EU vs. individual plants in third countries (€/MWh) (2008 – 2015)

	2010	2014	2015
RU	56,3	52,4	38,4
US		72,5	83,8
EU	78,2	95,4	97,3
CEE	71,9	74,0	67,6
NWE	92,1	98,7	91,6
SE	111,5	120,8	123,4
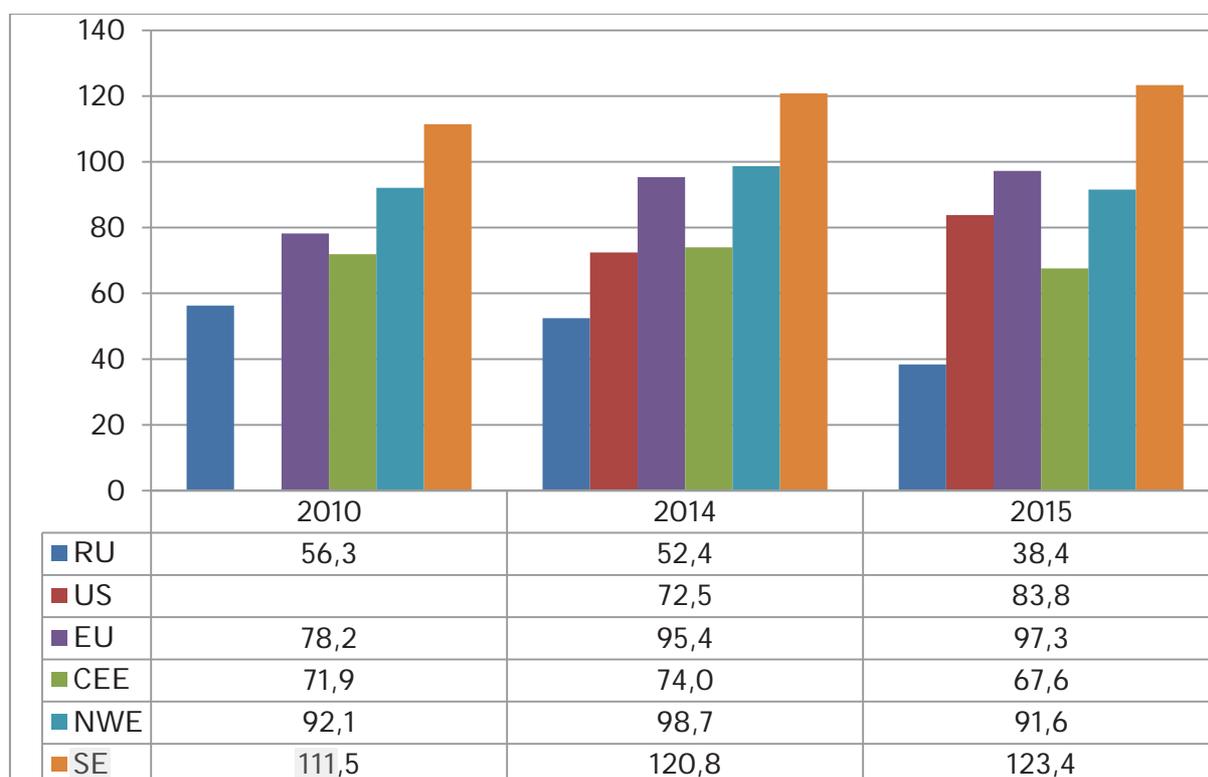
Source: *CEPS et al.*

Performance indicators and impacts of energy costs in the wall and floor tiles sector

CEPS et altri also give indication of recent trends in main performance indicators for wall and floor tiles producers.

Energy prices and costs showed to be important for the competitiveness of the sector, in particular having a potential major impact on the financial performance of respondents. Total energy costs were higher than or significant compared to EBITDA and represented some 20% or more of the total production costs over the whole period investigated.

Figure 271 - **Wall and floor tiles - Energy costs vs. EBITDA (euro/m^2) for sampled producers (consumption weighted averages)**
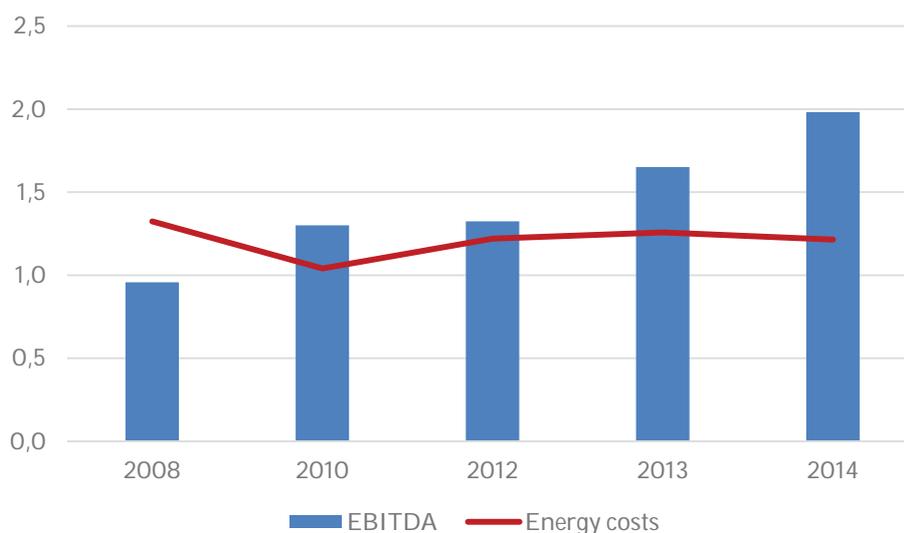
Note: Observations from 22 plants in all years but in 2008 (21 plants for EBITDA and 20 plants for energy costs). 2015 data are not shown due to a lower number of respondents and confidentiality reasons.
Source: CEPS et al.

Figure 272 - **Wall and floor tiles - Energy costs vs. Production costs (euro/m2) for sampled producers (consumption weighted averages)**
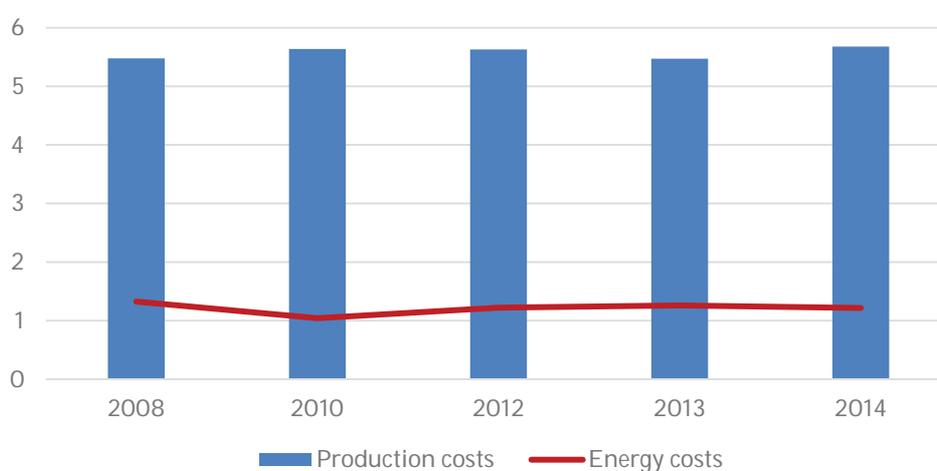
Note: Observations from 22 plants in all years but in 2008 (21 plants for production costs and 20 plants for energy costs). 2015 data are not shown due to a lower number of respondents and confidentiality reasons.
Source: CEPS et al.

2.8 Bricks and Roof Tiles

Source: CEPS et altri

The *CEPS et altri* study allows to get insight on the **energy prices paid** by the Bricks and Roof Tiles industry.

EU average *natural **gas price*** paid increased in the period 2008-2013 (from 27.2 €/MWh to 30.1 €/MWh) and then declined until 2015 back to levels slightly lower than in 2008 (27 €/MWh). High and increasing variation can be observed across Europe between minimum and maximum price paid, with the latter being almost four times the former in 2015.

As for other sectors, the split of the *natural gas price* into components shows a very limited role of the non-energy components.

Table 33. Bricks and roof tiles - Descriptive statistics for natural gas prices paid by sampled producers (2008-2015, €/MWh)

	2008	**2010**	**2012**	**2013**	**2014**	**2015**
EU - Weighted Average	27.19	26.26	29.10	30.09	29.61	27.04
EU - Simple Average	28.79	28.59	32.51	33.26	30.01	30.93
EU - Median	28.56	29.93	31.30	33.54	31.97	30.61
EU - Inter-Quartile Range	3.38	5.88	6.99	5.68	5.93	5.61
EU - Minimum	18.66	13.16	18.96	17.60	16.45	14.37
EU - Maximum	40.31	38.00	49.17	52.86	49.12	52.72
NWE - Weighted Average	26.96	19.63	22.50	29.95	29.42	27.00
SE - Weighted Average	29.02	32.00	35.83	36.59	36.59	33.66
CEE - Weighted Average	26.54	21.79	26.59	26.59	26.67	23.95
NWE - Simple Average	29.85	28.84	30.97	31.91	31.42	29.85
SE - Simple Average	28.71	31.67	37.58	39.37	39.13	36.62
CEE - Simple Average	26.04	21.84	26.73	26.26	26.52	23.99

Note: Based on 60 respondents; 10.5% of the sector's production value.
Source: CEPS et al.

Figure 273 - Bricks and roof tiles - Components of the natural gas bills paid by sampled producers, (€/MWh, 2008 – 2015)

| | 2008 | 2010 | 2012 | 2013 | 2014 | 2015 | 2008 | 2010 | 2012 | 2013 | 2014 | 2015 | 2008 | 2010 | 2012 | 2013 | 2014 | 2015 | 2008 | 2010 | 2012 | 2013 | 2014 | 2015 |
	EU average						North-Western Europe						Southern Europe						Central-Eastern Europe					
Other taxes, fees, levies and charges (excl. VAT)	0,75	0,69	0,81	0,96	0,72	0,68		0,99	1,27	1,44	0,96	0,90			0,51	0,72	0,72	0,67		0,08	0,12	0,12	0,09	0,09
Network costs	2,24	2,15	2,64	2,10	2,10	2,26		1,80	2,04	1,61	1,64	1,75			3,67	2,73	2,72	3,00		2,85	2,27	2,18	2,11	2,17
Energy supply costs	25,86	22,96	28,19	28,25	27,65	25,16		19,90	25,05	26,86	26,58	23,82			34,28	32,20	30,75	28,79		18,85	24,82	24,28	24,46	21,69
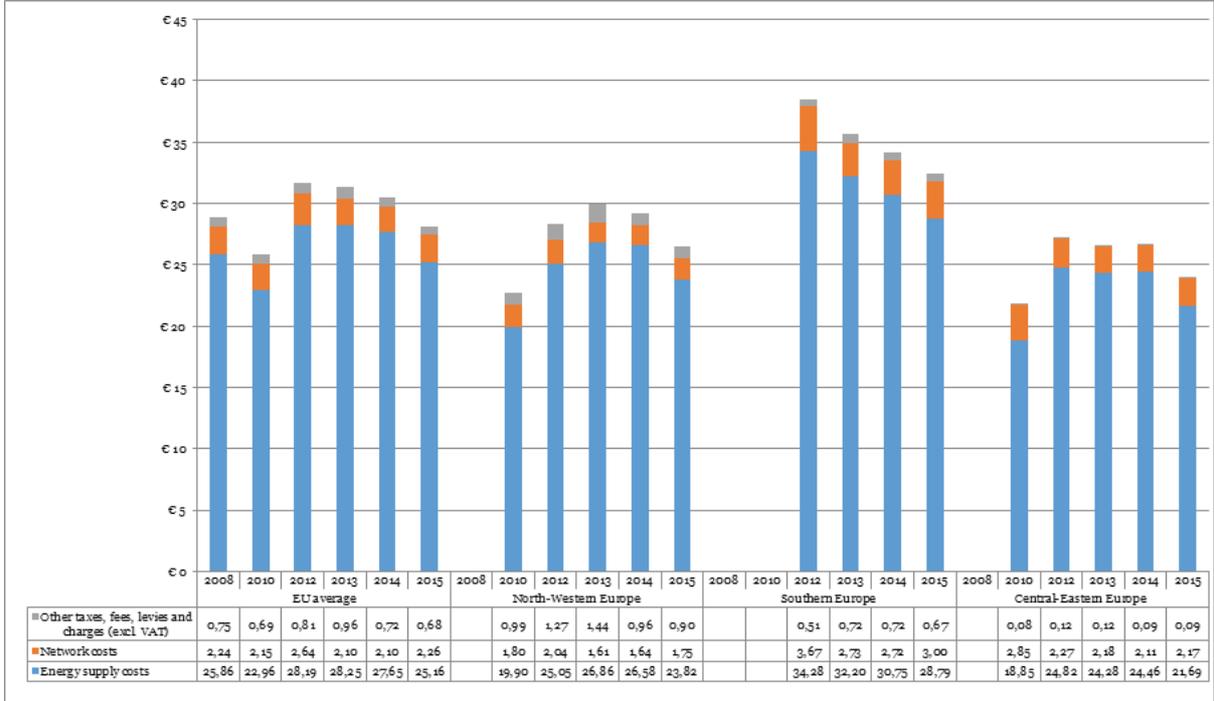
Note: Based on 43 respondents; 8.9% of the sector's production value
Source: CEPS et al.

Figure 274 - Bricks and roof tiles - Components of the natural gas bills paid by sampled producers, (%, 2008 – 2015)

| | 2008 | 2010 | 2012 | 2013 | 2014 | 2015 | 2008 | 2010 | 2012 | 2013 | 2014 | 2015 | 2008 | 2010 | 2012 | 2013 | 2014 | 2015 | 2008 | 2010 | 2012 | 2013 | 2014 | 2015 |
	EU average						North-Western Europe						Southern Europe						Central-Eastern Europe					
Other taxes, fees, levies and charges (excl. VAT)	2,6%	2,7%	2,5%	3,1%	2,4%	2,4%		4,3%	4,5%	4,8%	3,3%	3,4%			1,3%	2,0%	2,1%	2,1%		0,4%	0,4%	0,5%	0,3%	0,4%
Network costs	7,8%	8,3%	8,4%	6,7%	6,9%	8,0%		7,9%	7,2%	5,4%	5,6%	6,6%			9,5%	7,7%	8,0%	9,2%		13,1%	8,3%	8,2%	7,9%	9,1%
Energy supply costs	89,6%	89,0%	89,1%	90,2%	90,7%	89,6%		87,7%	88,3%	89,8%	91,1%	90,0%			89,1%	90,3%	89,9%	88,7%		86,5%	91,2%	91,3%	91,7%	90,5%
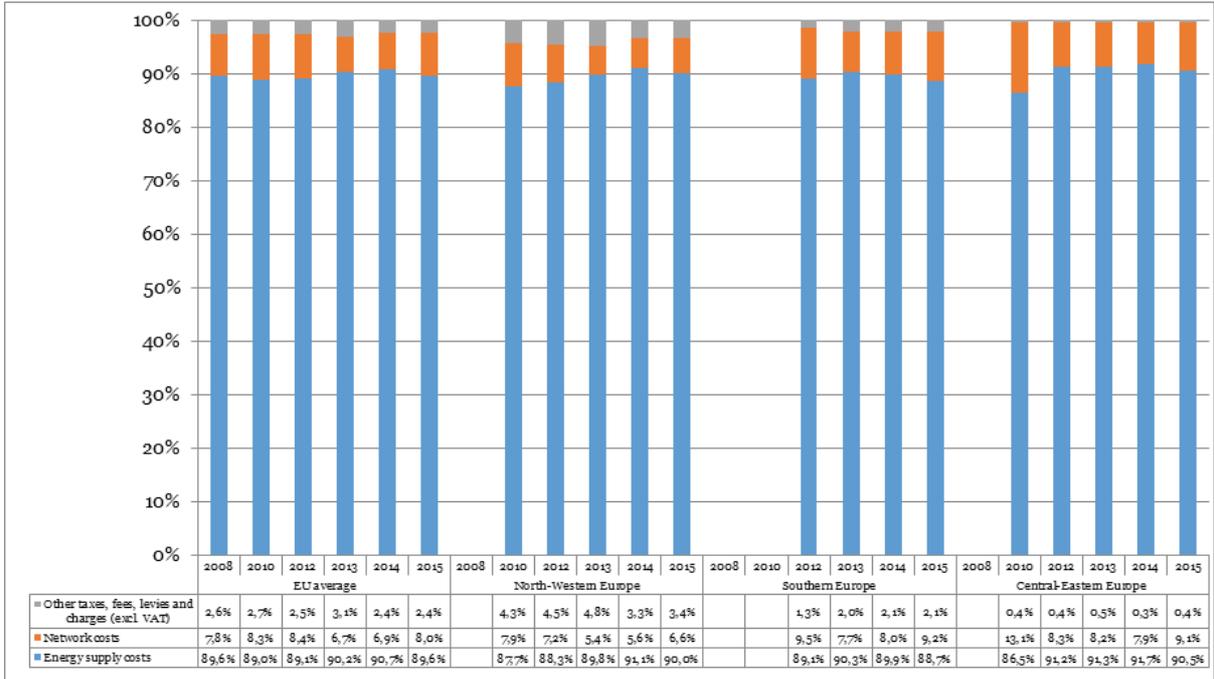
Note: Based on 43 respondents; 8.9% of the sector's production value
Source: CEPS et al.

The average *electricity price* shows an increasing trend, from 80.4€/MWh in 2008 to 86 €/MWh in 2013, up to 89.8 €/MWh in 2015.

Price variation across regions is even larger than for gas, possibly due to higher weight of regulated components and higher fragmentation of national policies. The spread between minimum and maximum price paid by respondents was the highest in 2012 (158 €/MWh) but still above 100 €/MWh in 2015.

Table 34. Bricks and roof tiles - Statistics for electricity prices paid by sampled producers (€/MWh, 2008-2015)

	2008	**2010**	**2012**	**2013**	**2014**	**2015**
EU - Weighted Average	80.42	72.09	83.94	85.97	90.72	89.82
EU - Simple Average	88.70	89.17	108.65	109.29	107.43	103.42
EU - Median	86.52	83.05	97.82	97.95	92.09	88.32
EU - Inter-Quartile Range	23.83	29.41	33.69	23.83	33.46	41.39
EU - Minimum	43.88	26.95	30.00	40.30	42.95	32.27
EU - Maximum	115.01	133.05	188.30	179.10	155.68	150.83
NWE - Weighted Average	78.17	74.02	87.30	89.95	97.62	97.26
SE - Weighted Average	102.94	98.40	133.49	134.49	129.56	127.68
CEE - Weighted Average	72.73	67.91	77.43	77.82	72.57	66.43
NWE - Simple Average	88.18	92.12	102.16	97.34	98.69	91.57
SE - Simple Average	96.70	95.82	133.74	141.73	137.78	138.04
CEE - Simple Average	74.35	67.99	77.00	77.72	71.62	67.59

Note: Based on 43 respondents; 10.5% of the sector's production value
Source: CEPS et al.

Contrary to gas, the impact of non-energy components on the electricity price is significant and increased over time. In 2015, network costs, RES support, and other taxes and fees (excluding VAT) accounted for 51% of the weighted EU average price.

The result is mainly driven by increasing RES support and network costs in absolute terms, with both reaching about 23 €/MWh in 2015, compared to 17 €/MWh and 14 €/MWh respectively in 2008.

Figure 275 - Bricks and roof tiles - Components of electricity bills paid by sampled producers (€/MWh, 2008 - 2015)

	EU average						North-Western Europe						Southern Europe						Central-Eastern Europe					
	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015
Other taxes, fees, levies and charges (excl. VAT)	11,72	9,23	11,69	10,18	9,77	9,13		6,86	8,46	3,74	3,28	3,33			19,92	21,82	21,77	19,72		2,88	4,29	4,90	3,90	4,15
Renewable support	17,44	15,83	21,70	20,74	22,72	23,35		9,65	14,37	10,29	14,91	18,97			41,33	44,39	43,39	40,13		1,87	3,12	2,78	3,40	2,27
Network costs	13,61	15,45	19,96	22,97	24,09	23,39		19,13	22,53	27,95	30,01	27,59			14,75	14,22	15,36	17,11		20,42	23,16	26,56	25,10	24,24
Energy supply costs	52,30	52,06	59,38	57,47	58,77	54,65		59,50	62,62	56,99	61,33	55,98			61,21	64,19	63,42	61,18		40,37	46,86	45,55	42,62	38,16

Note: Based on 43 respondents; 8.5% of the sector's production value
Source: CEPS et al.

Figure 276 - Bricks and roof tiles - Components of electricity bills paid by sampled producers (%, 2008 - 2015)

	EU average						North-Western Europe						Southern Europe						Central-Eastern Europe					
	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015
Other taxes, fees, levies and charges (excl. VAT)	12,3%	10,0%	10,4%	9,1%	8,5%	8,3%		6,4%	7,8%	3,9%	3,0%	3,1%			14,5%	15,1%	15,1%	14,3%		4,4%	5,5%	6,1%	5,2%	6,0%
Renewable support	18,3%	17,1%	19,3%	18,6%	19,7%	21,1%		8,9%	13,3%	10,4%	13,6%	17,9%			30,1%	30,7%	30,1%	29,1%		2,9%	4,0%	3,5%	4,5%	3,3%
Network costs	14,3%	16,7%	17,7%	20,6%	20,9%	21,2%		17,7%	20,9%	28,2%	27,4%	26,1%			10,8%	9,8%	10,7%	12,4%		31,2%	29,9%	33,3%	33,5%	35,2%
Energy supply costs	55,0%	56,2%	52,7%	51,6%	50,9%	49,5%		55,1%	58,0%	57,6%	56,0%	52,9%			44,6%	44,4%	44,1%	44,3%		61,6%	60,5%	57,1%	56,8%	55,5%

Note: Based on 43 respondents; 8.5% of the sector's production value
Source: CEPS et al.

International price comparison in clay building materials (NACE 23.3, including wall and floor tiles and bricks and roof tiles)

The assessment at international level is common between wall and floor tiles and bricks and roof tiles. (See considerations and graphs above).

Performance indicators and impacts of energy costs in the wall and floor tiles sector

CEPS et altri also give indication of recent trends in main performance indicators for bricks and roof tiles producers.

As for the wall and floor tiles sector, the assessment gives indication of the importance of the potential impact of energy prices and costs for the competitiveness of the sector. The weighted average energy costs over total production costs ranged between 28% and 35%, varying in line with energy price trends (i.e. peaking in the 2012-2013 period). Natural gas is confirmed to be the main energy carrier and represents about two thirds of energy costs (gas and electricity), with a weight of 19.5% on total production costs in 2015.

When compared to EBITDA, the importance of energy costs is even more prominent, as they are larger than plants' margins across the whole period.

Figure 277 **- Bricks and roof tiles - Energy costs over production costs and EBITDA for sampled producers (2008-14)**
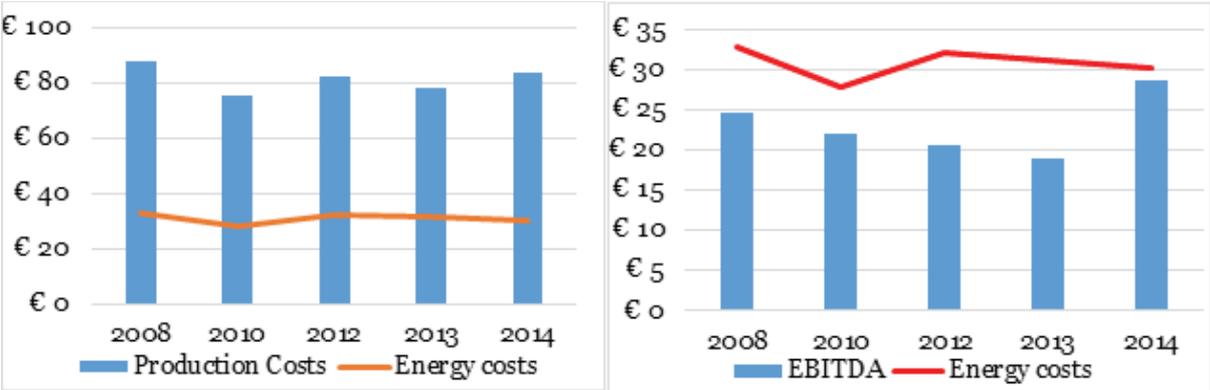
Note: Based on 41 respondents; 8% of the sector's production value
Source: CEPS et al.

2.9 Refineries

Sources: Solomon Associates and study by CEPS et altri

The sector energy costs could not be appropriately covered in the analysis of the Ecofys study based on Eurostat SBS statistics due to the fact that these statistics do not include crude oil as part of the purchases of energy (see explanation following Table 18). Data of the refinery sector is anyhow scarce due to confidentiality issues. Therefore this in part relies not only on the results of the plant data from the *CEPS et altri study* but also on other publicly available studies/sources.

The EU oil refining sector is a strategically important EU industry sector in terms of employment and energy security of supply. Despite the fact that EU refineries are among the most energy efficient in the world they are facing serious challenges. These include high energy prices, reduction in oil products demand, aggressive competition from non-EU refiners, cumulative impact of regulation, diesel-gasoline imbalance[25].

Trade analysis by CEPS et altri shows net trade flows for refined products. Due to the significant excess gasoline production capacity, 60% of the EU refineries' net exports are gasoline. More than 50% of these exports traditionally go to North America which is however reducing its imports due to shale gas/oil production. Conversely European refineries do not cover the EU's demand for diesel and jet fuel which are mainly imported from Russia, the Middle East and the US (FuelsEurope, 2015)

Energy prices paid by the Refinery sector

The study by *CEPs et altri* also maps the prices paid by the sector which have evolved similarly to other energy intensive sectors assessed. Overall, average EU *natural gas prices* have decreased between 2008 and 2015 by 11% although a peak was registered in 2013. The spread between minimum and maximum price paid increased significantly over the observation period (from 11 €/MWh in 2008 to 28 €/MWh in 2015, mainly linked to the inclusion of some plants with very low price at the end of the period). The share of the energy component was above 90% in all years, with very low impact associated of other non-energy (regulated) components.

Table 35. Oil Refining - Statistics for natural gas prices paid by sampled producers (€/MWh, 2008-2015)

	2008	2010	2012	2013	2014	2015
Plant sites/total sample	5/15	7/15	10/15	11/15	14/15	14/15
EU (weighted average)	26.36	21.89	26.41	30.17	26.00	23.44
EU (median)	28.31	24.64	28.22	30.59	26.17	23.50
EU (relative standard deviation)	13.7%	15.8%	23.6%	7.7%	29.4%	25.4%
EU (IQR)	1.81	6.55	12.36	4.98	13.62	8.37
EU (minimum)	23.92	17.57	17.31	25.87	8.8	7.87
EU (maximum)	35.03	26.46	37.73	34.31	41.59	35.94
CEE EU (weighted average)	--	--	--	--	--	--
SE EU (weighted average)	--	26.26	34.80	33.99	26.68	22.39
NWE EU (weighted average)	26.02	20.90	24.66	29.36	25.80	23.76

Source: CEPS et al.

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[25] *Refining Fitness Check*

Figure 278 – **Oil Refining - Components of natural gas bills paid by sampled producers, (€/MWh, 2008-2015)**

	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015
							North-Western Europe					
■ Other taxes, fees, levies and charges (excl. VAT)	1,08	0,65	0,50	0,48	0,58	0,65	1,27	0,79	0,53	0,55	0,67	0,75
■ Network costs	1,45	0,91	0,81	0,70	0,76	0,69	1,70	1,10	0,87	0,79	0,89	0,77
■ Energy supply costs	23,82	20,33	25,10	28,99	26,55	23,41	23,04	19,01	23,26	27,98	24,88	22,33
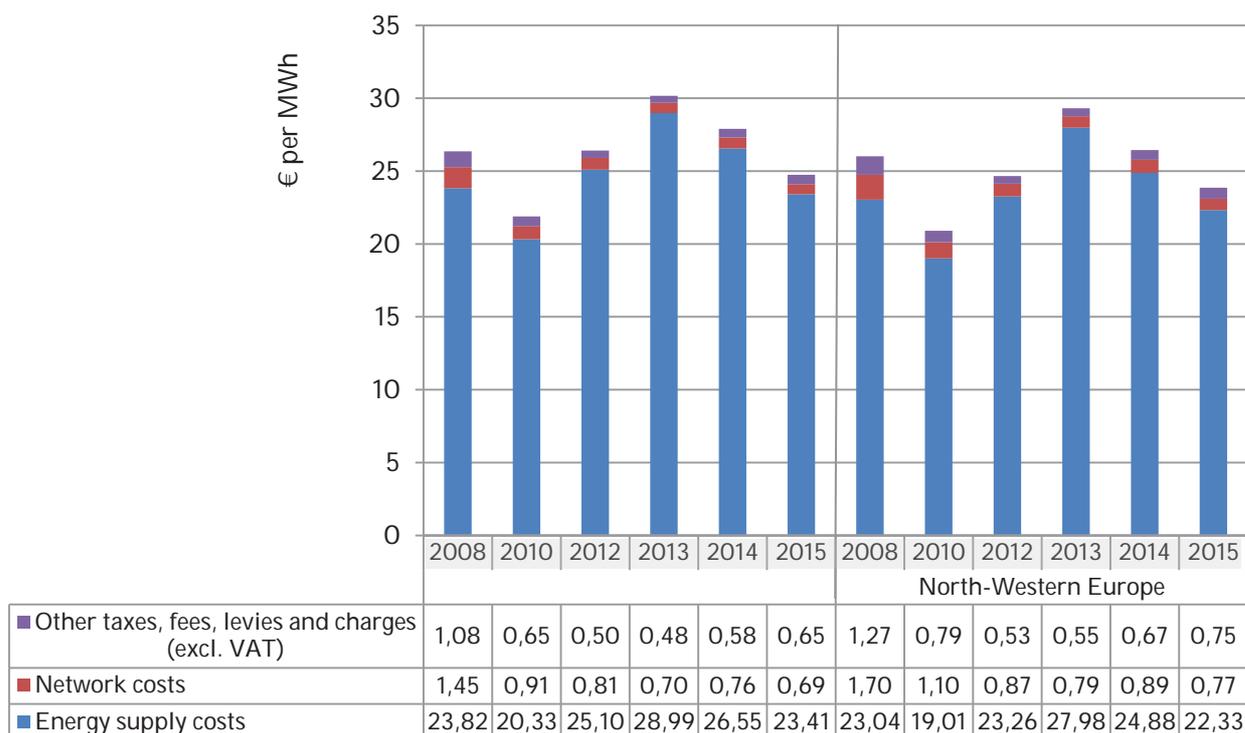
Source: *CEPS et al.*

Figure 279 – **Oil Refining -Components of natural gas bills paid by sampled producers (%, 2008-2015)**

	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015
	EU average						North-Western Europe					
■ Other taxes, fees, levies and charges (excl. VAT)	4,1%	3,0%	1,9%	1,6%	2,1%	2,6%	4,8%	3,8%	2,1%	1,9%	2,5%	3,1%
■ Network costs	5,5%	4,1%	3,1%	2,3%	2,7%	2,8%	6,5%	5,3%	3,5%	2,7%	3,4%	3,2%
■ Energy supply costs	90,4%	92,9%	95,0%	96,1%	95,2%	94,6%	88,6%	90,9%	94,3%	95,4%	94,1%	93,6%
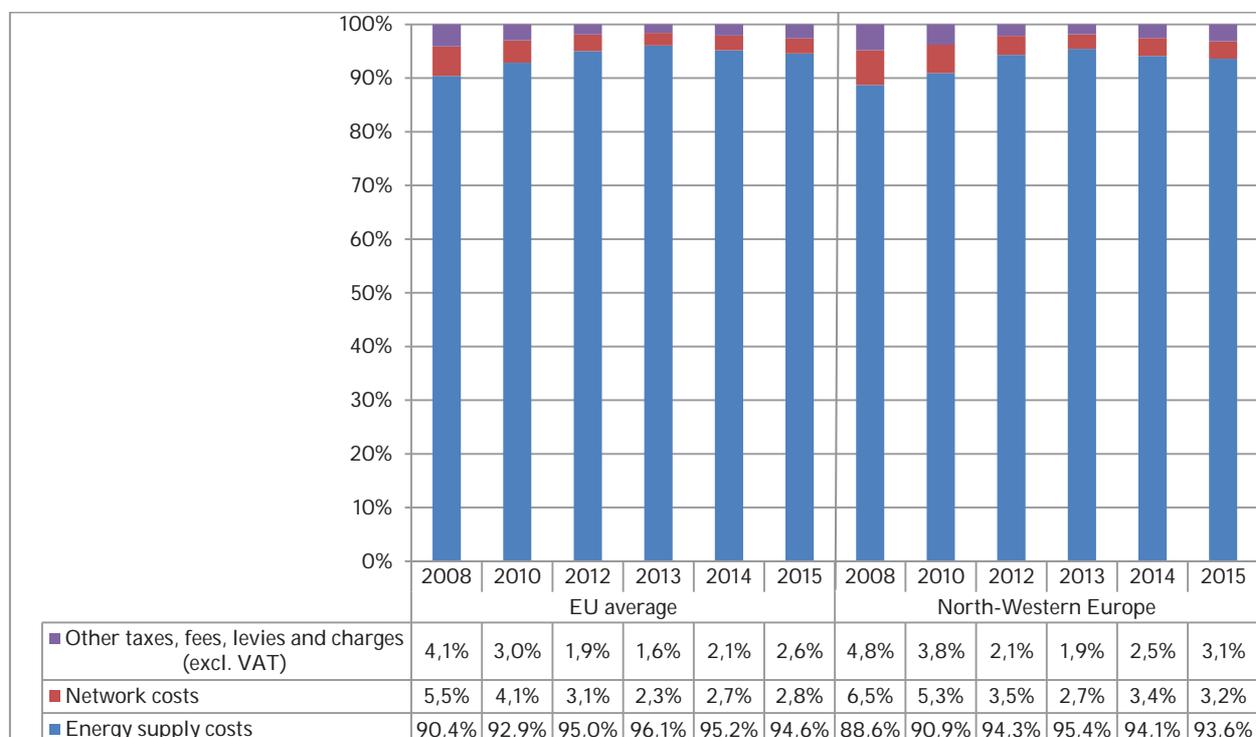
Source: *CEPS et al.*

Looking at all observation available CEPS et altri indicate that average electricity prices showed a clear downward trend, decreasing by about 7% between 2008 and 2015. A

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decreasing trend is confirmed also when looking only at plants which provided data for all the years but it is much less pronounced and is associated with a peak of average prices in 2014.

A very high spread between minimum and maximum price paid - in the order of 100 €/MWh – across the whole period.

The decrease in total price was driven by a reduction in energy supply component. At the same time, network costs component continuously increased in both absolute and relative terms, accounting in 2015 for 13% of the total price versus 3.9% in 2008. Renewable energy support costs were fluctuating due to changes in the German renewable energy support scheme, which impacted some of the respondents in the sample with high consumption, therefore significantly affecting the weighted average.

Table 36.- Oil Refining - Descriptive statistics for electricity prices paid by sampled producers (€/MWh, 2008-2015)

	2008	2010	2012	2013	2014	2015
Plant sites/total sample	7/15	8/15	13/15	14/15	14/15	14/15
EU (weighted average)	62,37	64,59	59,41	58,89	58,75	57,82
EU (median)	70,71	66,29	66,09	66,34	59,97	56,98
EU (relative standard deviation)	18.8%	30.1%	40.5%	41.0%	60.0%	44.4%
EU (IQR)	17,36	20,61	31,09	32,68	29,52	47,05
EU (minimum)	51,28	38,88	33,88	24,43	23,73	23,35
EU (maximum)	91,06	103,9	131,71	134,89	171,82	134,82
CEE EU (weighted average)	--	--	--	--	--	--
SE EU (weighted average)	70.03	67.06	71.46	73.45	68.48	78.40
NWE EU (weighted average)	59.12	63.59	55.09	53.65	55.32	50.65
EU (weighted average)*	62,37	68,21	66,46	66,74	70,34	65,24

* Average calculated only for 7 plants which provided data for all years
Source: CEPS et al.

Figure 280 – **Oil refining - Components of electricity bills paid by sampled producers, (€/MWh, 2008-2015)**

	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015
							North-Western Europe					
■ Other taxes, fees, levies and charges (excl. VAT)	7,06	7,07	5,52	4,40	4,57	4,57	7,87	7,42	5,43	4,07	4,25	4,26
■ Renewable support	1,13	8,84	2,58	0,67	3,45	0,92	1,31	10,37	2,99	0,70	4,12	1,04
■ Network costs	2,37	4,29	4,44	5,53	6,80	7,25	2,49	3,76	4,10	5,05	6,84	7,31
■ Energy supply costs	50,13	43,85	45,38	46,47	42,95	42,35	47,45	42,04	42,57	44,00	40,41	37,81
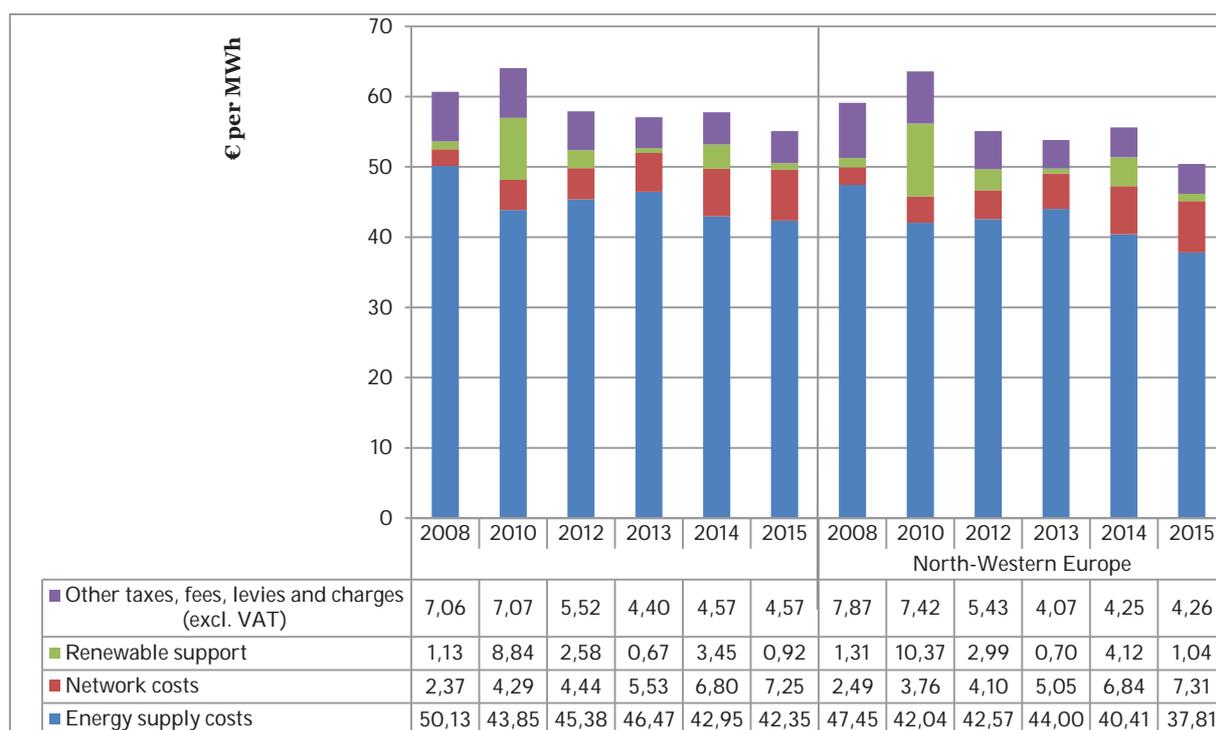
Source: *CEPS et al.*

Figure 281 – **Oil refining - Components of electricity bills paid by sampled producers, (%, 2008-2015)**

	2008	2010	2012	2013	2014	2015	2008	2010	2012	2013	2014	2015
	EU average						North-Western Europe					
■ Other taxes, fees, levies and charges (excl. VAT)	11,6%	11,0%	9,5%	7,7%	7,9%	8,3%	13,0%	11,7%	9,9%	7,6%	7,6%	8,4%
■ Renewable support	1,9%	13,8%	4,4%	1,2%	6,0%	1,7%	2,2%	16,3%	5,4%	1,3%	7,4%	2,1%
■ Network costs	3,9%	6,7%	7,7%	9,7%	11,8%	13,2%	4,2%	5,9%	7,4%	9,4%	12,3%	14,5%
■ Energy supply costs	82,6%	68,5%	78,4%	81,4%	74,4%	76,9%	80,3%	66,1%	77,3%	81,8%	72,7%	75,0%

Source: *CEPS et al.*

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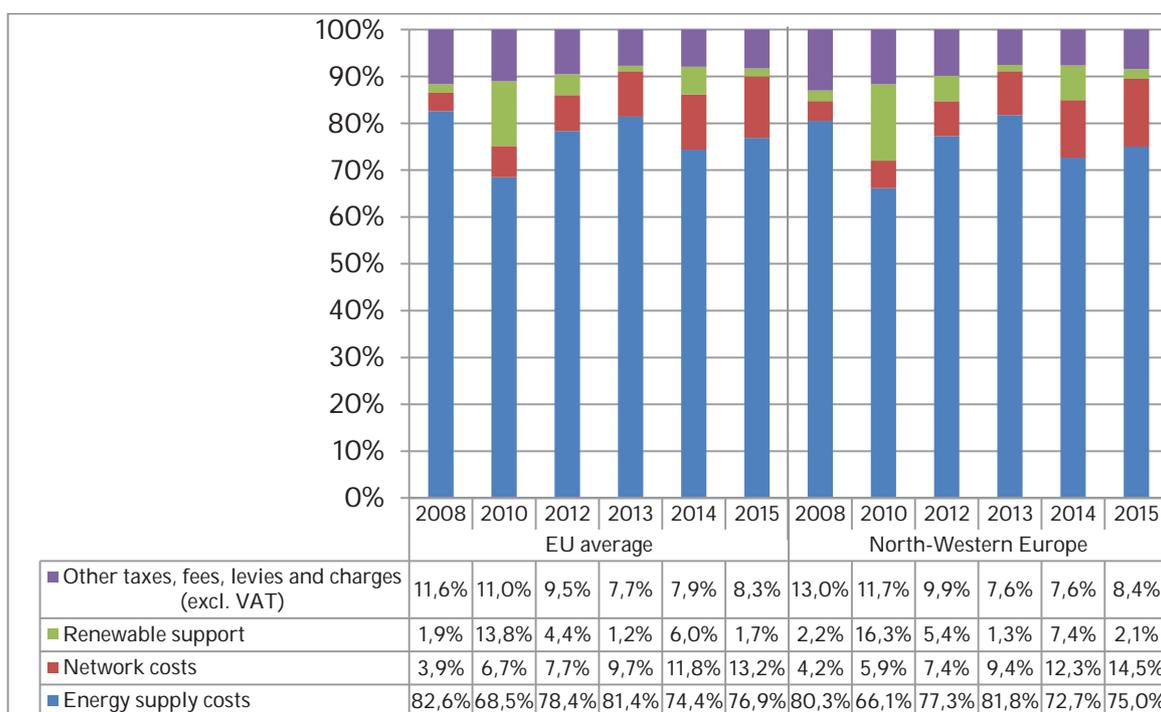
Energy costs in the refinery sector

Figure 282 – Oil refining - Net trade flows for refined products

Source: FuelsEurope (2015).

Based on a recent *analysis by Solomon Associates*[26], which collects confidential refinery plant site questionnaires, European refineries' operational energy expenditures have tripled between 2000 and 2014 (As seen in the chart, in 2014 they reached an indexed level of 340 compared to 100 in 2000). Refiners in the two regional peer groups - India and Korea/Singapore - show stronger increases in energy costs, while those of US Gulf Coast show a declining trend since 2008. Energy expenditures of refineries in the Middle East region, while the lowest among the 7 studied regions, remained fairly stable at a level of 61 (the EU28 peer group average is indexed to 100 in operating year 2000).

Figure 283 – Oil refining - Energy costs for refineries in 2014 (Max, min and average values)
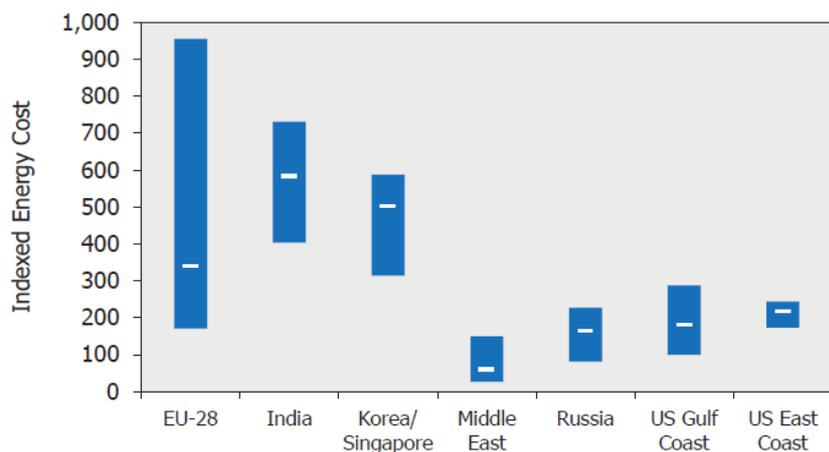
OpEx – Energy Cost in USD/bbl indexed relative to EU-28 Peer Group Avg = 100 in Year 2000

Source: Solomon Associates (2015)

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[26] One of the most prominent sources in the refining sector is Solomon Associates. Every two years, Solomon provides a summary of the refining costs and margins in EU28 compared to other competing world regions. The latest update of the Solomon study includes data up to 2014

European *refining margins* have been shrinking since 2008, mainly as a result of reduced demand, overcapacity and shifting product demand to diesel. This is deterring the necessary investments in medium-to long-term in Europe, which are divested from Europe to non-OECD countries.

The *Refining Fitness Check* (equally to CEPS study) reveals that the main factor of loss of competitiveness of the sector in that period was the cost of energy. Furthermore, the contribution from the cost of legislation was responsible for up to 25% of the loss of competitiveness of the oil refining sector as a whole over the studied period 2000-2012. High energy and regulatory costs could be leading to lower profit margins making EU refineries more vulnerable.

