EUROPEAN
COMMISSION

Brussels, 14.10.2020
SWD(2020) 951 final

PART 1/6

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(2020) 951 final}

Contents

List of Figures

List of Tables

Introduction

This edition of the energy prices and costs report comes at an appropriate time alongside with the State of the Energy Report (SoEUR). The profound changes entailed by the energy transition require ample social and political support. Energy prices and energy costs (prices multiplied by consumption) should drive the markets' transformation to achieve a carbon neutral economy while keeping energy affordable for citizens and businesses. In these difficult moments created by the COVID crisis, it is essential to ensure a fair energy transition that complements our efforts for recovery, provides a level playing field for our industry and keeps energy affordable for households. A successful energy transition towards the climate neutrality by 2050 as foreseen by the European Green Deal will require affordable energy while at the same time triggering investments in technologies needed for further decarbonisation. With the Clean energy for all Europeans package now under implementation and several Green Deal initiatives related to energy, taxation and climate policies being prepared, monitoring energy prices and costs helps to understand better the effects of our existing policies and provide useful insights for the preparation of the forthcoming proposals.

The evidence provided by the energy prices and costs report will serve to assess the implementation of our recent actions and initiatives..

The work and analyses presented in the report were impacted by important political, economic and societal events in recent years.

First, following the confirmation of exit of the United Kingdom from the EU, this report focuses now on the EU-27. Although, in various occasions statistics of UK are provided, the focus of the analysis and comprehensive approach is systematically applied to current 27 Member States. This significantly affects the direct comparability of the results of this report with previous ones[1].

Second, as for many aspects of our societies and lives, the COVID pandemic has required changes in the approach of this report which usually focused on analyses of 'historical' trends in data. While the available historical data covers until 2018 and in some cases 2019, given the COVID pandemic severe impact on energy prices and costs, where possible, the latest figures were included in the report to provide the most recent picture. That said, the COVID pandemic has also affected the quality and comprehensiveness of some of the collected data. Not all Member States were able to fully respond to our call to supply updates on household energy expenditure and less industrial sectors than foreseen participated in the specific collection of data at plant level which provides precious insights on the energy prices paid and the importance of energy costs for the most energy intensive industrial segments. Compared to the two previous editions of this report in 2016 and 2018[1], the COVID pandemic has in some cases limited the reporting ability in particular by the industry and this is reflected in somewhat reduced international comparisons and comprehensiveness of the assessment of energy prices and costs' importance for some highly energy intensive sectors.

Part I of the report (Energy Prices, comprising Chapters 1-3) looks at the developments on wholesale and retail energy prices for electricity, gas and oil products between 2008 and 2019-20. On retail prices, the European Commission analyses the cost elements driving them up (or down). It presents the currently most extensive available breakdown of components affecting prices, in particular for taxes and levies, merging the very detailed *ad hoc* data

[1] COM(2016) 769, COM(2019) 1

collections done in the context of the preparation of past reports with the recently available new electricity and gas price statistics collected by Eurostat[2]. Insights on the evolution, composition and drivers of retail prices together with international comparisons of the prices for petroleum, gas and electricity products are also provided in this Part of the report.

The impact of the energy costs on the economy, the industry and households, is addressed in in **Part II** (Energy costs, Chapters 4-6) of the report. Chapter 4 analyses the latest developments of EU's energy import bill and the reasons behind them. Chapter 5 looks at the evolution of households' energy expenditure, what drives it and to which extent it is affecting households' budgets across income levels and energy poverty. Chapter 6 focuses on the evolution and impact of energy expenditure (energy costs) on the European industry. An assessment of the costs is made for manufacturing, agriculture and services sectors (more than 40 sectors are analysed) putting emphasis on the most energy intensive industries. There is an assessment of sectors' energy costs shares, energy intensities and energy prices and, where possible under the limited available data, comparisons with international EU-trade partners. The analysis in this chapter benefits from the results of aggregated statistical data and the results of studies that collected data at plant level.

Part III (Chapter 7) looks at the taxes imposed on energy products and assesses their importance for government's budgets and their impact on the prices of these products.

In **Part IV** of the report (Chapter 8), the collected 'realised' prices of different generation technologies in the power market are analysed together with other sources of revenues and costs in order to map the profitability of these technologies. A sensitivity analysis of the profitability is also undertaken considering certain scenarios which include future evolution of key inputs (oil prices, carbon price) and other conditions.

Finally, the **Annex** of this report presents factsheets of the Member States with detailed information about their energy prices and costs.

[2] REGULATION (EU) 2016/1952

PART I

ENERGY PRICES

1 Electricity prices

1.1 Wholesale electricity prices

Main findings

- Over the last twelve years, wholesale electricity prices in Europe have generally moved in cycles, following developments in coal and gas markets. The current cycle began in 2016, when electricity prices bottomed out, and reached its peak at the end of 2018, when the European Power Benchmark (EPB) climbed above 60 €/MWh on a monthly basis. Since then, wholesale electricity prices have been on a declining trajectory on the back of falling fuel costs, weakening demand and rising renewable penetration. All these trends were magnified since the imposition of social distancing measures induced by the coronavirus pandemic. Electricity prices in many markets reached all-time lows during the lockdown period in the spring of 2020.
- Price convergence across European wholesale markets also displays a cyclical nature. Whereas electricity prices on the continent were getting closer to each other in the period between 2015 and 2018, the opposite has been true ever since. The coronavirus pandemic has exacerbated the trend and drove differences in prices among and within regions to record levels. This was caused by the fact that electricity prices have been falling to a different degree, depending on the severity of the demand shock, weather conditions and the structure of the local power mix. Overall price convergence has remained low, which underlines the potential and opportunities for further investment in strengthening network capacities both among and within Member States.
- The coronavirus pandemic has pushed spot electricity prices to record lows, but has had only a passing effect on long-term electricity prices. Since a significant part of electricity for final consumption is bought by traders year-ahead or even longer before the delivery, there is uncertainty whether the trend of falling retail prices observed in 2020 can be sustained in 2021.
- In 2019, as widespread coal-to-gas switching progressed on the continent, wholesale power prices began to be influenced more by the developments in the gas market. Rising correlation between gas and electricity prices has been observed in markets where fuel switching has been particularly strong, such as the Netherlands, Germany, Greece, Portugal and Spain. This trend continued in 2020 and is expected to strengthen in the years ahead as coal capacities across Europe are retired in an accelerated fashion.
- CO2 prices were rising steadily since 2018, culminating in the middle of 2019 at 30 €/t, the highest level since 2008. Unlike during the last major economic crisis in 2008-2009, the carbon market showed resilience in the face of the coronavirus pandemic. The effect of more expensive emission allowances on wholesale power prices has so far been blunted by declining fuel prices, weakening power demand and rising renewable generation. However, in regions with greater reliance on fossil fuels, pricier carbon exerted much stronger upward pressure on electricity prices.
- Falling costs of renewable technologies and higher carbon prices have triggered a wave of investment in renewable capacities capable of competing with other participants in wholesale markets without any public support. This should be beneficial for consumers as it reduces budgetary needs sourced from renewable taxes imposed on electricity consumption.

1.1.1 Evolution of wholesale electricity prices

Since 2008, day-ahead electricity prices in European wholesale markets have developed in cycles, influenced by costs of input fuels (coal and gas) and carbon allowances and by the changing structure of the power mix. The first cycle of the examined period started in the aftermath of the financial crisis in 2008-2009 when energy prices collapsed. The recovery lasted until 2011 and was followed by a prolonged downward path, stretching out to early 2016 when prices sank to levels not seen in more than a decade. A turnaround ensued quickly, however, driven by growing consumption and rising fuel and carbon prices, the effect of which was occasionally reinforced by supply restrictions during high-demand winter periods. This trend culminated in late 2018 on the back of peaking coal and gas prices. At the beginning of 2019, wholesale electricity prices fell abruptly and started to follow a downward trajectory again. This time, slowing economic activity, which curbed consumption, combined with falling fuel costs and rising renewable penetration to drive wholesale prices down. The coronavirus pandemic accentuated all these factors. Widespread lockdown measures imposed since March 2020 drastically reduced power demand, sent coal and gas prices to extreme lows and significantly raised the presence of renewables in the power mix. As a result, average European wholesale prices on the spot market reached an all-time low in April 2020 and began to recover only slowly in the following months.

The next chart **(Figure 1)** shows the evolution of the European Power Benchmark (EPB) and the range of minimum and maximum monthly wholesale electricity prices since 2008. The EPB is a weighted average of day-ahead prices in nine representative markets, serving as a general European benchmark. After averaging 43 €/MWh in 2017, the EPB rose to 52 €/MWh in 2018 and climbed back to 43 €/MWh in 2019. In the first half of 2020, it reached 24 €/MWh, its lowest level on record.

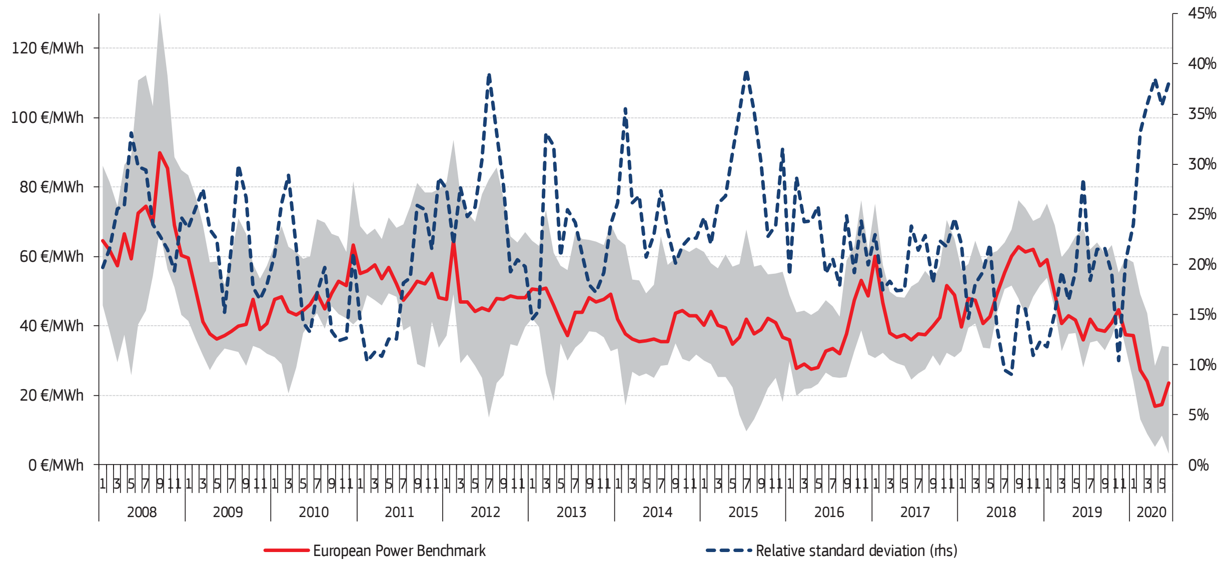


Figure 1 - Evolution of monthly average wholesale day-ahead baseload electricity prices in Europe, showing the European Power Benchmark and the range of minimum and maximum prices across the markets

Source: Platts, European power exchanges

Price convergence across European markets also displays a cyclical nature. Whereas wholesale prices on the continent were getting closer to each other in the period between 2015 and 2018, the opposite has been true ever since. The coronavirus pandemic has exacerbated the trend and drove differences in prices among and within regions to record levels. This was caused by the fact that prices were falling to a different degree, depending on the severity of the demand shock, general weather conditions and the structure of the local power mix. The sharpest declines occurred in the Nordic region where ample hydro reservoirs and rising wind generation reduced daily averages to single digits. Markets in Eastern and South Eastern Europe, on the other hand, experienced a more measured reaction as their lignite-oriented power mixes grappled with resilient carbon prices. As a general observation, it can be noted that rising wholesale prices tend to bring about greater convergence and vice versa.

Figure 2 illustrates in greater detail the degree of price convergence in day-ahead markets within selected European regions expressed in percentages of hours in a given year. The price convergence provides an indication of the level of market integration. Its longer-term drivers are market coupling initiatives or the expansion of transmission infrastructure. In the short term, fluctuations in convergence may also be caused by factors not necessarily related to the level of market integration, such as changes in the amount of cross-zonal capacity designated by grid operators for commercial purposes.

European electricity markets saw mixed developments in terms of convergence between 2018 and 2019. In Central Western Europe, where flow based market coupling has been applied since 2015, the number of occurrences of full price convergence (when the difference between hourly prices in all bidding zones falls within 1 €/MWh) increased noticeably in 2019 compared to the previous year (from 36% to 46% of hours). The decreasing divergence occurred despite the splitting of the DE-LU-AT bidding zone, which came into effect in October 2018 and which increased the number zones in the region from four to five. This could be explained by the fact that full price convergence between the partitioned zones of DE-LU and AT turned out to be relatively high, at 72% of hours in 2019. A considerable increase in full price convergence occurred also within the Baltic region and between Croatia and Slovenia where hourly prices were nearly identical more than 90% of the time in 2019. Price convergence also rose on the British Isles, following the implementation of market coupling between Great Britain and the Irish Integrated Single Electricity Market in October 2018. A new 1 GW interconnector linking Great Britain and the continent since January 2019 contributed to the rise in price convergence between France and Great Britain. On the other hand, decreases in price convergence were observed in Central and Eastern Europe, the Nordic region and between Spain and France in 2019. Overall levels of price convergence in Europe remain relatively low, which underlines the potential for further investment in strengthening network capacities both among and within Member States.

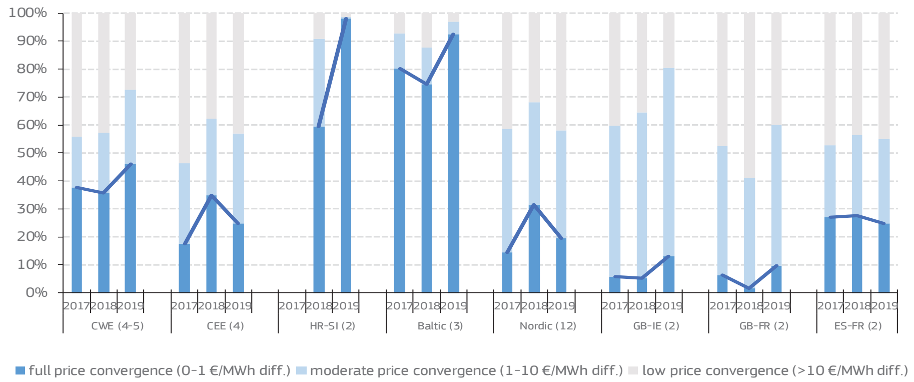


Figure 2 – Price convergence on day-ahead markets in selected regions as percentage of hours in a given year

Source: ENTSO-E, OTE, Nord Pool, Platts. The numbers in brackets refer to the number of bidding zones included. The CWE region comprises of BE, FR, NL and DE-LU-AT zones until October 2018, and separate DE-LU and AT zones since then. The CEE region includes CZ, SK, HU, RO bidding zones which are coupled.

The Baltic region includes EE, LV, LT bidding zones. The Nordic region includes 12 bidding zones of Norway, Sweden, Finland and Denmark.

In order to obtain a comprehensive picture of how European wholesale electricity prices have developed since 2017, a consumption-weighted baseload benchmark (EP5) of 5 most advanced markets offering up to a 3-year visibility into the future was created and compared to a day-ahead (spot) equivalent. As shown in **Figure 3**, since the beginning of 2019, markets have been expecting power prices in the future to be higher than in the spot market, a situation which favours buying electricity closer to the time of delivery. The gap between the spot and year-ahead benchmarks has grown to almost 20 €/MWh during the coronavirus pandemic due to low demand, a high presence of renewables in the grid and abundance of cheap gas. The spot benchmark reached its all-time low in April.

The segment of prices for future delivery (forward prices), which are an important indicator for the future development of retail prices, experienced a remarkable shift. Until the end of 2019 the market expected wholesale prices to generally decline going into the future on the back of higher renewable penetration. But those expectations have reversed since then. The further one goes into the future, the higher the prices should climb, with the biggest jump apparent between year-ahead (2021) and two-year-ahead (2022) delivery periods. This is consistent with expectations of economic recovery in the years ahead.

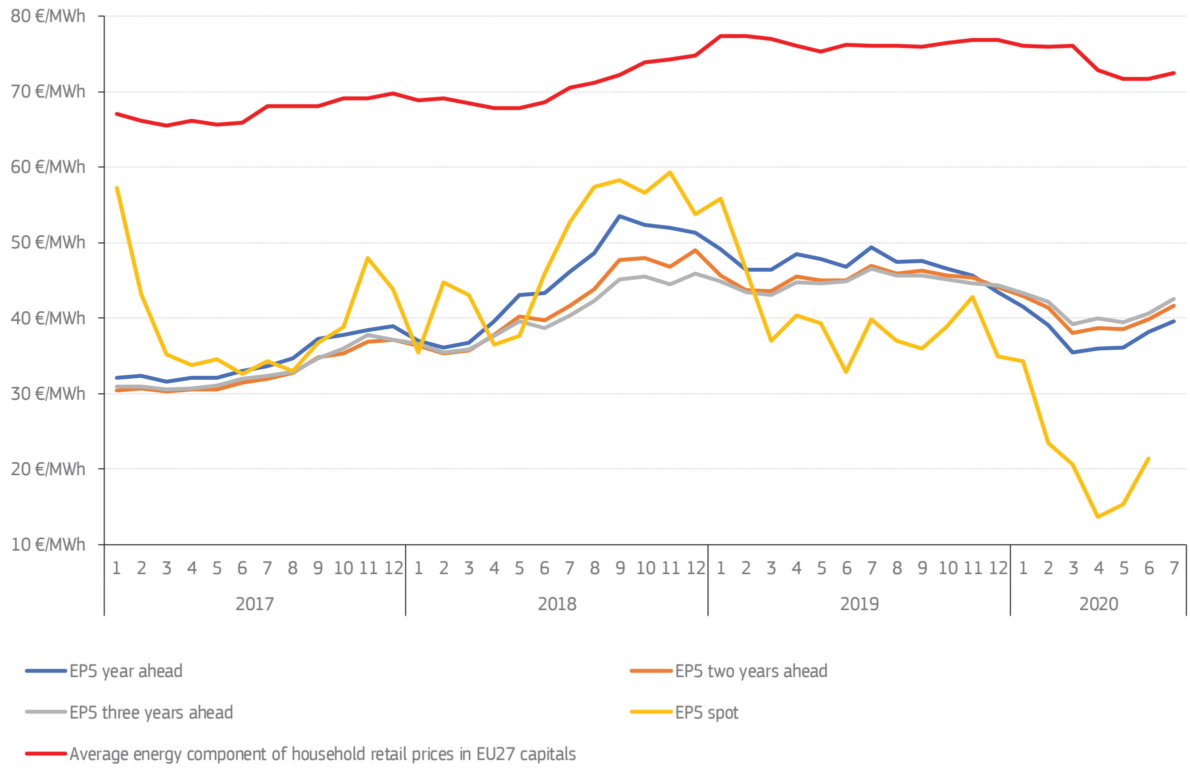


Figure 3 – Monthly evolution of spot and forward wholesale electricity prices and the energy component of retail prices in Europe since 2017

Source: Platts, Vaasaett. The average energy component of household retail prices is weighted using population figures of EU27 capitals.

In 2017 and in the first half of 2018, forward prices generally followed their spot peers and rose considerably on the back of rising carbon and fuel costs. Afterwards, a period of relative stability ensued which lasted until the end of 2019. Forward prices decreased measurably before and especially during the lockdown period in 2020, when the number of known unknowns surrounding the coronavirus grew exponentially. However, forward prices recovered nearly all their losses by the end of July 2020 on the back of quickly rising carbon prices which offset the effect of lower fuel costs (mainly gas) expected in the future. Thus, the pandemic has pushed spot electricity prices to record lows on the one hand, but has had only a passing effect on long-term prices on the other.

Figure 3 illustrates that the interplay between spot and forward prices is not always straightforward. Additionally, since a significant part of electricity for final consumption is bought on the forward market by traders year-ahead of the delivery or even longer, forward wholesale prices play a vital role in determining the energy component of retail prices for households and industry. That is why a decrease in wholesale prices is channelled into retail prices with some delay and usually in a non-linear fashion. The delayed transmission effect helps explain why retail prices rose between 2017 and 2019 despite the fall in spot wholesale prices observed since 2019. A significant part of electricity destined for consumption in 2019 was bought at elevated price levels in 2018.

Given the fact that forward electricity prices have been much less affected by the coronavirus crisis, there is uncertainty whether the trend of falling retail prices observed in 2020 can be sustained in 2021.

According to data from Vaasaett, the average energy component of household retail prices in EU27 capitals started to decline measurably in April 2020 and this trend continued in May and June. The decline could be explained by falling spot prices in the wake of the pandemic.

Figure 4 shows the regional wholesale electricity prices in the North Western Europe (NWE) market coupling area, including Central Western Europe (Germany, France, Austria and the Benelux), Great Britain, the Nordic markets (Norway, Sweden, Denmark, Finland and the Baltic States) and the Iberian market (Spain and Portugal). Nordic markets have generally kept the lowest wholesale prices in Europe thanks to the prominent role of hydro power and rising wind generation in the region. However, Central Western Europe (CWE) moved closer to Nordic levels since 2018 on the back of rapidly rising renewable penetration and a solid performance of local nuclear capacities. During periods of exceptionally high wind generation in springtime, CWE prices went even below their Nord Pool peers.

Prices in the Iberian region kept their usual premium over the EPB during most of 2018 and 2019, but moved closer to the benchmark in 2020 due to significantly expanded renewable capacities, improved hydro generation and the covid-related demand shock. The British market generally displayed the highest prices since 2018, partly due to a carbon levy that puts additional costs on the local generators.

A warm and windy winter of 2019/2020 and restrictions on economic and social activity imposed in response to the spreading coronavirus put wholesale prices in the observed markets on a steep downward path in 2020. The most significant declines occurred in the Nordic markets where ample hydro reservoirs exacerbated the supply overhang.

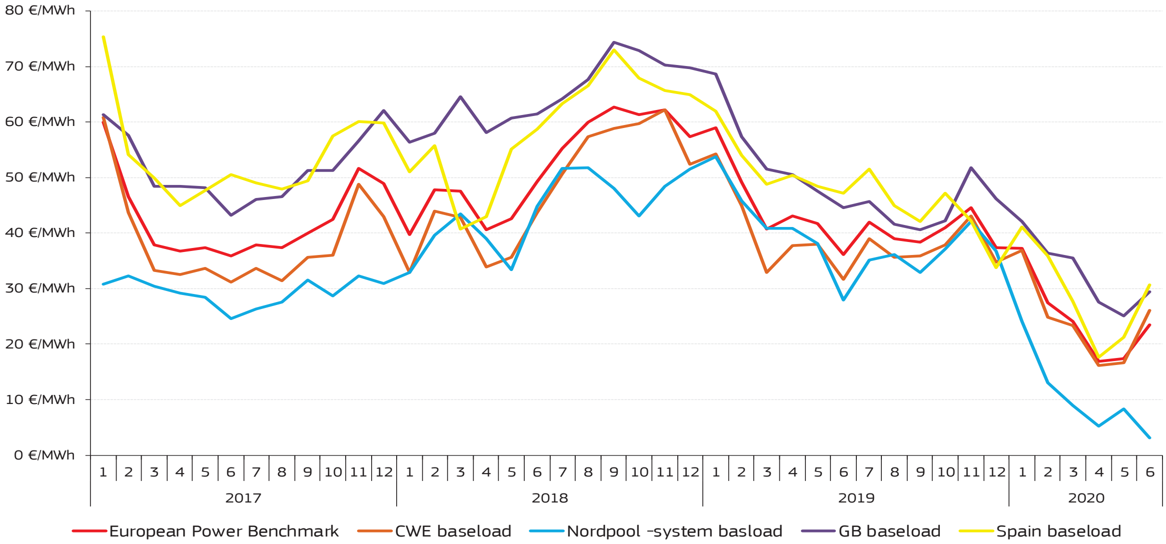


Figure 4 - Regional market prices in the North-Western Europe coupled area
Source: Platts, European power exchanges

In the Central and Eastern Europe region (CEE – Poland, Czechia, Slovakia, Hungary, Romania, Croatia and Slovenia), prices followed the EPB closely in 2018, but disconnected afterwards as higher carbon prices imposed additional costs on local coal and lignite generators which constitute a large portion of the power mix. The average premium over the EPB reached 10 €/MWh since March 2020 (see **Figure 5**). In the face of the decreased competitiveness of local power plants, the region also began to rely more on imports from Germany and Nordic markets.

Four CEE day-ahead markets (Czechia, Slovakia, Hungary and Romania) are coupled, but overall price convergence within the area remains lower compared to the CWE region (see **Figure 2**). The Polish market is coupled with Sweden (and thus with the NWE region). Croatia and Slovenia are not coupled with the rest of the CEE region.

Figure 5 - The Central Eastern Europe average wholesale price and the EPB benchmark
Source: Platts, European power exchanges

Italy and Greece traditionally display higher wholesale electricity prices compared to the EPB due to the heavy presence of fossil fuels in their power mix and due to a relatively high reliance on imports (**Figure 6**). Since 2019, Greek prices have been consistently the highest of the group as increased carbon costs have challenged the economic viability of the domestic lignite fleet. The market has experienced a broad coal-to-gas switch that partially mitigated the impact of more expensive emission allowances. Italy has traditionally been a net electricity importer, as the cost of import (mainly from the CWE region) is competitive to domestic, primarily gas-fired power generation. Increased renewable penetration and the particularly pronounced covid-related demand shock brought Italian wholesale prices unusually close to the European benchmark in 2020.

Bulgarian wholesale prices shifted from a discount compared to the EBP in 2018 to a sizeable premium in 2019, as headwinds stemming from higher carbon prices impacted the generation costs of local lignite capacities. Bulgaria is normally a net electricity exporter, but its net outflows have been diminishing lately.

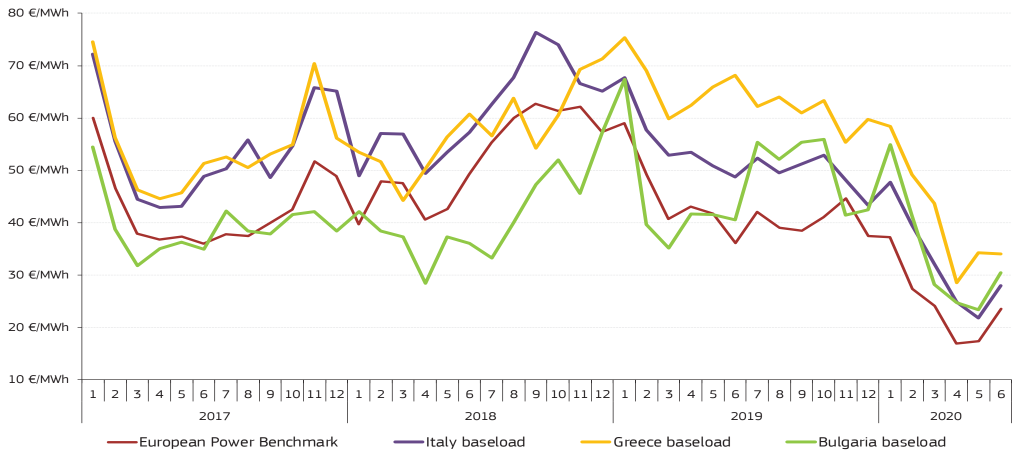


Figure 6 - Regional market prices in Italy and South Eastern Europe
Source: Platts, European power exchanges

1.1.2 Factors impacting the evolution of wholesale prices

Wholesale electricity prices are determined by market forces. In this section, we look at factors influencing both the demand and supply side.

On the demand side of the electricity market, residential consumption tends to be driven up by rising number of households, proliferation of electric appliances or the electrification of heating, while energy efficiency measures such as installing LED lightbulbs push electricity demand lower. Average temperatures play an important role too. In the case of businesses, the consumption of electricity is mainly influenced by two similarly countervailing factors: the level of economic activity and energy efficiency measures.

The next chart (**Figure 7**) assesses the relation between electricity consumption, economic activity and population trends. By the end of 2019, the gross domestic product in the EU27 was up by more than 14% and its population rose by 1.4% compared to 2010, yet electricity consumption decreased by 2% in the meantime. The decoupling of economic and population growth from electricity consumption points to the strengthening effect of efficiency measures over the last decade. In the last few years, the trend of exceptionally warm winters also contributed to the stagnation of electricity consumption, which is to some extent influenced by temperature conditions, especially in certain Member States.[3]

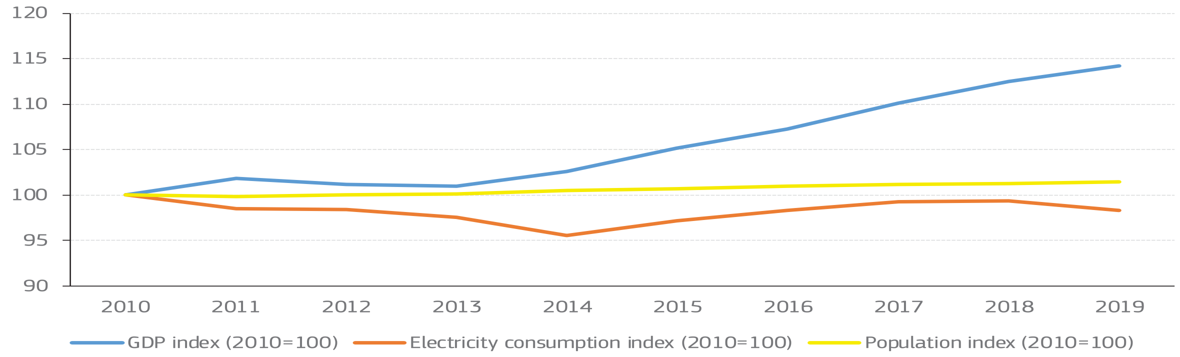


Figure 7 - Electricity consumption, population and economic growth in the EU27
Source: Eurostat

On the supply side, the costs of the marginal generation technology (including imports as a competing alternative) in the merit order of a particular market determine wholesale prices. Therefore, the structure of the power mix and its changes can give some clues about price trends. The next chart (**Figure 8**) illustrates these changes in the EU27 electricity mix between 2010 and 2019. The share of fossil fuels (lignite, coal, gas and oil) decreased significantly (from 46% in 2010 to 37% in 2019). The role of coal has diminished in particular, falling from 24% to 16% over the last 10 years. At the same time the share of renewables (including wind, solar, hydro and biomass) increased from 23% to 35%. The share of nuclear-powered generation, meanwhile, decreased from 29% to 26%.

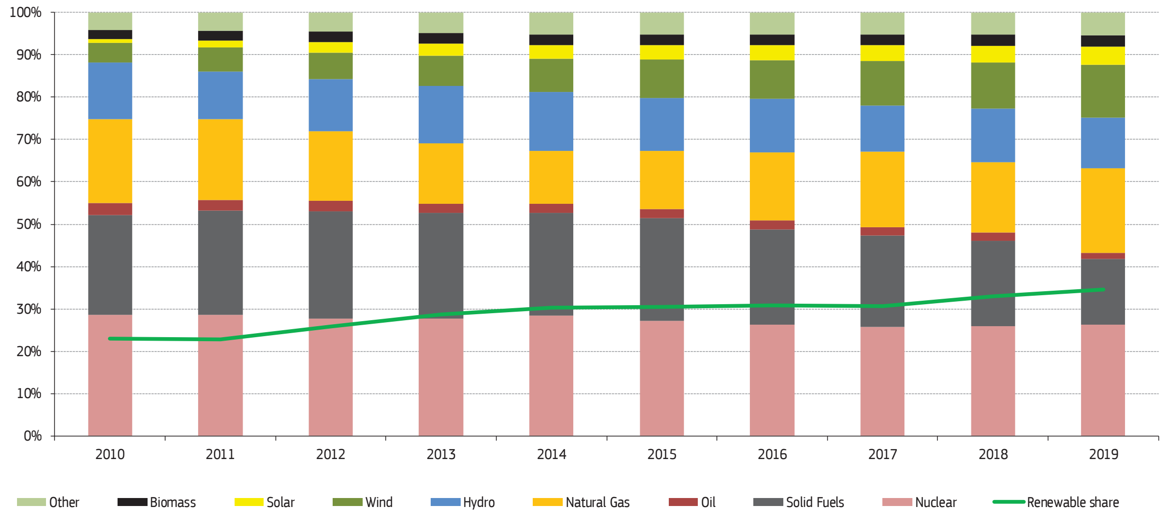


Figure 8 - Electricity generation mix in the EU27
Source: Eurostat. Based on gross generation data. 2019 series are estimates calculated from net generation data

Within renewables, the share of hydro power fluctuated between 11% and 14% depending on meteorological conditions. The increasing importance of renewable energy in the EU27 generation mix was driven mainly by wind power, whose share went up from 5% to 13%

[3] On the relationship between temperature conditions and electricity consumption, the following publications offer some evidence: De Felice, M., Busch, S., Kanellopoulos, K., Kavvadias, K. and Hidalgo Gonzalez, I., Power system flexibility in a variable climate, EUR 30184 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-18183-5; Winter Outlook 2019/2020 Summer Review 2019, ENTSO-E.

between 2010 and 2019, and to a smaller extent by solar PV installations, which emerged from a barely visible presence to capture 4% of the electricity mix in 2019.

Figure 9 offers a more detailed look at the generation mix which underwent considerable changes in the last three years. Two main trends shaped the developments. First was a large-scale switch from coal to gas which gathered strength in the course of 2019 across many markets and which was propelled by falling gas prices and elevated CO2 prices beneficial for less carbon-intensive technologies. Second, rapidly expanding wind and solar capacities together with favourable weather conditions measurably boosted renewable penetration. The coronavirus pandemic magnified both trends. Reduced power demand from the industrial and commercial sector coupled with rising renewable generation significantly restricted the space for coal-fired power plants in the merit order. Additional headwinds for coal came from record low gas prices and the resilience of the carbon market. This combination resulted in a 30% decline in coal generation in the EU27 in the first quarter of 2020 compared to the same quarter in 2019. Pressure on coal intensified in April and May as lockdown restrictions multiplied and dented demand levels. Power demand is expected to recover eventually but by that time rising renewable generation will have prevented coal from clawing back its place in the merit order. Additionally, low gas prices are expected to persist in the months and years ahead, which means that coal should continue to be at a disadvantage to its less CO2-intensive rival. In fact, gas prices fell so low at times in 2020 that they made the least efficient gas plants more competitive than the most efficient lignite plants. This development has been helped by the fact that the carbon market withstood the pandemic and continues to favour cleaner alternatives to coal. Several announcements of accelerated plant closures (Czechia, Denmark, Germany, Italy, Portugal, Spain, Sweden) or abandoned new projects (Poland) confirm the persisting deterioration of coal's position in the European power sector.

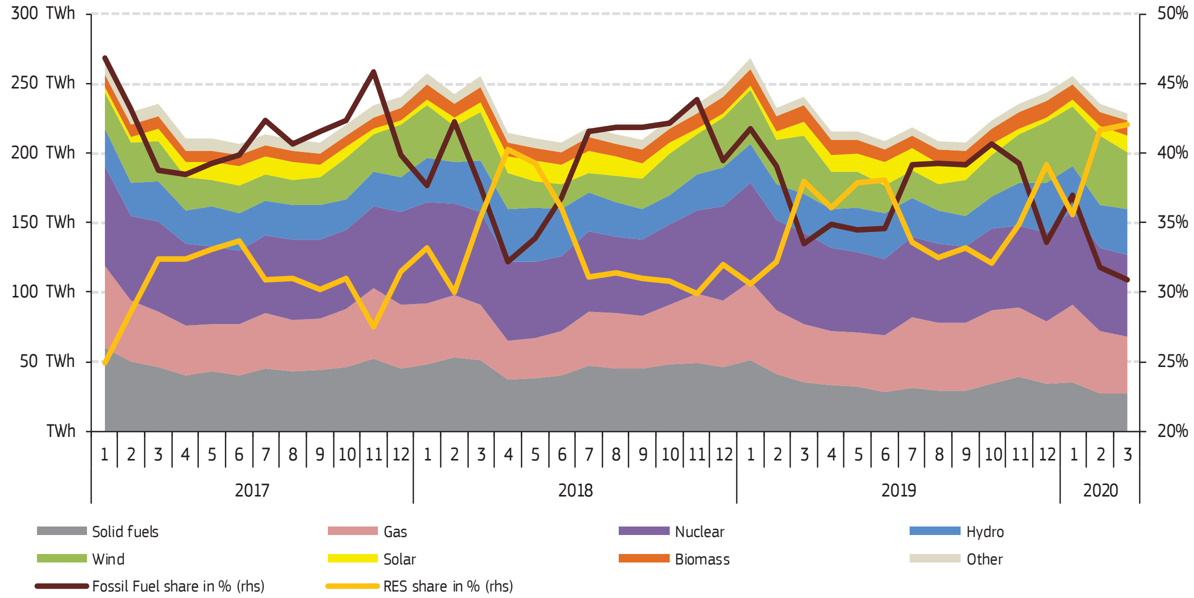


Figure 9 - Monthly electricity generation in the EU27 and the shares of renewables and fossil fuels
Source: ENTSO-E, Eurostat. Data represent net generation.

The marginal costs of each generation technology, which play a crucial role in determining wholesale prices, differ greatly. Wind farms, solar PV installations and hydro power plants have very low or negligible marginal generation costs. Nuclear power plants also display relatively low marginal costs (due to the fact that the cost of nuclear fuel compares very favourably to the amount of energy it is able to release). Coal-, gas- and oil-fired generation technologies have higher running costs (due to a bigger influence of prices of the fuel they burn) and since they usually provide flexibility in response to fluctuating demand patterns, they tend to set the clearing price. Rising generation from intermittent renewables (wind, solar) and other low marginal cost technologies tends to push fossil fuels farther on the merit order curve and, as a result, drags wholesale prices lower, assuming the same level of power demand.

Figure 10 shows monthly coal, gas and emission allowance prices and the European Power Benchmark compared to the average of 2008. Gas prices disconnected from their coal peers in the wake of the Fukushima accident in 2011 as gas-fired power generation in Japan surged to make up for the lost nuclear output. This trend combined with very low carbon prices to seriously undermine the profitability of gas-fired power plants in Europe and gave boost to coal firing in the electricity sector. It is clearly visible that the EPB closely followed coal prices between 2012 and 2016. Afterwards, the trend started to change as European coal and gas prices became more interlinked again. Power prices showed greater correlation with the gas market in 2017, before going back to following coal in 2018. In 2019, as widespread coal-to-gas switching progressed, wholesale power prices seemed to be taking more cues from the gas market. Rising correlation between gas and electricity prices has been detected in markets where the fuel switch has been particularly strong such as the Netherlands, Greece, Germany, Portugal and Spain. This trend continued in 2020 and is expected to strengthen in the years ahead as coal capacities across Europe are retired in an accelerated fashion. Overall, it is obvious that power prices are still greatly influenced by the prices of fossil fuels. However, at local level, higher renewable penetration tends to be associated with lower wholesale prices (*Trinomics et altri, 2020*).

After a period of low prices between 2011 and 2017, CO2 emission allowances embarked on a rising trajectory since 2018, culminating in the middle of 2019 at 30 €/t, which was the highest level since 2008. The rising trend was underpinned by a tightening of supply through the Market Stability Reserve which started operating in January 2019. Unlike during the last major economic crisis in 2008-2009, the carbon market remained resilient in the wake of the coronavirus pandemic. CO2 prices declined only briefly in the first weeks of the lockdown period in March and gradually recovered in April and May 2020. Monthly averages stayed at or above 20 €/t in the first six months of 2020. Developments in the carbon market significantly contributed to the coal-to-gas switch and to driving current generation capacities as well as planned investments towards the decarbonisation of the European electricity sector. The carbon footprint of power generation in the EU27 declined by 16% in 2019 compared to a year before.[4] The effect of more expensive emission allowances on wholesale power prices has so far been blunted by declining fuel prices, weakening power demand and rising renewable generation. However, in regions with greater reliance on fossil fuels, pricier carbon exerted much stronger upward pressure on electricity prices.

[4] https://ec.europa.eu/clima/news/emissions-trading-greenhouse-gas-emissions-reduced-87-2019_en.

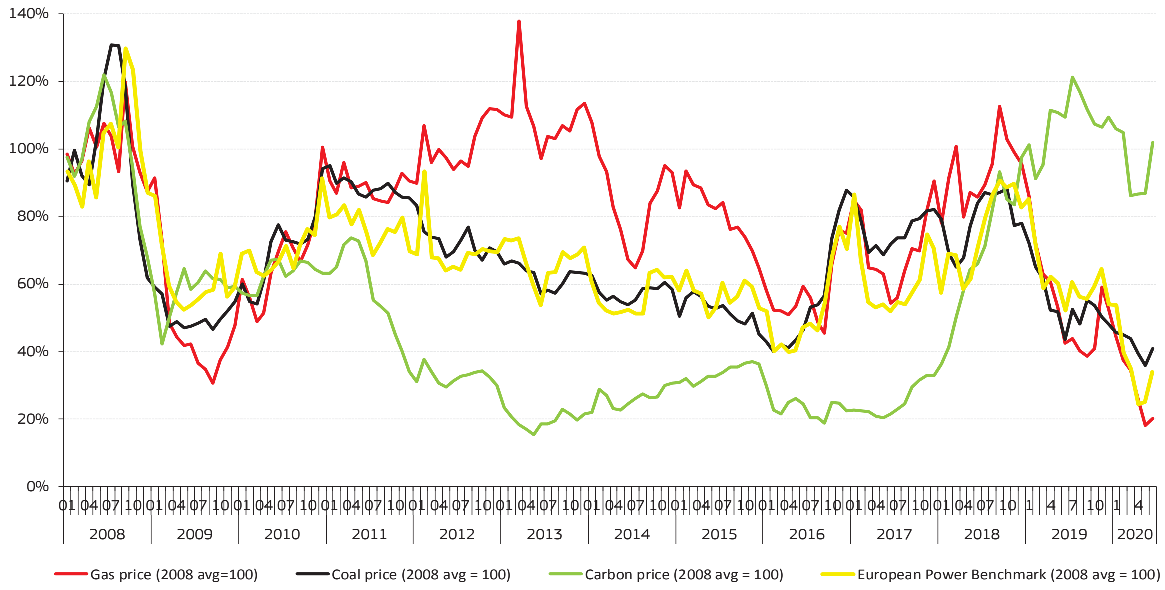


Figure 10 - Monthly coal, natural gas and carbon price indexes, compared to the 2008 average price and the share of renewable energy (right hand scale)

Source: Platts

The growth in renewable energy generation has been helped by supporting policies at EU level as well as at the level of Member States who need to meet their 2020 renewable energy targets. Various instruments such as feed-in-tariffs or feed-in-premiums have incentivised the uptake of wind and solar power in the grid. Falling costs of renewable technologies and higher carbon prices have ignited a wave of investment in new renewable capacities that do not rely on any form of public support. Such renewable projects typically sell part of their production on the open market (day-ahead), while the rest is secured in advance via long-term power purchase agreements, either with industrial electricity consumers or with utilities who then re-sell the electricity to end users. This indicates that in a growing number of markets, renewable technologies are able to compete with other participants without any subsidies. This should be beneficial for consumers as it reduces budgetary needs sourced from renewable taxes imposed on electricity consumption.

Further savings can be expected from the continued integration of European wholesale electricity markets, supported by EU policies. Initiatives such as European Single Intraday Coupling (SIDC), which links intraday markets of more than 20 countries, should bring about more efficiencies thanks to improved liquidity and increased cross-border electricity trade.

At EU level, electricity trade with third countries does not significantly influence wholesale market prices as extra-EU electricity imports or exports are negligible compared to bloc's total consumption. However, for some regions the situation is different (e.g.: Baltic states and Italy), as they source significant amounts of their consumption needs from abroad (see Figure 11), which sometimes includes third countries. Of all the regions under observation, only Central Western Europe remained consistently in surplus, retaining its position as Europe’s main exporting region thanks to plentiful and diverse generation capacities, competitive prices and a central position suitable to supply the rest of Europe. The Nordic region shifted repeatedly from surplus to deficit, depending mainly on the regional hydro reservoir level. The other regions remained in a net importer position. As electricity normally flows from areas with lower prices to higher-priced ones, net exporter regions have lower wholesale prices compared to net importers.

The covid-related demand shock reduced importing needs especially in Italy and the British Isles, curbing exports from the CWE region. The Nordic net exports surged in the spring of 2020 on the back of high hydro reservoir levels supported by increased precipitation. The abundance of cheap electricity led to extremely low spot prices in Nord Pool markets in the first half of 2020.

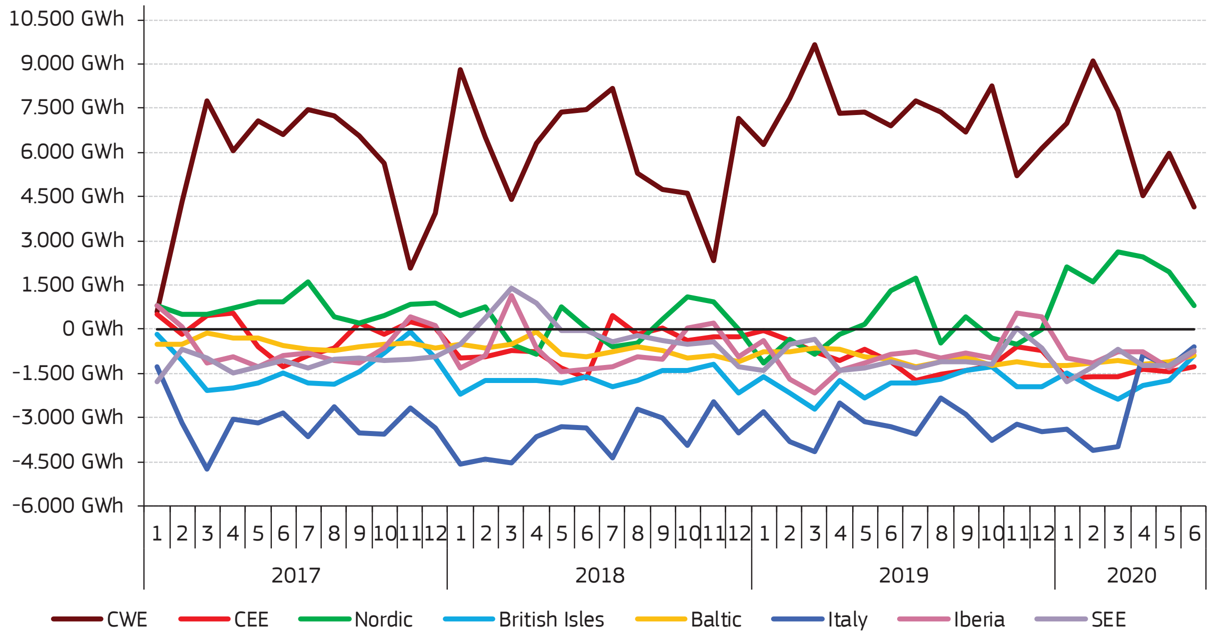


Figure 11 - Net electricity flow positions of individual European regions

Source: ENTSO-E

1.1.3 International comparisons

Comparing the average prices in the EU27 with wholesale prices of Europe's important trading partners can provide a useful insight into how energy cost differentials can impact the competitiveness of European energy-intensive industries with a high international exposure. Electricity bills are only one of the factors determining international competitiveness. A more detailed analysis of the impact of prices on competitiveness can be found in chapter 6.

Figure 12 shows that since 2008 wholesale electricity prices in the US have been mostly lower than in the EU27, with the EU-US price ratio staying close to 2:1 between 2018 and 2019. This can be traced to the abundance of domestically produced, low-cost natural gas that serves as the fuel to price-setting power plants in most US electricity markets. In contrast, prices in Japan increased significantly after the Fukushima accident in 2011 as a large amount of nuclear capacity was put offline and the country had to rely more on burning imported natural gas. This drove Japanese wholesale prices 3-4 times above their EU peers between 2012 and 2014. Since 2016, as nuclear capacities were gradually put back into operation, the wholesale price gap decreased but never disappeared entirely.

The proxy for wholesale prices in China[5] has accelerated its decline since 2017. The proxy price level is relatively high, but in reality, the wholesale price is likely to be much lower, as suggested in other studies, but for which price data was not usable[6].

Figure 13 shows some further examples of wholesale prices of important EU trade partners. Wholesale prices in Canada were one of the lowest in the world over the last twelve years due to the dominant presence of hydro power plants (60%) in the national power mix, supplanted by other renewables and nuclear generation (21% combined). Similarly low power prices were observed in Russia, richly endowed with natural resources of all kinds. Prices in Australia rose above EU levels in 2018 and 2019, while those in Turkey generally followed their EU peers.

An analysis of the evolution of price differentials between the EU27 average and G20 countries in constant 2018 EUR prices shows that price developments across 10 of the 14 non-EU G20 countries have been positive for the EU. In 2008, six countries (AU, CA, ID, RU, ZA and TK) had lower prices than the EU27 average, but this fell to four countries by 2019 (CA, IN, RU, US), with Australia, Turkey and South Africa becoming more expensive than the EU27 and the US and Indonesia becoming cheaper.

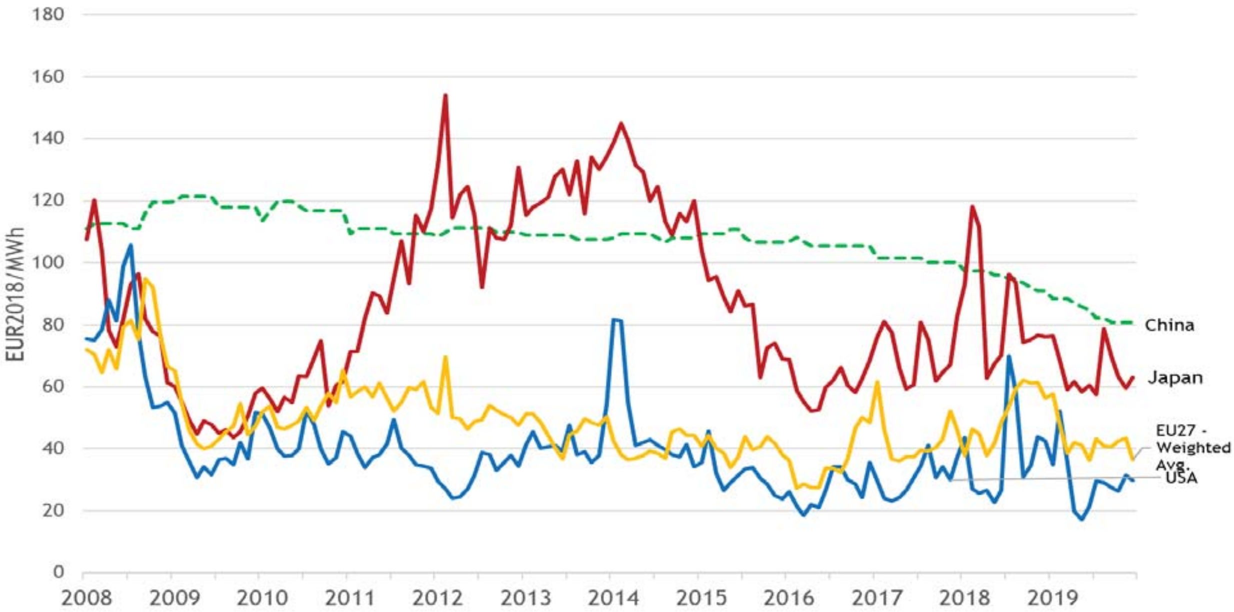


Figure 12 - Comparison of wholesale electricity prices in the EU with global trade partners
Source: Trinomics et altri study (2020)

---

[5] Used industrial price as proxy, this dataset from CEIC: CN: Purchasing Price Index: Fuel and Power (China).
[6] https://eta.lbl.gov/sites/all/files/publications/ced-9-2017-final.pdf

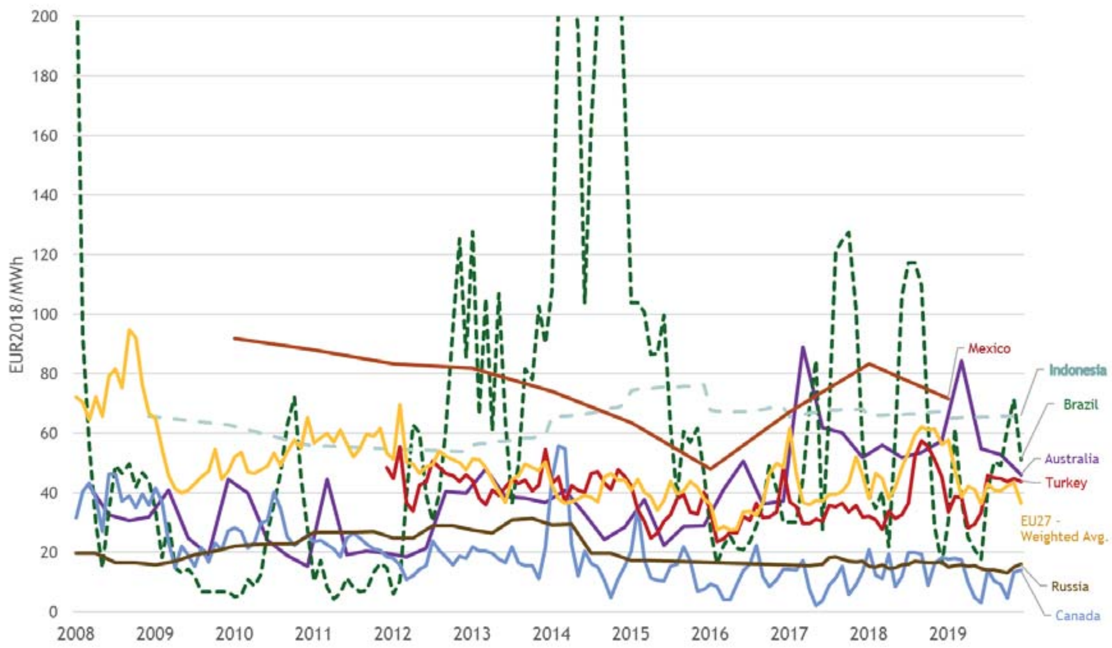


Figure 13 - Comparison of wholesale electricity prices in the EU with global trade partners

Source: Trinomics et altri study (2020)

1.2 Retail electricity prices

Main findings

- Retail electricity prices across all consumer types increased between 2017 and 2019, driven mainly by rising prices of baseload power in the wholesale market in 2017-2018. In the case of households, the average EU27 retail price went up by 4% to 214 €/MWh. Mid-size industrial companies experienced a 5% increase in the average price to 106 €/MWh.
- The amount of electricity taxes and levies paid by households in the EU27 per MWh has stabilized since 2017 and has fallen in the case of industrial enterprises. Thus, the role of the tax component, which had long acted as the main inflationary element in the total electricity bill, has decreased for the first time.
- Progress towards the completion of the single energy market continued and brought energy components in individual Member States closer together than ever before: they became 14% and 9% less spread out since 2010 for households and industrial consumers respectively. This contributed to rising convergence in total retail prices for both consumer categories which can be observed since 2016.
- Taxes and levies remain by far the most important source of differences in retail prices across Member States, displaying dispersion that is three times higher on average than that of the network and energy components. This is caused by a very varied nature of Member States' policies and fiscal instruments affecting the taxation of electricity consumption. In 2019, environmental taxes paid by households ranged from 1 €/MWh in Luxembourg to 118 €/MWh in Denmark, while applied VAT rates spread from 5% in Malta to 27% in Hungary.
- The average amount of electricity taxes collected from households to finance renewable support schemes peaked in 2015 at 29 €/MWh and has stabilized in recent years at 25 €/MWh. This is remarkable as renewable generation in the EU27 expanded by 14% between 2015 and 2019 and the share of renewable electricity in the grid is growing rapidly.
- The average EU27 household electricity price grew annually by 2.3% since 2010, while general inflation, measured by the harmonised index of consumer prices, advanced by 1.4% annually during the same period. Meanwhile, industrial electricity prices in the ID band grew at an annual rate of 1.1%, which compares to the 1.3% annual inflation rate in producer prices. In the case of large consumers and energy-intensive industries in the IF band, electricity prices in 2019 were 5% lower than in 2010.
- The most recent data available indicate that the substantial decline in wholesale electricity prices induced by the coronavirus pandemic in the first half of 2020 has already had a measurable impact on household retail prices, which have started to decrease. Furthermore, a fall in the tax component also contributed to the decrease in retail household prices. As a result, the average price paid by a representative household in one of EU27 capitals declined by 3% during the first six months of 2020 compared to 2019.

Table 1 - Key figures on the evolution and drivers of retail electricity prices between 2010 and 2019

Consumer type	Household (DC)			Industrial (ID)			Large Industrial (IF)		
Component	Annual growth	Share 2019	Δ Share 2010-2019	Annual growth	Share 2019	Δ Share 2010-2019	Annual growth	Share 2019	Δ Share 2010-2019
Energy	-0.2%	32%	- 8 p.p.	-2.5%	46%	- 17 p.p.	-3.2%	55%	- 15 p.p.
Network	2.3%	27%	+ 0 p.p.	2.2%	19%	+ 1 p.p.	1.2%	15%	+ 2 p.p.
Taxes	4.7%	41%	+ 8 p.p.	8.5%	34%	+ 16 p.p.	5.7%	30%	+ 13 p.p.
Total	2.3%			1.1%			-0.6%		

Source: DG ENER in-house data collection. Eurostat

Aim and scope of the chapter

The following chapter analyses retail electricity prices, taking an in-depth look at the evolution, composition and drivers of prices paid by final consumers in the EU27 and selected non-Member States from 2010 to 2019.

Data sources

The chapter draws on past in-house data collection efforts by the Directorate General for Energy of the European Commission (DG ENER) used in the previous iteration of this report and, for the most recent period, on publicly available Eurostat databases of electricity price components for household and non-household consumers (nrg_pc_204_c and nrg_pc_205_c).

The chapter is structured along different consumer types. These are defined by Eurostat methodology under Regulation (EU) 2016/1952 of the European Parliament and of the Council of 26 October 2016 on European statistics on natural gas and electricity prices. It differentiates household and industrial consumers[7], whereas both consumer types are further broken down into consumption bands. Different bands are applied to electricity and natural gas. Due to the derogations granted to several Member States with regard to the provision of statistics pursuant to Regulation (EU) 2016/1952, the complete set of data for the whole EU27 and certain Member States for 2018 are not available and therefore not included in the report.

The chapter commences by examining household electricity prices at EU level and in each reporting country. Next, the chapter looks at electricity prices paid by industrial consumers. It differentiates between two levels of industrial consumption in order to provide a nuanced picture of a diverse group of consumers, from mid-size businesses to manufacturing industries consuming large amounts of energy.

In order to investigate driving forces behind retail price developments, total prices are further decomposed into three main components: Energy and supply (Energy), Network costs (Network) and Taxes, fees, levies and charges (Taxes and levies). The Taxes and levies category is then further disaggregated into six subcomponents (five in the case of gas) designed to display the importance and impact of specific Member State policies in a comparable way.

[7] 'Industrial' consumers are currently referred to in Eurostat statistics as 'Non-households' consumers

All figures representing the EU27 are consumption-weighted averages of EU27 Member States. The number of countries included in each EU average can differ across consumption bands, depending on data availability.

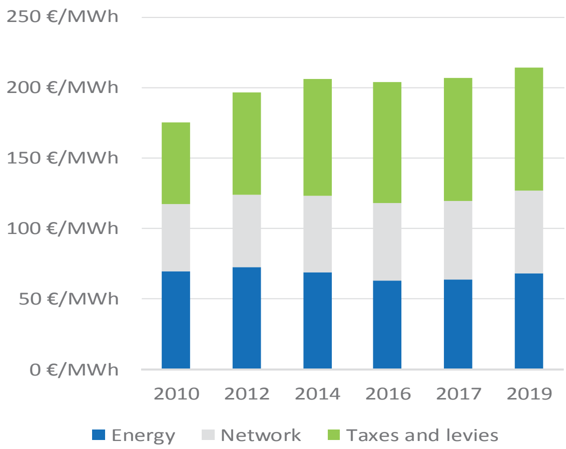
1.2.1 Household electricity prices

The following section analyses prices paid by household electricity consumers. It examines weighted EU27 averages for the DC band, covering annual consumption of 2500 to 5000 kWh, which is the most common volume for the majority of households. A comparison of reporting countries based on a most representative band is also included. In this case, each Member State (and selected non-Member States) is represented by the consumption band accounting for the largest share in total household consumption. In other words, it is represented by the price for which most electricity in the household category was sold. It is irrespective of the number of consumers in the band.

Evolution of household electricity prices

Retail prices in the DC band grew at an annual rate of 2.3% from 2010 to 2019, while general inflation, measured by the harmonised index of consumer prices, advanced by 1.4% annually during the same period. Thus, electricity has become 9% more expensive in real terms during the last ten years. In absolute terms, the EU27 retail price grew from 175 to 214 €/MWh in the same period.

The average EU27 price rose by 4% between 2017 and 2019, driven mainly by the rising energy component (+7%), which responded to the developments in the wholesale market, and by more expensive network costs (+5%). The taxes and levies category remained unchanged and its share in the total bill decreased by a percentage point to 41%. This was the first time that the dominant tax component saw its importance reduced. It underlines the fact that the inflationary effect of this category, propelled in the past mainly by renewable support policies, has subsided.



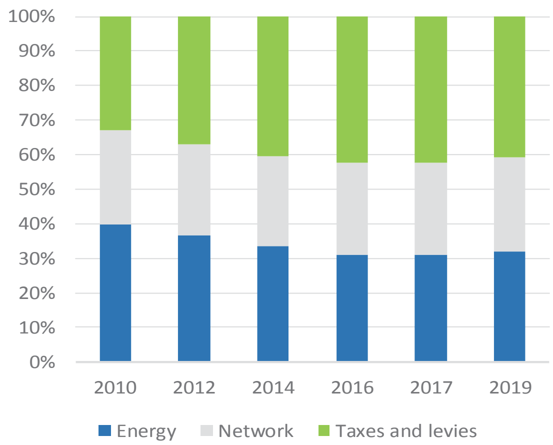


Figure 14 - Evolution and composition of the EU household price (DC band)
Source: DG ENER in-house data collection, Eurostat

Long-term trends in main retail price components

Over the last ten years, the composition of household retail prices changed markedly. The share of the energy component decreased by 8 percentage points to 32% in 2019. At the beginning of the decade, the commodity component, determined largely by wholesale prices, was the most important of the three components at EU level.

In absolute terms, the energy component was little changed in 2019 compared to 2010, decreasing by 2% to 68 €/MWh. At Member State level, 13 Member States reported lower energy components in 2019 than in 2010. One of the most remarkable changes occurred in Germany where the energy component declined by 32% to 58 €/MWh in the last decade. In Romania, meanwhile, the same component rose by 76% to 59 €/MWh. Across Member States, energy components were less spread out in 2019 than ten years earlier (their relative standard deviation decreased by 14%) on the back of progressing wholesale market integration and more competition between suppliers.

The share of network costs in the final household bill has been almost constant at 27% throughout the decade. In absolute terms, the network component grew at an annual rate of 2.3% and reached 59 €/MWh in 2019. This underlines the rising need for infrastructure investment necessary to make the grid more flexible and resilient in order to accommodate growing amounts of decentralized and intermittent renewable electricity.

The taxes and levies component has been the most significant driver of retail price developments over the last decade. Whereas in 2010 it accounted for 33% of the average EU27 price for DC households, its share grew to 42% in 2016, before retreating to 41% in 2019. In absolute terms, taxes grew at an annual rate of 5% and reached 87 €/MWh in 2019. The next section analyses in greater detail which specific policies and fiscal instruments were driving this increase.

Composition of taxes, levies, fees and charges

In order to better understand how Member State policies and fiscal instruments impact household retail prices, the taxes levies, fees and charges category is broken down into six subcomponents. It is important to note that only policies and mechanisms that directly impact retail prices are considered. Also, not every tax subcomponent exists or is applied in each Member State. The following chart displays the evolution of EU27 averages.