Figure 284 – Oil refining - Net cash margin for refineries by region (2000 -2014, indexed relative to EU-28=100 in 2000)
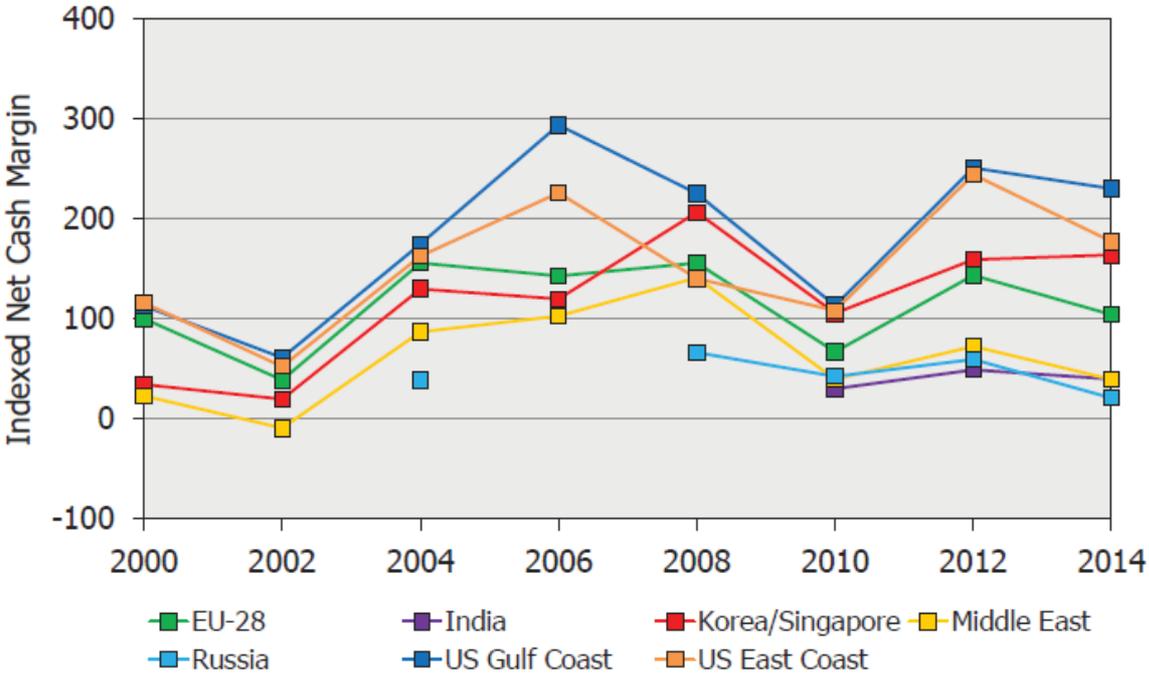
Net Cash Margin in USD/bbl for all regions indexed relative to EU-28 = 100 in Year 2000

Source: Solomon Associates (2015)

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PART 10/13

COMMISSION STAFF WORKING DOCUMENT
Accompanying the document

**REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE
COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE
COMMITTEE OF THE REGIONS**

Energy prices and costs in Europe

{COM(2016) 769 final}

EN   **EN**

Annex 3 - Country fact sheets

For all reporting countries:

Electricity "household price" refers to Eurostat consumption band DC covering annual consumption of 2500 to 5000 kWh.

Electricity "industrial price" refers to Eurostat consumption band ID covering annual consumption of 2000 to 20000 MWh.

Natural gas "household price" refers to Eurostat consumption band D2 covering annual consumption of 20 GJ to 200 GJ.

Natural gas "industrial price" refers to Eurostat consumption band I3 covering annual consumption of 10 000 GJ to 100 000 GJ.

"Energy products in household expenditure" refers to household expenditure on energy products excluding transport fuels

Austria

Evolution of electricity and natural gas prices

Composition of electricity prices

Composition of median industrial electricity prices

EUR/MWh

Legend: Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

Composition of gas prices

Composition of median household gas prices

EUR/MWh

Legend: Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

Composition of median industrial gas prices

EUR/MWh

Legend: Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

Oil products prices

Gasoline

Diesel

Heating oil

Legend:
- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price

Energy in Households budgets

Austria

Share of energy products in household expenditure in different quintiles
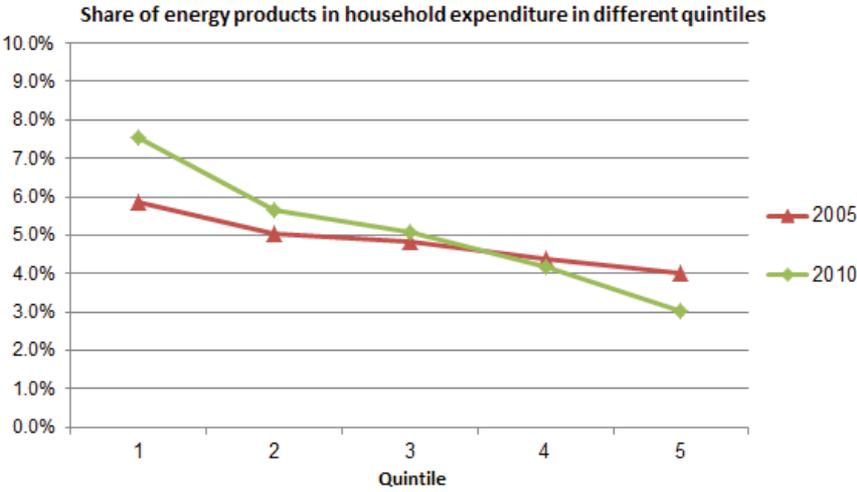
- 2005
- 2010

In 2005 in Austria (red line) the poorest households (Quintile 1) had to spend 5.9% of their total expenditures on energy products. In 2010 (green line) the poorest households spent 7.5% of their total expenditure on energy. In the case of middle income households (Quintile 3) the share of energy remained practically unchanged.

Energy costs shares in total production costs

Share of energy costs in total production value in industry and services: AT vs. EU28

Source: ESTAT, SBS and NA, own calculatios
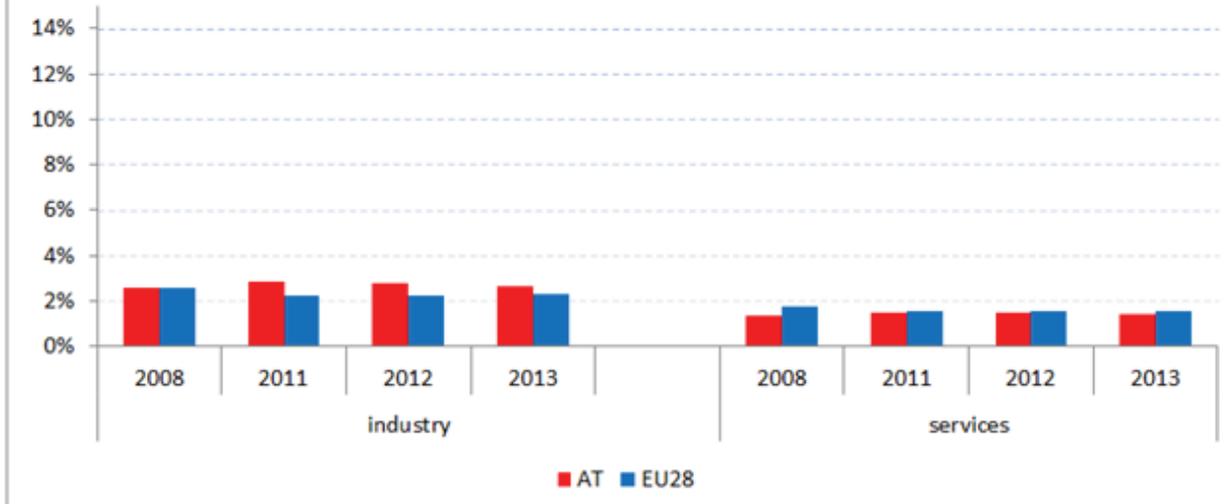
Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Energy	0.066800
Total energy component	**0.066800**
Network	0.059300
Total network component	**0.059300**
Local tax	0.002200
Renewables, CHP	0.024100
VAT	0.033000
Excise Tax	0.015000
Total taxes & levies component	**0.074300**
Total price	**0.200400**

Band ID	EUR/kWh 2015
Energy	0.046700
Total energy component	**0.046700**
Network	0.018000
Total network component	**0.018000**
VAT	0.000000
Excise Tax	0.015000
RES Support	0.010000
Total taxes & levies component	**0.025000**
Total price	**0.089700**

Band D2	EUR/kWh 2015
Energy	0.035500
Total energy component	**0.035500**
Network	0.018400
Total network component	**0.018400**
Natural Gas tax	0.005900

Municipality charges	0.001100
VAT	0.012200
Total taxes & levies component	**0.019200**
Total price	**0.073100**

Band I3	EUR/kWh 2015
Energy	0.025800
Total energy component	**0.025800**
Network	0.004800
Total network component	**0.004800**
Natural Gas tax	0.005900
Municipality charges	0.003100
VAT	0.000000
Total taxes & levies component	**0.009000**
Total price	**0.039600**

Belgium

Evolution of electricity and natural gas prices

Composition of electricity prices

Composition of median industrial electricity prices

EUR/MWh

Legend (top to bottom): Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

Composition of gas prices

Composition of median household gas prices

EUR/MWh

Legend (top to bottom): Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

Composition of median industrial gas prices

EUR/MWh

Legend (top to bottom): Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

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Oil products prices

Gasoline

Diesel

Heating oil

Legend:
- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price

Energy in Households budgets

Share of energy products in household expenditure in different quintiles

Between 2004 (blue line) and 2009 (red line) the share of energy in total household expenditure went up from 5.8% to 8.5% in Belgium in the case of the poorest households (Quintile 1), while it increased from 4.8% to 6.1% in the case of middle income households (Quintile 3). In 2014 (green line) the share of energy slightly decreased in all income quintiles.

Energy costs shares in total production costs

Share of energy costs in total production value in industry and services: BE vs. EU28

Source: ESTAT, SBS and NA, own calculatios
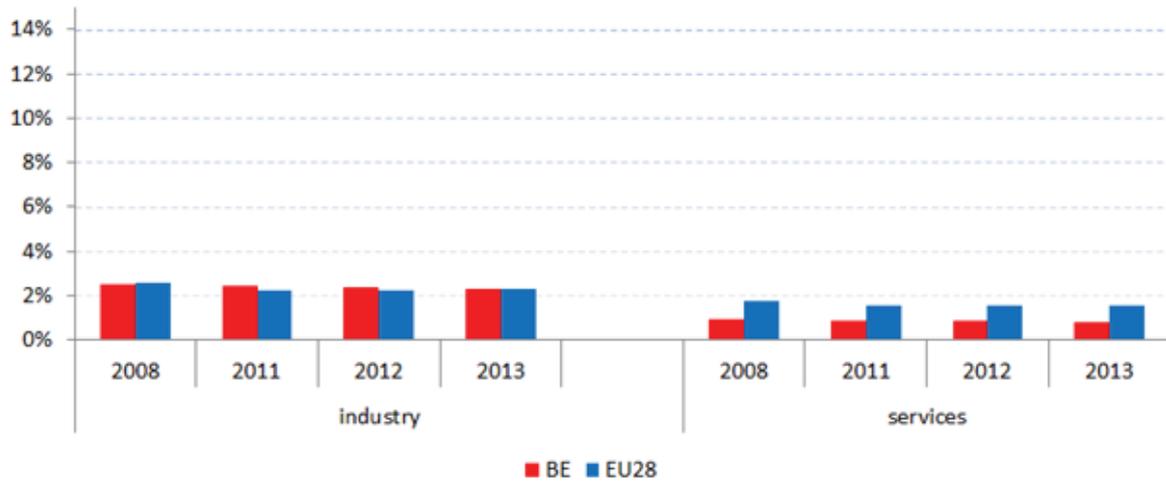
Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Energy	0.171185
Total energy component	**0.171185**
Transmission Distribution	
Total network component	**0.000000**
VAT	0.012000
Capacity payments	0.000560
Others	0.014104
Connection of offshore wind	0.000063
Nuclear decommissioning	0.000978
Social measures	0.003316
Connection fee	0.000256
Promotion rational use of energy	0.000035
Contribution for federal regulator (CREG)	0.000151
Promotion of renewables and CHP	0.009600
Levy for occupying public domain Kyoto	0.000351
Total taxes & levies component	**0.041415**
Total price	**0.212600**

Band ID	EUR/kWh 2015
Energy	0.047140
Total energy component	**0.047140**
Transmission	0.004461
Distribution	0.018652
Total network component	**0.023112**
VAT	0.000000
Capacity payments	0.000560
Others	0.012919
Connection of offshore wind	0.000063
Nuclear decommissioning	0.000978
Social measures	0.002838
Connection fee	0.000217
Promotion rational use of energy	0.000040

	EUR/kWh
Contribution for federal regulator (CREG)	0.000151
Promotion of renewables and CHP	0.008868
Levy for occupying public domain	0.000315
Kyoto	
Total taxes & levies component	**0.026948**
Total price	**0.097200**

Band D2	EUR/kWh 2015
Energy	0.032569
Total energy component	**0.032569**
Transmission	0.001517
Distribution	0.013650
Total network component	**0.015167**
Others	0.001207
Contribution for federal regulator (CREG)	0.000036
Levy for occupying public domain	0.000606
Connection fee	0.000018
VAT	0.010700
Social measures	0.001752
Promotion rational use of energy	0.000039
Total taxes & levies component	**0.014357**
	0.000000
Total price	**0.062093**

Band I3	EUR/kWh 2015
Energy	0.023696
Total energy component	**0.023696**
Transmission	0.000805
Distribution	0.001878
Total network component	**0.002683**
Others	0.000000
Contribution for federal regulator (CREG)	0.000036
Levy for occupying public domain	0.000530
Connection fee	0.000020
VAT	0.000000
Social measures	0.001752

Promotion rational use of energy	
Total taxes & levies component	**0.002337**
Total price	0.02871723

Bulgaria

Evolution of electricity and natural gas prices
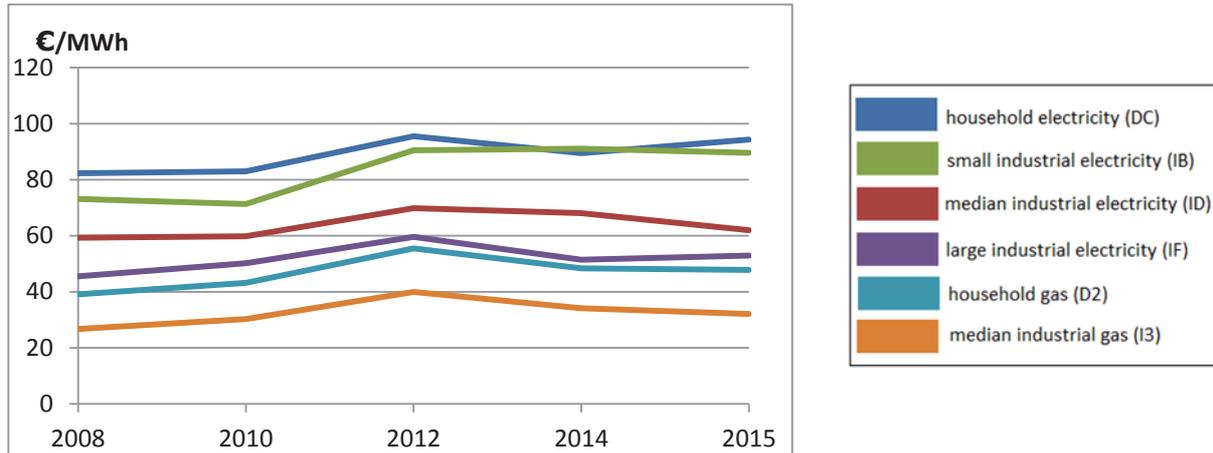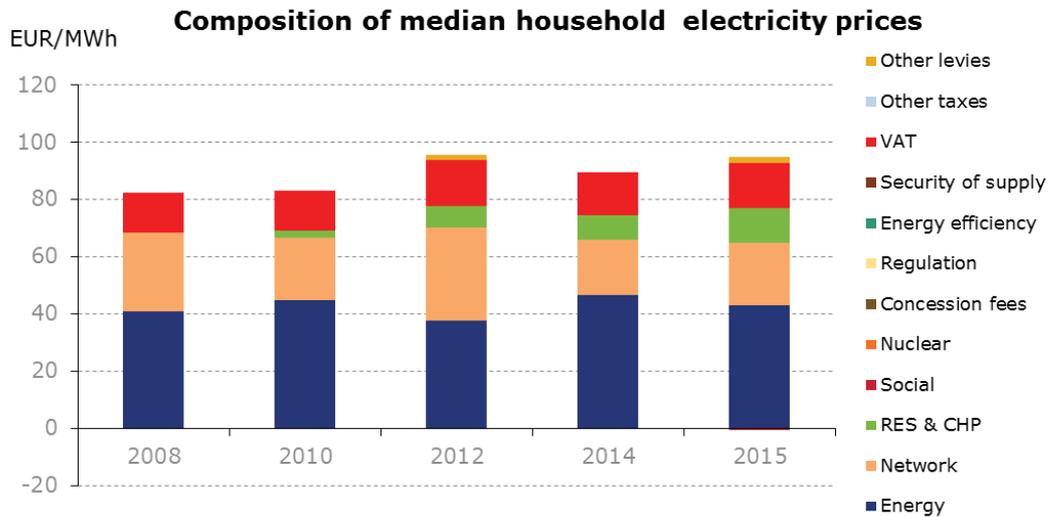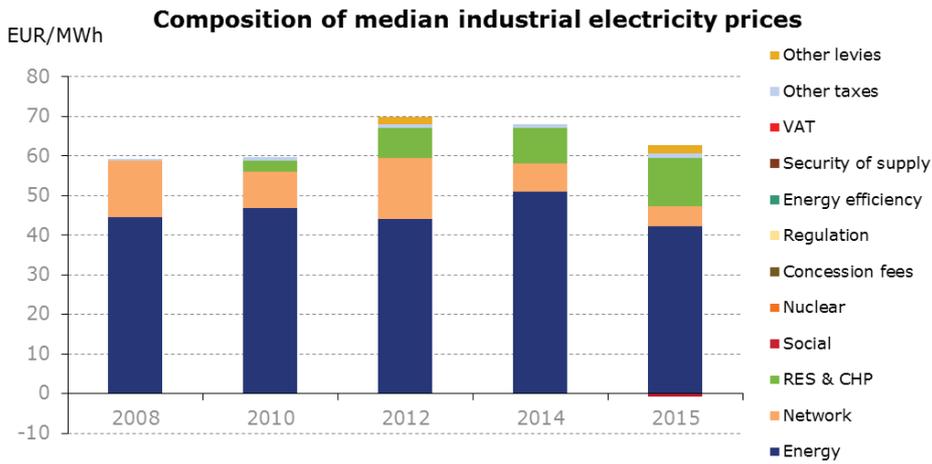
Composition of electricity prices

Composition of median industrial electricity prices

Composition of gas prices

Composition of median household gas prices

### Composition of median industrial gas prices

Oil products prices

Gasoline

Diesel

Heating oil

Legend:
- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price
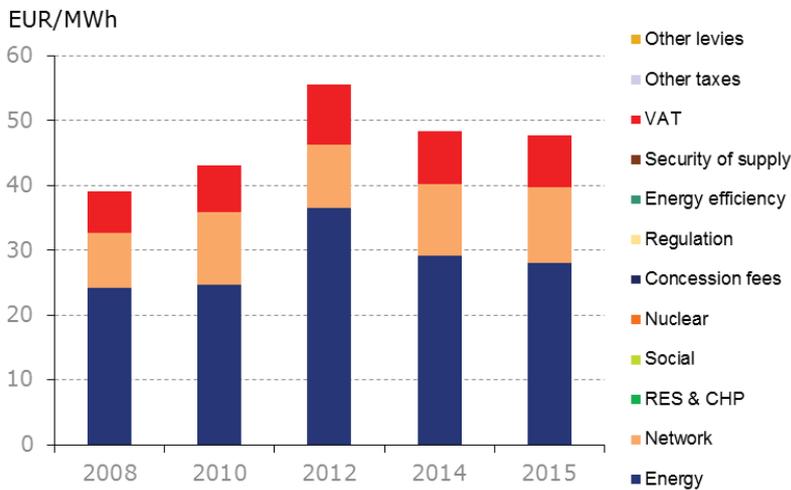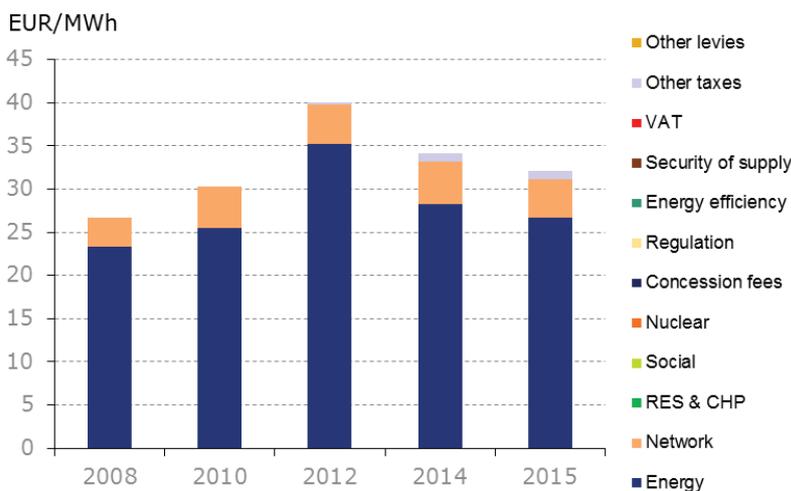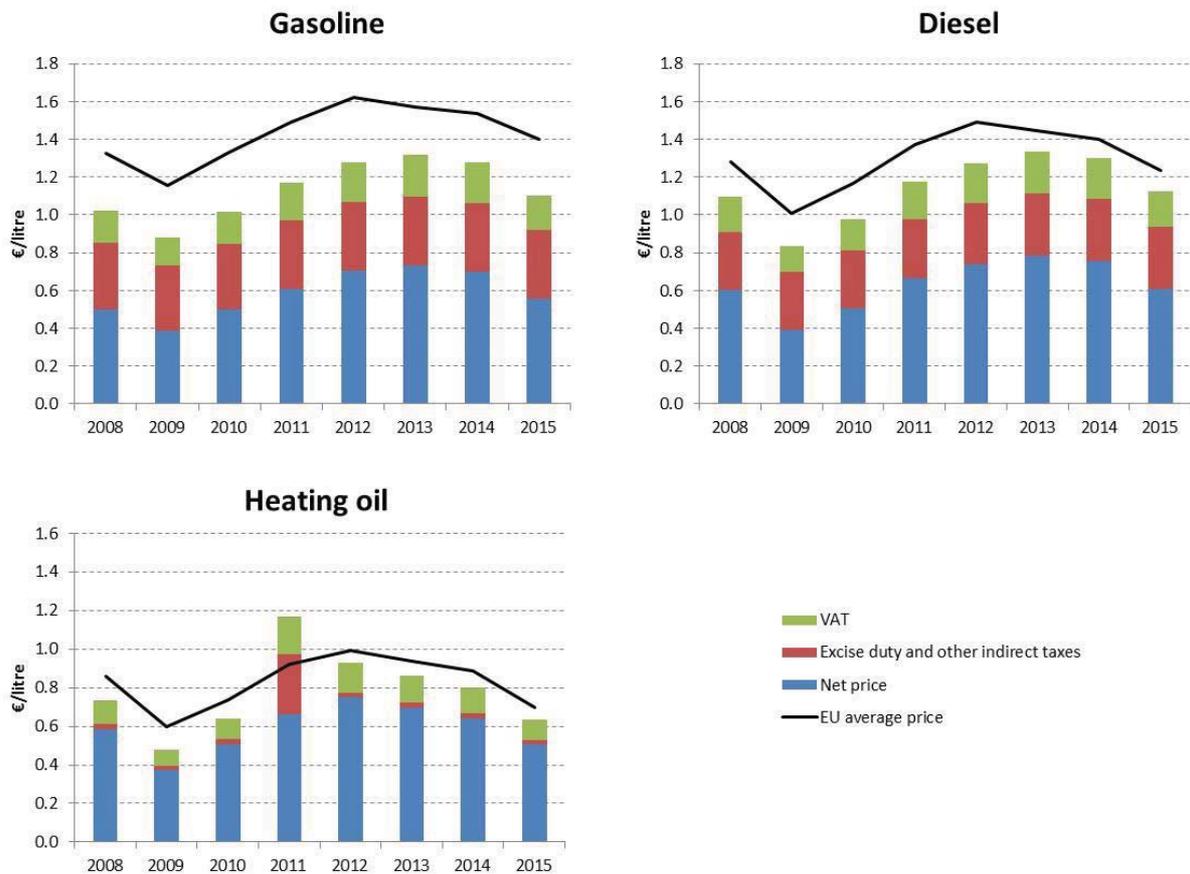
Energy in Households budgets

Bulgaria
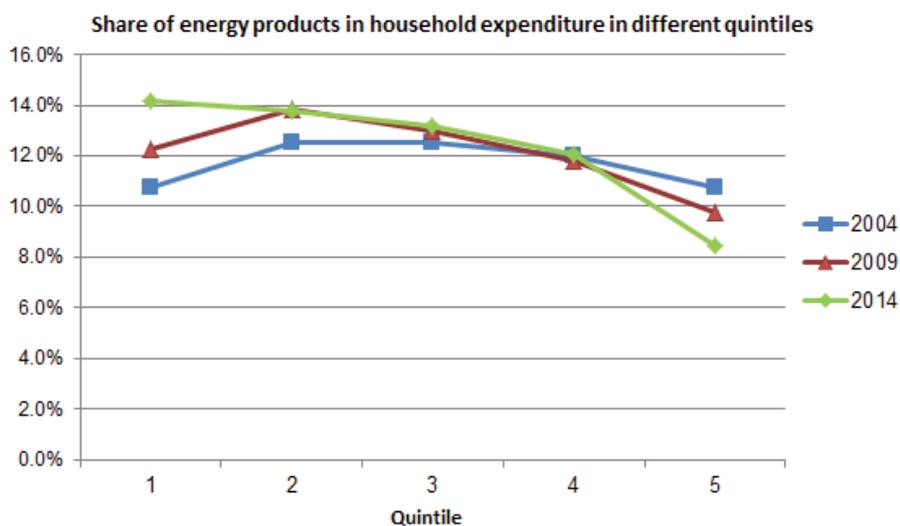
Share of energy products in household expenditure in different quintiles

- 2004
- 2009
- 2014

Between 2004 (blue line) and 2014 (green line) the share of energy in total household expenditure for the poorest households (Quintile 1) in Bulgaria went up from 10.8% to 14.2%, while for the richest households (Quintile 5) it decreased from 10.7% to 8.4%, implying growing differences in the country in energy affordability across different income quintiles.
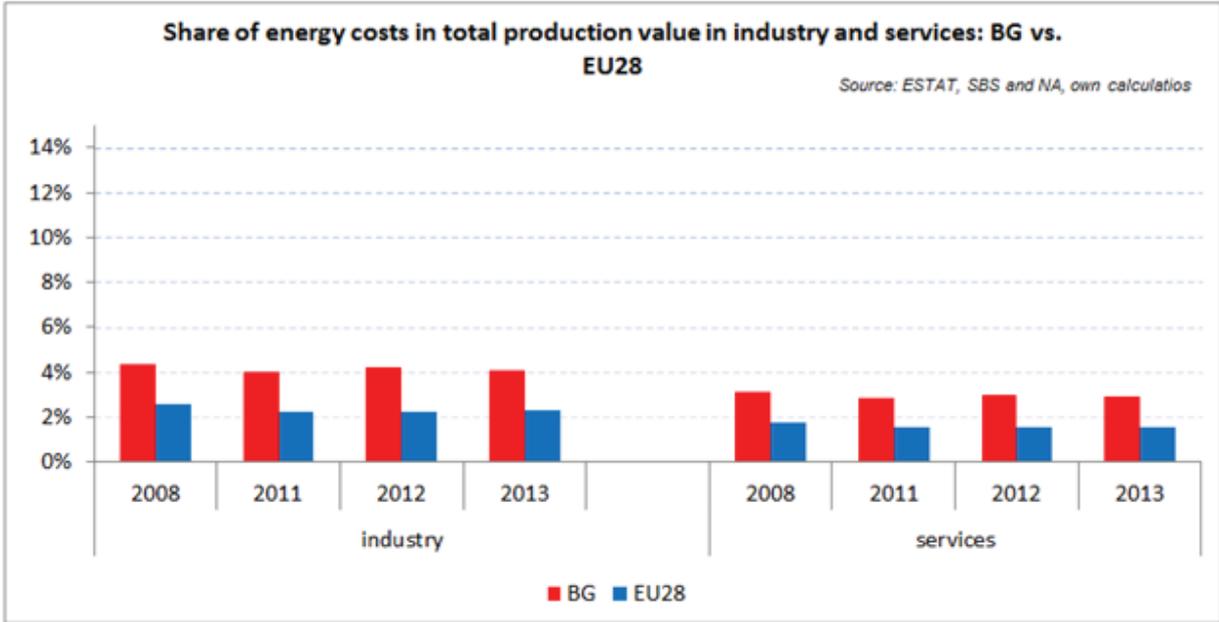
Energy costs shares in total production costs

Share of energy costs in total production value in industry and services: BG vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Price for energy and supply	0.042949
Total energy component	**0.042949**
Network	0.021986
Total network component	**0.021986**
Price for high effective combined production of heat and electricity	0.001764
Price for 'green energy supplement'	0.000000
Price for 'non-recoverable expenses'	0.002168
RES Support	0.010441
Critical infrastructure	0.000026
PSO rebate for vulnerable consumers (from stability reserve fund)	-0.000767
VAT	0.015697
Total taxes & levies component	**0.029328**
Total price	**0.094263**

Band ID	EUR/kWh 2015
Price for energy and supply	0.042356
Total energy component	**0.042356**
Network	0.004960
Total network component	**0.004960**
Price for high effective combined production of heat and electricity	0.001764
Price for 'green energy supplement'	0.000000
Price for 'non-recoverable expenses'	0.002168
Excise Tax	0.001023
RES Support	0.010441
Critical infrastructure	0.000026
PSO rebate for vulnerable consumers (from stability reserve fund)	-0.000767
VAT	0.000000
Total taxes & levies component	**0.014654**
Total price	**0.061970**
Band D2	**EUR/kWh**
	2015
Energy	**0.026383**
Supply	**0.001687**

Total energy component	**0.028070**
Network	**0.011709**
Total network component	**0.011709**
VAT	**0.007976**
Total taxes & levies component	**0.007976**
Total price	**0.047755**

Band I3	**EUR/kWh 2015**
Energy Supply	0.025821 0.000920
Total energy component	**0.026741**
Network	0.004346
Total network component	**0.004346**
VAT Excise Tax	0.000000 0.001023
Total taxes & levies component	**0.001023**
Total price	**0.032110**

Croatia

Evolution of electricity and natural gas prices
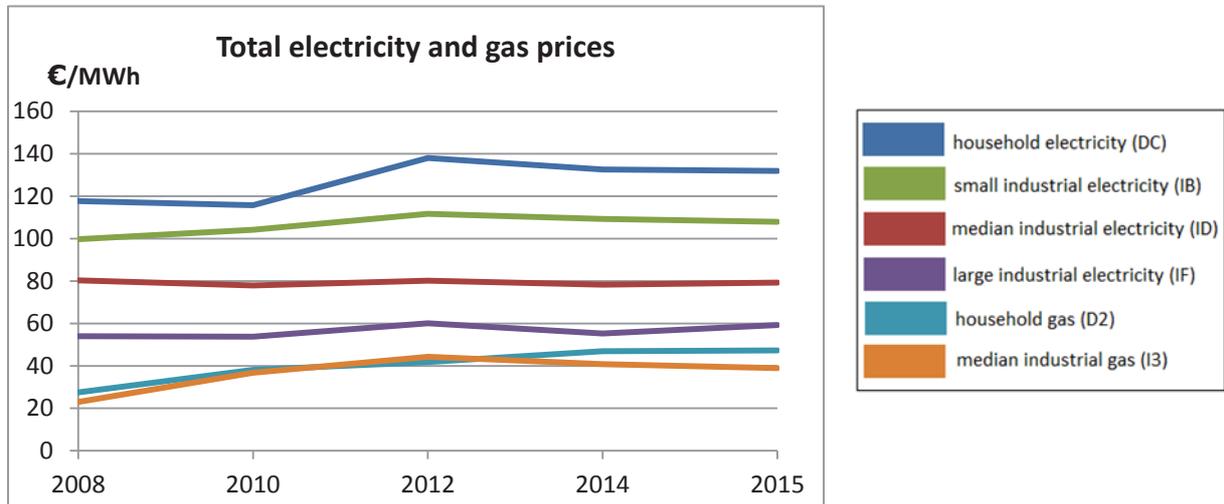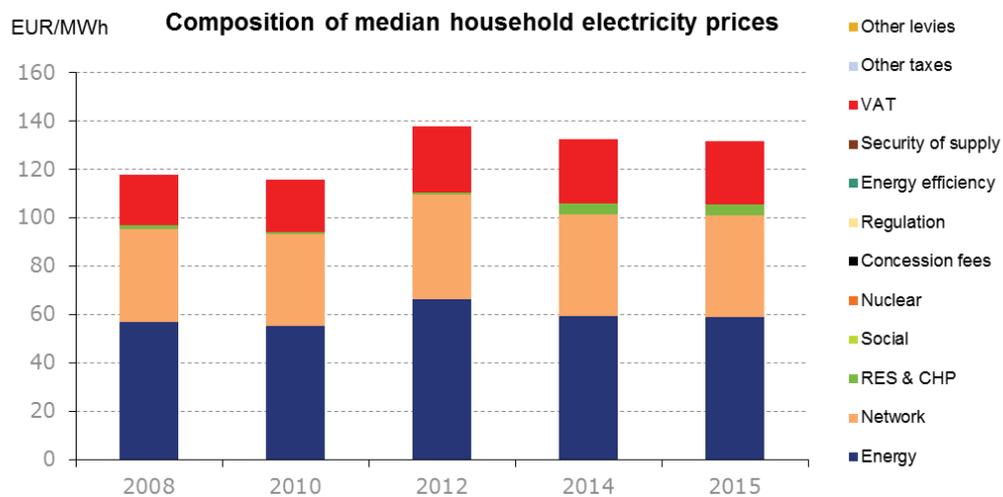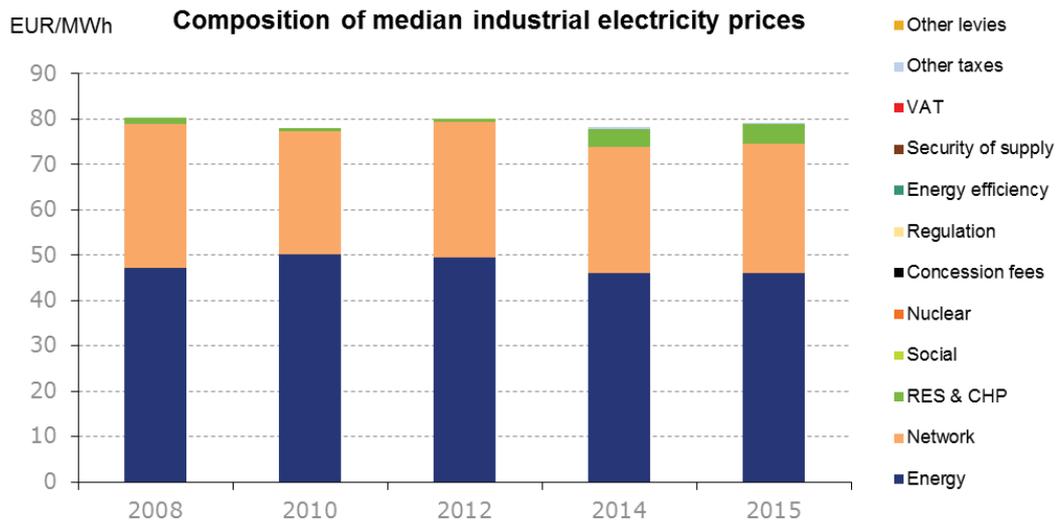
Total electricity and gas prices

€/MWh

Legend:
- household electricity (DC)
- small industrial electricity (IB)
- median industrial electricity (ID)
- large industrial electricity (IF)
- household gas (D2)
- median industrial gas (I3)

Composition of electricity prices

EUR/MWh

Composition of median household electricity prices

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Composition of median industrial electricity prices

Composition of gas prices

Composition of median household gas prices

Composition of median industrial gas prices

Oil products prices

Gasoline

Diesel

Heating oil
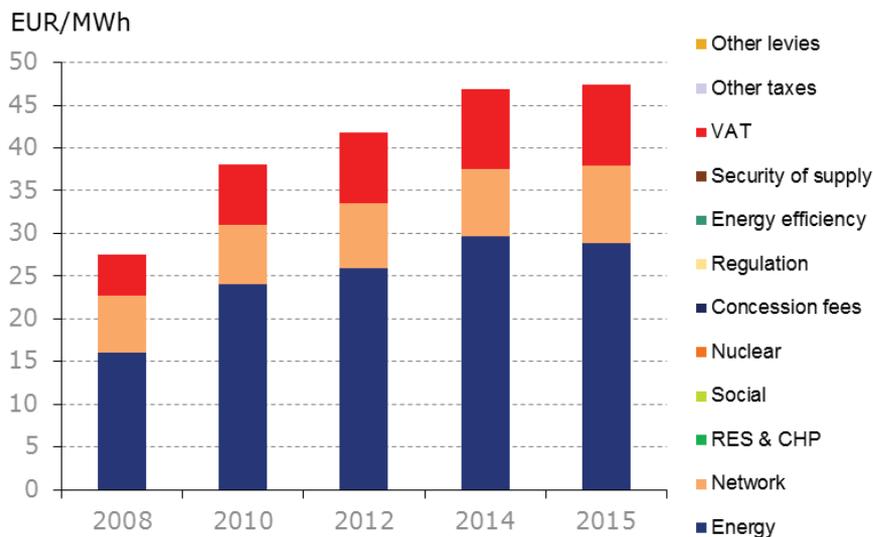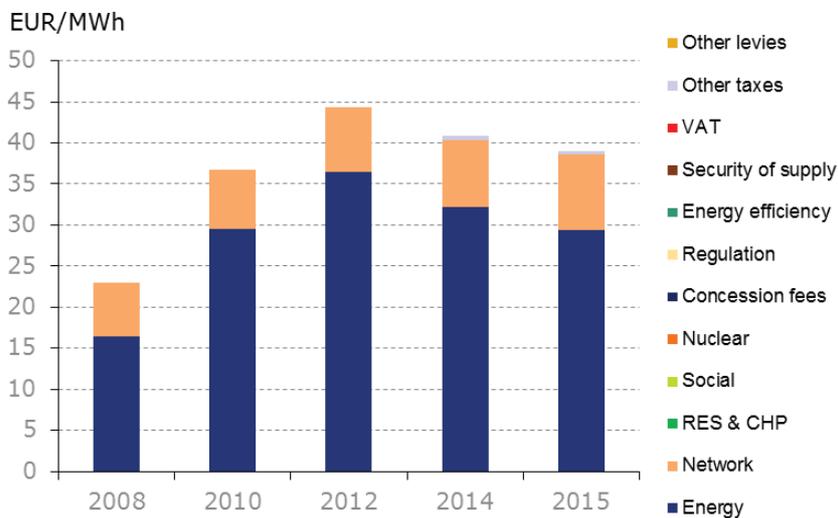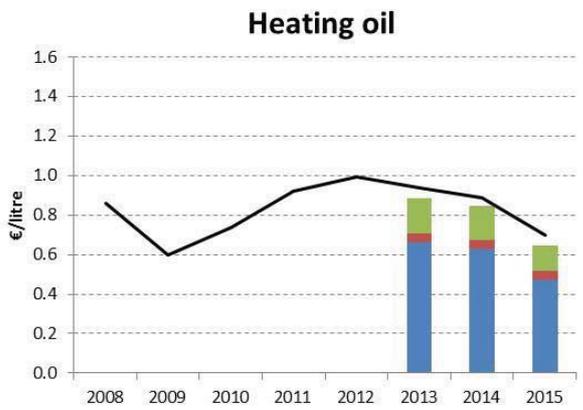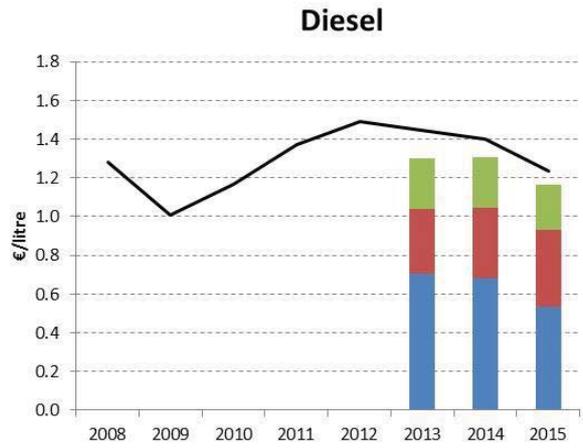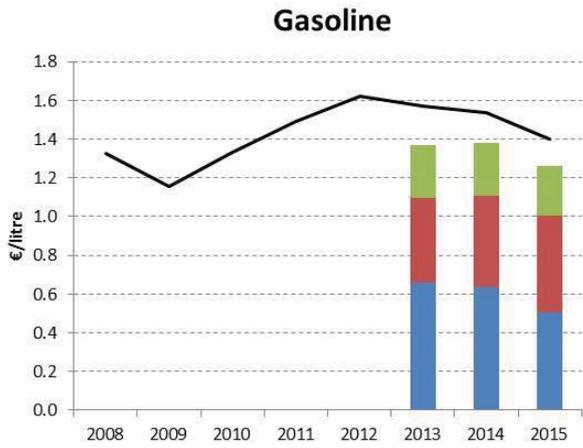
Legend:
- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price

Note: Croatia started reporting oil product prices from 2013

Energy in Households budgets

Share of energy products in household expenditure in different quintiles
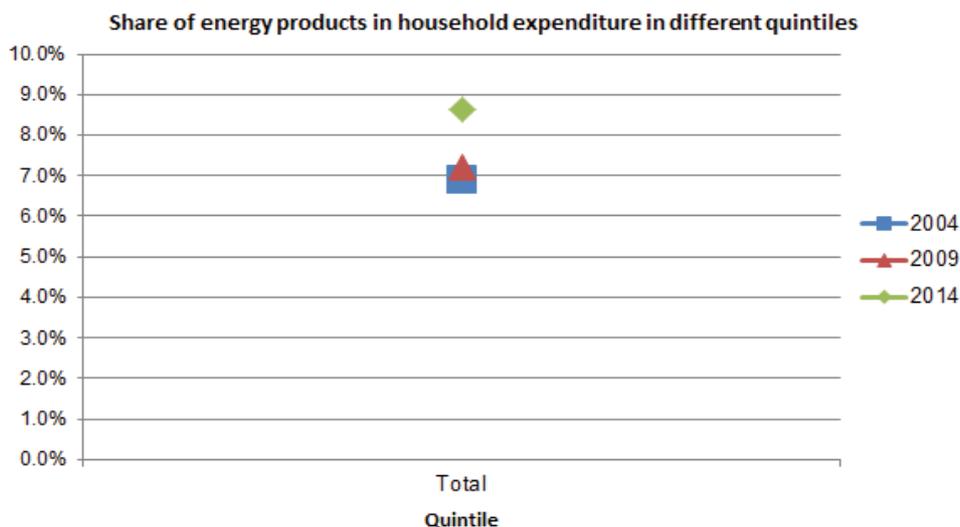
In the case of Croatia we only have data for households as whole (without information on different income quintiles) regarding the share of energy in the total expenditure, which practically did not change between 2004 and 2009, however, in 2014 it rose to 8.6% from 6.9% in 2004.