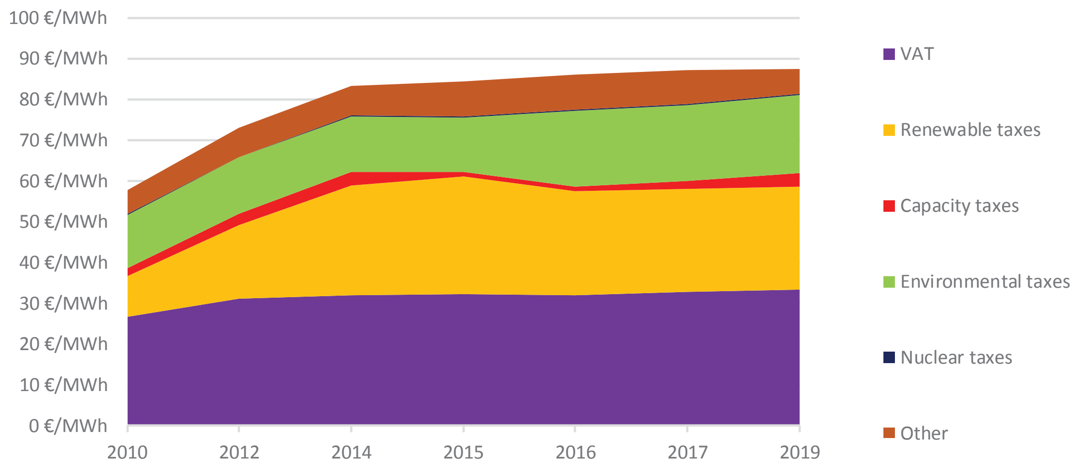


Figure 15 – Evolution of taxes, fees, levies and charges for EU households since 2010 (DC)
Source: DG ENER in-house data collection, Eurostat

Figure 15 shows that taxes and levies associated with policies designed to support renewable energy sources were the main driver behind the rise in the whole tax component in the first half of the observed decade, growing from 10 €/MWh in 2010 to 29 €/MWh in 2015. Since then, however, a decline in this subcomponent could be observed, as governments gradually embraced more economically efficient forms of public support (by setting subsidy levels at auctions rather than via fixed feed-in-tariffs for instance). Between 2017 and 2019, the renewable tax subcomponent remained unchanged at 25 €/MWh, making up 12% of the total retail price.

Rising VAT and, in the last few years, rising environmental taxes have also contributed to the growth of the tax component. The VAT subcomponent increased from 27 €/MWh in 2010 to 33 €/MWh in 2019, accounting for 16% of the total household bill for electricity at the end of the observed period. Environmental taxes in the EU27 rose from 13 €/MWh in 2010 to 19 €/MWh in 2019, making up 9% of the total retail price. The influence of other subcomponents has been less pronounced.

The structure of the taxes and levies component changed very little between 2017 and 2019, as did its absolute value. The share of individual subcomponents in 2019 can be seen in **Figure 16**.

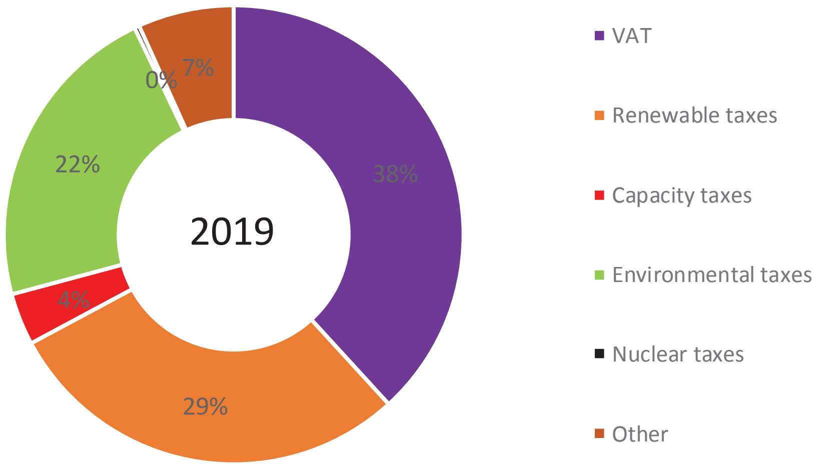


Figure 16 - Composition of the taxes and levies component of household electricity prices in 2019 (DC band)

Source: DG ENER in-house data collection, Eurostat

The next section offers a brief description of individual subcomponents.

Value added tax

VAT is imposed on household electricity prices in all reporting countries. The EU VAT Directive explicitly allows Member States to apply reduced rates to electricity. As a result, VAT rates range from 5-6% in Greece and Malta to 25-27% in Denmark, Sweden and Hungary. Most common rates average 20%. As the largest sub-component, VAT accounted for 38% of the tax component and 16% of the total retail price for households. VAT is an ad valorem tax, its absolute value is based on the value of all other elements in the price. Even if VAT rates remain unchanged but other elements increase, the absolute amount of VAT increases. The average amount of VAT paid by households in the EU27 rose by 26% since 2010, which compares with a 22% increase in the total retail price and suggests a slight rise in the average VAT rate applied to electricity.

Environmental taxes

The sub-component includes any manifestation of excise duty, environmental, greenhouse gas emission, transmission and distribution taxes. Their common characteristic is that revenues from these taxes are not normally earmarked to energy, climate- or environment-related policies. In other words, revenues flow into the central state budget regardless of the name of the tax. Minimum excise duty levels on energy products are harmonised at EU level and are defined by the Council Directive 2003/96/EC22. The sub-component excludes VAT. Environmental taxes were collected by 20 Member States in 2019. They made up 22% of the taxes and levies component, representing the third largest item after VAT and renewable taxes. The average amount of environmental taxes paid by households in the EU27 rose by 50% since 2010.

Renewable taxes

This sub-component includes any support to renewable energy, energy efficiency and combined heat and power generation (CHP). Renewable taxes are not collected in 5 Member States. In Finland and Malta, the renewable energy support scheme is not financed through an explicit levy but from the state budget. France has been following the same example since 2016. In Hungary, household electricity consumers, unlike their industrial counterparts, are exempted from renewable surcharges. No green levies are imposed also on Bulgarian households. It is important to note that electricity consumers still contribute to the support of renewable energy as they are also tax payers. In several countries renewable energy is supported also from other sources than taxes on consumer bills.

An average household in the EU27 paid 25 €/MWh in renewable taxes in 2019. This figure is equal to 29% of the taxes and levies component and to 12% of the total EU price. The average amount of renewable taxes paid by households in the EU27 rose by 153% since 2010.

Capacity taxes

This category includes taxes, fees, levies or charges related to ensuring adequate capacity for generation, taxes on coal industry restructuring, taxes on electricity distribution, stranded costs and levies on financing energy regulatory authorities or market operators. Capacity taxes were imposed by 11 Member States in 2019. The impact of these charges remains limited, at around 1% of the total retail price.

Nuclear taxes

This category includes taxes, fees, levies or charges relating to the nuclear sector, including nuclear decommissioning, inspections and fees for nuclear installations. Nuclear taxes are collected in Belgium, Italy (which closed its last nuclear power plant in 1990) and Slovakia. Their impact on prices is negligible at EU level.

Other charges

This category includes all other taxes, fees, levies or charges not covered by any of the previous five categories, such as support for district heating, local or regional fiscal charges, island compensation or concession fees relating to licences and fees for the occupation of land and public or private property by networks or other devices. At 6 €/MWh in 2019, the absolute value if this subcomponent decreased slightly compared to 2010. Its share in the total retail price amounted to 3% in 2019.

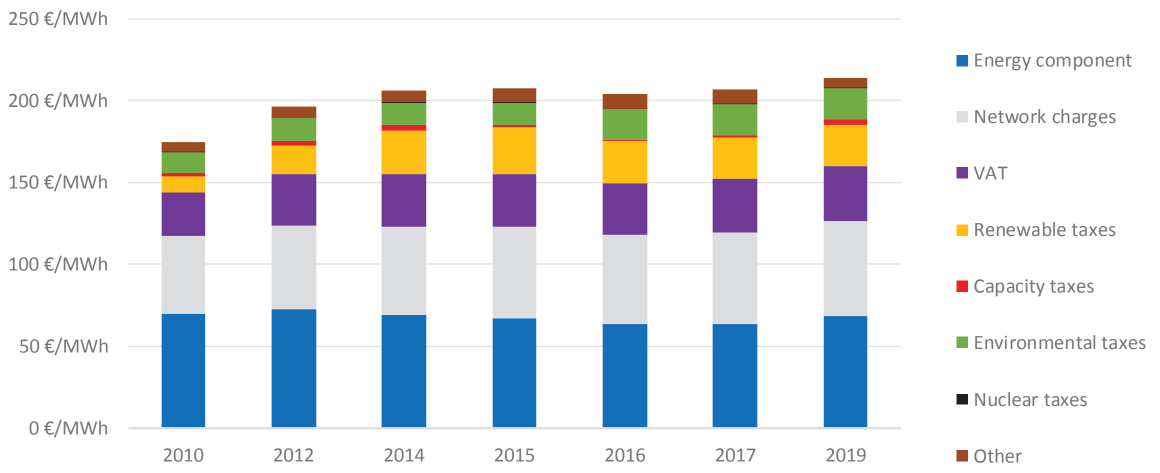


Figure 17 - Breakdown of household electricity prices (DC band)

Source: DG ENER in-house data collection, Eurostat

Situation in individual Member States

Figure 18 informs about household retail prices and their composition in individual Member States in 2019. Denmark reported the highest price of 295 €/MWh, overtaking Germany with a price of 287 €/MWh. German households in the DC band, which occupied the top spot in 2017, saw retail prices falling by 6% in the last two years. Relatively high prices were also reported from Belgium (285 €/MWh). Bulgaria had the lowest price among Member States (98 €/MWh). The ratio of the highest to the lowest price across the EU27 reached 3:1 in 2019, a slight decrease compared to previous years. 19 Member States reported prices lower than the EU27 average in 2019, indicating the inflationary influence over the average of larger Member States such as Germany, Spain and Italy which reported above-average prices and which carry a significant weight given their consumption levels. Overall, household retail prices have become less spread out in the last three years. Their relative standard deviation declined by 8% since 2016, pointing towards rising convergence across Member States.

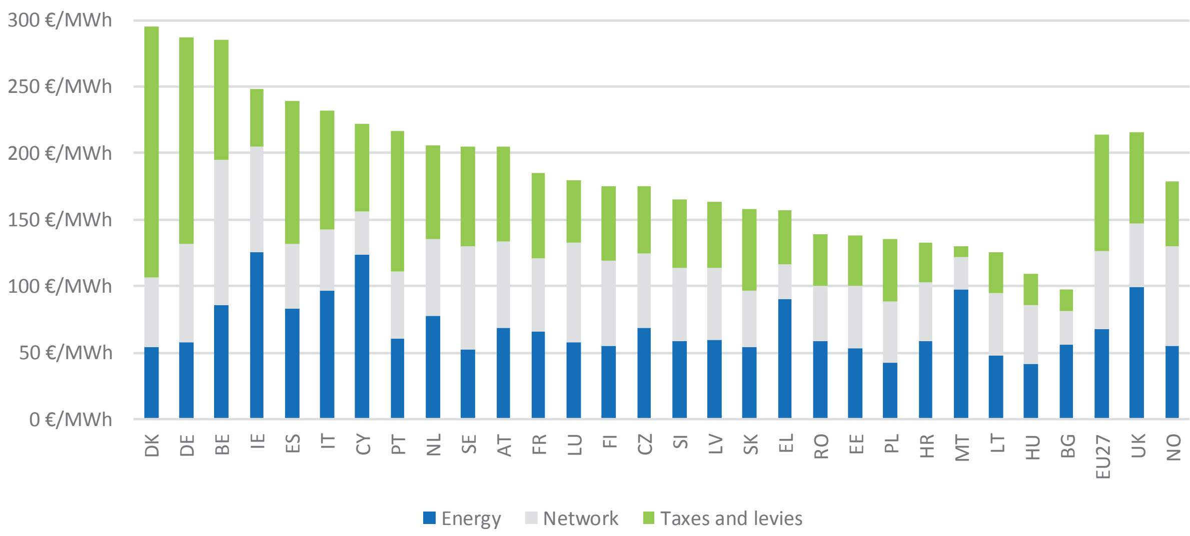


Figure 18 - Household prices in 2019 (DC band)

Source: Eurostat

Despite the fact that retail prices for households have risen at EU level since 2017, eight Member States experienced price falls of a mostly modest nature during the period. The largest of them occurred in Greece where retail prices declined by 13% between 2017 and 2019 on the back of falling taxes. The biggest upward move was reported in the Netherlands where prices rose by a third since 2017 due to a significant increase in VAT and in environmental and renewable taxes.

Denmark and Germany reported the highest tax components of almost 190 and 156 €/MWh respectively, which accounted for more than half of the total retail price in 2019. No other Member State had such a high share of taxes in the final price. In contrast, Belgium's tax component was in line with the EU27 average, but higher network and energy costs propelled it close to German price levels. The lowest taxes on electricity, both in absolute and relative terms, were assessed in Malta (8 €/MWh) where no renewable surcharges are collected and where the VAT rate is set at 5%, the lowest in the EU27.

As was the case in 2017, Belgium recorded by far the highest network component of 109 €/MWh in 2019, which was nearly double that of the EU average (59 €/MWh). On the opposite side of the spectrum, Malta and Bulgaria had the lowest network charges (25 €/MWh).

The largest energy components were reported in the island systems of Ireland (125 €/MWh), Cyprus (124 €/MWh) and Malta (97 €/MWh). Relatively high energy costs result from their typical characteristics: limited or (in the Cypriot case) non-existent interconnection capacities, the absence of economies of scale, a limited variety of power sources and a higher proportion of costs to ensure security of supply. Italy and Greece also reported commodity costs above 90 €/MWh which stems from relatively higher wholesale prices in these Member States highly dependent on burning fossil fuels for electricity generation and on imports. The lowest values of the energy component were recorded in Hungary (42 €/MWh) and Poland (43 €/MWh), markets with stronger forms of price regulation. Average wholesale day-ahead prices in both markets climbed above 50 €/MWh in 2019. This is visible in **Figure 19** which depicts the difference between the energy component of household retail prices and the average day-ahead baseload price in wholesale markets of respective countries in 2019.

While other factors influenced the total amount of retailers' purchasing costs for electricity supplied to their customers in 2019 (such as year-ahead wholesale prices in the previous year, hedging strategy, consumption profiles, structure of customers, balancing costs, various forms of price regulation), the wide differences shown in **Figure 19** still betray relatively large mark-ups netted by retailers in some Member States. In the case of Ireland, even when considering the cost of the energy component for the more representative DD band, the difference still reaches 60 €/MWh.

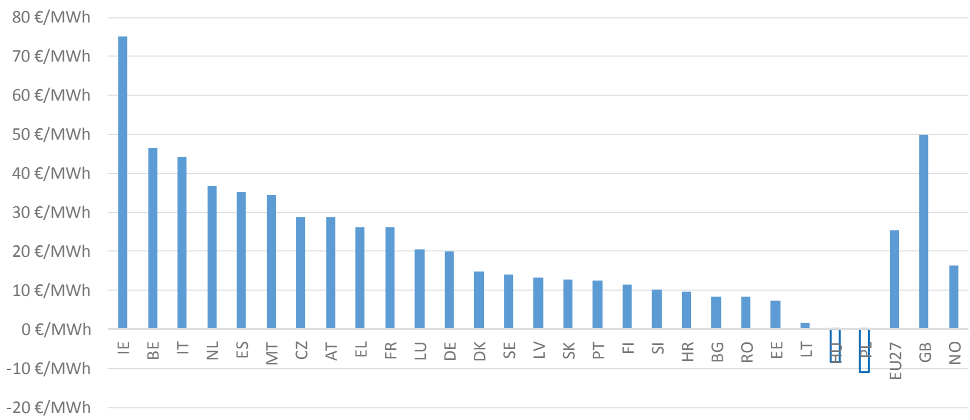


Figure 19 – Difference between the energy component of household retail prices and average day-ahead baseload prices in individual markets in 2019 (DC band)

Source: Eurostat, Platts, European power exchanges

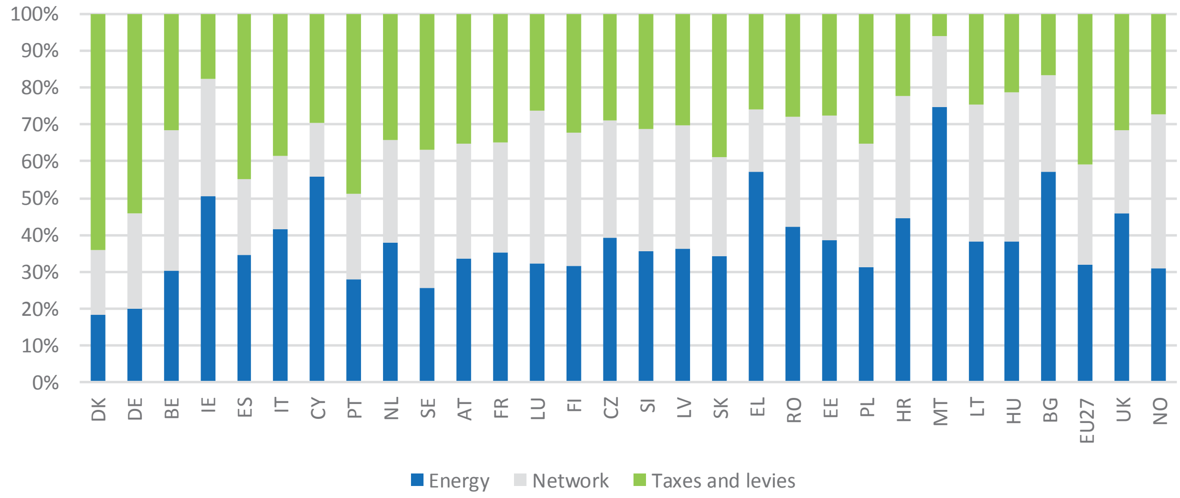


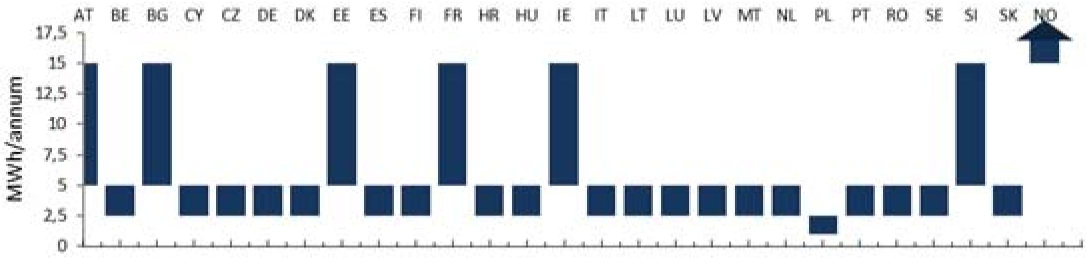
Figure 20 - Composition of hosehold prices in 2019 (DC band)

Source: Eurostat

Box – Definition of the most representative band

Household electricity consumption is broken down into 5 bands in Eurostat methodology. The most representative band is defined as the one of these five bands with the highest share in total consumption. In other words, the price for which the most electricity is sold. While the DC band is used as the main point of reference for comparative analysis, a few Member States register only a small portion of consumption in this category. Household consumption varies across countries. It is determined by factors including household size, climatic conditions (availability of sunlight and consequent lighting needs, heating and cooling needs), the extent to which electrification is used in heating or the number and efficiency of electric appliances in a typical household.

To analyse prices in a comprehensive manner, reporting in the most representative band in each market is also included. The selection of consumption bands is based on the previous iteration of this report where this concept was introduced.



Source: DG ENER in-house data collection

As visible from **Figure 21**, the results do not differ greatly from the DC-based comparison. No changes occur either at the top or at the bottom of the chart. Ireland, which falls in the DD band, records 15% lower prices than in the DC band, moving by five spots closer to the centre of the chart. In France, where household heating is dominated by electricity, retail prices in the most representative DD category are 10% lower than in the DC band. A similar, if slightly larger difference could be observed in Slovenia, also put in the DD band. The largest difference was observed in Norway, placed in the DE band with the highest average consumption level in Europe. Retail prices for the most typical Norwegian household reached 117 €/MWh, a third lower than in the DC band.

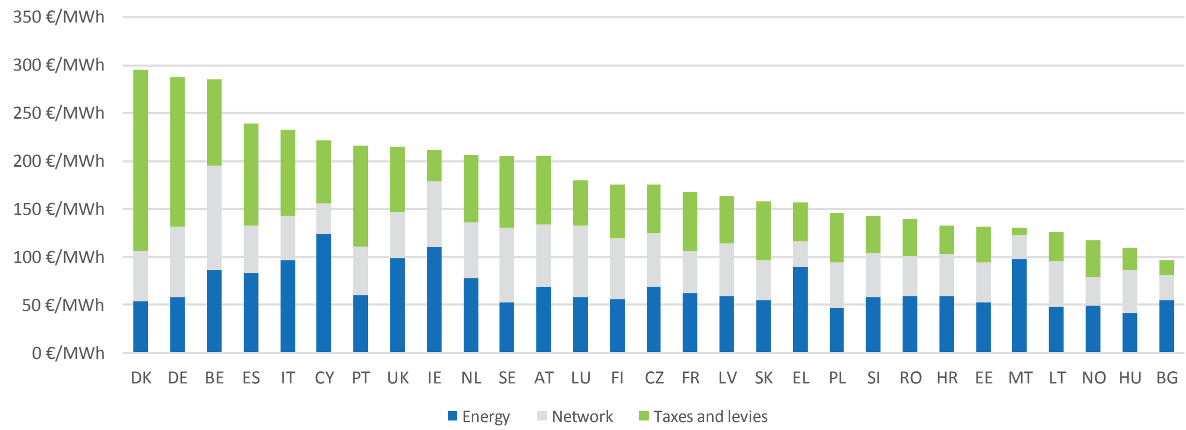


Figure 21 - Household prices in 2019 (most representative band)

Source: Eurostat

Box – European Commission efforts to increase interconnection and storage capacities

Interconnection and storage capacities – or more precisely the lack thereof – are an important factor driving up wholesale prices and, by extension, energy components of retail prices. The socioeconomic value of electricity interconnectors comes from their ability to reduce costs by increasing the efficiency of the electricity system, improving security of supply and facilitating a cost-effective integration of rising volumes of renewable energy in the grid.

The framework for the trans-European energy networks (TEN-E) and the Projects of Common Interest (PCIs) are the main tools of the EU energy policy to increase physical electricity exchange capacity among Member States. The PCIs aim particularly to better connect the peripheral regions such as the Iberian Peninsula, Ireland or Malta with the rest of Europe or to integrate rapidly growing share of renewables from remote generation areas such as the North Sea. The current fourth PCI list includes 100 electricity transmission and storage projects which benefit from streamlined permitting procedures, improved regulatory conditions and, under certain conditions, are eligible for funding through the Connecting Europe Facility.

In addition, the 10% electricity interconnection target set for 2020 has provided political momentum to advance key cross-border projects. 17 Member States reported being on track to reach that target by 2020, or have already reached the target, but more interconnections are needed in some regions. PCIs currently planned or under construction should help with this effort.

In November 2017, the Commission proposed to operationalise the 15% interconnection target by 2030 through a set of additional and more specific thresholds which serve as indicators of the urgency of the action needed. The new thresholds reflect the three headline goals of European energy policy: increasing competitiveness through market integration and better prices, guaranteeing security of supply and achieving the climate targets through increased use of renewable sources.

Recent developments in household prices

The most recent data available indicate that the substantial decline in wholesale prices observed in the first half of 2020 has already had a measurable impact on household retail prices which have started to decrease. The average energy component of a representative household in EU27 capitals declined by 3% in the first half of 2020 compared to 2019, with falls observed in 19 Member States. Several capitals experienced substantial decreases in the energy component between December 2019 and June 2020, most notably Brussels and Madrid (-29%), followed by Stockholm (-21%) and Copenhagen (-19%). In addition, a fall in the tax component contributed even more to the decrease in retail household prices. Between 2019 and the first half of 2020, the average value of taxes and levies paid by households in EU27 capitals (VAT plus all the other types) decreased by 5%. The largest declines in taxes were observed in the Netherlands, Cyprus and Spain. As a result of falling taxes and wholesale prices, the average household retail price in EU27 capitals declined by 3% during the first six months of 2020 compared to 2019.

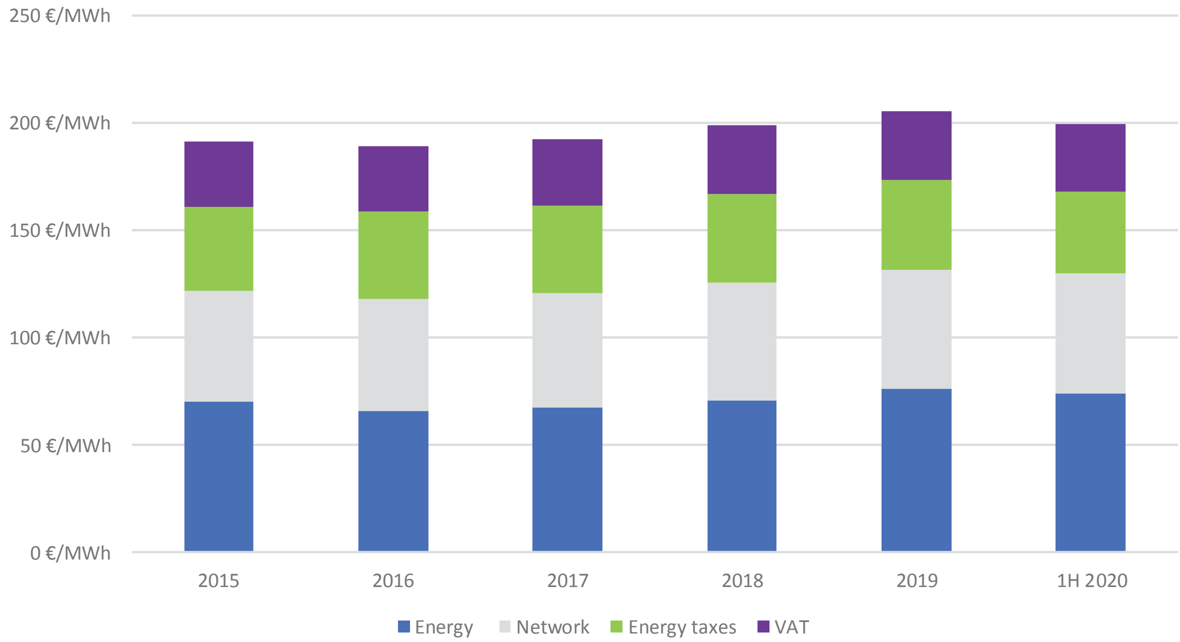


Figure 22 - Evolution and composition of the average retail electricity price for representative households in EU27 capitals (DC band)

Source: Vaasaett, the EU27 average is weighted by population figures of EU27 capitals.

1.2.2 Industrial electricity prices

The following section analyses prices paid by non-household electricity consumers at EU and Member State levels. It examines prices of the Eurostat band ID, covering annual consumption of 2000 to 20 000 MWh. This band can be considered representative of mid-size businesses across many segments of the economy. Price trends in the IF band are also analysed in order to look more closely at the situation of large enterprises and energy-intensive industries.

Box – Sectoral split of electricity consumption

Households accounted for 27% of the total EU27 electricity consumption in 2018, the most recent year for which data are available. This was slightly lower than a decade earlier, when households made up 28% of the total and reflects progress in energy efficiency measures in the sector and the trend of warmer winters. The share of electricity consumed by industrial users, meanwhile rose from 36% to 37% as efficiency improvements in the sector were outweighed by higher production volumes. Public institutions and commercial establishments kept their share largely unchanged at 28% between 2010 and 2018. The same was true for the transport sector which accounted for just 2% of the total electricity consumption in the bloc. Most of this electricity was consumed by railway operators.

Evolution and drivers of industrial electricity prices at EU level

Industrial electricity prices in the ID band grew at an annual rate of 1.1% during the last decade, or from 96 €/MWh in 2010 to 106 €/MWh in 2019 in absolute terms. This growth was slower than the overall inflation of industrial producer prices which averaged 1.3% annually during the same period.[8] Since 2017, industrial electricity prices rose by 5%, driven by the energy component which gained 21% (or +9 €/MWh). The effect of higher wholesale prices was slightly mitigated by a 6% (-2 €/MWh) fall in the taxes and levies component and a similar relative decline in the network component (-1 €/MWh).

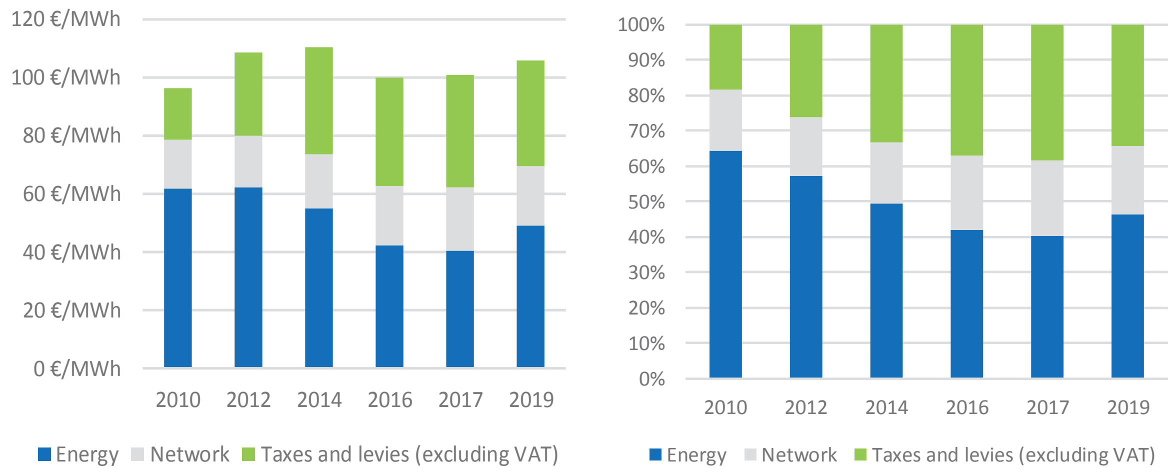


Figure 23 - Evolution and composition of the EU27 industrial retail prices (ID band)
Source: DG ENER in-house data collection, Eurostat

Due to the exclusion of VAT and other factors related to tariff calculation, industrial electricity prices are more influenced by the energy component compared to households and,

---

[8] Eurostat Producer Price Index, (sts_inppd_a)

hence, more driven by developments in wholesale markets. Nevertheless, even in the case of industry, the importance of taxes has grown considerably in the past decade. Whereas taxes (excluding VAT) accounted for 18% of the total retail price in 2010, their share grew to 38% in 2017, before falling to 34% in 2019. This was the first decrease since at least 2007 and mirrors a similar trend in household prices. The share of the energy component declined as the amount of taxes paid by the industry grew. At the beginning of the decade, commodity costs and retailers' mark-ups accounted for 64% of the total price. Their share reached 46% in 2019.

In absolute terms, the energy component declined by 21% to 49 €/MWh in 2019 compared to 2010. The contraction of the energy component, which apart from wholesale electricity prices contains retailers' mark-ups, can be partly linked to EU energy policies supporting competition through more interconnection capacities, market coupling and greater supplier choice. The network component grew by 21% over the past decade to 21 €/MWh and its share in the total price rose slightly from 18% to 19%. The taxes and levies component doubled since 2010 to 36 €/MWh.

Situation in individual Member States

As illustrated by **Figure 24**, Denmark reported the highest retail industrial price (186 €/MWh), followed by Cyprus (166 €/MWh), Germany (142 €/MWh) and Italy (141 €/MWh). Sweden (63 €/MWh) and Finland (68 €/MWh) stood at the other end of the price spectrum. The ratio of the highest to the lowest price across the EU27 reached 3:1 in 2019, a significant improvement compared to 4:1 in 2015. 20 Member States reported prices lower than the EU27 average in 2019, indicating the inflationary influence of Germany and Italy which reported above-average prices and which accounted for 34% of the total weight in the average price due to their high consumption levels. Overall, industrial retail prices have become much less spread out in the last few years. Their relative standard deviation declined by 21% since 2016, pointing towards rising convergence across Member States. The main driver behind this development has been the convergence in the energy component, which has risen by a third since 2012 thanks to wholesale market integration and more competition between suppliers. Differences in the tax component remain three times larger (measured by relative standard deviation) than the in the case of network and energy costs. Thus, taxes and levies are the main source divergence of retail prices for the industry.

Taxes and levies were the main reason for high prices in Denmark and Germany. No other Member State came close to amounts collected by governments in Copenhagen and Berlin. Renewable taxes made up 70% of the taxes and levies component in Germany, while in Denmark environmental taxes were responsible for 95% of the whole component. In Cyprus, the energy component was the biggest contributor to the total price, mirroring the composition in the household sector. The lowest taxes were recorded in Bulgaria (1 €/MWh), Malta (2 €/MWh) and Sweden (4 €/MWh).

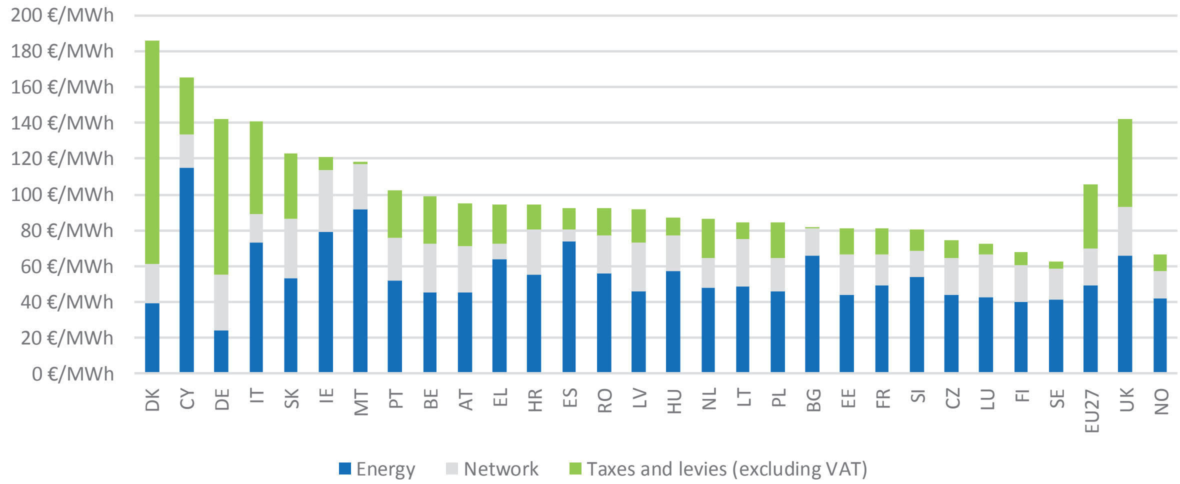


Figure 24 - Industrial retail electricity prices in 2019 (ID band)
Source: DG ENER in-house data collection, Eurostat

As for the network costs, Ireland (34 €/MWh), Slovakia (33 €/MWh) and Germany (31 €/MWh) reported the highest values in this component. The lowest network costs were registered in Spain (7 €/MWh) and Greece (9 €/MWh).

The largest energy components were reported in the island systems of Cyprus (115 €/MWh), Malta (92 €/MWh) and Ireland (79 €/MWh), similar to the situation in the household sector. German and Danish industrial consumers enjoyed the lowest commodity costs, which partly helped mitigate the high volume of taxes and levies in both countries. In relative terms, the energy component played the biggest role in the final bill of Bulgarian and Spanish businesses where it accounted for 80% of the total price.

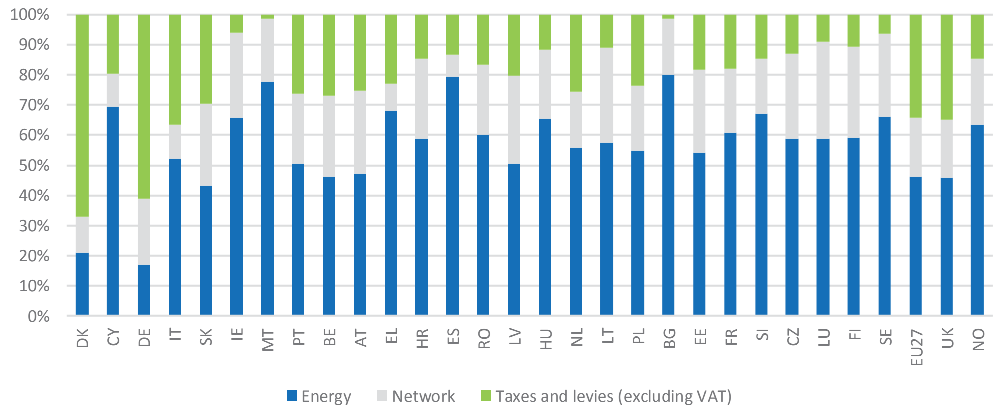


Figure 25 – Relative composition of industrial retail electricity prices in 2019 (ID band)
Source: DG ENER in-house data collection, Eurostat

Several countries grant tax reductions to energy-intensive industries. As energy intensity is not based on consumption volumes alone, but also on the share of the energy bill in the total production cost, the ID band can include enterprises that benefit from such reduced tax rates.

Total retail prices increased in all but seven Member States between 2017 and 2019. The largest falls occurred in Latvia and Greece (both -11%), the largest increase was reported from Romania (+28%).

Composition of taxes, levies, fees and charges

The following section considers only policies that directly impact retail prices. The decrease in the tax component between 2017 and 2019 was driven mainly by falling renewable taxes subcomponent (-3 €/MWh), while slight rises in capacity and environmental taxes partly compensated for this.

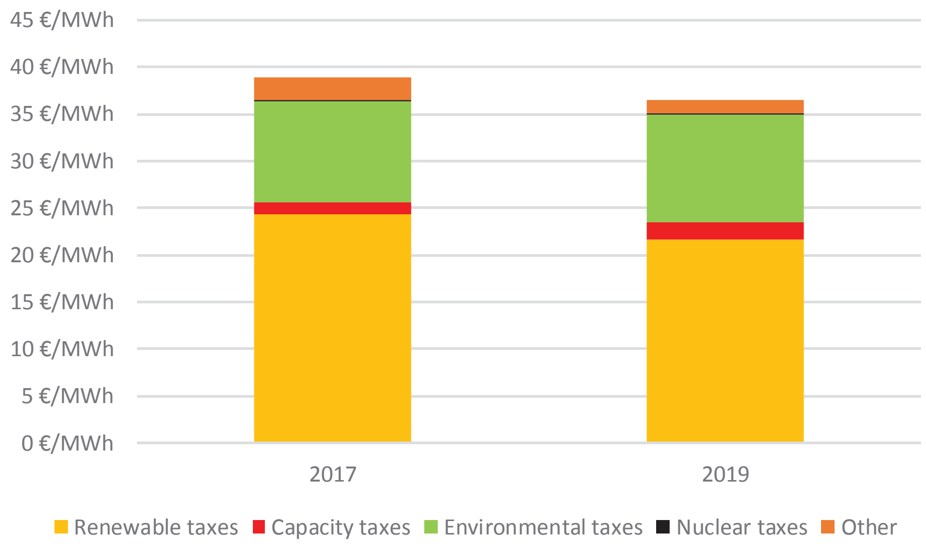


Figure 26 – Comparison of taxes and levies between 2017 and 2019 (ID band)
Source: DG ENER in-house data collection

In 2019, more than half of the whole tax component paid by the industry went towards the support of renewable energy. Environmental taxes were the second biggest item with a 31% share. Capacity taxes accounted for 5% of the tax component.

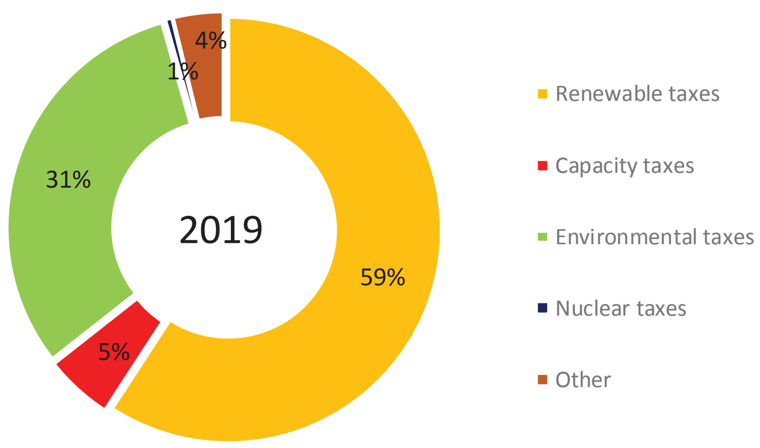


Figure 27 - Composition of taxes and levies in 2019 (ID band)
Source: DG ENER in-house data collection

The following section contains brief comments on the individual subcomponents of the taxes and levies category. The definitions of the subcomponents can be found in the previous chapter on household retail prices.

Value added tax

VAT is recoverable for most industrial consumers in all reporting countries. Therefore, this report analyses industrial prices excluding VAT. Other recoverable taxes are also excluded from the price.

Environmental taxes

Environmental taxes rose by 6% between 2017 and 2019 to 11 €/MWh at EU level. They were collected in some form in all Member States with the exception of Latvia. The rise of the EU27 average was driven mainly by higher taxes in Germany, the Netherlands and Spain, which were partly mitigated by declines in France and Denmark (where the highest tax of more than 100 €/MWh is applied).

Renewable taxes

Taxes financing the support of renewable energy, CHP and energy efficiency measures declined by 11% between 2017 and 2019 to 22 €/MWh at EU level for industrial users. Renewable taxes accounted for 20% of the total retail price in 2019, down from 24% in 2017. Similar to the household category, renewable taxes were not imposed in Bulgaria, Finland, France and Malta. In Finland and Malta, the renewable energy support scheme is not financed from a levy on electricity consumption but from the central state budget. France has been following the same example since 2016. Therefore in these 3 countries the explicit cost of supporting renewable energy is zero for industrial consumers. In Hungary, industrial consumers are subject to a renewable surcharge, while households are exempted. Bulgaria does not impose renewable levies on electricity consumption at all. Renewable taxes have declined in most Member States since 2017. The only significant exception was Belgium, where the renewable surcharge has tripled, and the Netherlands, where it has doubled.

Capacity taxes

Charges related to security of supply or the financing of regulatory authorities were collected in 11 countries in 2019, up from 6 in 2008. The impact of security of supply related charges remained limited, below 2% of the average EU27 price.

Nuclear taxes

Nuclear taxes are collected in Belgium, Italy (which closed its last nuclear power plant in 1990) and Slovakia. Their impact on retail prices at EU level is negligible.

Other charges

The absolute value of the residual subcomponent decreased from 2 €/MWh in 2017 to 1 €/MWh in 2019. Its share in the total retail price amounted to 1% in 2019.

Situation of large enterprises and energy-intensive industries

This section analyses retail prices for the IF band which contains consumption levels between 70 and 150 GWh per annum. Industrial electricity prices in the IF band were unchanged at 76 €/MWh between 2017 and 2019 at EU level, and were 5% lower compared to 2010. Thus, electricity for the largest consumers is today cheaper than it was a decade ago both in nominal and real terms. Since 2017, the energy component rose by 13% to 42 €/MWh, but the effect of rising wholesale prices was fully compensated by falling taxes, which declined by 18% to 23 €/MWh. The network component remained unchanged at 12 €/MWh in the same period.

For large electricity consumers, the influence of the energy component and, by extension, wholesale prices over the final retail price is even more pronounced than in the case of smaller or mid-size companies. Nevertheless, even in this segment, the importance of taxes has grown considerably in the past decade, mostly at the expense of the energy component. The share of taxes in the final bill more than doubled to 36% between 2010 and 2017, but then it fell to 30% in 2019, in line with developments in other consumer bands. This was the first decrease since at least 2007 and mirrors a similar trend in household prices. The share of the energy component declined as the amount of taxes paid by the industry grew. At the beginning of the decade, commodity costs accounted for 70% of the total price. Their share reached 55% in 2019, which was nine percentage points higher than in the ID band.

In absolute terms, the energy component declined by 25% to 42 €/MWh in 2019 compared to 2010. The contraction of the energy component, which apart from wholesale electricity prices contains retailers' mark-ups, can be partly linked to EU energy policies supporting competition through more interconnection capacities and market coupling. The network component grew by 11% over the past decade to 12 €/MWh and its share in the total price rose from 13% to 15%. The taxes and levies component rose by 65% since 2010 to 23 €/MWh.

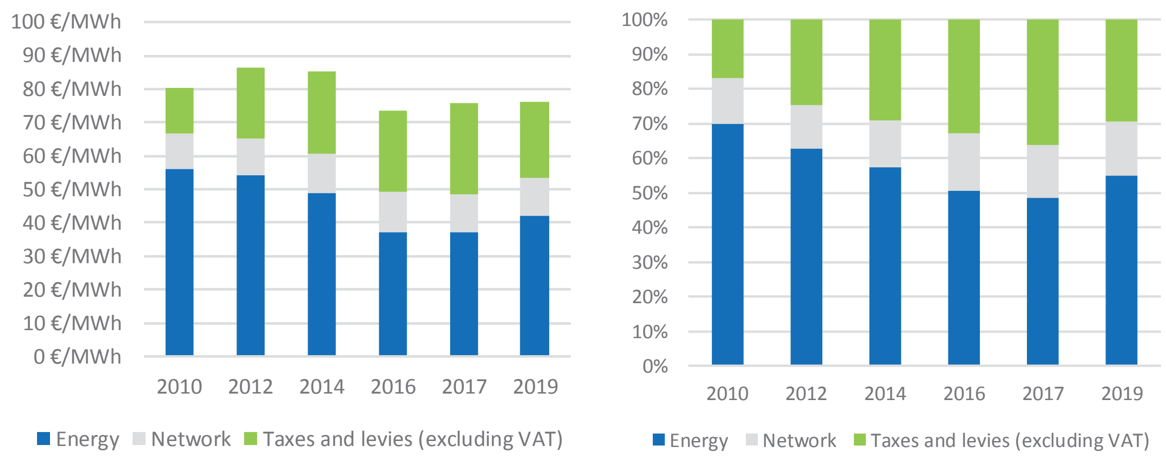


Figure 28 - Evolution and composition of the EU27 industrial retail prices (IF band)
Source: DG ENER in-house data collection, Eurostat

Situation in individual Member States

As illustrated by **Figure 29**, Denmark reported the highest retail price in the IF band (177 €/MWh), followed by Cyprus (144 €/MWh). Sweden (50 €/MWh) and Finland (58 €/MWh) stood at the other end of the price spectrum. 11 Member States reported prices lower than the EU27 average in 2019, indicating that larger economies with a greater weight have prices closer to the average level compared to other consumer categories. Overall, industrial retail prices in the IF band were much less spread out in 2019 compared to previous years. Their relative standard deviation, which moved around 40% for most of the past decade, declined by to 33% in 2019, pointing towards rising convergence across Member States. The main driver behind this development has been the convergence in the energy component, which has risen substantially since 2012 thanks to wholesale market integration and more competition between suppliers. Differences in the tax component have also come down over the last years, but still remain three to four times larger (measured by relative standard deviation) than the in the case of network and energy costs. Thus, taxes and levies are the main source of divergence of retail prices for the industry.

By far the highest taxes and levies were paid by large industrial enterprises in Denmark (125 €/MWh). Germany came up distant second (61 €/MWh). The lowest taxes were recorded in Bulgaria (1 €/MWh), Malta (2 €/MWh) and the Netherlands (3 €/MWh).

As for the network costs, Malta (25 €/MWh) and Czechia (23 €/MWh) reported the highest values in this component. The lowest network costs were registered in Spain (5 €/MWh) and Cyprus (6 €/MWh).

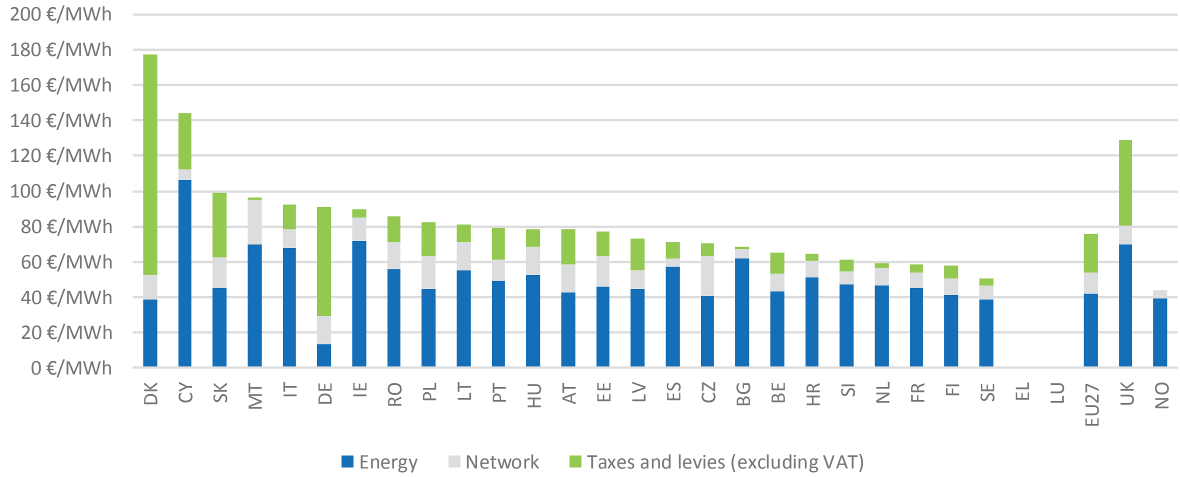


Figure 29 - Industrial retail electricity prices in 2019 (IF band)

Source: DG ENER in-house data collection, Eurostat. Data for Greece and Luxembourg are either unavailable or confidential.

The largest energy components were reported in the island systems of Cyprus (106 €/MWh), Ireland (72 €/MWh) and Malta (70 €/MWh), similar to the situation in the household sector. Large German enterprises enjoyed the lowest commodity costs, which partly helped mitigate the high volume of taxes and levies. At 13 €/MWh, the German energy component was three times cheaper than the price of baseload electricity in the local wholesale market. In relative terms, the energy component played the biggest role in the final electricity bill of Bulgarian and Spanish businesses where it accounted for 80-90% of the total price.

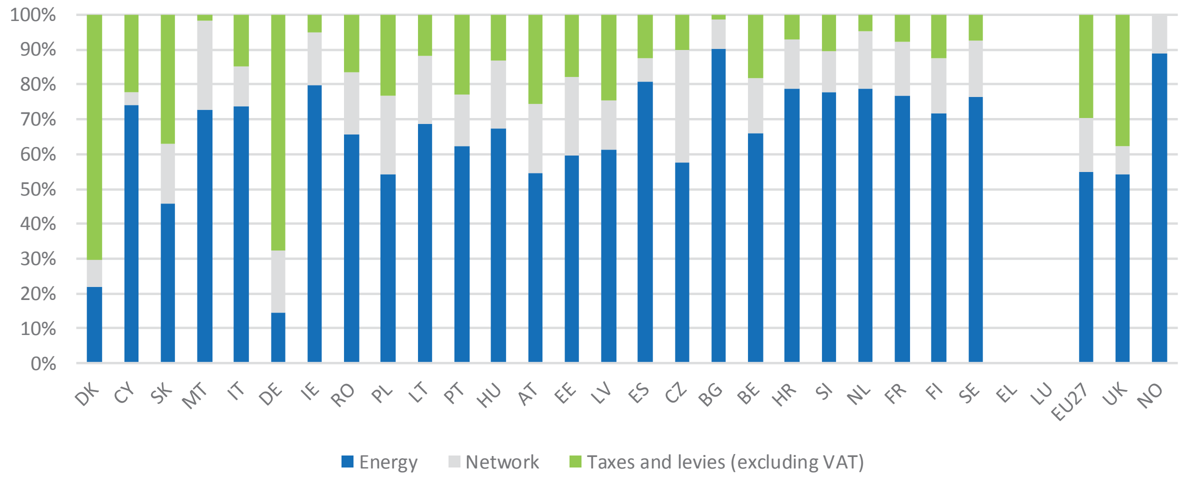


Figure 30 – Relative composition of industrial retail electricity prices in 2019 (IF band)

Source: DG ENER in-house data collection, Eurostat. Data for Greece and Luxembourg are either unavailable or confidential.

1.2.3 International comparisons

Component level data enables the identification of price drivers. As this data is not available for G20 trading partners, the difference between wholesale and retail prices can serve as a proxy. The difference consists of network charges, taxes, levies as well as of the costs and profit margins of supply companies. Consequently, the difference includes elements from all three components. The non-regulated, supply-related costs account for only a small share of the total difference in most countries.

The difference between wholesale and retail prices, or the impact of the regulated part of the retail price, is larger in the EU27 than in its G20 trading partners. This holds for both electricity and natural gas and both households and industry. Retail prices are below wholesale prices in some trading partner countries, indicating that prices are subsidized and regulated at low levels. Consumers pay less than the actual generation cost of the electricity they use.

Electricity wholesale prices in the EU are often comparable to those in G20 countries. This however does not translate into retail prices as these are on average higher in the EU than in all G20 trading partners. This is a result of relatively high value of taxes and levies which, among other things, provide financing for the promotion of renewable energy, for energy efficiency measures and for other climate-related policies. Higher taxes have brought about higher retail prices but have also propelled the EU to become the leading force in combatting climate change.

Household Electricity Prices

The EU27 average difference between household retail prices and wholesale prices has increased from around 100 €/MWh in 2008 to more than 180 €/MWh in 2019.

The difference in the US is lower, at around 80-90 €/MWh, but it has increased since 2008. The same analysis using the wholesale proxy for China shows negative values, which highlights the fact that household consumers in China are not paying the full cost of their electricity use. Since 2018, the proxy used for China has been increasing, which suggests that subsidies for households are being reduced. The difference in Japan has varied considerably over the observed period, with the Fukushima effect on wholesale prices likely to have played an important role in the 2011 peak. UK’s trend mirrors closely that of the EU27. For the other G20 countries, the difference is also much lower than the EU27 average. In Mexico, Indonesia and Russia, there was only a small difference between the two prices, highlighting also that retail prices are being held low in these countries. In Canada and Turkey, the difference is greater, but still significantly smaller than in the EU27, while Brazil appears to have caught up with the EU27, displaying a greater differential in 2019.

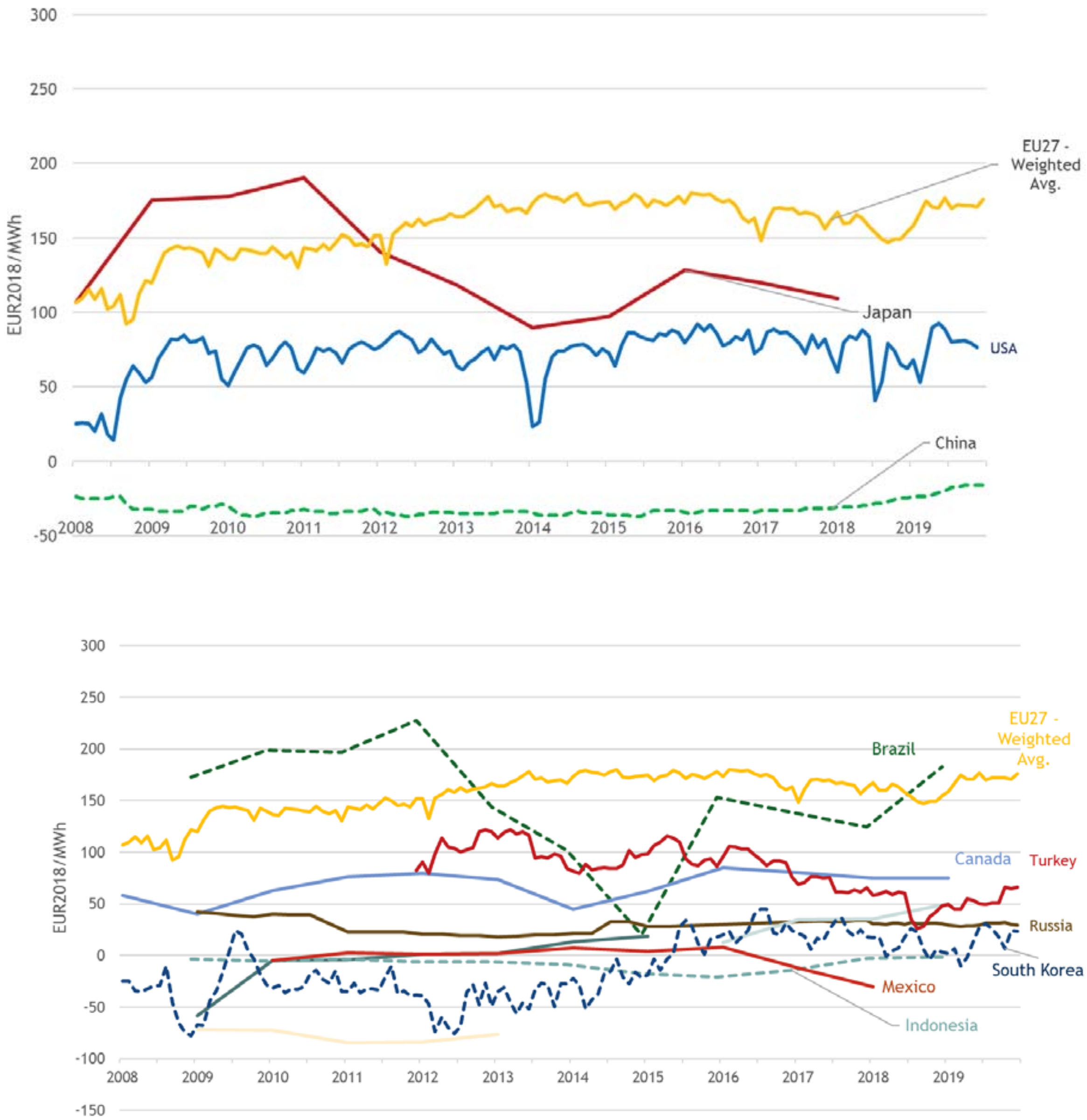


Figure 31 - Difference between household retail electricity prices and electricity wholesale prices 2008-2019, EUR_{2018}/MWh

Source: Trinomics et altri study (2020)

Industrial Electricity Prices

The EU27 average difference between industrial retail prices for the average consumption band and wholesale prices has been relatively volatile lately, moving from 50 to 80 €/MWh within short periods of time due to rapid changes in the wholesale market. The difference in the US was lower than in the EU27, at around 15-40 €/MWh over the period. The difference in Japan is in the same order of magnitude as the EU27 average and US levels, but has varied considerably over the period, with the annual frequency of the data playing a role, and the Fukushima effect on wholesale prices likely to have played an important role in the 2011 peak. The same analysis using the wholesale proxy for China shows virtually no difference, likely due to the proxy being similar to the industrial price. It poses an interesting contrast to household prices, pointing towards energy policy priorities and price interventions in favour of households rather than industry.

For the rest of the G20 countries the difference compared to the EU27 average is typically lower, although the Canadian figures have generally been similar to the EU level.

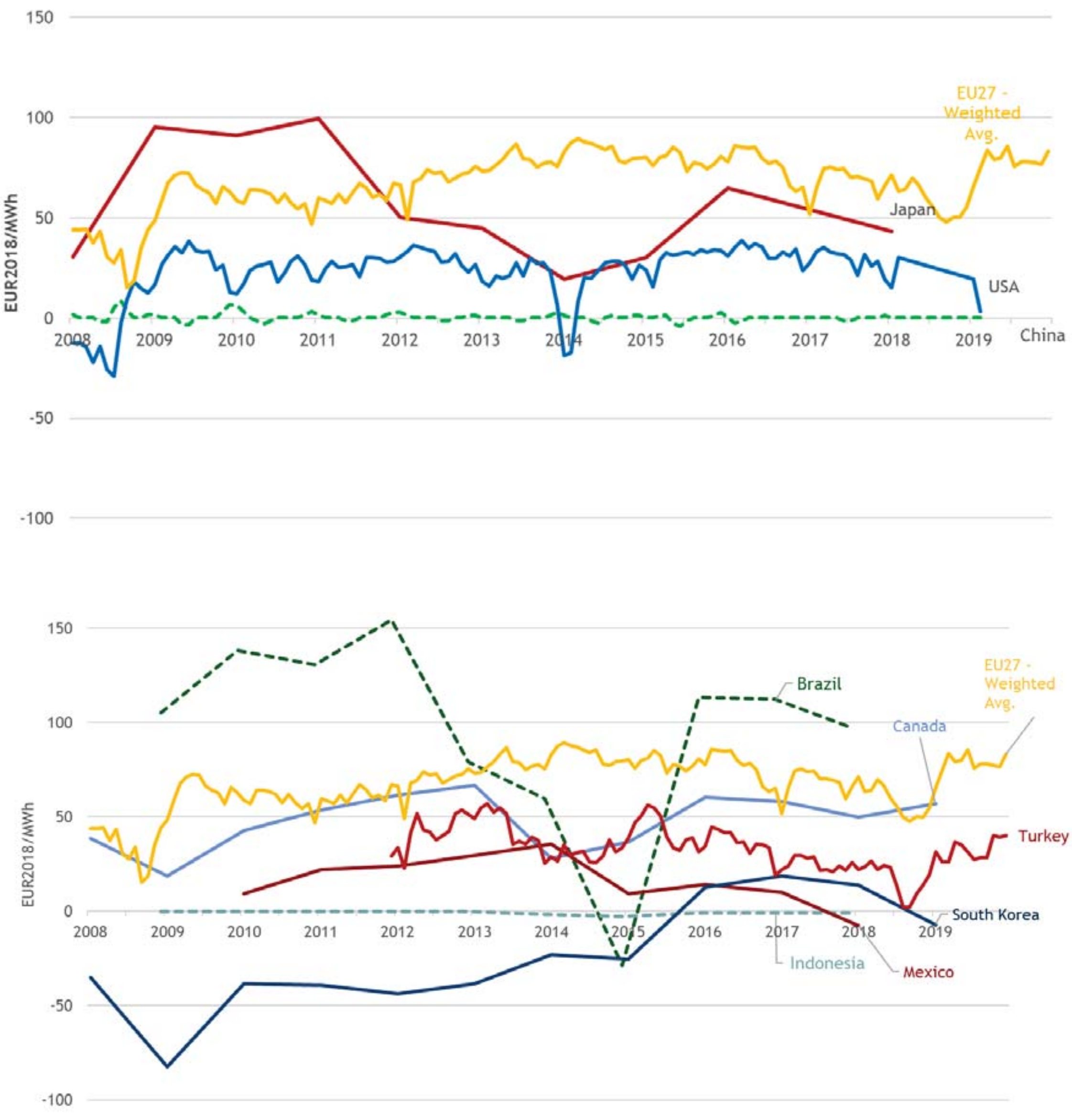


Figure 32 - Difference between industrial retail electricity prices and electricity wholesale prices, EU27 and other G20 countries, 2008-2019, EUR_{2018}/MWh

Source: Trinomics et altri study (2020)

2 Gas prices

2.1 Wholesale gas prices

Main findings

- European wholesale gas prices showed a high degree of volatility in the period of 2008-2020. In 2009, amid the economic crisis, they fell from the 2008 highs, followed by a recovery until 2012. In 2014 crude oil prices started to fall, which also impacted the wholesale gas market, reaching a new trough in 2016. This was followed a recovery again until late 2018, when LNG imports started to ramp up, resulting in a significant price fall in 2019.
- In 2020, primarily owing to the confinement measures related to the Covid-19 pandemic, resulting in falling gas demand, wholesale gas prices decreased further, and by the end of May 2020 the Dutch TTF hub price fell to historic lows (3.4-3.5 €/MWh). Meanwhile, other energy commodities, such as crude oil, underwent significant price falls in the first four months of 2020. Oil prices were impacted by the demand decrease amid transport restrictions (Covid-19 confinement measures) and by the lack of agreement on production adjustment measures by major oil producers until mid-April 2020.
- Among the different pricing mechanisms, oil-indexation has been losing ground in Europe but continues to play an important role in certain regions, in particular in the Mediterranean. On the other hand, hub prices gained significant ground in Central Europe and in Scandinavia and the Baltics: wholesale prices in these regions are more and more aligned with Northwest European hub prices, rather than with oil-indexed prices. In Europe on average, the share of hub priced contracts rose to 78% within the total gas consumption in 2019, up from 15% in 2005.
- Although oil-indexed prices have a diminishing role in the European market, a correlation between European wholesale gas prices and the oil price still exists, reflecting the close relationship between the gas market and the wider energy complex, which also depends on the macro-economic situation. Amid increasing LNG imports in the EU, reaching a historically high 89 bcm in 2019, wholesale gas prices decoupled from oil, which might point to a further weakening link of oil in gas price formation.
- The importance of LNG is growing on the European gas markets; in 2019 it gave around a quarter of the total gas imports in the EU and its share in the EU gas consumption was 22%. LNG, if it is competitively priced, can be an alternative to pipeline gas imports. The presence of LNG therefore can contribute to the further diminishing role of oil indexation and increasing energy security of supply.
- Daily wholesale gas prices can show extreme volatility, typically when cold snaps sharply increase the gas demand while supply is constrained by infrastructure unavailability or other factors, such as low nuclear or renewables generation in the electricity sector. Over the past decade there were two price spikes in March (in 2013 and 2018), when low gas storage levels at the end of the winter also contributed to the price spikes. On the other hand, extremely low prices (such as in 2009 and 2020) can occur when demand drops unexpectedly, in the consequences of unforeseeable events.