Energy costs shares in total production costs
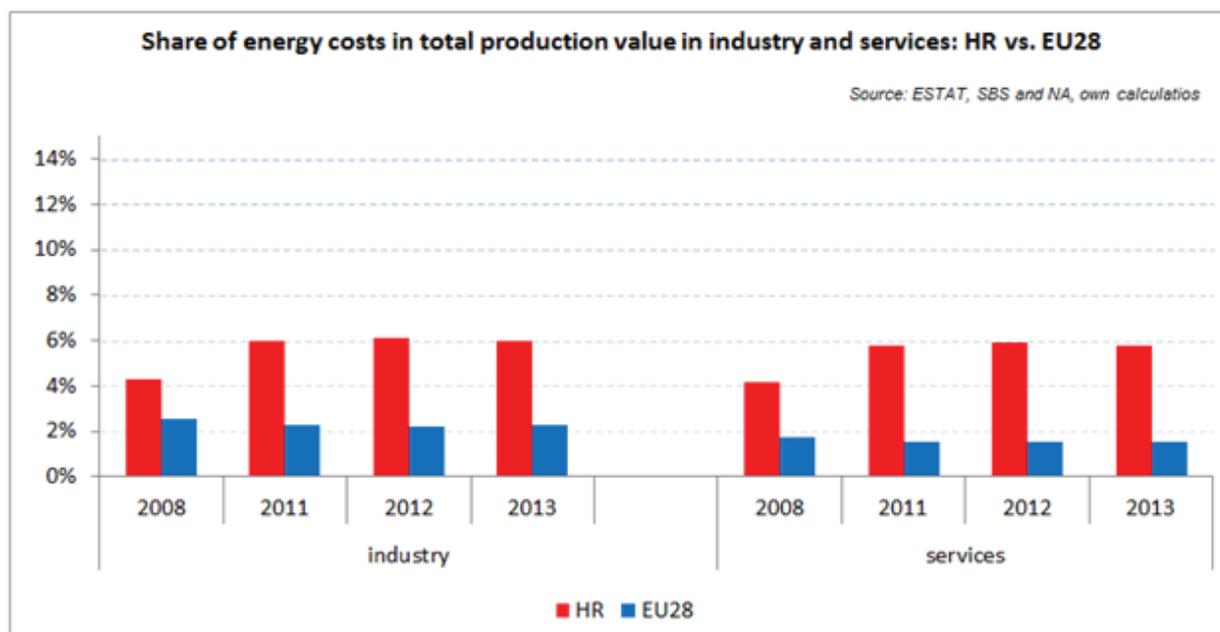
Share of energy costs in total production value in industry and services: HR vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Energy and supply	0.058806
Total energy component	**0.058806**
Distribution	0.030559
Transmission	0.011601
Total network component	**0.042160**
VAT	0.026381
RES support	0.004598
Total taxes & levies component	**0.030979**
Total price	**0.131945**

Band ID	EUR/kWh 2015
Energy and supply	0.045957
Total energy component	**0.045957**
Distribution	0.018919
Transmission	0.009762
Total network component	**0.028680**
VAT	0.000000
RES support	0.004191
Excise tax	0.000407
Total taxes & levies component	**0.004598**
Total price	**0.079235**

Band D2	EUR/kWh 2015
Energy and supply	0.0288
Total energy component	**0.0288**
Transmission	0.0024
Distribution	0.0067
Total network component	**0.0091**
VAT	0.0095

Total taxes & levies component	**0.0095**
Total price	**0.0473**

Cyprus

Evolution of electricity and natural gas prices

€/MWh

Legend:
- household electricity (DC)
- small industrial electricity (IB)
- median industrial electricity (ID)
- large industrial electricity (IF)
- household gas (D2)
- median industrial gas (I3)

Composition of electricity prices

Composition of median household electricity prices

EUR/MWh

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Composition of median industrial electricity prices

EUR/MWh

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Oil products prices

Gasoline

€/litre

Diesel

€/litre

Heating oil

€/litre

Legend:
- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price

Energy in Households budgets

In Cyprus the share of energy in the total consumption expenditure remained low in EU comparison between 2005 (blue line) and 2009 (red line): in the case of the poorest households (Quintile 1) the energy share decreased by 0.2% (from 4.6% to 4.4%), while for middle income households (Quintile 3) it remained unchanged.

Energy costs shares in total production costs
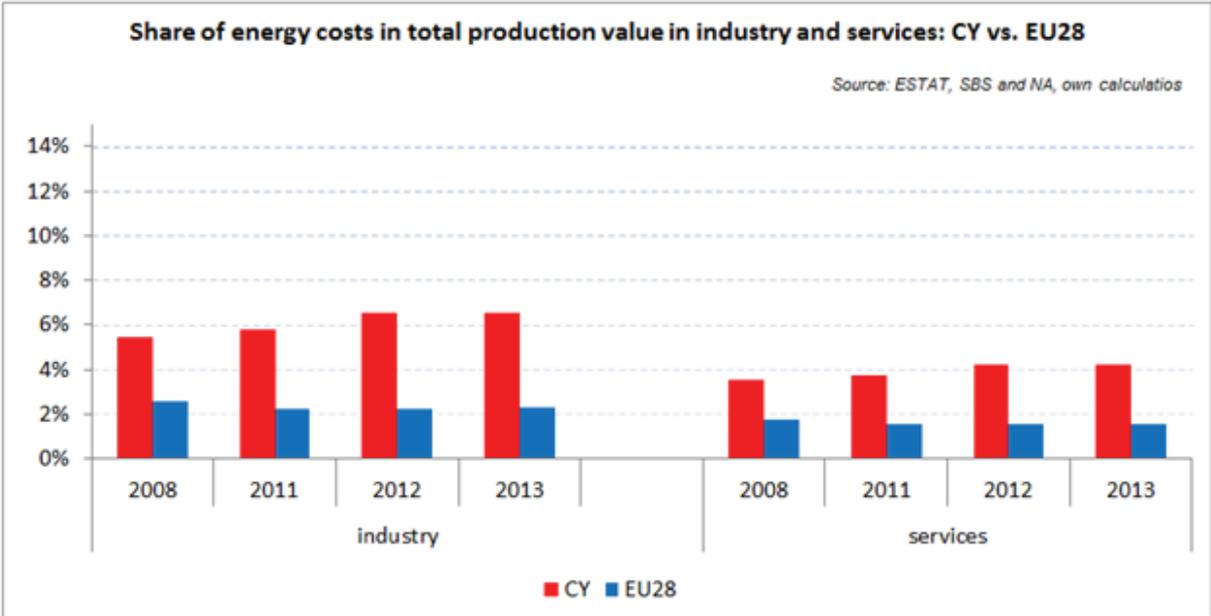
Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Energy Supply and Network	0.000000
Long term reserve	0.000000
Ancillary services	0.002100
Capacity reserve margin	0.004600
Generation and supply	0.113100
Total energy component	**0.119800**
Transmission System Operator	0.001100
Network	0.036600
Total network component	**0.037700**
PSO - Vulnerable consumers	0.001400
Greenhouse gas allowances (CO2)	0.001400
RES Support	0.005000
VAT	0.030500
Total taxes & levies component	**0.038300**
Total price	**0.195800**

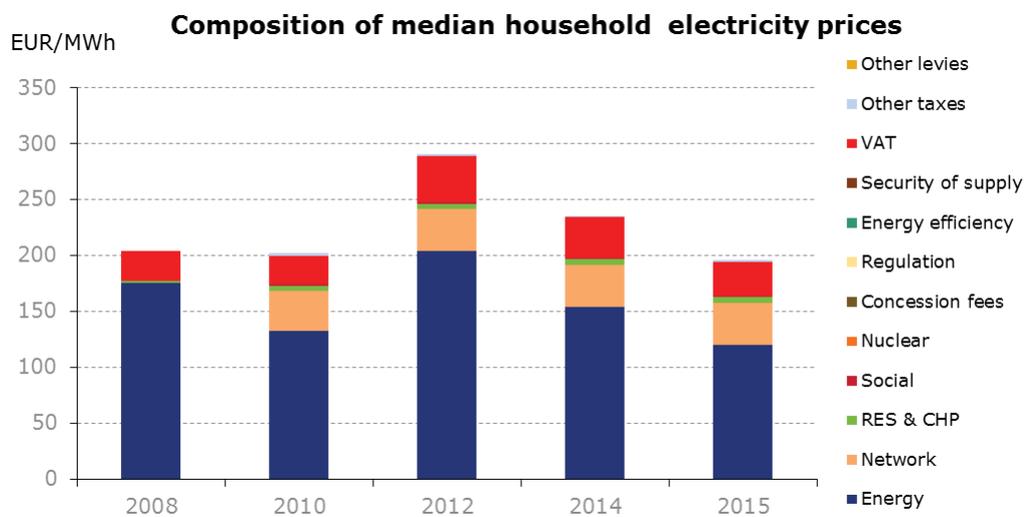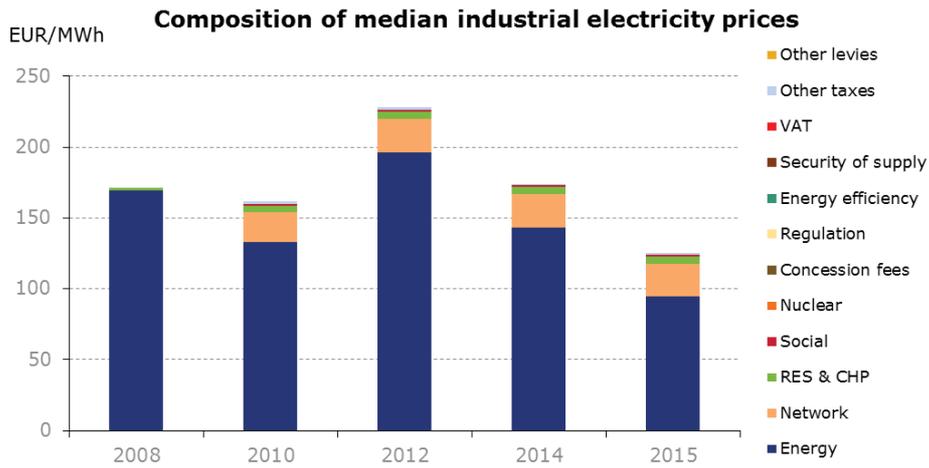| Band ID	EUR/kWh 2015
Energy Supply and Network	0.000000
Long term reserve	0.004600
Ancillary services	0.002100
Generation and supply	0.087800
Total energy component	**0.094500**
Transmission System Operator	0.001100
Network	0.022200
Total network component	**0.023300**
PSO - Vulnerable consumers	0.001400
Greenhouse gas allowances (CO2)	0.001400
RES Support	0.005000
VAT	0.000000
Total taxes & levies component	**0.007300**
Total price	**0.125100**

Czech Republic

Evolution of electricity and natural gas prices

€/MWh

Legend:
- household electricity (DC)
- small industrial electricity (IB)
- median industrial electricity (ID)
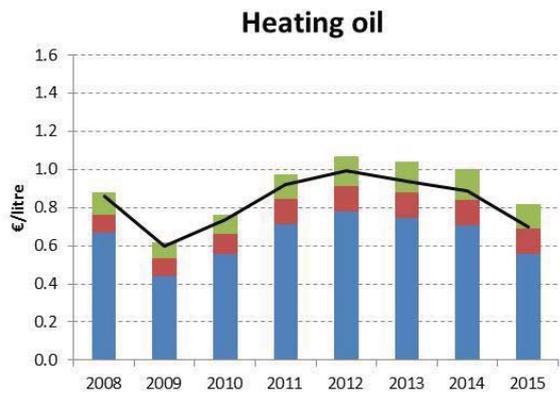- large industrial electricity (IF)
- household gas (D2)
- median industrial gas (I3)

Composition of electricity prices

Composition of median household electricity prices

EUR/MWh

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
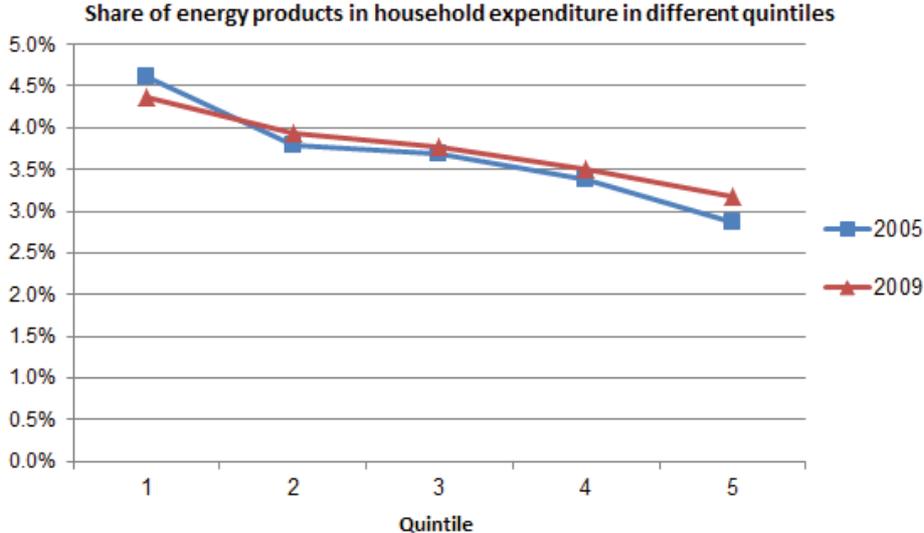- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Composition of median industrial electricity prices

EUR/MWh

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Composition of gas prices

Composition of median household gas prices

EUR/MWh

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Composition of median industrial gas prices

EUR/MWh

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Oil products prices

Gasoline

Diesel

Heating oil

- ■ VAT
- ■ Excise duty and other indirect taxes
- ■ Net price
- — EU average price

Energy in Households budgets

Share of energy products in household expenditure in different quintiles

In the Czech Republic the share of energy in the total household expenditure rose by 0.5-1% across different income quintiles between 2004 (blue line) and 2014 (green line), amounting to 12.4% in 2014 for the poorest households (Quintile 1)and to 12.7% for middle income households (Quintile 3).

Energy costs shares in total production costs

Share of energy costs in total production value in industry and services: CZ vs. EU28
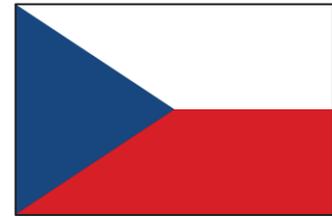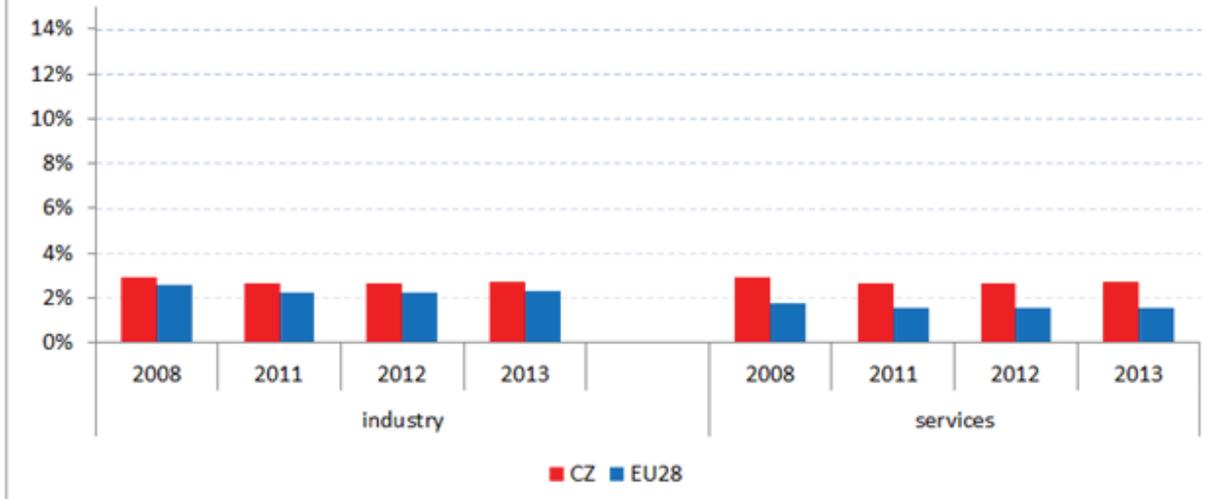
Notes

Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available

Data for 2009 and 2010 is incomplete and not reported

Industry defined as NACE Rev.2 Section C (Manufacturing)

Services defined as NACE Rev. 2 Sections G - U
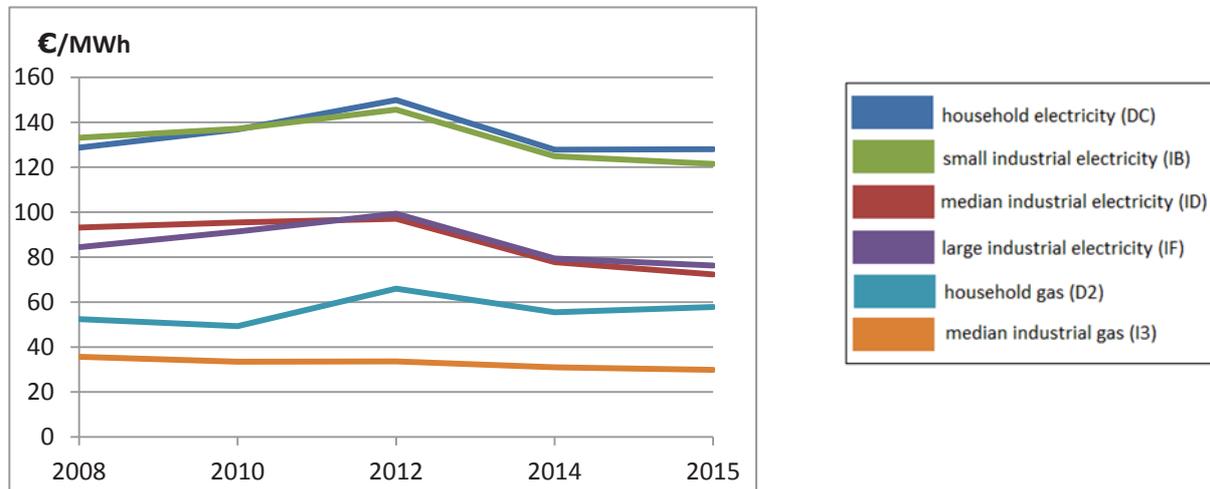
376

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Energy	0.034065
Total energy component	**0.034065**
Transmission	0.003857
Distribution	0.048453
Total network component	**0.052310**
VAT	0.022216
electricity (environmental) tax	0.001037
charge for market operator	0.000253
RES Support	0.018131
Total taxes & levies component	**0.041636**
Total price	**0.128012**

Band ID	EUR/kWh 2015
Energy	0.036333
Total energy component	**0.036333**
Transmission	0.003857
Distribution	0.012692
Total network component	**0.016549**
VAT	0.000000
electricity (environmental) tax	0.001037
charge for market operator	0.000253
RES Support	0.018131
Total taxes & levies component	**0.019421**
Total price	**0.072303**

Band D2	EUR/kWh 2015
Energy	0.036985
Total energy component	**0.036985**
Transmission	0.005359
Distribution	0.005377

	EUR/kWh
Total network component	**0.010736**
Charge for market operator VAT	0.000081 0.010040
Total taxes & levies component	**0.010121**
Total price	**0.057841**

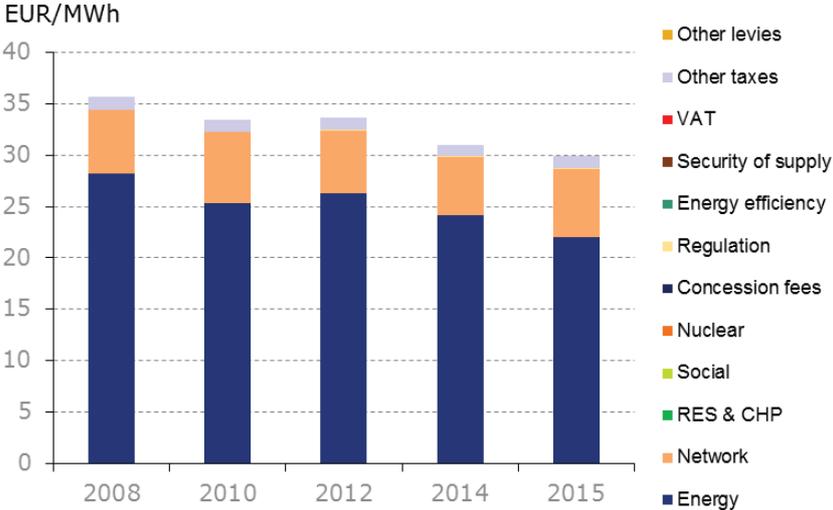| Band I3	EUR/kWh 2015
Energy	0.022029
Total energy component	**0.022029**
Transmission Distribution	0.000418 0.006238
Total network component	**0.006656**
Charge for market operator VAT Environmental tax	0.000081 0.000000 0.001121
Total taxes & levies component	**0.001201**
Total price	**0.029886**

Denmark
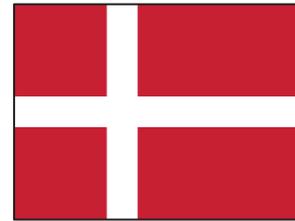
Evolution of electricity and natural gas prices
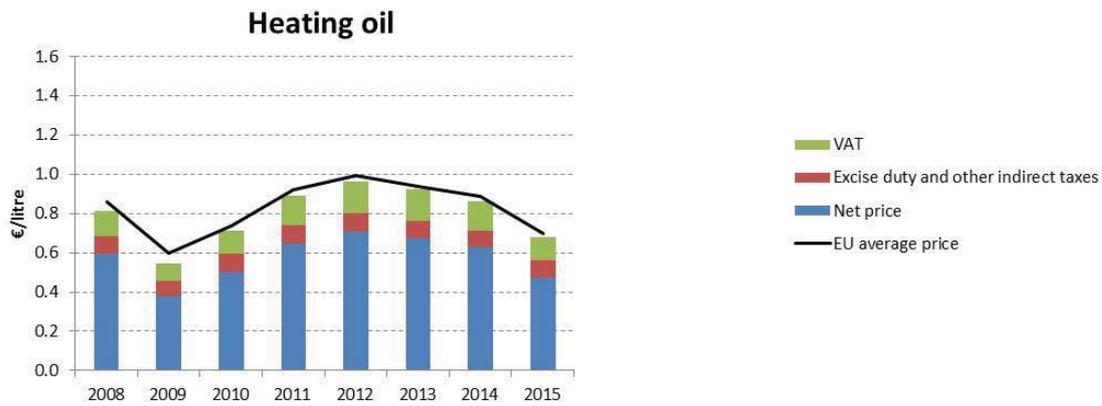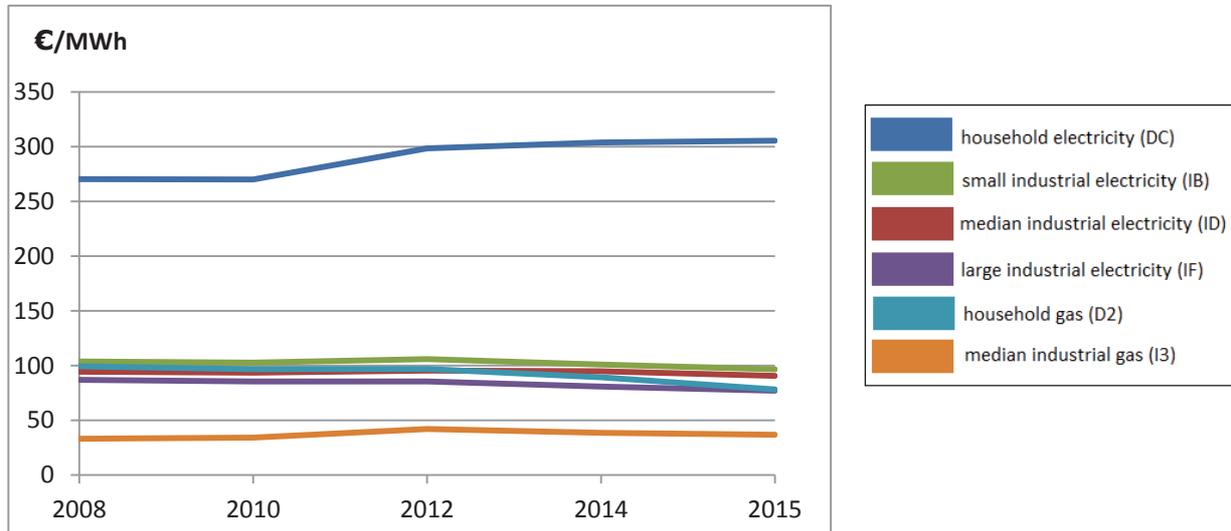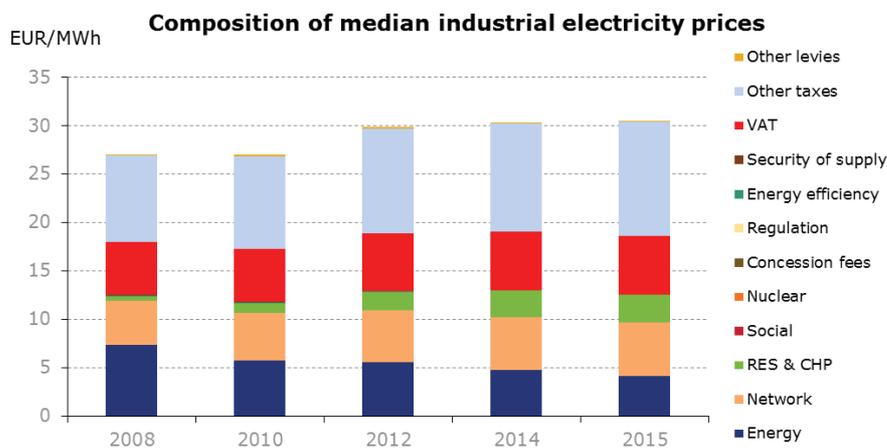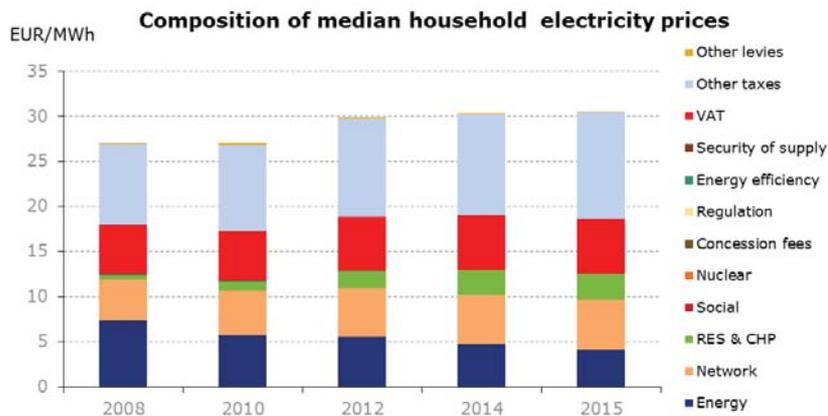

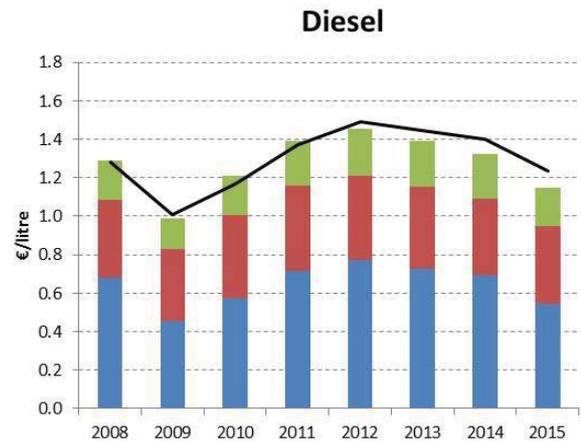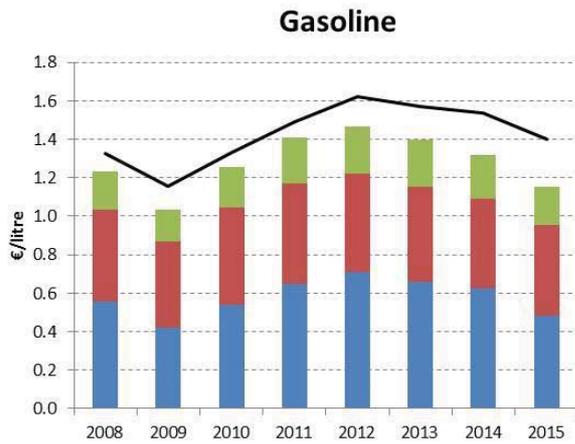## Composition of electricity prices

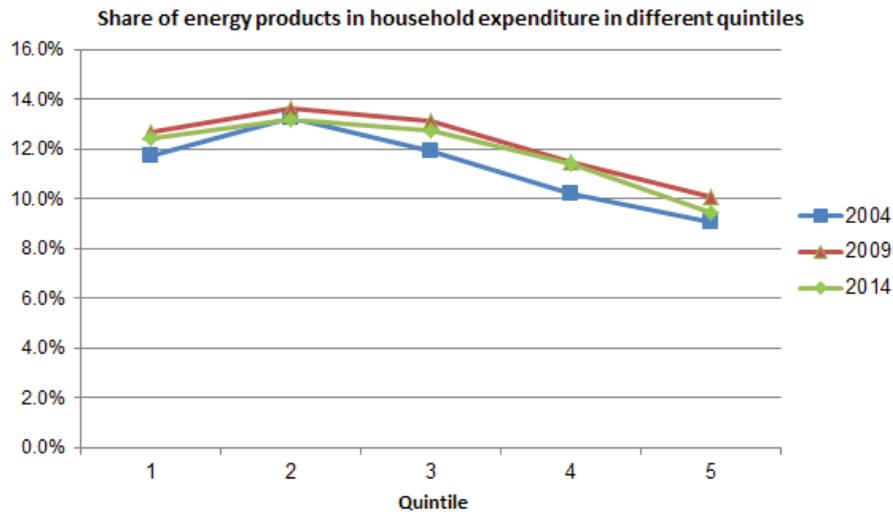# Composition of gas prices

Composition of median household gas prices

Composition of median industrial gas prices

Oil products prices

Gasoline

Diesel

Heating oil

- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price

Energy in Households budgets

Share of energy products in household expenditure in different quintiles

- 2004
- 2009
- 2014
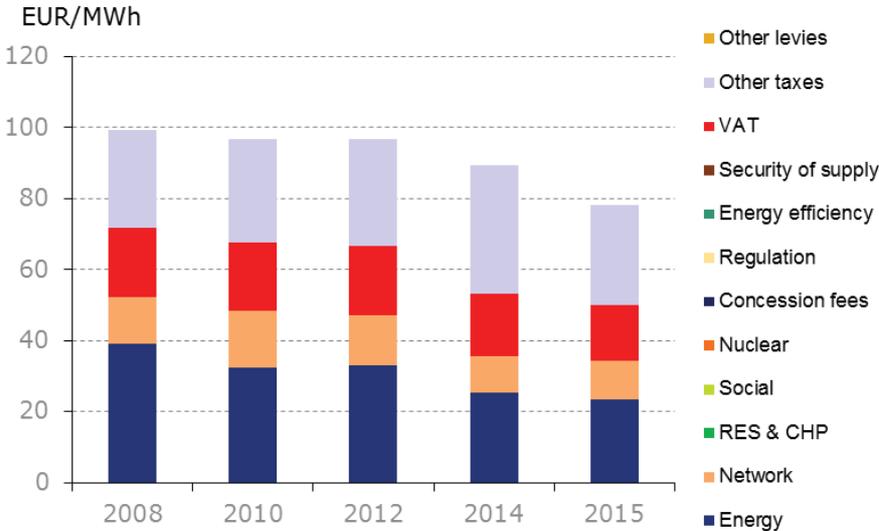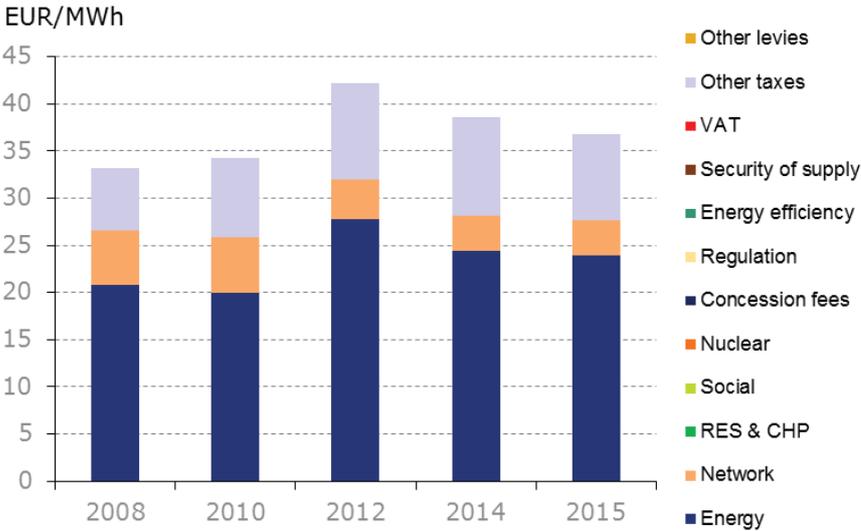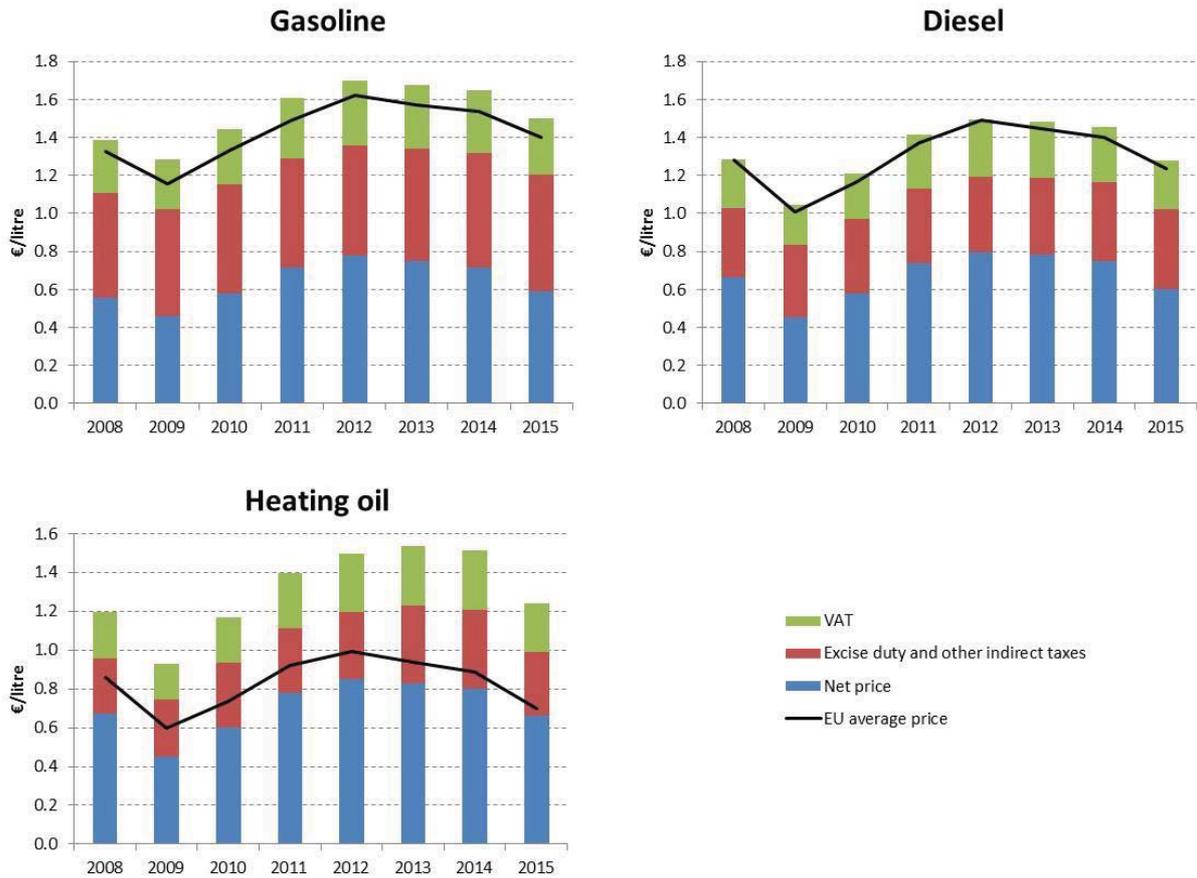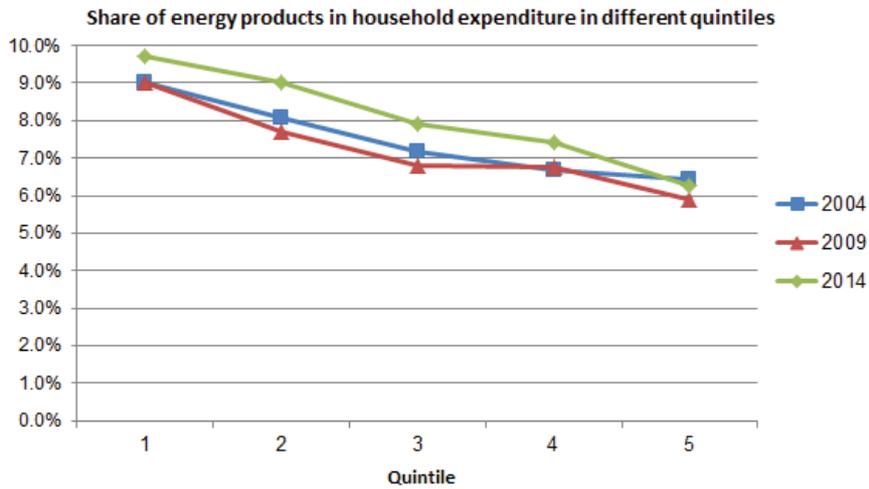
Between 2009 (red line) and 2014 (green line) the share of energy in the total household expenditure in Denmark went up from 9% to 9.7% in the case of the poorest households (Quintile 1), while in the case of middle income households (Quintile 3) it rose from 6.8% to 7.9%.

Energy costs shares in total production costs
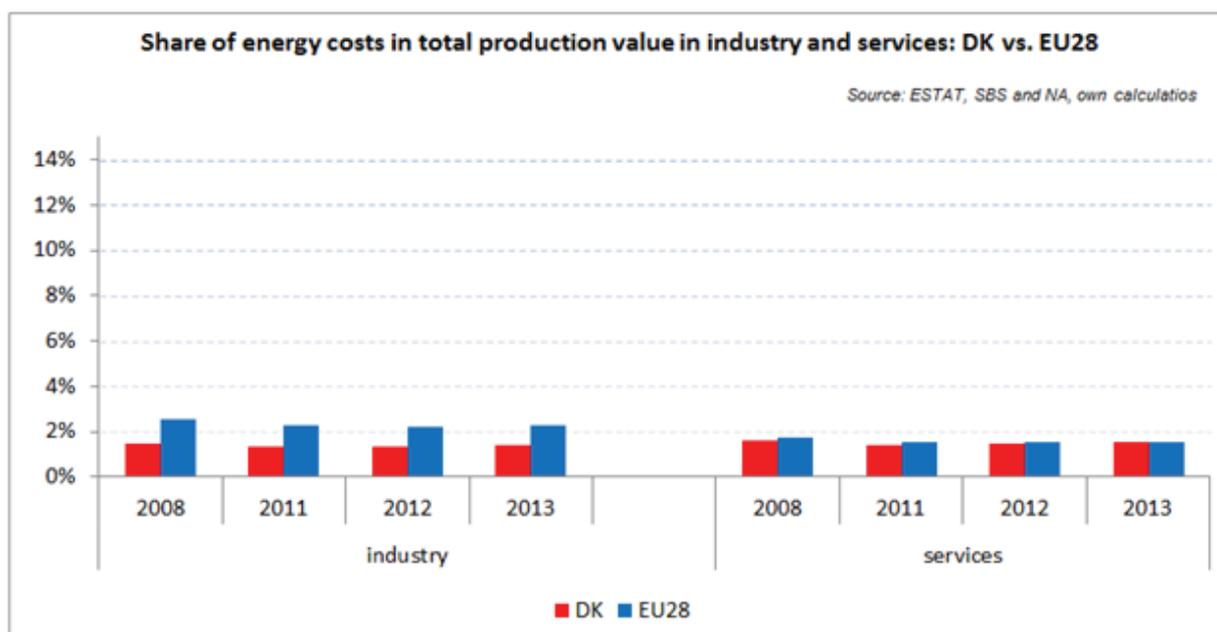
Share of energy costs in total production value in industry and services: DK vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Subscription supplier	0.004424
Energy	0.036736
Total energy component	**0.041161**
Local network tariff	0.027498
Overlying network tariff	0.000644
Transmission and system tariff	0.009519
Subscription network company	0.017805
Total network component	**0.055466**
Electricity tax	0.117716
VAT	0.061097
Electricity distribution tax	
Electricity-saving contribution	
Energy saving tax	
PSO_Support for RE	0.022980
PSO_Support for CHP	0.005202
PSO_Support for security of Supply	0.000308
PSO_Compensation for CO2 levy	0.000697
PSO_Support for R&D	0.000912
Total taxes & levies component	**0.208913**
Total price	**0.305540**

Band ID	EUR/kWh 2015
Energy	0.036093
Total energy component	**0.036093**
Local network tariff	0.013260
Overlying network tariff	0.000402
Transmission and system tariff	0.009519
Subscription network company	0.000737
Total network component	**0.023919**
Electricity tax	0.000536
VAT	0.000000
Electricity distribution tax	
Electricity-saving contribution	

Energy saving tax	
PSO_Support for RE	0.022927
PSO_Support for CHP	0.005229
PSO_Support for security of Supply	0.000268
PSO_Compensation for CO2 levy	0.000670
PSO_Support for R&D	0.000939
Total taxes & levies component	**0.030569**
Total price	**0.090580**

Band D2	EUR/kWh 2015
Energy	0.023329
Total energy component	**0.023329**
Emergency tariff	0.000067
Distribution	0.010833
Total network component	**0.010900**
Carbon Tax	0.004237
NOx tax	0.000469
VAT	0.015650
Natural gas tax	0.023731
Total taxes & levies component	**0.044087**
Total price	**0.078316**

Band I3	EUR/kWh 2015
Energy	0.023865
Total energy component	**0.023865**
Emergency tariff	0.000027
Distribution	0.003727
Total network component	**0.003754**
Carbon Tax	0.003499
NOx tax	0.000469
VAT	0.000000
Natural gas tax	0.005242
Total taxes & levies component	**0.009211**

Total price	0.036830

Estonia

Evolution of electricity and natural gas prices

€/MWh

Legend:
- household electricity (DC)
- small industrial electricity (IB)
- median industrial electricity (ID)
- large industrial electricity (IF)
- household gas (D2)
- median industrial gas (I3)

Composition of electricity prices

EUR/MWh — **Composition of median household electricity prices**

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

EUR/MWh — **Composition of median industrial electricity prices**

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Composition of gas prices

EUR/MWh

Legend (first chart):
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Composition of median industrial gas prices

EUR/MWh

Legend (second chart):
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Oil products prices

Gasoline

Diesel

Heating oil

Legend:
- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price

Energy in Households budgets

Share of energy products in household expenditure in different quintiles

In Estonia the share of energy products in the total household expenditure slightly decreased between 2010 (red line) and 2012 (green line) for the poorest households (Quintile 1) (from 11.2% to 10.7%), while for households with middle (Quintile 3) and with high income (Quintile 5) it remained practically unchanged.

Energy costs shares in total production costs

Share of energy costs in total production value in industry and services: EE vs. EU28

Source: ESTAT, SBS and NA, own calculatios
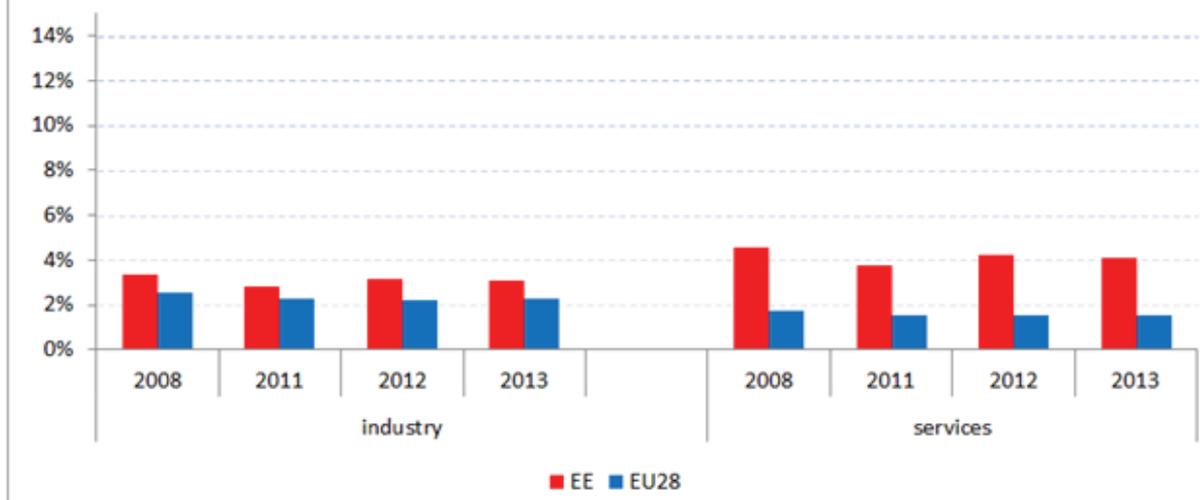
Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G – U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Energy and supply	0.037360
Total energy component	**0.037360**
Network	0.051620
Total network component	**0.051620**
VAT	0.020470
Excise Tax	0.004470
Support for renewable energy	0.008900
Total taxes & levies component	**0.033840**
Total price	**0.122820**

Band ID	EUR/kWh 2015
Energy and supply	0.033110
Total energy component	**0.033110**
Network	0.029200
Total network component	**0.029200**
VAT	0.000000
Excise Tax	0.004470
Support for renewable energy	0.008900
Total taxes & levies component	**0.013370**
Total price	**0.075680**

Band D2	EUR/kWh 2015
Energy and supply	0.032520
Total energy component	**0.032520**
Network	0.004080
Total network component	**0.004080**
VAT	0.007920
Excise Tax	0.002980

Total taxes & levies component	0.010900
Total price	**0.047500**

Band I3	EUR/kWh 2015
Energy and supply	0.029080
Total energy component	**0.029080**
Network	0.003690
Total network component	**0.003690**
VAT	0.000000
Excise Tax	0.002980
Total taxes & levies component	**0.002980**
Total price	**0.035750**

Brussels, 30.11.2016
SWD(2016) 420 final

PART 11/13

COMMISSION STAFF WORKING DOCUMENT
Accompanying the document

**REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE
COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE
COMMITTEE OF THE REGIONS**

Energy prices and costs in Europe

{COM(2016) 769 final}

EN   **EN**

Contents

Finland

Evolution of electricity and natural gas prices

Total electricity and gas prices

€/MWh

Legend:
- household electricity (DC)
- small industrial electricity (IB)
- median industrial electricity (ID)
- large industrial electricity (IF)
- household gas (D2)
- median industrial gas (I3)

Composition of electricity prices

EUR/MWh

Composition of median household electricity prices

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Composition of median industrial electricity prices

Composition of gas prices

Composition of median industrial gas prices

Oil products prices

Gasoline

Diesel

Heating oil

Legend:
- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price

Energy in Households budgets

Share of energy products in household expenditure in different quintiles
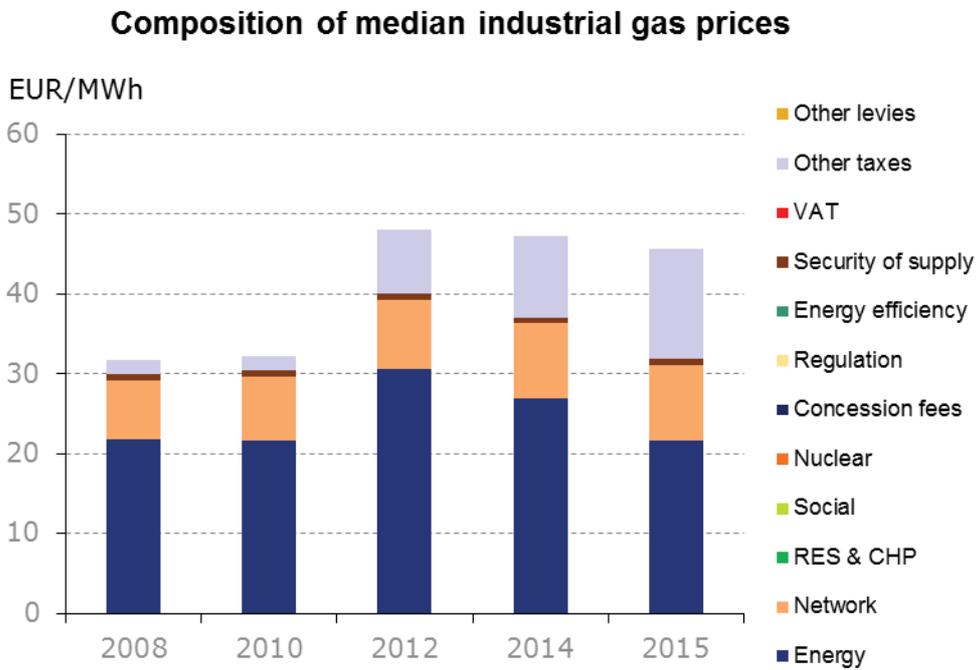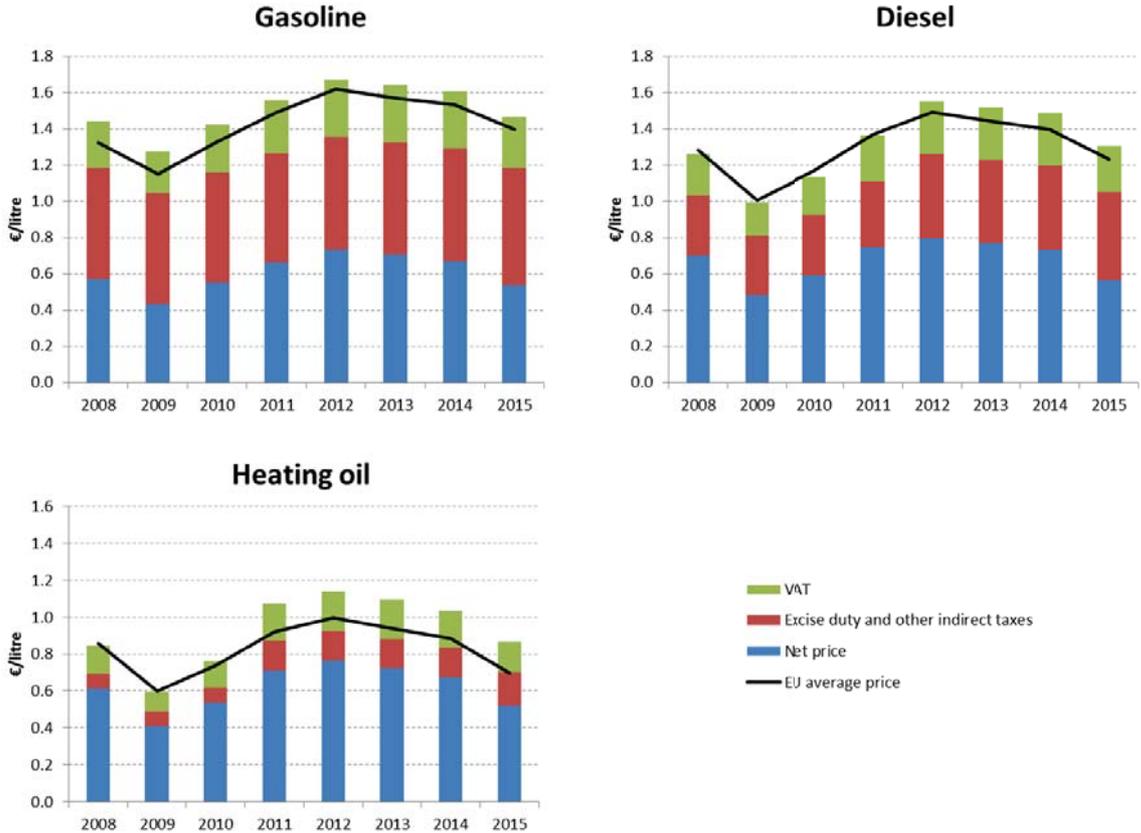
- 2006
- 2012

Finland has been among the EU countries where household spent the lowest share on energy from their total expenditure. However, between 2006 (red line) and 2012 (green line) the share of energy in the poorest households (Quintile 1) rose from 3.2% to 3.9%, while for the middle income households (Quintile 3) it went up from 3.6% to 4.1%.

Energy costs shares in total production costs
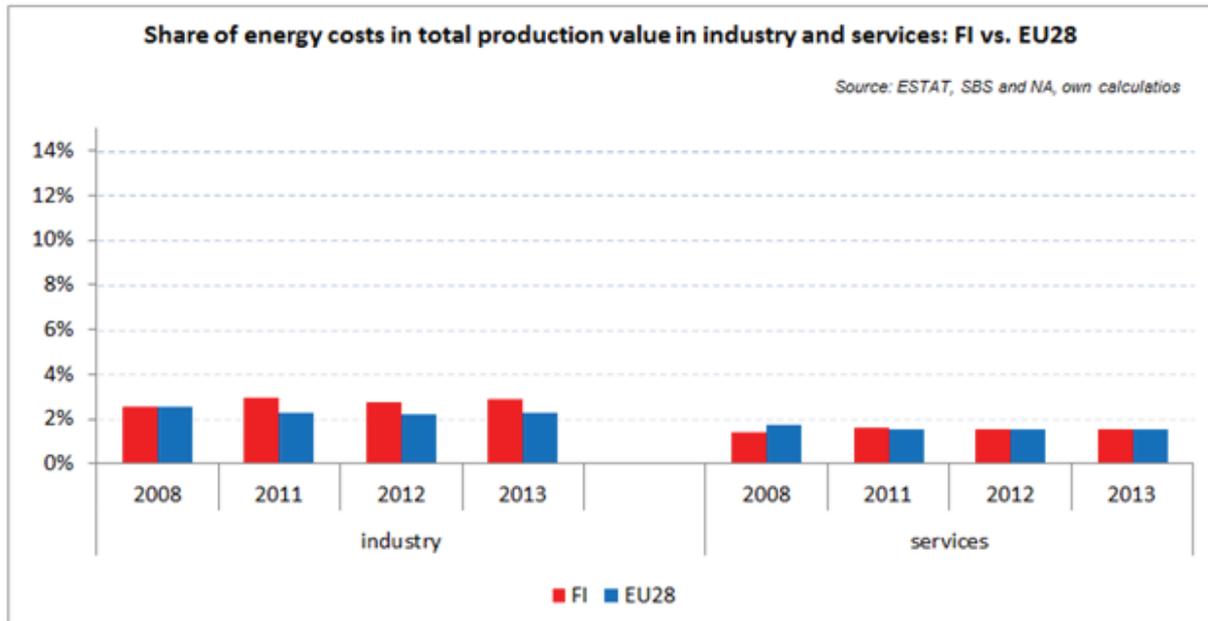
Share of energy costs in total production value in industry and services: FI vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Energy	0.054600
Total energy component	**0.054600**
Network	0.048000
Total network component	**0.048000**
Strategic stockpile fees	0.000000
Excise tax, electricity (I class)	0.022400
Supply security fee	0.000100
VAT	0.030000
Excise tax, electricity (II class)	
Total taxes & levies component	**0.052500**
Total price	**0.155100**

Band ID	EUR/kWh 2015
Energy	0.043450
Total energy component	**0.043450**
Network	0.015750
Total network component	**0.015750**
Strategic stockpile fees	0.000130
Excise tax, electricity (I class)	
Supply security fee	
VAT	0.000000
Excise tax, electricity (II class)	0.006900
Total taxes & levies component	**0.007030**
Total price	**0.066230**

Band D2	EUR/kWh 2015
Energy	
Total energy component	**0.000000**
Network	

Total network component	0.000000
Excise Tax Strategic stockpile fees Energy content tax Carbon Tax VAT	
Total taxes & levies component	0.000000
Total price	0.000000

Band I3	EUR/kWh 2015
Energy	0.021600
Total energy component	**0.021600**
Network	0.009540
Total network component	**0.009540**
Excise Tax Strategic stockpile fees Energy content tax Carbon Tax VAT	0.000000 0.000756 0.005985 0.007839 0.000000
Total taxes & levies component	**0.014580**
Total price	**0.045720**

France

Evolution of electricity and natural gas prices

Total electricity and gas prices

Legend:
- household electricity (DC)
- small industrial electricity (IB)
- median industrial electricity (ID)
- large industrial electricity (IF)
- household gas (D2)
- median industrial gas (I3)

Composition of electricity prices

Composition of median household electricity prices

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Composition of median industrial electricity prices

Composition of gas prices

Composition of median household gas prices

Composition of median industrial gas prices

Oil products prices

Gasoline

Diesel

Heating oil

Legend:
- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price

Energy in Households budgets

Share of energy products in household expenditure in different quintiles

In France the share of energy in total household expenditure was quite stable between 2001 (blue line) and 2011 (green line); in the case of the poorest households (Quintile 1) it remained practically unchanged, while for households with middle income (Quintile 3) it increased from 4.4% to 4.9%.

Energy costs shares in total production costs
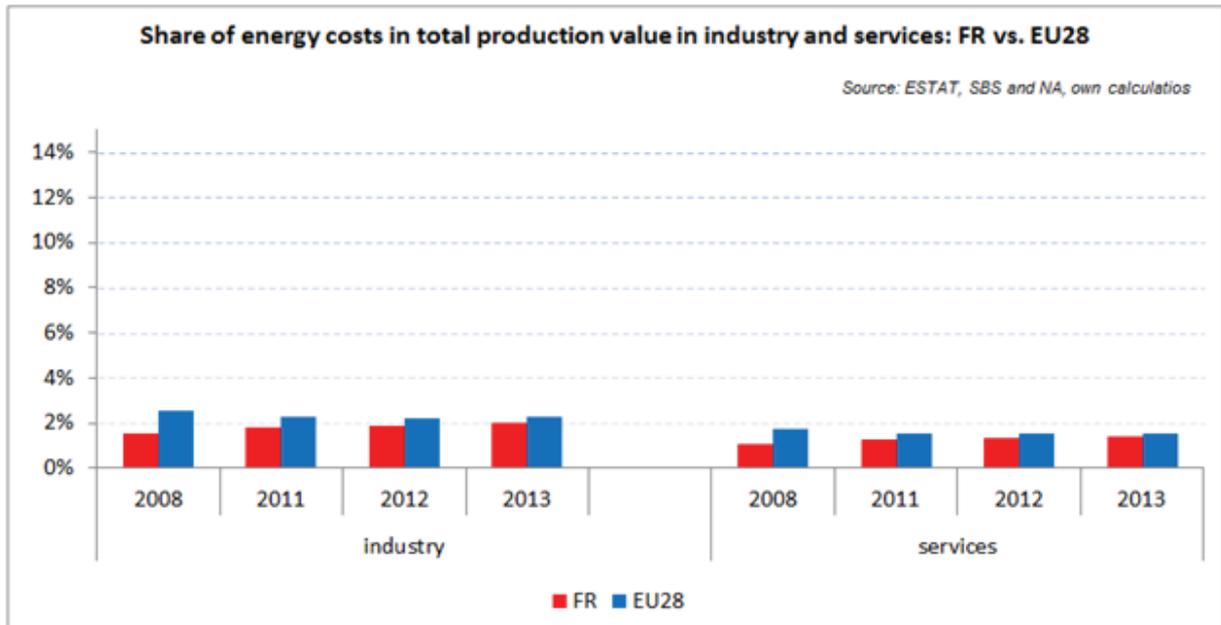
Share of energy costs in total production value in industry and services: FR vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Supply	0.060910
Total energy component	**0.060910**
Transmission and distribution	0.046210
Total network component	**0.046210**
PSO renewable and combined heat generation	0.012920
PSO national tariff equalization	0.004950
Tax on final consumption of electricity	0.009000
PSO vulnerable consumer	0.000470
Transmission and distribution duties	0.003690
VAT	0.024270
Total taxes & levies component	**0.055300**
Total price	**0.162420**

Band ID	EUR/kWh 2015
Supply	0.050790
Total energy component	**0.050790**
Transmission and distribution	0.016840
Total network component	**0.016840**
PSO renewable and combined heat generation	0.014350
PSO national tariff equalization	0.005500
Tax on final consumption of electricity	0.000520
PSO vulnerable consumer	0.000520
Transmission and distribution duties	0.001250
VAT	0.000000
Total taxes & levies component	**0.022140**
Total price	**0.089770**

Band D2	EUR/kWh 2015
Supply	0.031530

Storage	0.002750
Total energy component	**0.034280**
Network	0.021120
Total network component	**0.021120**
Transmission and distribution duties (distribution)	0.002040
VAT	0.009560
Interior tax on consumption of natural gas	0.002650
Transmission and distribution duties (other)	0.000410
Total taxes & levies component	**0.014660**
Total price	**0.070060**

Band I3	EUR/kWh 2015
Supply	0.024650
Storage	0.001810
Total energy component	**0.026460**
Network	0.008040
Total network component	**0.008040**
Transmission and distribution duties (distribution)	0.000160
VAT	0.000000
Interior tax on consumption of natural gas	0.002330
Transmission and distribution duties (other)	0.000030
Total taxes & levies component	**0.002520**
Total price	**0.037020**

Germany

Evolution of electricity and natural gas prices

Composition of electricity prices

Composition of median industrial electricity prices

EUR/MWh

Legend: Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

Composition of gas prices

Composition of median household gas prices

EUR/MWh

Legend: Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

Composition of median industrial gas prices

EUR/MWh

Legend: Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

Oil products prices

Gasoline

Diesel

Heating oil

Legend:
- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price

Energy in Households budgets

Share of energy products in household expenditure in different quintiles

In Germany the share of energy in the total household expenditure rose from 7.4% to 8.4% in the case of the poorest households (Quintile 1) between 2003 (blue line) and 2013 (green line), while in the case of middle income households (Quintile 3) the energy share went up from 5.9% to 7% in the same period.
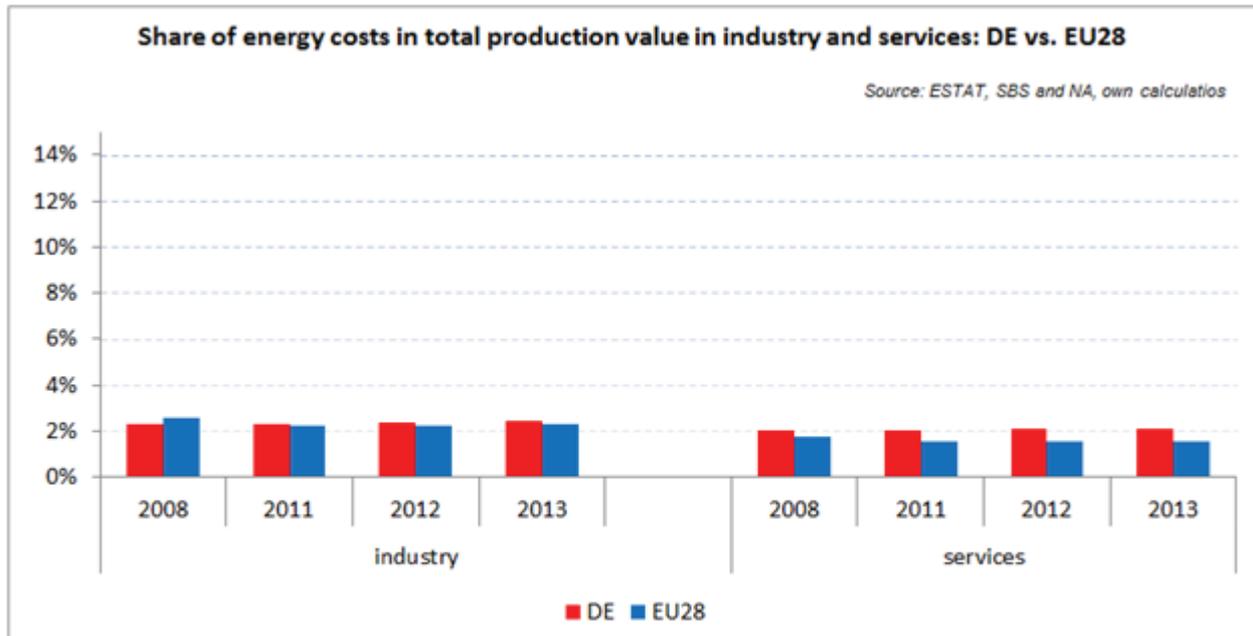
Energy costs shares in total production costs

Share of energy costs in total production value in industry and services: DE vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Energy and supply	0.076800
Total energy component	**0.076800**
Grid fee incl. Metering and Metering Services Grid fee Metering, Metering Services	0.061300 0.006200
Total network component	**0.067500**
Levy for financing interruptible loads	0.000060
VAT	0.047000
Concession Fee	0.016600
Support for combined heat and power (CHP)	0.002540
Electricity Tax	0.020500
Levy to finance reduced grid fees	0.002370
Renewable Energy Levy	0.061700
Levy for liability of risk at offshore wind	-0.000510
Total taxes & levies component	**0.150260**
Total price	**0.294560**

Band ID	EUR/kWh 2015
Energy and supply	0.045500
Total energy component	**0.045500**
Grid fee incl. Metering and Metering Services Grid fee Metering, Metering Services	0.023000
Total network component	**0.023000**
Levy for financing interruptible loads	0.000060
VAT	0.000000
Concession Fee	0.000990
Support for combined heat and power (CHP)	0.000520
Electricity Tax	0.000000
Levy to finance reduced grid fees	0.000650
Renewable Energy Levy	0.060500
Levy for liability of risk at offshore wind	0.000400
Total taxes & levies component	**0.063120**

Total price	**0.131620**

Band D2	EUR/kWh 2015
Energy and supply	0.037700
Total energy component	**0.037700**
Grid fee incl. Metering	0.013200
Total network component	**0.013200**
Natural Gas Tax	0.005500
VAT	0.010800
Concession Fee	0.000450
Total taxes & levies component	**0.016750**
Total price	**0.067650**

Band I3	EUR/kWh 2015
Energy and supply	0.029500
Total energy component	**0.029500**
Grid fee incl. Metering	0.005900
Total network component	**0.005900**
Natural Gas Tax	0.004040
VAT	0.000000
Total taxes & levies component	**0.004040**
Total price	**0.039440**

Greece

Evolution of electricity and natural gas prices

Total electricity and gas prices

€/MWh

- household electricity (DC)
- small industrial electricity (IB)
- median industrial electricity (ID)
- large industrial electricity (IF)
- household gas (D2)
- median industrial gas (I3)

Composition of electricity prices

Composition of median household electricity prices

EUR/MWh

- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Composition of median industrial electricity prices

EUR/MWh

Legend: Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

(Stacked bar chart with years 2008, 2010, 2012, 2014, 2015 on the x-axis and values from 0 to 120 on the y-axis)

Composition of gas prices[1]

Composition of median household gas prices

EUR/MWh

Legend: Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

(Stacked bar chart with years 2008, 2010, 2012, 2014, 2015 on the x-axis and values from 0 to 80 on the y-axis)

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[1] Combined energy and network compotent both for household and industrial data

Composition of median industrial gas prices

EUR/MWh

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Oil products prices

Gasoline

€/litre

Diesel

€/litre

Heating oil

€/litre

Legend:
- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price

Note: Greece has not reported fuel oil prices from May 2015 to mid-October 2015

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Energy in Households budgets
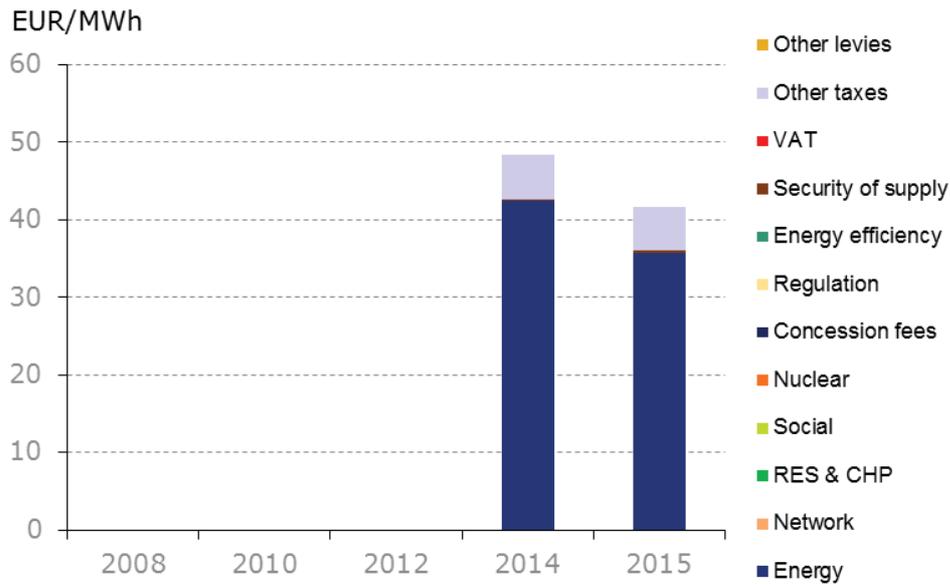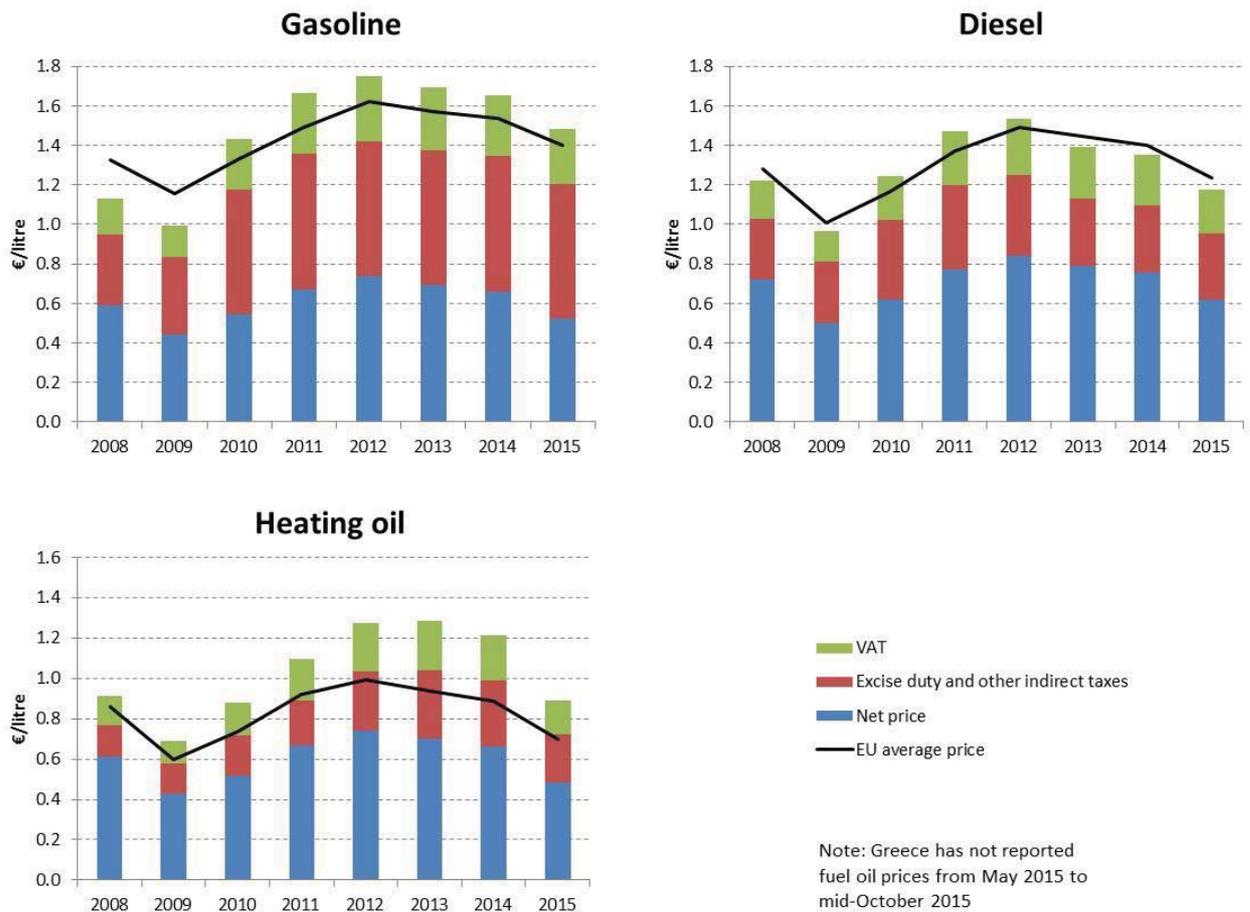
Share of energy products in household expenditure in different quintiles
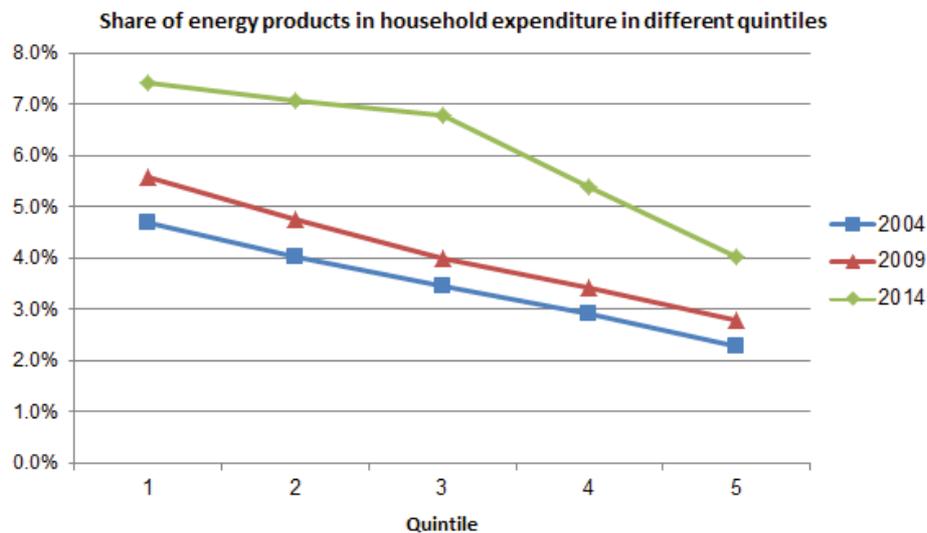
Even between 2004 (blue line) and 2009 (red line) the share of energy in the total expenditure of Greek households showed a measurable increase, however, by 2014 (red line) the energy share in the case of the poorest households (Quintile 1) went up from 4.7% to 7.4% compared to 2004. In the case of households with middle income (Quintile 3) the energy share doubled from 3.4% to 6.8% between 2004 and 2014.

Energy costs shares in total production costs
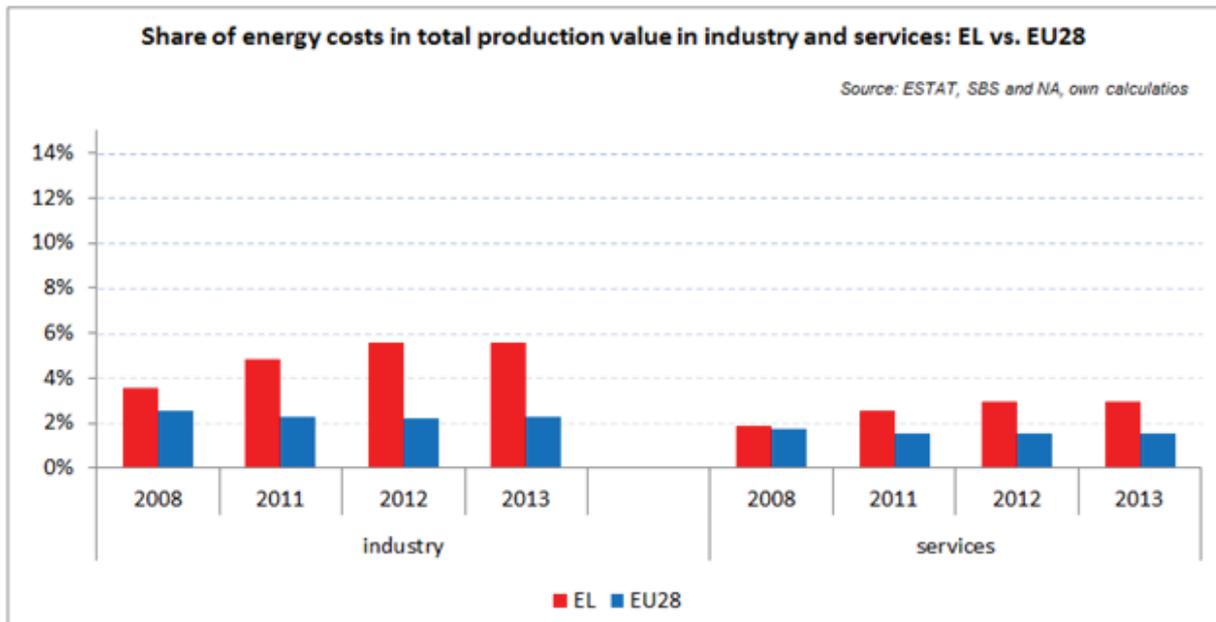
Share of energy costs in total production value in industry and services: EL vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Supply Charges	0.096200
Total energy component	**0.096200**
Network	0.024900
Total network component	**0.024900**
Public Service Obligation (PSO) - Island compensation	0.009024
Public Service Obligation (PSO) - Vulnerable consumers	0.000576
Energy Tax	0.002200
VAT	0.020300
Levy for Renewable Energy Source(RES)	0.023600
Total taxes & levies component	**0.055700**
Total price	**0.176800**

Band ID	EUR/kWh 2015
Supply Charges	0.073100
Total energy component	**0.073100**
Network	0.008900
Total network component	**0.008900**
Public Service Obligation (PSO) - Island compensation	0.000564
Public Service Obligation (PSO) - Vulnerable consumers	0.000036
Energy Tax	0.005000
VAT	0.000000
Levy for Renewable Energy Source(RES)	0.007500
Total taxes & levies component	**0.013100**
Total price	**0.095100**

Band D2	EUR/kWh 2015
Energy Charge + Capacity Charge	0.054480
Total energy component	**0.054480**
Total network component	**0.000000**
VAT	0.007850
Security of Supply Fee	0.000480
Excise Tax	0.005400
Customs Tax	0.000300
Total taxes & levies component	**0.014030**
Total price	**0.068510**

Band I3	EUR/kWh 2015
Energy Charge + Capacity Charge + RAE Levy	0.035770
Total energy component	**0.035770**
Total network component	**0.000000**
VAT	0.000000
Security of Supply Fee	0.000220
Excise Tax	0.005400
Customs Tax	0.000210
Total taxes & levies component	**0.005830**
Total price	**0.041600**

Hungary

Evolution of electricity and natural gas prices

Total electricity and gas prices

€/MWh

Legend:
- household electricity (DC)
- small industrial electricity (IB)
- median industrial electricity (ID)
- large industrial electricity (IF)
- household gas (D2)
- median industrial gas (I3)

Composition of electricity prices

EUR/MWh

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

EUR/MWh

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Composition of gas prices

Composition of median household gas prices

EUR/MWh

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Composition of median industrial gas prices

EUR/MWh

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Oil products prices

Gasoline

Diesel

Heating oil

VAT
Excise duty and other indirect taxes
Net price
EU average price

Energy in Households budgets

Share of energy products in household expenditure in different quintiles

In Hungary the share of energy within the total household expenditure rose significantly between 2005 (blue line) and 2009 (red line) in the case of both households with low income (Quintile 1 – from 13.9% to 18.6%) and middle income (Quintile 3 - from 12.1% to 16.7%).By 2014 (green line) the share of energy went down 1.3% in both quintiles compared to 2009.

Energy costs shares in total production costs
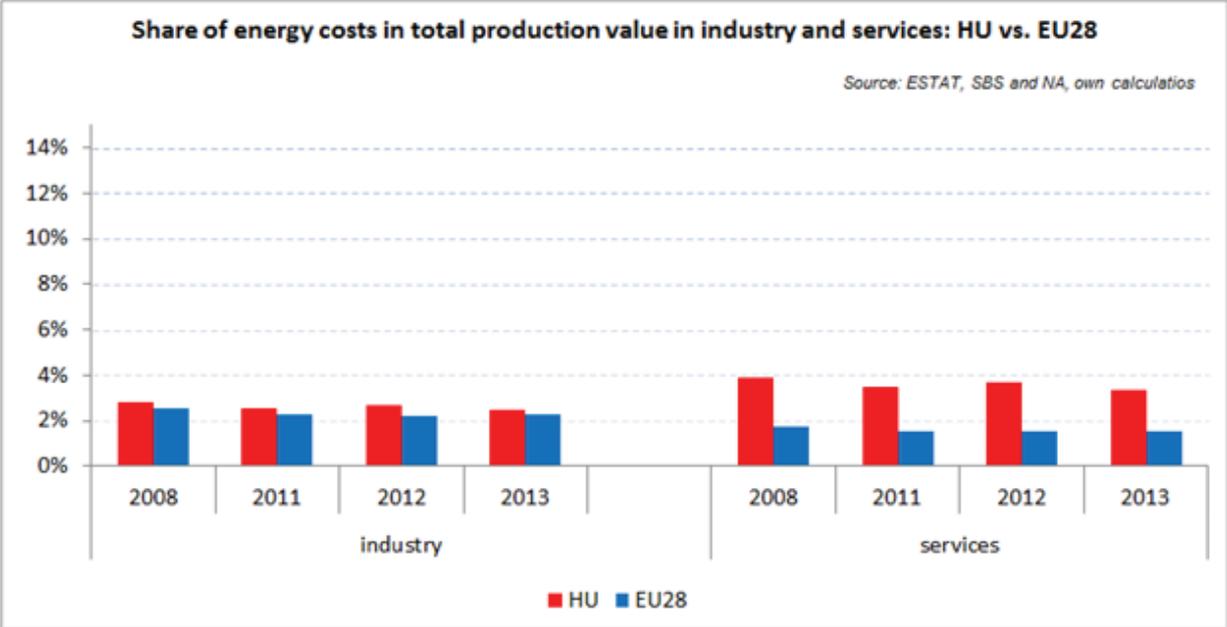
Share of energy costs in total production value in industry and services: HU vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Energy	0.047256
Total energy component	**0.047256**
Network	0.040892
Total network component	**0.040892**
RES support	0.000000
Financial support for employment in the electricity industry	0.000000
Financial support for restructuring cogeneration	0.000000
Financial support for restructuring the coal industry	0.000000
VAT	0.023805
Total taxes & levies component	**0.023805**
Total price	**0.111954**

Band ID	EUR/kWh 2015
Energy	0.046779
Total energy component	**0.046779**
Network	0.021480
Total network component	**0.021480**
RES support	0.007583
Financial support for employment in the electricity industry	0.000420
Financial support for restructuring cogeneration	0.006719
Financial support for restructuring the coal industry	0.000678
VAT	0.000000
Energy tax	0.001003
Total taxes & levies component	**0.016403**
Total price	**0.084661**

Band D2	EUR/kWh 2015
Energy	0.023792
Total energy component	**0.023792**
Network	0.003813
Total network component	**0.003813**
VAT	0.007452
Strategic storage stockpiling fee	0.000000
Total taxes & levies component	**0.007452**
Total price	**0.035057**

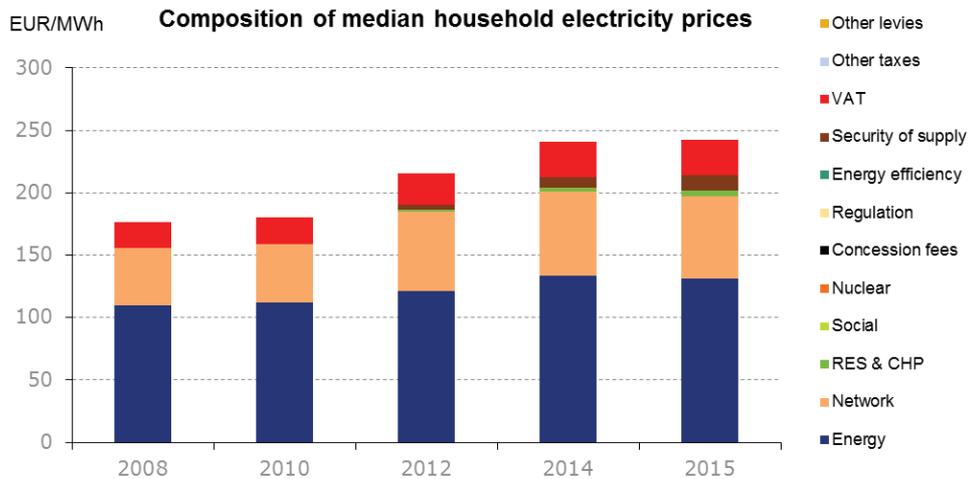| Band I3	EUR/kWh 2015
Energy	0.028710
Total energy component	**0.028710**
Network	0.006029
Total network component	**0.006029**
VAT	0.000000
Energy Tax	0.001030
Strategic storage stockpiling free	0.000718
Other price elements, not regulated by law	0.000007
Total taxes & levies component	**0.001755**
Total price	**0.036494**

Ireland

Evolution of electricity and natural gas prices

Total electricity and gas prices

€/MWh

- household electricity (DC)
- small industrial electricity (IB)
- median industrial electricity (ID)
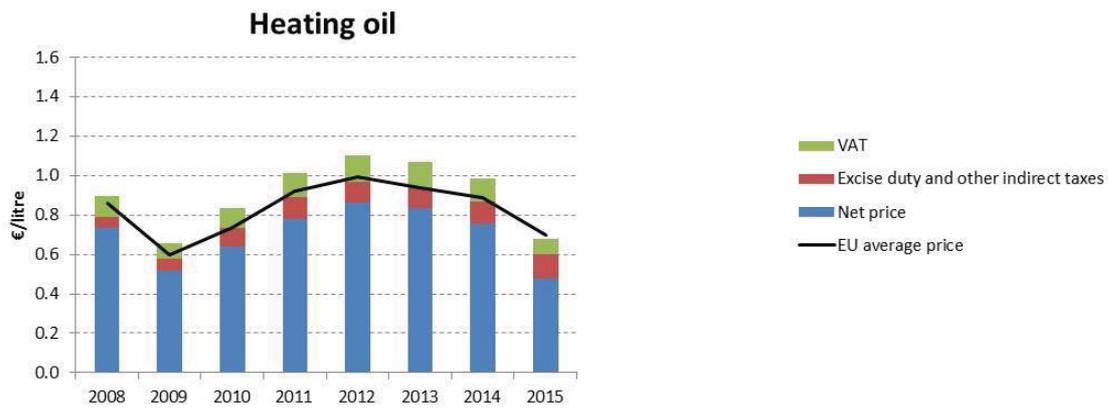- large industrial electricity (IF)
- household gas (D2)
- median industrial gas (I3)

Composition of electricity prices

Composition of median household electricity prices

EUR/MWh

- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
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- Nuclear
- Social
- RES & CHP
- Network
- Energy

Composition of median industrial electricity prices

EUR/MWh

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Oil products prices

Gasoline

Diesel

Heating oil

Legend:
- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price

Energy in Households budgets

Share of energy products in household expenditure in different quintiles

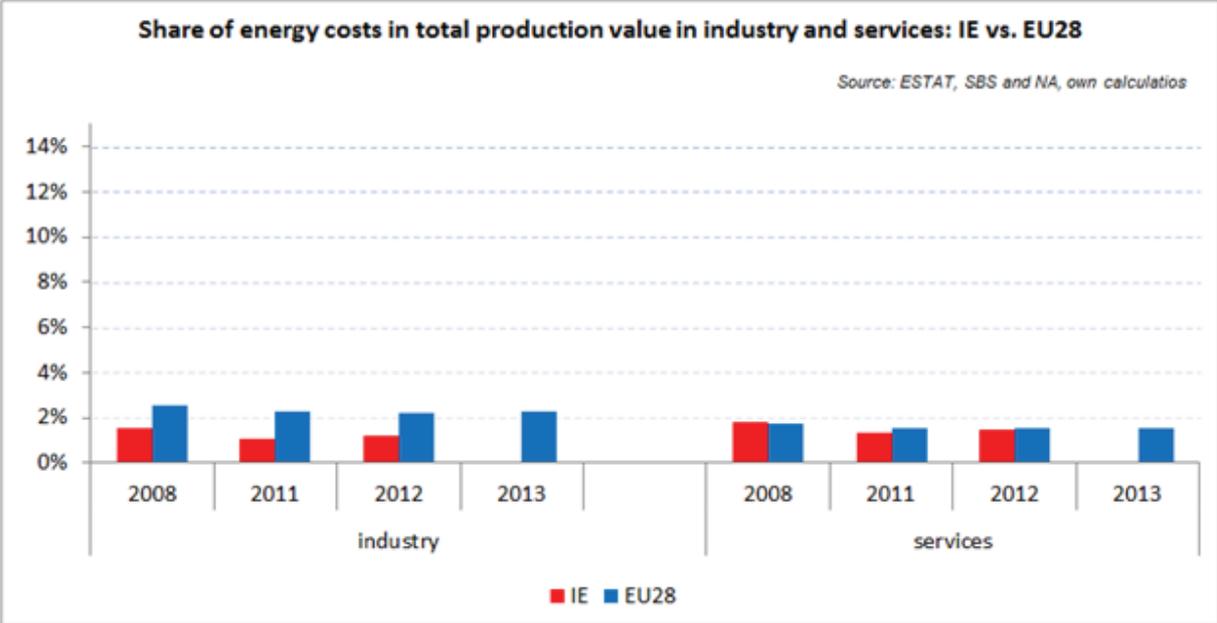With the exception of the poorest households (Quintile 1), where the share of energy within the total household expenditure remained practically unchanged, around 8 %, between 2005 (red line) and 2010 (green line) in Ireland, all other households had to spend 1.5-2% higher share of their total expenditure on energy in 2010 than in 2005.

Energy costs shares in total production costs

Share of energy costs in total production value in industry and services: IE vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Energy and supply	0.131100
Total energy component	**0.131100**
Network	0.065900
Total network component	**0.065900**
Indigenous Fuel (Peat) Support	0.006300
Security of Supply	0.005500
Renewables and CHP	0.005000
VAT	0.028900
Total taxes & levies component	**0.045700**
Total price	**0.242700**

Band IB	EUR/kWh 2015
Energy and supply	0.103900
Total energy component	**0.103900**
Network	0.045700
Total network component	**0.045700**
Indigenous Fuel (Peat) Support	0.005200
Security of Supply	0.004600
Renewables and CHP	0.004100
VAT	0.000000
Electricity Tax	0.000500
Total taxes & levies component	**0.014400**
Total price	**0.164000**

Band D2	EUR/kWh 2015

	EUR/kWh
Total energy component	**0.000000**
Total network component	**0.000000**
Carbon Tax	0.003800
VAT	0.008000
Total taxes & levies component	**0.011800**
Total price	**0.011800**

Band I3	EUR/kWh 2015
Total energy component	**0.000000**
Total network component	**0.000000**
Carbon Tax	0.003600
VAT	0.000000
Total taxes & levies component	**0.003600**
Total price	**0.003600**

Italy

Evolution of electricity and natural gas prices

Total electricity and gas prices

€/MWh

Legend:
- household electricity (DC)
- small industrial electricity (IB)
- median industrial electricity (ID)
- large industrial electricity (IF)
- household gas (D2)
- median industrial gas (I3)

Composition of electricity prices

Composition of median household electricity prices

EUR/MWh

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Composition of median industrial electricity prices

EUR/MWh

Legend: Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

Composition of gas prices

Composition of median household gas prices

EUR/MWh

Legend: Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

Composition of median industrial gas prices

EUR/MWh

Legend (right side):
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Oil products prices

Gasoline

€/litre

Diesel

€/litre

Heating oil

€/litre

Legend:
- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price

Energy in Households budgets
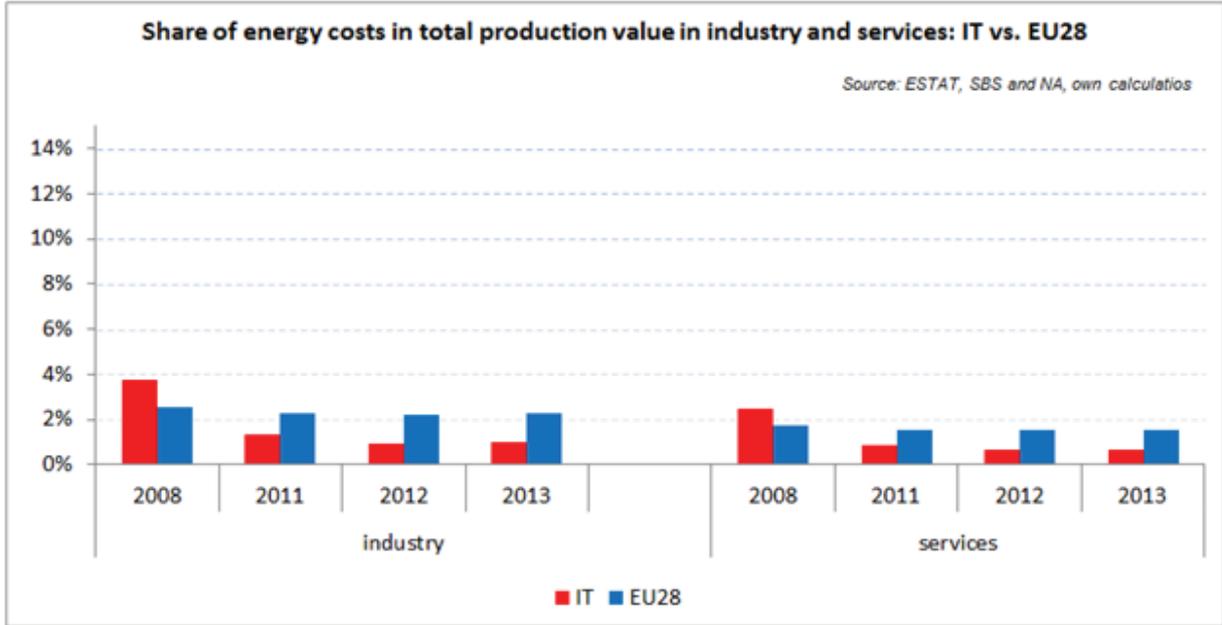

Share of energy products in household expenditure in different quintiles

In the case of Italy data on the share of energy in the total household expenditure are only available for 2014, showing that in this year the poorest households (Quintile 1) spent 7.1% of their expenditure on energy. In the same year households with middle income (Quintile 3) and high income (Quintile 5) respectively spent only 5.1% and 3.2% of their total expenditure on energy.