- EU natural gas demand shows a strong seasonality as in many EU countries natural gas is the principal fuel for residential heating. There is a clear negative correlation between temperatures and daily gas consumption in the residential sector. There is a weak negative link between temperatures and wholesale gas prices, however, price level is influenced by many other factors, as the most liquid Dutch TTF hub prices is increasingly used as global gas benchmark.
- In international comparison, European wholesale gas prices are well above those in major gas producing countries (Canada, Russia, US) but in general lower than in other G20 economies, especially those which solely or largely rely on LNG imports (e.g. China, Japan, South Korea). International prices have slightly converged since 2015 which means that the absolute value of the regional differences decreased but, nevertheless, these differences proved persistent. In 2019 the ratio of the lowest and the highest observed wholesale gas price was nearly 7 among G20 countries.

2.1.1 Evolution of wholesale gas prices

After the peak in 2008, driven by robust global economic growth and rising demand from emerging markets, particularly China, gas prices in Europe showed a sharp decrease in 2009 during the economic crisis. However, as of 2010 they started to recover and by the end of 2012 they reached the peak levels of 2008, helped by the economic recovery and the Fukushima accident that increased global LNG demand. In March 2013, hub prices exceeded the record levels reached in 2008, also owing to the unusual cold spell across Europe at the end of that month.

In 2013-2016, wholesale gas showed a gradual decline and by 2016, European wholesale gas prices fell to the lowest levels since 2009. Gas prices in this period were impacted by low oil prices (falling from 120 USD/bbl in summer 2014 to less than 30 USD/bbl in February-March 2016) and increasing global LNG supplies, coupled with weak demand put pressure on European gas prices.

Wholesale gas prices started to increase again in the first half of 2016 and by autumn 2018 they rose to the levels seen in 2012, owing to increasing energy commodity prices (oil, coal, etc.) and on the demand side to good economic performance in the EU and in the emerging markets as well. EU hub prices in October 2018 were close to 27-28 €/MWh.

As of the end of 2018 LNG imports, especially from Qatar, US and Russia started to pick up, owing to the narrowing price premium of the Asian markets that made the EU more attractive LNG destination. By the end of 2019, owing to abundant global LNG supply, mild winter weather and high gas storages, EU gas hub prices fell to 10-12 €/MWh.

In 2020 the downward price trajectory continued. In January and February 2020 mild winter conditions, and high renewables share in power generation resulted in decreasing demand for gas, in parallel with high LNG imports and storage withdrawals in the EU, pushing the wholesale prices further down. As of March confinement measures related to the outbreak of the Covid-19 pandemic have been introduced, resulting in restriction of free movement of persons and decreasing industrial activity, demand for gas dropped further, resulting in falling gas wholesale prices. By the end of May 2020 spot prices on the Dutch TTF hub fell as low as 3.4-3.5 €/MWh, the lowest since the beginning of the trade on this hub, being around one fifth of the typical range (18-20 €/MWh) throughout several years.

In parallel, the crude oil market underwent a supply and demand side shock, as major oil producers could not find an agreement on production adjustment (OPEC+) until April 2020, which, combined with dropping demand for oil products amid the confinement measures leading to falling transport, resulted in a huge oversupply and steep price falls on the oil market. In April 2020 the Brent crude physical contracts fell as low as 10-15 USD/bbl, which also impacted the wholesale gas market and other energy commodities.

The Commission follows the development of a number of wholesale gas prices across the EU, including prices at trading hubs, estimated border prices calculated based on customs data and other prices reported by commercial data providers or other sources. Wholesale prices move in a rather broad band: in 2008-2014, the average difference between the highest and lowest price was close to 20 €/MWh. From 2015 to early 2019, prices have perceivably converged, however, as of 2019 hub prices decreased but oil indexed contracts remained stable, the difference between the lowest and highest prices rose again. In case of extreme events (cold spells and/or supply disruptions) affecting specific regions, (e.g. in the first quarter of 2018), the price band can become much wider.

Hub prices, especially those in the liquid Northwest European markets have been close to the lower boundary of the price range during most of the last decade, as demonstrated in Figure 33by the price at the Dutch (TTF) and the UK (NBP) hubs. Oil-indexed prices, on the other hand, have been typically closer to the upper boundary of the price band for most of the period, as indicated by the development of the Platts North West Europe Gas Contract Indicator (GCI), a theoretical index showing what a gas price linked 100% to oil would be.

It is important to note that some long term contracts, for example Russian imports in many countries have gradually moved away from oil indexation and adopted hub based pricing, which resulted in more competitive prices for gas customers in these countries, mainly in Central and Eastern Europe. This could also be observed for the German average border price.

Regional price differences are largely explained by the different pricing mechanisms and the different levels of competition. In general, markets with higher levels of competition show a lower price level than markets with only one supply source. Lower oil prices, the decreasing role of oil-indexation and, in some cases, alternative supply sources (e.g. increasing LNG imports as of 2019) contributed to converging wholesale prices in Europe.

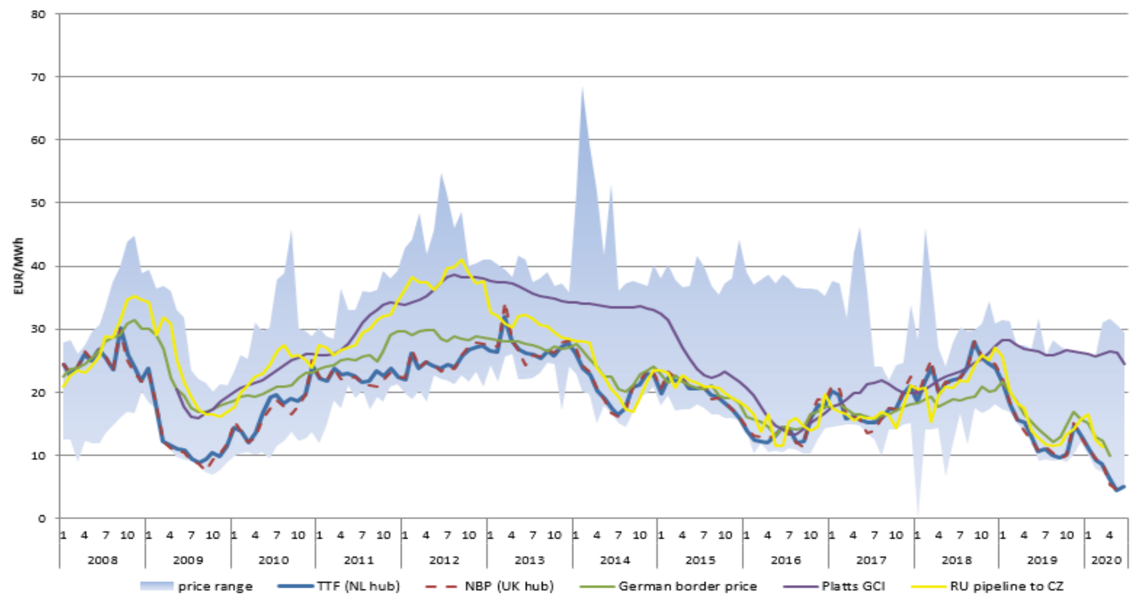


Figure 33 - Selected wholesale gas prices in Europe

Source: Platts, BAFA, Eurostat Comext

The difference between GCI and the price at the Dutch hub (TTF) averaged around 10 EUR/MWh in 2011-2014. In the wake of the oil price fall in 2014-2015, oil-indexed gas prices have significantly decreased, facilitating the convergence of European wholesale gas prices. In certain periods, oil-indexed prices were actually lower than the price at the most liquid gas hubs in Northwest Europe. This was the case during most of the 2016-2017 winter and in autumn 2018 as well. However, with the continuous decrease in the European hub prices and constantly high oil-indexed contracts, the GCI price premium started to increase as of the end of 2018 and by May-June 2020 it rose above 20 €/MWh, which was the highest since the creation of the GCI index in 2009. This perfectly underlines the uncompetitive nature of oil-indexed contracts vis-à-vis hub based gas pricing during the last two years, prompting gas exporter countries to adopt more hub based pricing in their gas price formulae.

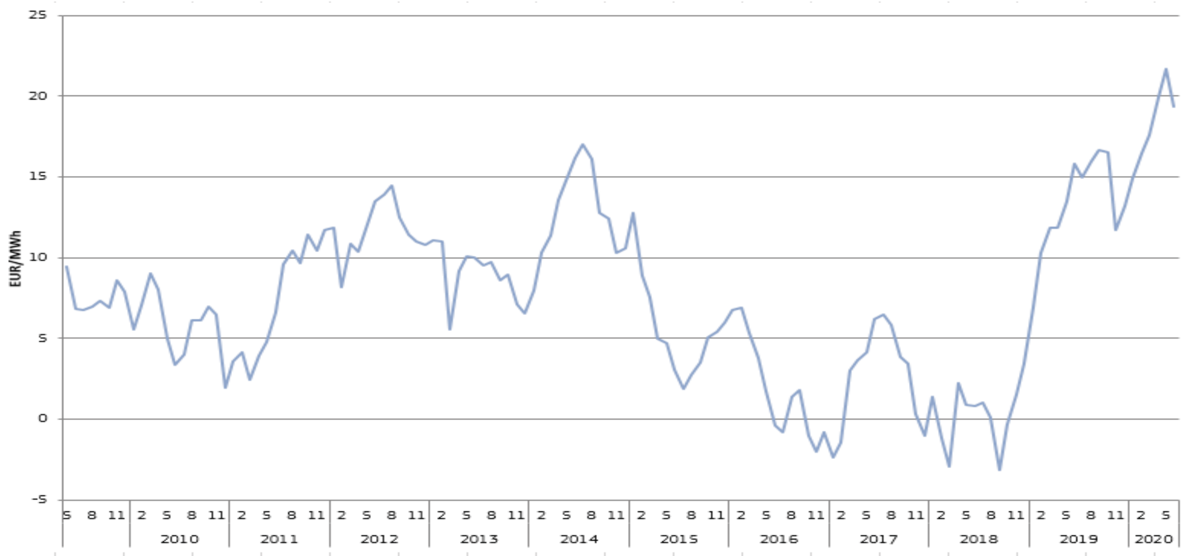


Figure 34 - The difference between the Platts North West Europe Gas Contract Indicator (GCI) and the Dutch hub price (TTF)

Source: Platts

Figure 35 and **Figure 36** provide a look at the evolution of gas price formation mechanisms over time and/or across regions. In Europe the share of gas-on-gas competition (hub-based pricing) increased from 15% to 78% between 2005 and 2019. However, there are big regional differences behind the European average.

In North-Western Europe (Belgium, Denmark, France, Germany, Ireland, Luxembourg, Netherlands, UK) gas-on-gas competition is now almost exclusive, its share was 95% in the total gas contracts (measured by consumption) in 2019, up from 27% in 2005. In other parts of Europe gas-on-gas competition practically did not exist in 2005, whereas in 2019 its share was 80% in Central Europe (Austria, Czechia, Hungary, Poland, Slovakia, Switzerland), 64% in Scandinavia and the Baltics (Estonia, Finland, Latvia, Lithuania, Norway, Sweden) and 60% in Southeast Europe (Bosnia, Bulgaria, Croatia, North Macedonia, Romania, Serbia, Slovenia). In the Mediterranean region (Greece, Italy, Portugal, Spain, Turkey) gas-on-gas competition had the lowest share, around 47% in 2019.

In parallel with the increasing share of gas-on-gas competition, the share of oil-price escalation (oil-indexed contracts) decreased, as well as other forms of price formation, such as bilateral monopolies or regulated contracts (such as regulation of cost of service, political and social regulation, etc.) between 2005 and 2019.

Gas-on-gas competition had a share of 49% in the world on average in 2019, and oil price escalation represented 19%, whereas bilateral monopolies and diverse forms of price regulation had the remaining share (32%). With its share of gas-to-gas competition of 78%, Europe is the second region in the world behind North America regarding the penetration of hub-based pricing. In other regions, such as Asia, oil price escalation is still predominant, with its share of 63-65% in 2019. High share of oil-price indexation impacts the gas price differential between Europe and Asia, which can be a crucial factor in LNG supply in Europe. In Russia and other countries of the former Soviet-Union, Africa, Latin-America and the Middle East price regulation was still the most important contract form in 2019.

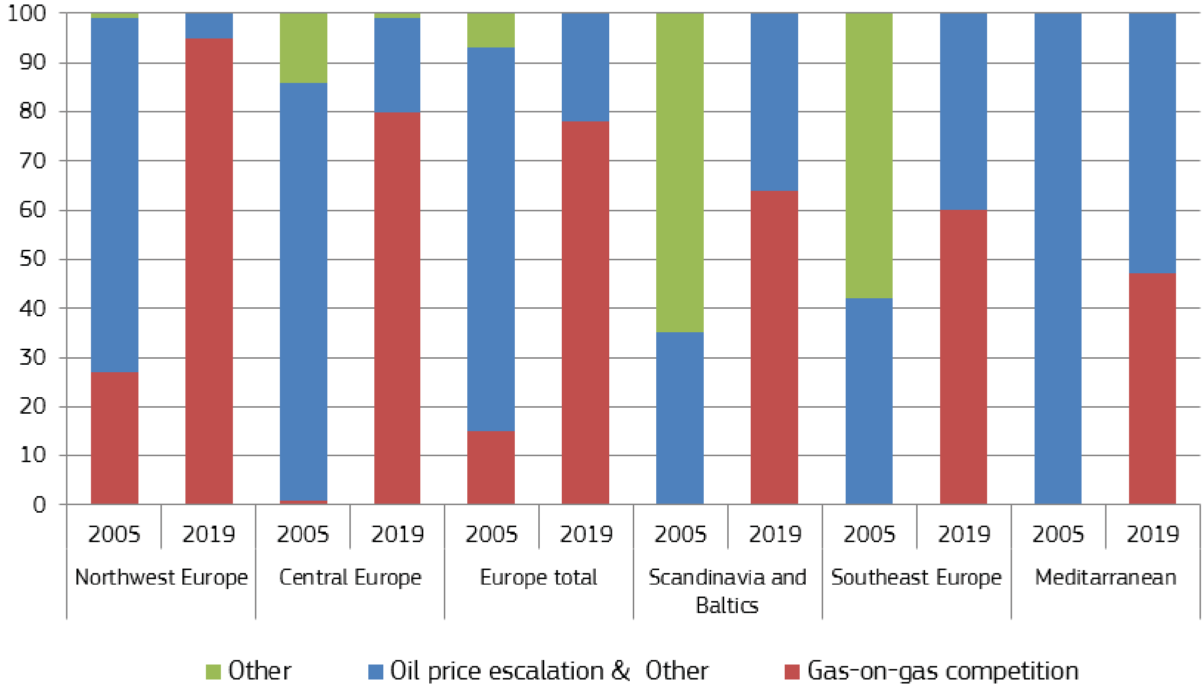


Figure 35 - Price formation in Europe

Source: IGU Wholesale Gas Price Survey, 2020 Edition
Northwest Europe: Belgium, Denmark, France, Germany, Ireland, Netherlands, UK
Central Europe: Austria, Czechia, Hungary, Poland, Slovakia, Switzerland
Mediterranean: Greece, Italy, Portugal, Spain, Turkey
Southeast Europe: Bosnia, Bulgaria, Croatia, FYROM, Romania, Serbia, Slovenia
Scandinavia & Baltics: Estonia, Finland, Latvia, Lithuania, Norway, Sweden
Other includes bilateral monopoly, netback from final product, regulated cost of service, regulated social and political, regulated below cost, no price available

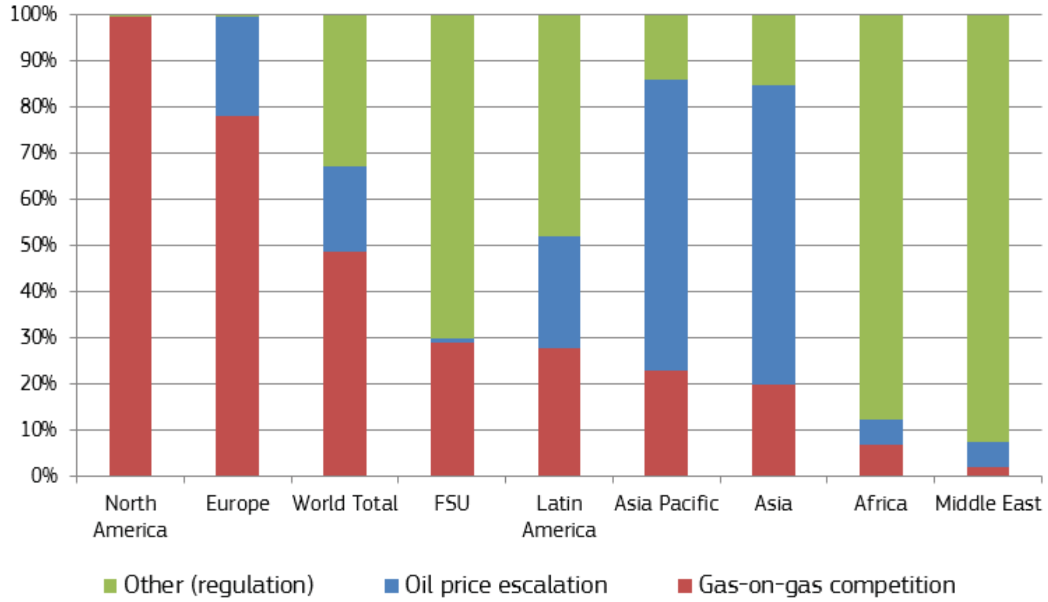


Figure 36 – The role of different price formation methods in different regions of the world
Source: IGU Wholesale Gas Price Survey, 2020 Edition Other includes bilateral monopoly, netback from final product, regulated cost of service, regulated social and political, regulated below cost, no price available

The monthly average prices depicted in Figure 33 often hide a high degree of daily volatility. For short periods, daily prices can reach exceptionally high levels, typically when cold snaps sharply increase demand while supply is limited by infrastructure constraints or other factors. Figure 37 shows that a few such occasions occurred over the last twelve years.

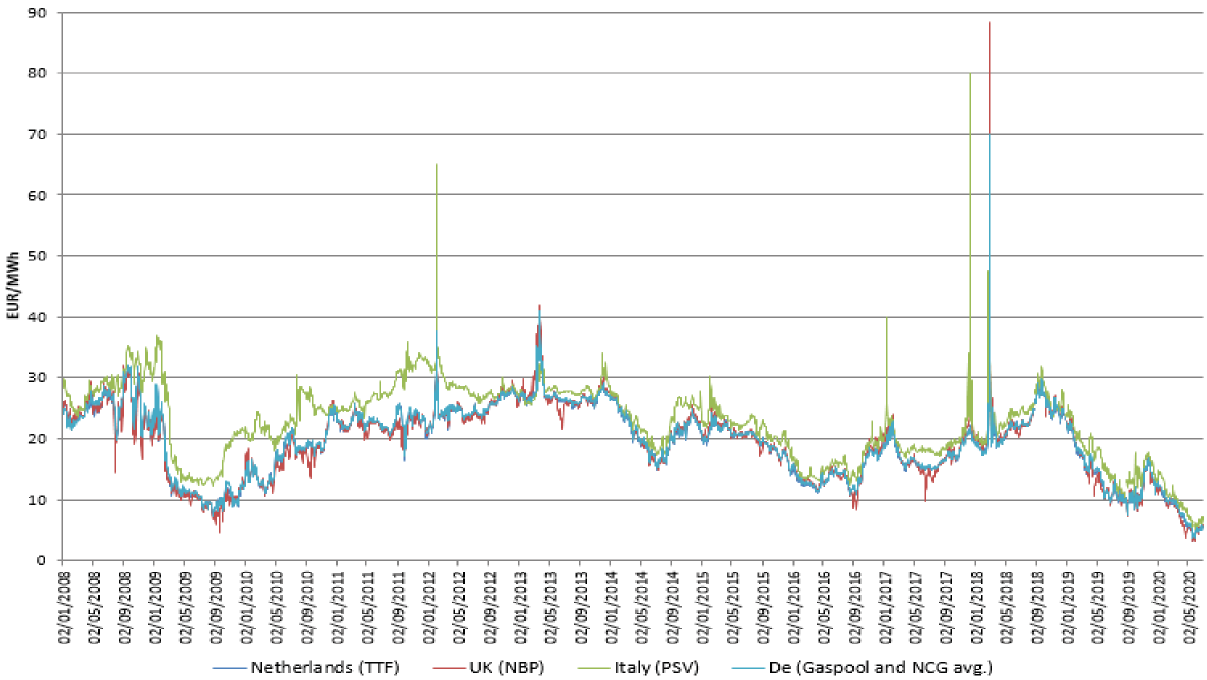


Figure 37 - Daily day-ahead prices at selected gas hubs from 2008 to mid-2018
Source: Platts

Cold spells occurred in February 2012, in March 2013 and January 2017, resulting in rapidly increasing demand for heating needs. This was in several occasions, combined with lower availability of other generation sources in the electricity mixes (e.g.: nuclear or renewables).

In March 2013 and March 2018 the cold spell arrived at the end of the winter, implying low gas storage levels, which also contributed, in the form of security of supply worries, to high market prices. In other cases infrastructure availability problems also contributed to security of supply worries, such as on 12 December 2017, when an explosion at the Baumgarten facility in Austria cut Russian supplies to the country, also impacting gas flows to Italy[9].

These occasions however resulted only in temporary price spikes, and rising prices provided the right signal to market participants and gas supplies were not interrupted at EU wide or larger regional levels, albeit the extent of the price rise seems to point toward the inflexibility of demand.

On the other hand, extreme low prices can also occur, when demand for gas falls unexpectedly (this was the case in the first half of 2009 and in the first half of 2020, when gas demand fell amid economic crisis). In these period spot prices undergo abrupt falls, however, looking at quarter-ahead or year-ahead contracts, it is usual the forward prices fall less steeply, showing that the market prices in price recovery and spot contracts may overreact the market situation.

[9] See more in Energy prices and costs in the EU, 2018 edition

2.1.2 Factors impacting the evolution of wholesale gas prices

The development of wholesale gas prices is influenced by a number of factors, such as demand in power generation and industry, heating related needs, level of gas storages, pipeline and LNG imports, etc. In this section we look into the impact of the oil price and the weather, and finally the latest developments of the European LNG imports are presented.

There is an existing correlation between oil and gas prices, which is the most obvious in the periods of large volatility of energy commodity markets (e.g.: steep price falls or hikes). However, as it was already mentioned, the gas market is now less influenced by the oil price, owing to the increasing role of hub pricing and LNG imports.

By definition, there is a strong correlation for oil-indexed gas prices, as shown by Figure 38which depicts the movement of the Brent oil price and the Platts North West Europe Gas Contract Indicator (GCI), a theoretical index showing what a gas price linked 100% to oil would be. Typically there is a 6-9 month time lag in the pricing formulas used which means that oil-indexed gas prices react to changes in the oil price with a delay. For example, Brent started to recover as of early 2016, and reached a peak in October 2018, but this was reflected in the development of oil-indexed prices only from the second half of 2016, and it reached its peak in spring 2019. The steep fall in Brent crude oil prices in March-April 2020 is not yet reflected in the GCI index (until June 2020), it might be perceivable as of autumn 2020.

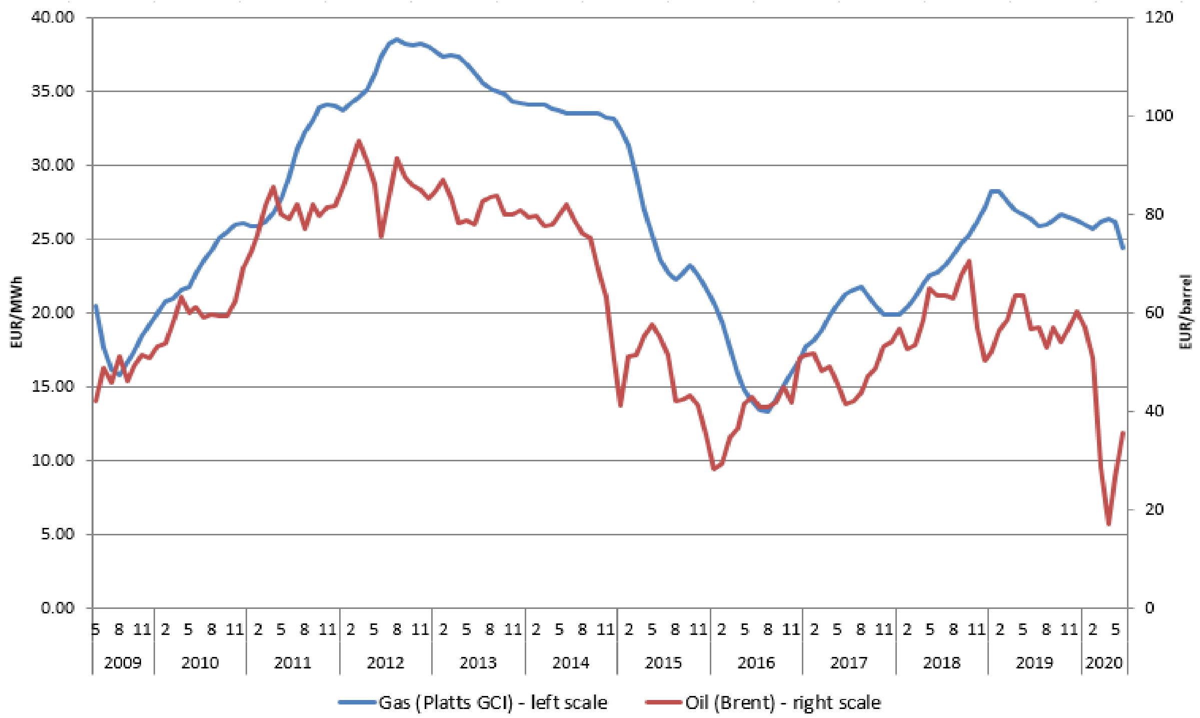


Figure 38 - The monthly average price of oil (Brent) and oil-indexed gas contracts (Platts GCI)
Source: Platts

The correlation between oil and gas prices also holds for European gas hub prices, as shown in Figure 39through the example of the Dutch TTF, Europe's most liquid hub. While oil-indexed prices have a diminishing role in the European market (see section 2.1.1), hub prices continue to be impacted by the oil price, reflecting the close relationship between the gas market and the wider energy complex, also reflecting the macro-economic situation. Nevertheless, in 2019 oil prices showed a relative stability, whereas gas hub prices fell measurably, largely owing to increasing LNG imports in the EU, which are mostly not oil-priced contracts. Therefore, we can expect that the direct link between oil and gas prices will be more perceivable for short term market movements and this will be the impact of the market sentiment on the energy commodities and not directly that of oil.

In last decade, this correlation was apparent during most of the time, however, there were shorter periods when the price trend of the two communities diverged (for example in the second half of 2014 when gas hub prices increased amid falling oil prices or in 2019 when gas prices fell amid stable oil prices).

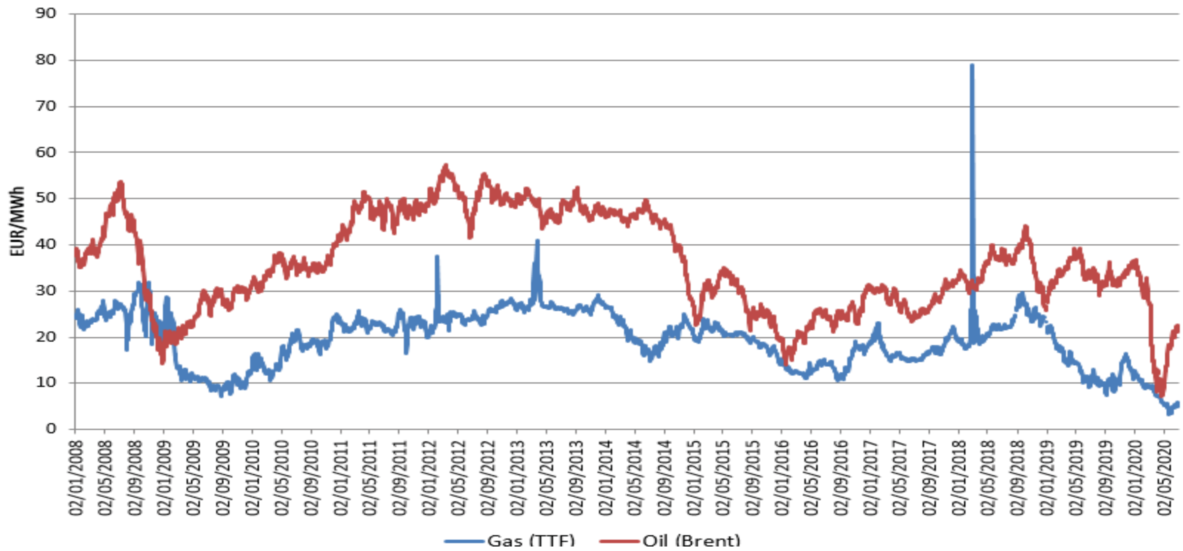


Figure 39 - Daily spot prices of oil (Brent) and gas (at the Dutch TTF hub)

Source: Platts

Figure 40 depicts daily changes of Brent and TTF. Dots represent individual days, showing the change of oil price (on the horizontal axis) and the gas price (on the vertical axis) compared to the previous day, expressed in percentage. While oil and gas prices do not necessarily change in the same direction every day, there is a weak positive correlation, particularly the increasing oil prices often coincide with increasing gas prices.

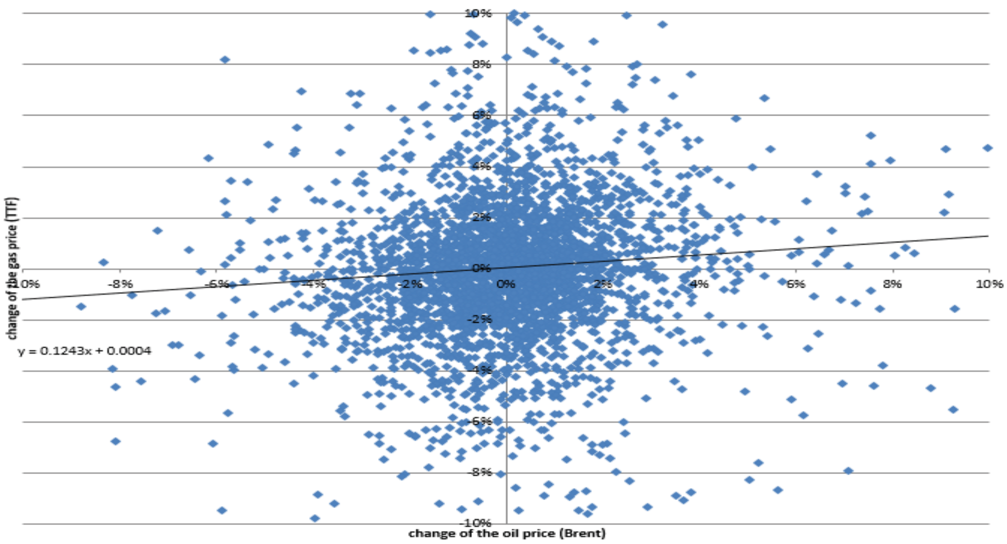


Figure 40 - Daily change of spot prices of oil (Brent) and gas (at the Dutch TTF hub), between 2008 and 2020

Source: Platts

Measured in energy content, oil has traditionally been more expensive than natural gas, owing to higher energy transformation costs (and transformation losses) and lower combustion efficiency in power generation. This was the case since 2008, with some short period of exceptions when sudden falls in oil price resulted in comparable or lower costs in energy content compared to natural gas. Between the beginning of 2008 and mid-2020, the price of Brent (measured in €/MWh) was on average 95% higher than the price of gas at the TTF hub. This ratio was following a decreasing trend between 2010 and 2018 (with the exception of the oil price fall in 2014), moving from 2 to 1.5. However, as of 2019 the gas price fall significantly, the ratio rose to 3.5 in September 2019. After volatile months, in June 2020 the ratio rose to 4.2, the highest in the last twelve years as oil prices recovered from the April lows amid permanently low gas prices. Otherwise saying, oil became very expensive vis-à-vis gas, looking at purely its energy content.

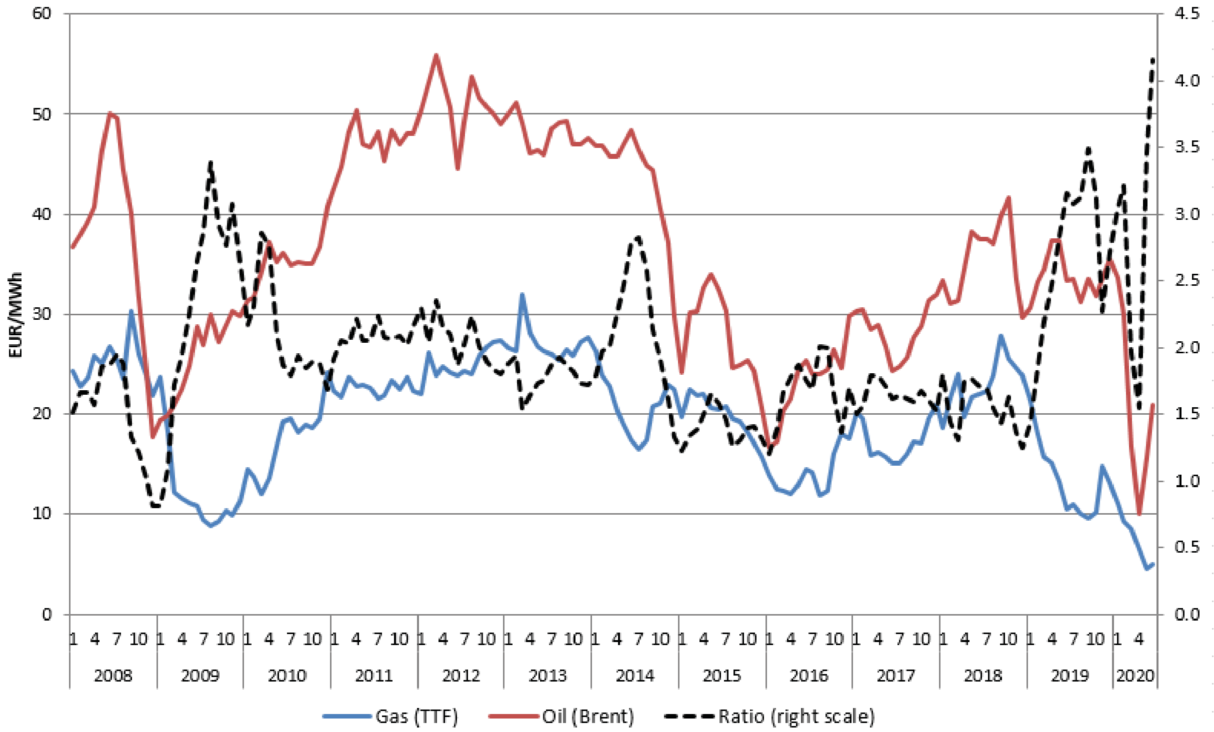


Figure 41 - The monthly average price of oil (Brent) and gas (at the Dutch TTF hub), measured in €/MWh

Source: Platts

Note: a conversion rate of 1.7 MWh/barrel was used for Brent

According to 2018 data, the residential sector covered 32% of the final energy consumption of gas in the EU; whereas natural gas had a share of 22% in the EU gross inland gas consumption.[10] Gas demand in the EU shows a strong seasonality, reflecting the fact that a large proportion of gas is used for space heating. Depending on temperatures, the level of gas consumption can be rather volatile during the winter months which can obviously have an impact on the price of gas.

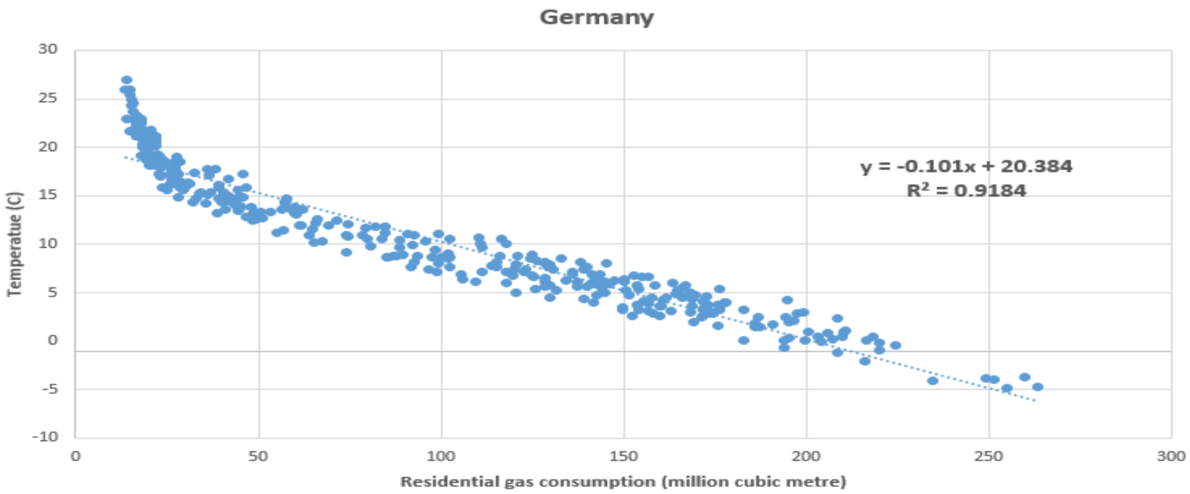
Figure 42 shows the relation between residential gas consumption and the daily average temperature in 2019 in some EU countries. Not surprisingly, lower average temperatures result in higher gas consumption in the household sector, and the relation between

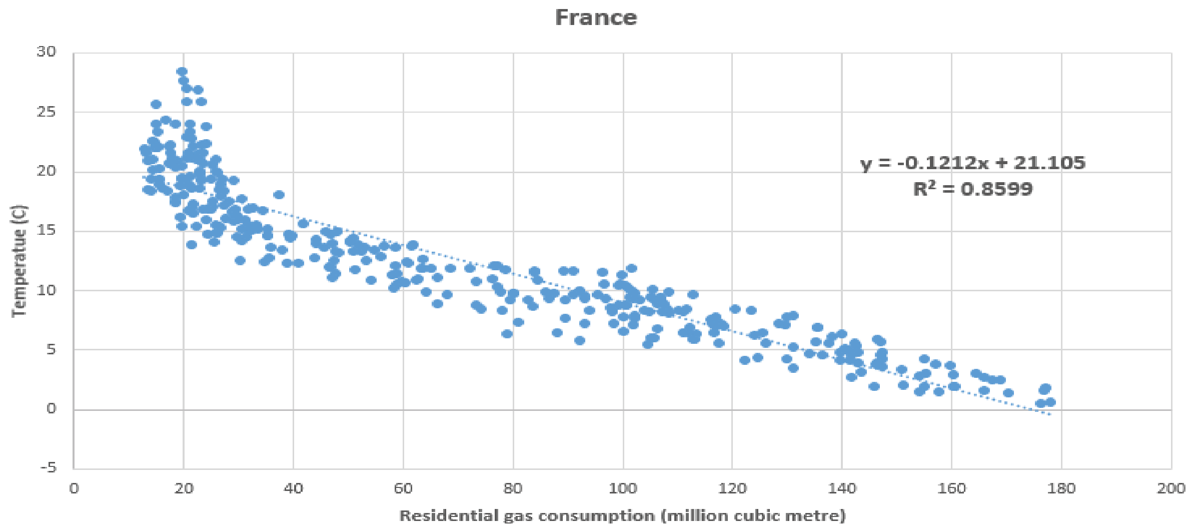
---

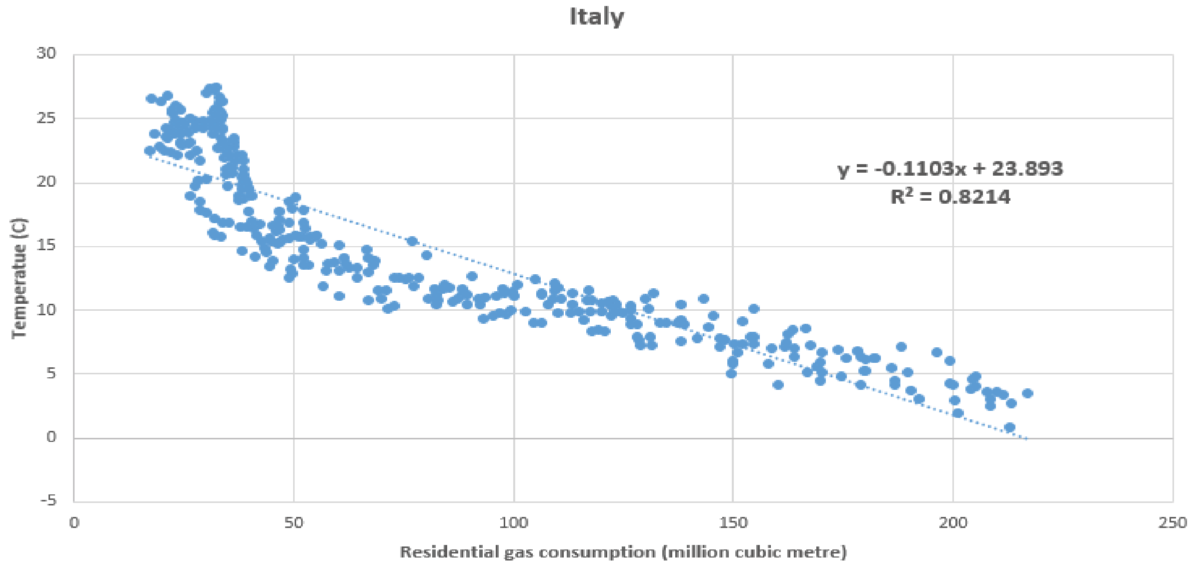
[10] Source: Eurostat (http://ec.europa.eu/eurostat/web/energy/data/energy-balances)

temperatures and gas consumption, with the exception of low consumption ranges (gas consumption other than heating) can be well approximated by a linear function.

In Germany the decrease of the daily average temperatures by 1ºC results in an increase of 9.9 million cubic meter (mcm) in the residential gas consumption. The same value in France is 8.3 mcm, in Italy it amounts to 9.1 mcm, while in the Netherlands it is 4.7 mcm. In the Netherlands the population is less compared to the three other countries, however, more than 70% of the total final energy consumption in the household sector is linked to natural gas, whereas in the other three countries this ratio is lower, amounting to 27-50%.







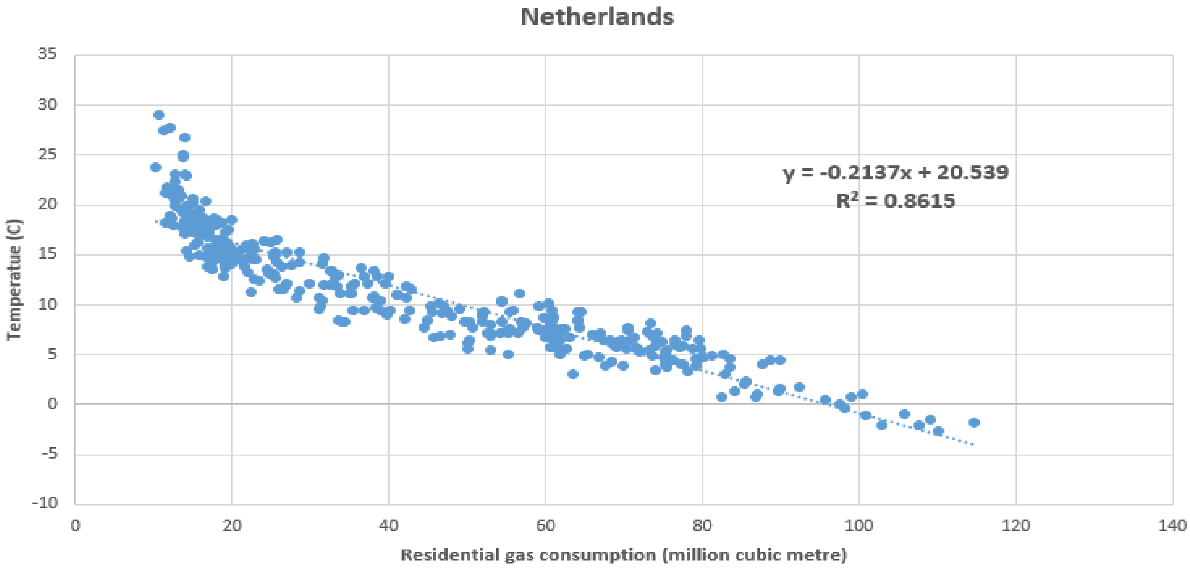


Figure 42 – Daily residential natural gas consumption and daily average temperatures in some EU countries

Source: Platts Eclipse Xplore and European Commission. Residential gas consumption is estimated by the consumption of Local Distributor Companies, which may also include consumption other than the residential sector

European gas prices over the last two years are increasingly impacted by LNG imports in the EU. Additional gas volumes result in competition with traditional pipeline gas contracts and putting under pressure the still existing oil-priced contracts. This has contributed to lower gas wholesale prices in the EU recently.

As the next chart shows, over the recent years liquefied natural gas (LNG) showed an increasing volume and role in gas consumption in the EU. In the early 2000s LNG imports in the EU showed a measurable increase in consequence of LNG regasification terminal investments in many European countries (e.g.: Spain, Italy, France, UK, Netherlands, Belgium, etc.). However, in 2011, as the aftermath of Fukushima nuclear incident in Japan, resulting in increasing demand for gas fired generation (as nuclear plants were taken offline) in the country, LNG prices in East Asia increased significantly, developing a measurable price premium to Europe and ensuring higher profitability for LNG producers to sell the gas in Asia, rather in Europe. Consequently, between 2010 and 2015 LNG imports in the EU practically halved. Since 2016 the US appeared as new player among LNG exporting countries, and the continuously increasing LNG supply on the global market (the key suppliers are: Qatar, Australia, US and more recently, Russia) outpaced the increase in LNG demand, which resulted in decreasing LNG prices and re-convergence of different regional (US, European, Asian, South-American, etc.) price benchmarks.

Decreasing Asian LNG price premium to Europe resulted in increasing imports in the EU, rising from 35 billion cubic meter (bcm) in 2015 to 89 bcm in 2019, which latter represented around 25% of total gas imports in the EU and around 22% of the total gas consumption.

The EU and the wider European market became to play a balancing role on the global LNG market. In 2019 the total global LNG trade reached an estimated 483 bcm, however, the five most important LNG importer countries in Asia (Japan, China, Korea, Taiwan and India) imported 292 bcm in this year, signalling that Asia is the demand driver on the global LNG market. However, as LNG supply showed a rapid increase owing to LNG liquefaction terminal investments in Australia, Qatar, US and Russia over the last few years, LNG that could not find a place in Asia were directed to other markets, such as Europe, which could also profit from its geographical proximity (implying lower shipment costs) to the main producers (US, Middle East and Russia).

In 2019 Europe (EU plus the UK) had an annual LNG regasification capacity of 213 bcm, signalling the still untapped opportunity to import more LNG in the future, which, if competitively priced, can be a real alternative to pipeline gas imports (from Russia, Norway and North Africa).

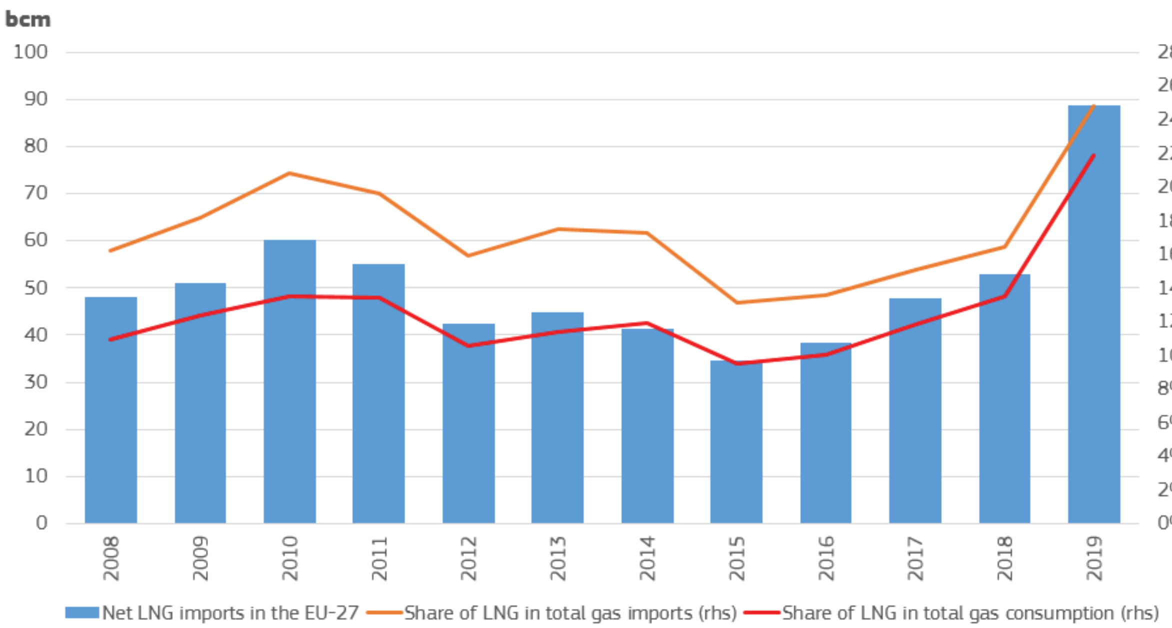


Figure 43 – LNG imports and its share in the EU-27 total gas imports and consumption

Source: Refinitiv, Eurostat

Figure 44 shows the main import sources of LNG in the EU. Since 2013, the beginning of available data series in such details, Qatar was the most important LNG exporter to the EU. In 2019 Qatar supplied 21 bcm LNG to the EU, while imports of Russian origin amounted to 18 bcm, followed by the US (14 bcm). However, in the first half of 2020 the US became the most important LNG import source, ensuring 12 bcm of imports, followed by Russia (10 bcm) and Qatar (9 bcm).

The rapid increase in LNG imports (+68% in 2019 compared to 2018) continued in the first quarter of 2020, showing an increase of 26% year-on-year in the EU. However, as of Q2 2020 confinement measures related to the Covid-19 pandemic entered in force, reducing economic activity and movement of persons, a number of LNG shipments to Europe was cancelled, and in year-on-year comparison LNG imports remained practically unchanged (-0.3%), whereas in June 2020 it fell by 18% compared to June 2019. Recovery in LNG imports might be hampered by sluggish demand owing to the economic recession and high gas storage levels across the EU, resulting in less seasonal demand during the summer storage filling season.

The two biggest LNG importer countries in the EU were France (close to 26% of the total EU imports) and Spain (with a share of little bit less than 25%) in 2019. LNG imports were also significant in the Netherlands and Belgium, having shares respectively of 10% and 8% of the total 89 bcm EU LNG imports. Measurable LNG imports could be observed in Portugal (7%), Poland (4%), Greece (3%) and Lithuania (2%), as Figure 45 shows. In Spain the utilisation rate of LNG regasification terminals is relatively low (was around 40% in Q1 2020), implying that if necessary interconnection capacities are built with the rest of the EU, more import opportunities are expected. In the Netherlands and Belgium the importance of natural gas (including LNG) imports is increasing as domestic gas production in the Netherlands is rapidly dwindling. In Poland and Lithuania LNG is seen as an important alternative to pipeline gas of Russian origin and thus an assurance of energy independence and security of supply.

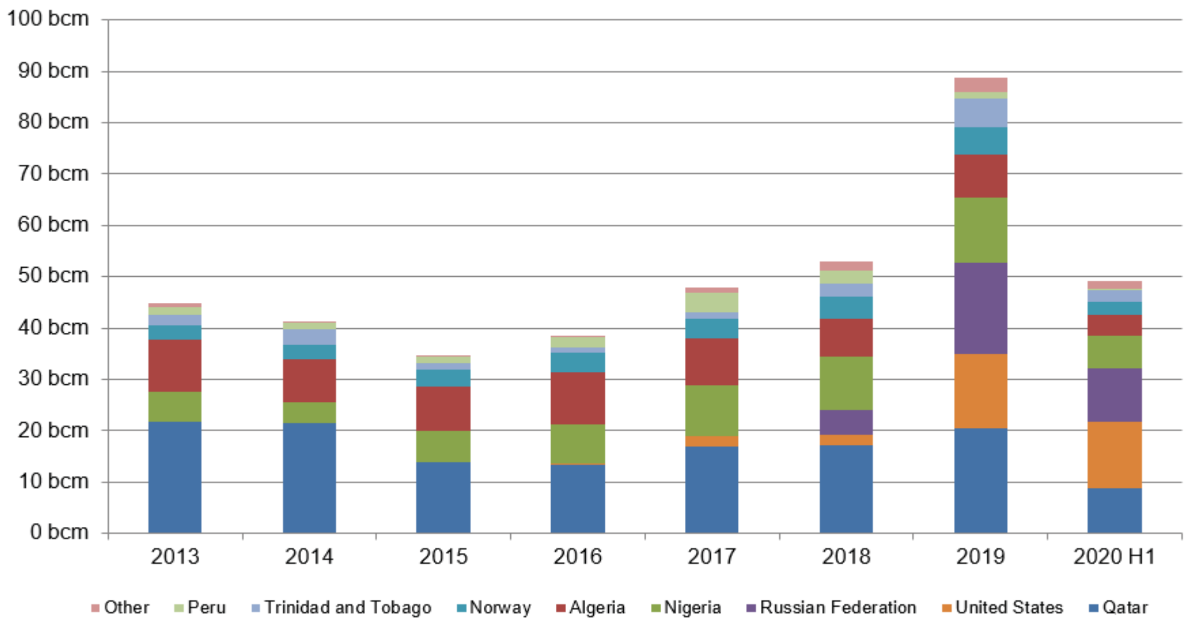


Figure 44 – Main extra-EU import sources of LNG

Source: Refinitiv

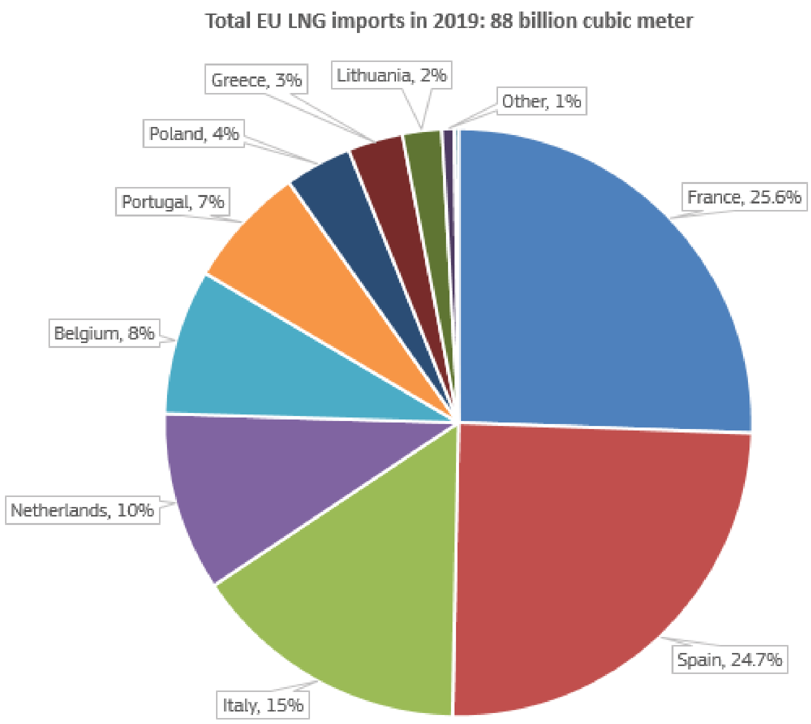


Figure 45 – Main EU LNG importer countries in 2019

Source: Refinitiv

2.1.3 International comparison

Comparing European gas wholesale prices with those in the EU's major trading partners provides an insight into how energy costs can impact the international competitiveness of energy intensive industries being exposed to global trade. Although energy prices are only one element of energy costs of industries, besides consumption and efficiency data they make an important part of such analysis.

The 2011 Fukushima accident in Japan resulted in an increasing demand for gas in the country's electricity generation, as nuclear power plants had to be taken off the grid. In the period of 2011 to 2014 Japanese gas prices were therefore significantly higher compared to the EU and US peers. At the same time the beginning of the US shale gas revolution resulted in abundant domestic gas supply and low prices in the US. Wholesale gas prices in the EU were influenced by high oil prices and dwindling LNG imports in this period, resulting in a divergence between the wholesale prices of the three regions, as **Figure 46** ￼ shows.

As of the end of 2014 Japanese wholesale prices started to decrease, as gas demand went down (returning some nuclear capacities to the electricity grid) and global LNG supply increased. Between 2015 and 2019 the Japanese price premium to Europe shrunk compared to the 2011-14 period, however, it showed a strong seasonality; practically disappearing during the summer months, and widening again during winter months, driven by the strong seasonal demand in Asia. However, as of the winter of 2018/2019 the seasonal gap did not reappear and over the last two years Asian and European gas hub prices remained well aligned, providing good opportunities for LNG shipments to the EU .

Meanwhile, the US Henry hub price remained stable over the last decade, showing a slightly decreasing trend between 2010 and 2019. During most of the decade there were alternation of converging and diverging periods between the TTF and the Henry Hub prices in the EU and the US. However, as of the end of 2018 US LNG exports to the EU ramped up and the EU also started to absorb larger quantity of LNG from other sources as well (like Qatar and Russia), the TTF started to converge to the Henry Hub.

In the first half of 2020, amid generally falling energy commodity prices, gas prices in the three regions also fell significantly (the TTF fell by two thirds by the end of May since the beginning of 2020), and the differentials between the three benchmark practically disappeared by May-June 2020, a phenomenon not seen since 2009-2010.

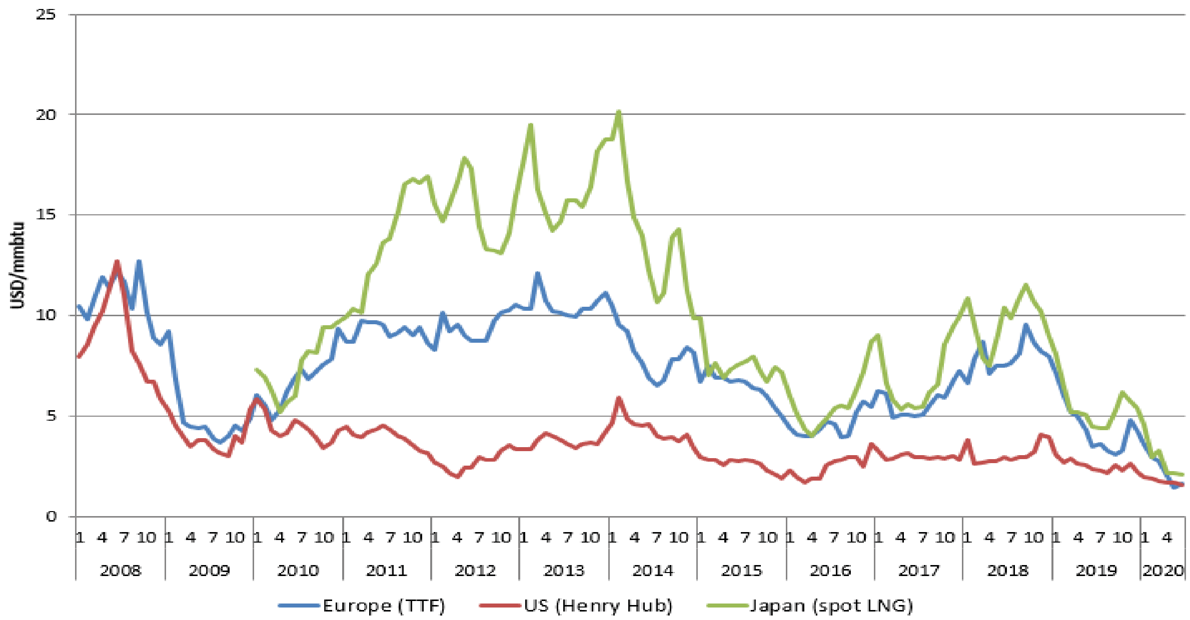


Figure 46 - Comparison of European, US and Japanese wholesale gas prices

Source: Platts, Thomson Reuters

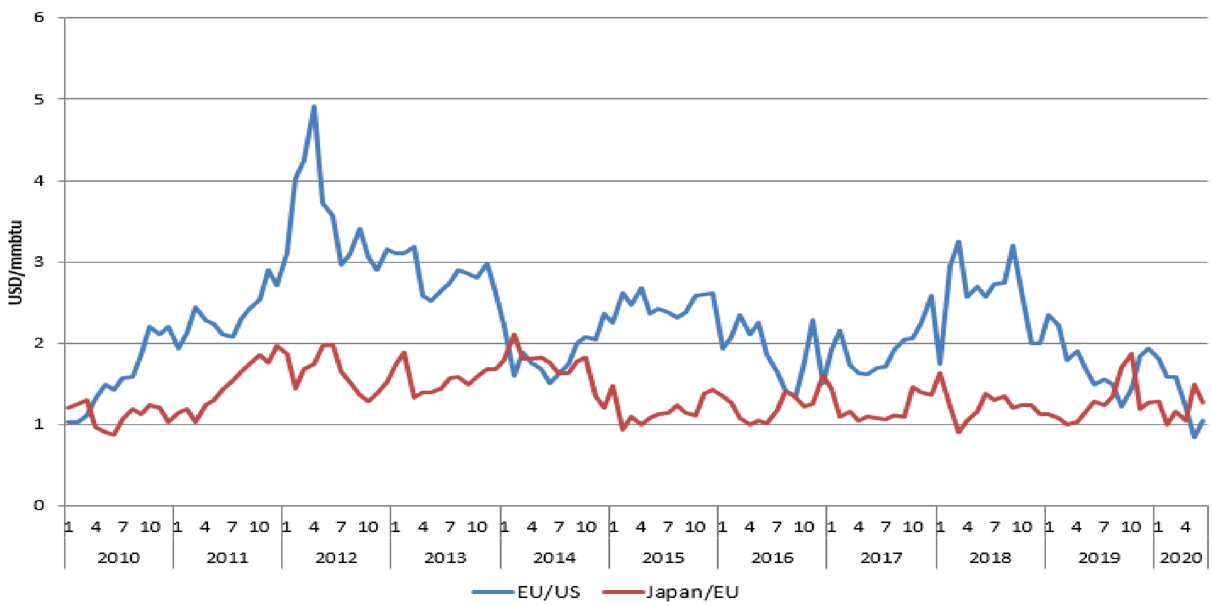


Figure 47 - The ratio of European, US and Japanese wholesale gas prices

Source: Platts, Thomson Reuters

In the first half of 2020 the average price ratio of the US Henry Hub and the TTF hub was 1.35, being the lowest since 2008-2009, as Table 2 shows. In absolute numbers the EU-US difference was less than 0.7USD/mmBTU, which was not seen in the last twelve years. In the Japan-EU relation the price ratio was stable between 2015 and the first half of 2020, whereas in absolute numbers the difference fell below 0.5USD/mmBTU.

Table 2 - The ratio and the difference of European, US and Japanese wholesale gas prices

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020H1
EU/US	1.25	1.24	1.58	2.34	3.51	2.84	1.88	2.48	1.88	1.95	2.59	1.74	1.35
Japan/EU			1.12	1.49	1.62	1.57	1.71	1.18	1.23	1.20	1.23	1.28	1.21
EU-US	1.90	1.00	2.35	5.24	6.68	6.81	3.76	3.83	2.05	2.79	4.80	1.93	0.65
Japan-EU			0.75	4.49	5.73	5.96	5.86	1.10	1.09	1.25	1.81	1.03	0.46

Source: Platts, Refintiv – The 2020H1 values refer to the period of the first half 2020

The study prepared by Trinomics[11] provides a more comprehensive international comparison of gas wholesale prices, covering most G20 economies, with the findings shown in Figure 48 and Figure 49. Prices are expressed in constant (2019) euros. In case of the EU, a weighted average of national wholesale prices was calculated and depicted.

The analysis reveals a very large dispersion of prices in 2011-2014, followed by a measurable convergence from 2015. Part of the gas wholesale prices is indexed to oil prices and hence the price convergence was largely driven by the lowering of the crude oil price in 2014-2016.

Major gas producing countries, including Canada, Russia and the US have the lowest gas wholesale prices in the G20. This was also the case in Australia until 2016 but then domestic supply shortages triggered a significant price rise.

Apart from the producing countries, wholesale prices in the G20 countries tend to be higher than the EU average, often showing a high degree of volatility.

Chinese wholesale prices follow a similar trend to the Japanese price but in 2011-2014, after the Fukushima accident, the absolute level of the price remained somewhat lower, probably because – unlike Japan– China is not fully reliant on LNG (the country also has indigenous production and pipeline imports from a couple of sources). In addition, Chinese prices exhibit less seasonality. Prices were the highest in 2019 in Indonesia, and in South Korea they were also in the top among G20 countries in the last few years, similarly to Mexico and Argentina. In 2019 the ratio of the highest price (Indonesia) and the lowest (Russia) was nearly 7 in 2019.

[11] Energy prices, costs and subsidies and their impact on Industry and Households (2020) by Trinomics et altri (2020)

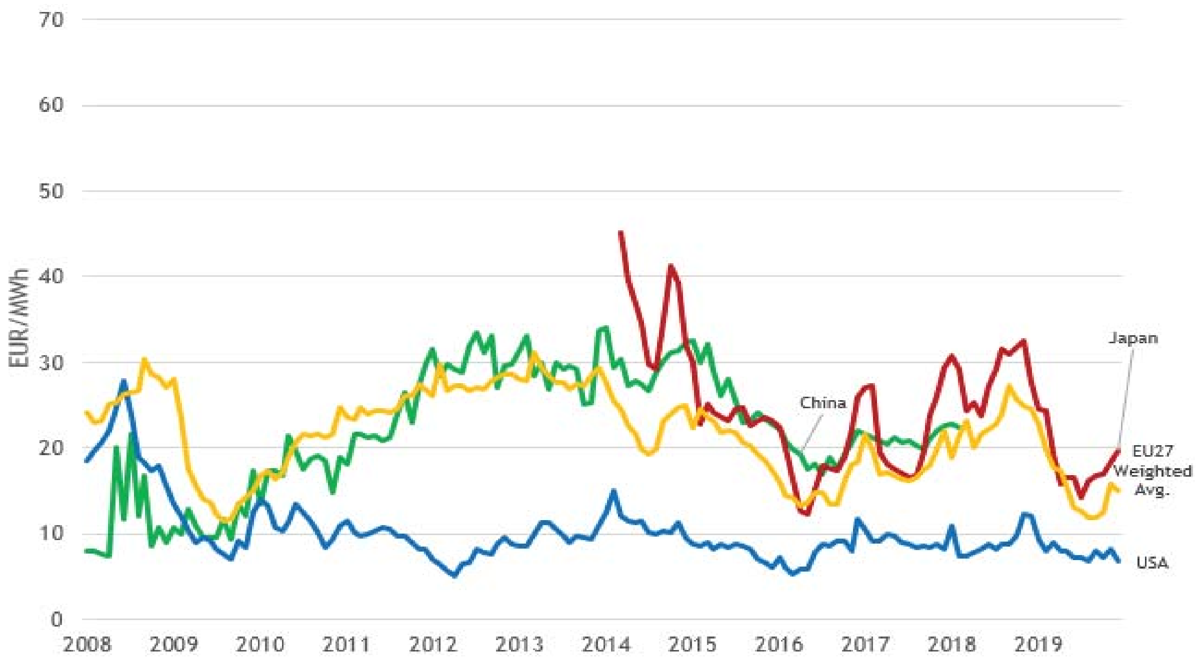


Figure 48 - Gas wholesale prices in the EU (weighted average), China, Japan and the US
Source: Platts, Thomson Reuters, Knoema (World Gas Intelligence; World Bank), World Bank Commodities Price Data (The Pink Sheet).

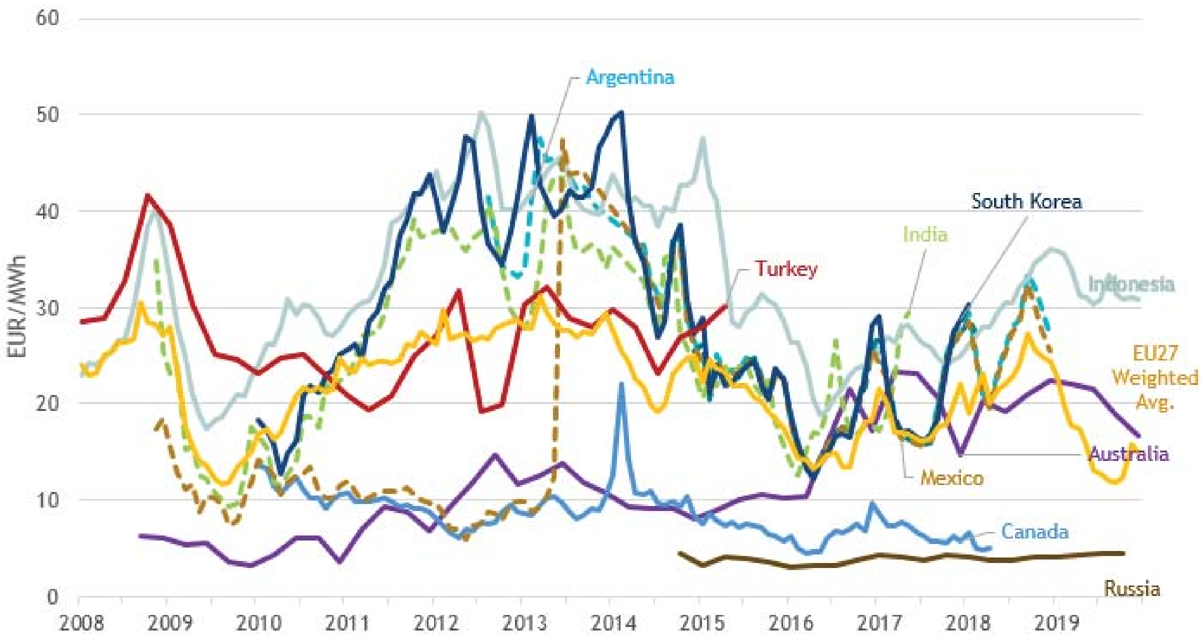


Figure 49 - Gas wholesale prices in the EU (weighted average) and selected markets
Source: Platts, Refinitiv, Knoema (World Gas Intelligence; World Bank), World Bank Commodities Price Data (The Pink Sheet).

2.2 Retail gas prices

Main findings

- Natural gas retail prices remained largely determined by the wholesale gas prices and followed its evolution with a slight time lag. Consequently, the energy component - containing wholesale prices- retained its dominant position of the three components, its share ranged from 45% in the case of households to 67-78% in the case of industrial customers within the total retail price.
- Household retail gas prices were on average 63 €/MWh in 2019 in the EU, whereas medium and large gas customers had to respectively pay 32 €/MWh and 22 €/MWh.
- Retail gas prices for household customers increased by 2.1% annually between 2010 and 2019, whereas for medium level industrial customers prices rose slightly, by 0.1% and for large industrials prices decreased by 1.3%. The inflation in the EU, measured by the Harmonised Index of Consumer prices was 1.4% over the same period.
- The energy component of household prices increased by 0.8% between 2010 and 2019 annually, whereas in the case of industrial customers it went down by 1.7-2.3% in each year.
- Network charges increased for all the three consumer types: for households network charges went up by 2.6% annually, whereas for medium and large industrial customers they rose respectively by 3.2% and 1.9% between 2010 and 2019.
- The tax component for both households and industrial customers rose measurably, by 3.6% annually for households, while for medium and large industrial customers respectively by 7.8% and 4.6% between 2010 and 2019.
- The impact of taxation on natural gas prices remained limited. Taxes made up 32% of household bills and only 13-16% of the bills for medium and large industrial customers.
- In the case of households the share of VAT and environmental taxes are the highest within the total taxation elements, whereas for industrials the main item is environmental taxes, often not related to energy and climate policy goals. Contrarily to electricity, renewable taxes have much lower importance in the taxation of gas.
- In 2019 the ratio of the most expensive and the cheapest gas price was 3.5 for household customers, whereas for medium and large industrial customers it respectively amounted to 2.6 and 2.8. For industrial customers, a slight price convergence could be observed across the EU over the last few years, whereas for households price differentials remained.
- Looking at the international comparison of retail gas prices, industrial prices show good correlation of the wholesale prices, whereas in the case of household customers retail prices seem to be low in some countries compared to what the wholesale contracts would suggest, implying the existence of subsidising of households.

Table 3 - Key figures on the evolution and drivers of retail gas prices between 2010 and 2019

Consumer type	Household (D2)			Industrial (I3)			Large Industrial (I5)		
Component	Annual growth	Share 2019	Δ Share	Annual growth	Share 2019	Δ Share	Annual growth	Share 2019	Δ Share
Energy	0.8%	45%	- 5 p.p.	-1.7%	67%	- 12 p.p.	- 2.3%	78%	- 8 p.p.
Network	+ 2.6 %	23%	+ 1 p.p.	+ 3.2%	17%	+ 4 p.p.	+ 1.9%	9%	+2 p.p.
Taxes	+ 3.6 %	32%	+ 4 p.p.	+ 7.8%	16%	+ 8 p.p.	+ 4.6%	13%	+6 p.p.
Total	+ 2.1 %			+ 0.1%			- 1.3%		

Source: DG ENER in-house data collection and data from Eurostat

Scope of the chapter

Following the Regulation (EU) 2016/1952 the report analyses prices of natural gas sold to consumers who purchase gas for their own use. Therefore prices paid by consumers who purchase gas for electricity generation in power plants or for non-energy purposes (e.g. for use in the chemicals industry) are excluded.

Box - The role of electricity and natural gas in our energy consumption

Natural gas accounted for 32% of the final energy consumption of households in 2018 in the EU on average. The share of natural gas in our final energy consumption has practically remained stable since 2008. The use of natural gas largely differs across EU countries: while in Cyprus and Malta natural gas is not used in the residential sector, and in Sweden and Finland its share was only 0.4% in the total final household energy consumption, in the Netherlands it represented more than 70%, and in Italy and Slovakia more than 50% of the energy consumption in households.

Household gas prices are available for 24 EU Member States in the database of the Eurostat. Natural gas is not used in Malta and Cyprus and gas prices for the household customers is not available in Finland. Regulation (EU) 2016/1952 lays down that reporting countries, where natural gas accounts only for an insignificant share of final energy consumption, are exempted from the obligation of providing price data. According to this Finland, where the share of household consumption of gas in final energy consumption is below 1.5%, is not reporting such data.

The following section analyses gas prices paid by household consumers whose annual consumption falls in the range of 20 to 200 GJ (5,56 to 55,56 MWh). This consumption band is defined by Eurostat as D2. It is the most representative consumption band in most of the EU countries.

Evolution Household Gas Prices

Household retail gas prices grew at 2.1% annual rate from 2010 to 2019. In absolute terms the EU average price grew from 56 €/MWh to 67 €/MWh. This growth is faster than inflation, which averaged at 1.4% annually during the same period. Prices steadily grew from 2010 to 2014, and until 2017 they decreased slightly, from the peak at 70 €/MWh to 63 €/MWh in 2017. And by 2019 they rose again, to 67 €/MWh. In 2019 Hungary reported the lowest (34 €/MWh) and Sweden the highest (116 €/MWh) price. The ratio of the highest to lowest price was 3.4 in 2019.

Composition of Household Gas Prices

The composition of gas prices changed over time, albeit less significantly than in the case of electricity. In 2019 the energy component, which mainly consists of the wholesale price, still made up almost half of the final price even after its share decreased by 5 percentage points from 50% to 45% between 2010 and 2019.

In absolute terms, the energy component increased at an annual rate of 0.8% and reached 30 €/MWh in 2019.

The share of the network component increased slightly from 22% to 23% of the total price. In absolute terms the network component grew at the annual rate of 2.6% and reached 16 €/MWh by 2019.

The share of the taxes component grew by 4 percentage points and reached 32% in 2019. In absolute terms, taxes grew at the annual rate of 3.6% and reached almost 22 €/MWh by 2019.

The impact of taxes was smaller on household gas prices than on their electricity counterparts as the energy component, remained the dominant component. However, the share of taxes increased, implying that taxing of gas consumption might also be subject to policies aiming increasing general budget revenues or, to a lesser extent, to contributing to energy and climate objectives.

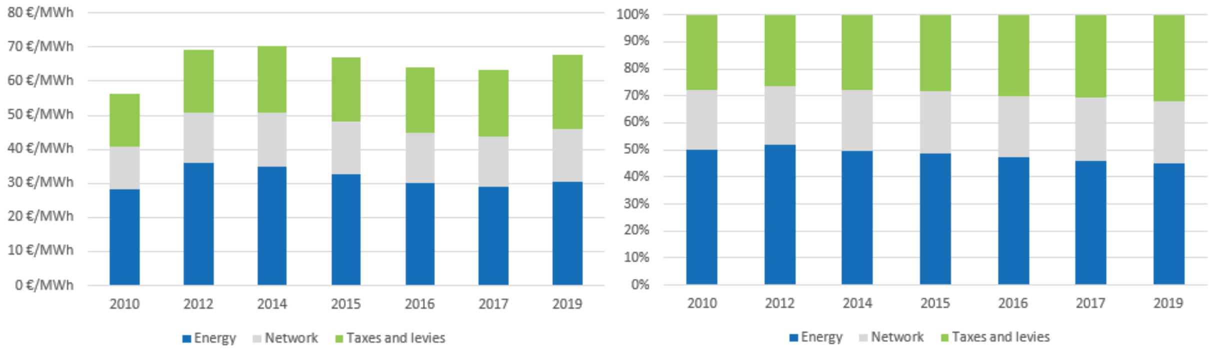


Figure 50 - Composition of the EU household gas price (DC)

Source: DG ENER in-house data collection

Drivers of Household Gas Prices

The EU natural gas price for household consumers peaked in 2014 decreased until 2017, which trend slightly reversed in 2019. The trend results from decline of the energy component, continued smaller increases in the network component and a volatile evolution of taxes. In 2019 all the three components increased, the taxation by the most.

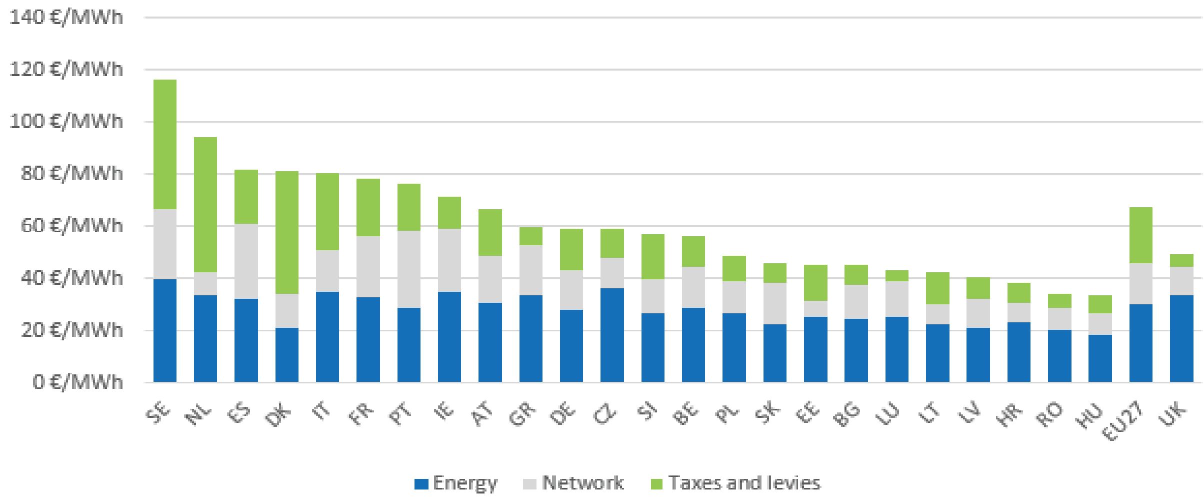


Figure 51 - Household gas prices in 2019

Source: DG ENER in-house data collection

In 2019 the two highest gas prices for household customers could be found in Sweden (116 €/MWh) and in the Netherlands (94 €/MWh). Sweden's high gas prices are highly influenced by a carbon tax, which aims to curb greenhouse gas emissions. In the Netherlands relatively high prices stem also from taxation, having the second highest share (reaching 55% of the total price and amounting to 51 €/MWh in 2019). This tax policy aims at reducing demand for natural gas, as domestic sources in the Netherlands dwindling rapidly and the biggest Groningen field will be phased out by 2022. The extraction of these resources causes seismic activity which in turn might cause significant damage to local businesses and homes.

In Denmark the share of the energy component was the lowest (barely 26% in 2019), whereas the taxation share was the highest (58%, in absolute terms 41 €/MWh). Similarly to electricity, Denmark imposes high taxes on natural gas consumption for households, although the energy component of the gas prices was the third lowest in 2019 in the EU, owing to the still existing domestic gas production.

The highest network components for household natural gas prices were reported in Portugal in 2019. In Portugal high investment costs in a relatively new gas grid resulted in higher access tariffs.

In 2019 the ratio of the most expensive and the cheapest retail gas price paid by household customers was 3.5, being stable over the last few years, implying that there is no real converging trend of retail gas prices across the EU.

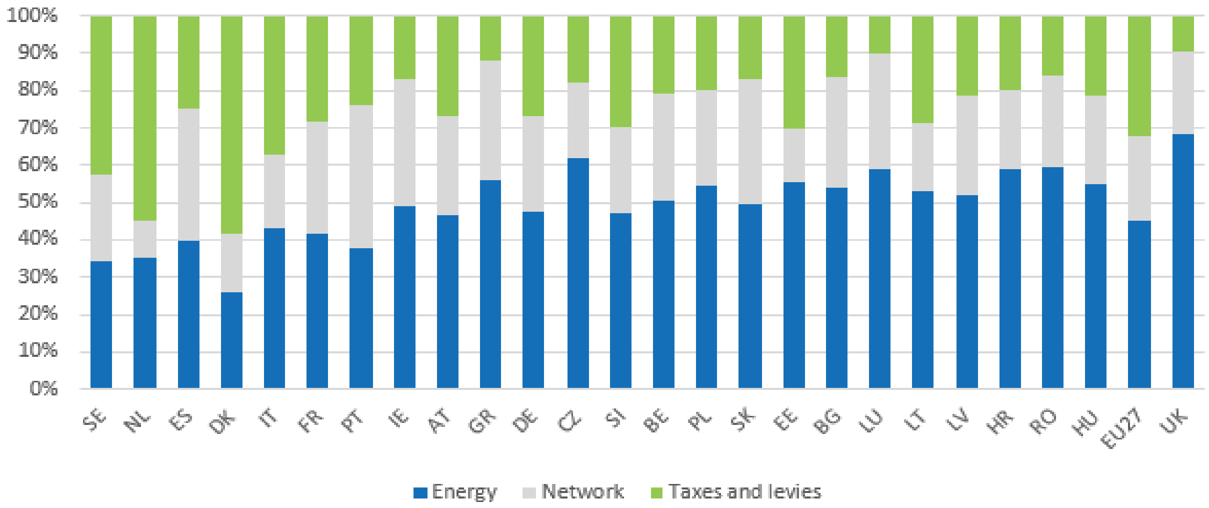


Figure 52 - Composition of household gas prices in 2019

Source: DG ENER in-house data collection

Composition of taxes, levies, fees and charges

In the case of natural gas prices taxes made up 32% of the total price for household customers. Generally we can say that the number and composition of taxes imposed on household gas prices differ from the ones on electricity taxation, as the variety of taxes on gas prices is much more limited.

Beyond the VAT applicable for household customers (which makes about the half of total payable taxes in the gas prices in 2019), taxation of household gas prices is dominated by environmental taxes, in 2019 making up 42% of the total applicable taxes. Renewable energy support costs, have a very limited impact on household gas prices, as they account for only 4 percent of the total taxes. Beyond this the share of other taxes (including capacity taxes) was around 4.2%. Bearing in mind that the share of taxes in final retail household gas prices were 32% in 2019, we can say that the share of VAT, environmental taxes, renewable taxes and other taxes within the final retail prices were respectively 16%, 14% and 1% for both renewables and others. Between 2017 and 2019 taxes in household gas prices rose by 11% on EU average, driven by the increase in environmental taxes and renewable taxes.

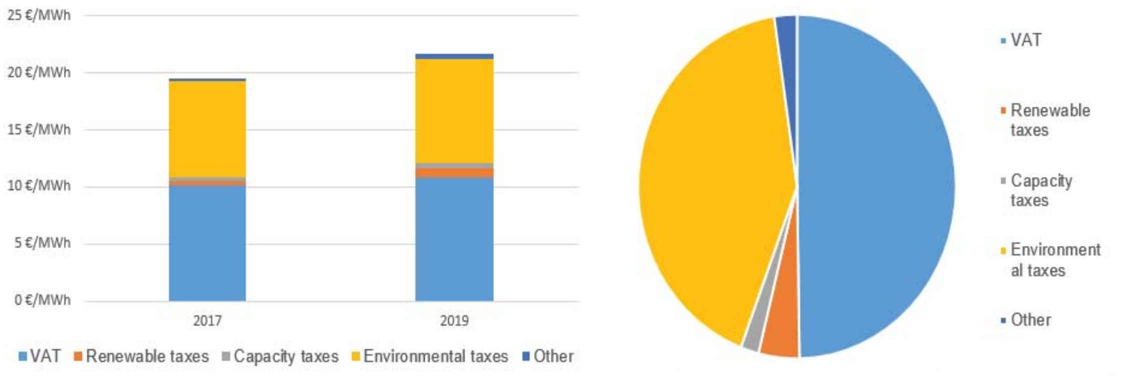


Figure 53 – Change in the composition of EU taxes on household gas prices in between 2017 and 2019 and the composition in 2019

Source: DG ENER in-house data collection

2.2.1 Industrial Natural Gas Prices

The following chapter compares gas prices paid by industrial consumers with medium versus large annual consumption. Medium industrial consumption is defined as band I3 by Eurostat, covering annual consumption volumes between 10 000 and 100 000 GJ (2,778 MWh and 27,778 MWh). Large consumption is defined as band I5 covering annual consumption between 1 million and 4 million GJ (277,778 to 1,111,111 MWh). Median industrial (I3) prices were available for 25 EU Member States (with the exception of Cyprus and Malta). Large industrial prices (I5) were reported by 19 EU Member States (on the top of Cyprus and Malta, no data were available for Greece, Croatia, Latvia, Lithuania, Slovenia and Finland), primarily owing to data confidentiality reasons).

Evolution Industrial Gas Prices

Retail gas prices reached the peak in 2012 for both I3 and I5 consumer groups on EU average during the 2010-2019 period. In the case of consumers belonging to the I3 band prices decreased until 2017, then prices slightly turned up in 2019. In the case of I5 band, prices decreased from their 2012 peak until 2016, then in 2017 and 2019 they remained practically stable (slightly rising in 2017 and then falling back in 2019) on EU average.

Looking at the whole of the last decade, industrial prices with median consumption (I3) showed a slight annual increase (+0.1%), whereas prices for large industrial customers (I5) underwent a significant annual decrease of 2.9%. Inflation during the same period averaged at 1.4%[12], implying that contrarily to household customers, industrials faced gas price changes lower than the inflation. In absolute terms the I3 price slightly rose from 32.1 to 32.4 €/MWh by 2019. The I5 price decreased from 25.1 to 22.3 €/MWh.

In 2019 Belgium reported the smallest I3 price (23€/MWh) and Finland the highest (57 €/MWh). The ratio of the highest and the lowest price across the EU was 2.5 in 2019. The lowest price for I5 consumption band was also reported by Belgium (18 €/MWh), whereas the highest by Denmark (48 €/MWh), implying a highest-lowest price ratio of 2.7 in 2019.

Composition of Industrial Gas Prices

Over time the composition of industrial gas prices also changed, albeit to a different extent for the two consumer types. In 2010, the first year of our observation period, the energy component accounted for 79% of medium (I3) and 86% of large industrial (I5) prices. Energy costs, complemented by the commercial costs of suppliers, made up most of the final consumer price. The impact of network costs and taxes was limited. The share of the energy component decreased to 67% for medium and to 78% for large industrial consumers by 2019.

In the case of I3 prices, the diminishing share of the energy component was taken up on one hand by network charges, increasing from 13% to 17% (by 4 percentage points) and on the other hand by the share of taxes, growing from 8% to 16% (by 8 percentage points) In

[12] Eurostat Producer Price Index (sts_inpp_a)

absolute terms, taxes also increased at a higher speed, by 2.5 €/MWh, reaching 5.1 €/MWh by 2019. Network costs rose by 1.4 €/MWh and reached 5.6 €/MWh in 2019.

The composition of I5 prices also changed significantly, as the share of the energy component decreased from 86% to 78% (8 percentage points) between 2010 and 2019. In absolute terms, energy component decreased by 4 €/MWh, falling to 17.5 €/MWh in 2019. The decrease of 8 percentage points in the share of the energy component was absorbed by the increase of the share of taxes (from 7% to 13%, or by 6 percentage points and by 0.9 €/MWh in absolute terms), and by the share of network costs, rising from 7% to 9% (2 percentage points, 0.3 €/MWh).

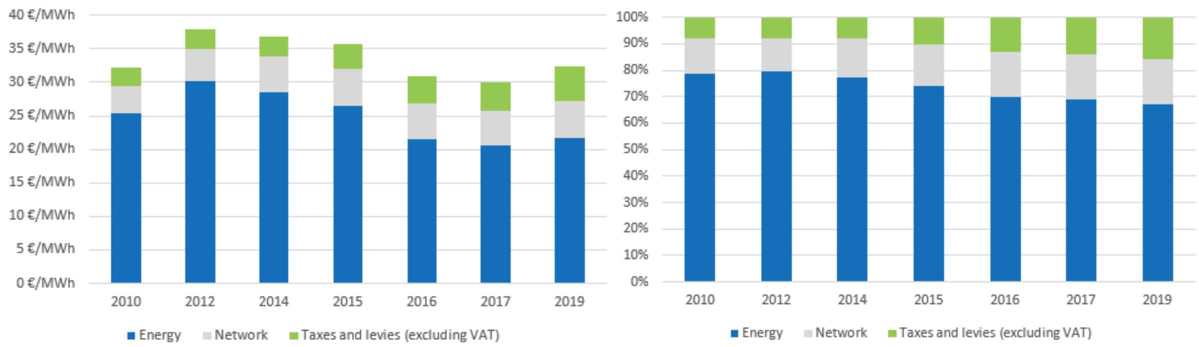


Figure 54 - Composition of EU prices for small (I3) industrial gas consumers

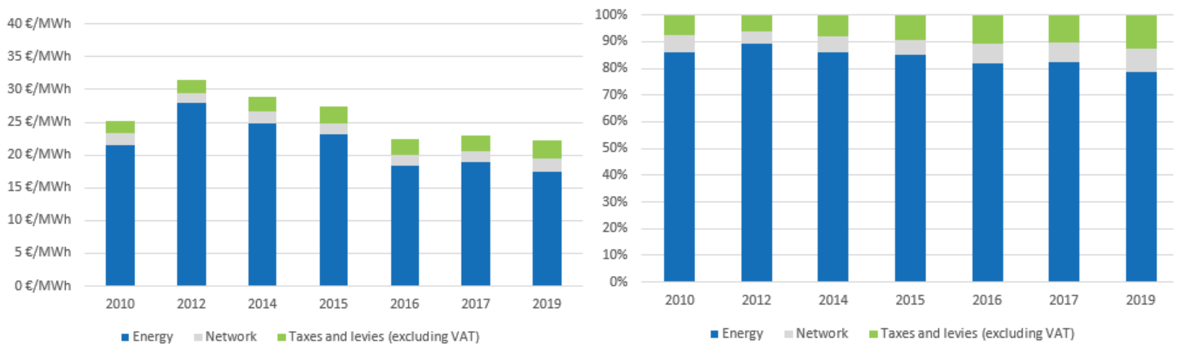


Figure 55 - Composition of EU prices for large (I5) industrial gas consumers

Source: DG ENER in-house data collection and Eurostat data

Drivers of Industrial Gas Prices

Industrial gas prices remained dominated by the energy component, which mainly consists of the commodity price. Consequently, consumer prices followed the developments on wholesale gas markets, albeit with a slight time lag. From 2010 to 2012 gas wholesale prices gradually recovered. As a result, I3 and I5 consumer prices grew by 18% and 25% respectively. Between 2012 and 2016/2017, both prices have been on a downward trajectory.

Decreases were mainly driven by the decreasing energy components. Between 2017 and 2019, the energy component slightly increased for the I3 band and owing mainly to the network costs and taxes, increasing by 10-20%, resulted in the increase of the total retail price for I3. For I5 both the final price and the energy costs decreased, albeit increasing network costs and taxes between 2017 and 2019.

In 2019 the ratio of the most expensive and the cheapest retail gas for medium level (I3) customers was 2.6, whereas for larger consumers (I5) it amounted to 2.8. For both consumer groups, a slight price convergence could be observed over the last few years across the EU.

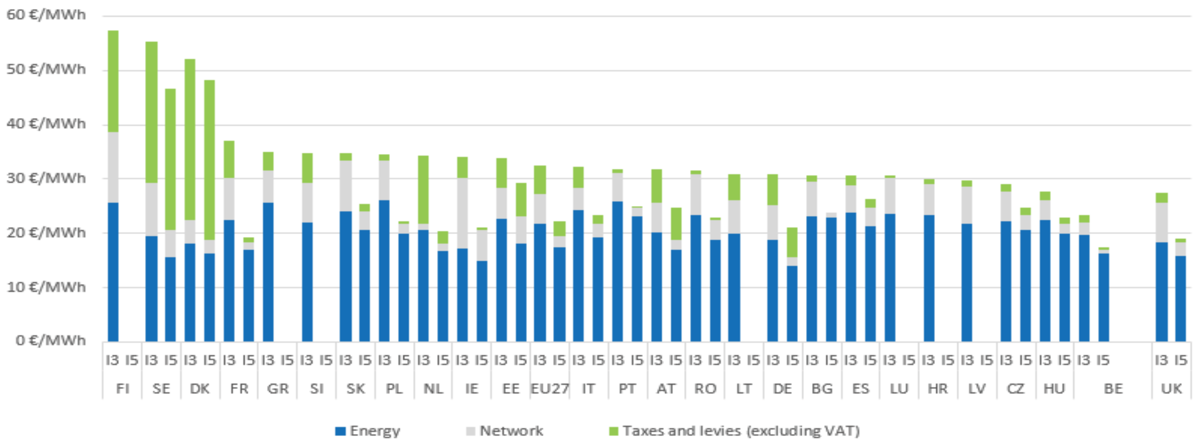


Figure 56 - Median (I3) and large (I5) industrial gas prices in 2019

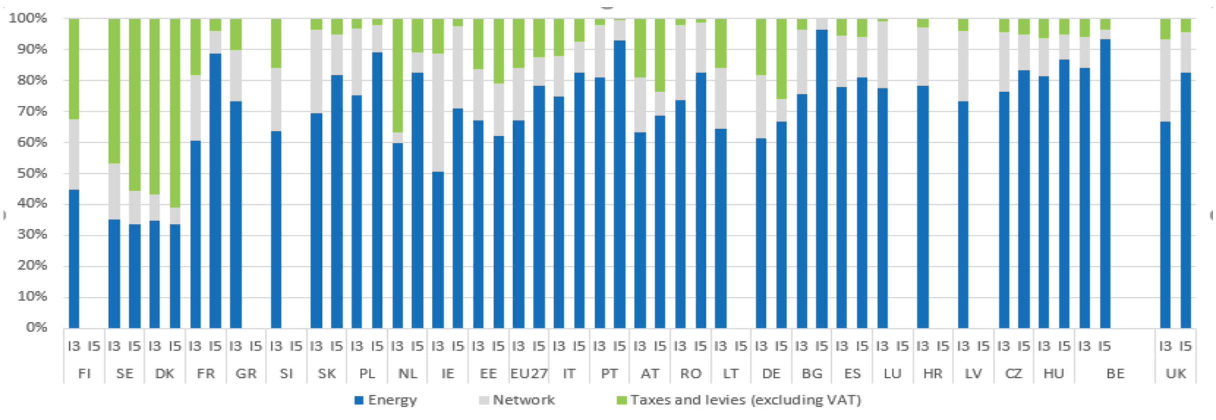


Figure 57 - Composition of median (I3) and large (I5) industrial gas prices in 2019

Composition of taxes, levies, fees and charges

Gas prices are generally less impacted by policy support costs and fiscal instruments compared to electricity prices. Also, industrial consumers benefit from exemptions and reduced tax rates in most countries. As a result, in 2019 taxes accounted for only 16% and 13% of the total price for medium (I3) and large (I5) consumers respectively. In comparison, taxes made up 32% of the household gas prices.

Taxes imposed on industrial gas prices consist mostly of excise duty and other non-earmarked taxes that do not support any specific policies (shown as environmental taxes on our graphs). These represented in 2019 4.3 €/MWh out of the total 5.1 €/MWh for band I3, representing 84% of the total tax and 13% of the final consumer price. Renewable taxes, similarly to the other taxes (including capacity tax), represented 8% out of the total tax and slightly more than 1% out of the final retail price in 2019.

For prices in band I5, the total tax amounted to 2.8 €/MWh in 2019, of which the environmental tax represented 86% (2.4 €/MWh), which was around 11% of the final retail price, whereas the impact of renewable, capacity and other taxes was much lower.

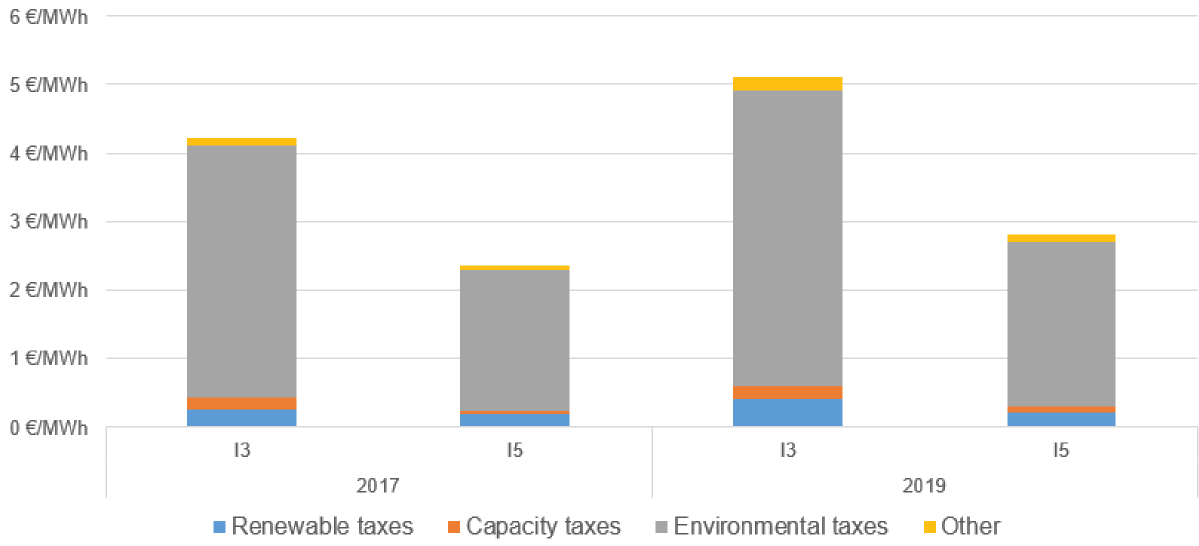


Figure 58 - Composition of the tax structure of the EU retail gas prices for median (I3) and large (I5) consumers

2.2.2 International comparisons

Household Natural Gas Prices

During most of the time since 2008, the EU27 average household retail gas price fluctuated in the range of 60-80 €/MWh. At the same time household retail gas prices in the US were in a much lower range, 20-40 €/MWh, owing to the price differential of wholesale US Henry Hub prices and the European wholesale benchmarks. Prices in Japan were in a much higher range, mostly between 100-140 €/MWh, owing to high local wholesale prices. Interestingly, retail gas prices paid by households in China were almost as low as in the US, albeit much higher wholesale prices in China, which might imply a subsidisation of household customers.

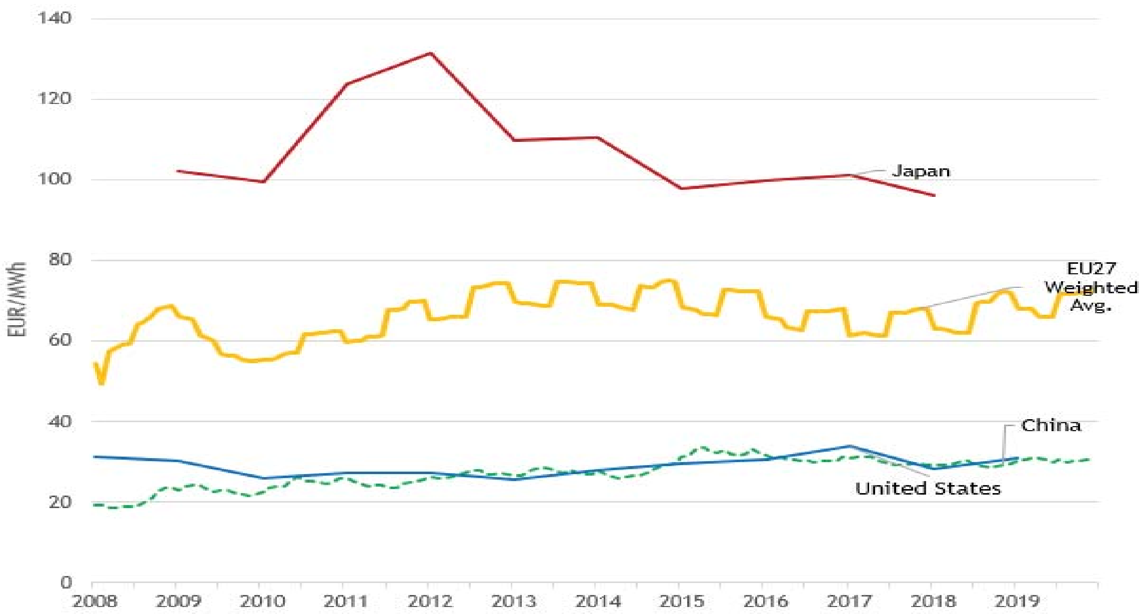


Figure 59 – Household gas retail prices in the EU, Japan, US and China

In Australia household retail gas prices were among the highest in the observed countries, albeit wholesale gas prices in the country where not among the highest ones. In Brazil and South Korea household retail prices are relatively high compared to the other observed G20 countries, but they were lower than the EU average over the last few years. Household gas prices were low in gas producer countries, such as the US and Canada, however, in Russia and Saudi Arabia the observed prices were low compared with the local wholesale price, which might mean households are being subsidised in these countries.

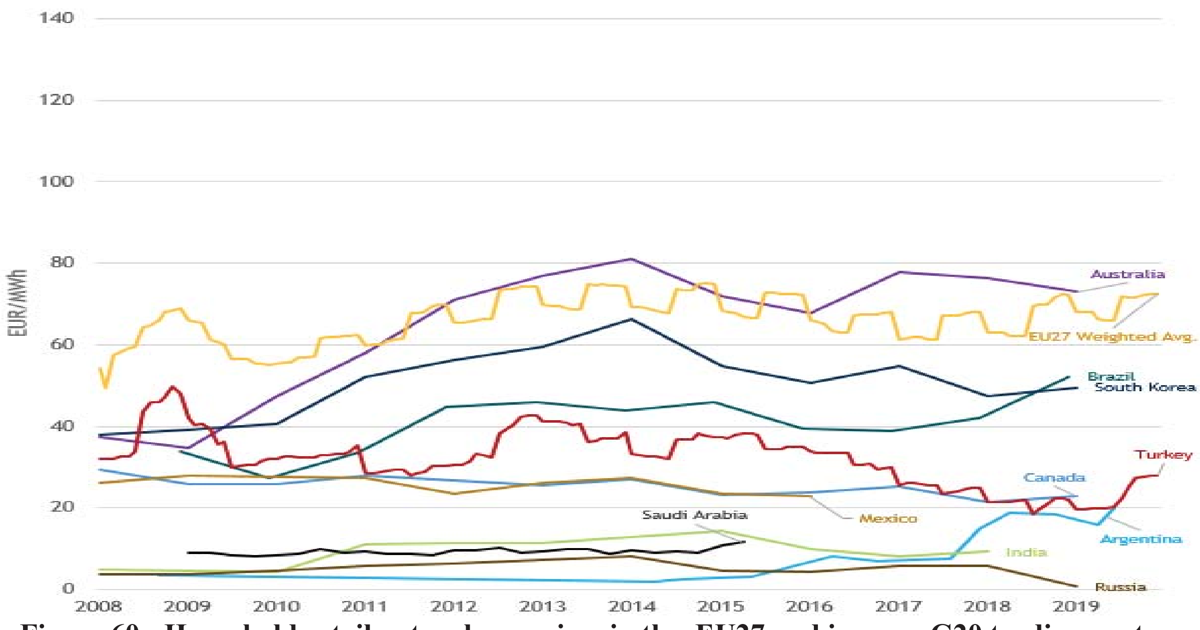


Figure 60 - Household retail natural gas prices in the EU27 and in some G20 trading partners
Source: Trinomics et altri study

Industrial Natural Gas Prices

The EU27 average industrial retail price was around 25€/MWh over the last few years, whereas since 2008 it was below 35 €/MWh during most of the time. Not surprisingly, industrial retail gas prices in the US were much lower than in the EU, owing to the significant discount of the US wholesale gas prices. On the other hand retail industrial prices in Japan was much higher than in EU, and prices in China, moving closely with EU prices for many years, now also developed a measurable premium to the EU prices.

Industrial gas prices in gas producer countries, like Russia, US, Canada were low in international comparison, similarly to their wholesale peers. Prices in South Korea were the highest among the observed countries, owing to the high wholesale prices in the country, as Korea solely relies on LNG imports with presumably oil indexation in the import price formula.

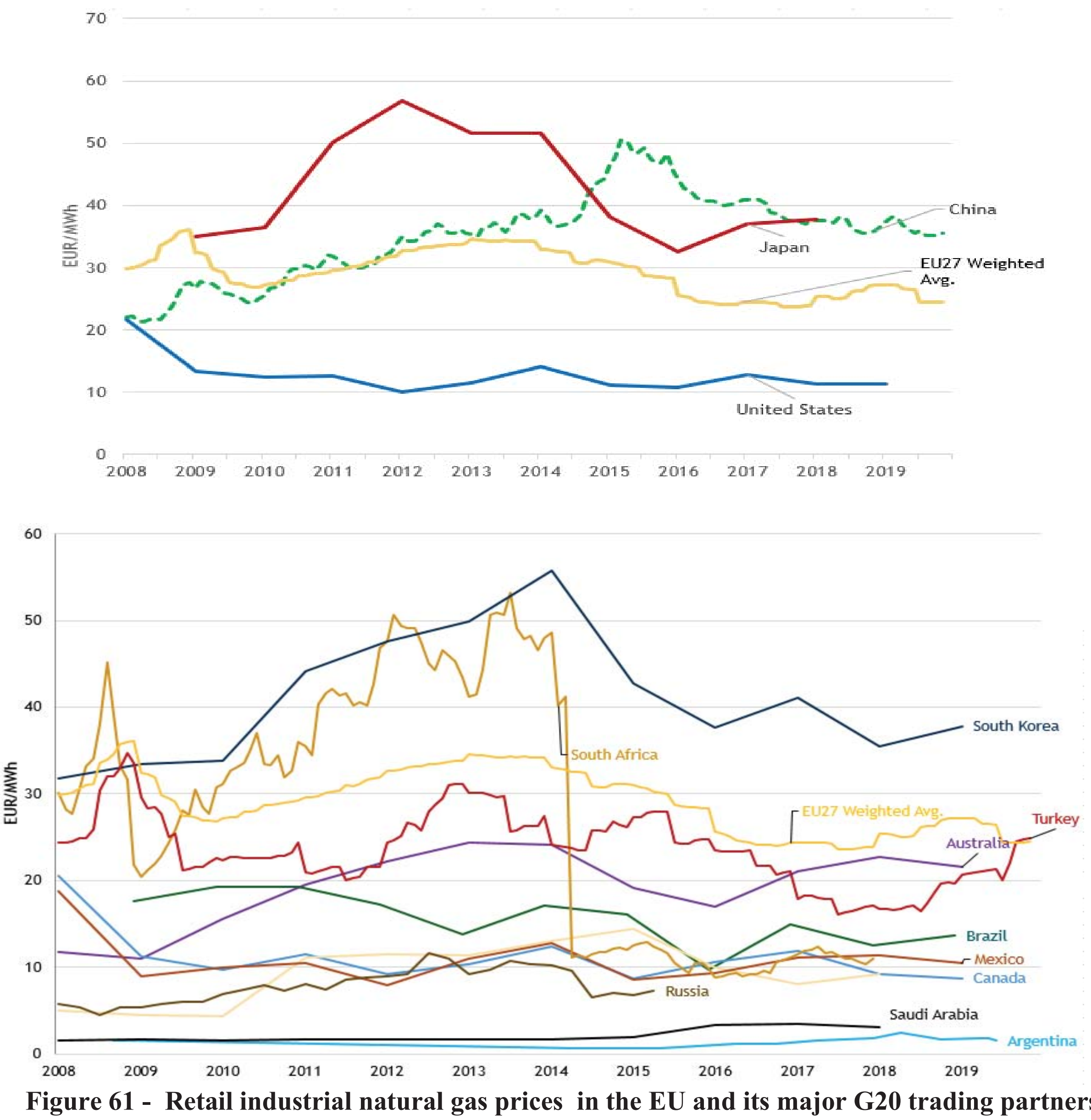


Figure 61 - Retail industrial natural gas prices in the EU and its major G20 trading partners

EUROPEAN
COMMISSION

Brussels, 14.10.2020
SWD(2020) 951 final

PART 2/6

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(2020) 951 final}

3 Oil and oil product prices[13]

Main findings

- After the dramatic fall seen in 2014-2016, crude oil prices have broadly been rising since mid-2017 until late 2018, driven by robust global demand growth, Middle East tensions, concerns over the impact of a return to US sanctions on Iranian oil, sliding output in Venezuela and the continued OPEC-led output cuts. In 2019 there was settling of price between 60 and 70 USD per barrel due to signs of slowing of global economy and increased production of US shale oil.

- Due to COVID-19 crisis decreased demand and longer time needed for OPEC + to come to the agreement on adjusting production on supply side, the oil price fell to 20 USD per barrel.

- 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 contrast, the tax component (excise duty plus VAT) can reach up to 70% of the retail price

- The high share of taxes and exchange rate developments moderate the pass-through of falling/rising crude oil prices to the retail prices of oil products in Europe.

- In 2018 and 2019, retail prices reached the highest levels since 2014-2015

- Due to COVID-19 crisis, retail prices in first half decreased of 2020 following movement of oil prices and wholesale prices.

- There has been some convergence of gasoline and diesel prices, helped by some convergence of the excise duty rates but in several Member States the tax advantage of diesel actually increased.

[13] This chapter analyses EU-28.

- International comparison of oil products reveals that differences in prices can be explained by differences in tax treatment amongst G20 countries. EU taxes on oil products are among the highest globally, resulting in a high retail price compared to most G20 countries.

- As regards to electricity prices for transport (alternative fuel to the conventional transport fuels) despite the limited available data, it can be observed that both home and public charging prices tend to be higher in Europe than in the main international G20 partners. However, superfast public charging prices in Europe tend to be comparable to the rest of G20 countries.

3.1 Crude oil prices

Crude oil prices reached unprecedented levels in 2008, with Brent 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 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 started to decline in mid-2014, driven by weak demand and robust supply growth, resulting in an oversupplied market. Global oil demand growth has significantly weakened in 2014, mainly because of lower than expected global economic growth and mild winter temperatures.

On the supply side, non-OPEC output showed a robust growth, driven by increasing unconventional oil production in North America. US light tight oil production proved to be rather resilient to low prices: improving efficiency and cost reductions allowed output to continue increasing in spite of the plummeting crude oil prices.

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. 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. OPEC and a few key non-OPEC producers finally agreed in November 2016 to limit their production, in order to accelerate the drawdown of the stock overhang and bring the rebalancing forward.

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.

Despite the November 2016 agreement of OPEC and non-OPEC producers to reduce output, oil prices decreased in the first half of 2017 reflecting increasing production in the US, as well as growing output in Libya and Nigeria which were exempted from the OPEC cut. The rollover of the cut in May 2017 failed to reverse the trend: in the second half of June 2017, the price of Brent dropped below 45 USD/bbl, the lowest level since November 2016.

From mid-2017, however, oil prices have broadly been on the rise, driven by a combination of factors, including the robust growth of global demand, growing tensions in the Middle East, a number of actual supply disruptions (Northern Iraq, hurricanes in North America, closure of the Forties pipeline system in the UK North Sea, a sustained plunge of Venezuelan supply), the weakening of the dollar and a further extension of the OPEC cut in November 2017. In late December and early January, the protests in Iran provided support to prices.

Prices receded in early February 2018 as the market remained well supplied, but the price rise resumed afterwards as growing tensions in Syria and the expectation of the US withdrawal from the Joint Comprehensive Plan of Action (the Iran nuclear deal) raised concerns about future oil supplies. In mid-May 2018, after President Trump announced the re-imposition of US sanctions on Iran, Brent reached 80 USD/bbl, the highest level in three and a half years. Compared to the 44 USD/bbl low on 20 June 2017, Brent increased by more than 75%. Prices continued to rise despite the strengthening of the US dollar which in general is conducive to lower oil prices.

Brent receded to around 75 USD/bbl in late May/early June after Russia and Saudi Arabia indicated they would increase production in the second half of the year. On 22 June, OPEC and non-OPEC producers agreed to do away with the over-compliance with the cuts agreed back in 2016, implying a theoretical output increase of around 1 million barrels per day (mb/d) in the second half of the year. Despite the agreement, prices rose again in late June and early July, supported by production outages in Libya and Canada.

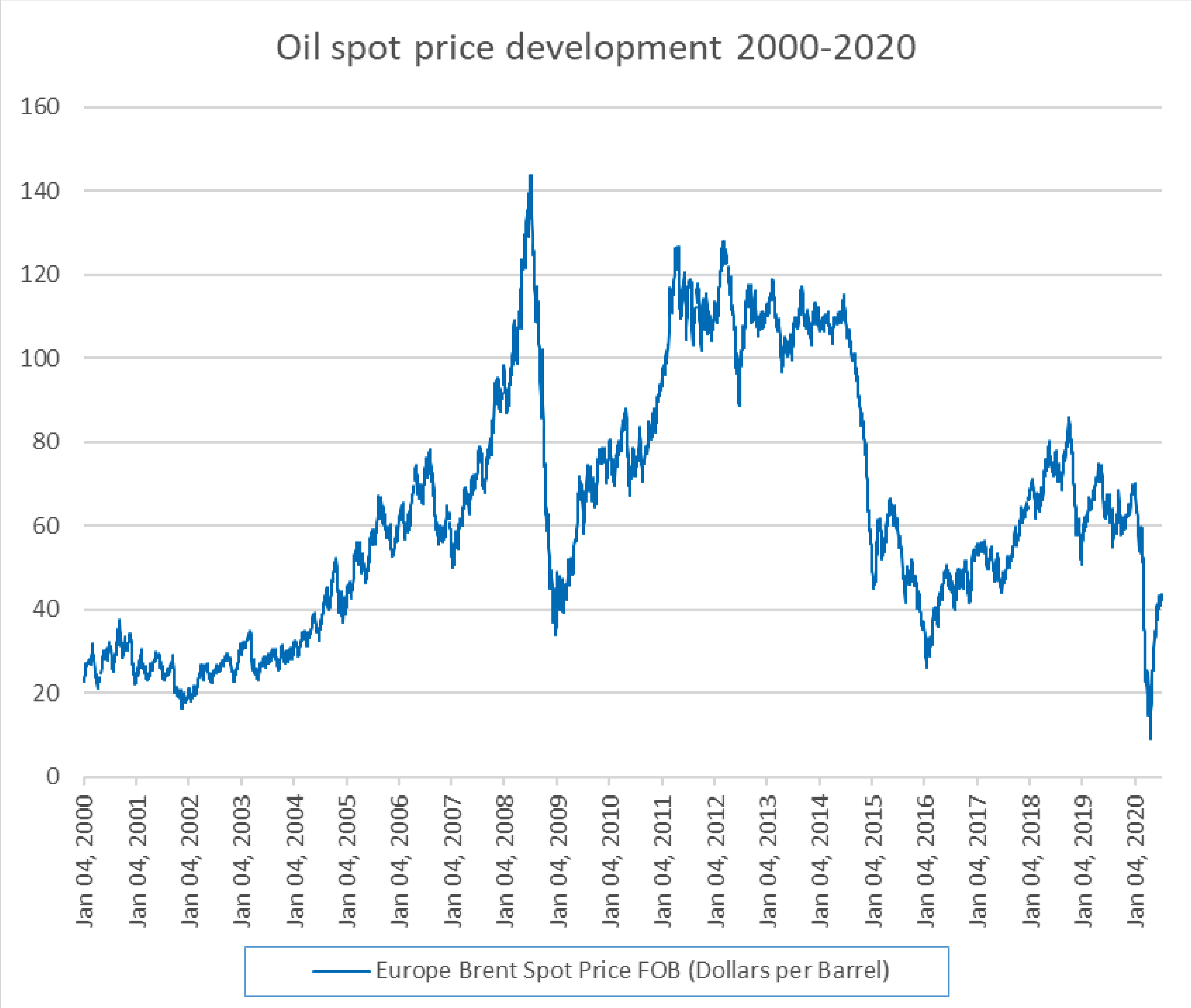


Figure 62 - The Brent crude oil price from 2000 to mid-2020

Source: Platts

The unilateral withdrawal of the US from the Iran nuclear deal cast a doubt about the future of Iranian crude exports, at a time when output in Libya and Venezuela was sliding, as well as geopolitical risks increasing in other parts of the world. This on one hand further tightened the global market, leading to additional price rise above 80 USD per barrel as OPEC and Russia could not fill this gap with their production.

Growth in energy markets slowed in 2019 due to weaker economic growth. Oil price dropped below 60 USD per barrel and fluctuated between 60 and 70 USD per barrel throughout 2019. However, in September 2019, due to an attack on key energy installations in Saudi Arabia, Brent oil prices increased by 9 USD per barrel, but only for a short while because of Saudi Arabia’s ability to bring production back online within weeks of the attack and global concerns about demand growth. Throughout 2019, increases in U.S. petroleum production put downward pressure on crude oil prices. In addition, the production increases likely limited the effect on prices from the attack on Saudi Arabia, production cut announcements from the Organization of the Petroleum Exporting Countries (OPEC), and U.S. sanctions on Iran and Venezuela that limited crude oil exports from those countries.

Since mid-January 2020 oil prices began to decrease based on slowing economic indicators, but dropped significantly to 20 USD per barrel (the lowest since 2002) as confinement measures for COVID-19 were imposed in China (and subsequently in other countries in the world) leading to immediate decrease for oil demand. Negotiations between OPEC members and non-OPEC members including Russia did not lead to production adjustment right away, but only in May after which oil price eased up a bit above 40 USD per barrel.

3.2 Wholesale prices of oil products

Crude oil is the main feedstock to produce oil products and 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.

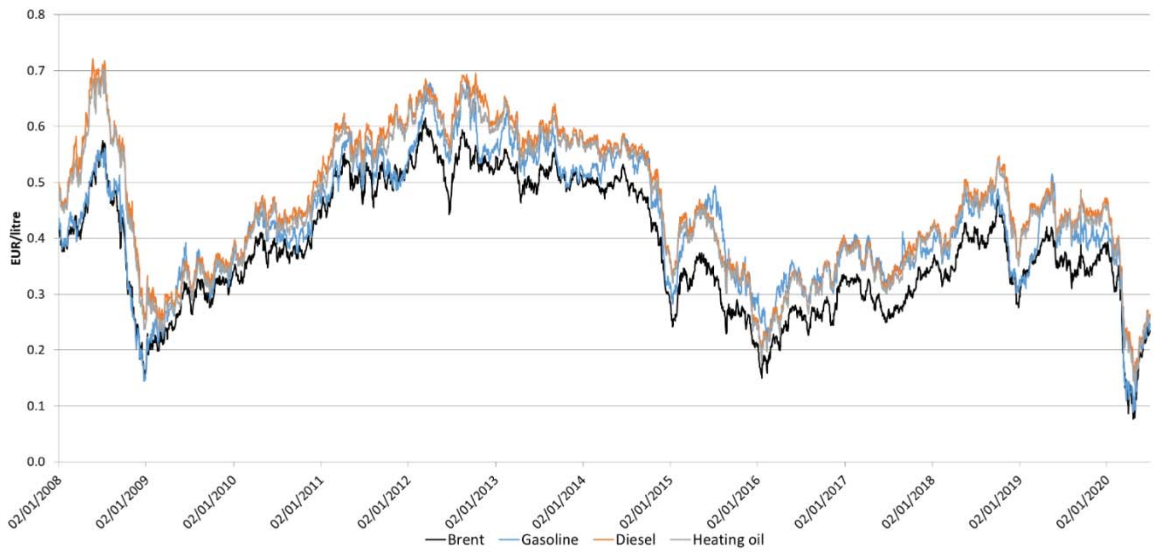


Figure 63 - Crude oil (Brent) and European wholesale gasoline, diesel and heating oil prices from 2008 to mid-2018

Source: Platts, ECB (for exchange rates).

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)
The following conversion rates were used: crude oil 159 litre/barrel, gasoline 1350 litre/ton, diesel and heating oil 1186 litre/ton.

Looking at the crack spreads (i.e. the differential between the wholesale price of oil products and crude oil), one can see that these spreads are however rather volatile and often follow different paths for different products.

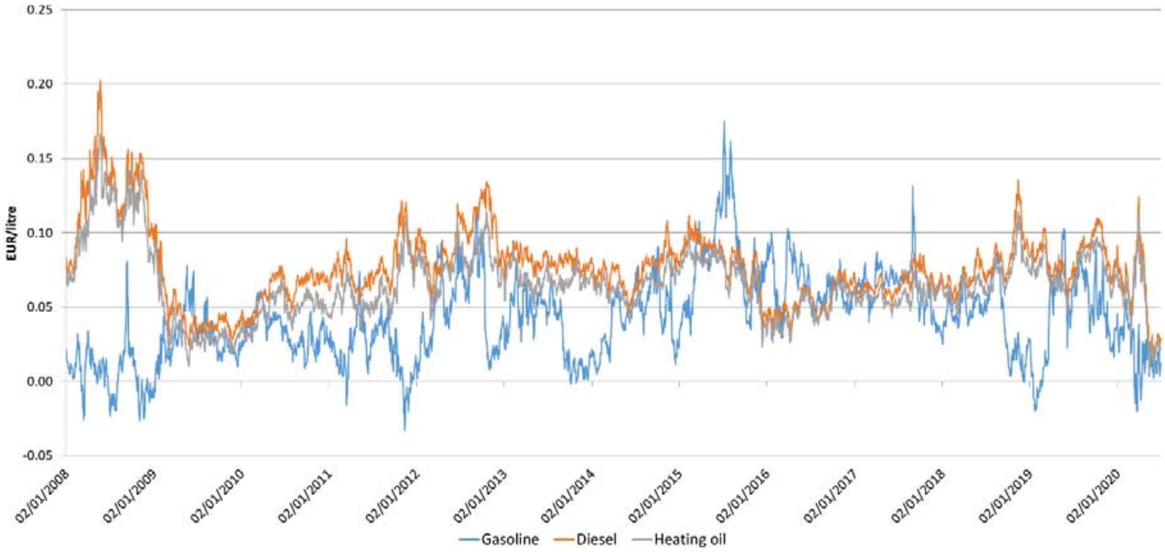


Figure 64 - Crack spreads of gasoline, diesel and heating oil from 2008 to mid-2018

Source: Platts, ECB (for exchange rates)

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 following conversion rates were used: crude oil 159 litre/barrel, gasoline 1350 litre/ton, diesel and heating oil 1186 litre/ton.

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). In the summer of 2015, gasoline crack spreads reached unusually high levels as low prices boosted gasoline demand.

Oil product supply can also fluctuate, for example as a result of refinery maintenance or natural disasters affecting refinery operations; this will also affect crack spreads. For example, Hurricane Harvey in the US triggered the spike of European gasoline crack spreads in late August 2017.

On Figure 64 one can see that European crack spreads have been relatively high in 2015, averaging 0.08 EUR/litre (around 13 EUR/barrel) for both gasoline and diesel. Afterwards, crack spreads diminished: in the period from the beginning of 2016 to mid-2018, both gasoline and diesel crack spreads averaged 0.06 EUR/litre (less than 10 EUR/barrel). There is divergence in gasoline in end of 2018 and in beginning of 2019, meaning gasoline being cheaper than oil due to US unilaterally getting out of the Iranian deal, reduction of production in Venezuela and Libya while at the same time growing indications of slowdown in economic activity and consumption especially in developing countries.

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 7.1). 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. Under certain conditions, however, 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.

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 decline of crude oil prices in 2014-2016, the above factors moderated the pass-through to oil product prices in the EU: while crude oil prices (expressed in USD) fell by 77% between mid-2014 and early 2016, in the same period[14] the average EU consumer price of

[14] Between 30 June 2014 and 15 February 2016

gasoline and diesel decreased by 24% and 28%, respectively. In case of heating oil, the decrease was 45%.

Similarly, the comparably high taxes in the EU mitigated the feed-through of the recent oil price rise: between 2017 and 2018, retail prices of gasoline and diesel (including taxes and duties) increased between 4% and 14%, 4 and 18%, respectively, as compared to a more than 50% increase in international crude oil prices in the same period (measured in USD). In case of heating oil, where the tax component is smaller, the price increase was between 5 and 24%.

Finally, although their current use is limited, alternative fuels provide an increasing share of the energy mix in transport and their importance is expected to grow in the future. At the same time, as shown by Trinomics et al. (2018), data on retail prices for compressed natural gas (CNG), liquefied natural gas (LNG), liquefied petroleum gas (LPG) and biofuels is not widely available. The growing importance of the market for alternative fuels shows the need of further efforts in collecting such retail prices in the future.

3.3.1 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 break down the final price to three main components: the net price, excise duty[15] and VAT. The reported data are published on the website of DG Energy.[16]

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 from 2005 to 2019. 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, from 2015, Greece does not report prices for the period from May to mid-October.

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 with weights in the previous year's consumption.

3.3.2 General findings

While the absolute level of the prices of the three oil products are different, their development over the last 15 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. Prices decreased afterwards, with the decrease

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

accelerating in 2015-2016. As crude oil prices recovered from 2016, oil product prices have been also rising and in 2018 and 2019 reached a level that was in 2011 and 2014.

For comparison, **Figure 65** also depicts the evolution of the Brent crude oil price (recalculated into EUR/litre).

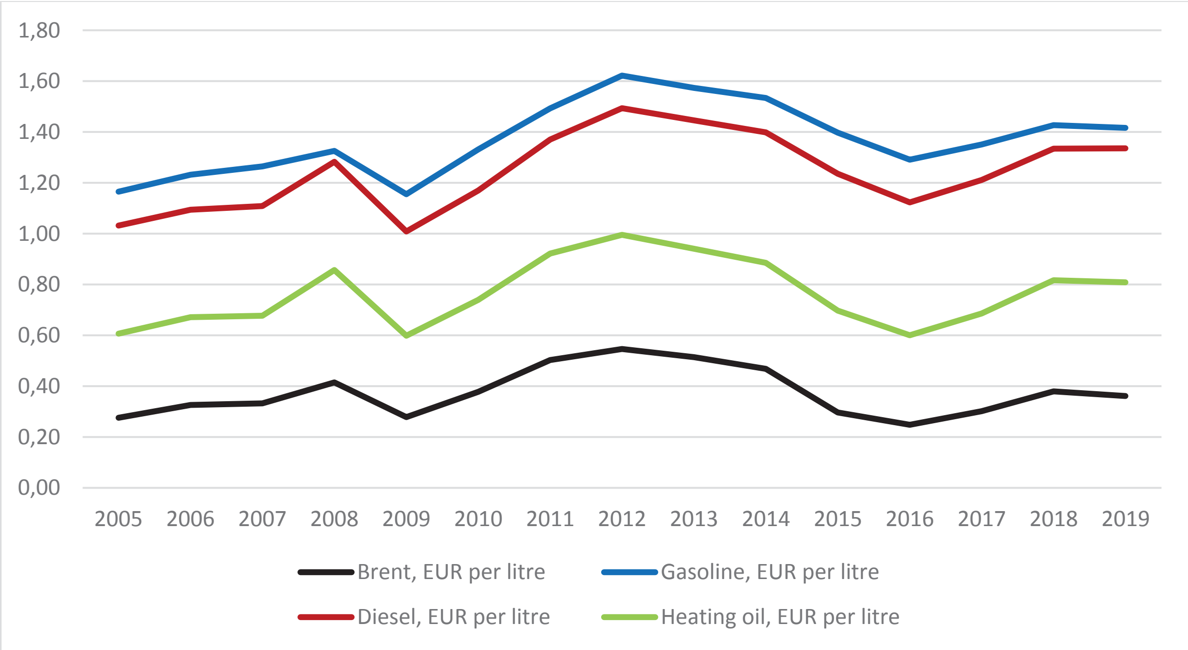


Figure 65 - Average retail price of oil products in the EU

Source: Oil Bulletin, DG Energy, Platts

The difference in the absolute price of the three products can be mostly attributed to the diverging tax rates.

All countries but UK, Ireland, and Luxembourg have the same VAT tax rates for all the fuels. UK, Ireland, Luxembourg have the same VAT rates for gasoline and diesel, but lower for heating oil (Portugal had a similar pattern up to 2012).