Energy costs shares in total production costs

Share of energy costs in total production value in industry and services: IT vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Energy and supply	0.098920
Total energy component	**0.098920**
Network	0.051530
Total network component	**0.051530**
A6: Stranded costs	0.000000
A5: costs of R&D	0.000250
UC7: costs arising from measures to promote energy efficiency in end uses	0.000230
Excise Tax	0.017020
AE: incentives for manufacturing enterprises with high electricity consumption	0.003050
A4: costs for subsidized customers (state railways)	0.000750
VAT	0.022260
AS: cost of social bonus	0.000090
A3: incentives to renewable generation	0.046030
UC4: islands compensations	0.000400
A2: decommissioning costs of nuclear plants	0.003620
MCT: geographical compensation measures	0.000730
Total taxes & levies component	**0.094430**
Total price	**0.244880**

Band IB	EUR/kWh 2015
Energy and supply	0.084620
Total energy component	**0.084620**
Network	0.028140
Total network component	**0.028140**
A6: Stranded costs	0.000000
A5: costs of R&D	0.000220
UC7: costs arising from measures to promote energy efficiency in end uses	0.000630
Excise Tax	0.012380
AE: incentives for manufacturing enterprises with high electricity consumption	0.003030
A4: costs for subsidized customers (state railways)	0.001030
VAT	0.000000
AS: cost of social bonus	0.000070
A3: incentives to renewable generation	0.055850
UC4: islands compensations	0.000270

A2: decommissioning costs of nuclear plants	0.002470
MCT: geographical compensation measures	0.000200
Total taxes & levies component	**0.076150**
Total price	**0.188910**

Band D2	EUR/kWh 2015
Energy and supply	0.029710
Total energy component	**0.029710**
Network	0.020110
Total network component	**0.020110**
Excise duty and regional surcharge	0.015400
VAT	0.010760
RE: for energy saving actions and renewable energy development	0.000540
Total taxes & levies component	**0.026700**
Total price	**0.076520**

Band I3	EUR/kWh 2015
Energy and supply	0.026800
Total energy component	**0.026800**
Network	0.005390
Total network component	**0.005390**
Excise duty and regional surcharge	0.002590
VAT	0.000000
RE: for energy saving actions and renewable energy development	0.000510
GS: cost of social bonus	0.000110
Total taxes & levies component	**0.003210**
Total price	**0.035400**

EUROPEAN
COMMISSION

Brussels, 30.11.2016
SWD(2016) 420 final

PART 12/13

COMMISSION STAFF WORKING DOCUMENT
Accompanying the document

**REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE
COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE
COMMITTEE OF THE REGIONS**

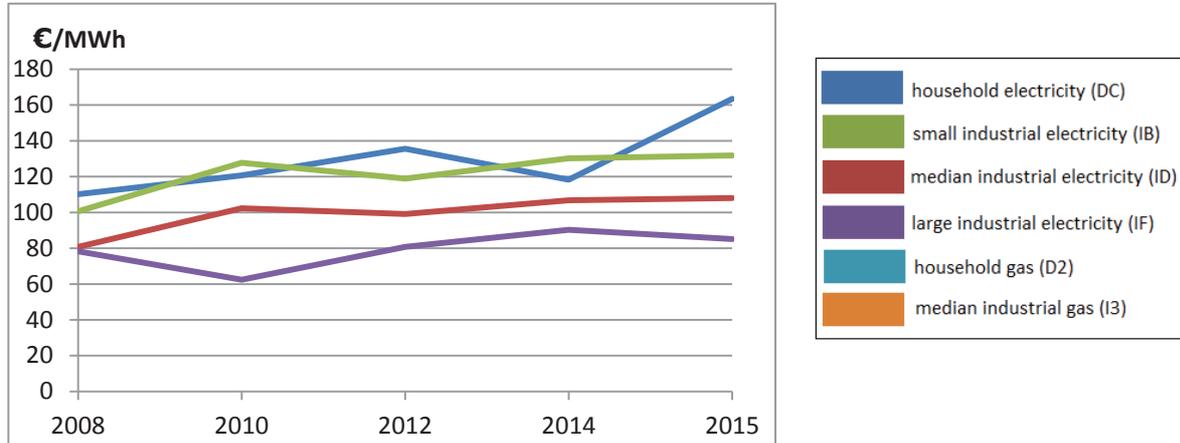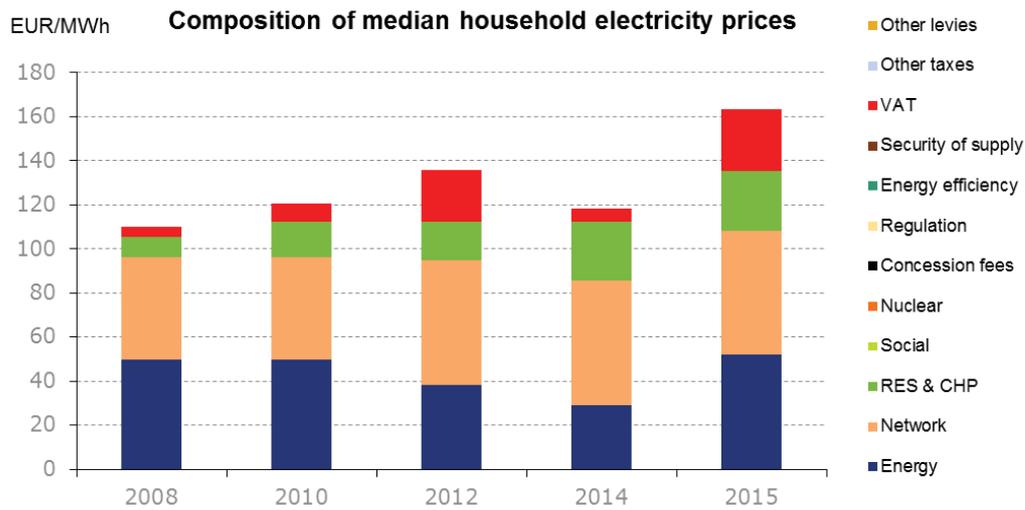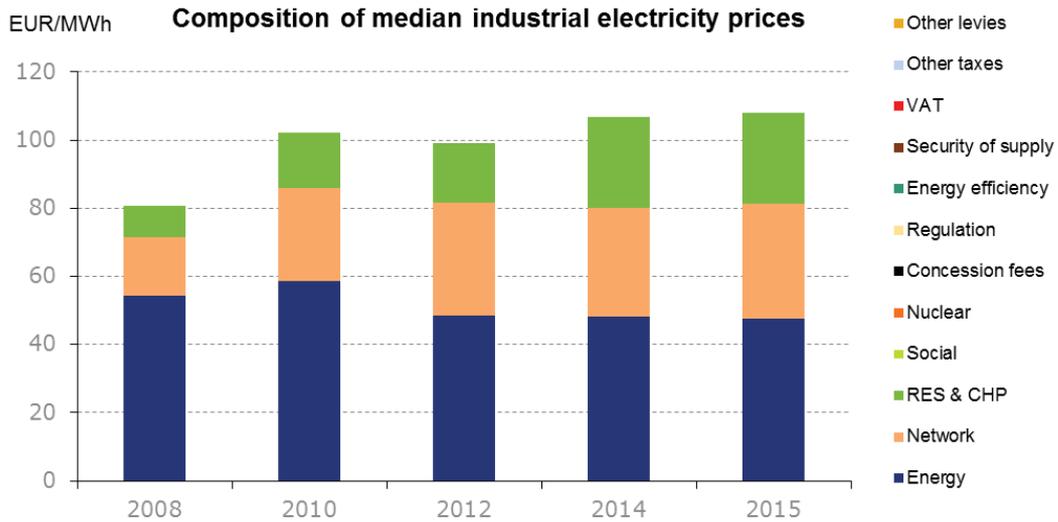**Energy prices and costs in Europe**

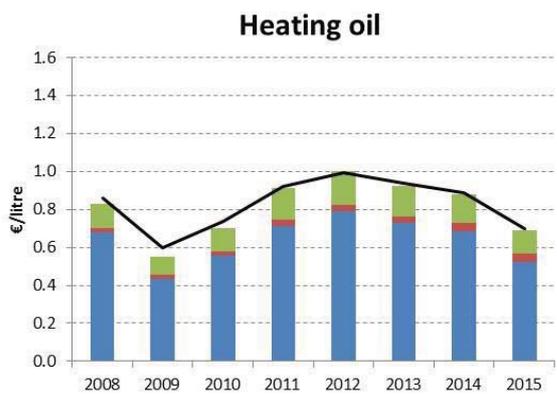{COM(2016) 769 final}

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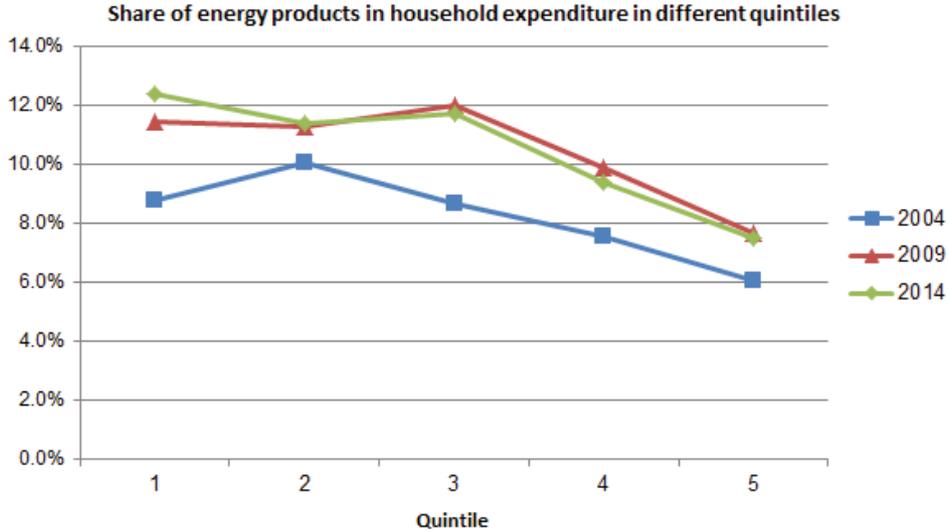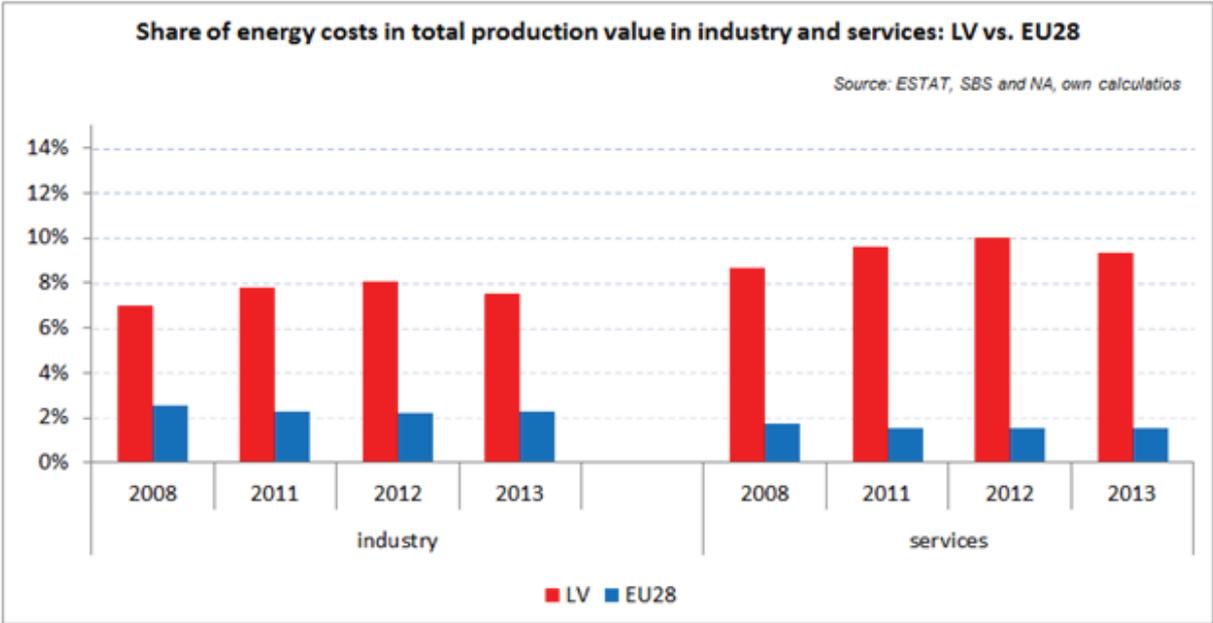Share of energy products in household expenditure in different quintiles
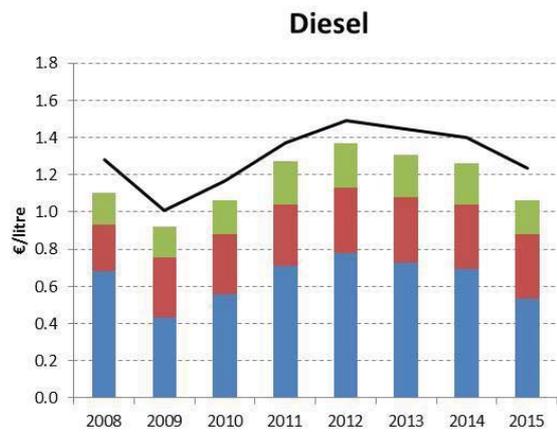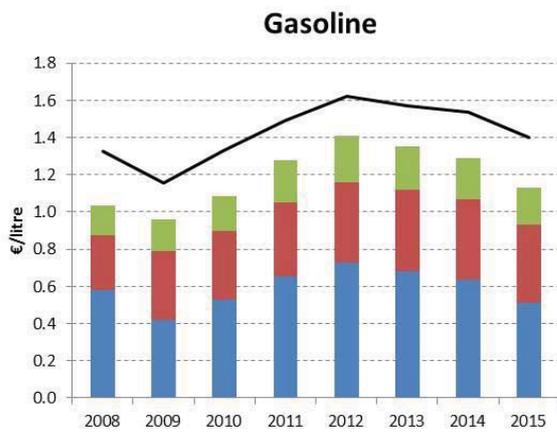
Between 2004 (blue line) and 2014 (green line) the share of energy in total household expenditure rose measurably in each income quintile in Latvia; in the case of the poorest households (Quintile 1) it went up from 8.8% to 12.4%, while in the case of households with middle income (Quintile 3) it rose from 8.6% to 11.7%.

Energy costs shares in total production costs

Share of energy costs in total production value in industry and services: LV vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
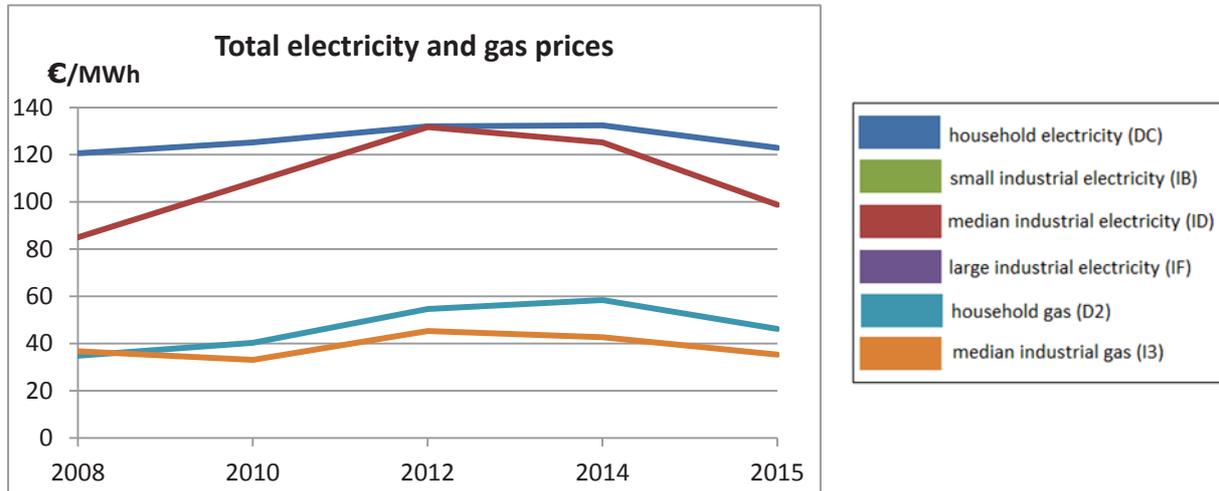Services defined as NACE Rev. 2 Sections G - U

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Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Energy	0.051900
Total energy component	**0.051900**
Network	0.056400
Total network component	**0.056400**
VAT	0.028400
Mandatory procurement component for CHP	0.016700
Mandatory procurement component for renewable energy resources	0.010100
Total taxes & levies component	**0.055200**
Total price	**0.163500**

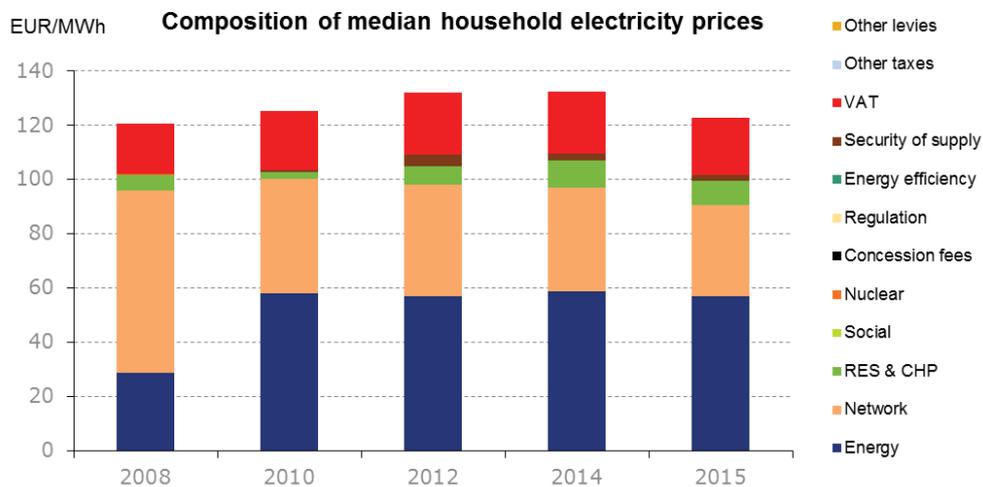| Band ID	EUR/kWh 2015
Energy	0.047600
Total energy component	**0.047600**
Network	0.033600
Total network component	**0.033600**
VAT	0.000000
Mandatory procurement component for CHP	0.016700
Mandatory procurement component for renewable energy resources	0.010100
Total taxes & levies component	**0.026800**
Total price	**0.108000**

Lithuania

Evolution of electricity and natural gas prices

Total electricity and gas prices

€/MWh

Legend:
- household electricity (DC)
- small industrial electricity (IB)
- median industrial electricity (ID)
- large industrial electricity (IF)
- household gas (D2)
- median industrial gas (I3)

Composition of electricity prices

EUR/MWh

Composition of median household electricity prices

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
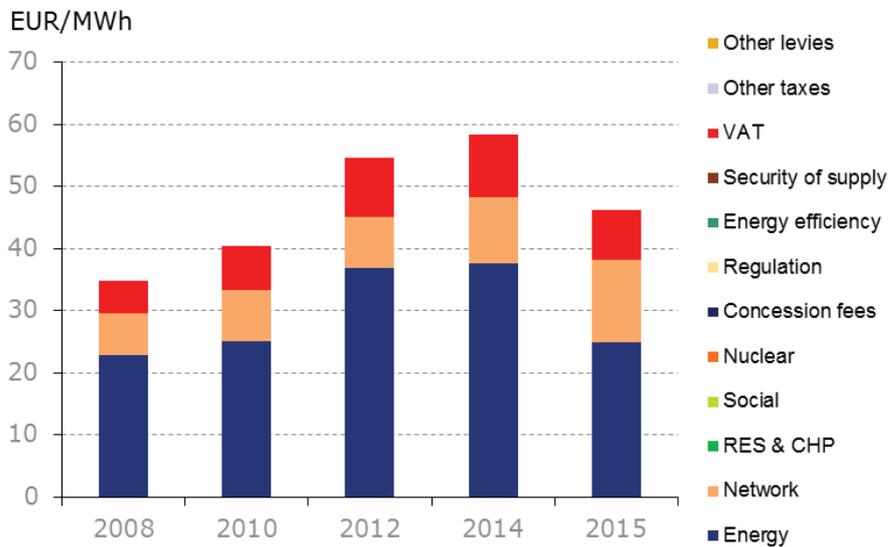- RES & CHP
- Network
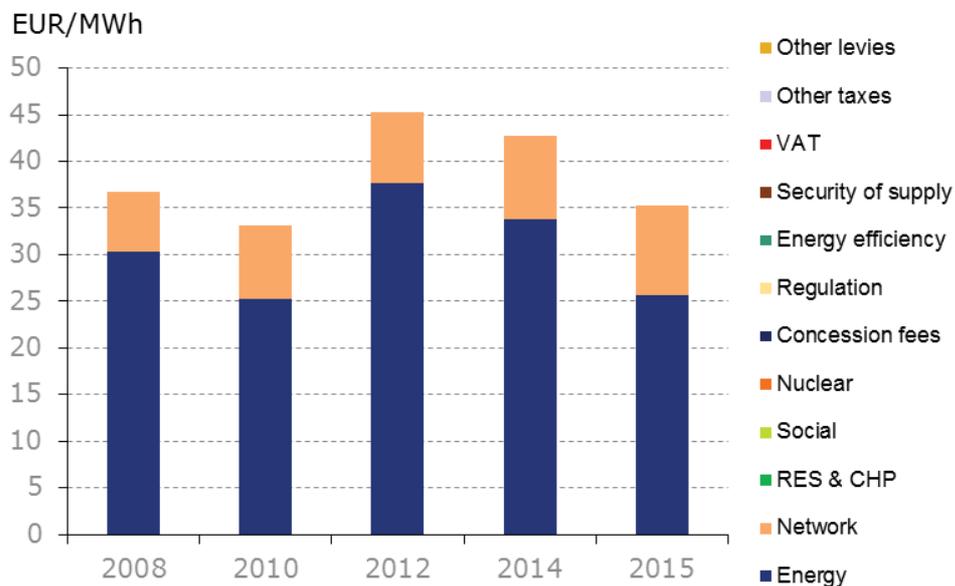- Energy

Composition of median industrial electricity prices

Composition of gas prices

Composition of median household gas prices

Composition of median industrial gas prices

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Oil products prices

Gasoline

Diesel

Heating oil

Legend:
- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price

Energy in Households budgets
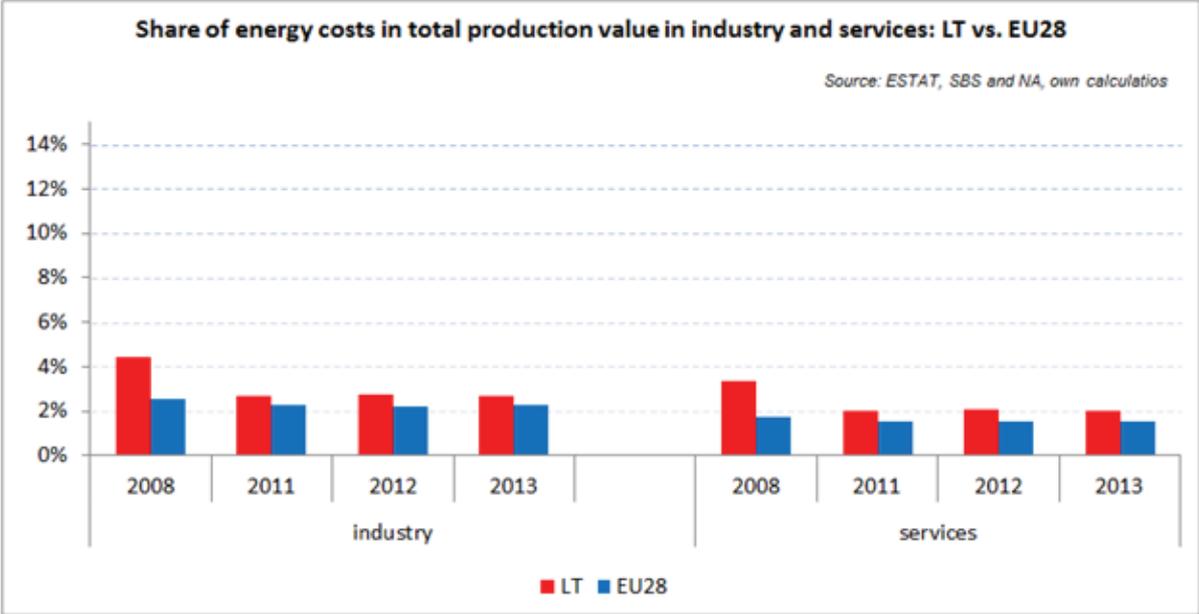

Share of energy products in household expenditure in different quintiles

In Lithuania the share of energy in total household expenditure changed only slightly between 2004 (blue line) and 2008 (red line). However, by 2012 (green line) the share of energy rose to 13.2% in the case of the poorest households (Quintile 1), while for middle income households it reached 13.9%, up from 8% and 9.6% respectively measured in 2004.

Energy costs shares in total production costs

Share of energy costs in total production value in industry and services: LT vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Energy	0.050200
Public supplier price	0.001400
Total energy component	**0.051600**
Distribution	0.027300
Transmission	0.006300
Total network component	**0.033600**
RES Connection to the transmission and distribution grids	0.000000
PSO - Ignalina Nuclear Power Plant	0.000000
VAT	0.021400
PSO - Fixed costs of Lithuanian Power Plant	0.000000
PSO - Financing of the market operator	0.000000
PSO - Compensation for the solar producers	0.000000
PSO - Renewable energy sources (RES) PSO and RES balancing	0.006600
PSO - Strategic Projects (NordBalt)	0.002100
PSO – Connection revenues (part paid by RES)	-0.000200
PSO – Compensation for solar producers	0.000300
PSO - Lithuanian Power Plant PSO (production)	0.005200
PSO - Combined Heat and Power Plant (CHPP) PSO	0.001800
PSO - PSO – RES connection to the transmission and distribution grids	0.000500
Total taxes & levies component	**0.037700**
Total price	**0.122900**

Band ID (average of all bands)	EUR/kWh 2015
Energy	0.051000
Public supplier price	0.001400
Total energy component	**0.052400**
Distribution	0.029200
Transmission	0.000900
Total network component	**0.030100**
RES Connection to the transmission and distribution grids	0.000000
PSO - Ignalina Nuclear Power Plant	0.000000
VAT	0.000000
PSO - Fixed costs of Lithuanian Power Plant	0.000000
PSO – Cost of market operator	0.000000
PSO - Renewable energy sources (RES) PSO and RES balancing	0.006600

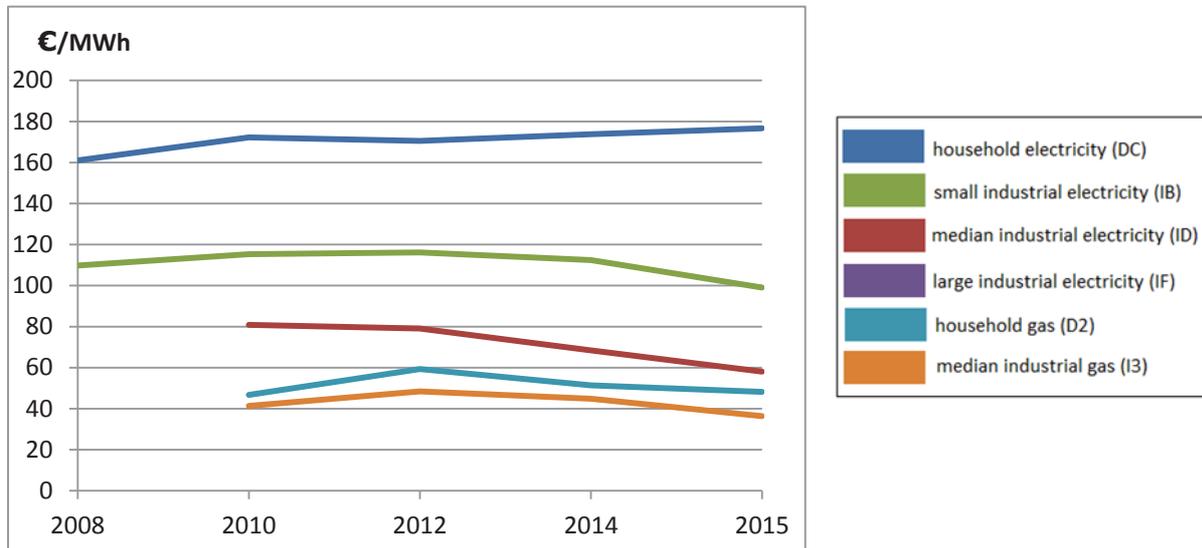|	
PSO - Strategic Projects (NordBalt)	0.002100
PSO – Connection revenues (part paid by RES)	-0.000200
PSO – Compensation for solar producers	0.000300
PSO - Lithuanian Power Plant PSO (production)	0.005200
PSO - Combined Heat and Power Plant (CHPP) PSO	0.001800
PSO - PSO – RES connection to the transmission and distribution grids	0.000500
Total taxes & levies component	**0.016300**
Total price	**0.098800**

Band D2	EUR/kWh 2015
Price of gas supply	0.024800
Total energy component	**0.024800**
Network	0.013400
Total network component	**0.013400**
VAT	0.008000
Total taxes & levies component	**0.008000**
Total price	**0.046200**

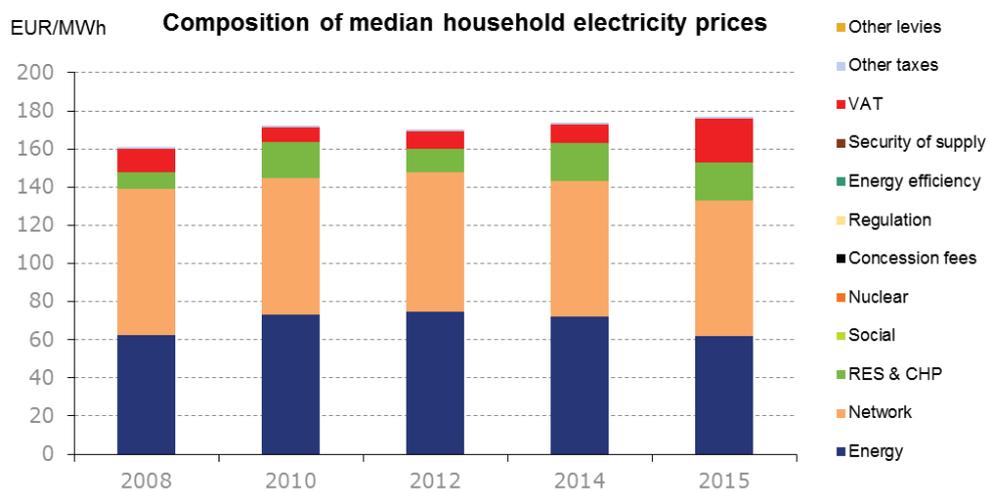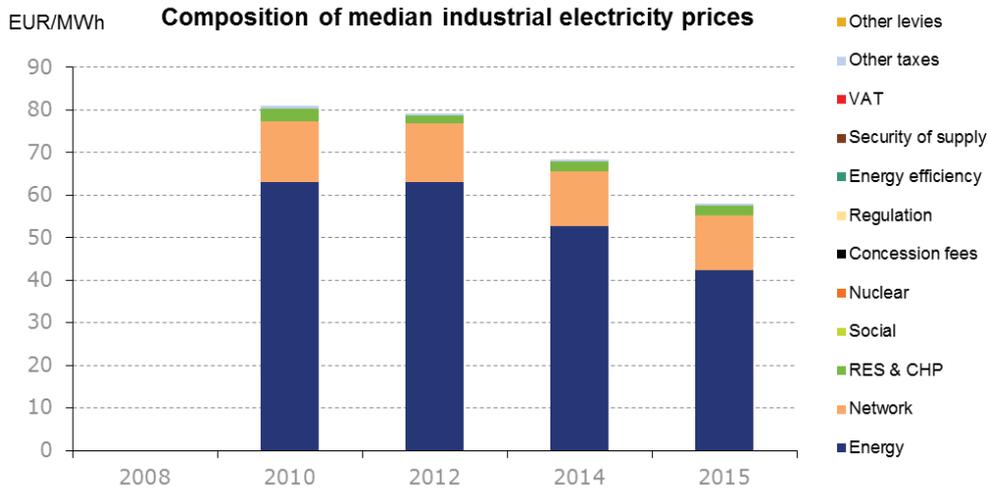| Band I3	EUR/kWh 2015
Price of gas supply	0.025700
Total energy component	**0.025700**
Network	0.009600
Total network component	**0.009600**
VAT	0.000000
Total taxes & levies component	**0.000000**
Total price	**0.035300**

Luxembourg

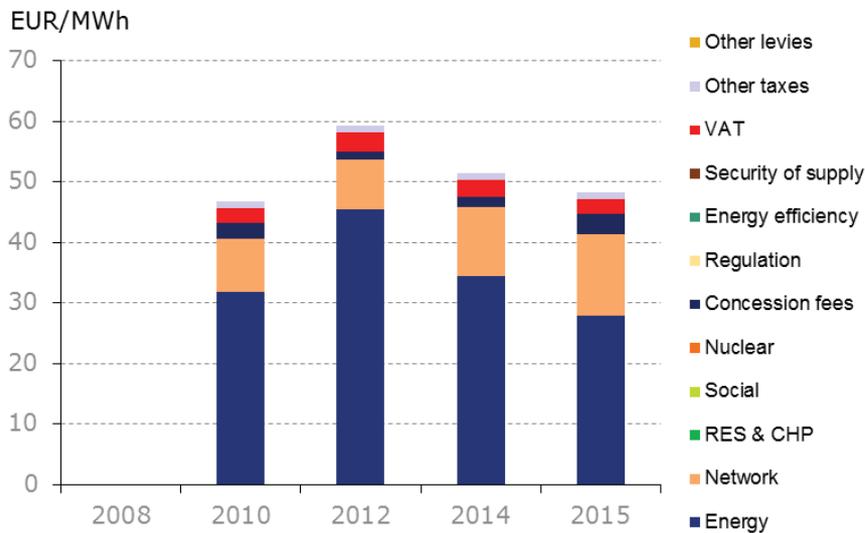## Evolution of electricity and natural gas prices

Composition of electricity prices

Composition of median industrial electricity prices

EUR/MWh

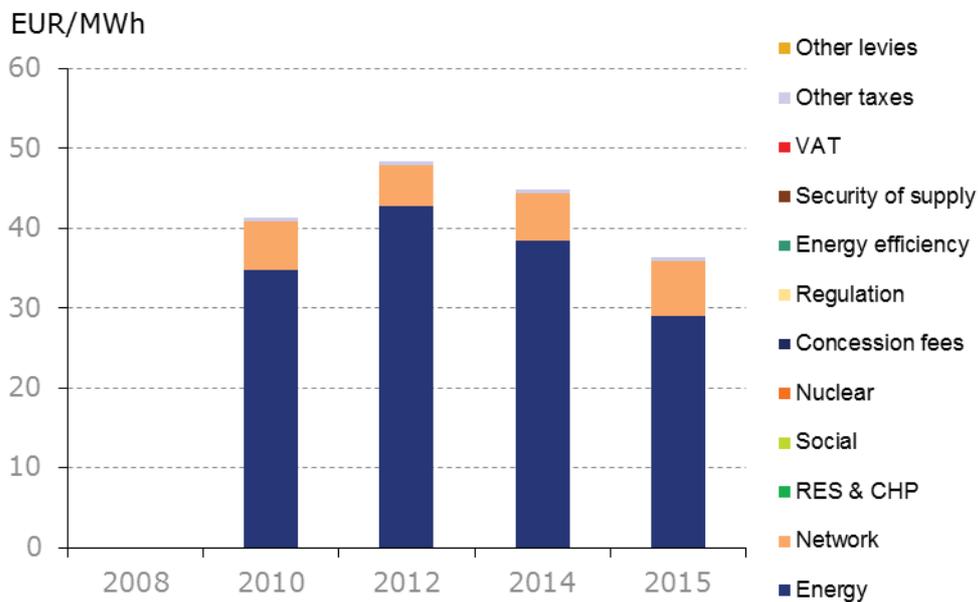Legend: Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

Composition of gas prices

Composition of median household gas prices

EUR/MWh

Legend: Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

Composition of median industrial gas prices

EUR/MWh

Legend: Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

Oil products prices

Gasoline

Diesel

Heating oil

Legend:
- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price
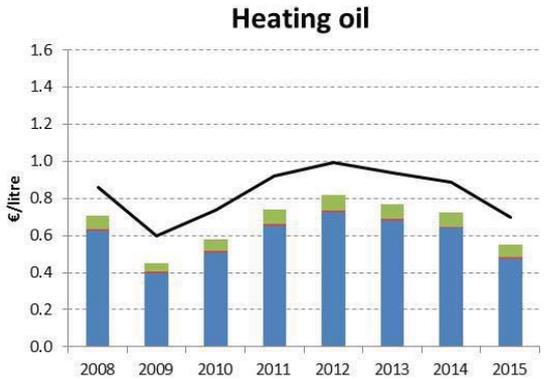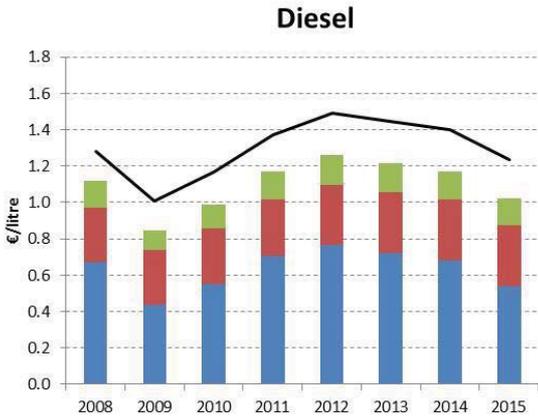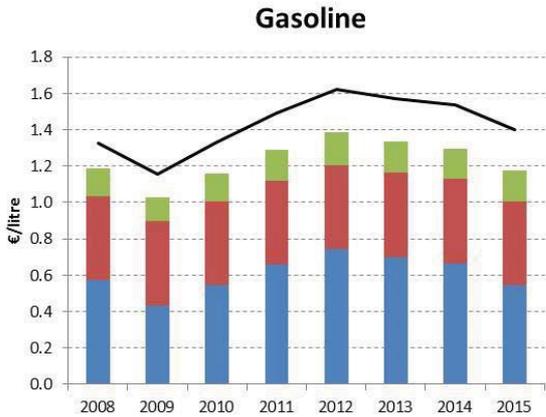
Energy in Households budgets

Share of energy products in household expenditure in different quintiles
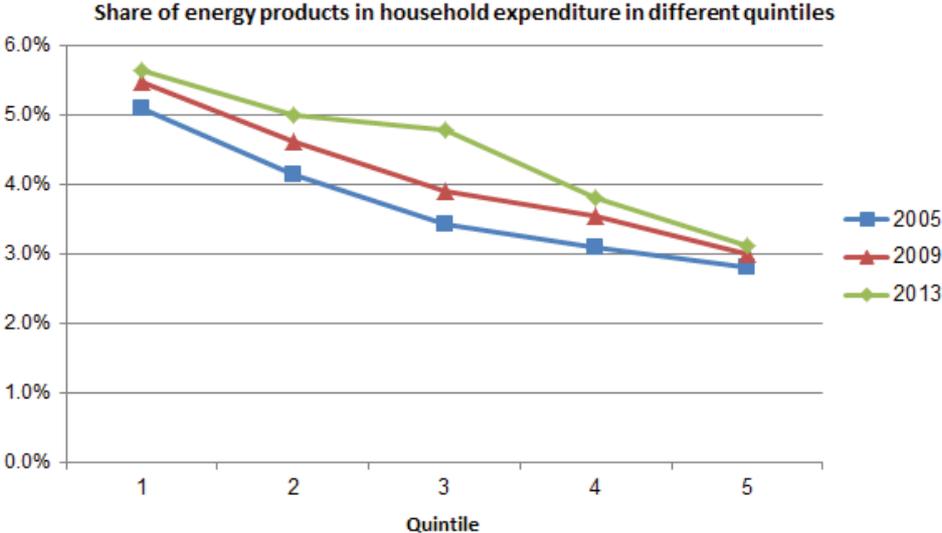
Between 2005 (blue line) and 2013 (green line) the share of energy in total household expenditure rose from 5.1% to 5.6% for the poorest households (Quintile 1) in Luxembourg, while for middle income households (Quintile 3) it went up from 3.4% to 4.8%, which was still moderate in EU comparison.