So most of the difference comes from excise taxes. The Energy Tax Directive sets a higher minimum excise rate for gasoline (0.359 EUR/litre) compared to diesel (0.33 EUR/litre). Most of the countries have excise tax rate for gasoline the highest, followed by rate for diesel, followed by rate for heating oil.

The minimum rate established by the Energy Tax Directive (0.021 EUR/litre) is much lower than those for motor fuels. The UK has long been the only state where the two motor fuels (gasoline and diesel) are taxed at the same level, with heating oil taxed by excise tax less, but is joined recently in 2019 by Belgium (gasoline excise = diesel excise > heating oil excise). In practically all Member States, the excise duty rate of gasoline is higher than that of diesel, which is higher than that for heating oil (gasoline excise > diesel excise > heating oil excise). Few Member States (Bulgaria, the Czechia, Hungary, Netherlands and Romania) apply practically the same excise duty rates for diesel and heating oil, with excise for gasoline higher (gasoline excise > diesel excise = heating oil excise). In most Member States, however, heating oil is taxed at a lower level. Czechia is the only country that has subsidies 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 EUR/litre to 0.33 EUR/litre on 1 January 2010, requiring some Member States to adjust their rates.

Contrary to the general trend, the weighted average excise duty rate for gasoline fluctuated slightly from 2104 to 2016. While a few Member States indeed reduced the excise duty rate for gasoline in this period, the decrease was driven mainly by exchange rate developments, in particular the depreciation of the pound sterling which made the UK excise duty (unchanged in the local currency) significantly lower when expressed in euros.

Austria is the only Member State that had other indirect taxes (mostly intended to curb pollution) on fuel throughout the period. Some Member States introduced them since 2010 or in last 5-6 years (CY, ES, GR, HU, IE, LV, NL, PT, SI, SK), but other member states did not. Since those are small compared to other taxes and are calculated per litre, we add them in our analysis to excise taxes.

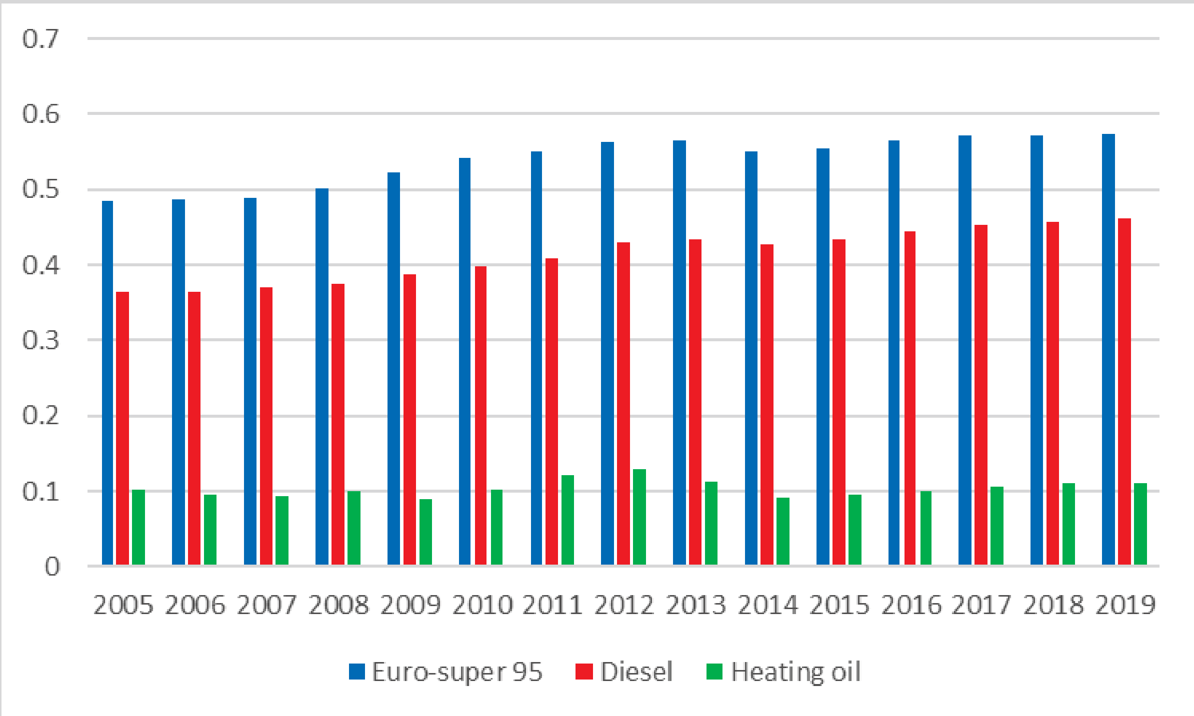


Figure 66 - Average excise duty rates for oil products in the EU (EUR/litre)

Source: Oil Bulletin, DG Energy

If the net price of the three 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.

Figure 67 also depicts the evolution of the Brent crude oil price (recalculated into EUR/litre), showing that crude oil is clearly the main component of the net price. Over the period, crude oil price represented on average 65-70% of the net price of gasoline and diesel but in 2015-2016, as crude oil prices dropped significantly, this share dropped below 60%.

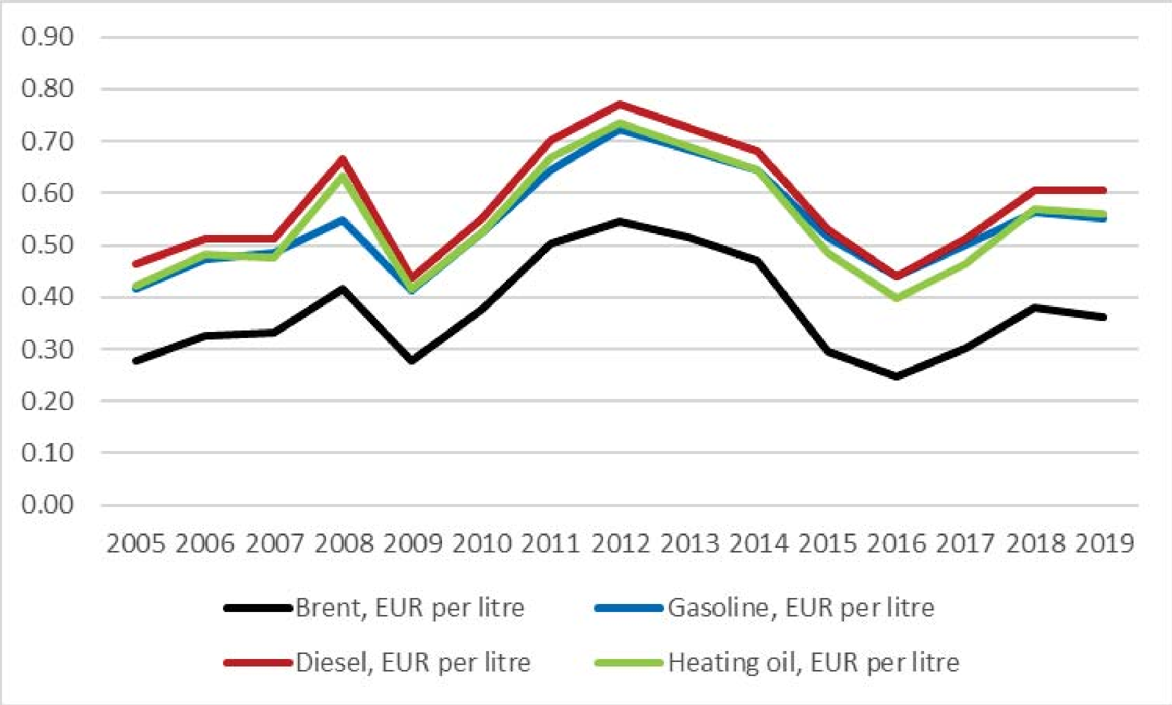


Figure 67 - Average retail price of oil products in the EU, without taxes

Source: Oil Bulletin, DG Energy

3.3.3 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 EUR/litre. This range has slightly narrowed between 2013 and 2016, towards 0.45 EUR/litre, indicating some degree of price convergence. However, the range widened afterwards, exceeding 0.6 EUR/litre in 2019.

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 the first half of 2018, the EU average gasoline price was 6% higher than in 2008; in case of Greece, the increase was 39%. At the other end of the spectrum, prices in Poland decreased by 8%, mainly because of the depreciation of the national currency in the second half of 2008 (measured in Polish zloty, the average price increased).

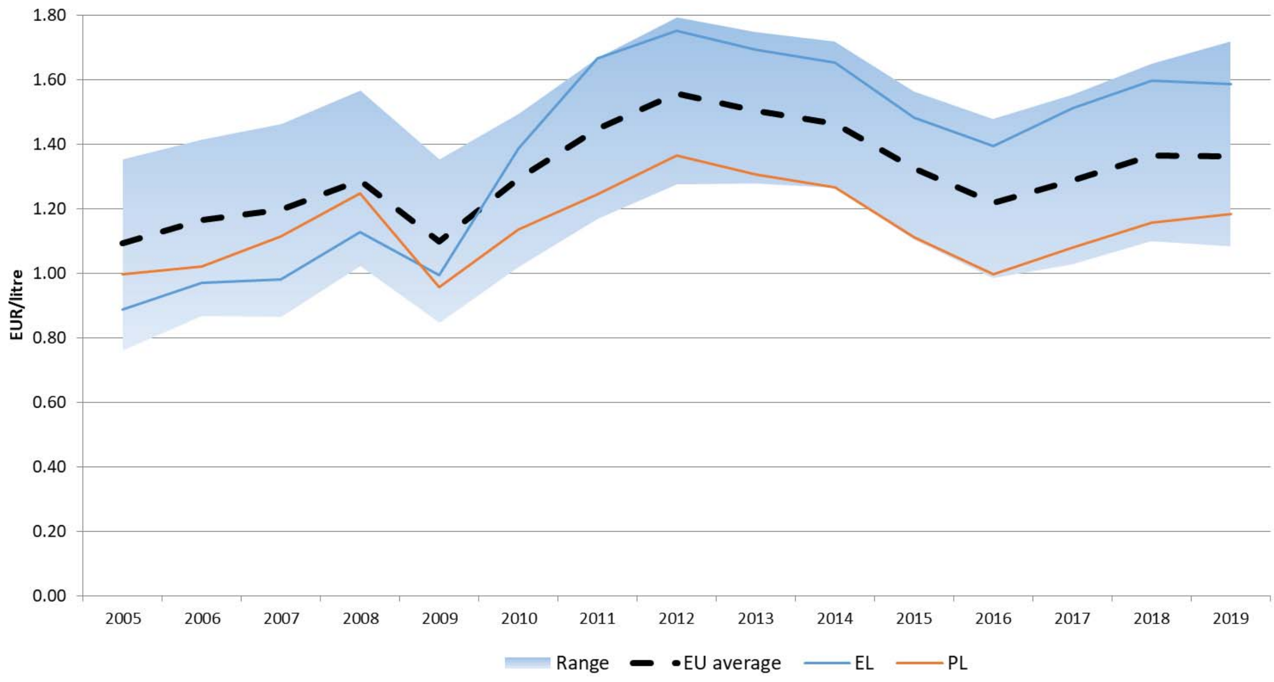


Figure 68 - The retail price of gasoline in the EU

Source: Oil Bulletin, DG Energy

Looking at net prices, the dispersion is smaller, the difference between the highest and the lowest price is typically between 0.10 and 0.15 EUR/litre. The net price depends on a number of factors, including the source of supply (local refinery or import), industry structure and competition. In 2019, the lowest net price was reported by Slovenia and Czechia, while the highest by the Denmark. Average net price follows the representative wholesale price (Platts Gasoline Prem Unleaded 10ppmS FOB AR Barge).

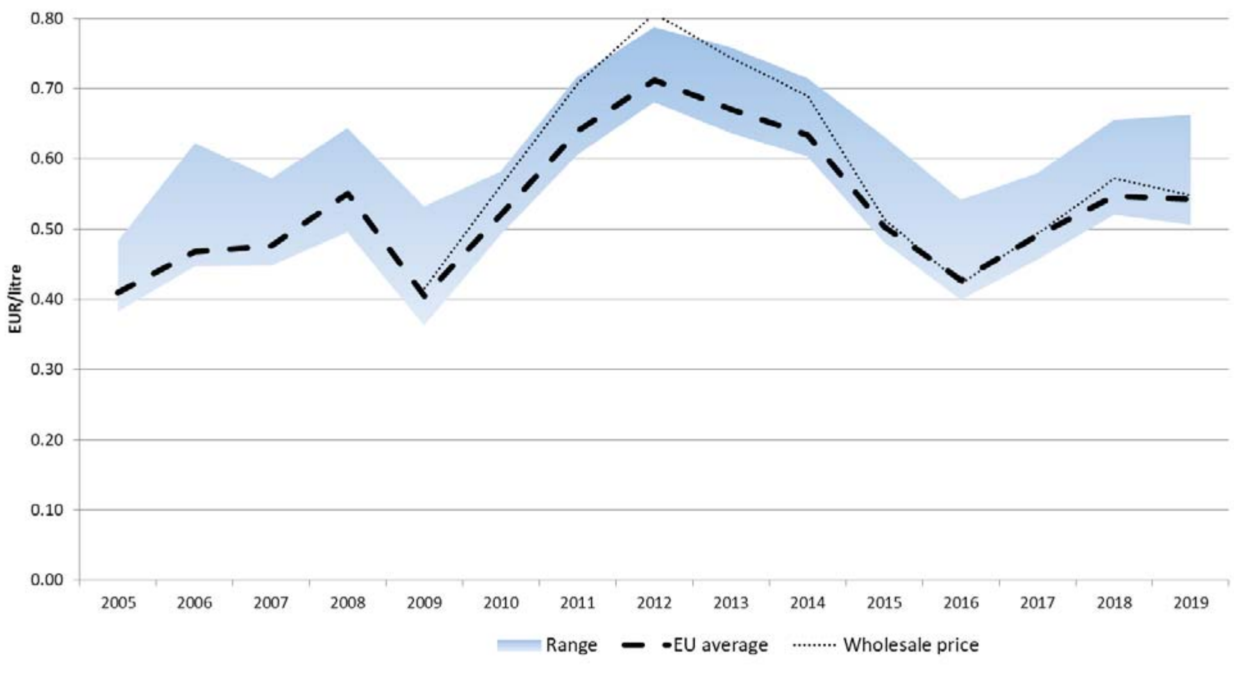


Figure 69 - The retail price of gasoline in the EU, without taxes

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 2019, in half of the Member States it actually exceeded the net price. Over the years, we see a gradual increase of the average excise duty rate, with a highest level in 2015 and then period of slight decreasing and rebounding again, from 0.50 EUR/litre in 2005, to 0.59 EUR/litre by 2015, and then falling back to 0.58 EUR/litre in 2018 and 2019.

In most Member States, excise duty rates increased between 2008 and 2019, with the biggest increases in Greece (98%), Latvia (63%) and Cyprus (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 Hungary and Poland, the excise duty rate measured in euro was lower in 2018 than in 2008, mainly because of exchange rate developments (in national currencies, the excise duty rates increased over this period). In 2015, the UK had the highest excise duty in the EU but since then, due to the depreciation of the pound sterling, the excise duty measured in euro has significantly decreased.

For most of the study period, the Netherlands applied the highest excise duty rate for gasoline while Bulgaria had the lowest rate, just above the minimum level prescribed by the Energy Tax Directive.

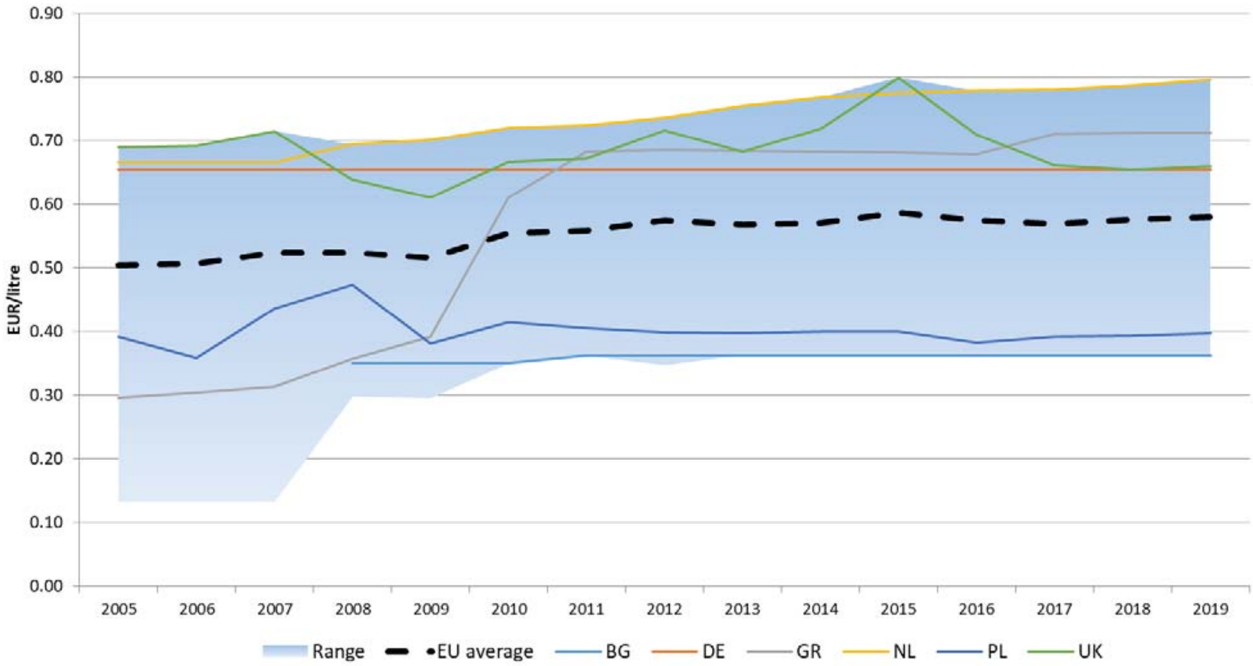


Figure 70 - The excise duty rate of gasoline in the EU

Source: Oil Bulletin, DG Energy.

The average VAT rate also increased during this period (as a part of the trend of fiscal policies of Member States of shifting more to consumption based taxation), from 19.3% in 2005 to 21.5% in 2014. Since then, the average VAT rate has not changed.

In 2014-2016, 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 54% in 2012 to 65% in 2016. Due to increases in the retail prices since 2017, the share of tax component decreased again towards 60%.

The average gasoline price increased in both 2017, 2018 and 2019, levelling the 2015 prices, while the 2012 remains the record high level. In 2019, the average price was 1.36 EUR/litre, composed of a 0.54 EUR/litre net price (40%), 0.58 EUR/litre excise duty (43%) and 0.24 EUR/litre (18%) VAT.

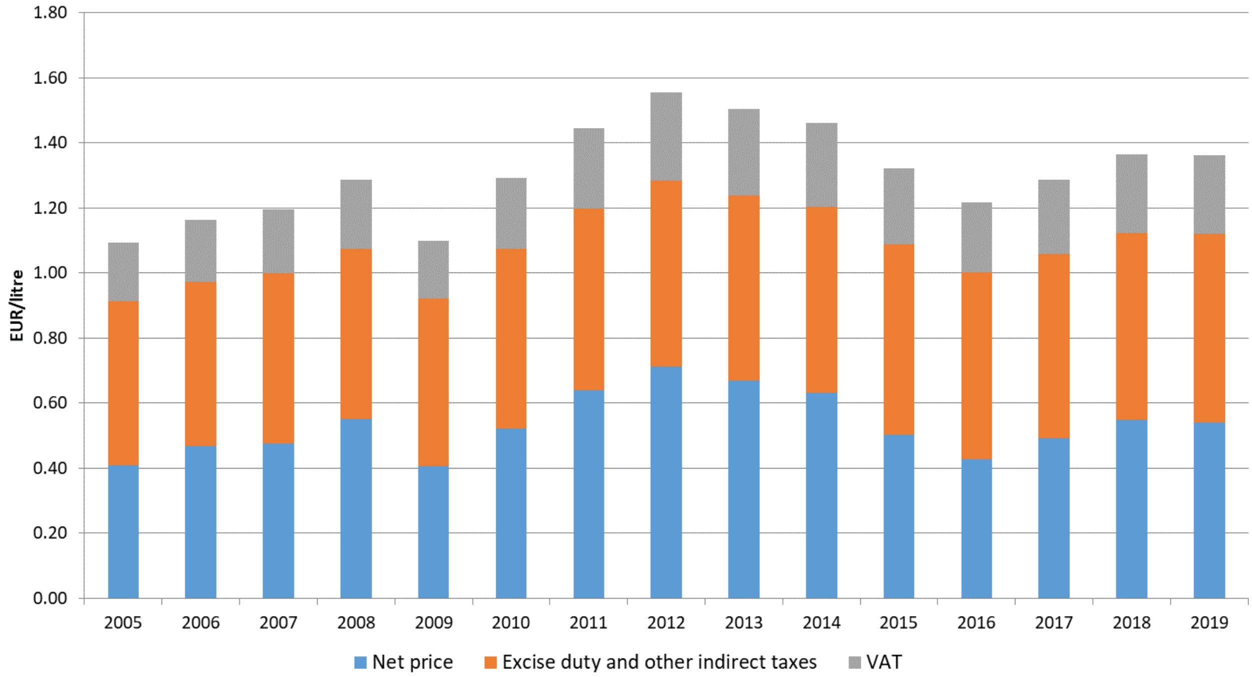


Figure 71 - Average retail price of gasoline in the EU by price component

Source: Oil Bulletin, DG Energy

The next graph shows the composition of the average gasoline price by Member State in 2019.

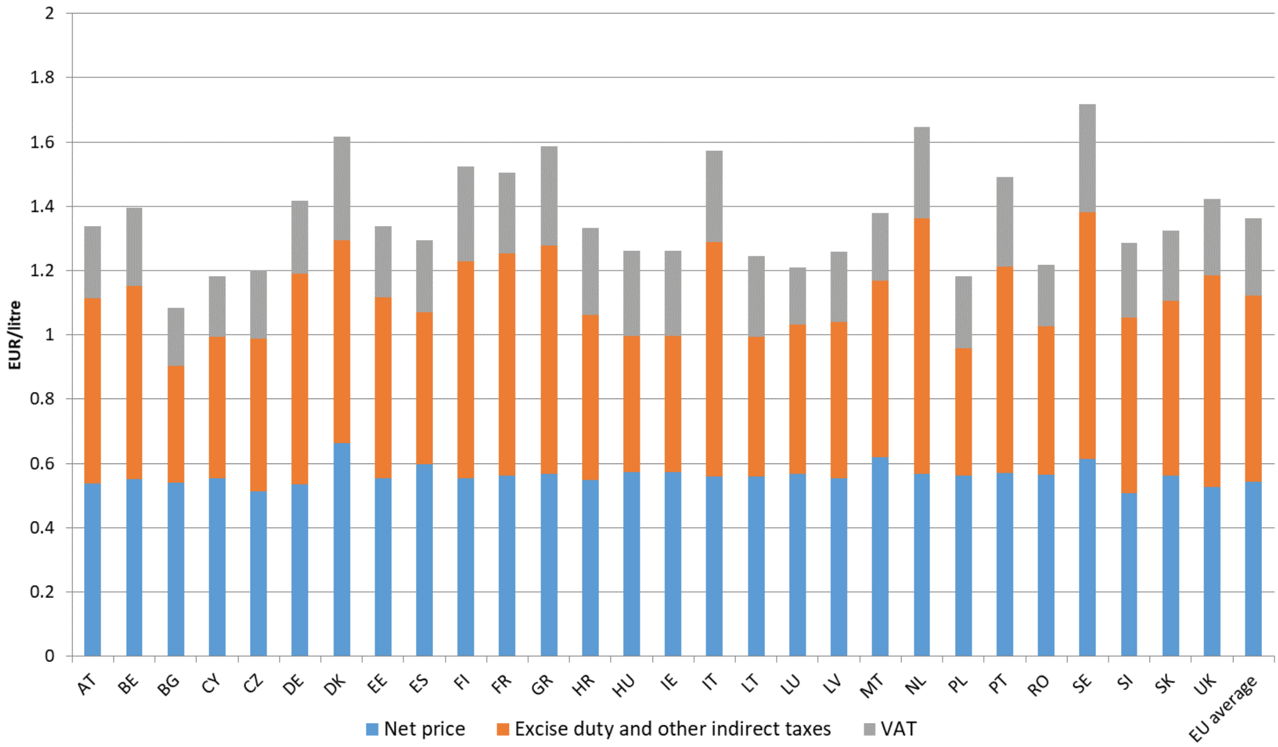


Figure 72 - Average retail price of gasoline in the first half of 2018 by Member State and price component

Source: Oil Bulletin, DG Energy

3.3.4 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 between 2008 and 2015: it was 0.37 EUR/litre in 2009 but grew to 0.50 EUR/litre in 2015 and was hovering around that level for much of the rest of the period with widening in 2018 and 2019 as most of the prices increased, but also situations in EU Member States economies started to diverge.

If the three most expensive countries (Italy, Sweden and the UK) were disregarded, the range would be considerably narrower. In 2015, the UK was by far the most expensive, 0.18 EUR/litre above the second most expensive country, Italy. However, the depreciation of the pound sterling in 2016-2017 had a negative impact on UK prices measured in euros and, as a result, it was "only" the third most expensive country in 2018 and 2019.

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 2018 and 2019, EU average diesel prices were 5% and 6% higher than in 2008; in case of Cyprus, the price increased by 15% and 13%.

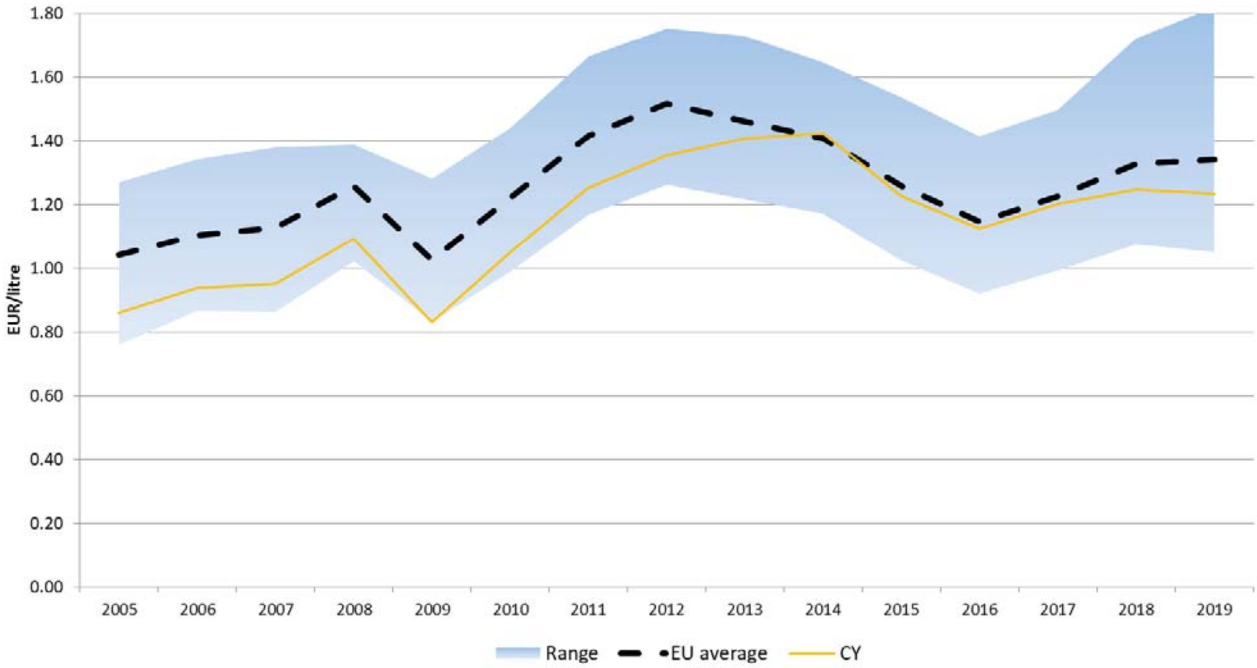


Figure 73 - The retail price of diesel in the EU

Source: Oil Bulletin, DG Energy

In case of net prices, the difference between the highest and the lowest price has been 0.23 in 2008 but the difference decreased to 0.13-0.16 EUR per litre. The widening of the range happened in 2018 and 2019 as prices grew. In 2019 Sweden was by far the most expensive country in terms of net prices, followed by other Scandinavian countries, while Czechia had the lowest net price. Looking at EU average net price with a representative wholesale price (Platts ULSD 10ppmS FOB ARA Barge), we find retail diesel prices followed the wholesale price.

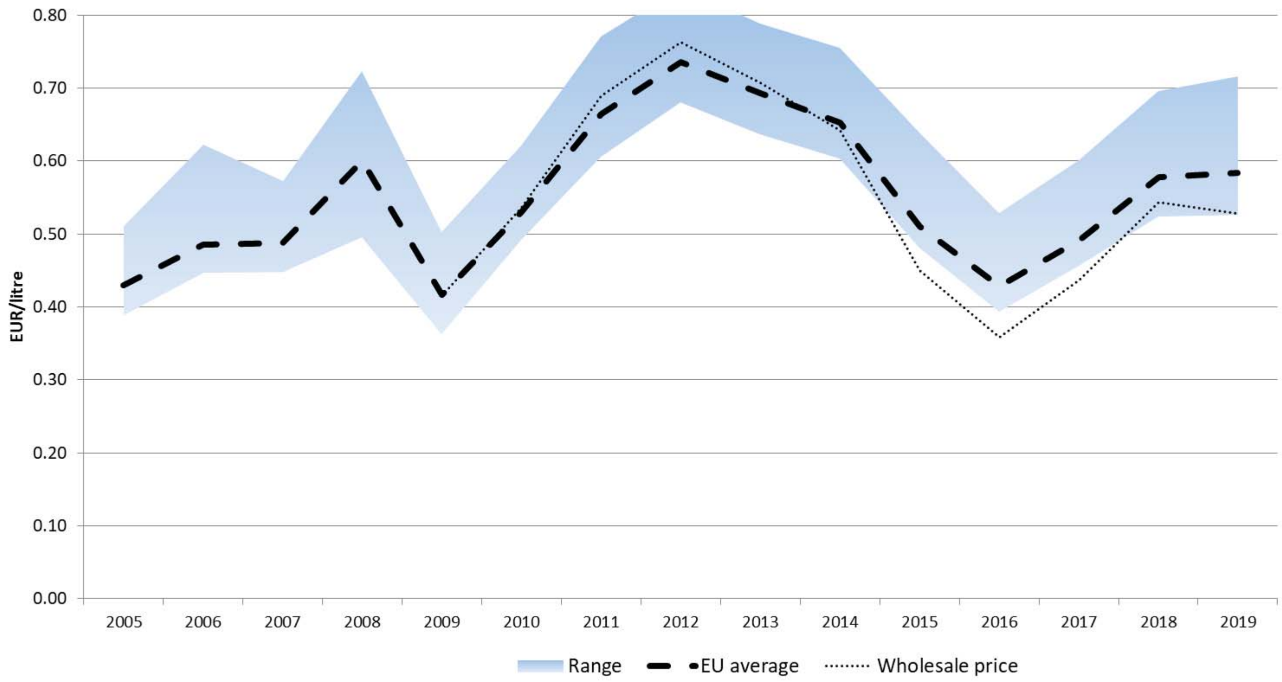


Figure 74 - The retail price of diesel in the EU, without taxes

Source: Oil Bulletin, DG Energy, Platts**.** The wholesale price is Gasoline Prem Unleaded 10ppmS FOB AR Barge reported by Platts

The average excise duty rate of diesel increased from 0.44 EUR/litre in 2005 to 0.52 EUR/litre in 2019, an increase of "only" 8% during the period. The excise on diesel has followed the movement on gasoline, trailing for the most time by 0.06 EUR per litre.

With two exceptions, excise duty rates increased in all Member States between 2005 and 2019, with the biggest increases in Cyprus (80%), Belgium (76%) and Slovenia (64%). 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 2019 than in 2008, as a result of a cut in the rate in 2010.

The excise duty rate applied by the UK, Sweden and other Scandinavian countries is significantly higher than in the rest of the countries. In contrast, Bulgaria and Luxembourg impose a rate at the minimum level prescribed by the Energy Tax Directive.

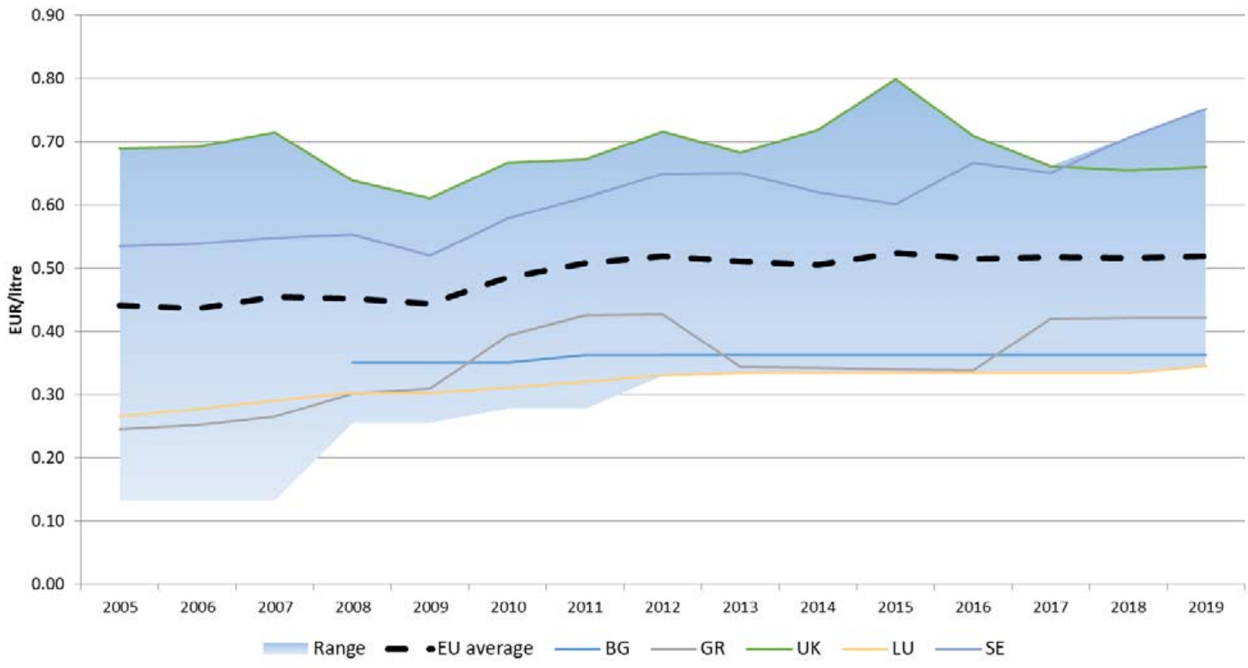


Figure 75 - The exercise duty rate of diesel in the EU

Source: Oil Bulletin, DG Energy

The average VAT rate of diesel also increased during the study period, from 19.6% in 2008 to 21.5% in 2013. Between 2014 and 2019, the average VAT rate for diesel has barely changed.

In 2012-2016, the average retail price of diesel decreased, with the share of the tax component increasing from 52% in 2013 to 63% in 2016. As prices rose again, tax component decreased again towards 56%.

Since 2016, the average retail price of diesel has been on the rise coming close to the record level reached in 2012. In 2019, the average price was 1.34 EUR/litre, composed of a 0.58 EUR/litre net price (43%), 0.52 EUR/litre excise duty (39%) and 0.24 EUR/litre (18%) VAT.

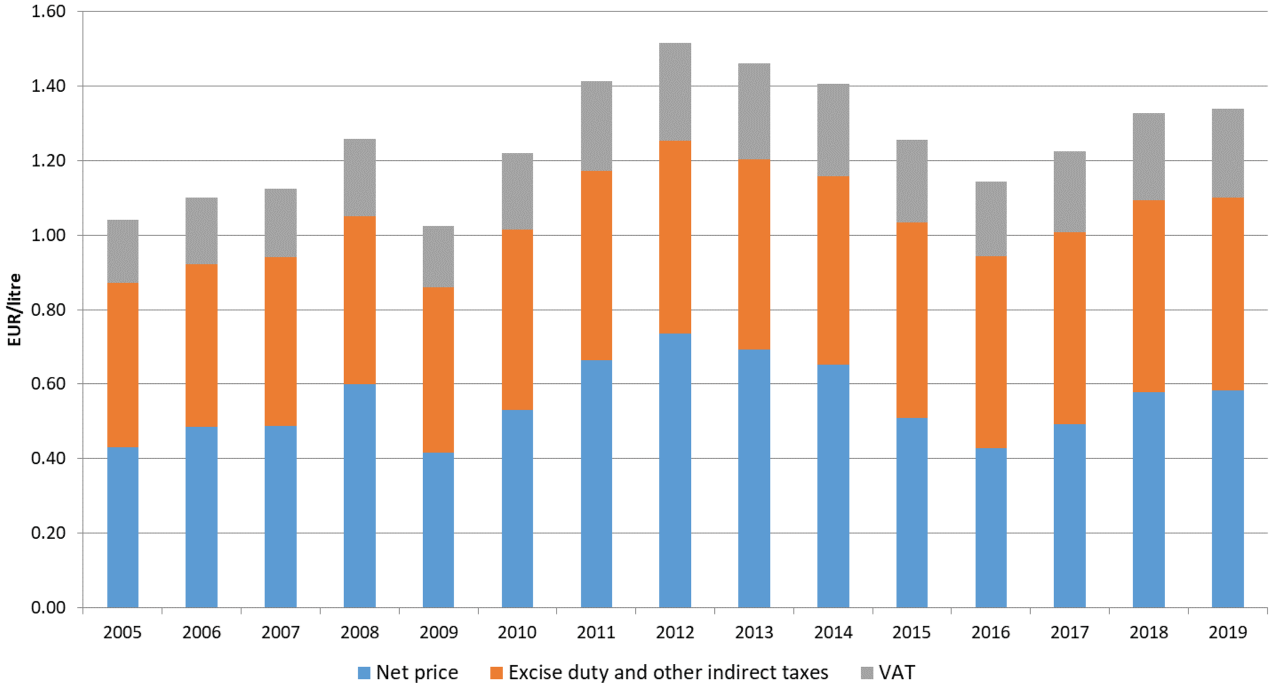


Figure 76 - Average retail price of diesel in the EU by price component

Source: Oil Bulletin, DG Energy

The next graph shows the composition of the average diesel price by Member State in 2019.

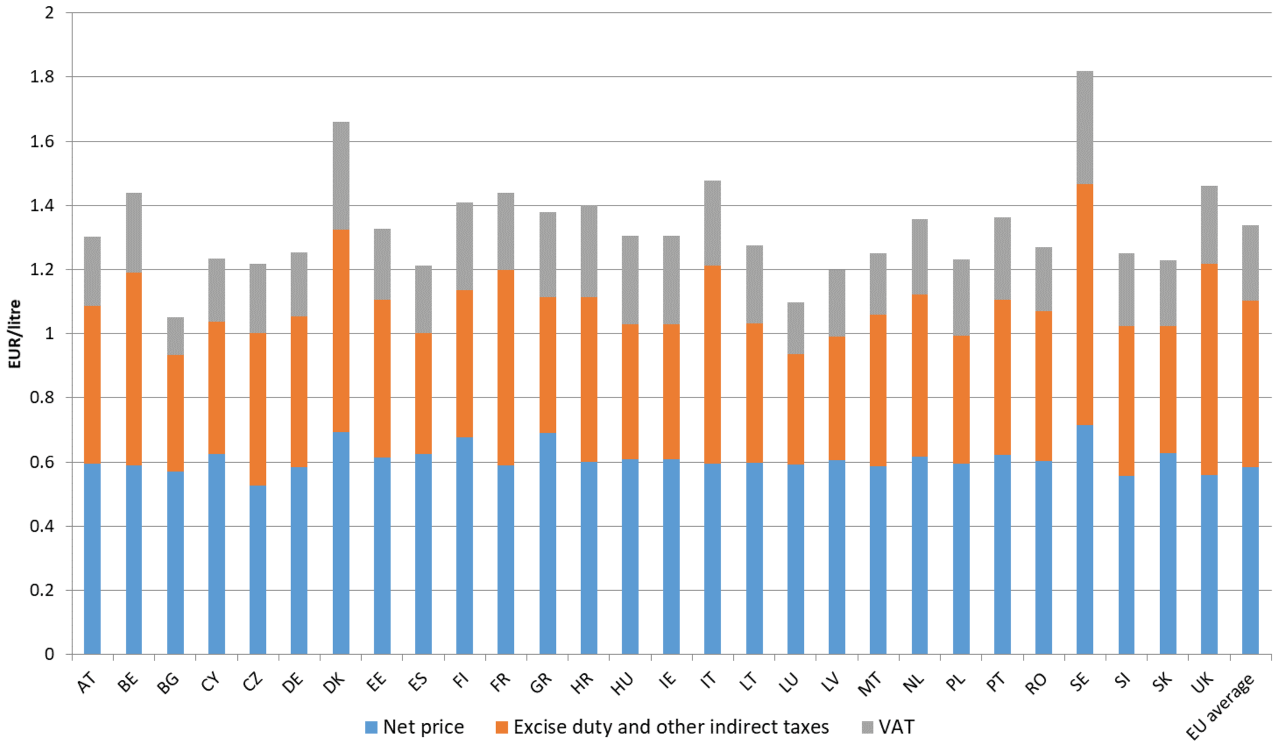


Figure 77 - Average retail price of diesel in the first half of 2018 by Member State and price component

Source: Oil Bulletin, DG Energy

3.3.5 Heating oil

The large 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 0.79 EUR/litre in 2005 to 0.89 EUR/litre in 2012 and kept widening throughout the period beyond 1 EUR per litre. Slovakia ceased to report heating oil in 2011. In the most expensive Member State, Denmark, the price in 2019 was 109% 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 has been consistently below the EU average.

Bulgaria experienced the biggest relative increase in heating oil prices: in 2008 its price was well below the EU average but today it is considerably higher. Ireland experienced the biggest price drop from the peak in 2012, 23%.

During most of the study period, Denmark had the highest heating oil prices in the EU, driven by a high excise duty.

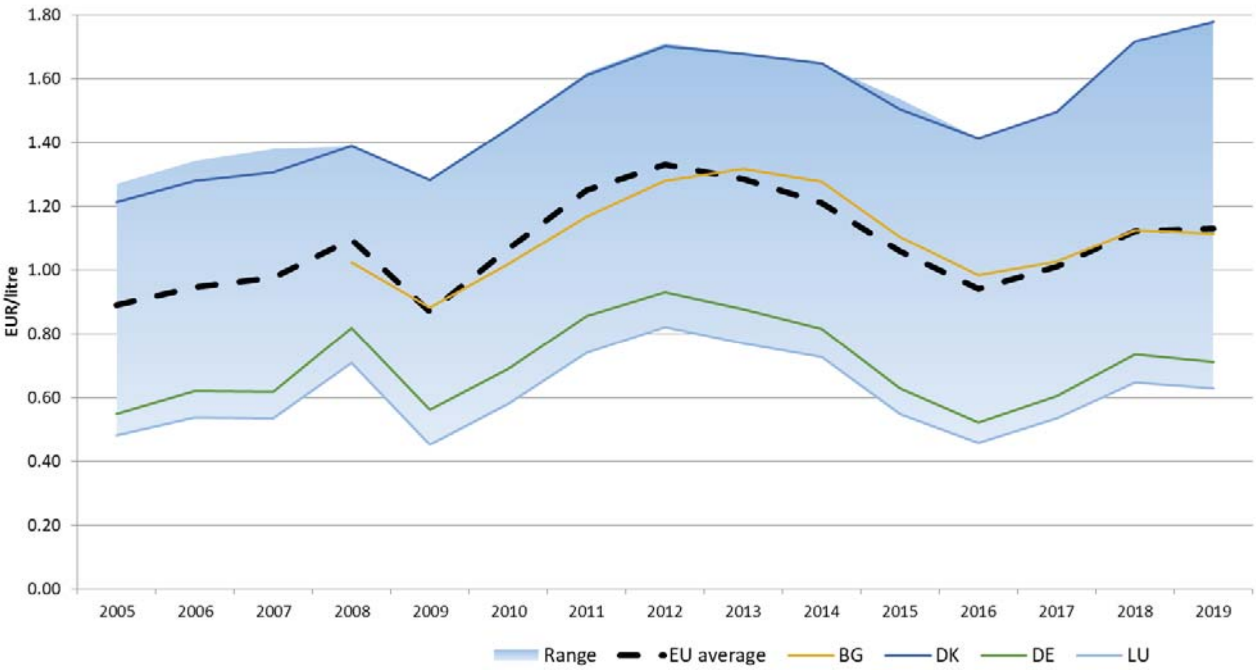


Figure 78 - The retail price of heating oil in the EU

Source: Oil Bulletin, DG Energy

The difference between the highest and the lowest price is rather high also in case of net prices (0.11-0.43 EUR/litre), significantly higher than for motor fuels. The gap significantly increased until 2013 but narrowed slightly back afterwards.

Denmark had the highest net price of heating oil in 2019; 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) shows that retail prices of heating oil have mimicked wholesale price.

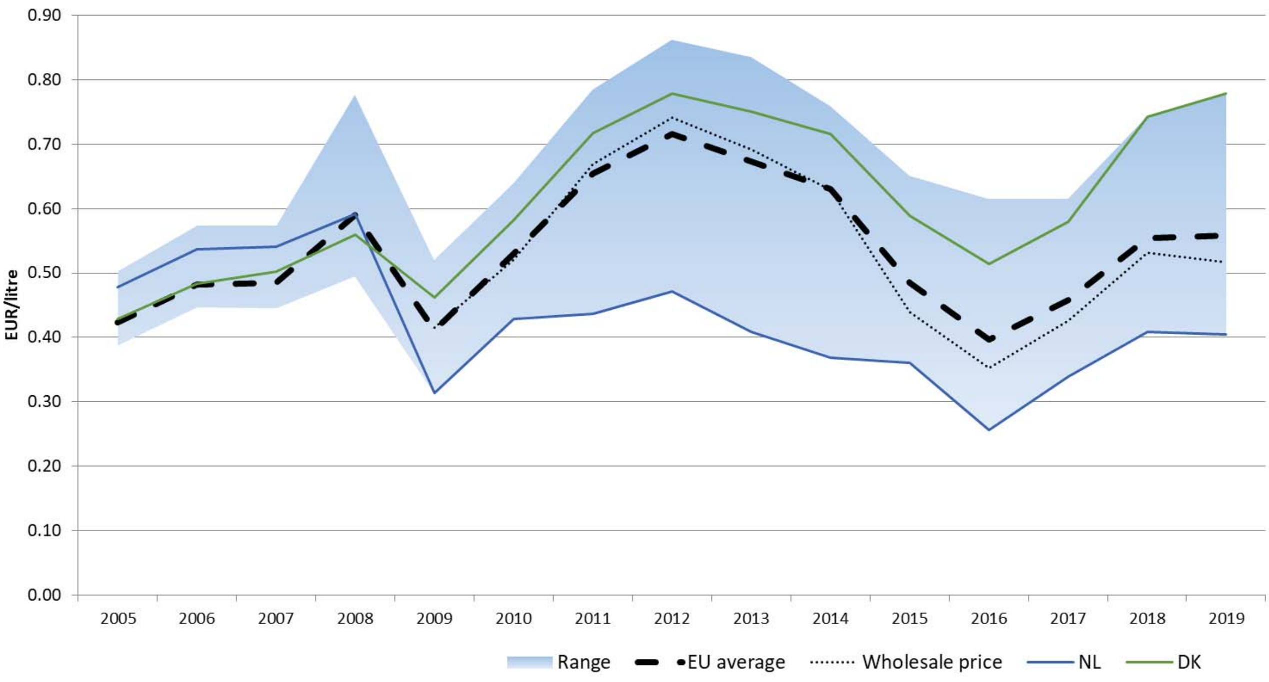


Figure 79 - The retail price of heating oil in the EU, without taxes

Source: Oil Bulletin, DG Energy, Platts

The wholesale price is Gasoline Prem Unleaded 10ppmS FOB AR Barge reported by Platts

The average excise duty rate of heating oil increased from 0.33 EUR/litre in 2005 to 0.39 EUR/litre in 2011-2013 and decreased slightly since towards 0.37 EUR/litre. Although most Member States apply a higher rate, the main consumer of heating oil, Germany, has an excise duty of only 0.06 EUR/litre.

Several Member States increased the excise duty rate between 2005 and 2019, but in a couple of countries (Austria, Germany, Italy, Lithuania and Luxembourg) it remained unchanged. Bulgaria significantly increased the excise duty rate in 2011 but returned to the previous, lower rate the following year; the rate was increased again in 2016. Sweden and other Scandinavian countries have the highest excise duty rate (0.71 and 0.69 EUR/litre in 2018 and 2019). Netherlands has also high excise rate and it is one of the few countries that apply the same rate for diesel and heating oil. Luxembourg reports the lowest excise duty rate, 0.01 EUR/litre. The rates applied by Belgium and Luxembourg are lower than the minimum level set by the Energy Tax Directive (0.021 EUR/litre); Lithuania uses the minimum level.

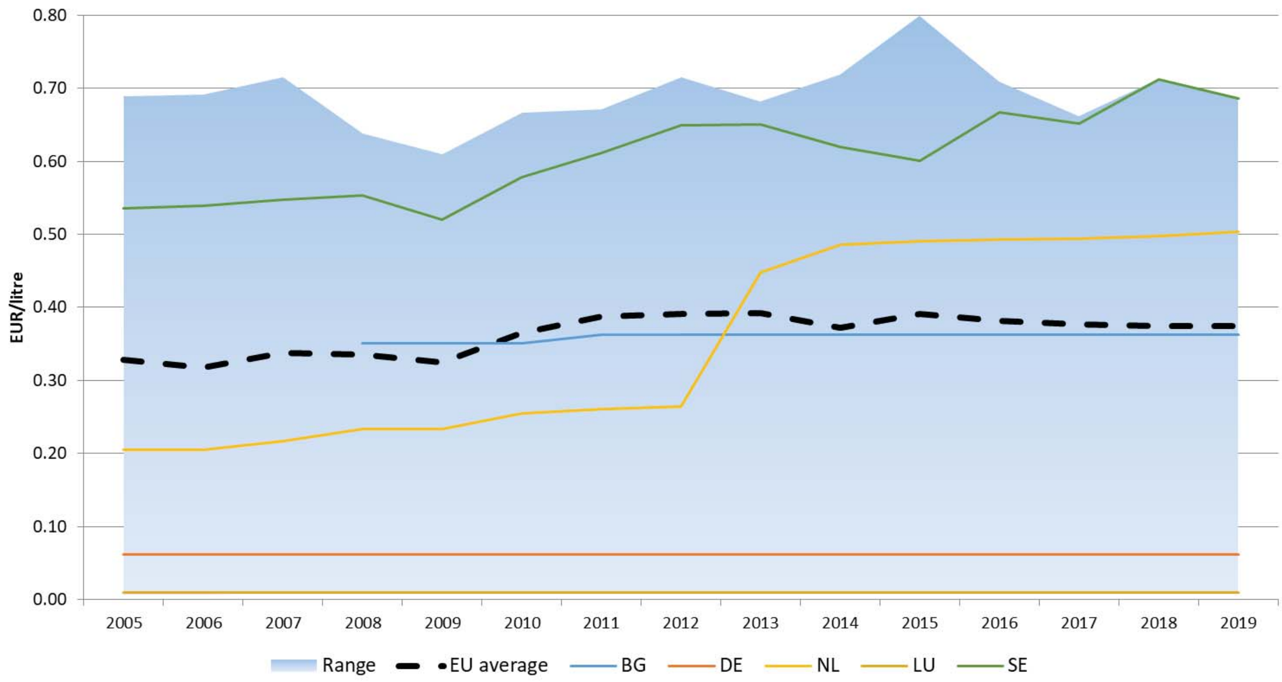


Figure 80 - The exercise duty rate of heating oil in the EU

Source: Oil Bulletin, DG Energy

The average VAT rate of heating oil also increased during this period, from 18.5% to 21.2%.

The average retail price of heating oil significantly decreased between 2012 and 2016, with the tax component increasing from 26% in 2012 to 46% in 2016. But with prices rising again since 2016, the tax component increased beyond 50%.

Prices have been rising since 2016 and in some cases (DK, SE) have surpassed the 2012 level. In 2019, the average price was 1.13 EUR/litre, composed of a 0.56 EUR/litre net price (50%), 0.37 EUR/litre excise duty (33%) and 0.20 EUR/litre (18%) VAT.

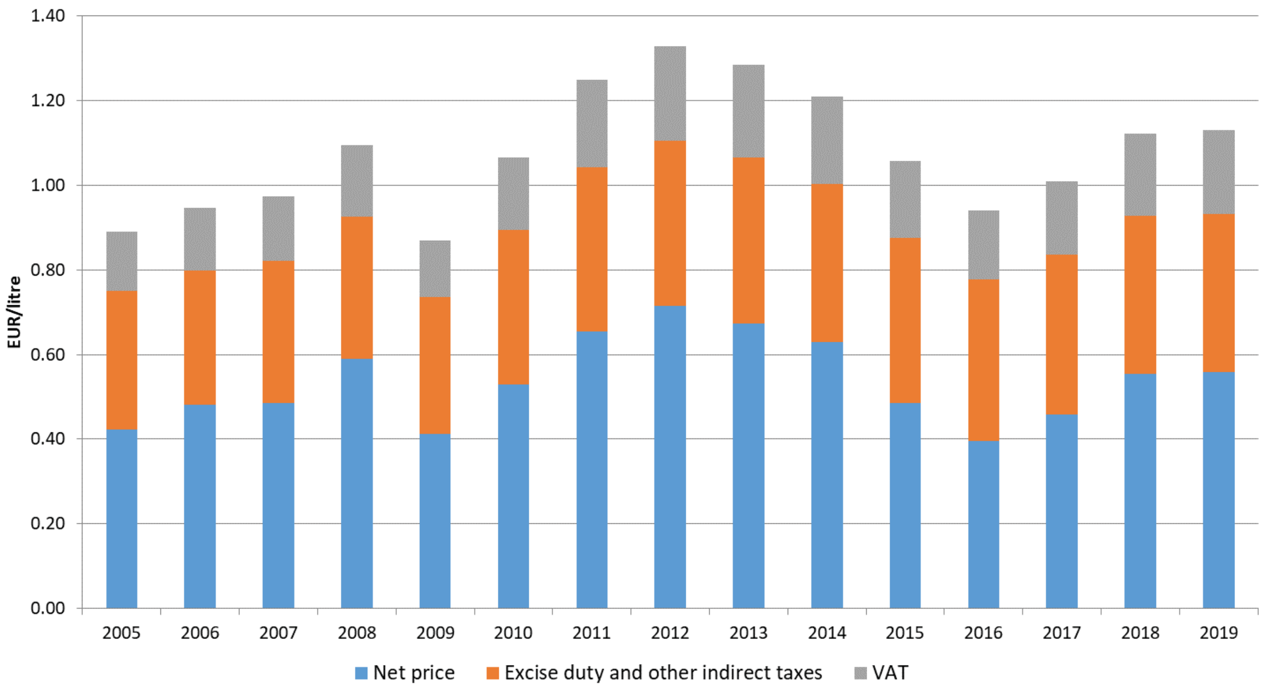


Figure 81 - Average retail price of heating oil in the EU by price component

Source: Oil Bulletin, DG Energy

The next graph shows the composition of the average heating oil price by Member State in the first half of 2019.

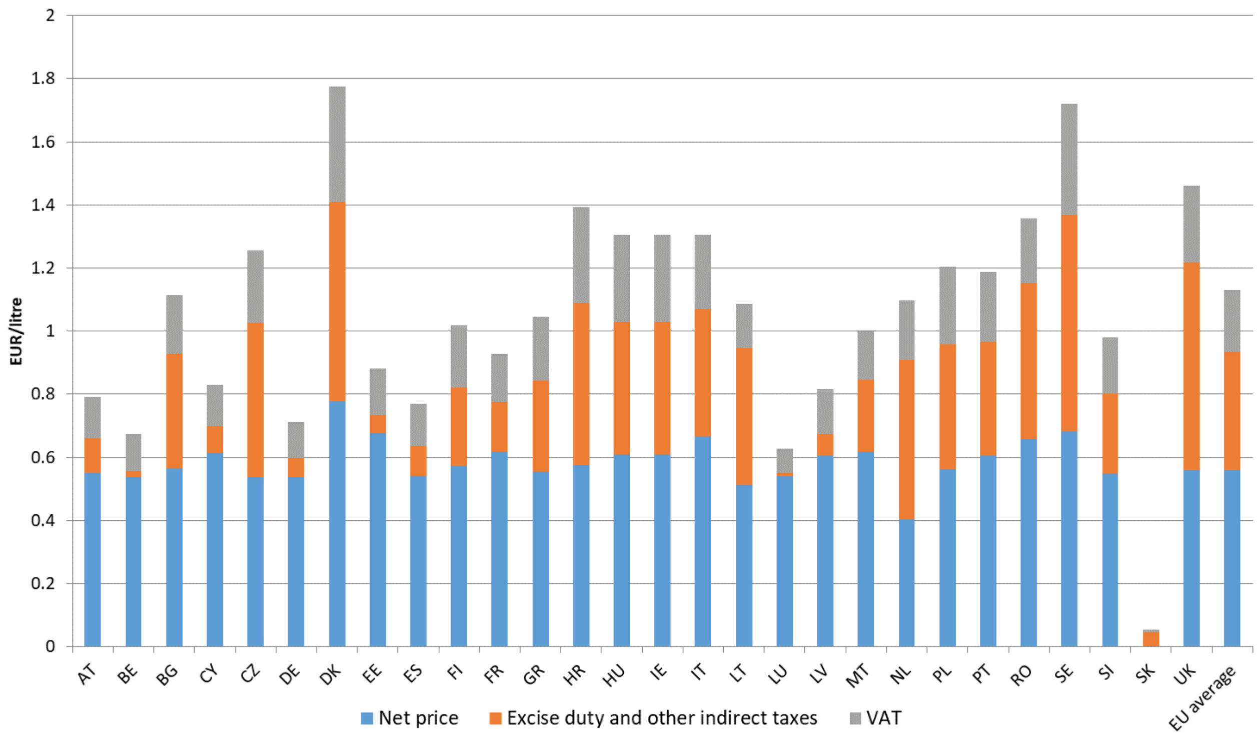


Figure 82 - Average retail price of heating oil in the first half of 2018 by Member State and price component

Source: Oil Bulletin, DG Energy

3.3.6 Gasoline vs diesel

The unequal tax treatment of the main motor fuels, gasoline and diesel, has been a contentious policy issue and was often considered as the most like explanation for the "dieselisation" of the European vehicle fleet. Most Member States impose a lower level of excise duty for diesel than for gasoil, resulting in a lower retail price, in spite of the fact that the wholesale price of diesel is typically slightly higher than that of gasoline. The price advantage of diesel, coupled with the improving fuel economy of diesel engines, made diesel cars increasingly popular in the passenger car and light duty vehicle segments, with their share from new registration reaching up to 70-80% in certain Member States. In contrast, in other regions of the world gasoline-engine cars continued to have a dominant role in the passenger car fleet. The dieselisation significantly contributed to the gasoline/diesel imbalance: European refineries produce too much gasoline which has to be exported while diesel output is insufficient to meet demand as Europe has to rely on imports.

More recently, the emission scandal with diesel-engine cars which broke out in September 2015, raised renewed questions about the tax advantage of diesel.

Back in 2011, the Commission made an attempt to remove the distortive tax treatment of the two fuels in the proposed revision of the Energy Taxation Directive.[17] According to the proposal, the minimum tax rates of energy products would have been based on the energy content and the CO2 content of the fuel, resulting in a lower minimum rate for gasoline (diesel has a higher energy and CO2 content per litre). However, following the unsuccessful negotiations between Member States in the Council, the proposal was withdrawn.

In this section we compare the development gasoline and diesel prices in the EU and try to investigate whether there has been an approximation of excise duty rates imposed on the two fuels.

Over the last ten years, the average retail price of gasoline has been consistently above the price of diesel, with the difference between 0.02 and 0.07 EUR/litre in this period, widening when prices drop and coming close when prices increase. In 2019 average difference was 0.07 EUR/litre.

[17] http://europa.eu/rapid/press-release_IP-11-468_en.htm?locale=en

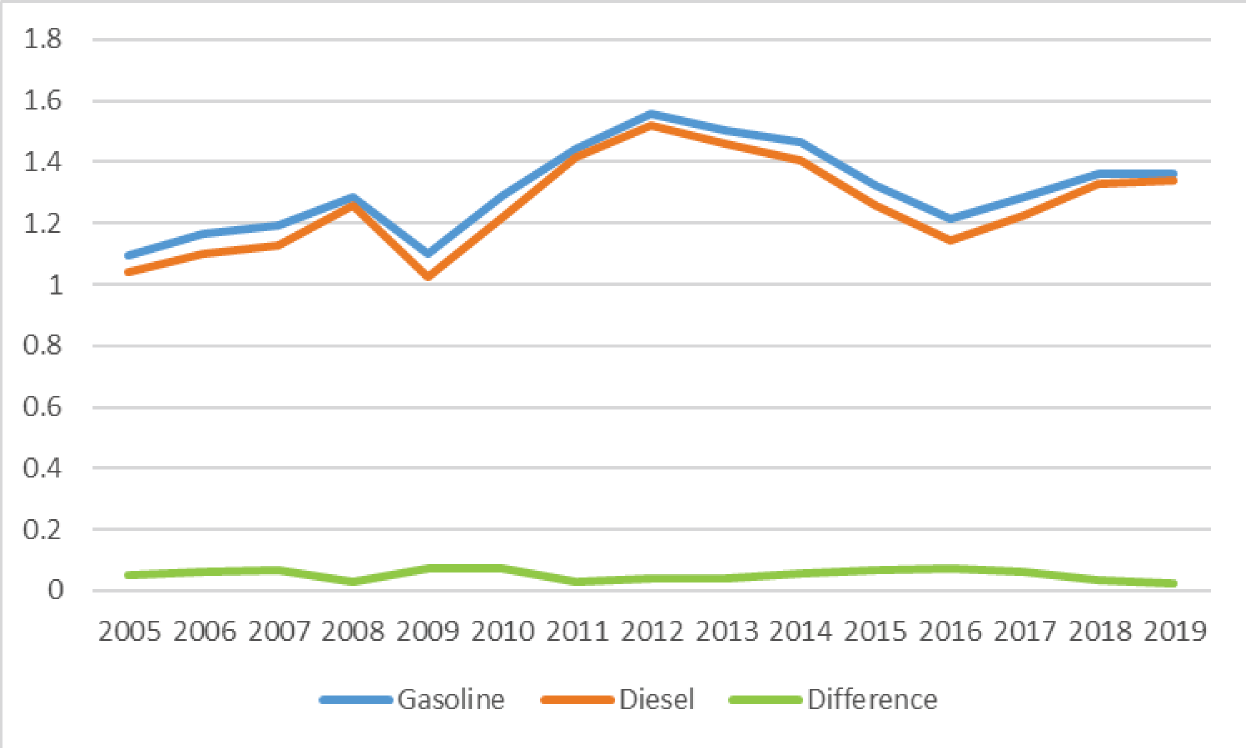


Figure 83 - Average retail price of gasoline and diesel in the EU, with taxes (EUR per litre)

Source: Oil Bulletin, DG Energy

When comparing the prices without taxes, it is striking that diesel prices are actually higher than gasoline prices. The only exception is 2016 when the average gasoline and diesel price was practically identical. In this year, global gasoline demand was supported by record-low oil prices, resulting in a relatively high gasoline price. Over the ten and half year period, the net price of diesel was on average 0.01 EUR/litre higher.

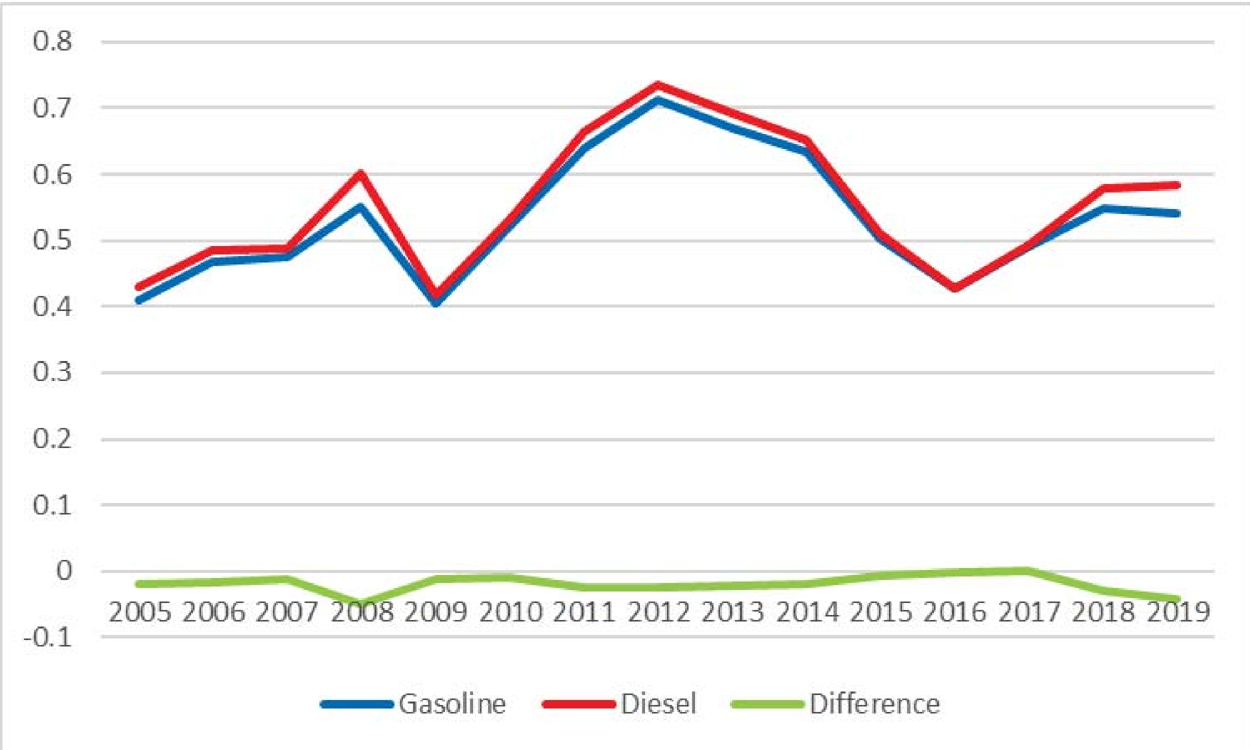


Figure 84 - Average retail price of gasoline and diesel in the EU, without taxes (EUR per litre)

Source: Oil Bulletin, DG Energy, Platts

The average excise duty rate for gasoline has been between 0.05 and 0.07 EUR/litre over the period, more than offsetting the lower net price of gasoline. The difference was largest in 2008 and 2009 (0.07 EUR/litre) but since then there has been declining a bit towards 0.05, with the average difference widening again in 2018 and 2019 as prices start rising again.

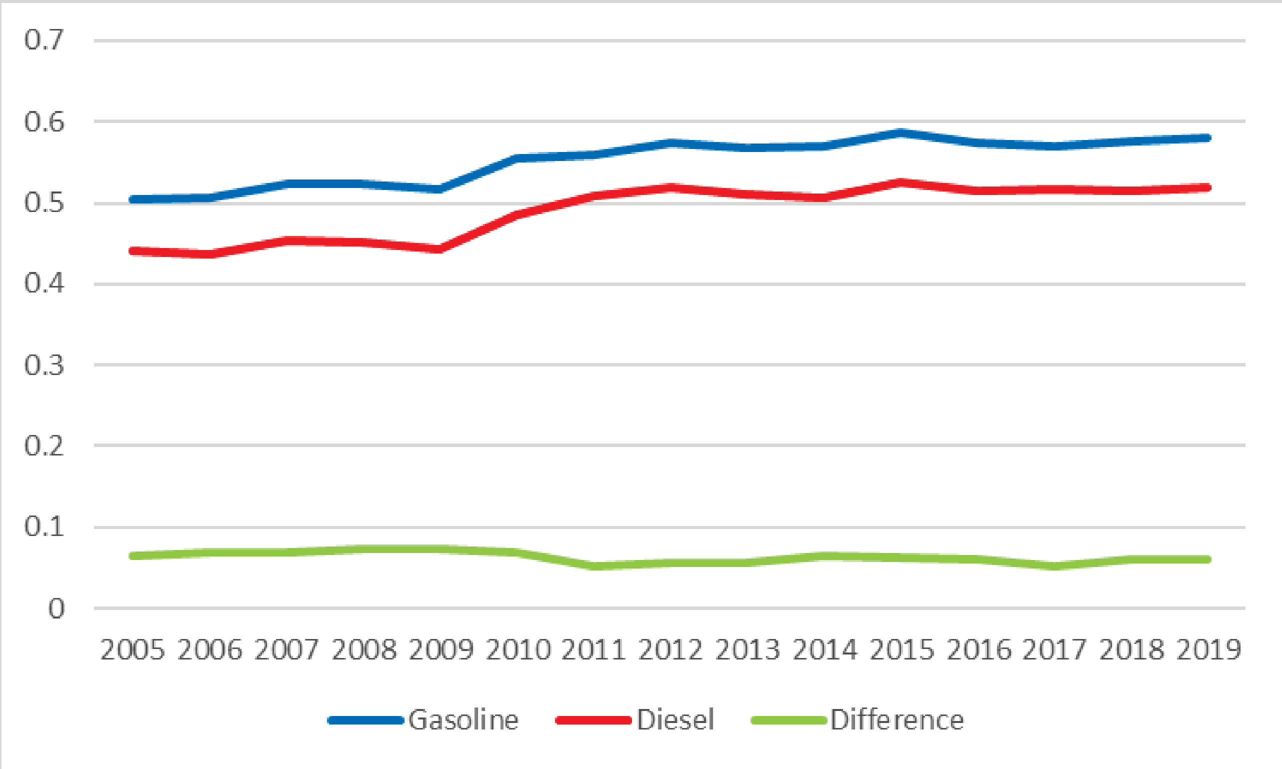


Figure 85 - Average excise duty rates for gasoline and diesel in the EU (EUR per litre)

Source: Oil Bulletin, DG Energy

In addition to the absolute difference, the relative (percentage) difference between gasoline and diesel excise duty rates also shows a decreasing trend: while in 2010 the excise duty on gasoline was on average 37% higher, by the first half of 2018 this difference decreased to 24%.

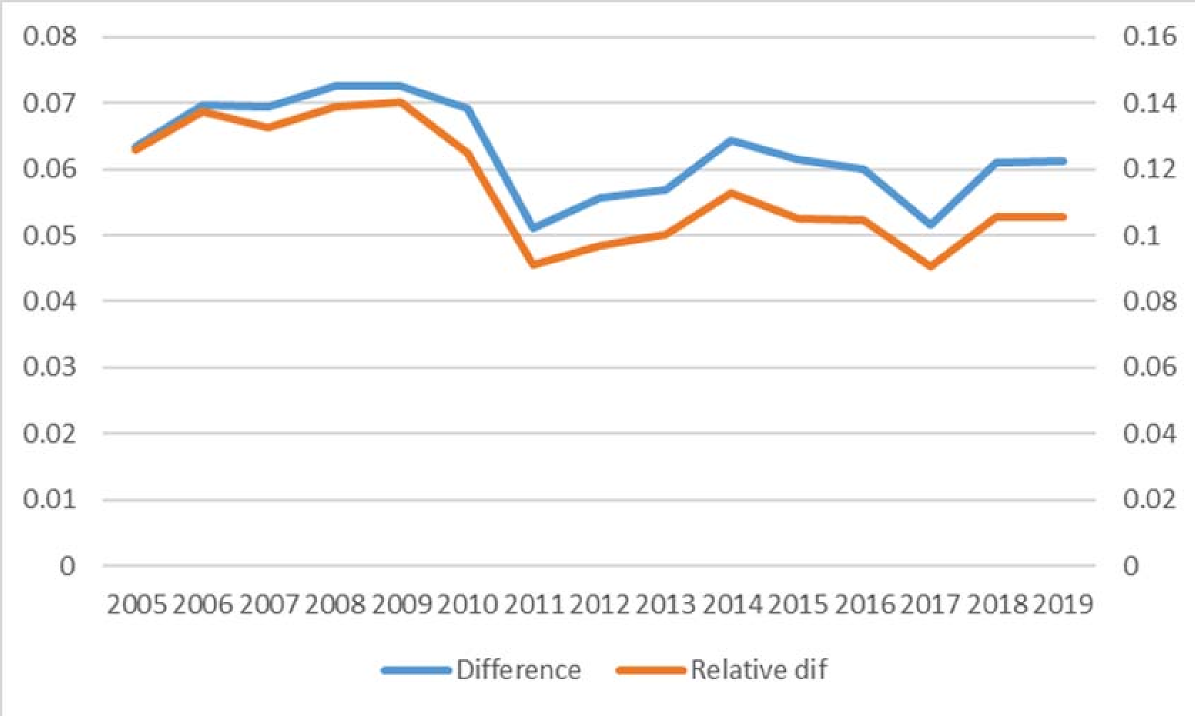


Figure 86 - The difference between the average excise duty rate on gasoline and diesel

Source: Oil Bulletin, DG Energy

In most Member States, excise duty rates increased for both gasoline and diesel in the last ten years. In case of gasoline, the average EU rate grew from 0.50 EUR/litre to 0.58 EUR/litre (+16%) while for diesel the average rate increased from 0.44 EUR/litre to 0.52 EUR/litre between 2005 and 2019. The faster growth of the diesel rate means that the difference has gradually diminished.

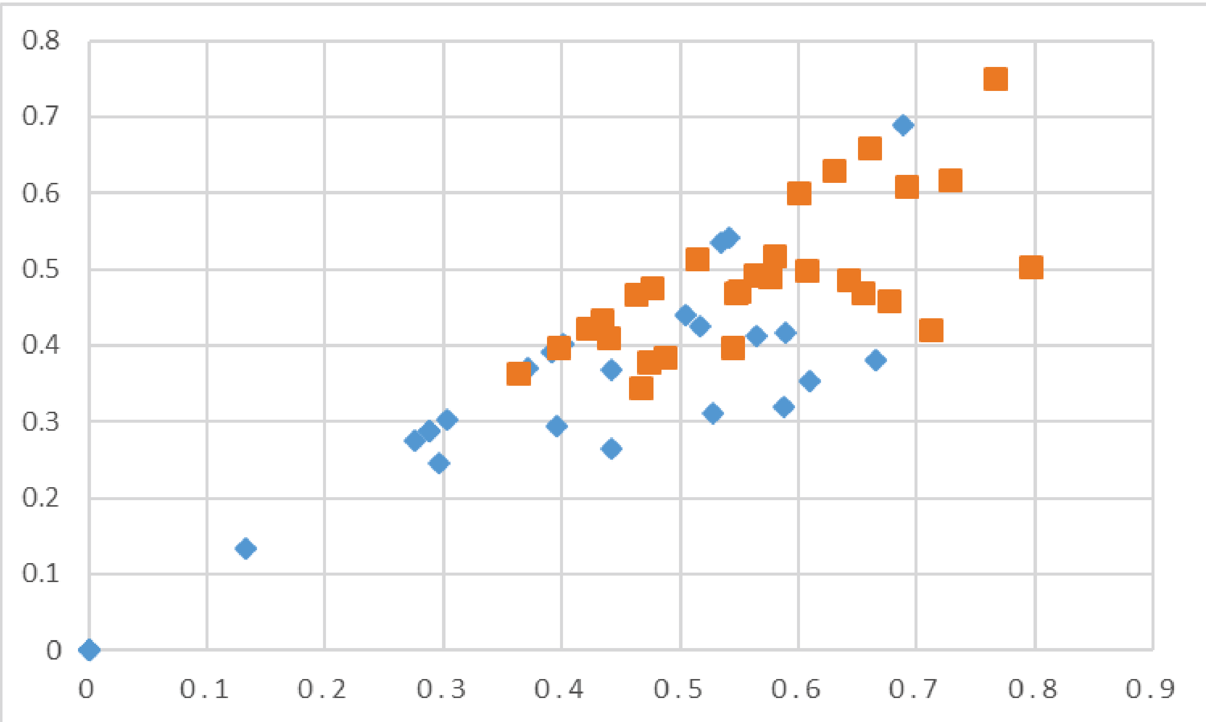


Figure 87 - Excise duty rates in individual Member States in 2005 (blue) and 2019 (red)

Source: Oil Bulletin, DG Energy

At EU level, the difference between the average gasoline and diesel excise duty rates decreased from 0.15 EUR/litre in 2005 to 0.10 EUR/litre in 2019. Looking at Member States, we can see that the difference decreased in only half of the Member States. In 12 Member States the absolute difference has actually increased, implying a growing tax advantage for diesel. For example, in Greece the gasoline excise duty rate has almost doubled (+98%) in this period while that of diesel grew by "only" 39%.

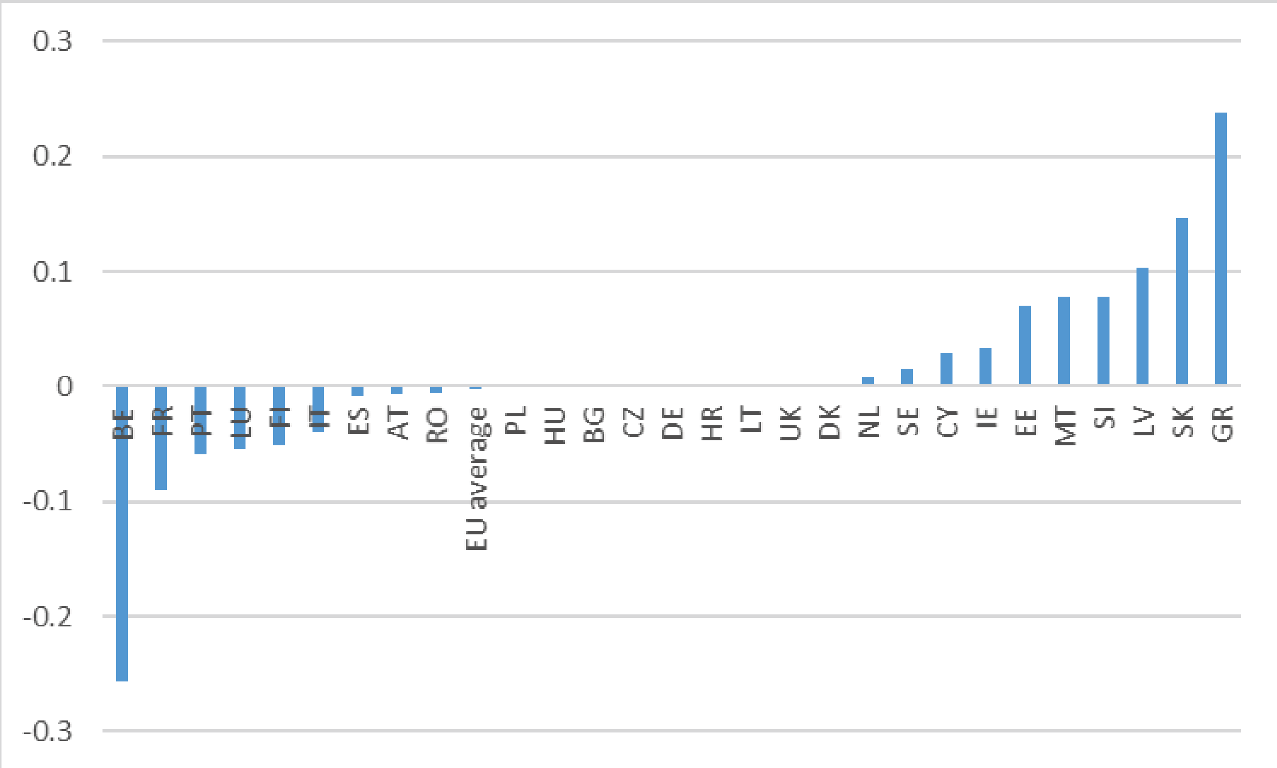


Figure 88 - the change of the difference between the gasoline and diesel excise duty rates between 2005 and the first half of 2019

Source: Oil Bulletin, DG Energy

In recent years, Belgium made the biggest step to remove the tax advantage of diesel: since 2016, the excise duty rate for diel has been gradually raised and by July 2018 the two excises were unified. As a result the difference between the retail prices of the two fuels has practically disappeared.

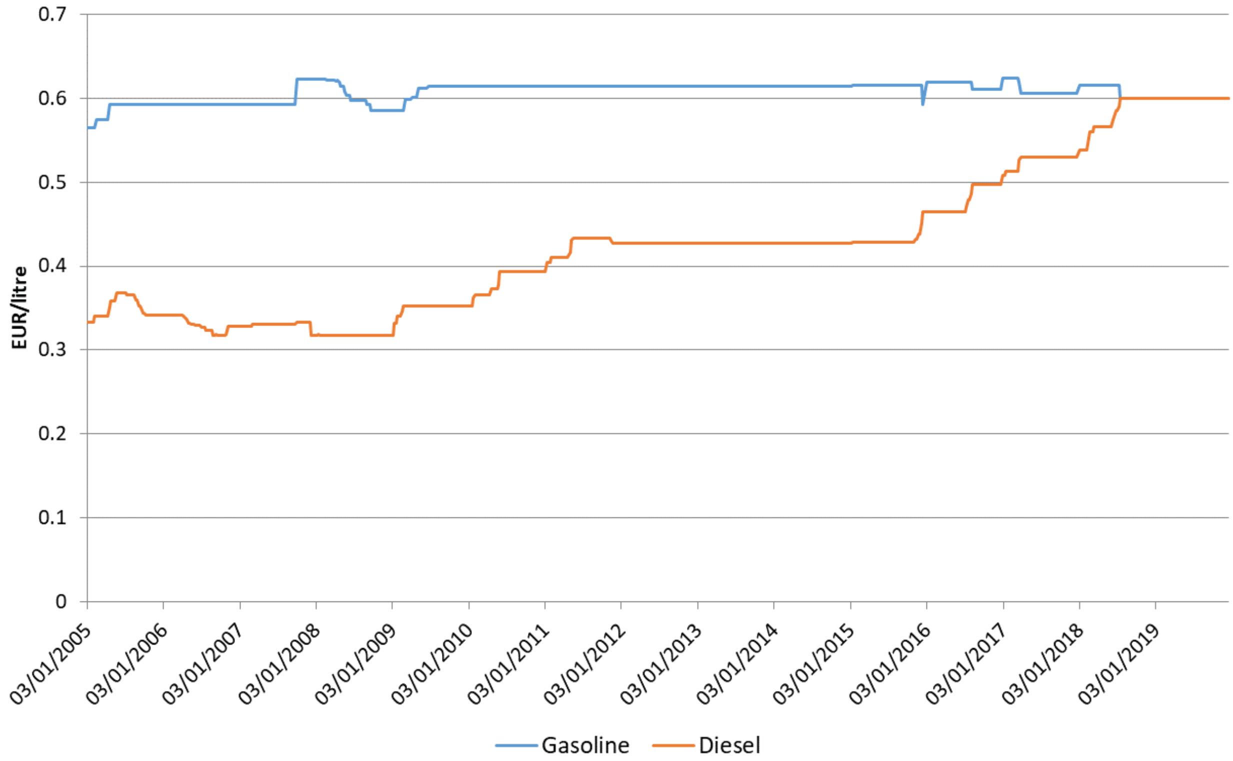


Figure 89 - Excise duty rates for motor fuels in Belgium

Source: Oil Bulletin, DG Energy

Note on prices for selected alternative fuels: LPG, biofuels and electricity for transport

In this note we are analysing the prices of some of the alternative fuels[18]: liquefied petroleum gases (LPG), biogasoline (pure or blended), biodiesel (pure or blended), other liquid biofuels, and biogases. Their use has been promoted in order to substitute non-renewable fossil fuels and their volume more than tripled since 2005. However, they still represent a small fraction of energy carriers- they represented together less than 1 percent in Gross Inland Consumption in 2005 and they are now more than 3%. The most important of alternative fuels are liquefied petroleum gases (LPG), pure biodiesels, and biogases, all representing around 30% of the total volume of alternative fuels.

[18] The full definition of the alternative fuels can be found in Art. 2 Directive 2014/94/EU as: 'fuels or power sources which serve, at least partly, as a substitute for fossil oil sources in the energy supply to transport and which have the potential to contribute to its decarbonisation and enhance the environmental performance of the transport sector'. This definition includes: 'electricity, hydrogen, biofuels as defined in point (i) of Article 2 of Directive 2009/28/EC, synthetic and paraffinic fuels, natural gas, including biomethane, in gaseous form (compressed natural gas (CNG)) and liquefied form (liquefied natural gas (LNG)), and liquefied petroleum gas (LPG)'.

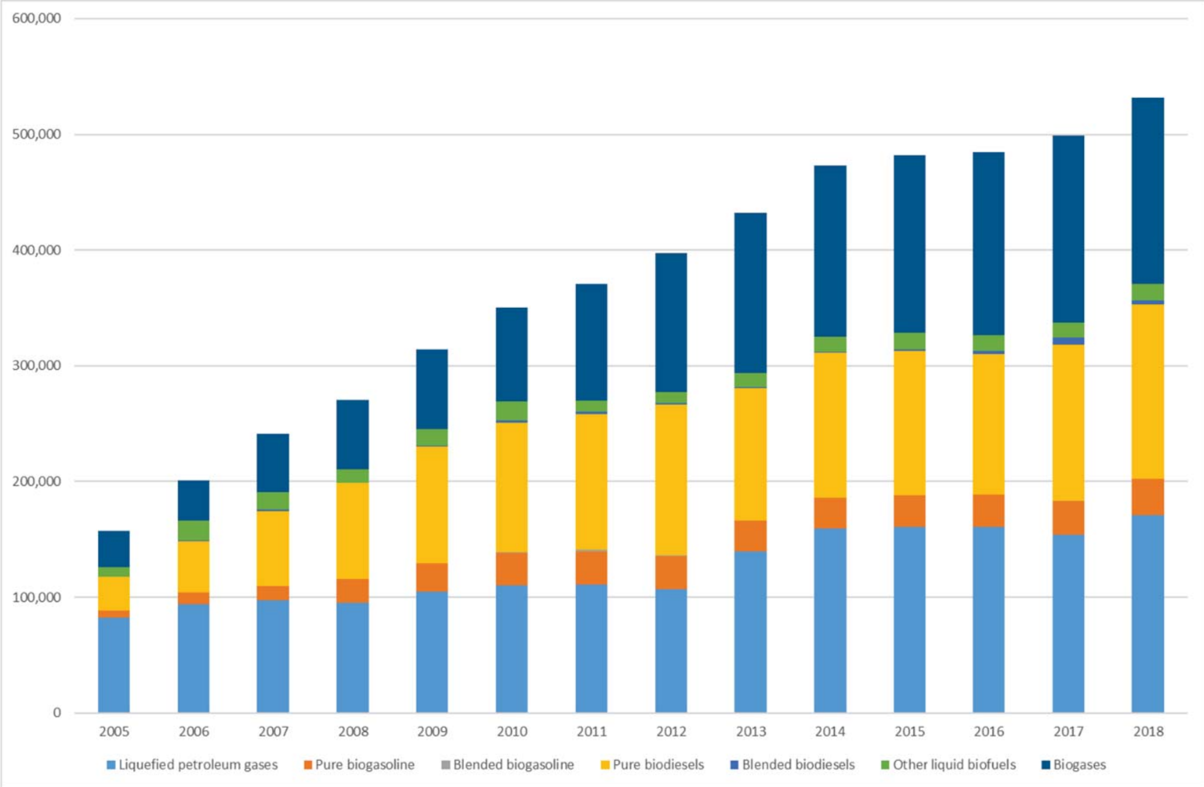


Figure 90 – Gross Inland Consumption of selected alternative fuels

Source: Eurostat, all figures in GWh.

In final energy consumption (energy use), alternative fuels have a little bit bigger share, starting around 2% in 2005 and almost doubling their share by 2018.

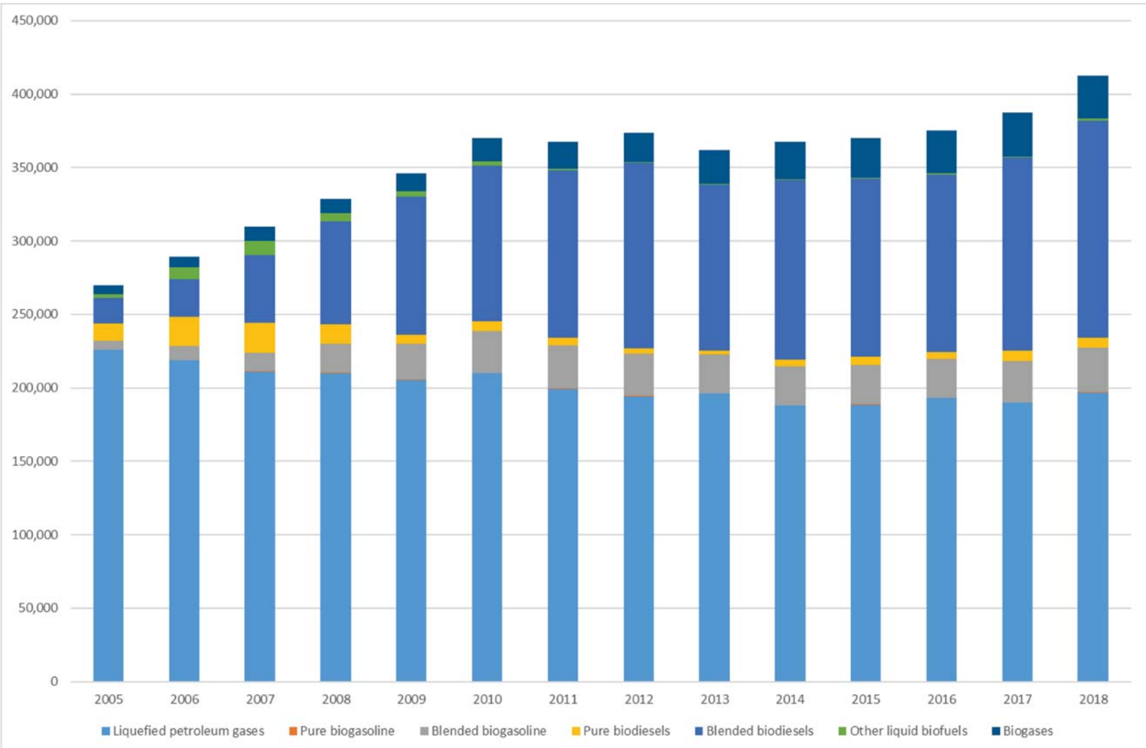


Figure 91 – Total (all sectors) Final Energy Consumption of selected alternative fuels

Source: Eurostat, all figures in GWh.

There are different preferences in different final energy consumption different activities. In industry on average liquefied petrol gas (LPG) dominates with rest taken almost by biogases:

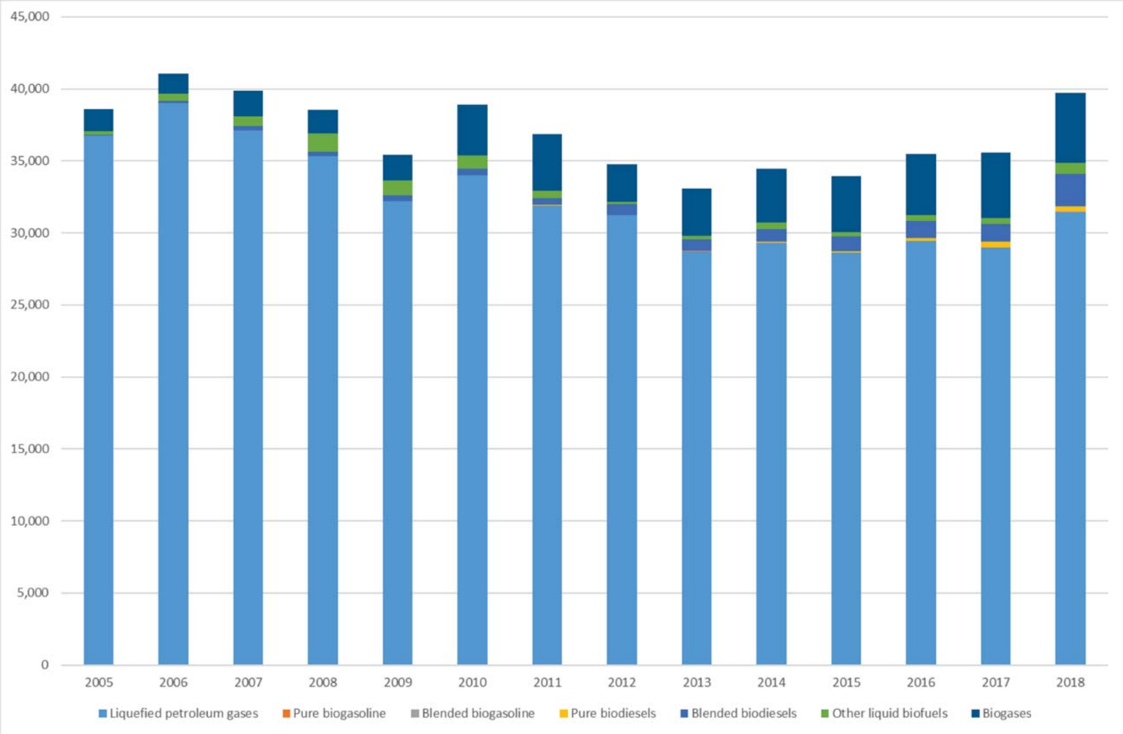


Figure 92 – Industry's Final Energy Consumption of selected alternative fuels

Source: Eurostat, all figures in GWh.

Final energy consumption of alternative fuels in transport relies on biogases, blended biodiesel and blended biogasoline.

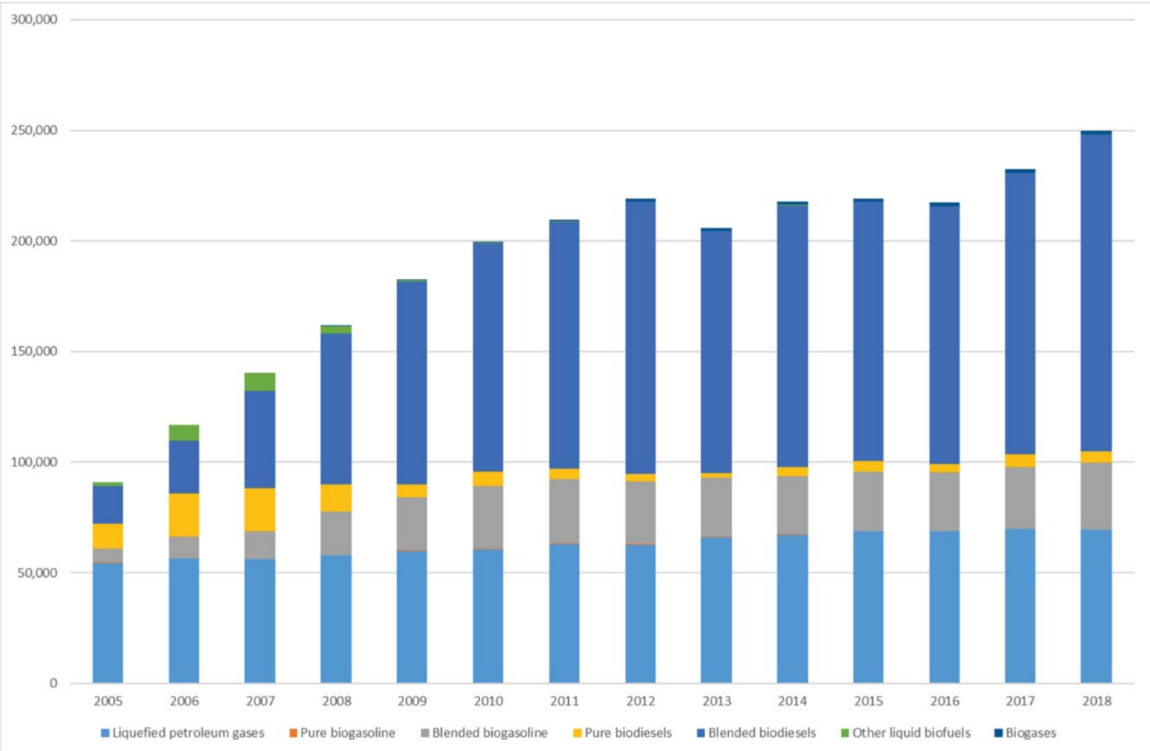


Figure 93 – Transport's Final Energy Consumption of selected alternative fuels

Source: Eurostat, all figures in GWh.

Households rely almost entirely on blended biodiesel in their Final energy consumption of alternative fuels (for heating and mobility) and also recently a little on biogases.

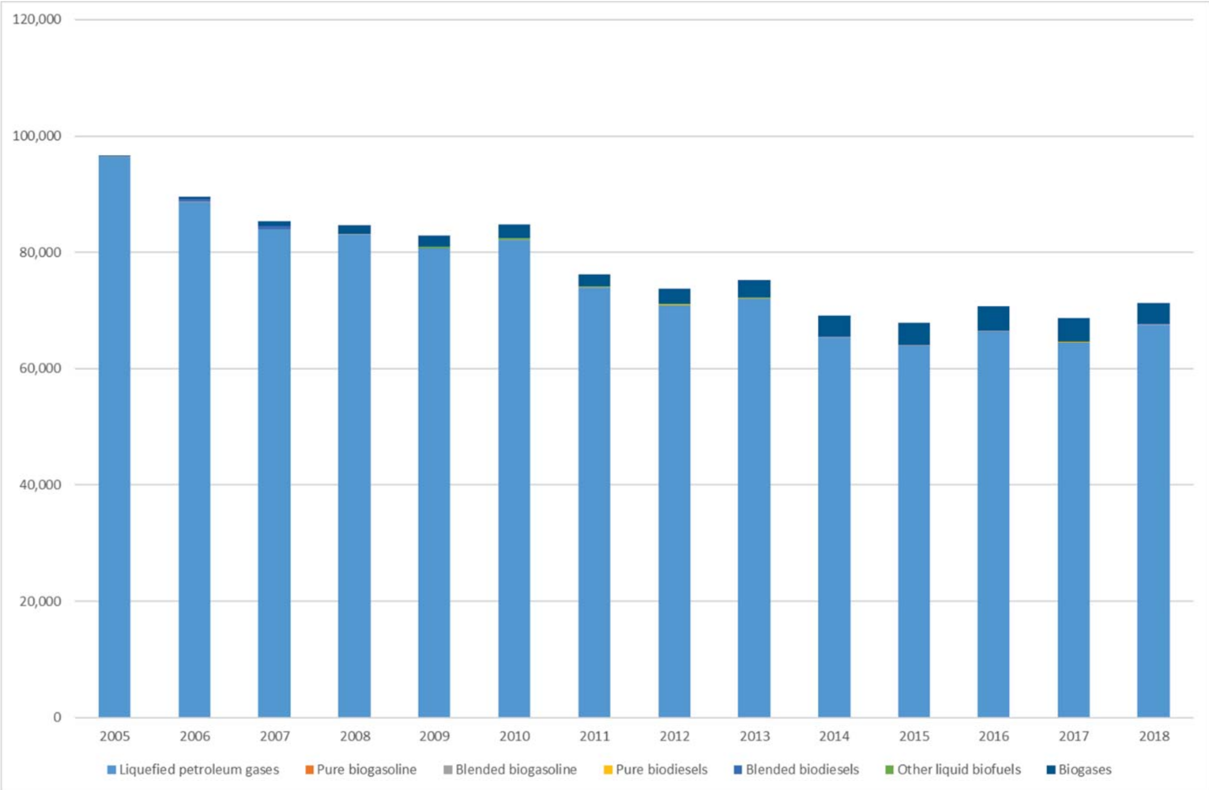


Figure 94 – Household's (and other sectors) Final Energy Consumption of selected alternative fuels

Source: Eurostat, all figures in GWh.

Prices of alternative fuels

Alternative fuels have followed generally the dynamic of prices of fossil fuels.

For ethanol, prices in EU (Roterdam Barge) are highest due to the fact that EU does not produce enough of it and has to import it. The lowest price are those in Brasil, a global leader in production of ethanol.

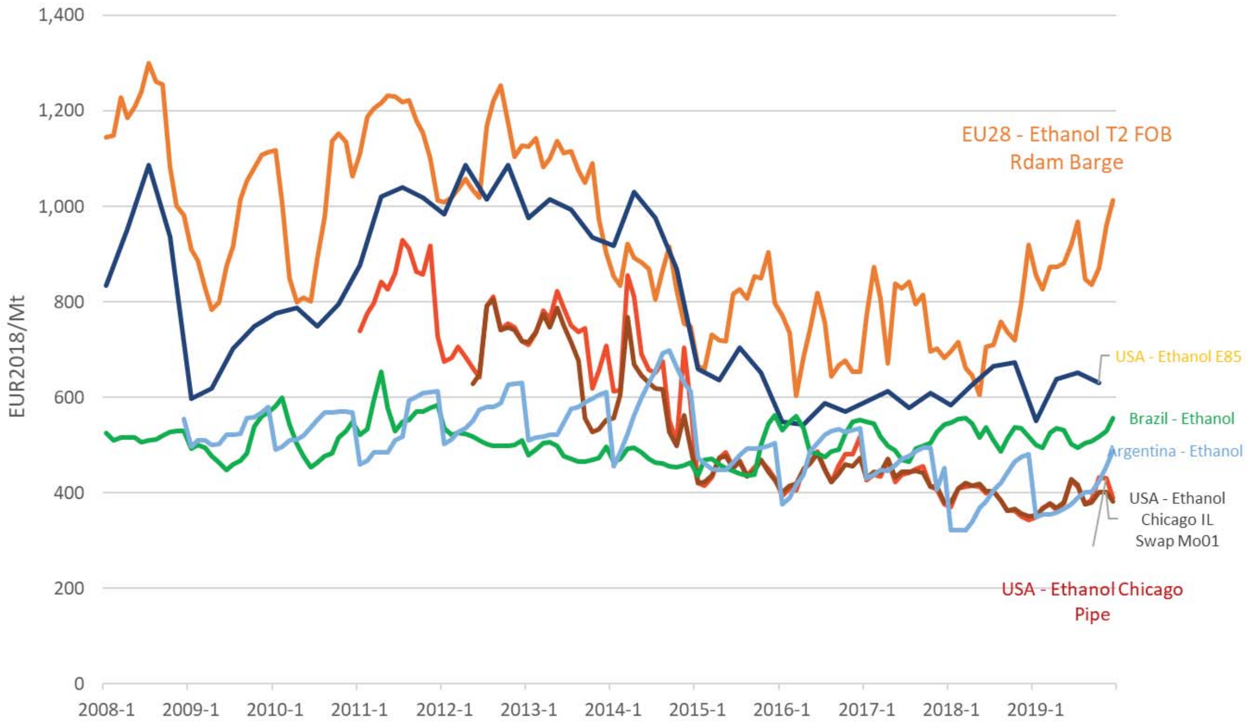


Figure 95 - International comparison of prices of ethanol

Source: Platts, Bloomberg, Trinomics (2020)

In biodiesel, wholesale prices in EU are similar to those in US, because both are importing than producing biodiesel, from countries like Argentina.

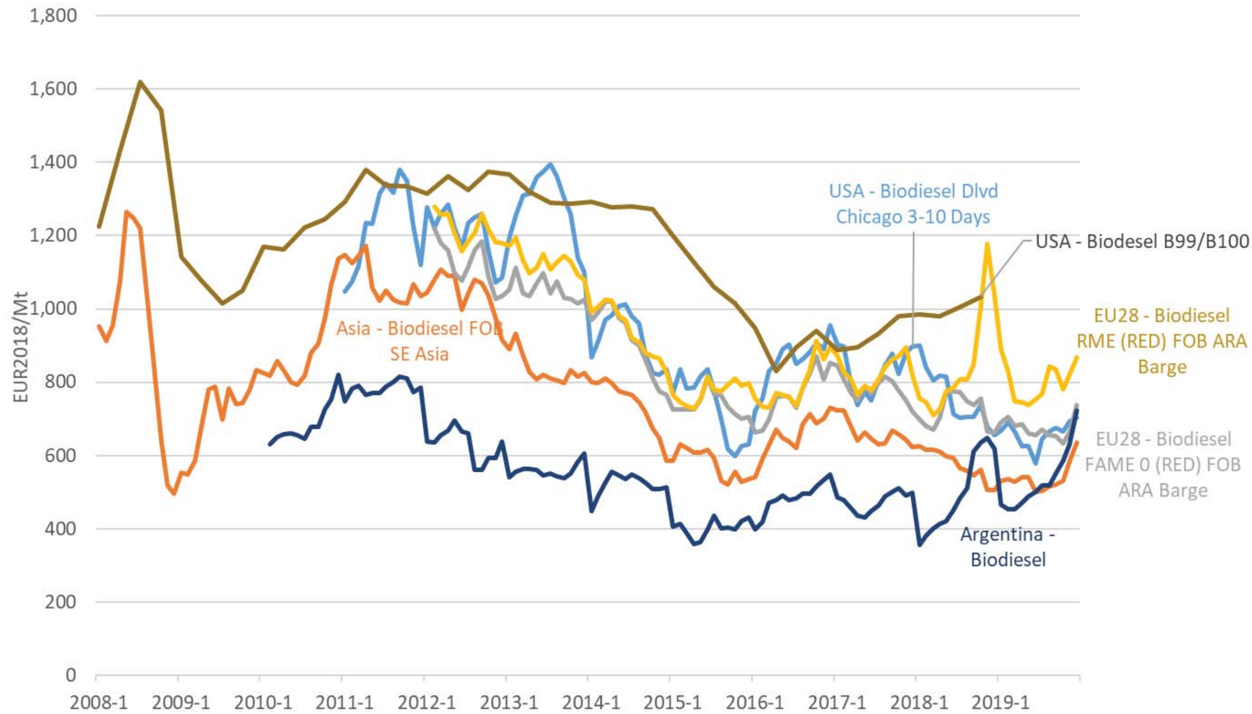


Figure 96 - International comparison of wholesale prices of biodiesel

Source: Platts, Bloomberg, Trinomics (2020)

For LPG, EU average retail prices including taxes have moved up and down within a relatively small range since 2008. Excluding taxes, it is possible to find that price trends mirror this price decline.

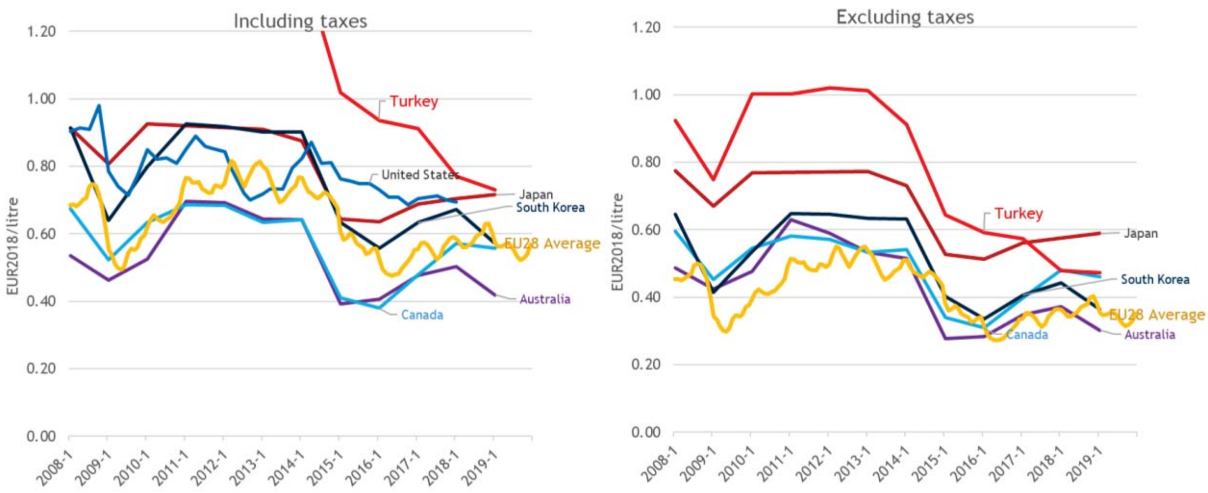


Figure 97 – International comparison of retail prices of LPG

Source: EU Oil Bulletin, IEA, US AFDA, Trinomics (2020)

Biogases in electricity and heat generation and blending with natural gas

In 2018 the total indigenous biogas production amounted to more than 580 thousand TJ (approximately 161 TWh). Out of this, the share of ‘other gases from anaerobic fermentation was 82%, amounting to 131 TWh. The share of landfilled gas was around 9% (15 TWh), while that of sewage sludge gas was 8% (13 TWh). The remaining 1% was represented by biogases from thermal processes, with less than 2 TWh volume. In 2019, according to preliminary Eurostat data, the total biogas production increased further and reached 590 thousand TJ (164 TWh). The biggest biogas producer in the EU was Germany (producing around 55% of the total EU production in 2018, around 90 TWh of biogas), followed by Italy (13%, around 21 TWh) and France (7%, 11 TWh).

As the next chart shows, over the last decade there was a dynamic increase in biogas production in the EU, reaching more than 160 TWh in 2018, whereas ten years earlier the total amount of produced biogas was barely 60 TWh. In 2018 around 81% of the biogas consumed were used for energy purposes, while 18% was used for other industrial purposes (and distribution losses accounted for 1%). Around 75% (121 TWh) was used in electricity and heat generation as fuel, while around 2.5% (4 TWh) was injected in the gas grids for blending natural gas.

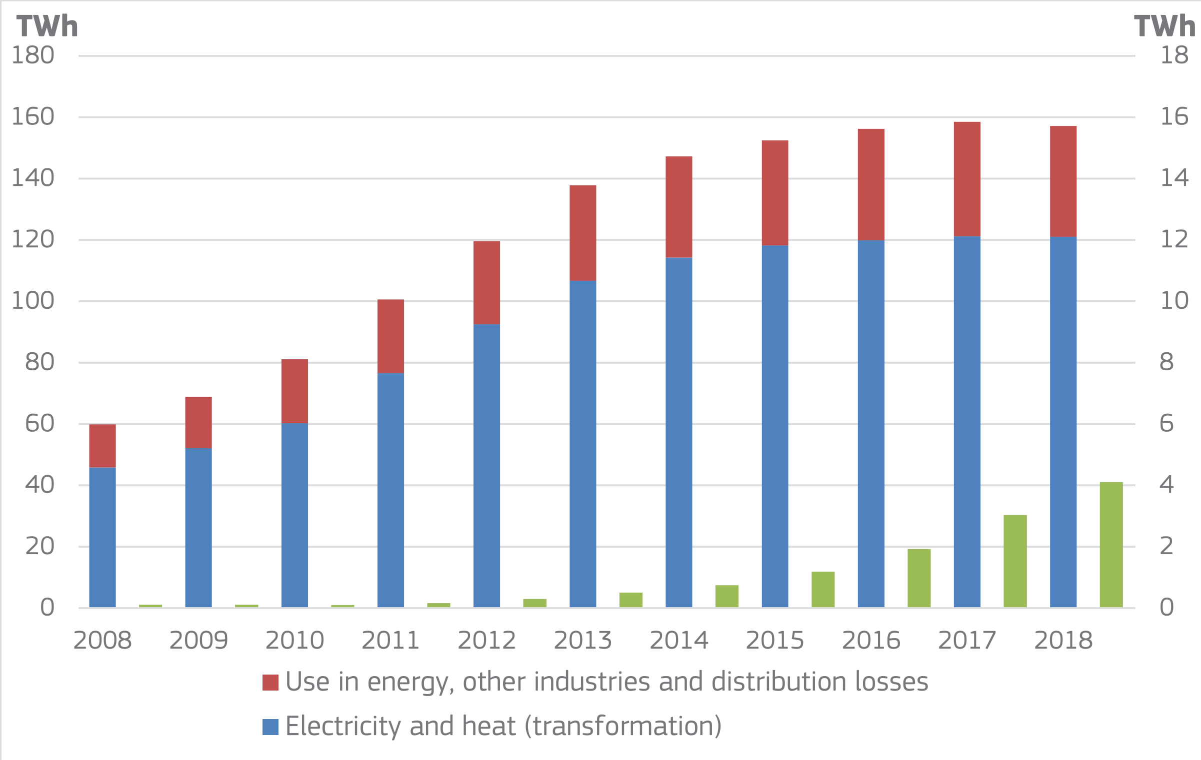


Figure 98 - Biogas in electricity and heat generation and biogas blending for natural gas

Source: Eurostat, DG ENER Calculation

Prices of electric mobility

EV users' preferences for charging location depends on a range of factors, such as access to a driveway at home, availability of public charging infrastructure, the pricing applied by operators, and driving habits. Charging at home is the most popular option. Prices paid for charging EVs essentially mirror regular electricity tariffs for private households. A survey of 12 European countries revealed that off-peak tariffs are available in most of them, although the uptake tends to be low in some cases. As of August 2020, dedicated EV tariffs were available only in Spain, France and the UK. In terms of the price differential between the average regular tariff and the average off-peak tariff, a substantial variation across markets can be observed. As shown in the Figure below, off-peak electricity prices for households (in €/MWh) could be over 40% lower compared to the average price. Countries with the highest difference include Australia, France, Spain and the UK.

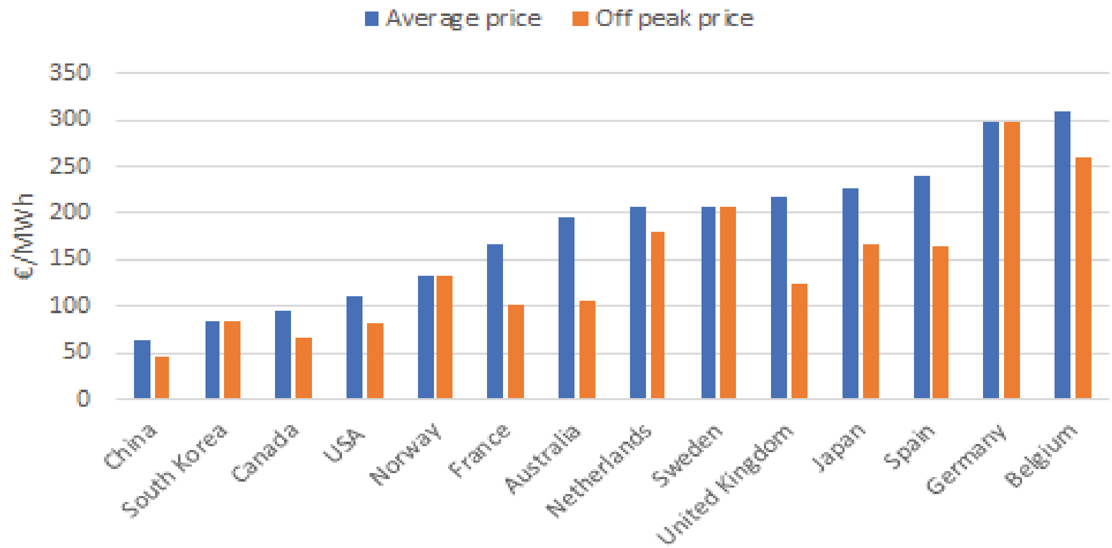
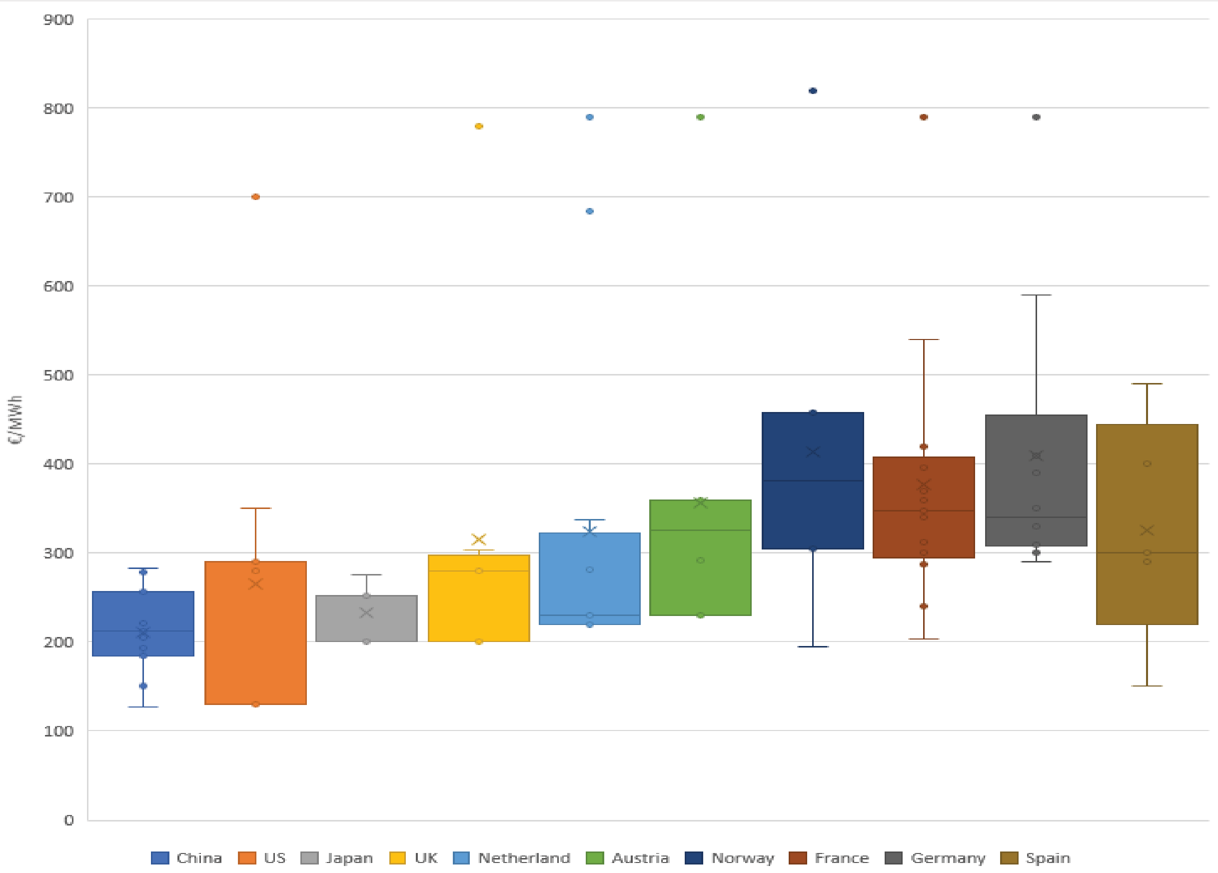


Figure 99: Electricity prices for households in €/MWh (2019)

Source: Trinomics (2020)

At public charging stations, tariffs vary according to charging capacity (which affects the speed of charge), type of batteries served, and loyalty programme discounts. Most of the time, charging prices vary between 200 and 450 €/MWh, while they can reach 800 €/MWh at the higher end. Public charging tends to be more expensive than home charging and the variation in prices between countries to a large extent mirrors the variation in home charging prices. Besides the price for the commodity, EV owners have also to subscribe (with a fee) to be able to use public charging stations. Recently announced investigations by Dutch and German competition authorities into the prices and practices of EV charging stations suggest a lack of transparency and fair treatment, which could hold back the uptake of green mobility solutions.[19] The available price data suggests public charging prices of €150-€250/MWh in China, the United States and Japan, which compares to €200-€500/MWh observed in the Austria, Spain, France, Germany and Netherlands. The differences are similar to that observed for household electricity prices. See Figure below.

19 https://www.bundeskartellamt.de/SharedDocs/Meldung/EN/Pressemitteilungen/2020/09_07_2020_Ladesäulen.html.



Note: the dots represent outliers in the distribution

Figure 100 - Representative sample of EV public charging prices in €/MWh

Source: Trinomics (2020)

The US-based EV maker Tesla has developed and operates its own charging network which includes fast and superfast charging points. The network currently counts around 13 000 charging points in more than 20 European countries. Given the homogenous charging specifications and conditions, it is possible to compare the charging prices to gauge differences between countries. **Figure 101** provides an overview of prices charged by Tesla in different countries. It is interesting to note that in most European countries, Tesla's prices are at the lower end of the band of offers available to EV owners, which is visible especially in France and Norway.

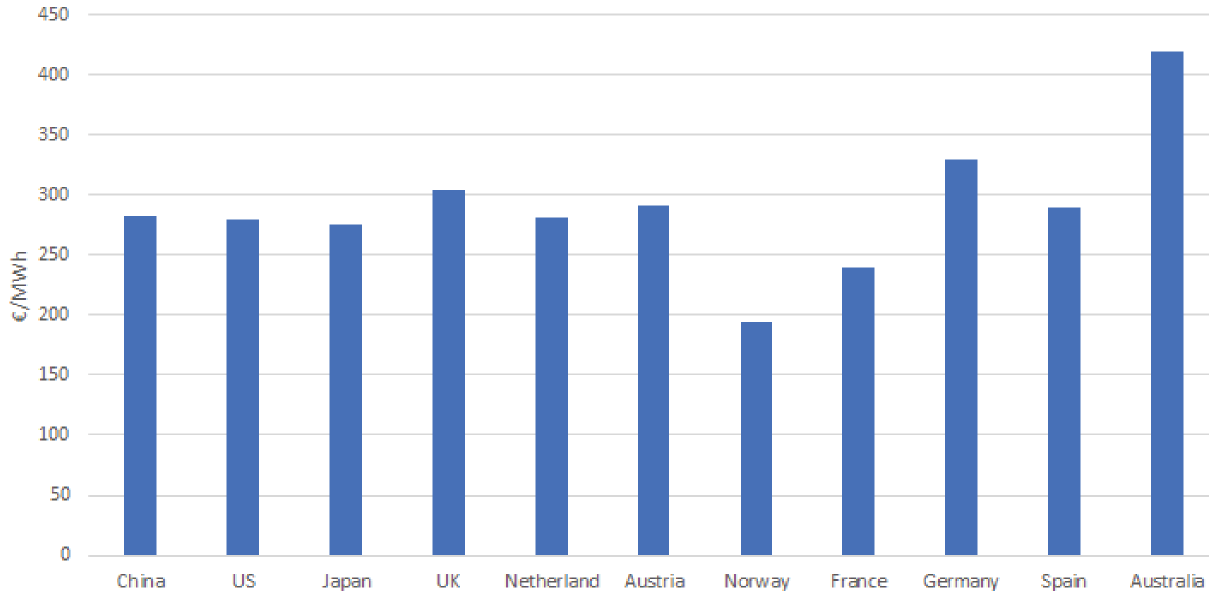


Figure 101 - EV fast and superfast public charging prices in Tesla network (€/MWh).

Source: Trinomics (2020)

— As a conclusion, it can be observed that both home and public charging prices tend to be higher in Europe (€200-€500/MWh) than in the main international G20 partners (€150-€250/MWh). However, superfast public charging prices in Europe tend to be comparable to the rest of G20 countries (€200-€400/MWh).

3.3.7 International comparison

This section is relying on the price data collected by Trinomics and covering G20 economies.[20]

Comparing the average retail price of motor fuels in the EU with prices in other G20 countries reveals that the trajectory of prices is in general very similar, basically following the development of crude oil prices. However, there can be significant differences in the absolute level of prices which are largely affected by taxes.

In case of gasoline, retail prices in most G20 countries are lower than the EU average. The retail price in the US is typically less than half of the EU average level. While in the EU the tax component is on average about 60% of the final price, this share in the US is only around 25%. Excluding taxes, EU and US prices are comparable. A few G20 countries had higher prices than the EU average for most of the period, in particular Korea and Turkey, but even these have converged to the EU average level over the last decade.

To sum up, differences in tax treatment are instrumental in explaining the price differences across G20 countries. EU taxes on fuels are among the highest globally, resulting in a high retail price compared to most G20 countries.

[20] Trinomics et altri (2020)

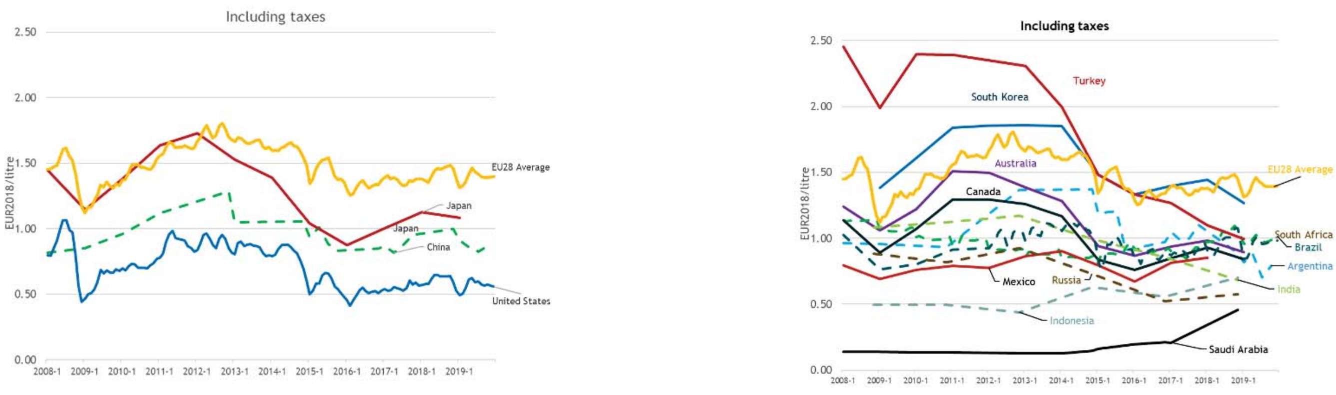


Figure 102 - International comparison of retail gasoline prices

Source: Oil Bulletin, DG Energy; IEA, GIZ

Note: prices are expressed in real (2018) euros; dotted line highlights that it is unclear if the excluding taxes price actually excludes relevant taxes

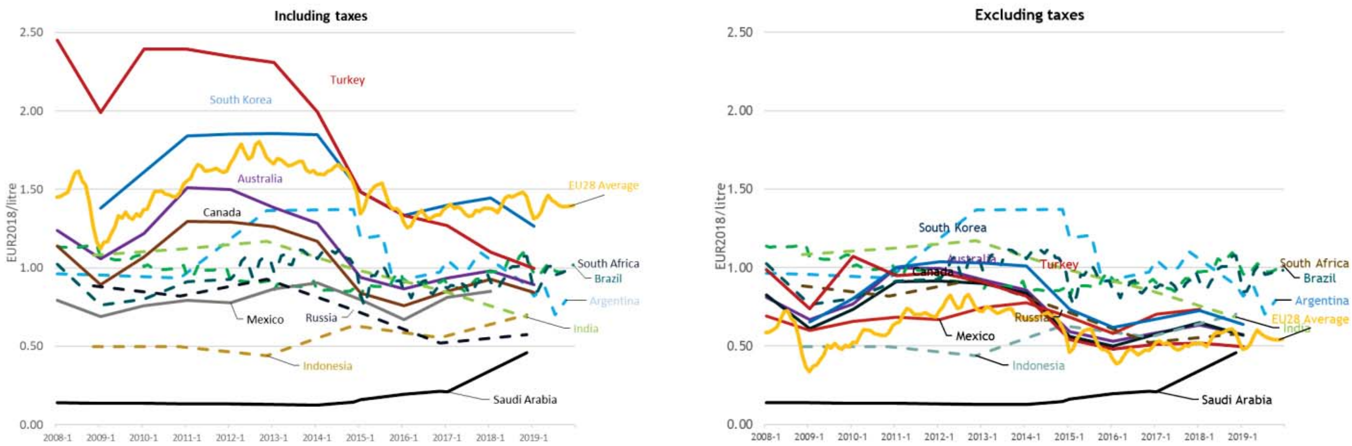


Figure 103 - International comparison of retail gasoline prices

Source: Oil Bulletin, DG Energy; IEA, GIZ

Note: prices are expressed in real (2018) euros; dotted line highlights that it is unclear if the excluding taxes price actually excludes relevant taxes

For diesel, the price is similar: the EU average price is one of the highest among the G20 countries. This is explained by a high tax component which on average constitutes about 50% of the final price. The retail price in the US, where the share of the tax component is only about 25%, is less than half of the EU average. Excluding taxes, EU prices are very similar to those in the US and lower than those in the majority of G20 countries. Turkey is the country which had a consistently higher price than the EU average for most of the period but the difference has largely disappeared by 2015-2016.

Similarly to gasoline, differences in tax treatment are instrumental in explaining the price differences across G20 countries. EU taxes on fuels are among the highest globally, resulting in a high retail price compared to most G20 countries, in spite of the relatively low net price.

The EU is not the only region with gasoline retail prices exceeding diesel prices. This is the case in practically all G20 economies.