Energy costs shares in total production costs
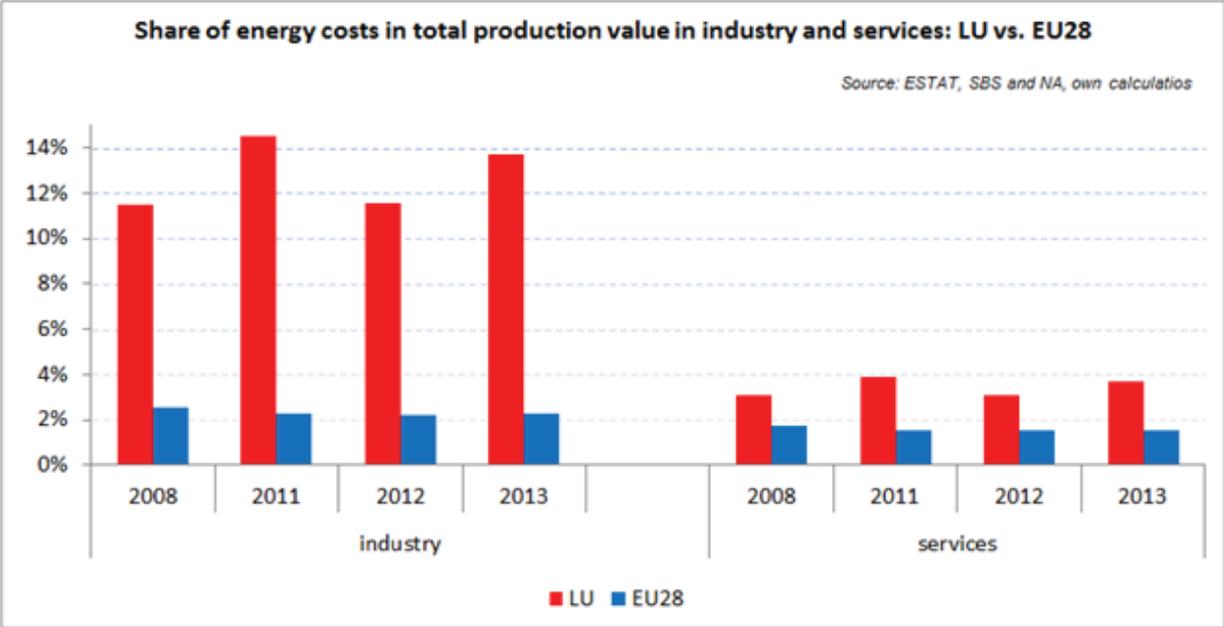
Share of energy costs in total production value in industry and services: LU vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes

Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available

Data for 2009 and 2010 is incomplete and not reported

Industry defined as NACE Rev.2 Section C (Manufacturing)

Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Energy	0.058500
other services	0.003600
Total energy component	**0.062100**
Network	0.060700
Other services - network	0.010300
Total network component	**0.071000**
support for renewable energy	0.019900
Electricity tax	0.001000
VAT	0.022700
Total taxes & levies component	**0.043600**
Total price	**0.176700**

Band ID	EUR/kWh 2015
Energy	0.041044
other services	0.001356
Total energy component	**0.042400**
Network	0.011546
Other services - network	0.001254
Total network component	**0.012800**
support for renewable energy	0.002363
Electricity tax	0.000500
Total taxes & levies component	**0.002863**
Total price	**0.058063**

Band D2	EUR/kWh 2015
Energy	0.024400
Other services - energy	0.003500
Total energy component	**0.027900**
Network	0.011700

Other services - network	0.001800
Total network component	**0.013500**
Other regional fee	0.003200
VAT	0.002500
Gas tax	0.001100
Total taxes & levies component	**0.006800**
Total price	**0.048200**

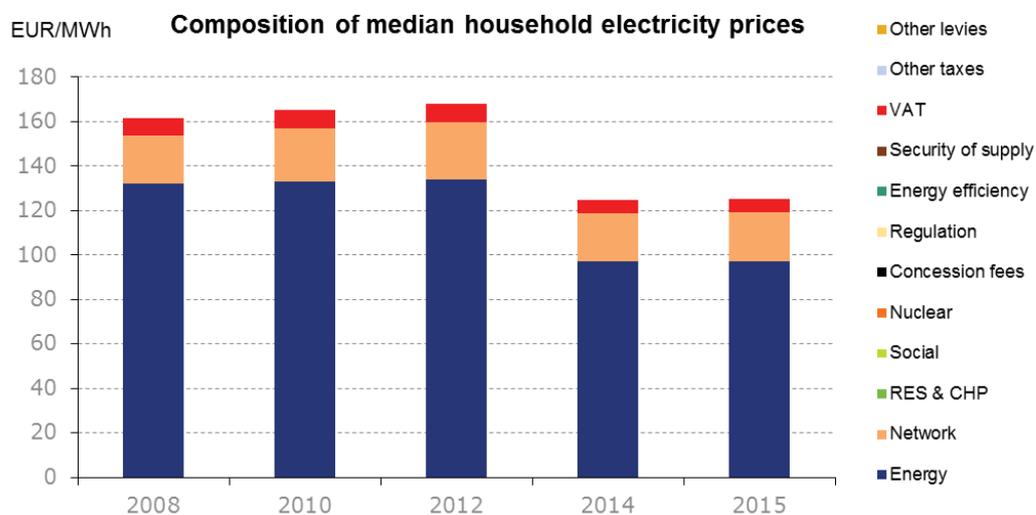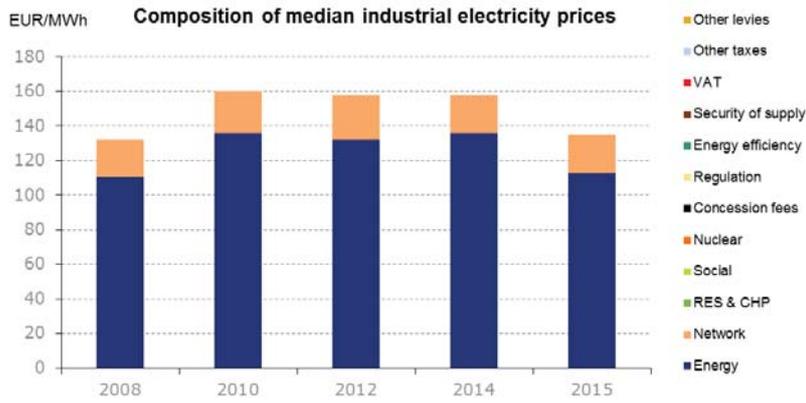| Band I3	EUR/kWh 2015
Energy	0.028500
Other services - energy	0.000500
Total energy component	**0.029000**
Network	0.006700
Other services - network	0.000200
Total network component	**0.006900**
Gas tax	0.000500
Total taxes & levies component	**0.000500**
Total price	**0.036400**

Malta
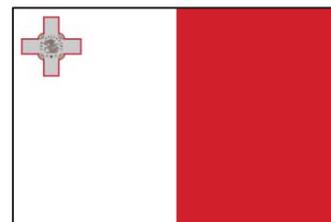
Evolution of electricity and natural gas prices
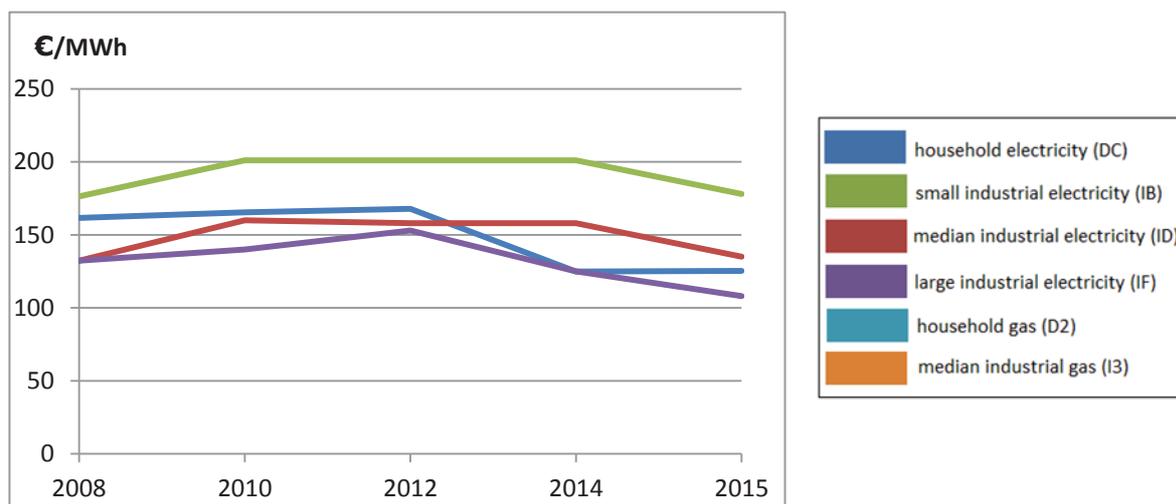
Composition of electricity prices

Composition of median industrial electricity prices

Oil products prices

Gasoline

Diesel

Heating oil

Energy in Households budgets
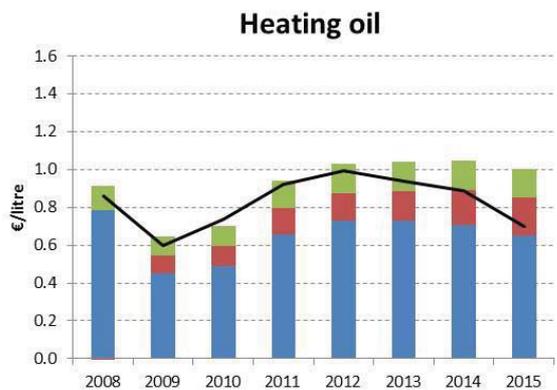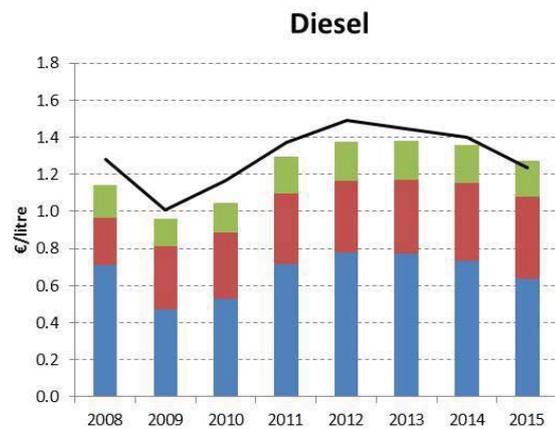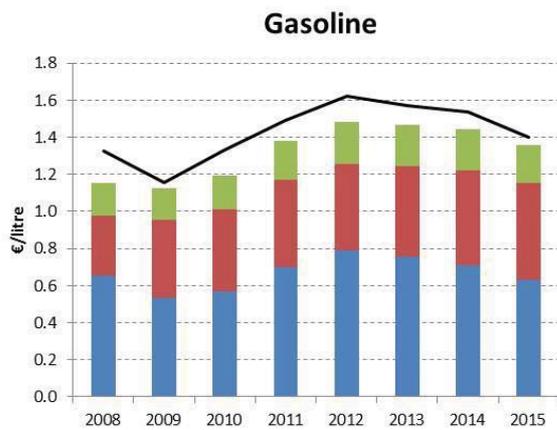
Share of energy products in household expenditure in different quintiles

In Malta 2008 data (most recently available) on the share of energy in total household expenditure show that households basically spent relatively low share on energy from their expenditures in EU comparison. The poorest households (Quintile 1) spent 3.3% of their expenditure on energy, while households with middle or high income (Quintile 3 and Quintile 5) spent slightly more than 2.5% on this purpose.

Energy costs shares in total production costs

Eurostat SBS data not available due to confidentiality issues

Electricity and gas prices – Breakdown by price components and subcomponents

Band DC	EUR/kWh 2015
Energy and supply	0.079300
Meter charge	0.018000
Total energy component	**0.097300**
Network	0.022000
Total network component	**0.022000**
VAT	0.006000
Total taxes & levies component	**0.006000**
Total price	**0.125300**

Band ID	EUR/kWh 2015
Energy and supply	0.103000
Meter charge	0.010000
Total energy component	**0.113000**
Network	0.022000
Total network component	**0.022000**
VAT	0.000000
Total taxes & levies component	**0.000000**
Total price	**0.135000**

Netherlands

Evolution of electricity and natural gas prices
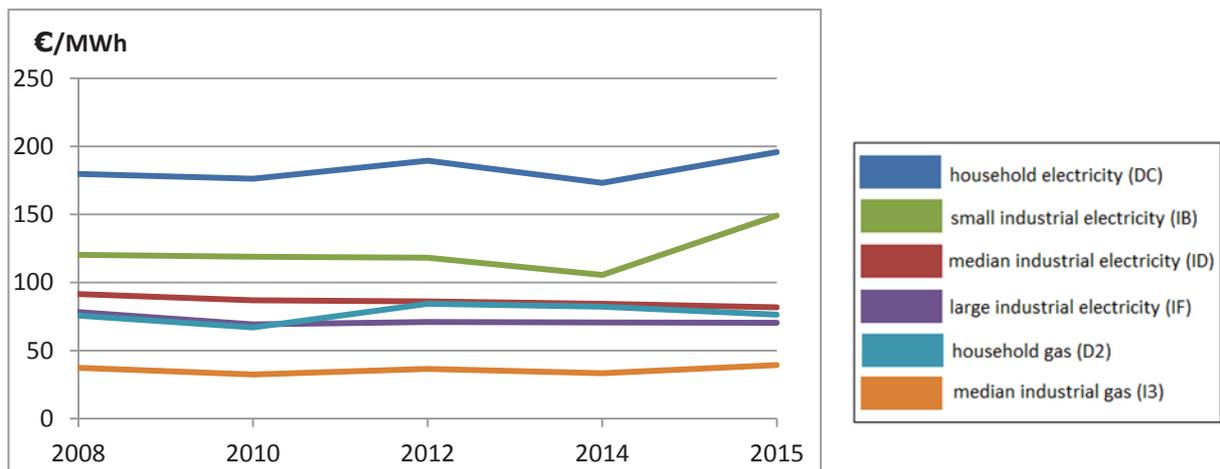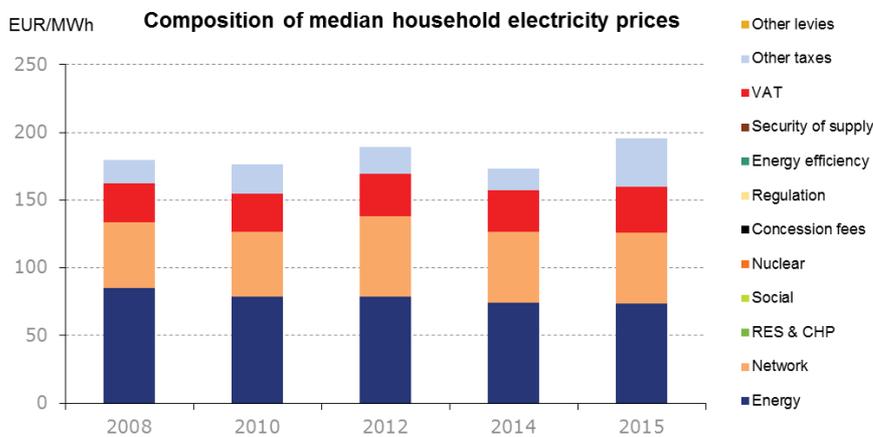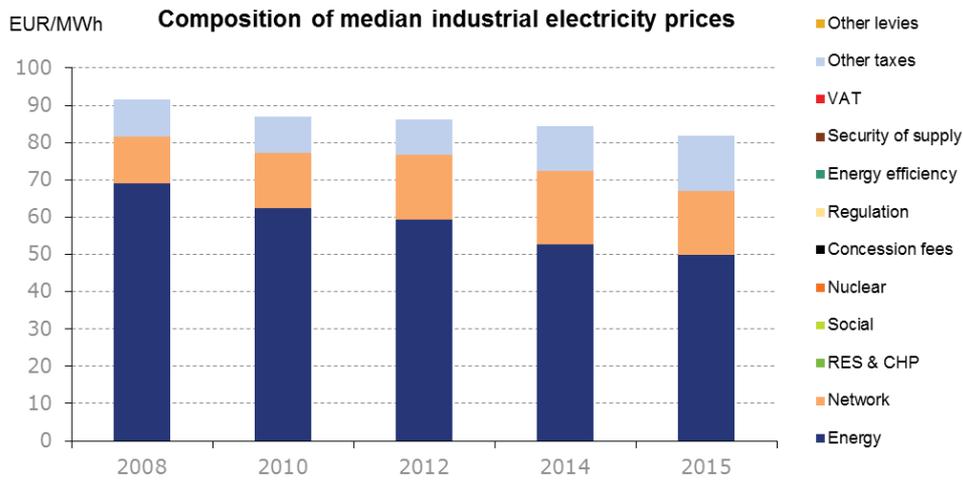
Legend:
- household electricity (DC)
- small industrial electricity (IB)
- median industrial electricity (ID)
- large industrial electricity (IF)
- household gas (D2)
- median industrial gas (I3)

Composition of electricity prices

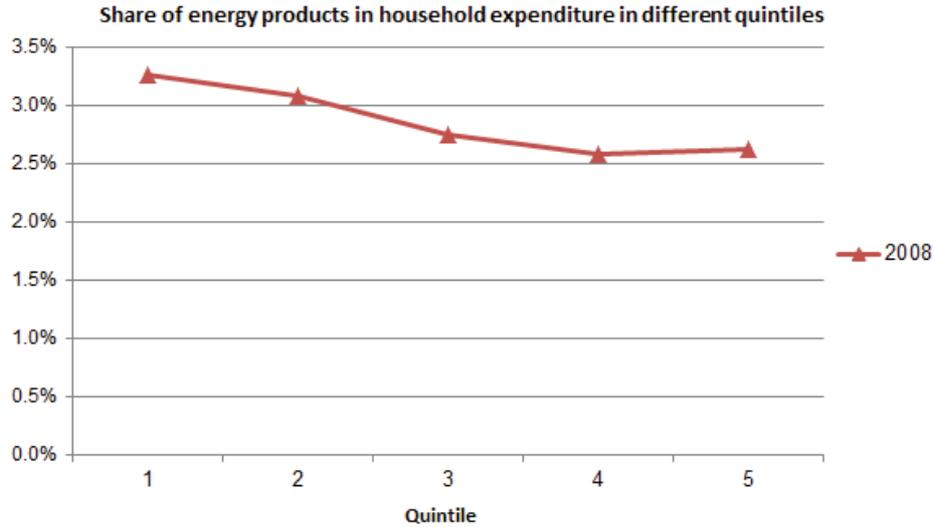**Composition of median household electricity prices** (EUR/MWh)

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Composition of median industrial electricity prices

Composition of gas prices

Composition of median household gas prices

Composition of median industrial gas prices

Oil products prices

Gasoline

Diesel

Heating oil

Legend:
- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price
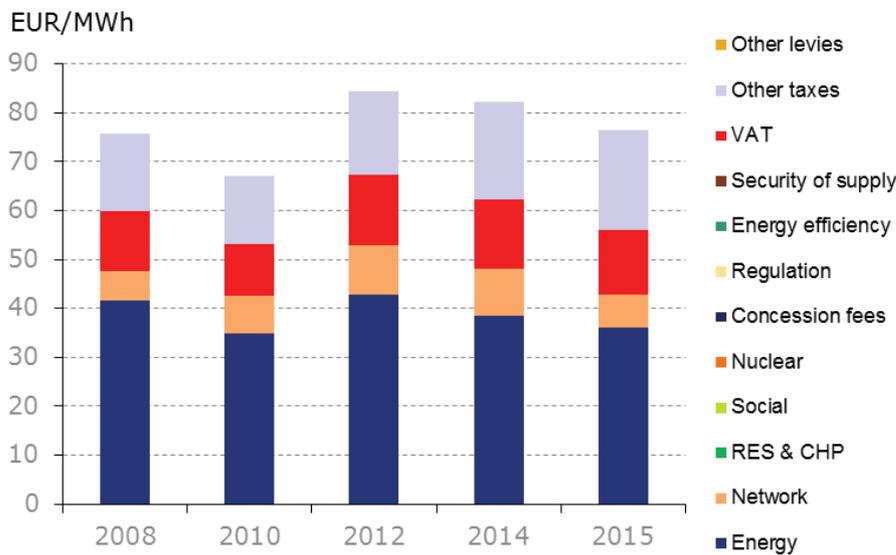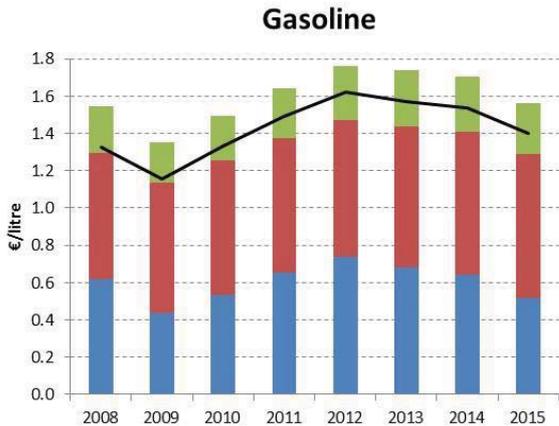
Energy in Households budgets

Share of energy products in household expenditure in different quintiles
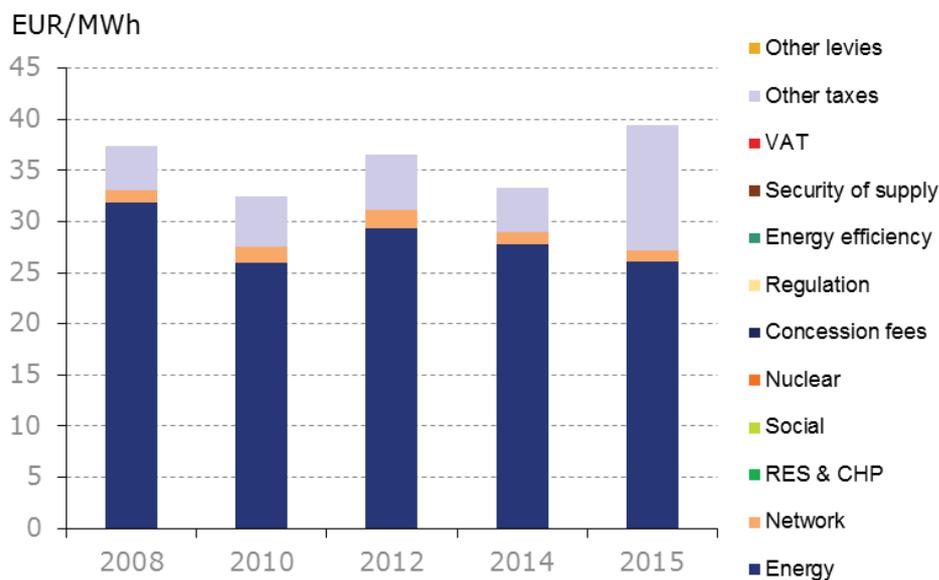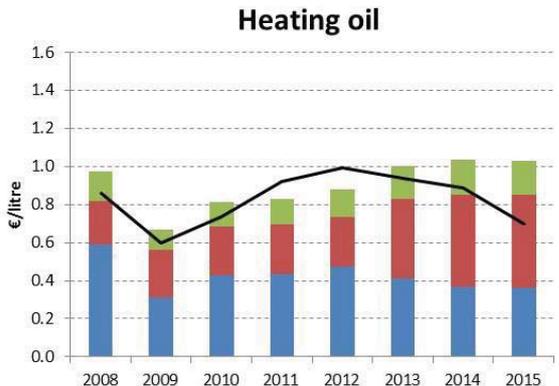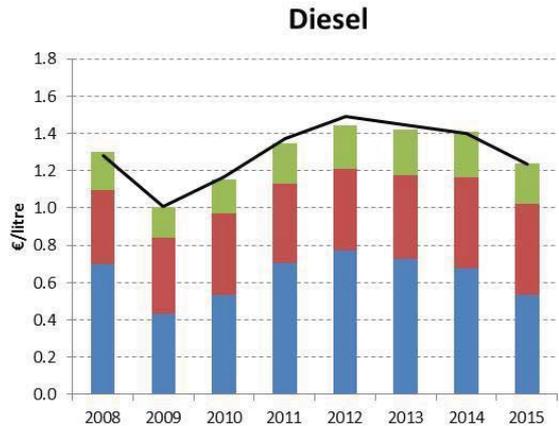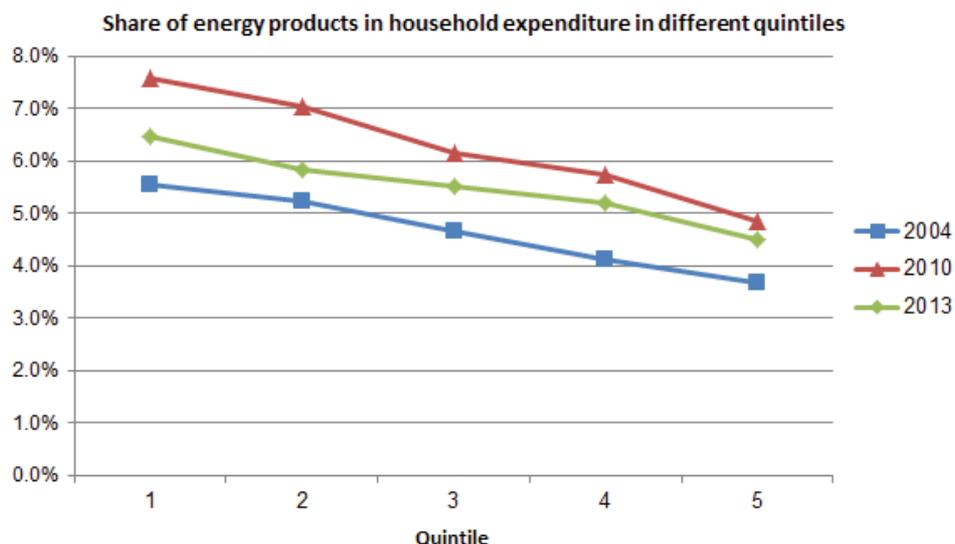
In the Netherlands the share of energy in total household expenditure rose measurably in all income quintiles between 2004 (blue line) and 2013 (green line). In the case of the poorest households (Quintile 1) the energy share went up from 5.5% to 7.6%, while in the case of households with middle income (Quintile 3) it rose from 4.6% to 6.2%.

Energy costs shares in total production costs
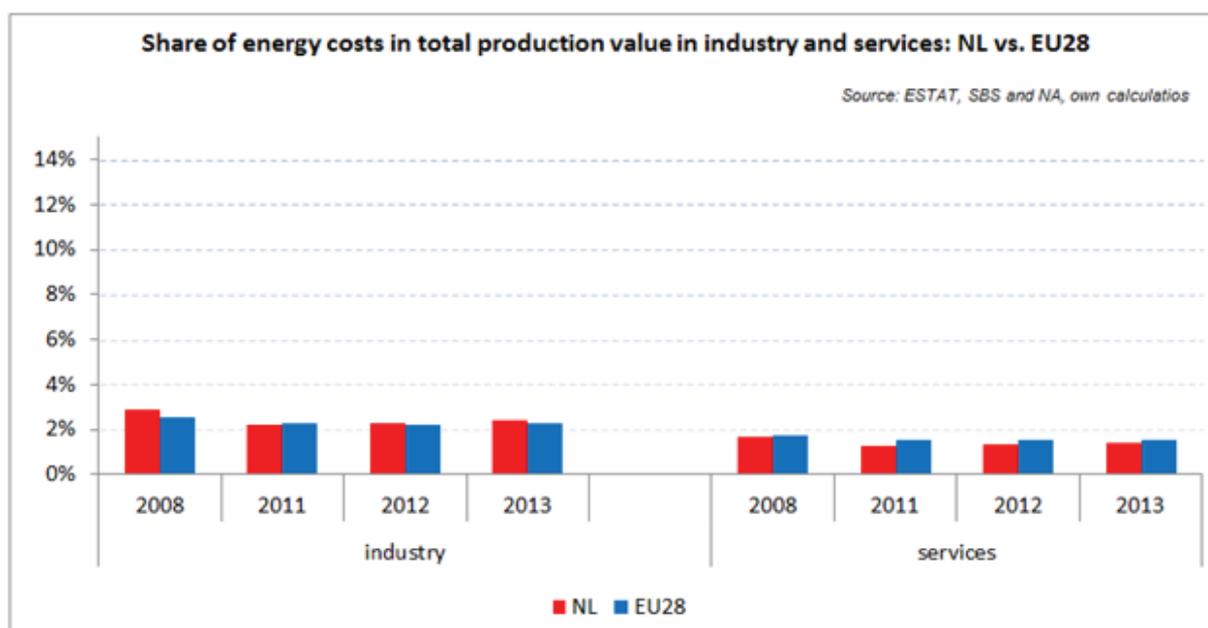
Share of energy costs in total production value in industry and services: NL vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Energy Supply	0.073300
Total energy component	**0.073300**
Transmission	0.006300
Standing charge	0.046500
Total network component	**0.052800**
Environmental tax on energy	0.035700
VAT	0.034000
Total taxes & levies component	**0.069700**
Total price	**0.195800**

Band ID	EUR/kWh 2015
Energy Supply	0.049800
Total energy component	**0.049800**
Transmission	0.017200
Standing charge	0.000100
Total network component	**0.017300**
Environmental tax on energy	0.014700
VAT	0.000000
Total taxes & levies component	**0.014700**
Total price	**0.081800**

Band D2	EUR/kWh 2015
Energy Supply	0.036031
Total energy component	**0.036031**
Standing charge	0.001185
Transmission	0.005643
Total network component	**0.006828**
Environmental tax on energy	0.020318
VAT	0.013267

Total taxes & levies component	**0.033586**
Total price	**0.076445**

Band I3	EUR/kWh 2015
Energy Supply	0.026124
Total energy component	**0.026124**
Standing charge	0.000021
Transmission	0.001000
Total network component	**0.001021**
Environmental tax on energy	0.012227
VAT	0.000000
Total taxes & levies component	**0.012227**
Total price	**0.039372**

Poland

Evolution of electricity and natural gas prices
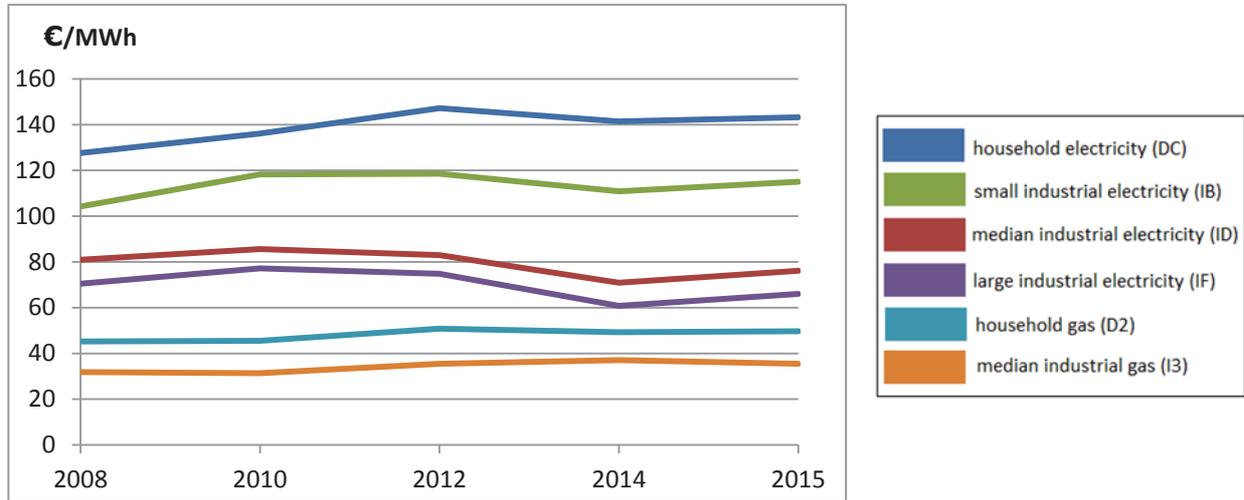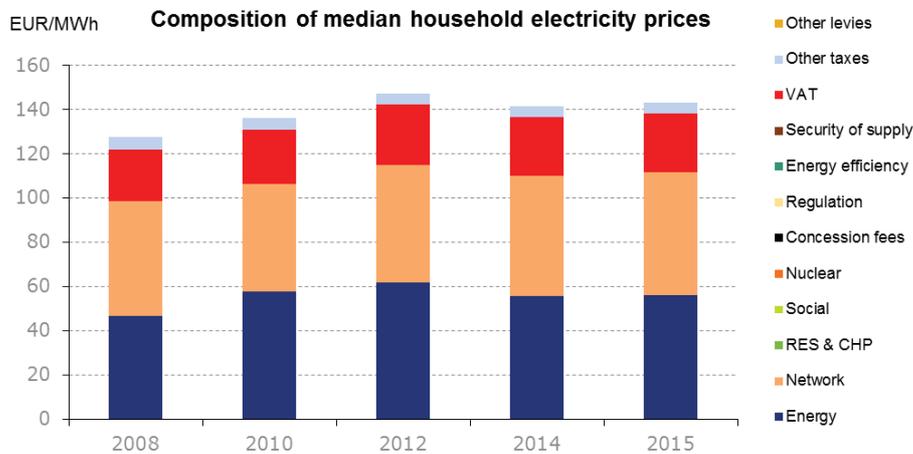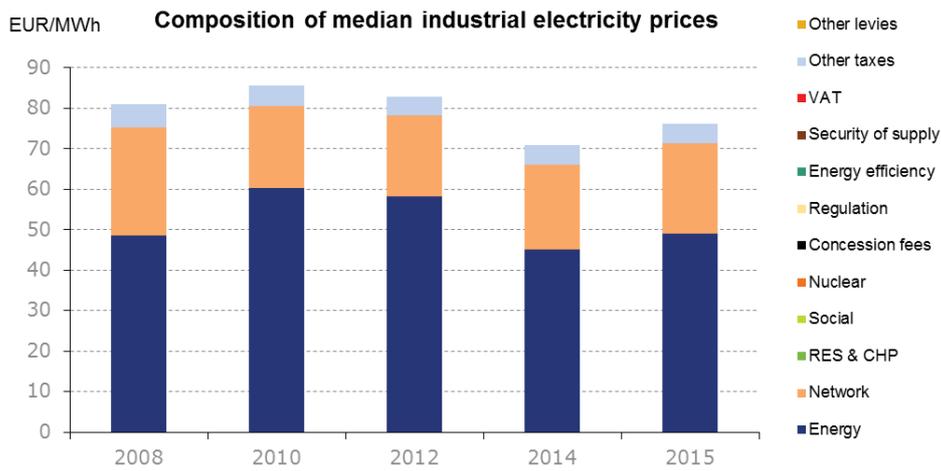
Composition of electricity prices

Composition of median household electricity prices

Composition of median industrial electricity prices

Composition of gas prices

Composition of median household gas prices

Composition of median industrial gas prices

Oil products prices

Gasoline

Diesel

Heating oil

Legend:
- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price
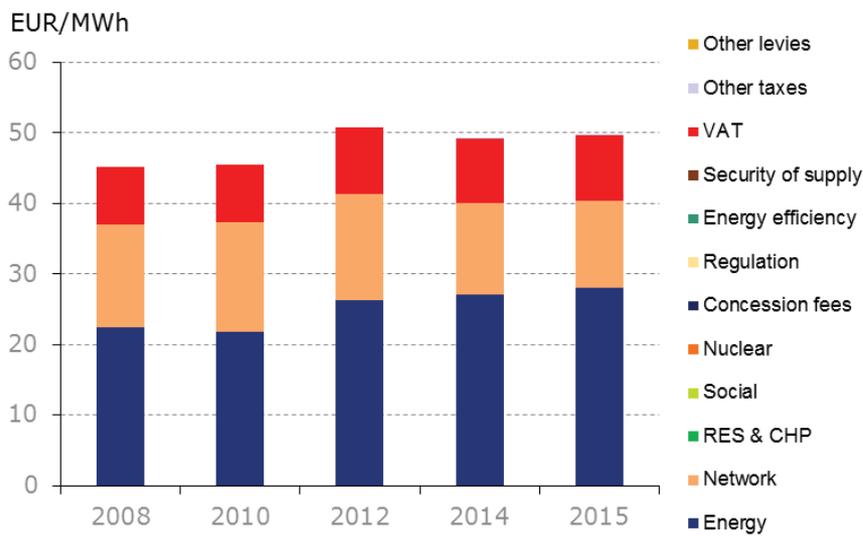
Energy in Households budgets
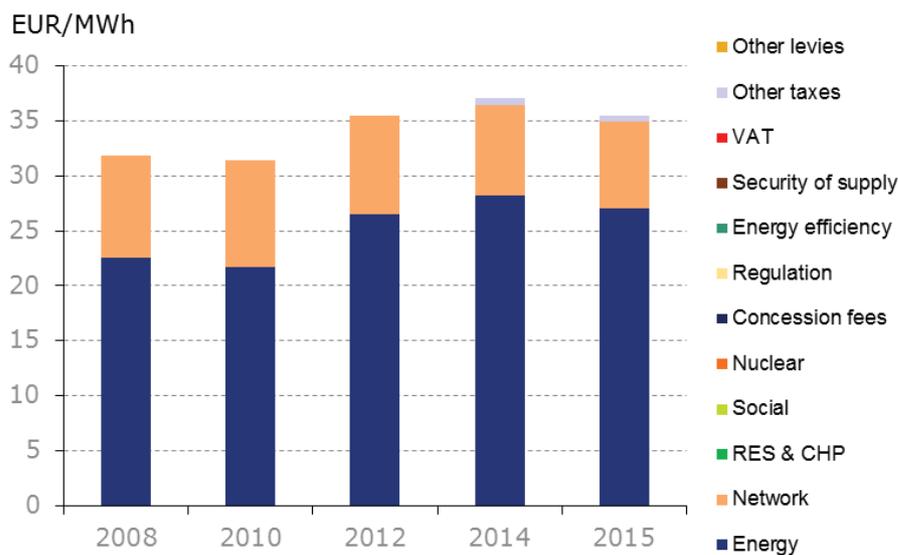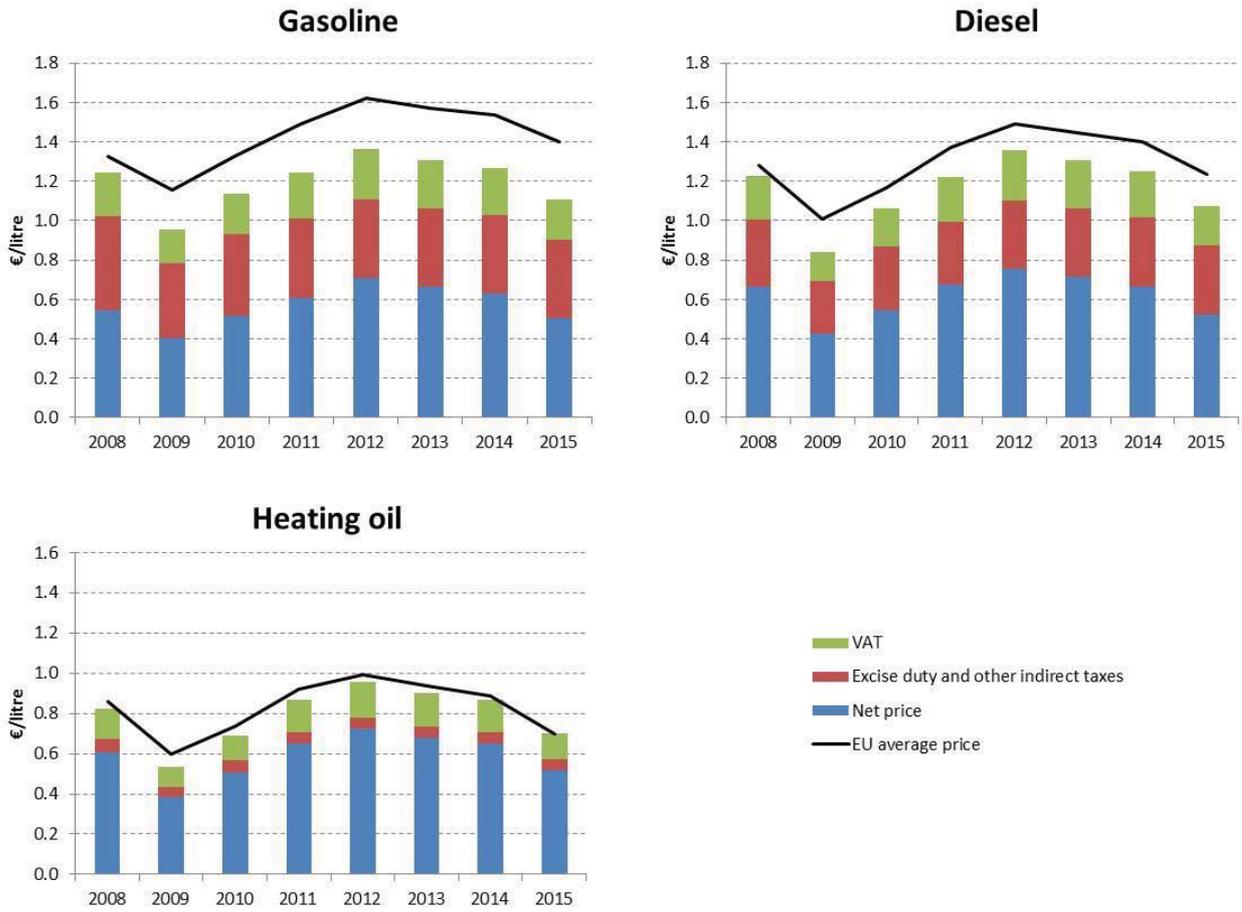
Share of energy products in household expenditure in different quintiles
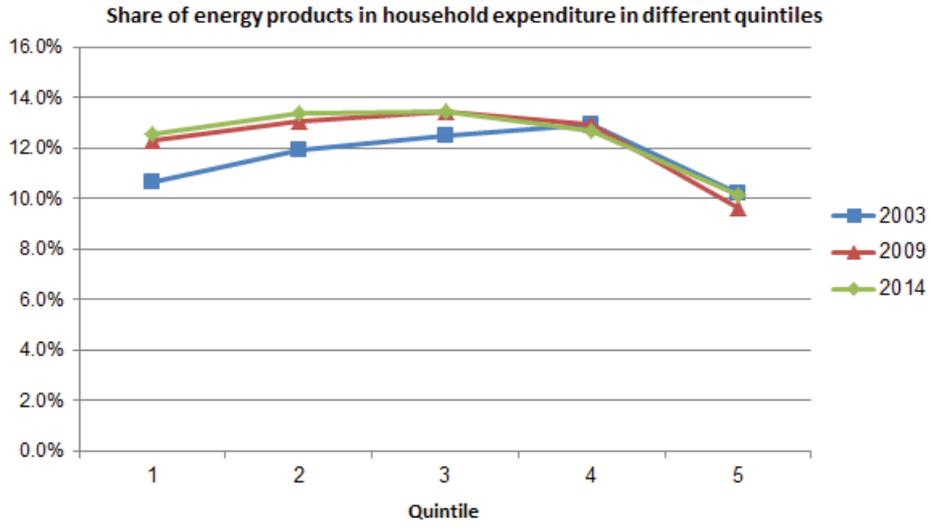
In Poland the share of energy in total household expenditure went up from 10.6% to 12.5% in the case of the poorest households (Quintile 1) between 2003 (blue line) and 2014 (green line). In the case of households with middle income (Quintile 3) the energy share rose from 12.5% to 13.4% in the same period.

Energy costs shares in total production costs

Data not available

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Energy and supply	0.055976
Total energy component	**0.055976**
network	0.055617
Total network component	**0.055617**
excise tax	0.004790
VAT	0.026779
Total taxes & levies component	**0.031569**
Total price	**0.143162**

Band ID	EUR/kWh 2015
Energy and supply	0.049126
Total energy component	**0.049126**
network	0.022228
Total network component	**0.022228**
excise tax	0.004790
VAT	0.000000
Total taxes & levies component	**0.004790**
Total price	**0.076144**

Band D2	EUR/kWh 2015
Energy	0.028120
Total energy component	**0.028120**
network	0.012240
Total network component	**0.012240**
excise tax	0.000024
VAT	0.009293
Total taxes & levies	**0.009317**

component	
Total price	**0.049677**

Band I3	**EUR/kWh 2015**
Energy	0.027018
Total energy component	**0.027018**
network	0.007904
Total network component	**0.007904**
excise tax	0.000551
VAT	0.000000
Total taxes & levies component	**0.000551**
Total price	**0.035473**

Portugal

Evolution of electricity and natural gas prices

Legend:
- household electricity (DC)
- small industrial electricity (IB)
- median industrial electricity (ID)
- large industrial electricity (IF)
- household gas (D2)
- median industrial gas (I3)

Composition of electricity prices

Composition of median household electricity prices

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Composition of median industrial electricity prices (EUR/MWh)

Legend: Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

Composition of gas prices

Composition of median household gas prices (EUR/MWh)

Legend: Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

Composition of median industrial gas prices (EUR/MWh)

Legend: Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

Oil products prices

Gasoline

Diesel

Heating oil

■ VAT
■ Excise duty and other indirect taxes
■ Net price
— EU average price

Energy in Households budgets

Share of energy products in household expenditure in different quintiles

Between 2005 (red line) and 2010 (green line) the share of energy in total household expenditure in Portugal rose from 6.4% to 8.2% for the poorest households (Quintile 1), while in the case of households with middle income (Quintile 3) it went up from 4.6% to 6.7%.

Energy costs shares in total production costs
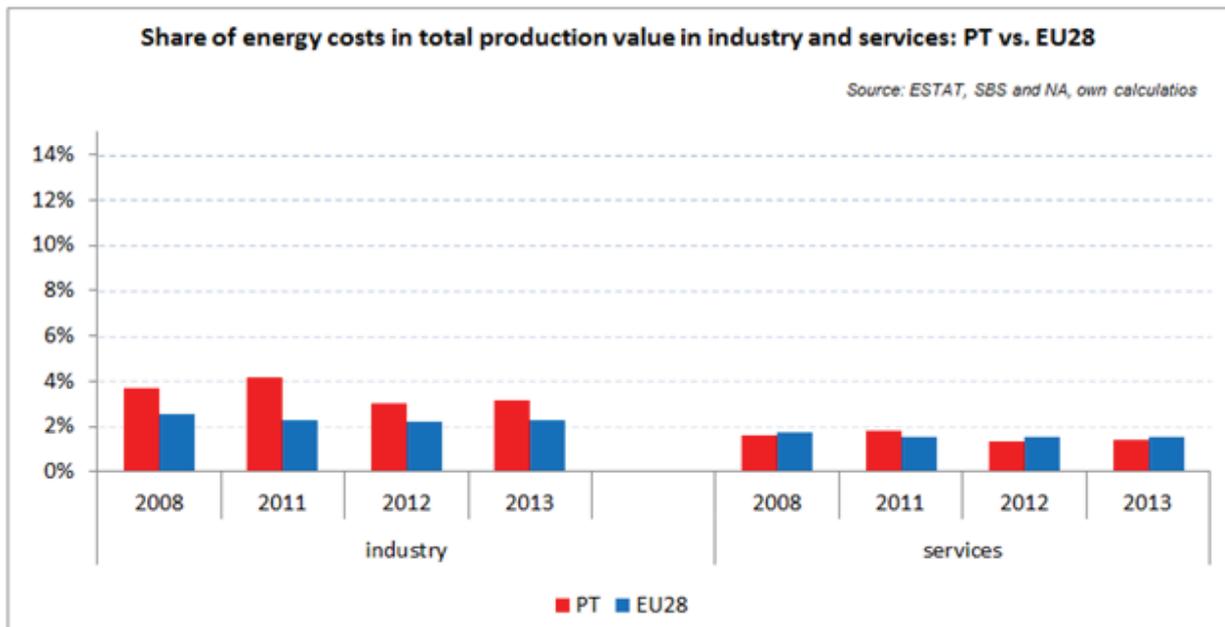
Share of energy costs in total production value in industry and services: PT vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

| Band DC	EUR/kWh
	2015
balancing energy	0.002766
electricity generation	0.056949
Total energy component	**0.059715**
Losses Transport	0.000977
Losses HV Distribution tariffs	0.000827
Losses MV Distribution tariffs	0.002511
Losses LV Distribution tariffs	0.003888
MV Distribution tariffs	0.008603
general system costs	0.005123
HV distribution tariffs	0.002062
LV distribution tariffs	0.022319
Transmission	0.006087
Total network component	**0.052398**
Plan for Promoting the Efficient Use	
isolated islands compensation	-0.001220
charges related with allocation mechanism incentive warranted guaranty	0.000000
Stranded Cost Compensation Mechanism	0.000000
Plans for energy efficient use and environmental performance	
stranded costs	-0.006266
concession fees or local/regional fiscal taxes	
support for renewable energy	0.041501
other taxes (financing NRA: ERSE, AdC, OMIP...)	0.000730
compensation to stranded costs CMECs	
concession fees related with tariffs deficits	0.003816
Support for combined heat and power (CHP)	0.010742

VAT	0.042300
CMECs	0.010281
excise tax	0.001720
Concession Fee	0.012183
renewable energy act	
other taxes (NRA...)	
Power purchase agreements (PPA)	
Total taxes & levies component	**0.115786**
Total price	**0.227900**
Band ID	**EUR/kWh**
	2015
balancing energy	0.002500
electricity generation	0.054900
Total energy component	**0.057400**
Losses Transport	
Losses HV Distribution tariffs	
Losses MV Distribution tariffs	
MV Distribution tariffs	0.010200
general system costs	0.004400
HV distribution tariffs	0.001800
Transmission	0.005500
Total network component	**0.021900**
generation fields	
isolated islands compensation	0.003700
charges related with allocation mechanism incentive warranted guaranty	
Stranded Cost Compensation Mechanism	
Plans for energy efficient use and environmental performance	0.000000
stranded costs	0.005200

support for renewable energy	0.000000
other taxes (financing NRA: ERSE, AdC, OMIP...)	0.000000
compensation to stranded costs CMECs	0.000000
concession fees related with tariffs deficits	0.002500
Support for combined heat and power (CHP)	0.009300
VAT	0.000000
CMECs	0.001700
excise tax	0.000500
Concession Fee	0.000200
renewable energy act	0.000200
other taxes (NRA...)	0.000600
Total taxes & levies component	**0.023900**
Total price	**0.103200**

Romania

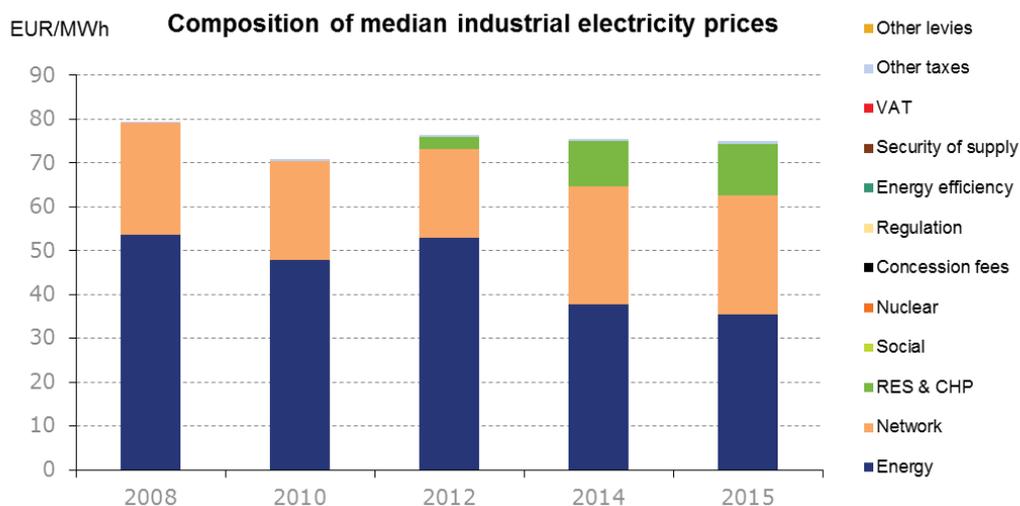## Evolution of electricity and natural gas prices
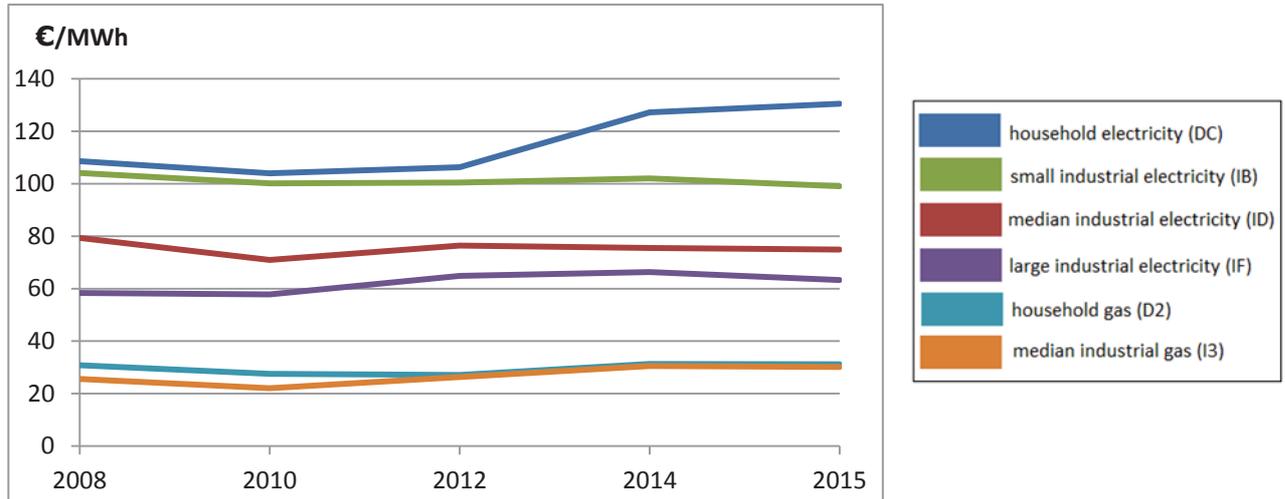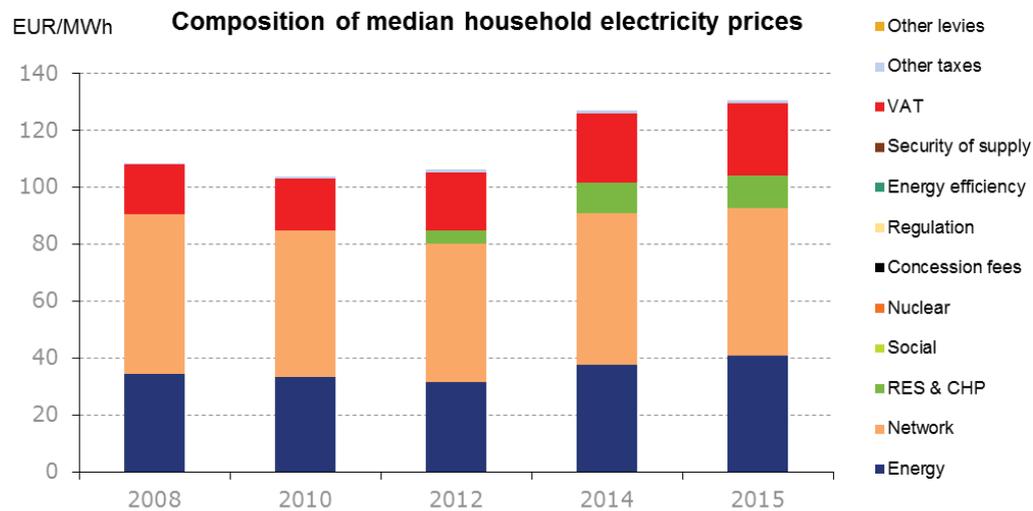
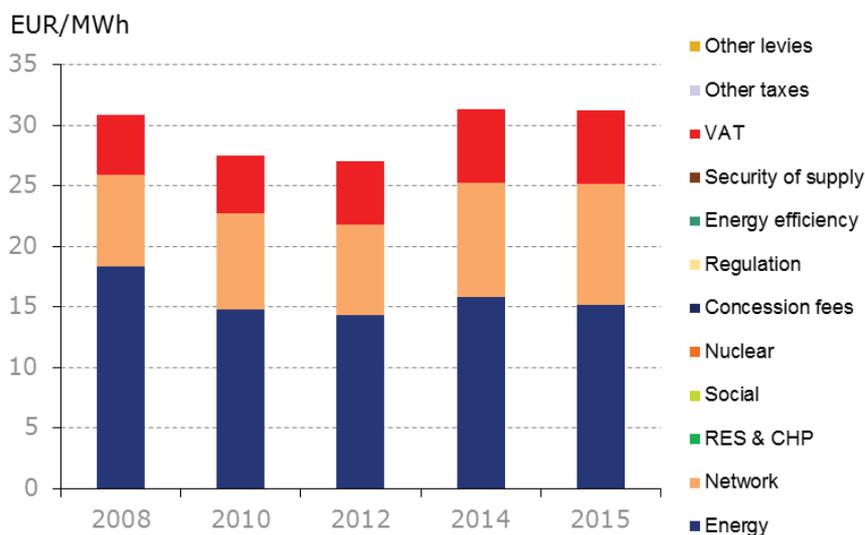## Composition of electricity prices

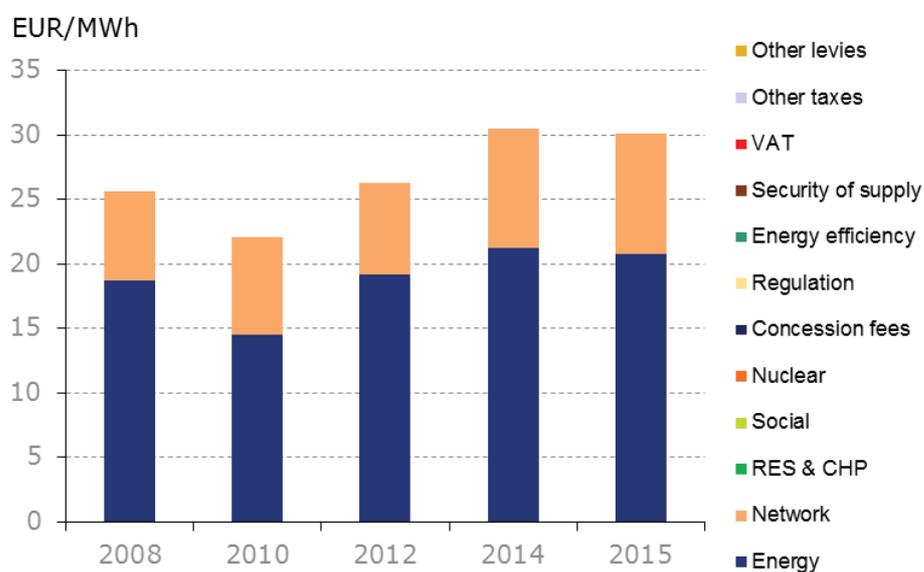Composition of median industrial electricity prices

Composition of gas prices

Composition of median household gas prices

Composition of median industrial gas prices

Oil products prices

Gasoline

Diesel

Heating oil

- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price
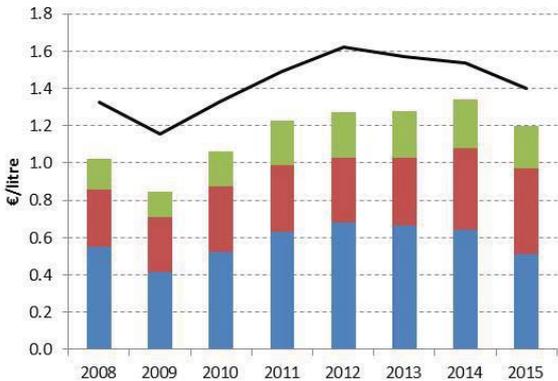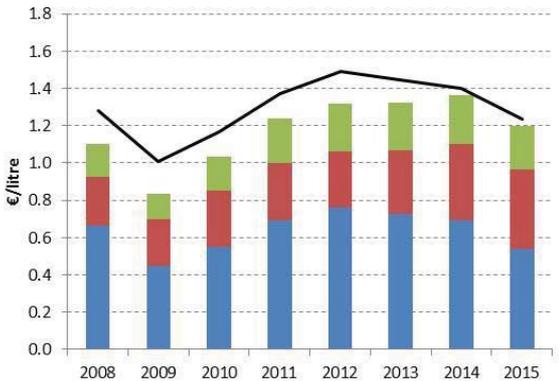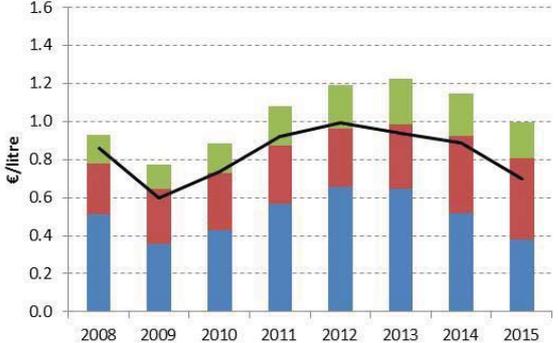
Energy in Households budgets

Share of energy products in household expenditure in different quintiles
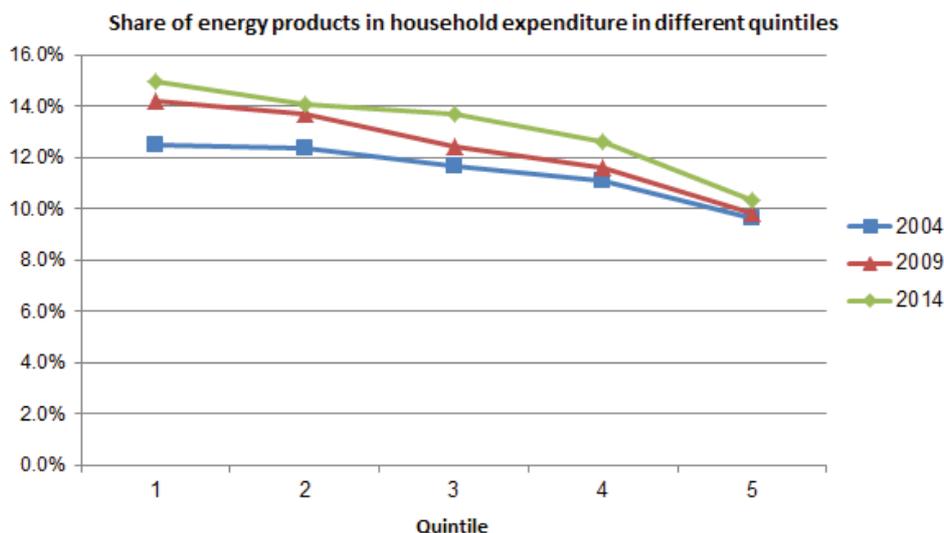
In Romania the share of energy in total household expenditure rose significantly between 2004 (blue line) and 2014 (green line): in the case of the poorest households (Quintile 1) it rose from 12.5% to 15%, while at the same time households with middle income (Quintile 3) also faced increasing share of energy in their expenditures (from 11.7% to 13.7%).

Energy costs shares in total production costs
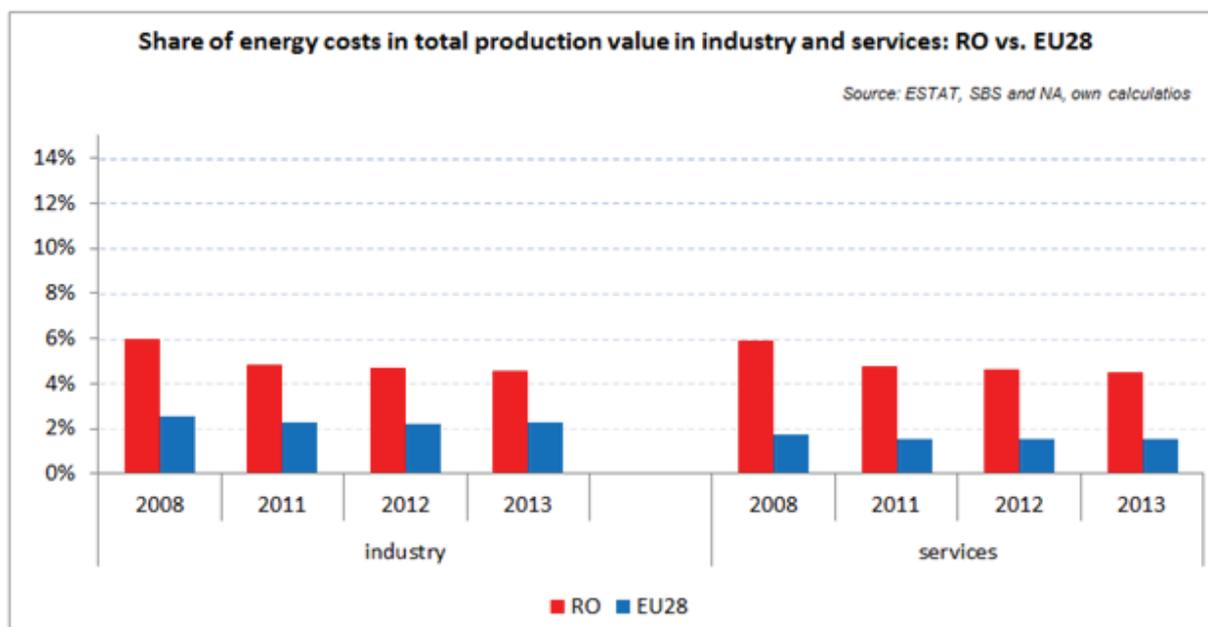
Share of energy costs in total production value in industry and services: RO vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh
	2015
Energy and supply	0.040904
Total energy component	**0.040904**
network	0.051956
Total network component	**0.051956**
Excise Tax	0.001077
VAT	0.025261
Support for RES and CHP combined	0.011326
Total taxes & levies component	**0.037663**
Total price	**0.130523**

Band IB	EUR/kWh
	2015
Energy and supply	0.044738
Total energy component	**0.044738**
network	0.042116
Total network component	**0.042116**
Excise Tax	0.000599
VAT	0.000000
Support for RES and CHP combined	0.011581
Total taxes & levies component	**0.012180**
Total price	**0.099033**

Band D2	EUR/kWh 2015
Energy and supply	0.015119
Total energy component	**0.015119**
Transmission	0.002151
Distribution	0.007892
Total network component	**0.010043**
VAT	0.006038
Total taxes & levies component	**0.006038**
Total price	**0.031200**

Band I3	EUR/kWh 2015
Energy and supply	0.020729
Total energy component	**0.020729**
Transmission	0.002151
Distribution	0.007241
Total network component	**0.009392**
VAT	0.000000
Total taxes & levies component	**0.000000**
Total price	**0.030121**

Brussels, 30.11.2016

SWD(2016) 420 final

PART 13/13

COMMISSION STAFF WORKING DOCUMENT
Accompanying the document

REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

Energy prices and costs in Europe

{COM(2016) 769 final}

EN   **EN**

Contents

Slovenia

Evolution of electricity and natural gas prices

Legend:
- household electricity (DC)
- small industrial electricity (IB)
- median industrial electricity (ID)
- large industrial electricity (IF)
- household gas (D2)
- median industrial gas (I3)

Composition of electricity prices

Composition of median household electricity prices

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
- Network
- Energy

Composition of median industrial electricity prices

Composition of gas prices[1]

Composition of median household gas prices

Composition of median industrial gas prices

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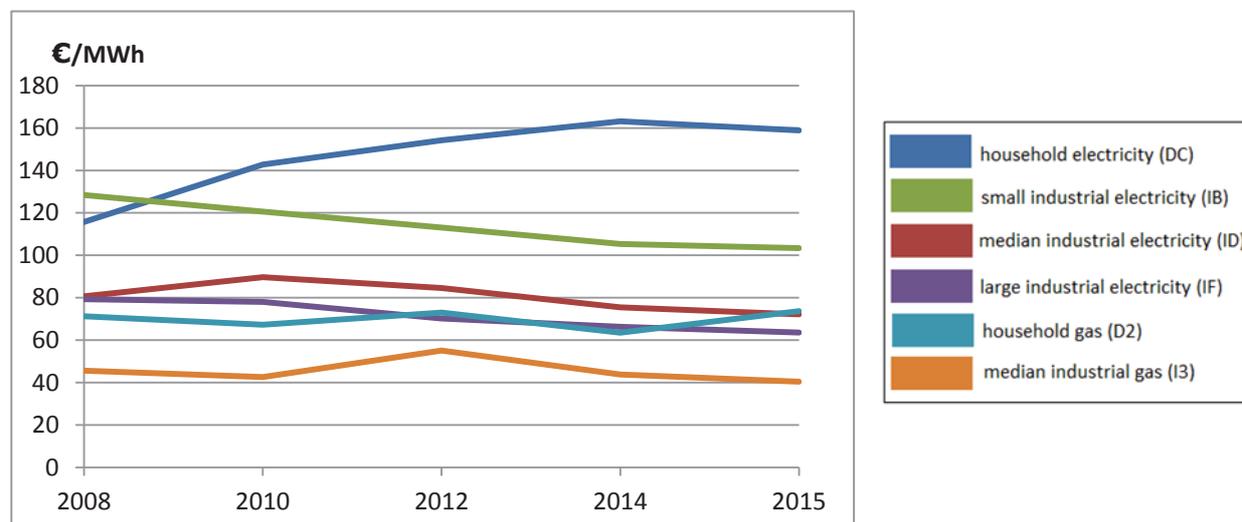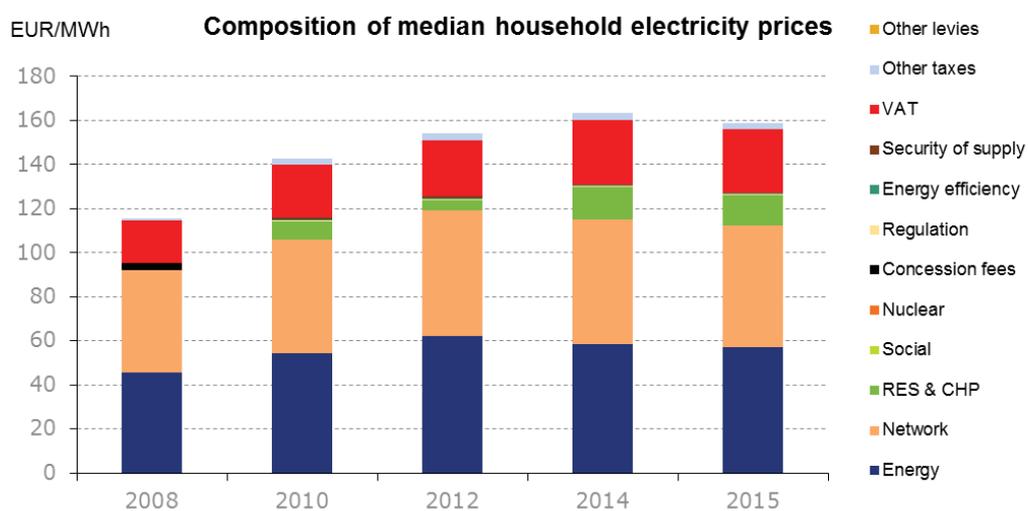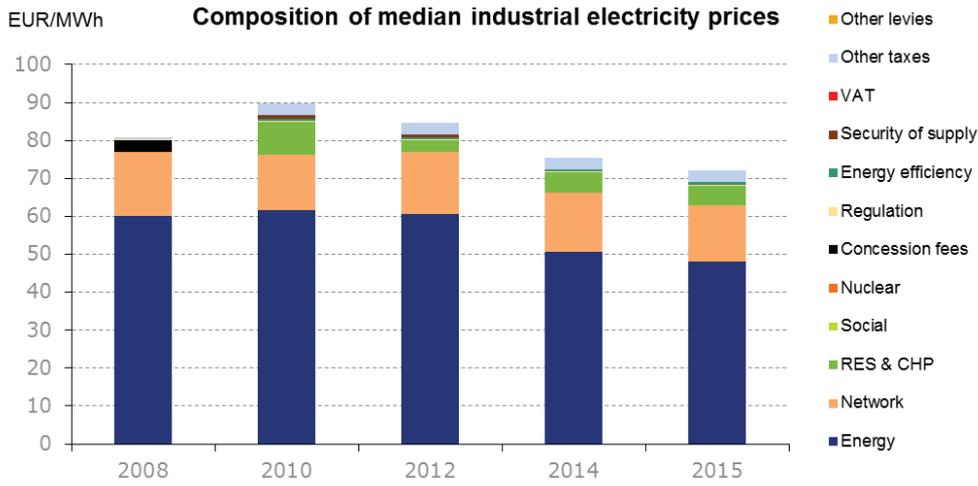
[1] Combined energy and network component for the years 2008 and 2010

Oil products prices

Gasoline

Diesel

Heating oil

Legend:
- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price

Energy in Households budgets

Share of energy products in household expenditure in different quintiles
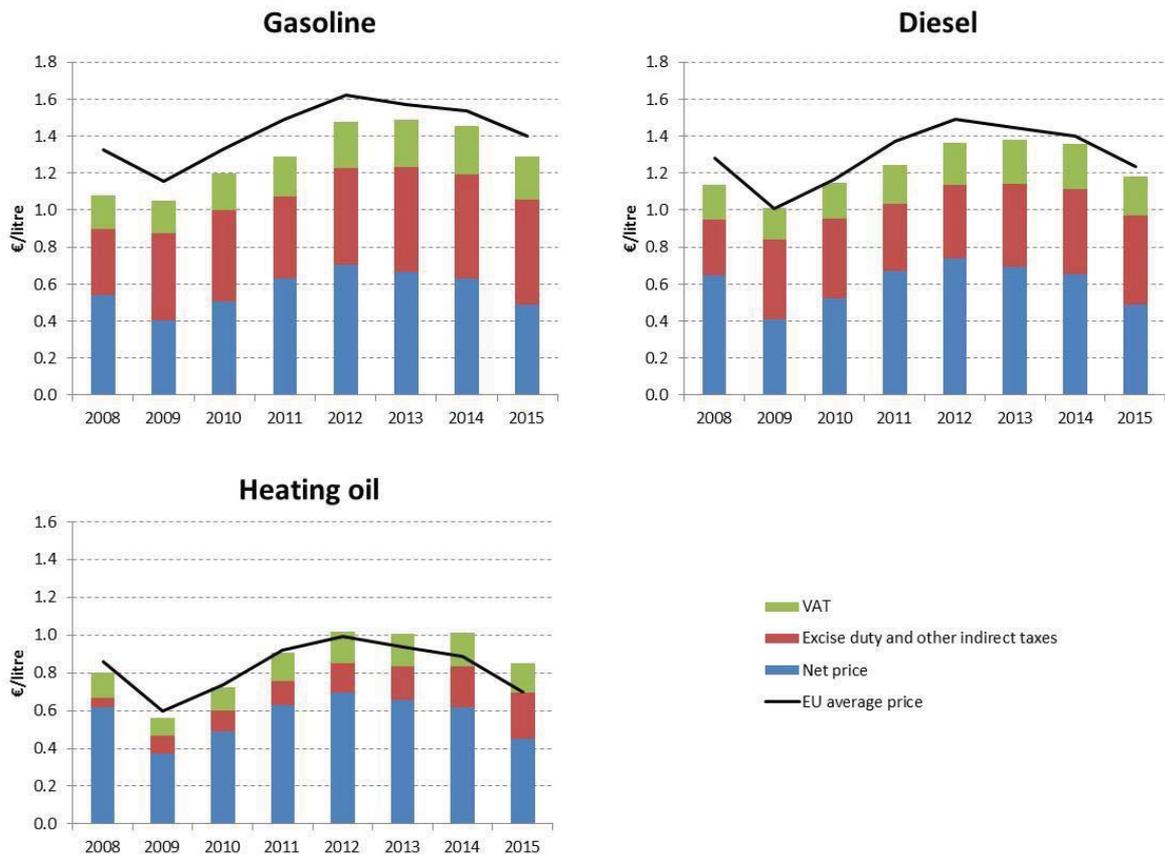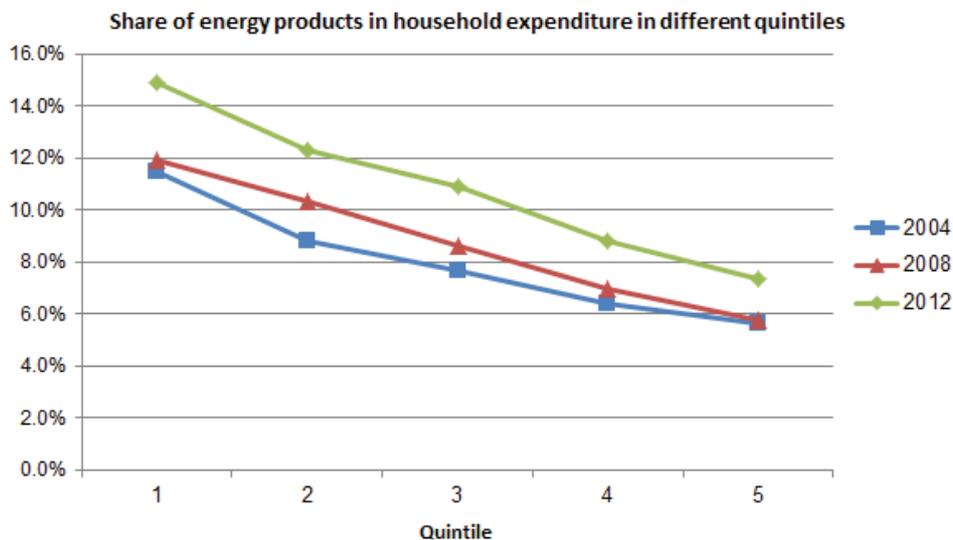
- 2004
- 2008
- 2012

In Slovenia the share of energy in total household expenditure rose measurably between 2004 (blue line) and 2012 (green line): in the case of the poorest households (Quintile 1) it went up from 11.5% to 14.9%, while in the case of households with middle income (Quintile 3) it rose from 7.6% to 10.9%.

Energy costs shares in total production costs

Share of energy costs in total production value in industry and services: SI vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Electricity Households (DC)	EUR/kWh
Energy and supply	0.064200
Day-ahead market	
Ancillary services	
Total energy component	**0.064200**
Distribution	0.037900
Transmission	0.012900
Total network component	**0.050800**
Nuclear sector	0.000200
Special tax on electricity consumption	0.009300
Deficit annuity	0.016200
Capacity payments	0.005400
Specific compensation for renewable energy	0.038700
VAT	0.040100
Financing for the NRA	0.000100
Island compensation	0.003900
Financing of system and market operators	0.000100
Energy security and generation adequacy	0.002000
Other costs	
Total taxes & levies component	**0.116000**
Total price	**0.231000**

Electricity Industry (ID)	EUR/kWh
	2015
Energy and supply	0.054100
Day-ahead market	
Ancillary services	
Total energy component	**0.054100**
Distribution	0.010500
Transmission	0.003600

Total network component	**0.014100**
Nuclear sector	0.000100
Special tax on electricity consumption	0.004700
Deficit annuity	0.004500
Capacity payments	0.005400
Specific compensation for renewable energy	0.010800
VAT	0.000000
Financing for the NRA	0.000100
Island compensation	0.001100
Financing of system and market operators	0.000100
Energy security and generation adequacy	0.002000
Other costs	
Total taxes & levies component	**0.028800**
Total price	**0.097000**

Natural Gas Households (D2)	**EUR/kWh**
Energy and supply	0.031772
Total energy component	**0.031772**
Conduction	0.030115
Capacity reserve	0.000420
Total network component	**0.030535**
VAT	0.013576
Hydrocarbons tax	0.002340
Total taxes & levies component	**0.015916**
Total price	**0.078223**

Natural gas Industry (I3)	**EUR/kWh**
	2015
Energy and supply	0.030487

Total energy component	**0.030487**
Conduction	0.003169
Capacity reserve	0.000420
Total network component	**0.003589**
VAT	0.000000
Hydrocarbons tax	0.000540
Total taxes & levies component	**0.000540**
Total price	**0.034616**

Slovakia

Evolution of electricity and natural gas prices

Composition of electricity prices

Composition of median industrial electricity prices

EUR/MWh

Legend: Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

Composition of gas prices

Composition of median industrial gas prices

EUR/MWh

Legend: Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

Composition of median household gas prices

EUR/MWh

Legend: Other levies, Other taxes, VAT, Security of supply, Energy efficiency, Regulation, Concession fees, Nuclear, Social, RES & CHP, Network, Energy

Oil products prices

Gasoline

Diesel

Heating oil

Legend:
- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price

Note: Slovakia is not reporting fuel oil prices from October 2011

Energy in Households budgets

Share of energy products in household expenditure in different quintiles

In Slovakia the share of energy in total household expenditure, being the highest in EU comparison, decreased significantly between 2004 (blue line) and 2014 (green line). In the case of the poorest households (Quintile 1) it went down from 26.5% to 21.7%, while in the case of households with middle income (Quintile 3) it decreased from 17.5% to 14.8%.

Energy costs shares in total production costs
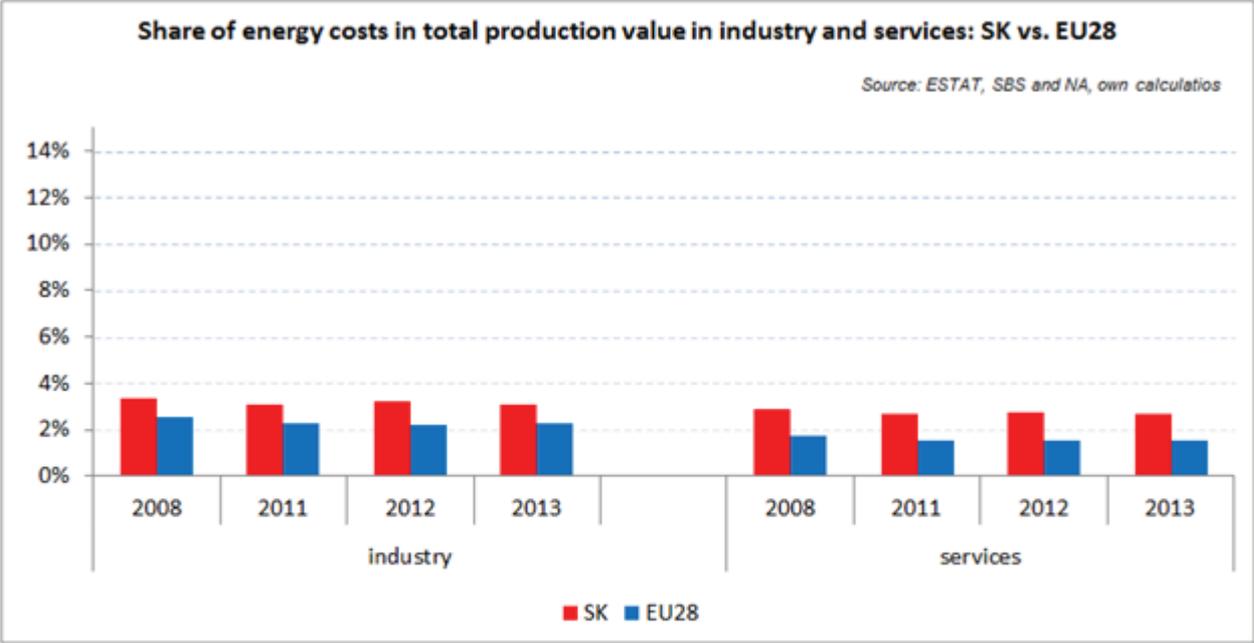
Share of energy costs in total production value in industry and services: SK vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Energy and supply	0.048100
Total energy component	**0.048100**
network	0.043500
Total network component	**0.043500**
Support for RES and CHP combined	0.000000
promotion of production from domestic coal	0.004400
market operator	0.000300
RES promotion	0.014300
Support for combined heat and power (CHP)	0.002800
national nuclear fund	0.003200
ancillary services tariff	0.007700
VAT	0.024200
Total taxes & levies component	**0.056900**
Total price	**0.148500**

Band ID	EUR/kWh 2015
Energy and supply	0.033400
Total energy component	**0.033400**
network	0.036700
Total network component	**0.036700**
Support for RES and CHP combined	0.000000
promotion of production from domestic coal	0.004400
market operator	0.000300
RES promotion	0.014300
Support for combined heat and power (CHP)	0.002800
national nuclear fund	0.003200
ancillary services tariff	0.007700
VAT	0.000000
excise tax	0.001300
Total taxes & levies component	**0.034000**
Total price	**0.104100**

Band D2	EUR/kWh

	2015
Energy and supply	0.028497
Total energy component	**0.028497**
network	0.012832
Total network component	**0.012832**
VAT	0.008269
Total taxes & levies component	**0.008269**
Total price	**0.049599**

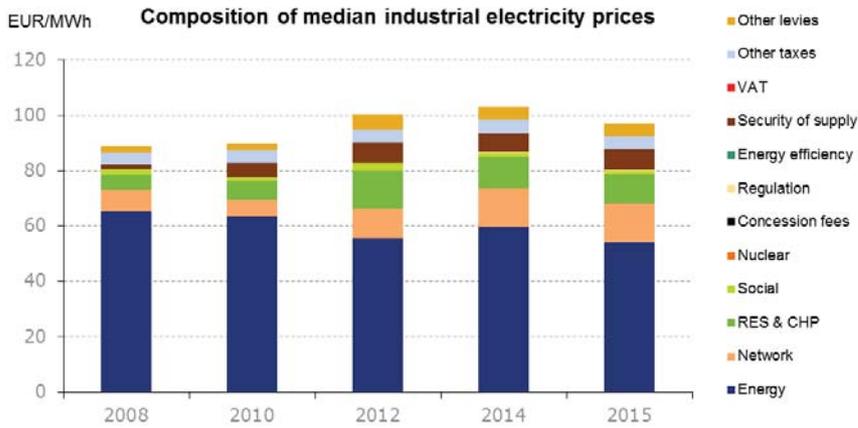| **Band I3**	**EUR/kWh 2015**
Energy and supply	0.025817
Total energy component	**0.025817**
network	0.007628
Total network component	**0.007628**
VAT	0.000000
excise tax	0.001296
Total taxes & levies component	**0.001296**
Total price	**0.034741**

Spain

Evolution of electricity and natural gas prices
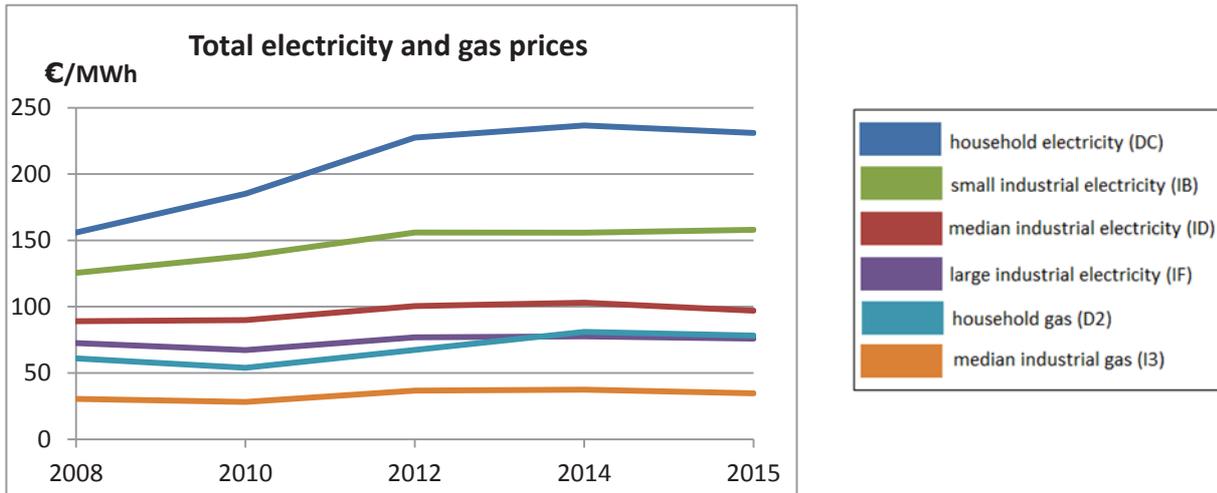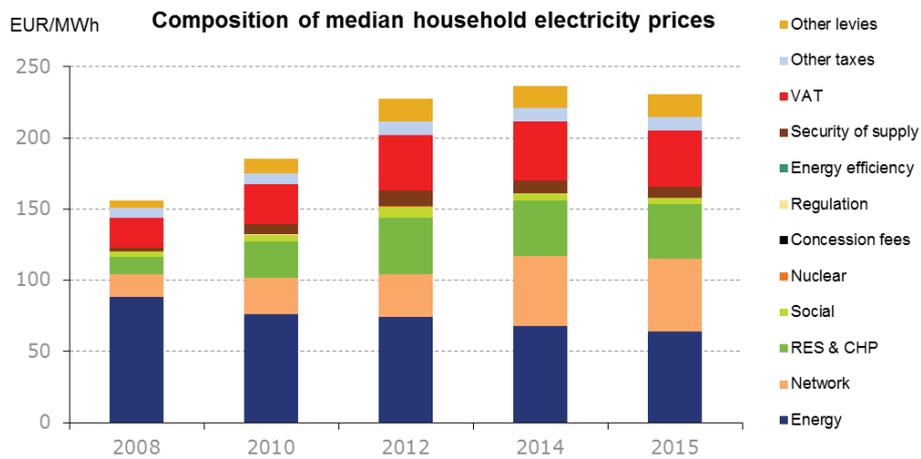
Total electricity and gas prices

Legend:
- household electricity (DC)
- small industrial electricity (IB)
- median industrial electricity (ID)
- large industrial electricity (IF)
- household gas (D2)
- median industrial gas (I3)

Composition of electricity prices

Composition of median household electricity prices

Legend:
- Other levies
- Other taxes
- VAT
- Security of supply
- Energy efficiency
- Regulation
- Concession fees
- Nuclear
- Social
- RES & CHP
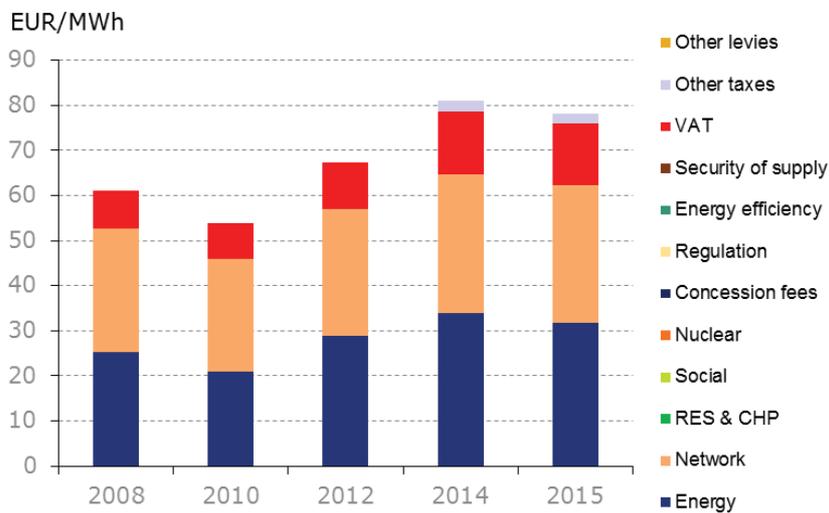- Network
- Energy

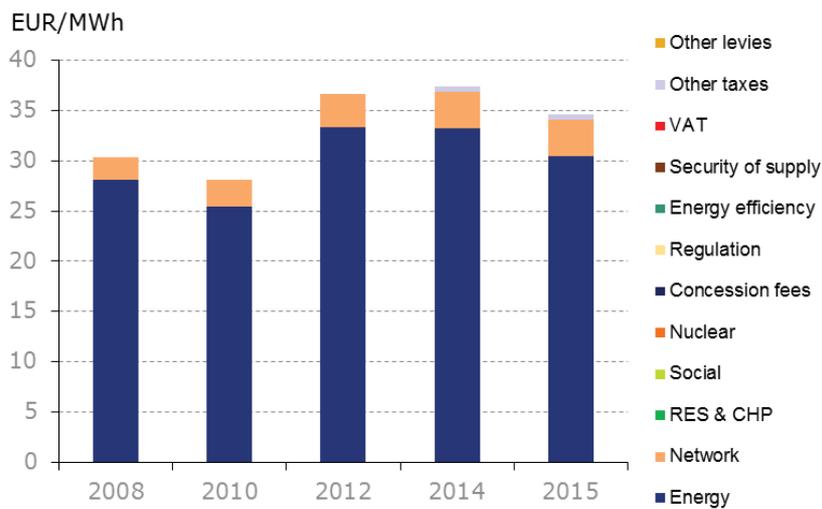Composition of median industrial electricity prices (EUR/MWh)

Composition of gas prices

Composition of median household gas prices (EUR/MWh)

Composition of median industrial gas prices (EUR/MWh)

Oil products prices

Gasoline

Diesel

Heating oil

- VAT
- Excise duty and other indirect taxes
- Net price
- EU average price

Energy in Households budgets

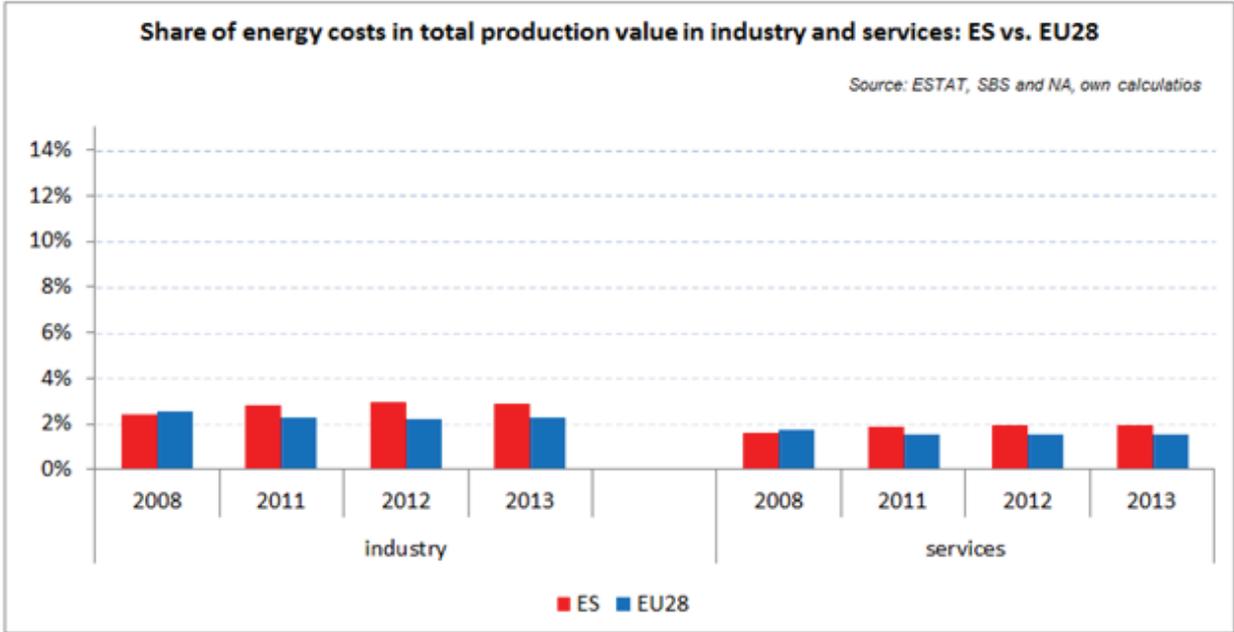### Share of energy products in household expenditure in different quintiles
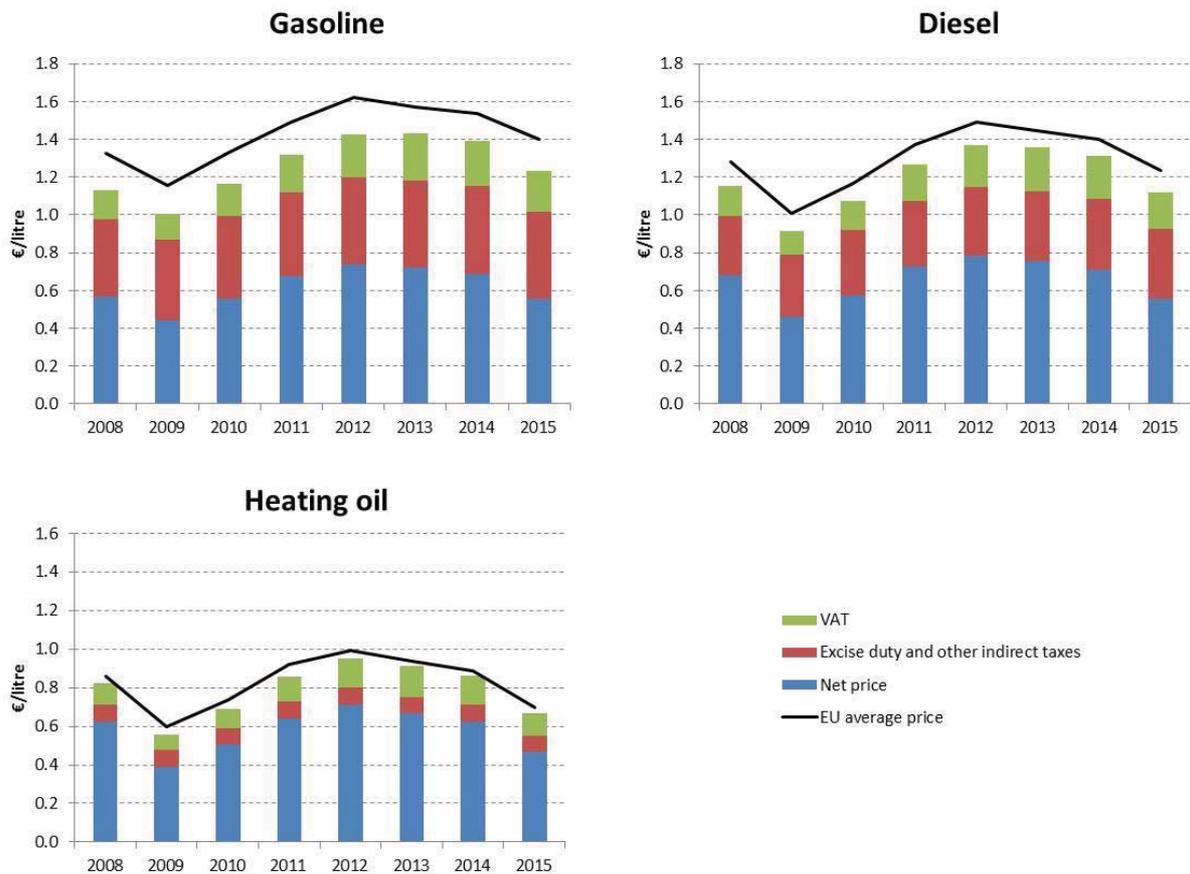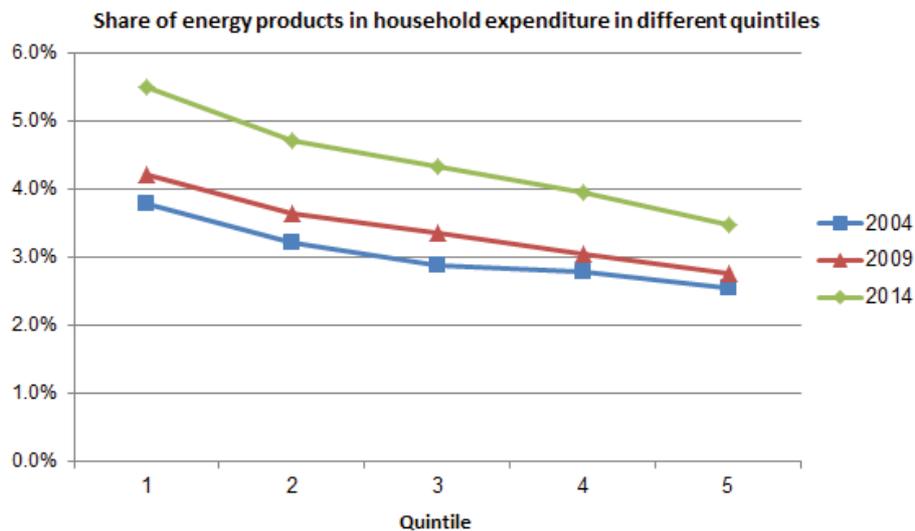
- 2004
- 2009
- 2014

Between 2004 (blue line) and 2014 (green line) the share of energy in total household expenditure rose by 1-1.7% in all income quintiles in Spain. In the case of the poorest households (Quintile 1) it went up from 3.8% to 5.5%, whereas for households with middle income (Quintile 3) it rose from 2.9% to 4.3%.