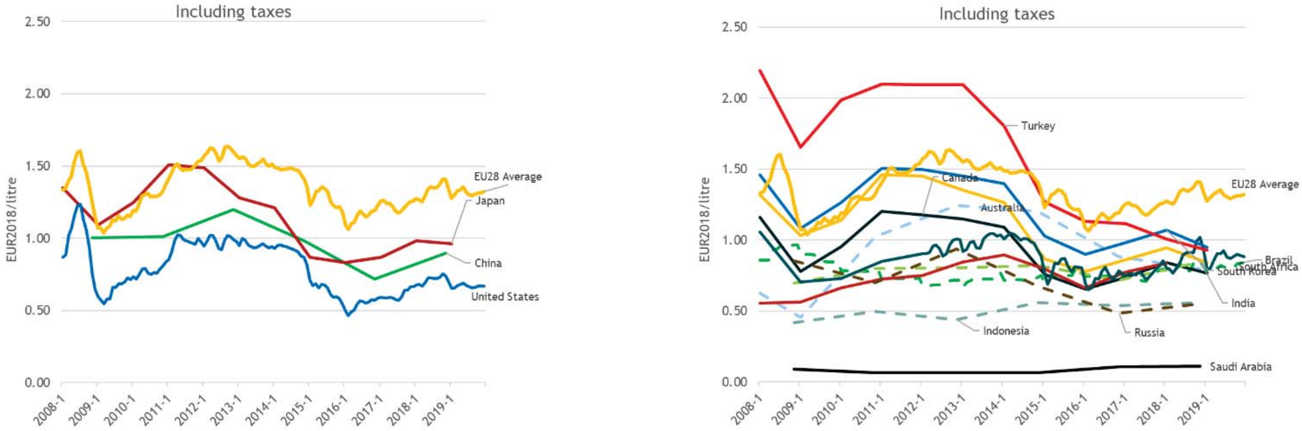


Figure 104 - International comparison of retail diesel prices

Source: Oil Bulletin, DG Energy; IEA, GIZ

Note: prices are expressed in real (2018) euros

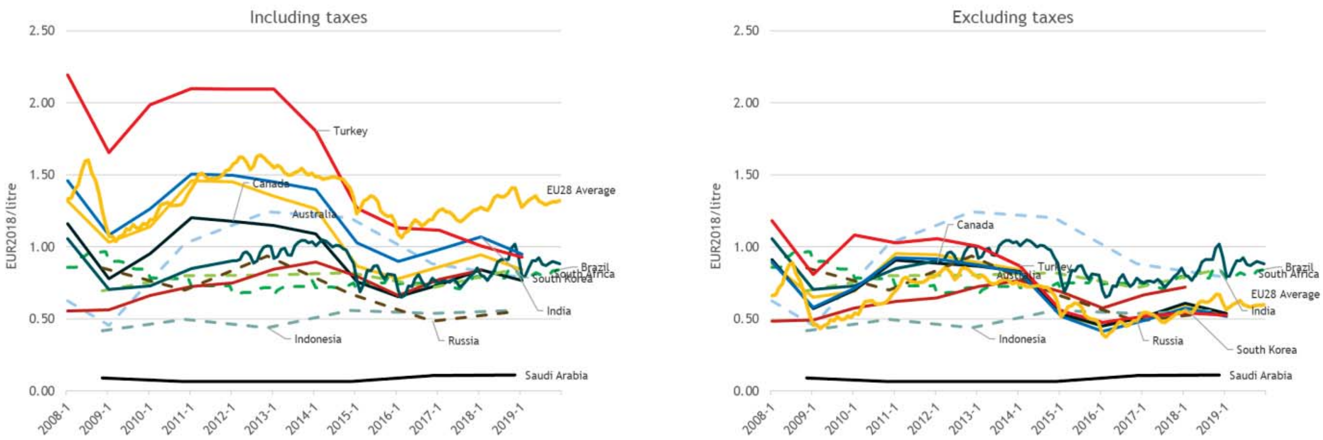


Figure 105 - International comparison of retail diesel prices

Source: Oil Bulletin, DG Energy; IEA, GIZ

Note: prices are expressed in real (2018) euros; dotted line highlights that it is unclear if the excluding taxes price actually excludes relevant taxes

EUROPEAN
COMMISSION

Brussels, 14.10.2020
SWD(2020) 951 final

PART 3/6

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(2020) 951 final}

PART II

ENERGY COSTS for the economy, households and industry

4 The EU energy bill[20]

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

Main findings

- EU has high import dependency and faces an important energy import bill.
- After bottoming out in 2016, energy commodity prices and the import bill have been on the rise, resulting in an increasing import bill.
- In 2013, the EU's estimated import bill reached EUR 400 billion. In 2013-2016, falling energy prices allowed the import bill to decrease significantly, although the weakening of the euro has partly offset this effect. In 3 years, the import bill has almost halved, thereby giving a boost to the economy.
- The prices of all three fuels increased in 2017, resulting in a growing import bill, but still well below the 2013 level: in 2017, the estimated import bill amounted to EUR 269 billion, 26% more than in 2016. Fuel prices continue to rise in 2018, resulting in continuing growing import bill, estimated at EUR 331 billion, 23% more than 2017.
- Crude oil is by far the main component of the import bill, making up 69% of the total in 2018. The share of gas and hard coal was 27% and 4%, respectively.
- Oil and other energy commodity prices started decreasing towards end of 2019 due to slowing of major developed and developing economies, and especially in the beginning of 2020 due to COVID-19 reduction of economic activity and transport. Along with reduced volume, this could reduce the energy bill for 2020.

4.1 Introduction

The EU is a net importer of energy: in 2018, the import dependency[21] stood at 55.7%, the highest in the years, plateauing between 2008 and 2016 but with clear upward trend visible in last couple of years as energy consumption grew. This means that the EU needs to import over half of the energy it consumes. Import dependency is particularly high in case of fossil fuels: in 2018, it was 86.6% for Oil and petroleum products, 77.4% for natural gas and 45.1% for solid fuels (from which 68.9% for hard coal).

Since 2014, import dependency increased for gas (because of rising consumption and falling indigenous production, and switching of industry and power generation from coal) but decreased for solid fuels (the consumption of which decreased to a larger extent than production). The import dependency for oil has not changed significantly.

[20] This chapter analyses EU-28.
[21] Import dependency is calculated as net imports divided by gross inland consumption.

EU energy import dependency seems to have stabilised in recent years: since 2005, it has been fluctuating between 52% and 56%. While the import dependency of fossil fuels shows a long-term 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.

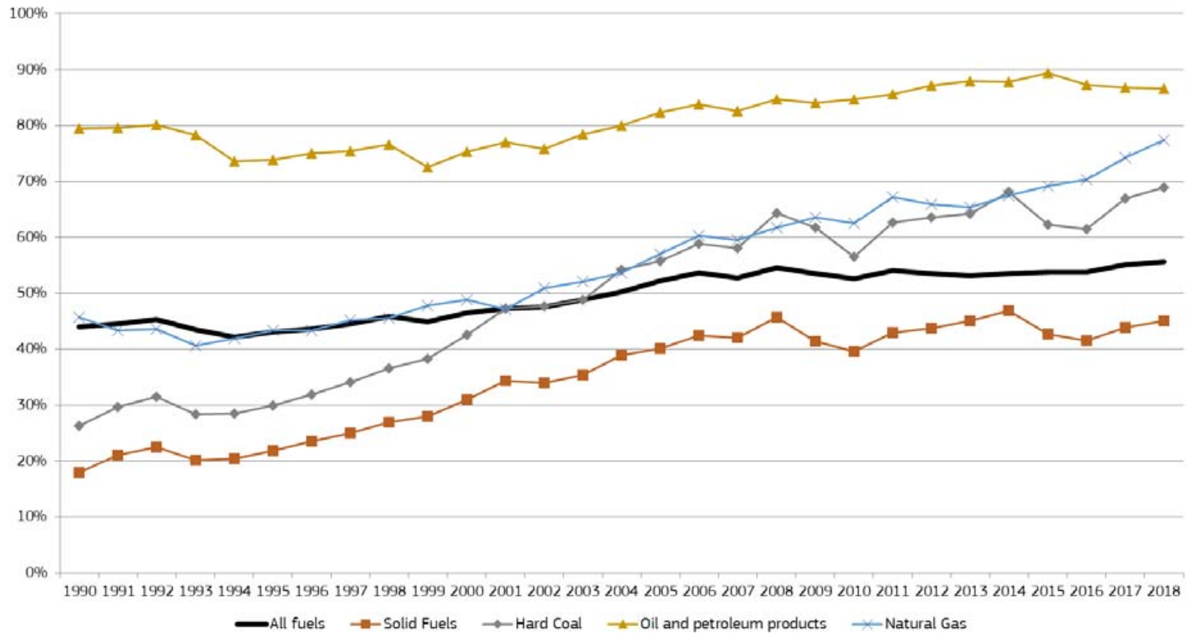


Figure 106 - EU import dependency by fuel

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 a significant energy import bill.

4.2 Methodology

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 still cover nearly three-quarters of the EU's gross inland energy consumption and the overwhelming majority (98% in 2016) of net energy imports. Crude oil alone makes up well over half of the EU's net energy imports while gas accounts for 30%.

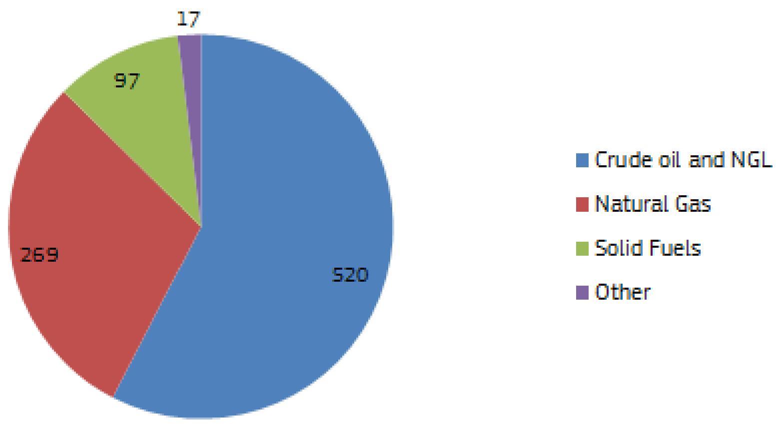


Figure 107 - EU net imports of energy in 2018 (mtoe)

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 2013-2018.

Data sources

In case of oil, we are in comfortable position as Member States report on a monthly basis the volume and the average CIF price[22] of imported oil under Regulation (EC) No 2964/95 of 20 December 1995 introducing registration for crude oil imports and deliveries in the Community.[23] Every year, the collected and aggregated information is published on the website of DG Energy[24] and this will continue in the future but in DG EUROSTAT database.

For gas, the import volumes used are from the Transparency Platform of the European Network of Transmission System Operators for Gas (ENTSO-G)[25] 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 2017, LNG was arriving from 12 supplying countries to around 25 terminals in 13 Member States.[26] 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,

---

[22] 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.
[23] http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:31995R2964
[24] https://ec.europa.eu/energy/en/statistics/eu-crude-oil-imports
[25] https://transparency.entsog.eu/
[26] Including small-scale terminals in Finland and Sweden.

Norway, Algeria, Libya and LNG) and for each year an estimated average price was established.

Table 4 - 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
2016	16.0	14.0	16.0	14.5	15.5
2017	17.8	17.1	18.1	15.4	18.3
2018	21.7	23.3	20.8	20.8	23.1

Source: DG Energy estimation

In case of coal, volumes are the imports of hard coal[27], reported in Eurostat annual (2013-2018) 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.

For the conversion from US dollars to euros, we used the annual average of the daily official exchange rates published by the European Central Bank[28].

4.3 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.

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

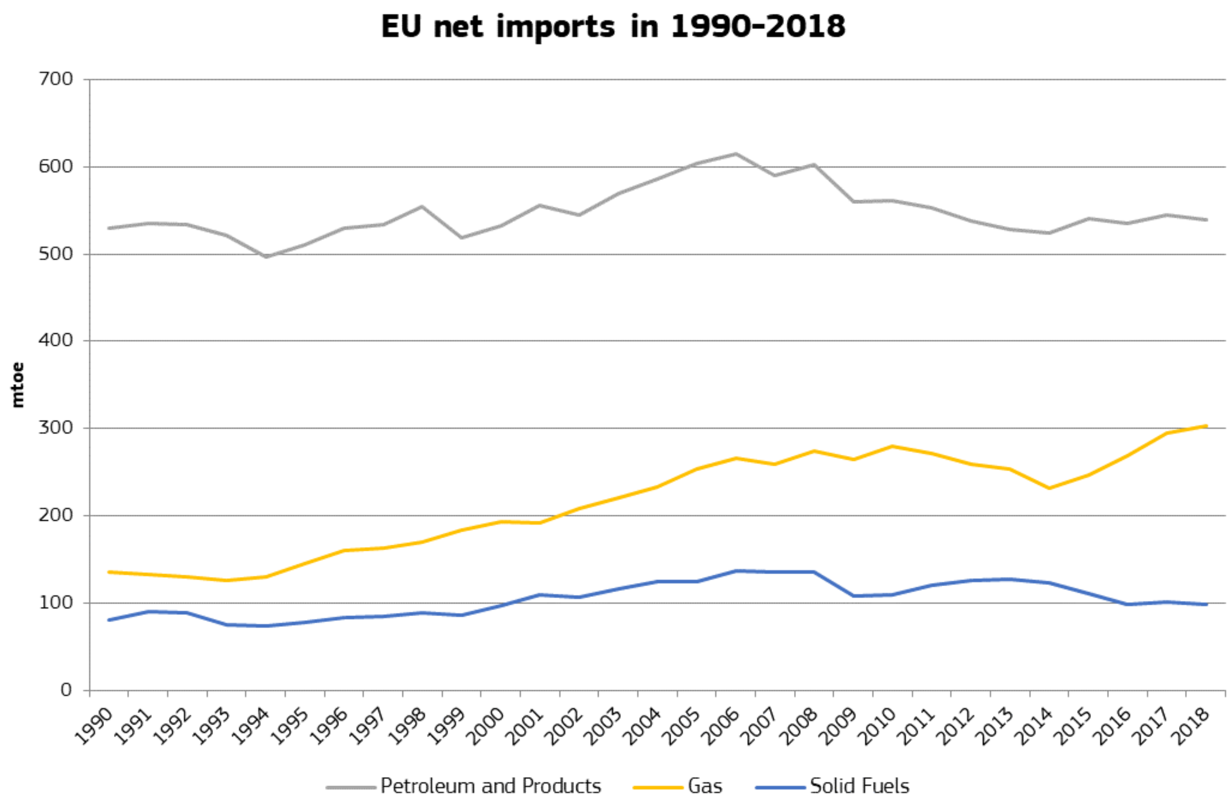


Figure 108 - EU net imports

Source: Eurostat

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.

In case of oil, imports have been decreasing since 2008 but bounced back in 2015, as the significant fall of oil prices triggered an increase in fuel demand, and stayed steady in that *niveau* since.

Gas imports decreased in 2010-2014 when this fuel lost ground in the electricity sector where it had to face increasing competition from renewables and coal. The trend turned after 2014 as increasing gas consumption and the ongoing fall of indigenous production increased import needs, as well as for switching of industrial and power generation needs from coal, with clear rising trend in recent years.

In case of hard coal, imports increased from 2009-2010, helped by low prices (cheap shale gas squeezed out the fuel from the US power sector and made it available for export), coupled with the low carbon prices. In 2013-2014, the trend reversed and coal imports started to fall again. The competitiveness of gas has improved compared to coal and, in addition, many Member States announced plans to phase out coal.

Prices

International commodity prices generally decreased in 2014-2016 and have been rising since 2016. There is a strong correlation between international commodity prices; in particular, one can observe a strong correlation between Brent and TTF (the Dutch gas benchmark) since 2015.

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 coal prices have more than doubled between the beginning and the end of 2016. Coal prices remained at that level until end of 2018, and then have decreased due to decreasing of growth in big users (like China). Other commodity prices followed the pattern except for oil that had important developments on demand and supply side.

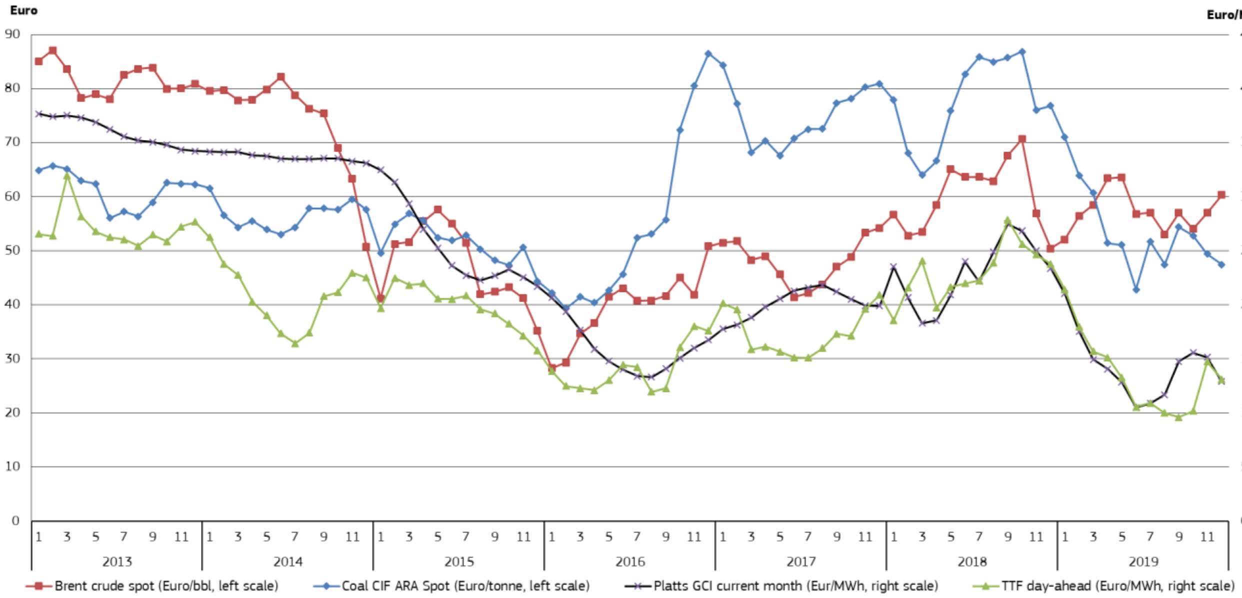


Figure 109 - Comparison of European oil, gas and coal prices

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.

As the EU is a net crude oil importer, price volatility impacts the energy expenditure of EU consumers and at macroeconomic level the impact can be tracked in economic growth and inflation. According to an analysis carried out by the European Commission, in 2015 and 2016 decreasing oil prices resulted in an additional GDP growth of 0.8% and 0.5%, respectively. As since crude oil prices started to rise again, an opposite impact is anticipated.

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. 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 dollars. 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. 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.

In 2015-2016, the exchange rate had been rather stable, moving in the 1.05-1.15 range during most of this period.

Throughout 2017, the euro strengthened compared to the US dollar ending slightly below 1.20 USD per EUR. Euro continued to gain strength until beginning of 2018, touching 1.25 US per EUR. After that recent peak, euro weakened towards the end of the period towards 1.10 US per EUR.

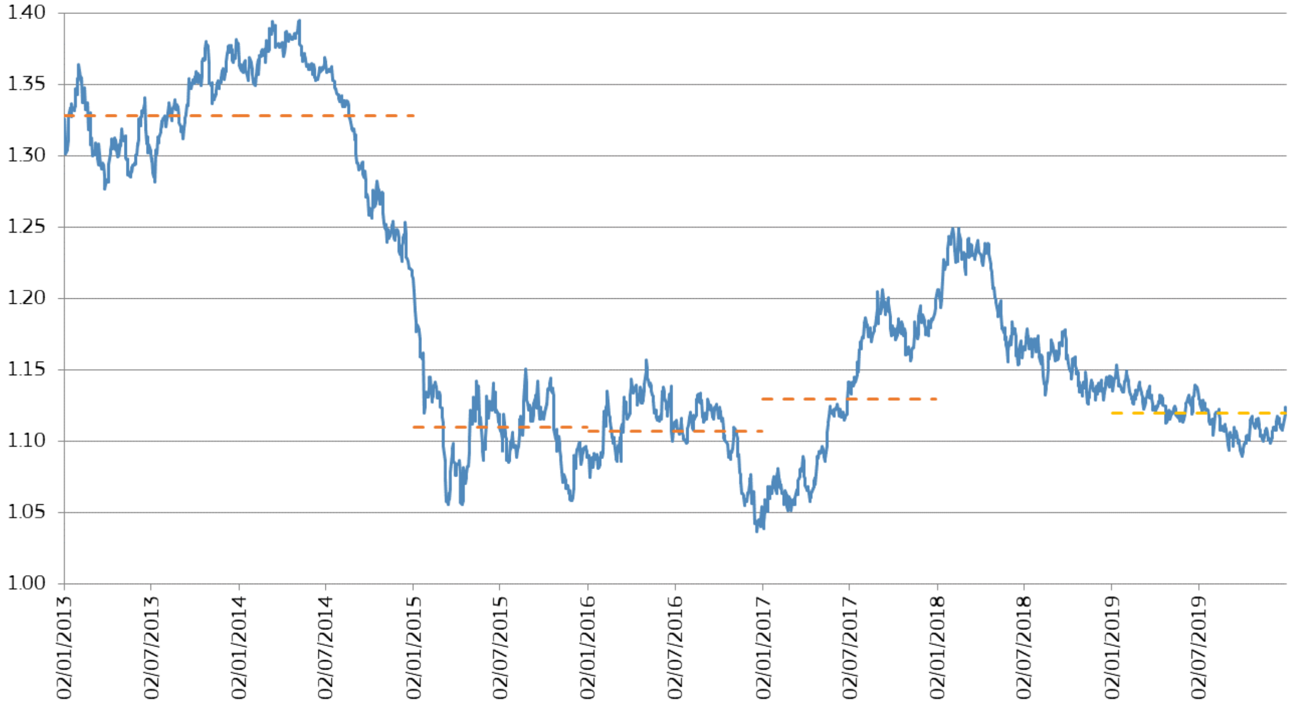


Figure 110 - The USD/EUR exchange rate since 2013

Source: ECB

The red dotted lines represent the annual average in 2013, 2014, 2015, 2016, 2017, 2018, and 2019

The European Union has a strong intention to "do more to allow the euro to play its full role on the international scene"[29]. As the EU is a net importer of petroleum products, gas and coal, broader deployment of euro in the international trade of these energy products could eliminate the risk of price volatility stemming from the fluctuation of euro against other major currencies, such as the US dollar.

[29] See Commission President Juncker's speech on the State of the Union, 2018. https://ec.europa.eu/commission/sites/beta-political/files/soteu2018-speech_en_0.pdf

4.4 Import bill calculation

Oil

Table 5 - EU crude oil import bill in 2013-2018

	2013	2014	2015*	2016*	2017*	2018*
Volume (million bbl/day)	9.83	10.01	10.48	10.29	10.53	10.45
Average Brent price (USD/bbl)	108.66	98.95	52.39	43.73	54.19	60.19
Average CIF import price (USD/bbl)	108.83	98.65	51.72	42.11	53.16	70.45
EUR/USD exchange rate	1.3281	1.3285	1.1095	1.1069	1.1297	1.1810
Import bill (bn USD)	390.6	360.4	197.8	158.6	204.3	268.7
Import bill (bn EUR)	294.1	271.3	178.3	143.2	180.8	227.5

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

*for confidentiality reason, from 2015 figures do not include the Czechia (in 2014, imports by the Czechia made up around 1.5% of total EU imports, implying an estimated annual import bill of 2-3 billion euros in 2015-2018)

In spite of the growing import volumes, the EU oil import bill significantly decreased in 2014-2016 as a result of the oil price fall. While in 2013 the oil import bill was close to USD 400 billion, in 2016 it dropped below USD 160 billion, a decrease of almost 60% within three years. The depreciation of the euro in the same period mitigated this trend: measured in euros, the import bill decreased from EUR 294 billion in 2013 to EUR 143 billion euros in 2016, a decrease of 51%.

2017 was the first year since 2012 when the average Brent price increased: it was 54 USD/bbl, 24% more than in 2016. The volume of daily imports also rose (by 2.3%), helped by falling indigenous production, rising fuel consumption and a relatively good refining environment. Driven mainly by the increasing oil prices, the EU's oil import bill increased from EUR 143 billion in 2016 to EUR 181 billion in 2017 (an increase of around 26%) but remained well below the level observed in 2013, the last year before the oil price fall. The euro slightly strengthened in 2017, which moderated the increase of the oil price bill.

In 2018 average oil price (measured by Brent) continued to increase to 60.19 USD per barrel. That combined with roughly the same volume of energy consumption as in 2017 produced higher oil import bill of 227.5 billion EUR. Should the oil price of oil and energy consumption continue to rise in 2019, we can expect continuation of the rise of import bill.

Gas

Table 6 - EU gas import bill in 2013-2018

	2013	2014	2015	2016	2017	2018
Volume (TWh)	3 390	3 113	3 445	3 853	4 238	4 111
Estimated average import price (€/MWh)	28.1	23.6	21.0	15.2	17.7	21.94
Import bill (bn EUR)	95.4	73.5	72.1	58.4	74.5	90.2

Source: ENTSO-G, DG Energy estimations

Gas imports showed a robust increase since 2014, but prices had been on the decline, bottoming out in 2016 and increasing again in 2017. In spite of the rising volumes, the estimated import bill decreased in 2014, 2015 and 2016 (as a result of the falling prices) but bounced back in 2017 when both import volumes and prices increased.

In 2017, the gas import bill increased by 27%, reaching EUR 74.5 billion, and due to continuing rise in prices and roughly the same volume, it reached 90.2 billion EUR.

Coal

Table 7 - EU hard coal import bill in 2013-2018

	2013	2014	2015	2016	2017	2018
Volume (million tons)	233.0	227.3	203.7	182.1	184.6	176.8
CIF ARA spot price (USD/ton)	81.56	75.23	56.86	60.18	84.73	91.65
EUR/USD exchange rate	1.3281	1.3285	1.1095	1.1069	1.1297	1.1810
CIF ARA spot price (EUR/ton)	61.41	56.63	51.25	54.37	75.00	77.60
Import bill (bn USD)	19.0	17.1	11.6	11.0	15.6	16.2
Import bill (bn EUR)	14.3	12.9	10.4	9.9	13.9	13.7

Source: Eurostat, Platts, ECB

Similarly to oil and gas, the coal import bill also decreased between 2013 and 2016 although the absolute values are significantly lower. The estimated coal import bill decreased by 29%, from EUR 14.3 billion in 2013 to EUR 9.9 billion in 2016. International coal prices significantly increased in 2017 and 2018 which offset the decrease of the imported volumes, resulting in a 40% increase of the import bill to EUR 13.9 billion in 2017 and EUR 13.7 billion in 2018.

Total

In 2013, the total import bill was about EUR 400 billion, more than EUR 1 billion per day. Falling prices helped the EU to decrease its estimated import bill to EUR 358 billion in 2014 (-11%), EUR 261 billion in 2015 (-27%) and EUR 211 billion in 2016 (-19%). The cumulative decrease between 2013 and 2016 was 47%.

In 2017, however, the import bill increased by 27%, reaching EUR 269 billion. Continuing growth of energy consumption and rise of prices led to an increase of another 23%, reaching 331.4 billion EUR.

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 1.4% in 2016. This saving gave a significant boost to GDP growth in 2015-2016: lower energy prices meant more disposable income for households, lower energy costs for businesses and increasing activity of energy intensive sectors (e.g. transport, refining and chemicals). In 2017, the estimated import bill increased to 1.7% of the GDP and in 2018 to 2.1% of the GDP.

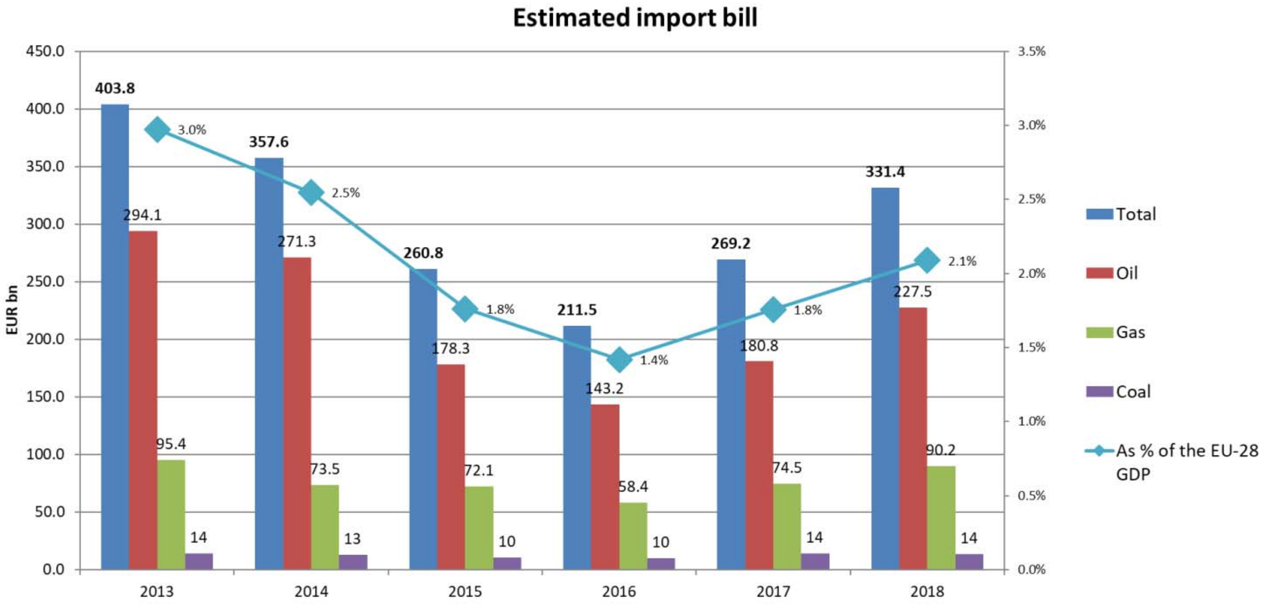


Figure 111 - The estimated EU import bill

Source: DG Energy calculation

5 Household energy expenditure and energy poverty

Introduction

Energy covers basic needs for households. Increasing proportions of energy related expenditures in total expenditure may imply less spending on other consumer purposes. Monitoring household energy expenditure is thus important to get an idea of how much 'efforts' households do to cover their basic energy needs (heating, transport, communication) but also to identify the households' ability to actually cover these needs and avoid energy poverty.

This chapter provides an analysis on the importance of energy products and transport fuels expenditure for households with different levels of income across the EU Member States, while looking at the particular circumstances of those households in energy poverty and vulnerable consumers.

Ensuring the fairness of the transition towards a climate neutral Union by 2050 lies at the heart the European Green Deal proposed by the Commission in December 2019[30].

The COVID-19 crisis has accentuated the urgency of addressing the challenge to deliver a social Europe that leaves no one behind. Vulnerable energy consumers may also be the most affected by the economic consequences of the crisis triggered by COVID. Energy poverty levels across Member States could likely be shifting as more Europeans struggle to keep their income and jobs to afford their necessary access to energy, particularly when forced to stay at home during lockdown. The "first-response" Next Generation EU[31] Recovery Package was presented to "guide and build a more sustainable, resilient and fairer Europe for the next generation". In this regard, the Renovation Wave as an important facilitator of the green recovery will "help save money on energy bills, provide healthier living conditions and reduce energy poverty".

In its Clean Energy for All Europeans legislative package, the European Commission has provided useful high-level principles and insights as to the potential causes and consequences of energy poverty, highlighting the importance of polices that tackle energy poverty, in particular in the context of the National Energy and Climate Plans (NECP) and Long-term Renovation Strategies[32].

Energy poverty has its root in a combination of low income, high energy bills and poor energy efficiency, in particular when it comes to the performance of buildings. The broad range of socio-economic factors surrounding general poverty, and challenges around housing tenure systems make the issue complex to address.

The Commission continues to support and finance the platforms provided by the European Energy Poverty Observatory (EPOV), aiming at collecting data, developing indicators and presenting best practices to tackle energy poverty in the EU Member States. The Commission

---

[30] COM(2019) 640 final – Commission Communication on the European Green Deal.
[31] European Commission, Communication From The Commission To The European Parliament, The European Council, The Council, The European Economic And Social Committee And The Committee Of The Regions Europe's moment: Repair and Prepare for the Next Generation, 27 May 2020
[32] As pursuant to Article 2a of the Energy Performance of Buildings Directive 2018/844/EU.

Recommendation on energy poverty[33] adopted alongside this report (as part of the accompanying package of the 2020 State of the Energy Union report) and strongly linked to the Renovation Wave underlines the importance that the Commission gives to this matter. All these initiatives should help to tackle energy poverty in line with the citizens' right to have access to energy as proclaimed in the European pillar of social rights.

Main findings

- In 2018 the poorest households in the EU spent on average € 945 on energy products (electricity, gas, liquid and solid fuels, central heating), representing around 8.3% of their total consumption expenditure. There were important differences across the EU Member states. Energy expenditure ranged from below to € 500 to € 2500 per household, but it is also important to consider that the purchase power also varies largely amongst Member States.
- When compared to the total energy expenditure (excluding transport), the poorest households in Sweden spent only 3.2% on energy, while in Slovakia this share was more than 22%.
- Households with middle income, though spending higher amounts on energy products, spent proportionally less on energy within their total expenditure, only 6.3% on EU average, as opposed to the aforementioned 8.3% in the case of the poorest.
- The relative spending on energy also vary importantly within the EU. Middle income households in Central and Eastern Europe spent around 10-15% of their expenditure on energy, owing to lower income compared to North and Western Europe, where this share was typically around 3-8% in 2018.
- The share of households being unable to keep their home adequately warm serves as a good complementary indicator on energy poverty, showing a positive correlation with the share of energy products within the total household expenditure. In 2018 around 19% of lower middle income households in the EU could not keep their home adequately warm, ranging from 3.1% in Finland to 56% in Bulgaria.
- Expenditures on transport fuels (petrol and diesel) represented € 390 (3% of the total expenditure) on EU average in the case of the poorest, while for middle income households it reached € 1060 (4.4% of the total expenditure). Once again, it is important to consider differences in purchase power capacities between Member States.
- Households with higher income spent proportionally more on transport fuels within their total expenditure than the poorer, and diesel had an increasing importance in their fuel spending compared to lower income households.
- Overall, the share of energy expenditure slightly decreased since 2008. In the case of the lower income decile households, this indicator rose to 9.1% in 2012 as a consequence of the economic crisis, falling to 8.3% in 2018. The middle income households were less affected as the share of energy expenditure fell slightly since 2008, with a peak in 2012 (7.1%), reaching 6.3% in 2018.
- While in energy the shares did not changed significantly over the period 2008-2018, the share of energy expenditure in transport has experienced a general increase over

[33] COM(2020) XX final – Commission Recommendation on Energy Poverty. [B3].

the same period of time. In the case of lower income households, this indicator rose steadily from 2008 (2.3%) until reaching a peak in 2013 (3.4%) and then it maintained relatively stable until 2018 (3.0%). The middle income households experienced a less significant change from 2008 (4.2%), reaching a peak in 2013 (4.9%) and then slowly decreasing until 2018 (4.4%).

Table 8 – Summary Table: Evolution of energy, affordable warmth and transport share 2008-2018

	2008	2018	2008-2018 change
Share of energy expenditure in the lowest income decile	8,3%	8,3%	0.0%
Share of energy expenditure in the lower-middle income decile	7,5%	7,4%	-0.1%
Share of energy expenditure in the middle income decile	6,8%	6,3%	-0.5%
Share of households below 60% of median equivalised income being unable to warm up their home sufficiently	(2010) 22.4%	19%	(2010-2018) -3.4%
Share of energy expenditure in the transport sector of the lowest income decile	2.3%	3.0%	0.7%
Share of energy expenditure in the transport sector of the lower-middle income decile	3.5%	4.0%	0.5%
Share of energy expenditure in the transport sector of the middle income decile	4.2%	4.4%	0.2%

Source: DG ENER ad hoc data collection on household consumption expenditures

5.1 Energy products' expenditure in household budgets

In this chapter we primarily rely on data collected from national statistical authorities (NSIs) on expenditure on energy products of households in the twenty-seven EU Member States and ad hoc data collection on household consumption expenditures by the Directorate General for Energy. A letter was sent to the Members of the Household Budget Survey Working Group (EU Member States) requesting data collection on energy expenditure by 15th June 2020. The data collected allowed the Commission to improve its evidence-based policy making regarding affordability of energy services. Energy expenditure of the residential sector usually covers heating, lighting, cooking needs, and the operation of electrical appliances. Household

Budget Survey (HBS) and Standard Income and Living Conditions (SILC) data, available in both Eurostat and NSI databases provide information on expenditures on products and services and the quality of living conditions. In order to analyse the burden energy expenditures mean to households, we assess the households' expenditure on major energy products households (electricity, gas, solid fuels, liquid fuels and heating – mainly district heating) and look at how much these households with different income levels spend on these products, in absolute figures and as a share of their total expenditure on products and services.

In the 2018 edition of the Energy prices and costs report, detailed data were provided on energy expenditures in each income quintiles (one fifth of the population regarding their income), in this report for most of the EU countries we have more refined data, detailed expenditures in each decile[34] (one tenth of the population, arranged into income strata). Furthermore, detailed data is available on expenditures on transport fuels (fuels total, expenditures on petrol and diesel). The analysis in this report intends to cover the share of energy consumption of household's expenditure, focusing primarily on the latest available data for the most interesting household's income deciles: first (lowest income), third (lower-middle income) and fifth (middle income), while also looking at the evolution of energy and transport expenditures over a ten-year long period (2008-2018). The first and third deciles were chosen for analysis in order to have an assessment on energy expenditure for the possibly most 'vulnerable consumers' which could also have higher risks of suffering energy poverty. The fifth decile was chosen to have an idea of the energy expenditures of the average (middle income) consumers.

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 expenditure compares to expenditures related to the consumption of other goods and services, in particular to those covering basic needs such as food, housing, transport (mobility services), fuels for personal transport, etc.

Figure 112 shows the decomposition of consumption expenditure of households in 2018 in the EU Member States. Looking at energy expenditures in each country, households in Hungary spent proportionally the most on energy products (12.8% of their total expenditures), while households in Luxembourg spent only 2.7% of their total budget. In the EU, the average household spent almost 6.4% of their total expenditure on energy products in 2018.

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 were generally higher and *energy* expenditures were lower than the EU average in Member States having higher GDP per capita. *Food* and non-alcoholic beverages had the biggest shares in household's expenditures in almost all Member States in 2018 (food products had higher shares in countries with lower purchasing power per capita). *Transport related expenditures* (mobility services and transport fuels) were also significant in most of the Member States; ranging between 13.6% and 7.8% measured in Slovenia, and 2.8% and 1.8% in Romania and Luxembourg, if expressed as the share of total consumption expenditure.

In most of the EU Member States, the expenditure on all 'basic' goods and services ranges between 45%-60%, with 'energy' expenditures representing slightly more than 10% in only one-fourth of the Member States.

[34] Data for Germany, Denmark and Poland remain as income quintiles.

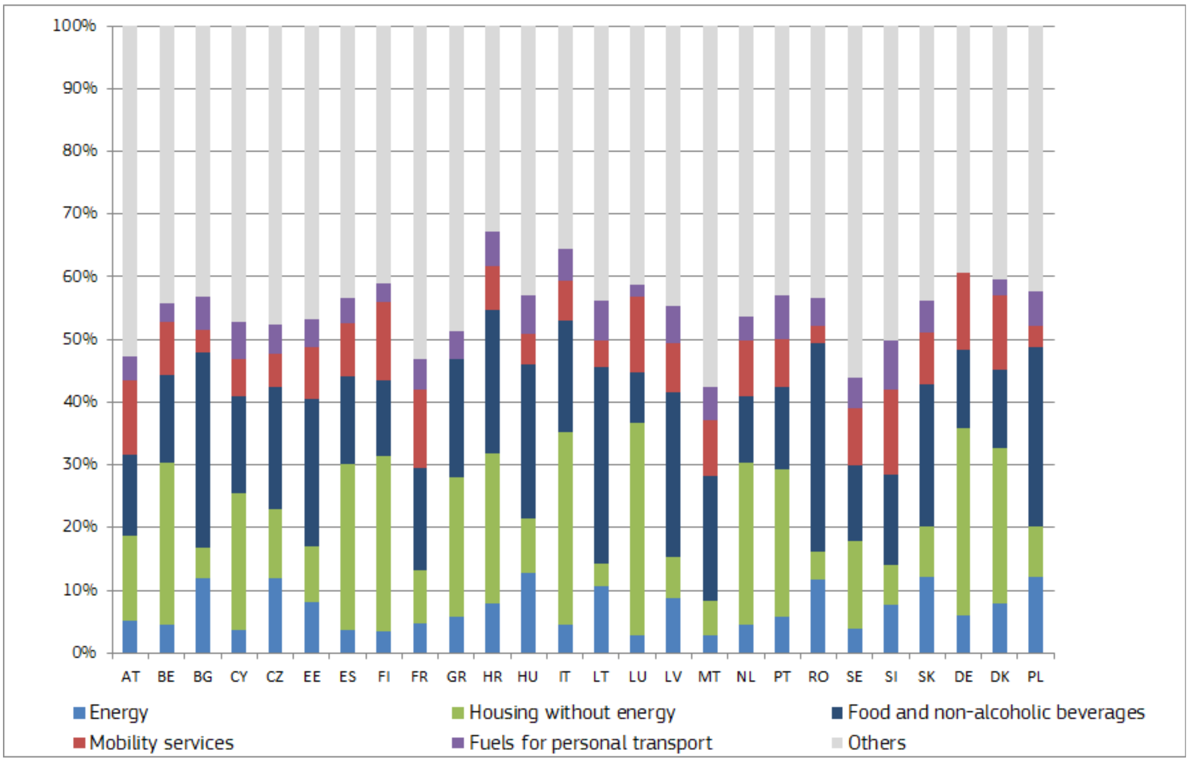


Figure 112 - Shares of consumer goods groups in household expenditure in Member States

Source: DG ENER ad hoc data collection on household consumption expenditures[35]

After looking at the overall consumption of goods and services in the household sector, the analysis will now focus on household expenditures on energy products. Almost all of the twenty-seven EU Member States responded to the Commission request for detailed data on the final household expenditures by decile over the last ten years. This has provided an excellent basis for analysis of households' expenditure on energy and other products. Each income decile represents 10% of the population regarding the income of households; hereinafter, the lowest income decile is called Decile 1, the lower-middle income of households is called Decile 3 and the middle income of households is called Decile 5. Households in different income deciles normally spend different shares of their financial resources on energy products as **Figure 113** shows. As it is presented on this chart, there were significant differences across EU Member States spending the share of energy products within the total household expenditure in 2018 in the main three deciles studied. We observe that the share of total expenditure on energy products is inversely proportional to income, implying that poorer income households spend proportionally more on energy products (a basic good) than households with high income.

35 Information was not available for IE.

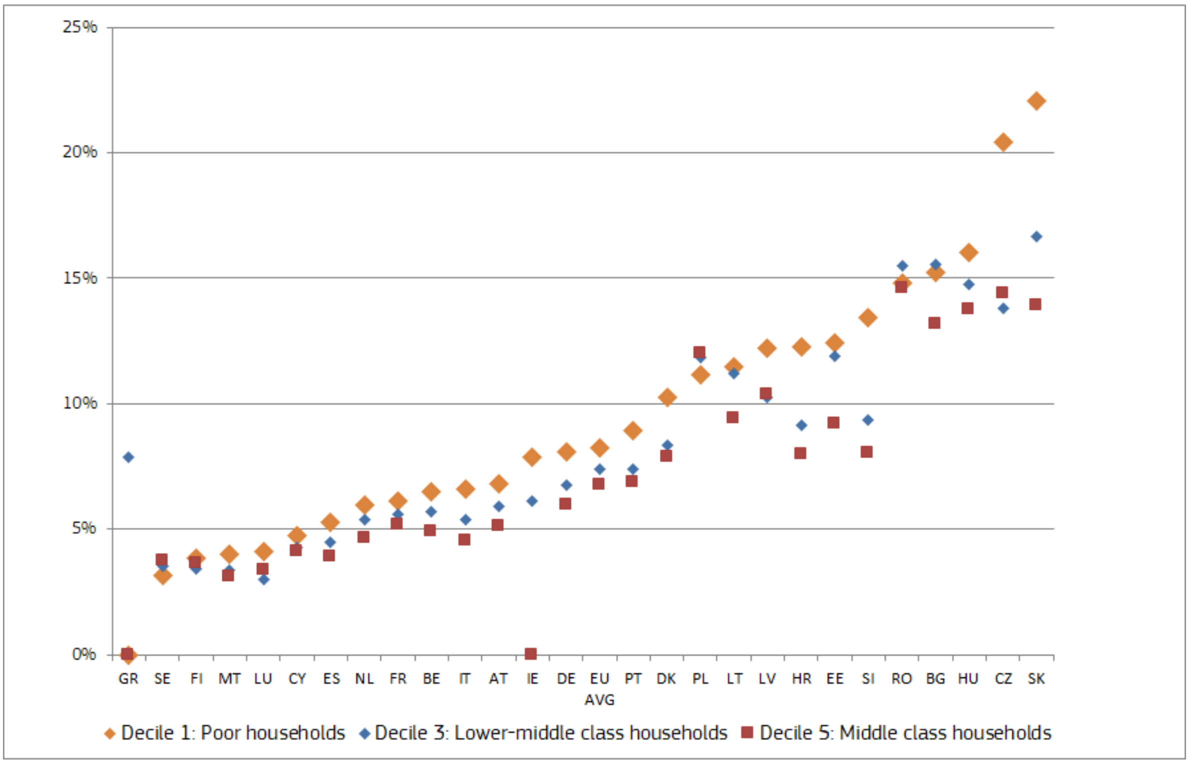


Figure 113 - Energy share in the total households' expenditure by income decile in 2018

Source: DG ENER ad hoc data collection on household consumption expenditures

5.1.1 Energy expenditure (excluding transport) in households

In order to have a better understanding at how consumption and monetary expending on energy products change over time in households, it is useful to analyse the purposes of energy consumption in the residential sector.

EUROSTAT, the Statistical Office of the European Union, has published the results of the latest data survey on final energy consumption of households. From this dataset some interesting conclusions can be drawn. **Figure 114** shows the distribution of energy products used in the residential sector: most of the EU final energy consumption in households is covered by natural (32.1%) and electricity (24.7%). On the other hand, renewables (mainly solid biofuels) and waste cover the 19.5% followed by petroleum products (11.6%) and derived heat (8.7%). A small proportion is still covered by coal products (solid fuels) (3.4%).

Most EU Member States rely mainly on electricity to meet their household needs. Nine Member States use electricity as the main energy source in households, followed by renewable energies (mostly in the form of solid biofuels) which is the main source of energy for eight Member States. Natural gas is the main source of energy for seven Member States. Three Member States use mostly other energy products: Denmark relies mainly on derived heat, Poland's main source of energy are solid fuels and Ireland uses mostly petroleum products.

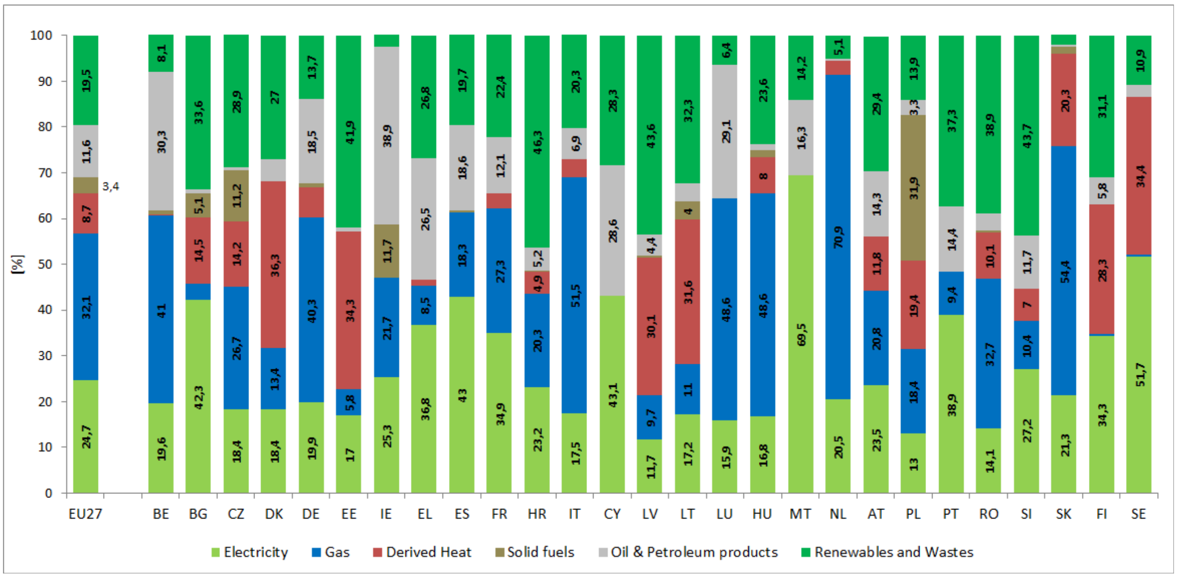


Figure 114 - Share of fuels in final energy consumption in the residential sector by EU Member State (2017)

Source: EUROSTAT Energy consumption in households[36]

Figure 115 shows the share of final energy consumption in the residential sector by type of end-use in 2018 for the EU member states. From the perspective of energy consumption in households, energy is mostly used for space heating (63.6%). Lighting and appliances represent 14.1% of the final energy consumption in households, while the proportion of energy used for water heating is slightly higher, representing 14.8%. Main cooking devices require 6.1% of energy used by households, while space cooling and other end-uses cover 0.4% and 1.0% respectively. It is worth mentioning that numbers for space cooling are much higher for Southern Europe and Mediterranean Member States (notably Malta with a 12.3% of the share of final energy consumption). It is interesting to note that heating of space and water consequently represents 78.4% of the final energy consumed by households.

According to the latest EUROSTAT information, heat energy, solid and liquid fuels are mostly used for space and water heating, and to a small extent also for cooking. Electricity is used largely for lighting and appliances, but also for water and space heating, while natural gas is utilised mainly for space heating and cooking purposes. Renewables (mainly solid biofuels) are used mostly for space heating purposes.

Furthermore, the highest proportions of energy used for space heating are observed in Luxembourg (78.7%), Belgium (73.5%), Estonia (72.7%), Hungary (71.7%) and Lithuania (70.3%), while the lowest quantities are used in Malta (20.4%), Portugal (28.2%) and Spain (43.1%).

[36] https://ec.europa.eu/eurostat/statistics-explained/index.php/Energy_consumption_in_households#Energy_products_used_in_the_residential_sector

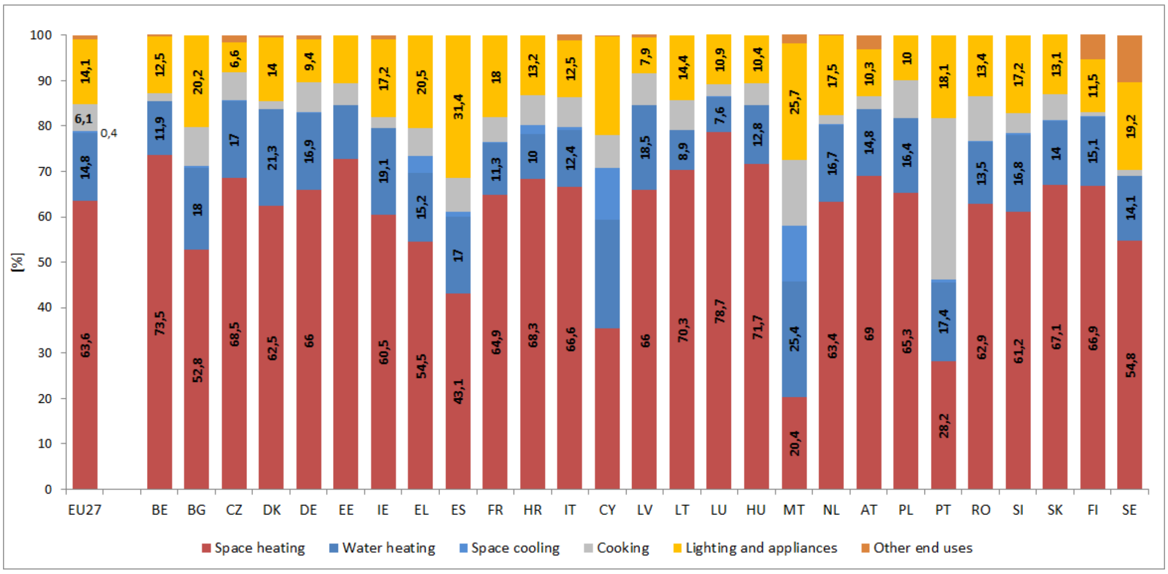


Figure 115 - Share of end-use energy consumption in the residential sector by EU Member State (2018)

Source: EUROSTAT Energy consumption in households[37]

5.1.2 Energy expenditure (excluding transport) in households with low income

The next chart (**Figure 116**) shows energy expenditure of households in the lowest decile (the poorest ten per cent of the population) in the EU countries[38]. In the EU € 945 was spent on energy on average by the poorest household according to the latest data[39], which represented **8.3%** of their total consumption expenditure. There were very significant differences across the EU on both absolute expenditures and the share of energy in the total household expenditure. In Latvia and Romania the annual energy expenditure remained below € 500[40], in contrast, in Denmark it was above € 2500 in 2017-2018. This five-fold difference in energy expenditures reflect mainly differences in average household incomes in different EU Member States, however, differences between household energy prices also play a role. In the case of heating related expenditure the quality of residential building stock also has of particular importance, as energy expenditure can be reduced if buildings are more energy efficient.

[37] https://ec.europa.eu/eurostat/statistics-explained/index.php/Energy_consumption_in_households#Energy_products_used_in_the_residential_sector

[38] For some countries (Germany and Denmark) data of the lowest quintile (the poorest 20% of the population) was used for the computations as we did not receive decile data from the national authorities or there were issues with the data quality.

[39] EU average is calculated as weighted average from Member States' expenditure data, using the number of households as weight. Latest available data in most cases mean 2017 or 2018 data, however, due to different data collection in different countries, in some cases data might be of earlier time period.

[40] In this chapter expenditures are expressed per household.

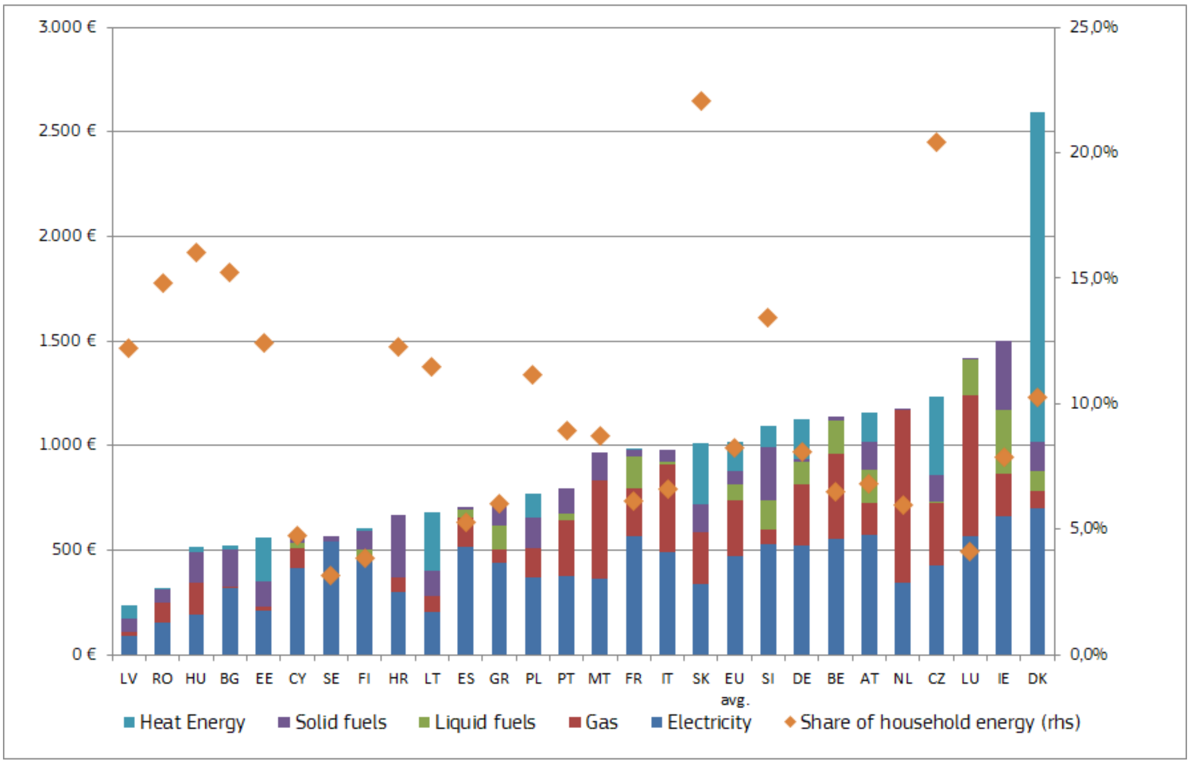


Figure 116 – Energy products expediture for the poorest households and the energy share in total household consumption expenditure by EU Member State

Source: DG ENER ad hoc data collection on household consumption expenditures

As **Figure 117** shows, looking at the shares of energy products in the households' budget[41], in Sweden the poorest households spent only 3.2% of their total expenditure on energy, whereas in Slovakia this share was higher than 22.1%. Countries in Central and Eastern Europe, primarily owing to lower incomes compared Northern and Western Europe, spent significantly higher share on energy within their household expenditure.

The role of different household energy products may also differ across the EU. A good example for this is the high share of district heating in Denmark, representing more than half of the total energy-related household expenditures[42]. In Estonia, Lithuania, the Czech Republic and Slovakia district heating also had an important share in household energy.

Electricity accounts for a high share of the household expenditure in Sweden, Finland, Cyprus and Spain; in these countries this energy source is dominant not only for residential lighting but also for heating. Natural gas represented a high share of household expenditure in the Netherlands, Malta and Luxembourg, and liquid fuels, mainly in the form of heating oil, are of importance within household energy in Ireland, Greece and France. Solid fuels only represented a small fraction in the total energy expenditure in the EU, however, in some Central and East European countries they still had a measurable share.

[41] As HBS data are not fully harmonised in the EU, the actual shares might differ from the result of this analysis. In some countries the share of energy is low in the total expenditure, as energy bills are "hidden" in the rental payments in the housing sector.

[42] The high expenditures on district heating in Denmark was rather due to the broad deployment of district heating, not to the costs of this technology. According to the Danish District Heating Association, around 64% of all Danish households were connected in 2017 to the district heating grid, and district heating companies were legally bound to run on a non-profit basis.

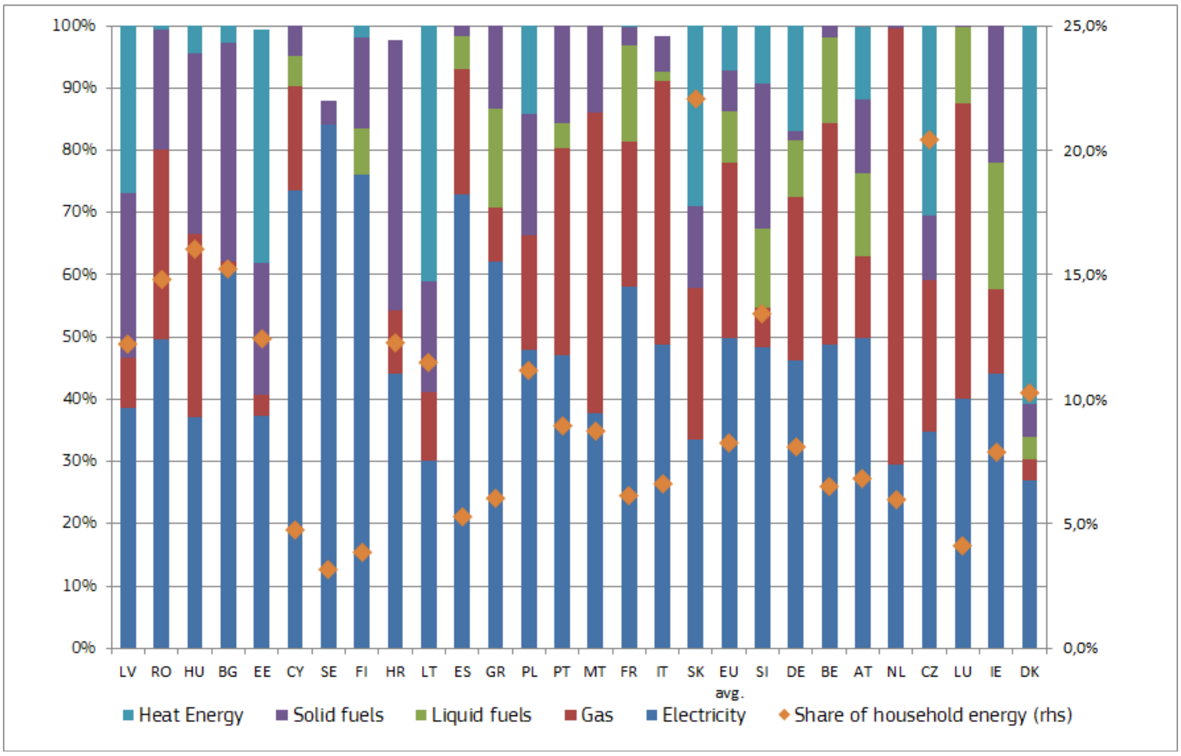


Figure 117 - Share of expenditure on household energy products and share of energy in total expenditure for the poorest households by EU Member State

Source: DG ENER ad hoc data collection on household consumption expenditures[43]

5.1.3 Energy expenditure (excluding transport) in households with middle income

Beside the poorest households, it is also important to analyse the situation of the lower-middle income and middle-income households. These household income levels are represented by the third and the fifth income decile (or by the second and the third quintile, for countries where deciles are not available) in the expenditure data**.** As **Figure 118**, **Figure 119**, **Figure 120** and **Figure 121** show, the order of the countries regarding the absolute spending on energy products and that the distribution of individual energy sources within the total spending on energy is similar in all income deciles. Naturally, the higher income a given household has, the higher is the amount it spends on energy products[44].

Conversely, households with higher income spend proportionally less on energy products, compared to their total consumption expenditure, than poorer households. In the third decile (lower-middle income households) the average share of energy in total spending was only 7.4% (as opposed to 8.3% in the case of the poorest), and in the fifth decile (middle income households it was 6.3%. However, even for middle income households differences across Europe are perceivable regarding the share of energy in total spending, as households in

---

[43]Ad hoc data collection was not complete for all Member States and this results in small shares of some products that could not be accounted for.

[44] Not big differences were found in the share of energy products in lower deciles, including for solid and liquid fuels (6.5% and 8% for the poorest households and 6% and 10% for middle income households) as well as gas (28% for the poorest households and 30% for middle income households). In the case of electricity, the share in the poorest households accounts for 50% while in the middle income decile was 49%.

Northern and Western Europe spent typically between 3% and 8% of their expenditure on energy, in Central and East Europe this share was 10-15% in recent times, implying that amid current income levels energy represents a significant burden for households in these latter countries.