496

Energy costs shares in total production costs

Share of energy costs in total production value in industry and services: ES vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Electricity Households (DC)	EUR/kWh
Energy and supply	0.064200
Day-ahead market	
Ancillary services	
Total energy component	**0.064200**
Distribution	0.037900
Transmission	0.012900
Total network component	**0.050800**
Nuclear sector	0.000200
Special tax on electricity consumption	0.009300
Deficit annuity	0.016200
Capacity payments	0.005400
Specific compensation for renewable energy	0.038700
VAT	0.040100
Financing for the NRA	0.000100
Island compensation	0.003900
Financing of system and market operators	0.000100
Energy security and generation adequacy	0.002000
Other costs	
Total taxes & levies component	**0.116000**
Total price	**0.231000**

Electricity Industry (ID)	EUR/kWh
	2015
Energy and supply	0.054100
Day-ahead market	
Ancillary services	
Total energy component	**0.054100**
Distribution	0.010500
Transmission	0.003600

Total network component	**0.014100**
Nuclear sector	0.000100
Special tax on electricity consumption	0.004700
Deficit annuity	0.004500
Capacity payments	0.005400
Specific compensation for renewable energy	0.010800
VAT	0.000000
Financing for the NRA	0.000100
Island compensation	0.001100
Financing of system and market operators	0.000100
Energy security and generation adequacy	0.002000
Other costs	
Total taxes & levies component	**0.028800**
Total price	**0.097000**

Natural Gas Households (D2)	**EUR/kWh**
Energy and supply	0.031772
Total energy component	**0.031772**
Conduction	0.030115
Capacity reserve	0.000420
Total network component	**0.030535**
VAT	0.013576
Hydrocarbons tax	0.002340
Total taxes & levies component	**0.015916**
Total price	**0.078223**

Natural gas Industry (I3)	**EUR/kWh**
	2015
Energy and supply	0.030487

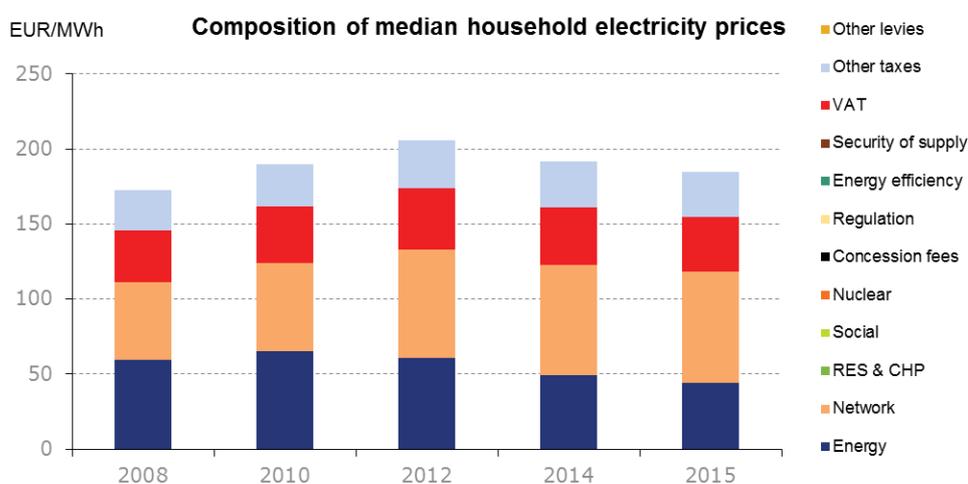|	
Total energy component	**0.030487**
Conduction	0.003169
Capacity reserve	0.000420
Total network component	**0.003589**
VAT	0.000000
Hydrocarbons tax	0.000540
Total taxes & levies component	**0.000540**
Total price	**0.034616**

Sweden

Evolution of electricity and natural gas prices
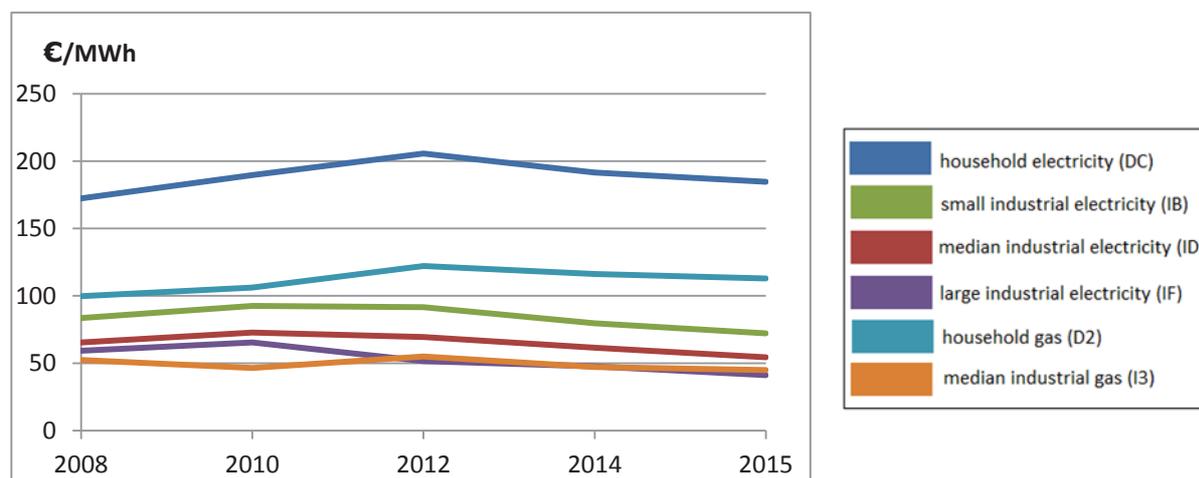

Composition of electricity prices[2]

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[2] It is to be noted that Sweden applies a Nuclear Capacity tax. This tax is not allocated to the nuclear sub-component of the taxes & levies main component, as the sub- component contains only costs elements that support the nuclear sector.
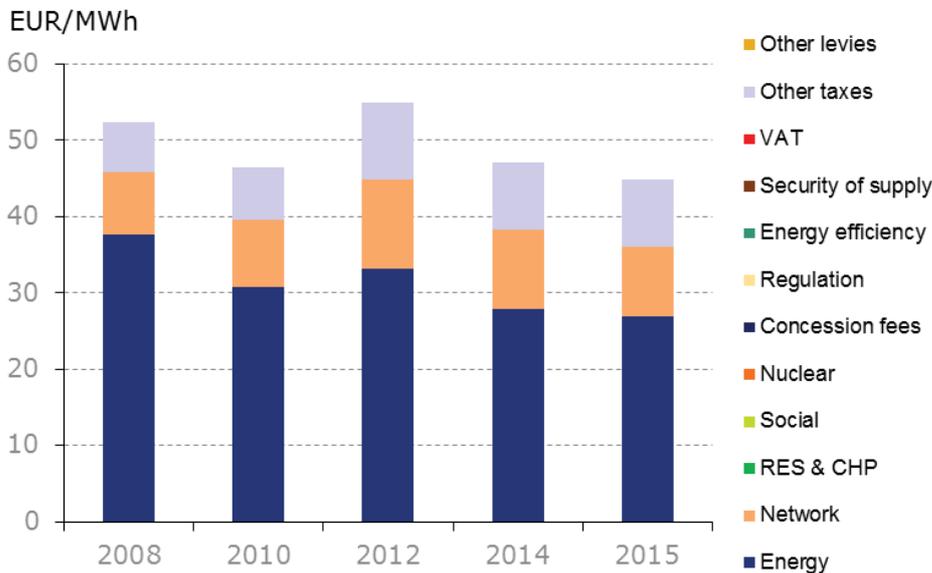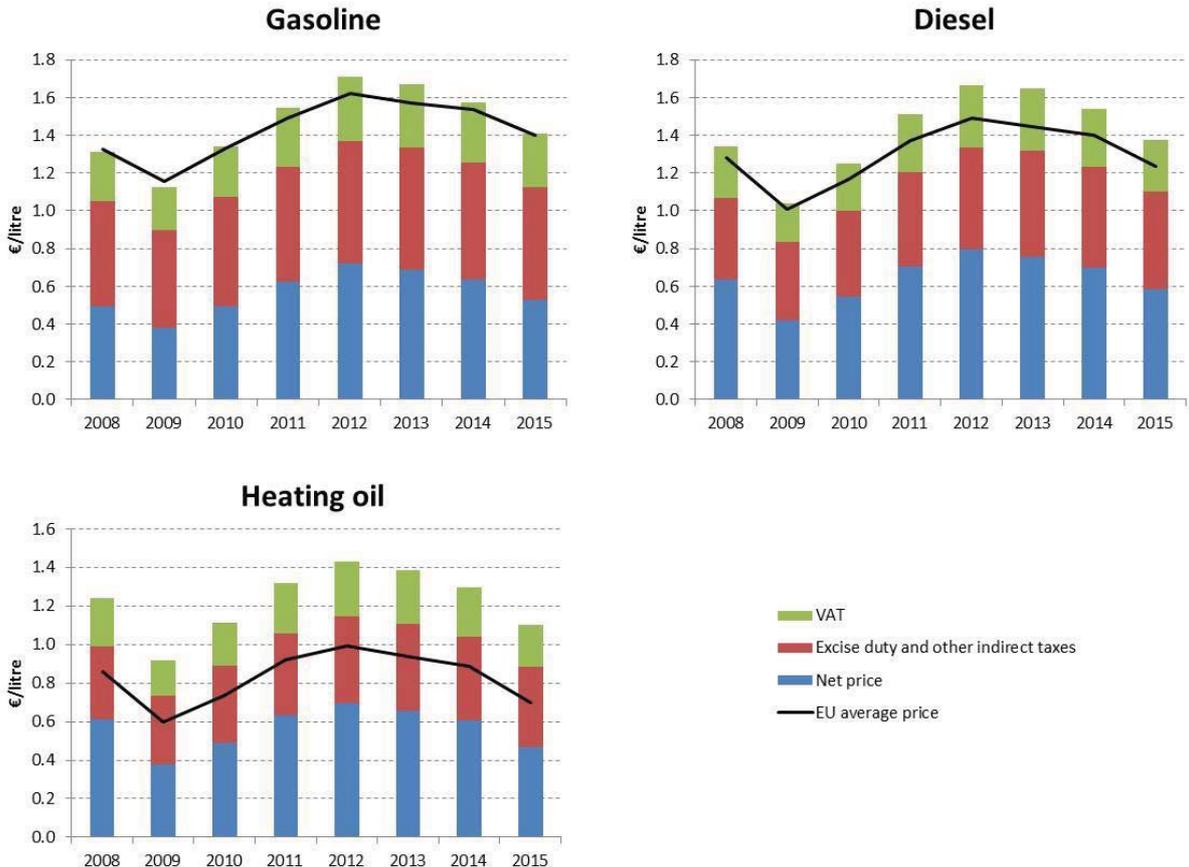
Composition of median industrial electricity prices
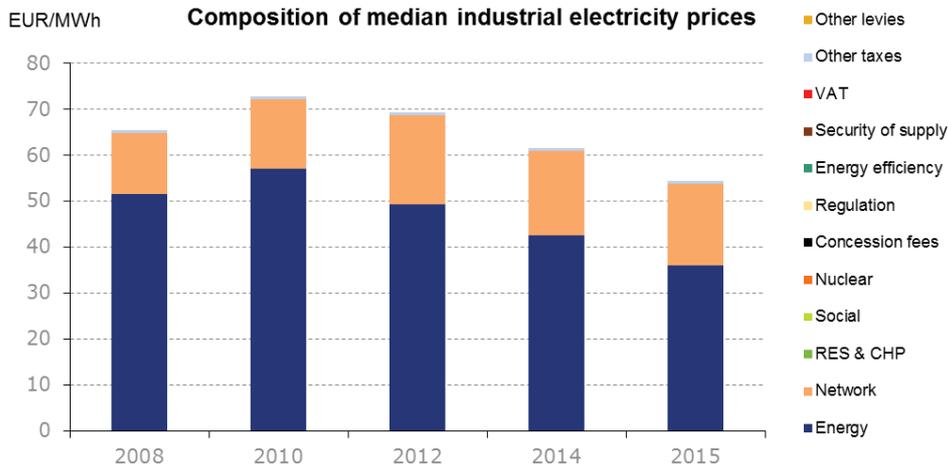
Composition of gas prices

Composition of median household gas prices
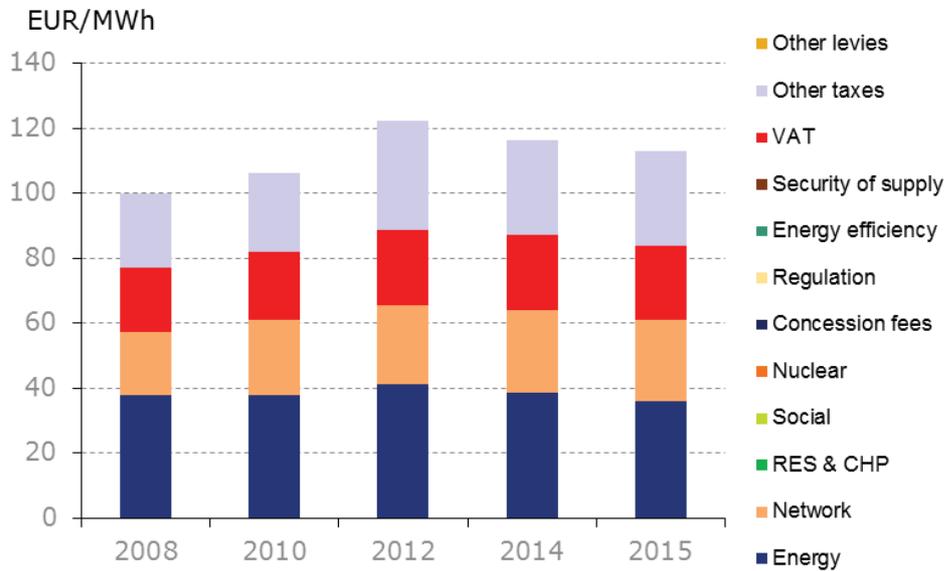
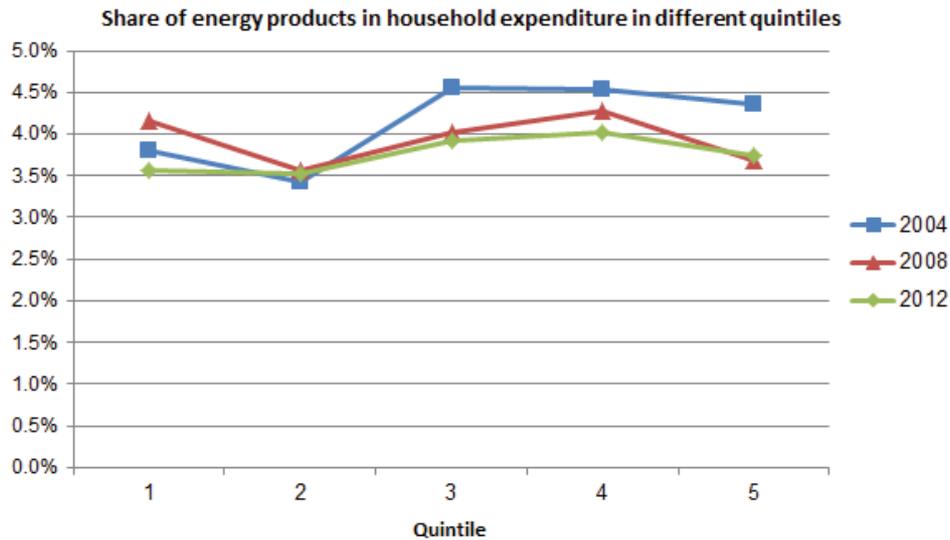
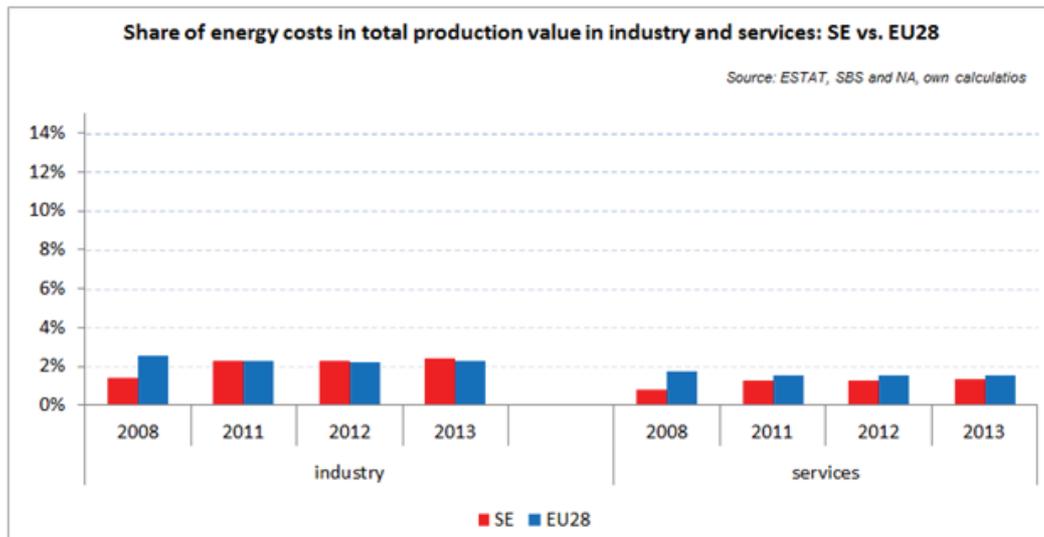Composition of median industrial gas prices

Oil products prices

Energy in Households budgets

Share of energy products in household expenditure in different quintiles

In Sweden the share of energy in total household expenditure has been low in EU comparison, and between 2004 (blue line) and 2012 (green line), unlike many EU countries, it decreased slightly in most of the income quintiles. In the case of the poorest households (Quintile 1) the energy share slightly went down from 3.8% to 3.6%, while for households with middle income (Quintile 3) it decreased from 4.6% to 3.9%.

Energy costs shares in total production costs

Share of energy costs in total production value in industry and services: SE vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Breakdown of electricity and natural gas prices by price element

Band DC	EUR/kWh 2015
Energy	0.044006
Total energy component	**0.044006**
Network	0.074020
Total network component	**0.074020**
energy taxes	0.029693
VAT	0.036956
Total taxes & levies component	**0.066650**
Total price	**0.184676**

Band IB	EUR/kWh 2015
Energy	0.036850
Total energy component	**0.036850**
Network	0.034713
Total network component	**0.034713**
energy taxes	0.000534
VAT	0.000000
Total taxes & levies component	**0.000534**
Total price	**0.072097**

Band D2	EUR/kWh 2015
Energy	0.035888
Total energy component	**0.035888**
Network	0.025100
Total network component	**0.025100**
Energy taxes	0.008224
VAT	0.022644
Carbon Tax	0.021042
Total taxes & levies component	**0.051910**
Total price	**0.112899**

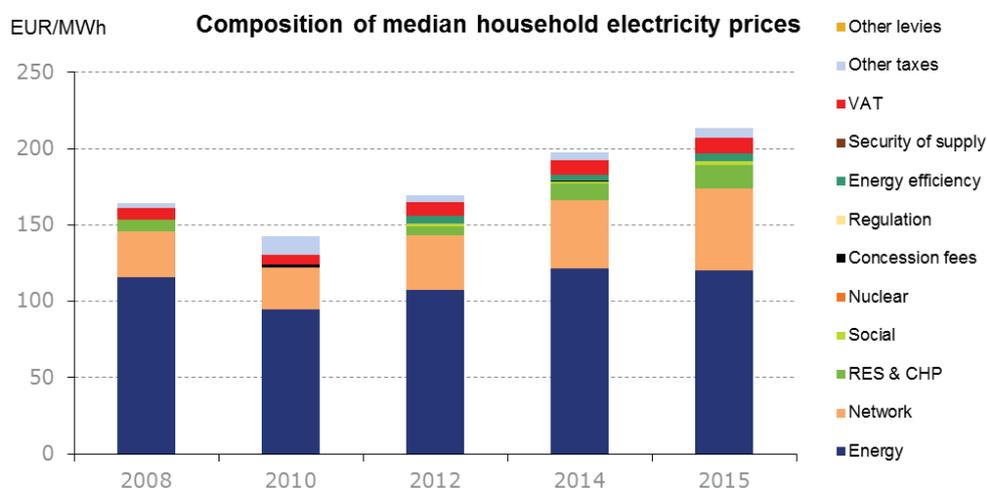| Band I3	EUR/kWh 2015
Energy	0.026916
Total energy component	**0.026916**
Network	0.009186
Total network component	**0.009186**
Energy taxes	0.002457
VAT	0.000000
Carbon Tax	0.006302
Total taxes & levies component	**0.008758**
Total price	**0.044860**

United Kingdom

**Evolution of electricity and natural gas prices**
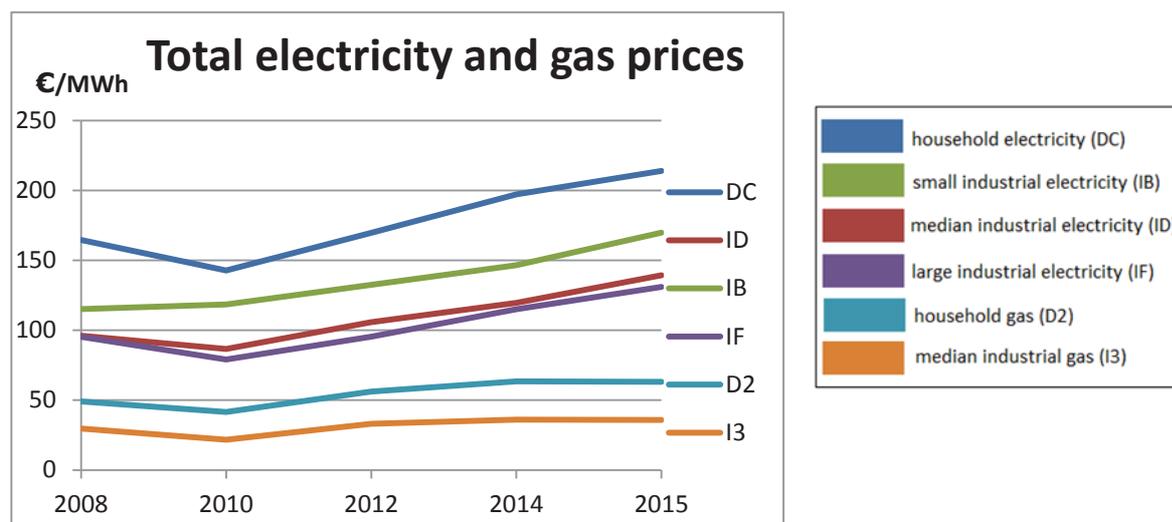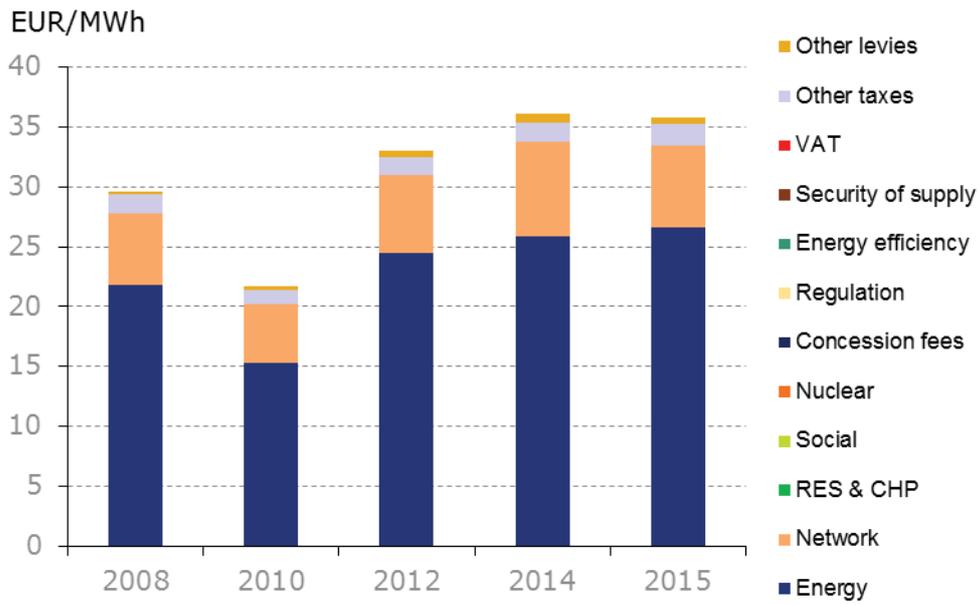

Composition of electricity prices[3]

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[3] The United Kingdom's Warm Home Discount is a redistributive levy. All households pay towards this levy via their gas and electricity bills. All the money collected is recycled back as £140 annual rebates on the electricity bills of eligible low-income and vulnerable households. As such, the net effect of the policy on average dual fuel (gas and electricity) bills is £0. In the current study, only the gross cost is reflected as the rebate only applies to a subset of households. Furthermore, United Kingdom distinguishes EU ETS and Carbon Price Support as taxes on the power generation sector which impact on the wholesale price, from other direct top- up taxes and levies.
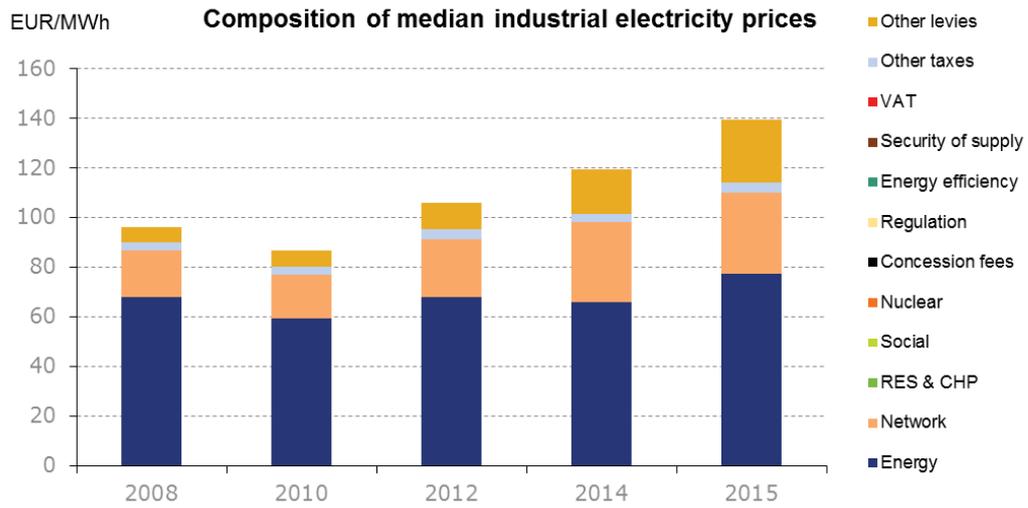
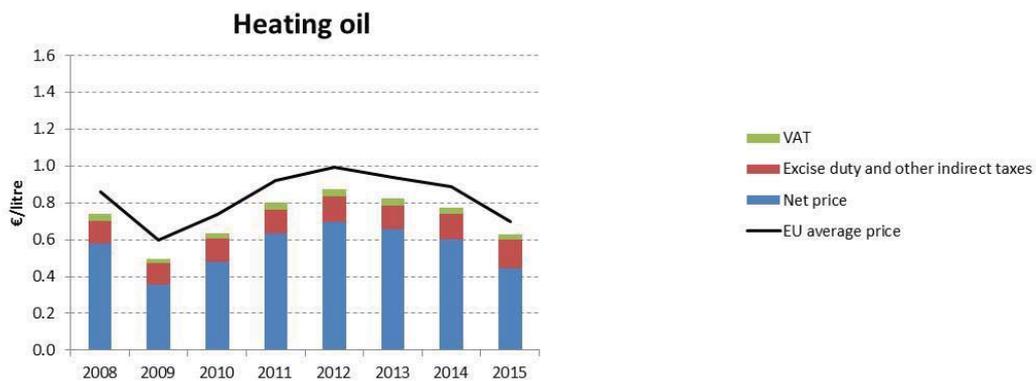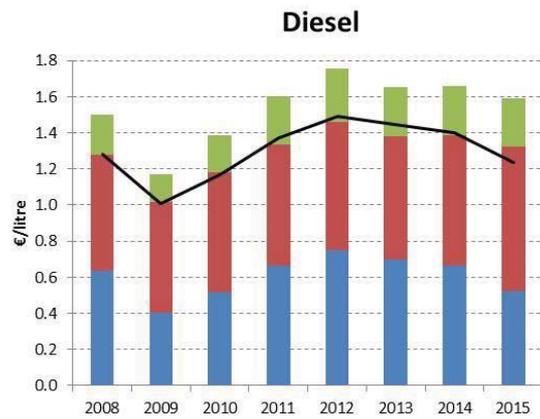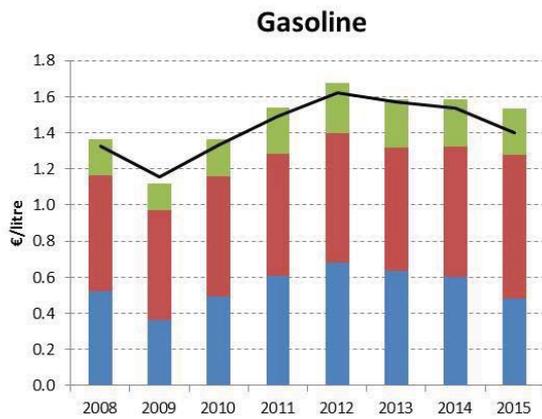Composition of median industrial electricity prices
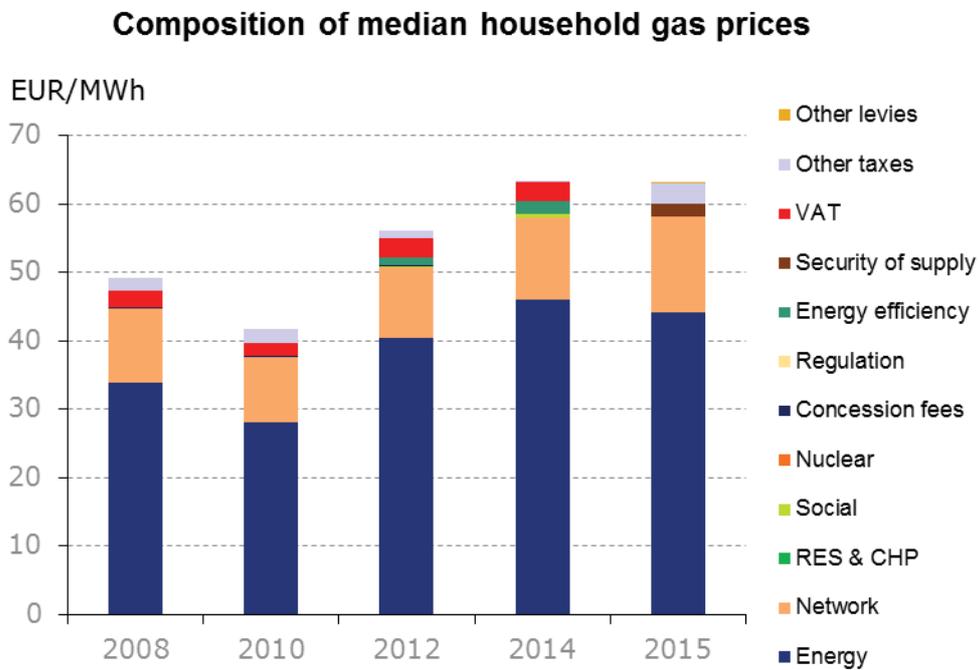
Composition of gas prices

Composition of median household gas prices

Composition of median industrial gas prices

Oil products prices

Gasoline

Diesel

Heating oil

Energy in Households budgets

Share of energy products in household expenditure in different quintiles
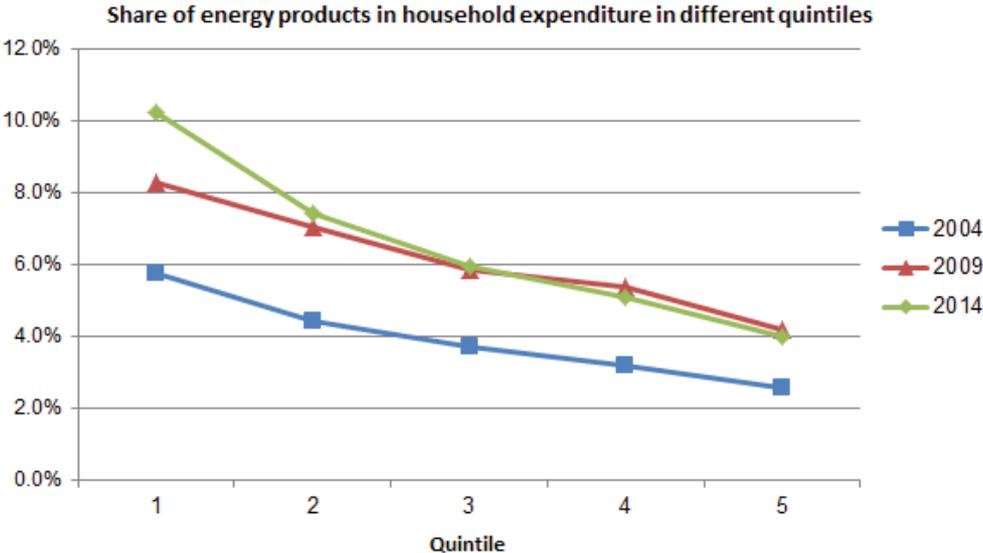
In the United Kingdom the share of energy in total household expenditure rose from 5.8% to 10.2% between 2004 (blue line) and 2014 (green line) in the case of the poorest households (Quintile 1). In the case of households with middle (Quintile 3) the energy share went up from 3.7% to 5.9%.

Energy costs shares in total production costs
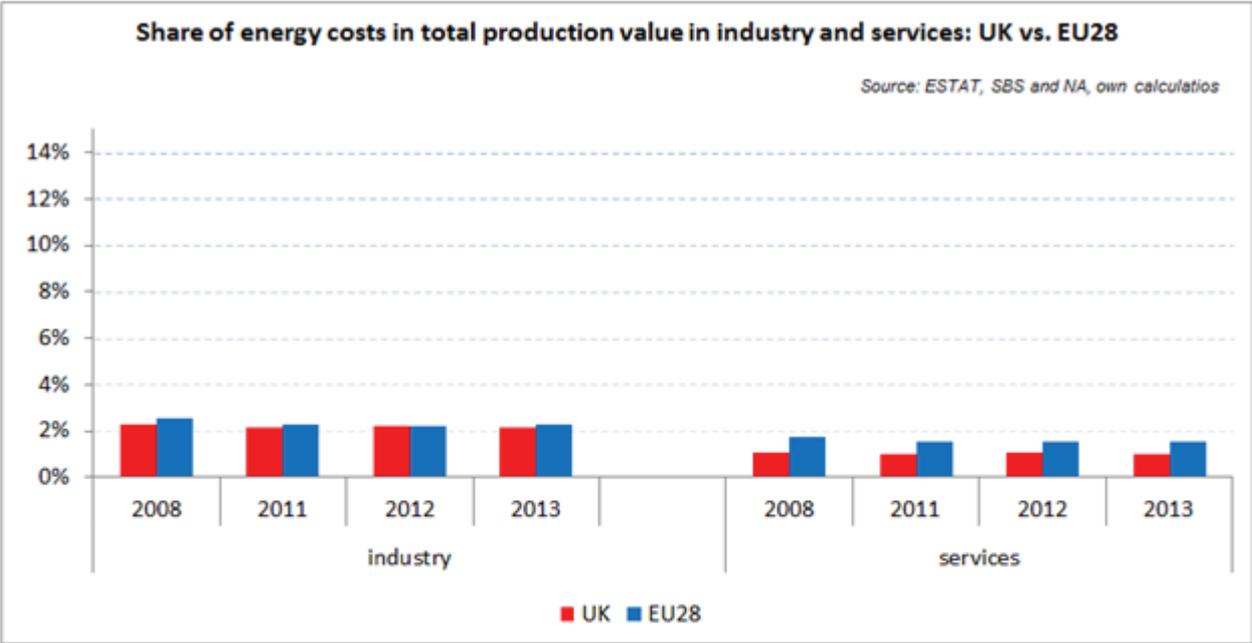
Share of energy costs in total production value in industry and services: UK vs. EU28

Source: ESTAT, SBS and NA, own calculatios

Notes
Data for Malta, Poland, Slovenia (prior to 2012) and Ireland (after 2012) is not available
Data for 2009 and 2010 is incomplete and not reported
Industry defined as NACE Rev.2 Section C (Manufacturing)
Services defined as NACE Rev. 2 Sections G - U

Electricity and gas prices – Breakdown by price element

Band DC	EUR/kWh 2015
Energy and supply	0.11990
Total energy component	**0.11990**
Network	0.05375
Total network component	**0.05375**
VAT	0.01020
Renewables Obligation (RO)	0.01268
Other	
Climate Change Levy (CCL)	
Carbon Price Support	0.00397
Smart Metering	0.00044
EU ETS	0.00234
CERT/ECO	0.00524
Warm Homes Discount support	0.00221
CESP	0.00000
FiTs	0.00317
Total taxes & levies component	**0.04024**
Total price	**0.21389**

Band ID	EUR/kWh 2015
Energy and supply	0.07718
Total energy component	**0.07718**
Network	0.03308
Total network component	**0.03308**
VAT	0.00000
Renewables Obligation (RO)	
Other	0.02536
Climate Change Levy (CCL)	0.00372
Carbon price floor	
Smart Metering	
Indirect ETS cpst	
CERT/ECO	
Warm Homes Discount support	
CESP	
FiTs	

Total taxes & levies component	**0.02908**
	0.00000
Total price	**0.13933**

Band D2	EUR/kWh 2015
Energy and supply	0.04410
Total energy component	**0.04410**
Network	0.01406
Total network component	**0.01406**
VAT	0.00303
Carbon price floor	0.00012
Smart Metering	0.00001
Climate Change Levy (CCL)	
Other	
CERT/ECO	0.00179
Warm Homes Discount support	0.00000
Total taxes & levies component	**0.00496**
	0.00000
Total price	**0.06312**

Band I3	EUR/MWh 2015
Energy and supply	0.026598777
Total energy component	**0.026598777**
Network	0.006890875
Total network component	**0.006890875**
VAT	0
Carbon price floor	
Smart Metering	
Climate Change Levy (CCL)	0.001791627
Other	0.00055127
CERT/ECO	
Warm Homes Discount support	
Total taxes & levies component	**0.002342897**
Total price	**0.035832549**

Annex 4 – Literature review of econometric analysis

Drivers of energy prices:

Cludius, J., Hermann, H., Matthes, F. C., Graichen, V. (2014). The merit order effect of wind and photovoltaic electricity generation in Germany 2008–2016: Estimation and distributional implications. Energy Economics, 44, 302–313.

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Sam Forrest, Iain MacGill, Assessing the impact of wind generation on wholesale prices and generator dispatch in the Australian National Electricity Market, Energy Policy, Volume 59, August 2013, Pages 120-132, ISSN 0301-4215, http://dx.doi.org/10.1016/j.enpol.2013.02.026 .

C.K. Woo, J. Moore, B. Schneiderman, T. Ho, A. Olson, L. Alagappan, K. Chawla, N. Toyama, J. Zarnikau, Merit-order effects of renewable energy and price divergence in California's day-ahead and real-time electricity markets, Energy Policy, Volume 92, May 2016, Pages 299-312, ISSN 0301-4215, http://dx.doi.org/10.1016/j.enpol.2016.02.023 .

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Alfredo Viskovic*, Vladimir Franki, Vladimir Valenti , Effect of regulation on power-plant operation and investment in the South East Europe Market: An analysis of two cases, in Utilities Policy 30 (2014) 8e17, http://dx.doi.org/10.1016/j.jup.2014.06.001

Blanca Moreno, Ana J. López, María Teresa García-Álvarez, The electricity prices in the European Union. The role of renewable energies and regulatory electric market

reforms, Energy, Volume 48, Issue 1, December 2012, Pages 307-313, ISSN 0360-5442, http://dx.doi.org/10.1016/j.energy.2012.06.059 .

Chivu Luminita, Ciutacu Constantin, Ioan-Franc Valeriu, Mateescu Mihaela, Marina Bădileanu, 1st International Conference 'Economic Scientific Research - Theoretical, Empirical and Practical Approaches', ESPERA 2013The Romanian Energy System Structure and its Impact on the Electricity Spot Market, Procedia Economics and Finance, Volume 8, 2014, Pages 453-458, ISSN 2212-5671, http://dx.doi.org/10.1016/S2212-5671(14)00113-0 .

Carlo V. Fiorio, Massimo Florio, Electricity prices and public ownership: Evidence from the EU15 over thirty years, Energy Economics, Volume 39, September 2013, Pages 222-232, ISSN 0140-9883, http://dx.doi.org/10.1016/j.eneco.2013.05.005 .

Monika Slabá, Petr Gapko, Andrea Klimešová, Main drivers of natural gas prices in the Czech Republic after the market liberalisation, Energy Policy, Volume 52, January 2013, Pages 199-212, ISSN 0301-4215, http://dx.doi.org/10.1016/j.enpol.2012.08.046.

P. Hauser, M. Schmidt and D. Möst, "Gas markets in flux: Analysis of components and influences for natural gas pricing in Europe," *2016 13th International Conference on the European Energy Market (EEM)*, Porto, 2016, pp. 1-8.
doi: 10.1109/EEM.2016.7521359

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Methods

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