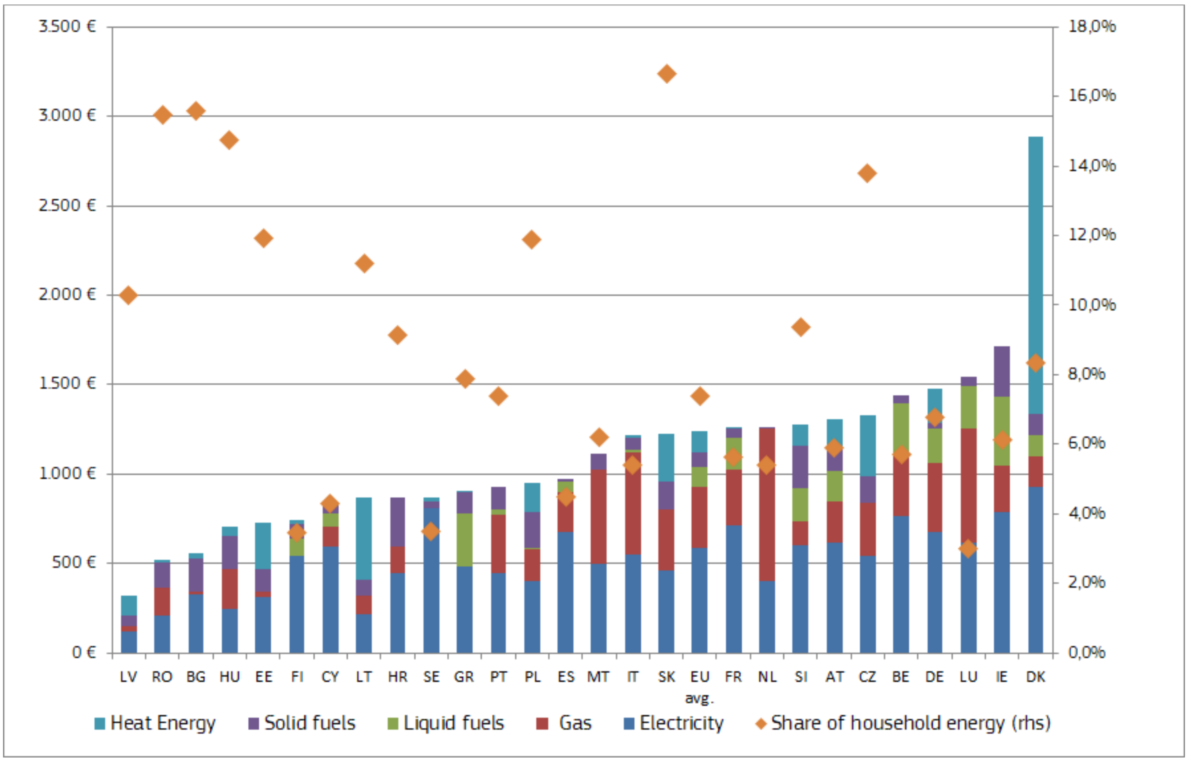


Figure 118 - Energy product expenditure for lower-middle income households and the energy share in household expenditure by EU Member State

Source: DG ENER ad hoc data collection on household consumption expenditures

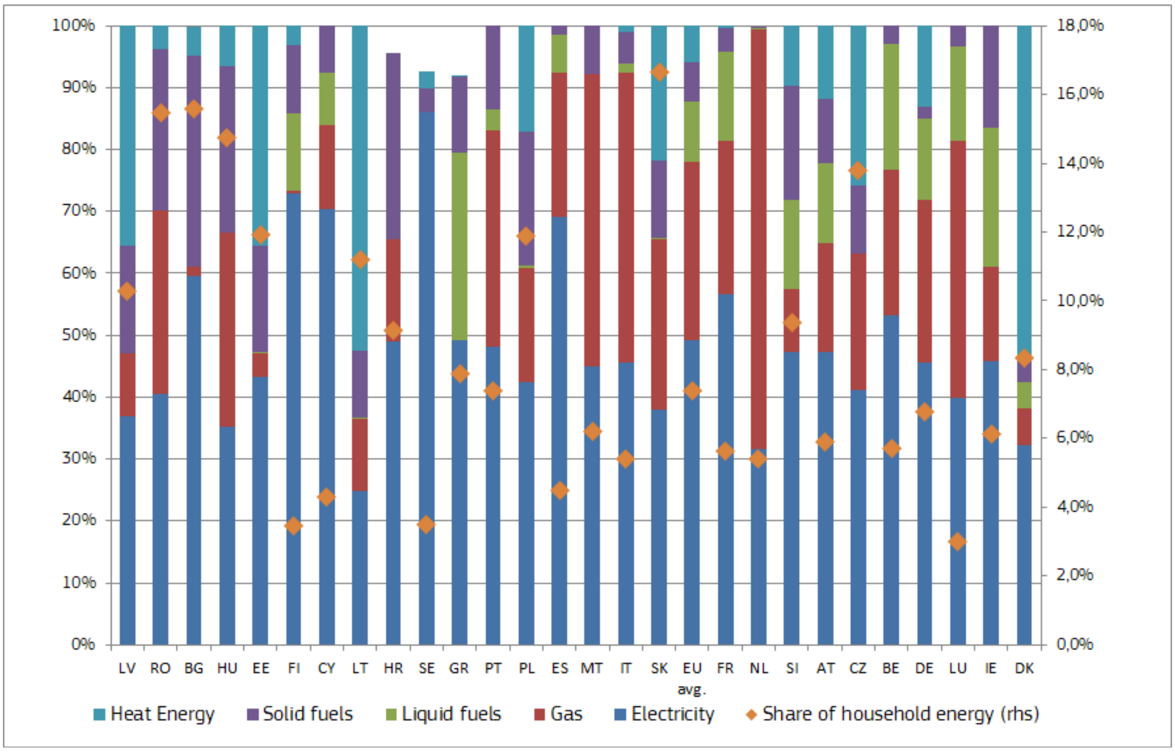


Figure 119 - Share of expenditure on household energy products and share of energy in total expenditure for lower-middle income households by EU Member State

Source: DG ENER ad hoc data collection on household consumption expenditures[45].

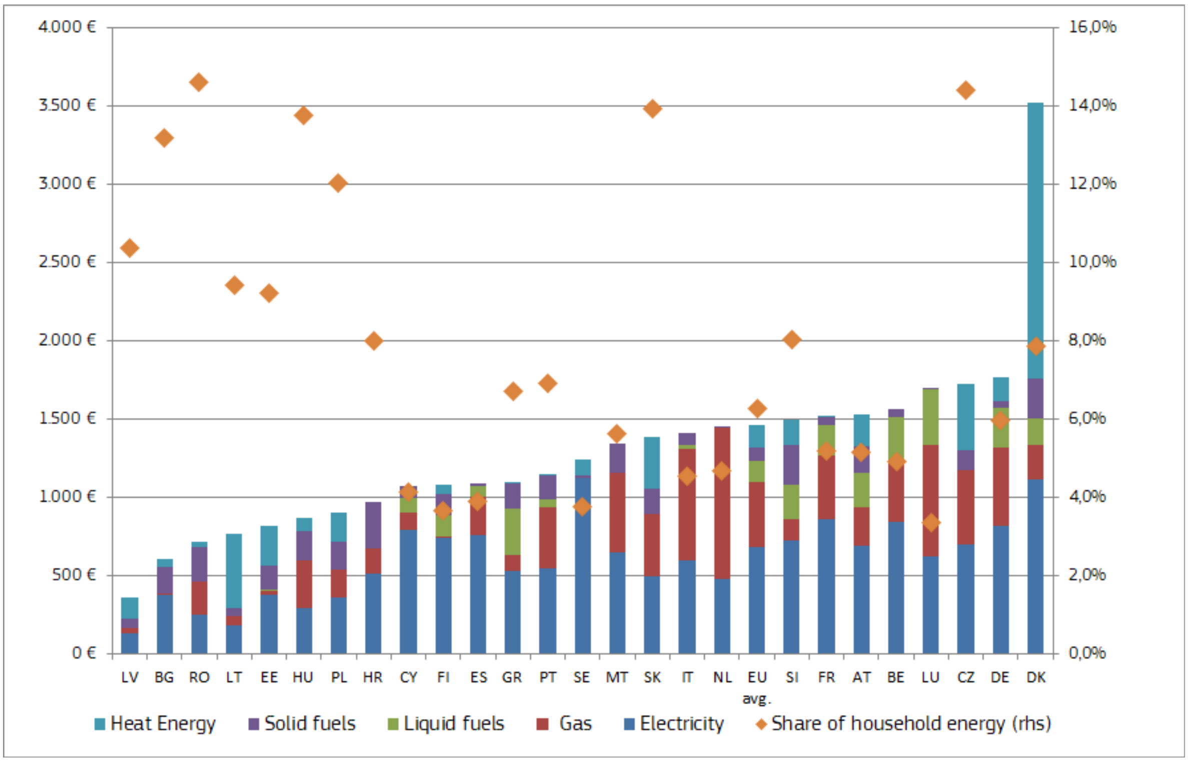


Figure 120 – Energy product expenditure for middle income households and the energy share in household expenditure by EU Member State

Source: DG ENER ad hoc data collection on household consumption expenditures

[45] Ad hoc data collection was not complete for all Member States and this results in small shares of some products that could not be accounted for.

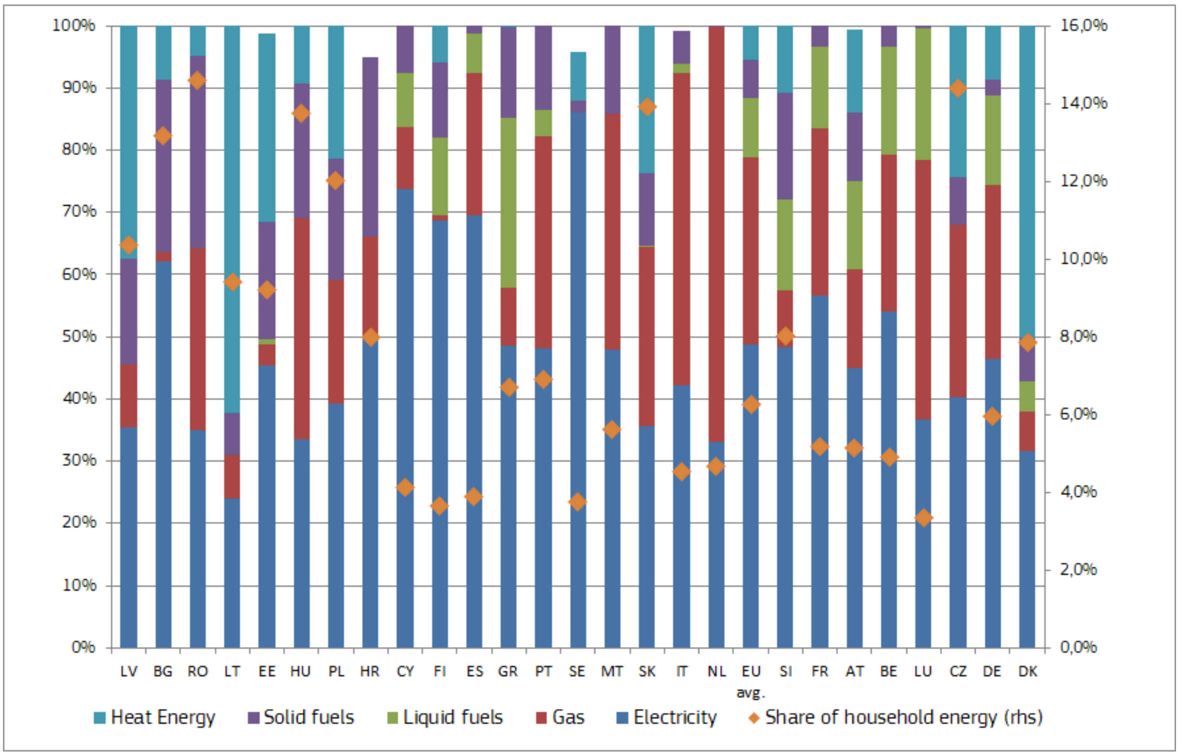


Figure 121 - Share of expenditure on household energy products and share of energy in total expenditure for middle income households by EU Member State

Source: DG ENER ad hoc data collection on household consumption expenditures[46]

A few other indicators exist that shed light on the burden of household relating to paying their energy bills and/or keeping their home sufficiently warm. **Figure 122** shows the relation between spending on energy (in the share of the total) for lower-middle income households and the share of those being unable to warm up their home sufficiently.

Whereas in Finland only 3.1% of the households being under 60% of the median income were not able to keep their home adequately warm, in Bulgaria this share was more than 56% in 2018. The share of homes non-adequately warm shows a positive correlation (though not very strong, having a coefficient around 0.21) with the share of energy in total expenditures. The correlation is weakened by the data in some Mediterranean EU Member States, owing to lower energy expenditure amid warmer climate; however, this is not reflected in the perception of households on having a sufficiently warm home.

[46]Ad hoc data collection was not complete for all Member States and this results in shares of some products that could not be accounted for.

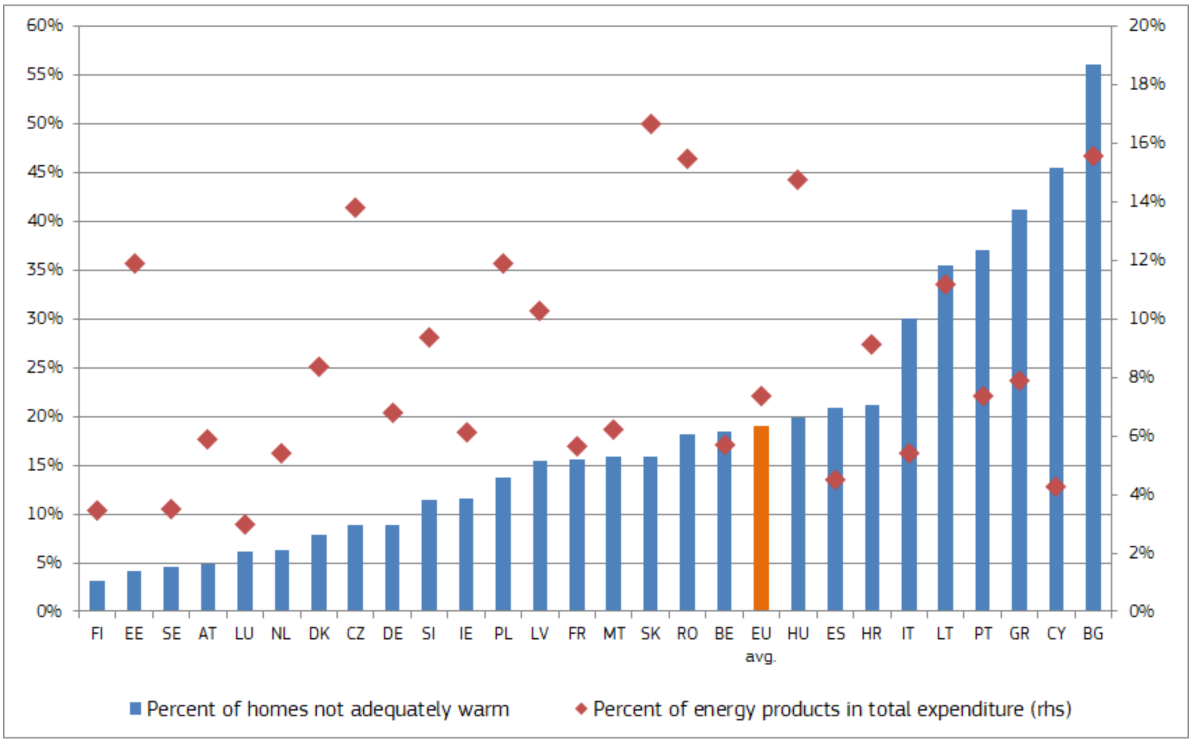


Figure 122- Ratio of homes not adequately warm for households below the 60% of the median income and the share of energy products in expenditure for the lower-middle income households

Source: DG ENER ad hoc data collection on household consumption expenditures and Eurostat

Box –Energy efficiency of the household sector

Energy efficiency measures can help the reduction of total residential energy consumption. Consumption of energy in the EU residential sector, accounting for around a quarter of total final energy use, dropped by 1.8% between 2016 and 2018. Over the last years, due to a well-established regulatory framework for energy performance of buildings and higher standards for equipment and appliances, the EU building stock became more efficient. This is particularly the case for new buildings. However, in order to reach climate-neutrality by 2050, consumption in households must decrease further. To achieve this, we need highly energy and resource efficient buildings and efficient heating systems and efforts should shift to existing households as almost 75% of the existing building stock in the EU is inefficient and current renovation rates are only about 1%. This is exactly the aim of the Renovation Wave initiative, a flagship initiative of the European Green Deal with central role to the Recovery package. It will seek to steer public and private funding towards renovation projects with the biggest societal gains. The aim of the Renovation wave is to significantly increase the renovation rate, support fast, integrated, high-quality deep renovation of buildings with direct impact on energy consumption in households. The Renovation Wave initiative in line with key tools like the national long-term renovation strategies, will pay special attention at the residential sector as it represents the majority of buildings and will carefully consider the social context, housing accessibility, affordability of housing and health issues linked to housing of poor quality, housing of low-income people and energy poverty. The national long-term renovation strategies are key for improving the energy performance of the existing building stock into a highly efficient and decarbonised building stock by 2050. These strategies should encompass a roadmap with measures, measurable progress indicators and indicative milestones for 2030, 2040 and 2050 as well as address many elements, such as energy poverty, health, policies targeting the worst performing buildings, split-incentive dilemmas, and social housing.

In addition, the efforts to ensure compliance and enforcement of the existing Energy labelling and Eco-design regulations needs to continue, and the Eco-design and Energy Labelling Working Plan under preparation will identify priorities for the years ahead.

That said, energy consumption in the residential sector is not only impacted by the energy efficiency of buildings and their equipment and appliances. A higher number of households, the higher floor area of buildings and a higher disposable household income may result in higher energy consumption. In addition, high energy prices could also result in lower consumption, although energy is a rather price-inelastic product. The weather and climate conditions influence importantly energy consumption (particularly in the cold seasons of the year as two thirds of total energy consumed by households is related to heating needs).

5.1.4 Share of energy in the household expenditure by income and Member States

The following charts show the share of energy in final expenditure in three different income deciles (poorest, lower-middle and middle income) in the EU-27 Member States. A regional approach has been followed to enable comparisons for the Member States with their neighbouring peers[47].

As **Figure 123** shows[48], these seven North Western European countries spent slightly less than the EU average on energy products in the most recent years. In the middle income decile households spent 3%-6% of their total expenditure on energy, while in the lowest income decile this share varied between 4% and 8%. In these Member States 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. In the case of Ireland, only data on the share of energy expenditure from the lowest and lower-middle income households was available.

[47]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.

[48]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 not stem from different years.

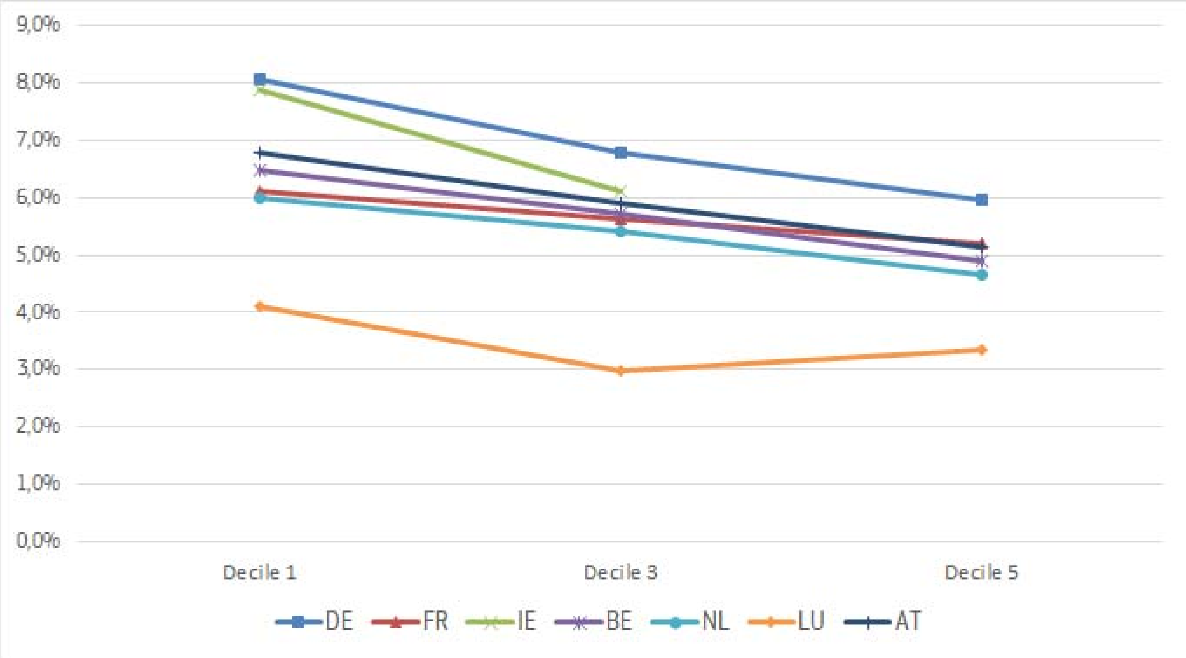


Figure 123 - Germany, France, Ireland, Belgium, Netherlands, Luxembourg and Austria - Share of energy in final household expenditure per income deciles

Source: DG ENER ad hoc data collection on household consumption expenditures

In the South European and Mediterranean islands countries the share of energy within total household expenditures was also lower than the EU average as shown in **Figure 124**. It is worth mentioning the dispersion in shares of energy within the total expenditure in different countries was quite significant[49]. In the lowest income decile households spent 4-9% of their total expenditure on energy, while in the middle income decile this share varied between 4% and 7%. Heating needs are commonly lower in these countries compared to other regions of Europe due to favourable weather conditions; this might also contribute to lower than EU average shares on energy within the total household expenditure.

[49]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.

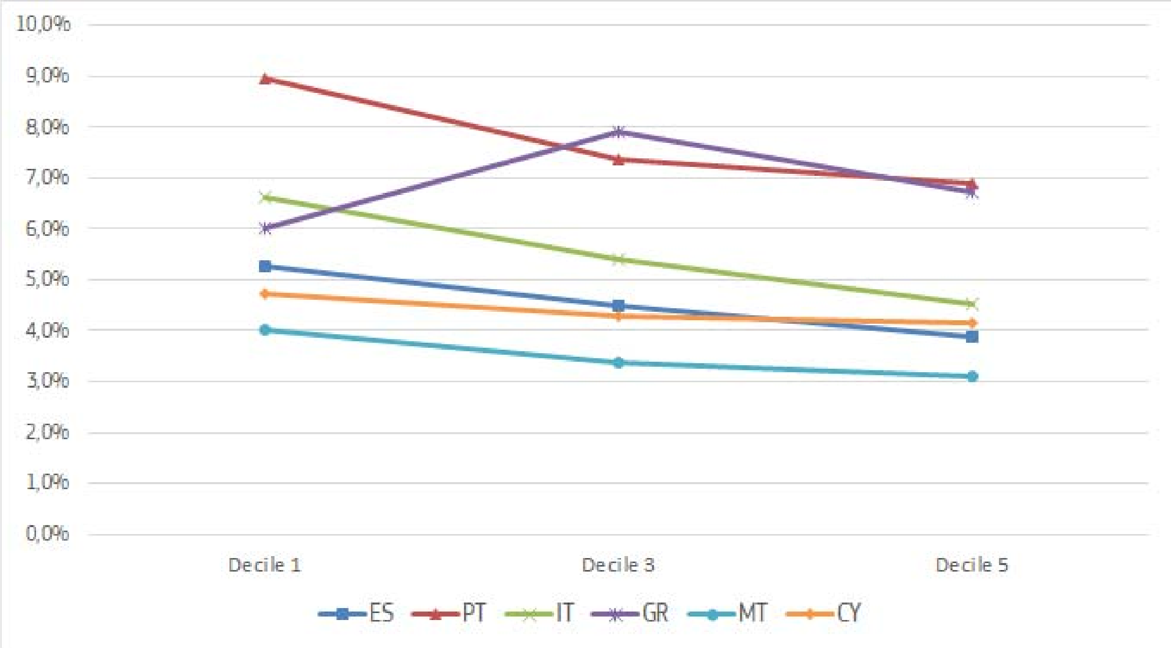


Figure 124 - South European countries: Spain, Portugal, Italy, Greece, Malta and Cyprus - Share of energy in final household expenditure per income deciles

Source: DG ENER ad hoc data collection on household consumption expenditures

Central and Eastern European countries (**Figure 125**) presented a share of energy in total household expenditures considerably higher than the EU average, ranging from 11% to 22% in the lowest income decile, while in the middle income decile it varied between 12% and 14%. Higher-than-EU average share of energy in the total household expenditure might reflect potential of improvements in energy efficiency of residential buildings and a relatively low purchasing power and total consumption expenditure in these Member States.

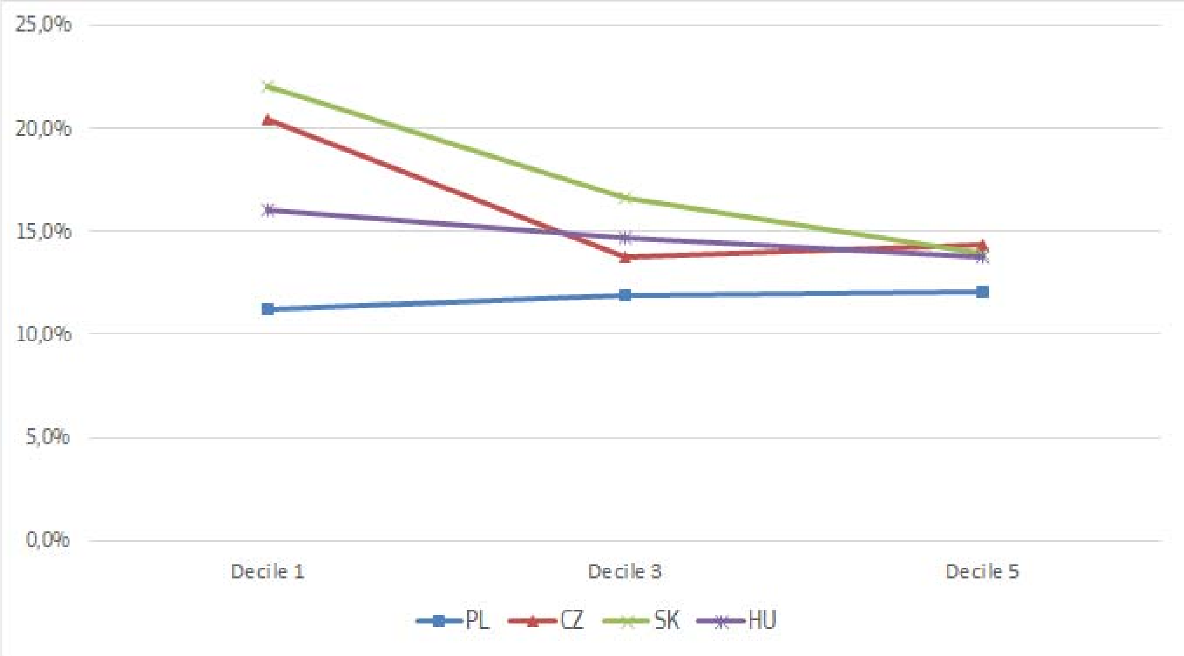


Figure 125 - Poland, Czechia, Slovakia and Hungary - Share of energy in final household expenditure per income deciles

Source: DG ENER ad hoc data collection on household consumption expenditures

Even when the climate conditions in Sweden and Finland (**Figure 126**) imply significant heating needs in comparison with other EU Member States, the share of energy in total household expenditures are among the lowest in the EU, reflecting high efficiency standards of residential buildings and elevated purchasing power and consumption expenditures of households. 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 is significantly higher than in the Nordic countries, in spite of the similar climate conditions and low retail electricity and gas prices in comparison with EU Member States.

Furthermore, the importance of energy in total household expenditures in Denmark is higher than in the rest of the Nordic countries, due to the relatively high energy prices.

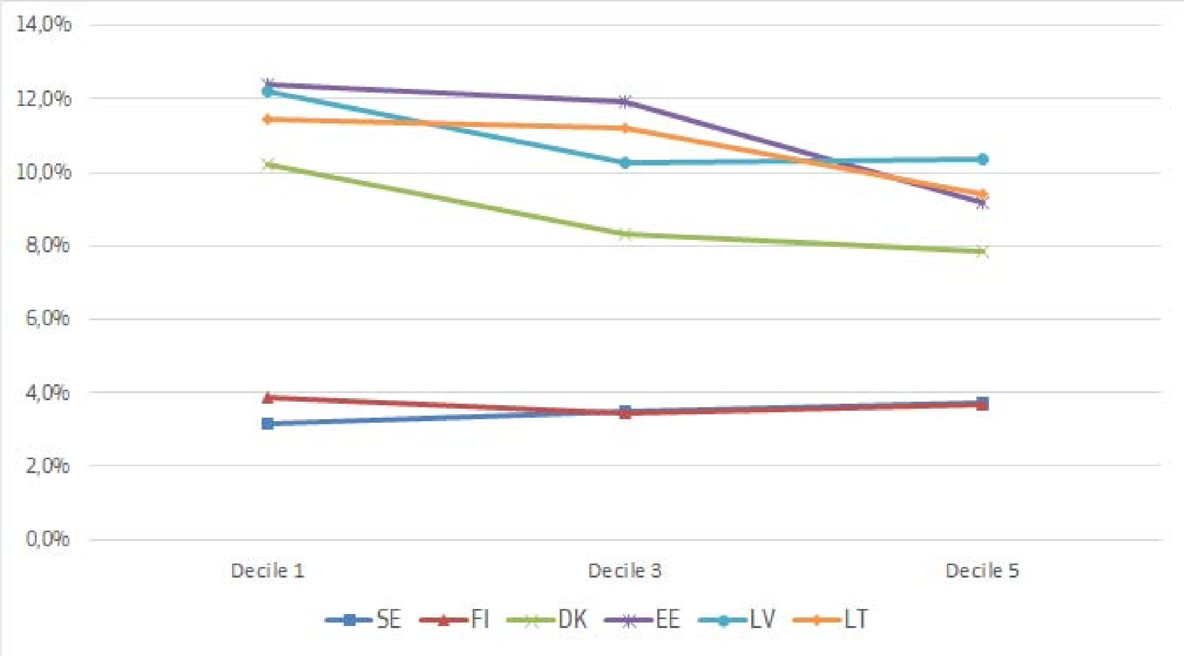


Figure 126 - Nordic and Baltic countries: Sweden, Finland, Denmark, Estonia, Latvia, Lithuania - Share of energy in final household expenditure per income deciles

Source: DG ENER ad hoc data collection on household consumption expenditures

Finally, in spite of having low retail energy prices in EU comparison, Croatia, Slovenia and Romania presented shares of energy expenditure higher than EU average according to the latest data (**Figure 127**). Low purchasing power and consumption expenditure of households plus low energy efficiency of residential buildings might be the potential cause for these results.

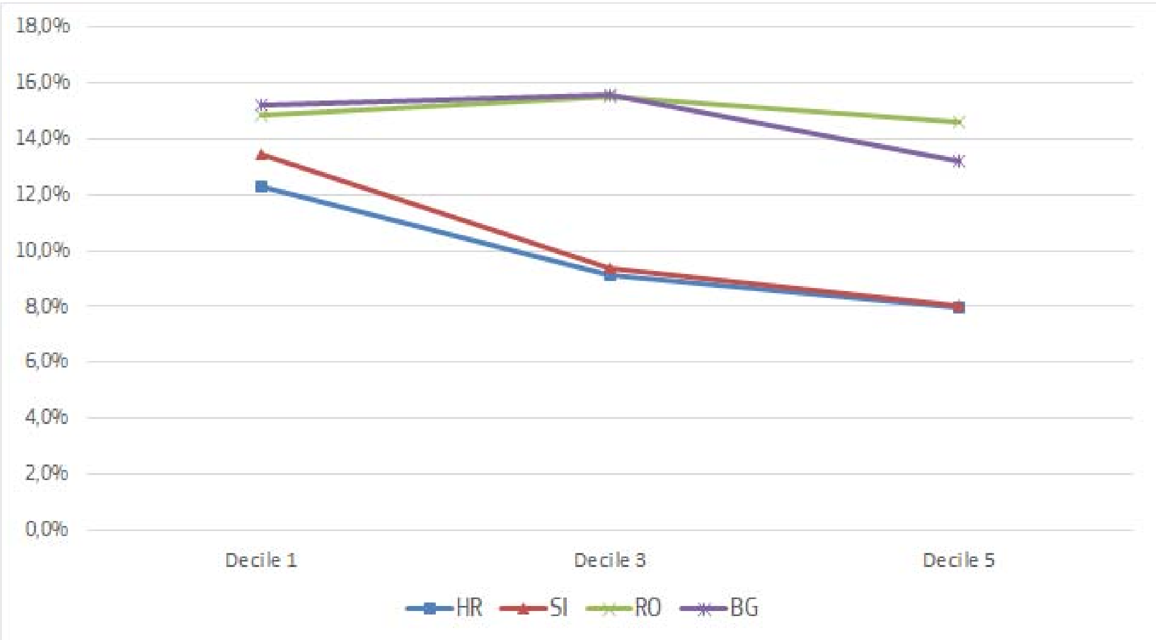


Figure 127 - South East Europe: Croatia, Slovenia, Romania and Bulgaria - Share of energy in final household expenditure per income deciles

Source: DG ENER ad hoc data collection on household consumption expenditures

5.1.5 Energy expenditures in the transport sector

Figure 128, Figure 129, **Figure 130** and **Figure 131** show the expenditures and the respective shares on transport fuels (petrol and diesel, or in the case of some Member States where detailed data were not available, fuels and lubricants total). Similarly to household energy products, there were significant differences across the Member States, both in absolute spending on fuels and in their share in the total household expenditure.

There were five Member States (Romania, Slovakia, Bulgaria, Estonia and Croatia) where spending on transport fuels remained below € 100 per household in 2018, whereas in Luxembourg, France, Cyprus and Malta it was above € 600. In the EU the poorest households spent € 390 on average on transport fuels, representing 3% of the total consumption expenditure. The lowest share of transport fuels within the total expenditure could be observed in Romania (0.6%), whereas in Malta the poorest households spent 9.5% on transport fuels of their total expenditure.

The share of petrol and diesel within transport fuels was different across the EU. In countries like the Netherlands, Sweden, and Czechia and most of the countries in Central and Eastern Europe expenditures on petrol dominated the transport fuel bill, whereas in France, Luxembourg, Latvia and Romania diesel had a significant share (though with the exception of Romania it was higher than the share of petrol).

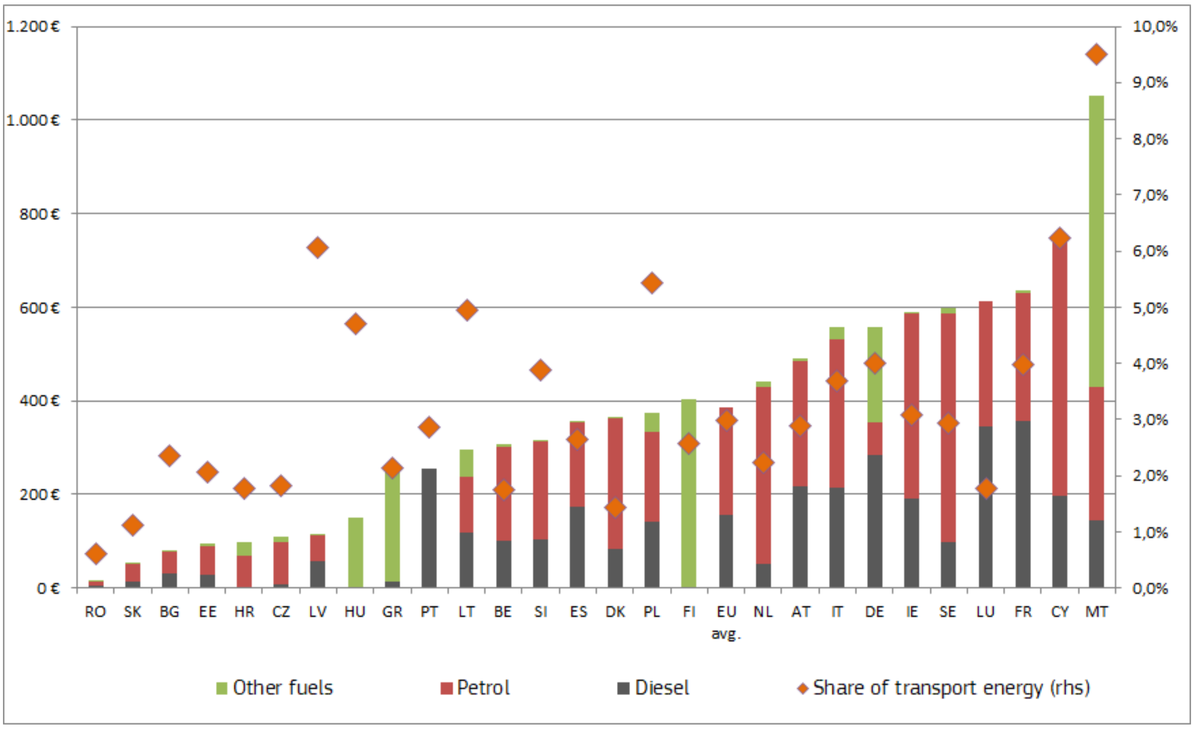


Figure 128 - Expenditures on transport energy products for the poorest households by EU Member State, and energy transport share in household expenditure

Source: DG ENER ad hoc data collection on household consumption expenditures[50]

[50]Note: "Fuels and lubricants total" cover diesel, petrol and other fuels and lubricants. A split is not available by fuel in these EU Member States.

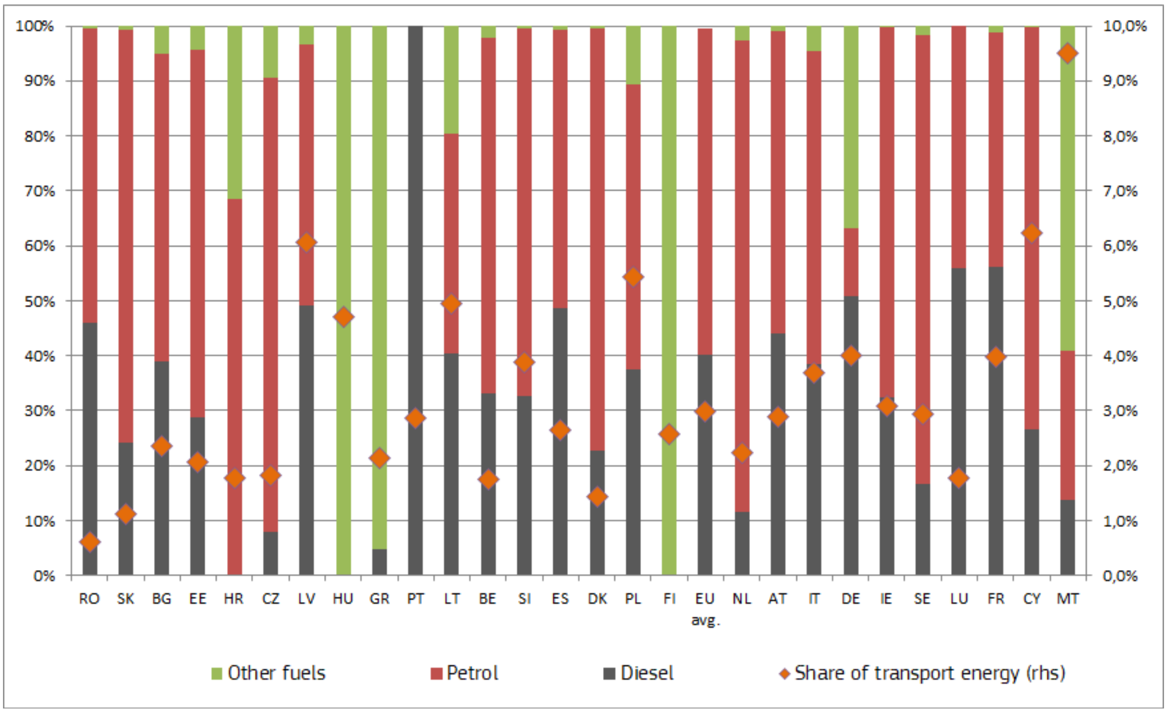


Figure 129 - Share of expenditure on transport energy products and share of transport energy in total expenditure for the poorest income households by EU Member State

Source: DG ENER ad hoc data collection on household consumption expenditures

In contrast to household energy products, the share of transport fuels within the total expenditure proportionally increases with the income of households, otherwise saying richer households tend to spend more on transport fuels within their total expenditure. As it was mentioned before, the poorest households spent 3% on transport energy on EU average, while those in the third income decile (lower-middle income) and in the fifth decile (middle income) respectively spent 4% and 4.4%. Expenditures on transport fuels reached € 1060 in the case of middle income households in 2018 in the EU.

Comparing the details of transport fuel expenditures of the poorest and middle income households, it seems that the share of diesel fuel is higher in the case of middle income households than for the poorest. Diesel engine cars are more popular among those who use their car more frequently, or having a higher annual mileage, as in many countries taxation of diesel fuels is more favourable (or at least it used to be in the past) compared to petrol.

As households with higher income rely more on private transport, they spend proportionally more on diesel than the poorer. However, in the future this might change as difference in taxation of petrol and diesel (mainly excise duties) will diminish and due to the changing environmental rules and public acceptance; thus diesel may not be as attractive alternative to petrol cars as in the past.

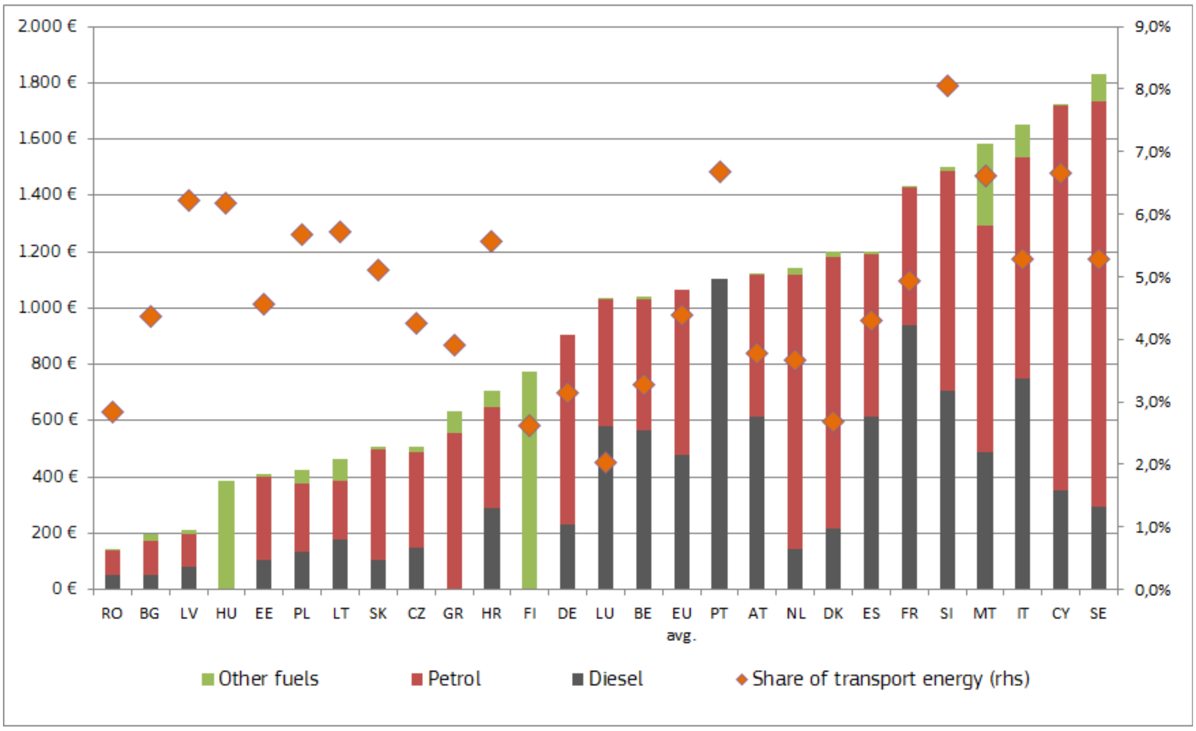


Figure 130 - Expenditures on transport energy products for middle income households by EU Member State, and energy transport share in household expenditure

Source: DG ENER ad hoc data collection on household consumption expenditures

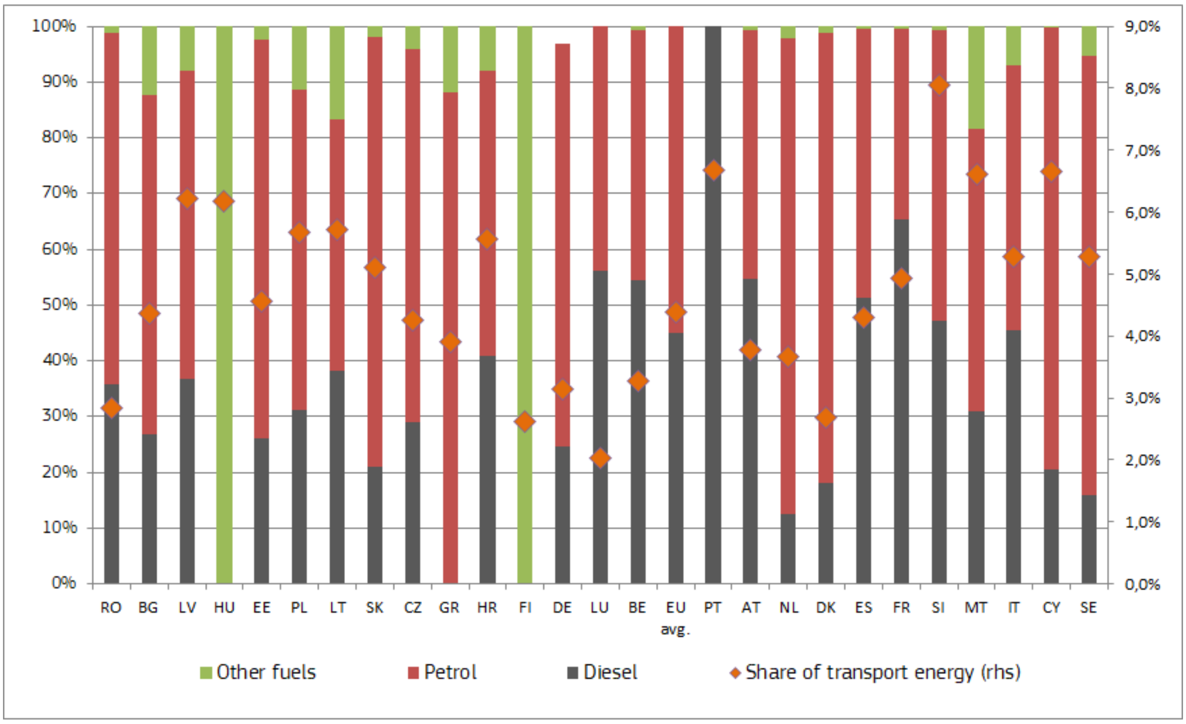


Figure 131 - Share of expenditure on household transport energy products and share of transport energy in total expenditure for middle income households by EU Member State

Source: DG ENER ad hoc data collection on household consumption expenditures

Energy poverty and other indicators

The European Energy Poverty Observatory looks at a wide array of income-related indicators, beyond the share of energy expenditure in the total expenditure of households. Where Member States have updated data, they can provide relevant insights about households suffering from energy poverty. Energy poverty can be revealed by households having high levels of their expenditure on energy. This may occur when there is a prioritisation of household expenditures which puts basic needs (including energy) first. One of these indicators measures the proportion of households whose energy expenditure is more than twice the national median share as shown in **Figure 132.**

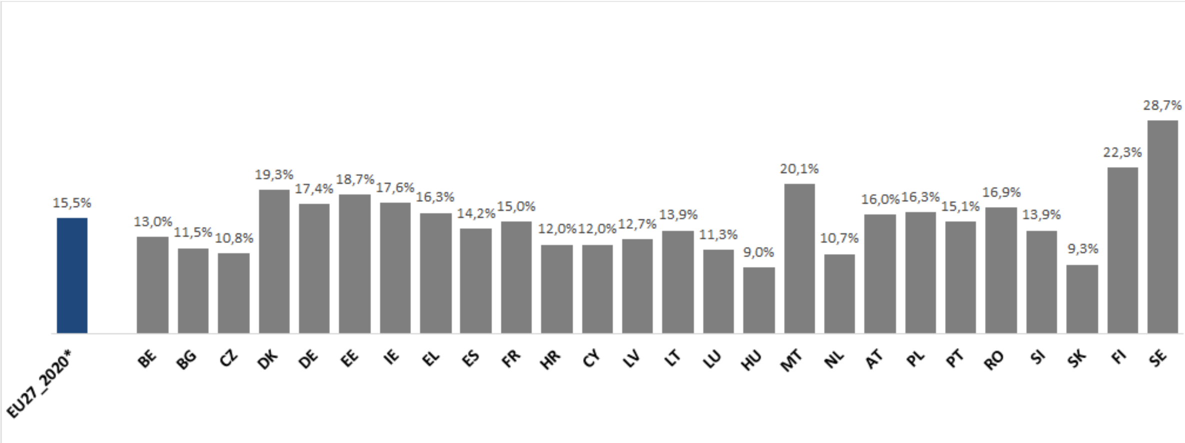


Figure 132 - Proportion of households whose share of energy expenditure in income is more than twice the national median share (2M)

Source: Eurostat, Household Budget Surveys, 2015

But not always higher shares of spending on energy may be revealing situations of energy poverty. In cases of extreme poverty, energy might be considered 'less necessary' than other spending on basic goods and services like food or house-renting. This re-prioritisation of spending can result in energy spending (while necessary) remaining at very low levels, 'hiding' that households are depriving themselves from having adequate levels of energy consumption. For these cases, an additional indicator which captures when the share of households whose absolutely energy expenditure is particularly low is useful and complements other indicators in identifying households' energy poverty. **Figure 133** shows the 'hidden' energy poverty across MS, defined as *'the share of households whose absolute energy expenditure is below half the national median'*. Where high shares of the indicator appear, it is important to assess whether they are caused by households seriously under-consuming energy, for example due to a lack of access to the market, or cases where high shares may depict high energy efficiency standards.

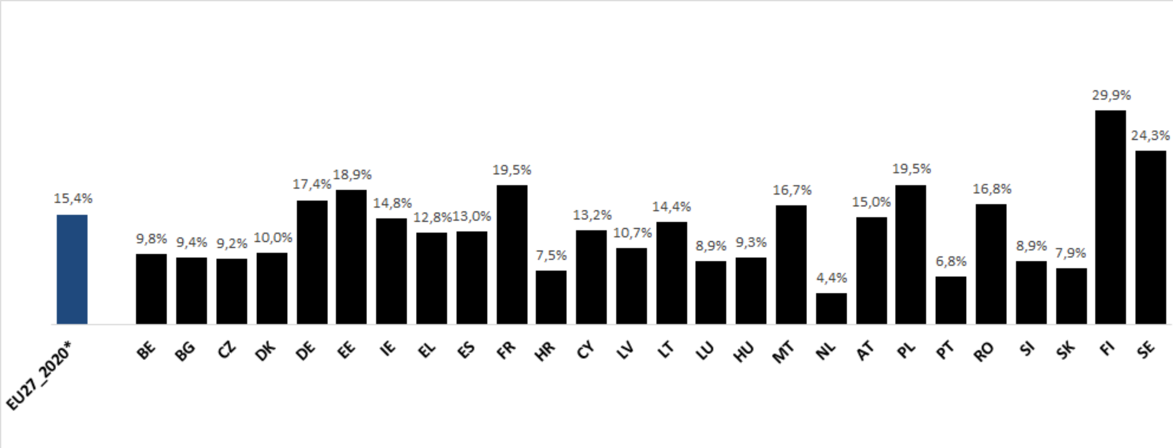


Figure 133 - Share of households whose absolute energy expenditure is below half the national median (M/2, hidden energy poverty).

Source: Eurostat, Household Budget Surveys, 2015

These two indicators show a shift in literature towards increased use in expenditure base metrics of relative thresholds rather than just fixed thresholds.

Whilst the above indicators aim to compare energy expenditure and income, income levels are beyond the scope of energy policy. In contrast, energy costs affecting energy expenditure and the energy-efficiency of dwellings are areas relevant for energy policy.

Another interesting indicator is to look into arrears on utility bills, i.e. the situation where a household has not been able to pay the utility bills (heating, electricity, gas, water, etc.) of the main dwelling on time due to financial hardship.

Figure 134 shows the evolution of arrears of utility bills in the European Union between 2010-2018, compared with the change in share of energy expenditure for the most susceptible deciles of income to suffer from this issue in same period of time (lowest, lower-middle and middle income).

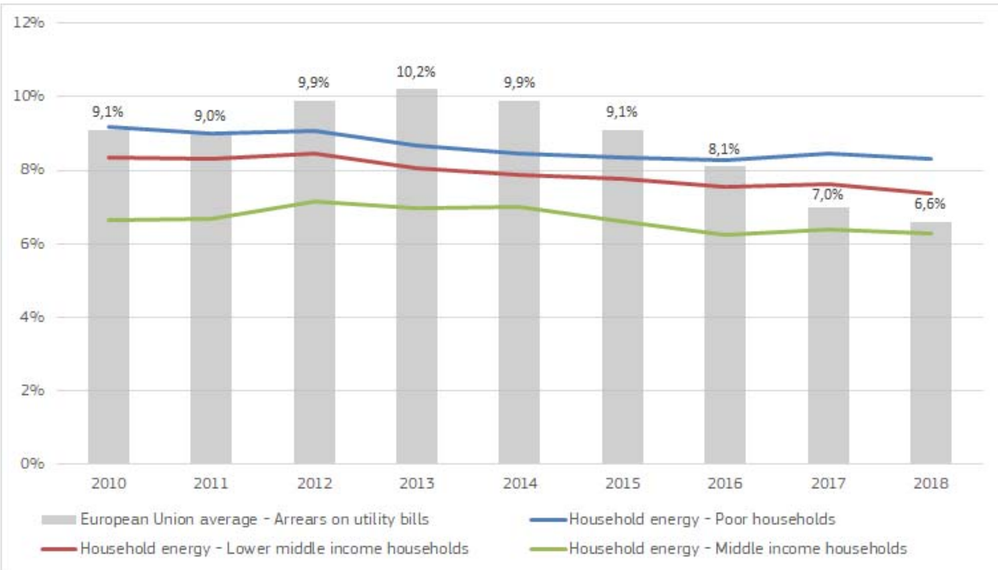


Figure 134 - Arrears on utility bills for EU average households and expenditures on household energy (electricity, gas, heating, etc.) for the poorest, lower-middle and middle income households by EU Member State

Source: Eurostat, SILC, [ilc_mdes07] and DG ENER ad hoc data collection on household consumption expenditures

It is interesting to observe that arrears on utility bills have been evolving favourable since the end of the last economic crisis, as this indicator rose from 9.1% in 2010 to 10.2% in 2013, and ever since it has been falling steadily to 6.6% in 2018. This trend can be explained by the increase of household income since the end of the 2008 financial crisis. Therefore as the economy improves, wages and incomes also ameliorate, thereby enabling households to pay for their energy expenditures.

5.1.6 Change in energy expenditures in the Member States (2008-2018)

Figure 135 shows how the share of energy and transport in the final household consumption expenditure has changed between 2008 and 2018, as the evolution in time for the poorest, lower-middle and middle income households of the energy expenditures on households (electricity, gas, heating and other fuels) and transport fuels (petrol and diesel, or in the case of some Member States where detailed data were not available, fuels and lubricants total).

The blue lines represent the share of energy and transport (dotted lines) in the first income decile, while the red and green lines represent households with lower-middle income and middle income for the average of EU27.

In the case of the share of energy expenditure in households, there is a marginal decreasing trend over the years that can be observed in the different deciles of income, as opposed by the slow but steady increase of energy expenditure in transport. It is interesting to notice that while poorest households tend to spent more on energy for appliances, gas, heating and other fuels, the same decile of income spent less on transport. The opposite situation happens for the middle income deciles: they spent less on energy for electricity, gas, heating, and other fuels, while they tend to spent more on transport related activities. As mentioned in the previous section, this can be explained as households with higher income, rely more on private transportation than lower income households.

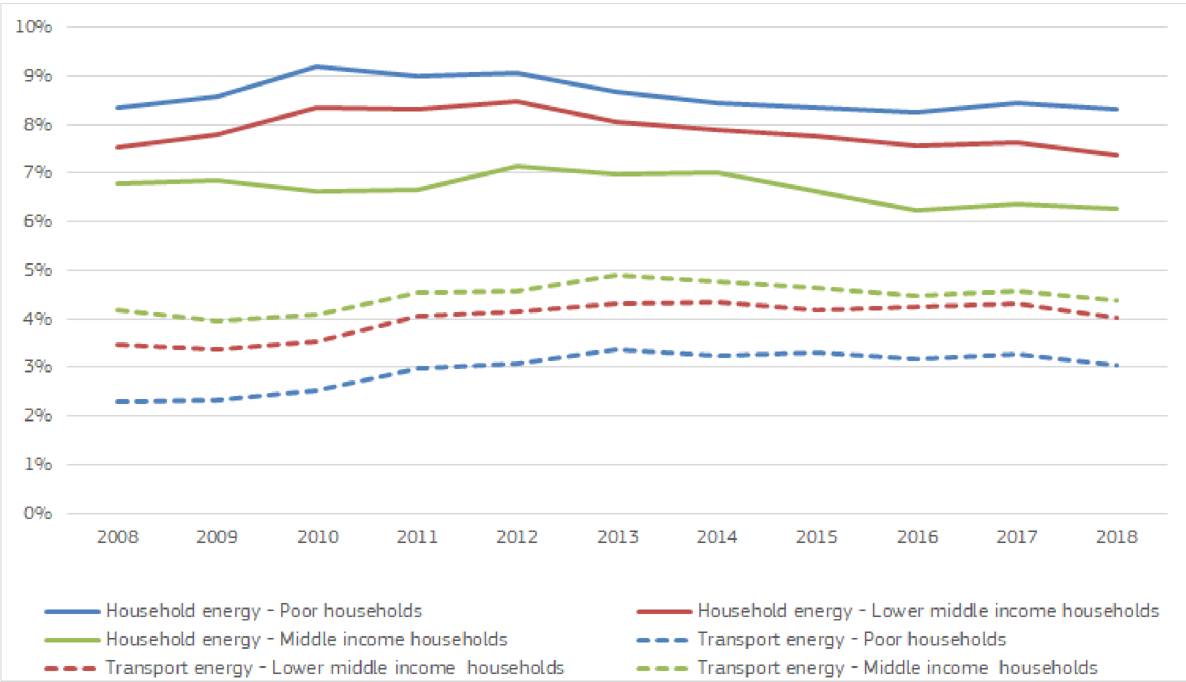


Figure 135 - Expenditures on household energy (electricity, gas, heating, etc.) and transport energy (petrol, diesel, etc.) for the poorest, lower-middle and middle income households by EU Member State

Source: DG ENER ad hoc data collection on household consumption expenditures

It is also worth noting different trends across the last ten years, as detailed in **Table 9.** While in 2008 the share of household expenditure on energy was 8.3% in the case of the poorest households, in 2012 this value reached 9.1%, as retail energy prices underwent a significant increase as consequence of the 2008 economic crisis. From 2012 to 2016, the lowest income decile experienced a slight decrease on the share of energy expenditure, leading to 8.3%. There was no meaningful change until 2018, where the share of energy expenditure in this decile remained in the same value (8.3%).

The share of energy expenditure in the middle income households was less affected by the economic crisis, as this value increased slightly from 6.8% in 2008, to 7.1% in 2012. From 2012 to 2018, the middle income decile experienced a decreasing overall trend with a peak in 2012 (7.1%) falling to 6.3% in 2018.

In the case of energy expenditure in transport, the data in **Table 10** shows an increasing overall trend from 2008 (2.3%) to 2013 (3.4%) in the lowest income decile of households, in spite of the effects of the global economic recession post 2008. This indicator remained relatively stable, reaching a value of 3.0% in 2018. Middle income households presented a similar pattern on energy transport expenditure, as share of transport energy expenditure rose from 4.2% in 2008, to 4.9% in 2013. Furthermore, this indicator marginally decreased to 4.4% in 2018. It is interesting to note that transport energy expenditure does not reflect the volatility of oil prices, showing that domestic fuel prices and expenditure are not directly related.

Table 9 - Timely evolution of energy expenditure shares (%) 2008-2018

	2008	2012	2018	2008-2012 change	2012-2018 change	2008-2018 change
Poor households	8.3	9.1	8.3	0.7	-0.7	0.0
Lower middle income households	7.5	8.5	7.4	0.9	-1.1	-0.1
Middle income households	6.8	7.1	6.3	0.4	-0.9	-0.5

Source: DG ENER ad hoc data collection on household consumption expenditures

Table 10 – Timely evolution of transport energy expenditure shares (%) 2008-2018

	2008	2013	2018	2008-2013 change	2013-2018 change	2008-2018 change
Poor households	2.3	3.4	3.0	1.1	-0.3	0.8
Lower middle income households	3.5	4.3	4.0	0.8	-0.3	0.6
Middle income households	4.2	4.9	4.4	0.7	-0.5	0.2

Source: DG ENER ad hoc data collection on household consumption expenditures

EUROPEAN
COMMISSION

Brussels, 14.10.2020
SWD(2020) 951 final

PART 4/6

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(2020) 951 final}

6 Industry energy costs

Introduction

The chapter looks at the impact of energy prices and energy costs on selected European industrial sectors. We will first analyse to which extent energy costs are important for the overall economy, for industry and services. We will then map the energy costs of several manufacturing, services and agricultural sectors. Special attention is given to the most energy-intensive sectors, the profitability and competiveness of which can be significantly affected by energy price and costs changes. A decomposition analysis of the energy costs, gives insights on how energy prices, economic activity and energy intensity and other factors affecting these drivers, have influenced the evolution of energy costs over the last decade. Finally international comparisons of energy costs are made to the extent permitted by the limited available data.

Main findings

On the overall impact on the EU's economy

— Energy costs represent a small part of the gross value added in the economy.

— At EU level, its share is estimated at around 1.7% of the total production value of manufacturing (2% in 2014), 1% for services (1.2% in 2014) and around 1.1% of the combined group of industry and services in 2017 (1.4% in 2014).

— Over the past decade, we can notice two periods of time. Between 2008 and 2013 the indicator for EU27 oscillated between 1.44% and 1.73% (peak in 2009) for the share of energy for industry and services. This share is falling since 2014 with the continued decarbonisation of the EU's economy.

— For Member States (except for Latvia and Romania in 2009), the share of energy related costs in total production value, industry and services, remains under 6%, with most Member States recording shares under 3% and a general trend to decreasing.

Energy costs shares

— Energy costs shares in total (operational) production costs fell for all the *manufacturing* sectors studied between 2010 and 2017, with the most important declines being in *paper* (-5.7%), *cement* (-5.1%), *steel* (-2.9%) and *building materials* (-2.9%).

— Energy cost shares also declined for the majority of *non-manufacturing* sectors studied, with the exception of some *extractive-energy* industries and *air transport*.

— The fall in energy costs in *manufacturing* was more pronounced and generalised in recent years. Between 2010 and 2013 energy costs fell in most sectors with non-negligible rises in shares in only a few of the most energy-intensives sectors like *man-made fibres*, *stone*, *glass*, *refractory products*, *ceramics*, *building materials* and in less energy-intensive sectors like *computers*. Between 2014 and 2017 energy cost fell in *all* manufacturing sectors.

- Energy costs in manufacturing accounted for around 1-10% of production costs. For some sectors of the most energy-intensive sectors, energy costs accounted for more than 10% of production costs in at least one year, e.g. for *paper*, *clay building materials*, *iron and steel* and *cement* (on the latter sector the energy costs share was consistently above 10%).
- Energy costs are typically 1-3% of production costs amongst the less energy-intensive sectors studied. *Computers, motor vehicles, electric equipment,* and *machinery* display energy costs shares around 0.6%-0.7% and *pharmaceuticals* reaches 1%.
- Amongst the *non-manufacturing* sectors studied, energy cost shares are comparable to or even higher than the most energy-intensive manufacturing sectors (see above) in the case of *land transport*, *air transport*, *mining of metal ores*, e*lectricity-gas* and o*ther mining*. Energy cost shares are also significant in *accommodation and restaurants (3-4.7%)*, *waste management* (~2%) while rather small in *construction (~1%)* and *trade (0.4%).*

Drivers of energy costs for industry

- The aggregated energy costs of the sectors studied at EU level fell by 13% over 2010-2017. A lower energy intensity contributed to the reduction in energy costs (by inducing at least a -15% decrease in costs). The decomposition analysis shows that the decrease in energy costs happened despite slightly increasing *prices* (that induced +2% increase in energy costs) and significant increases of *output* (that induced a +11% of the increase in energy costs).

- A very significant part of the decrease in energy costs over the period could not be linked directly to any of these three factors (a -11% additional reduction in energy costs is explained by the residual). The possible data limitation on price data (which may not account for all tax exemptions and reductions) and in particular the low quality of the energy consumption data may explain the high residual which could be due to an underestimation on the reduction of energy intensity.

- The analysis of the drivers behind these effects, indicates that the increase in output was driven almost completely by growth in domestic demand and that external demand increases were negligible. The lower energy intensity was explained to a very small extent by sectoral structural changes and fuel switching, suggesting that energy efficiency improvements of the processes would have played an important role in reducing the energy intensity, in particular amongst the less energy-intensive industries. These could have exploited their high potential for improving energy efficiency, as opposed to high energy insensitive industries which have been improving energy efficiency already for decades.

- Energy costs have a negligible negative impact (-0,3%) on the increase of the Total Production Costs in the vast majority of manufacturing sectors analysed over the period of study.

- Over the period 2010-2017, energy cost shares have fallen in *all* the manufacturing sectors studied. The largest declines in energy cost shares were observed in the most energy-intensive sectors like *cement* and *paper* (around -5%). *clay building materials* and steel (around -3%), *glass* and *chemicals* (-2%). Many other of the less energy-intensive sectors show smaller declines in absolute numbers (between -0.1% and -0.6%). However, in proportional terms there were rather significant declines for some of the less energy-intensive sectors (~ a proportional decline of the share from 20% to 40% of their shares).

Energy intensity

- Energy intensity (energy consumption/GVA) varies considerably across the sectors studied depending predominantly the technological production process. In manufacturing sectors, the highest energy intensity values appear in *steel*, *cement*, *refineries*, *paper and basic chemicals.* In non-manufacturing sectors, the highest energy intensities are found in *land transport* and *electricity-gas.*

- Energy intensity fell in most of the highly energy-intensive sectors in *manufacturing*, including *non-ferrous metals*, *steel*, *refineries* and *paper.* Energy intensity, however, increased in a few sectors such as *cement, clay building materials, grain products*, *sawmills* and *basic chemicals*. In relative terms, the energy intensity indicator fell the most in *stone* (-60%), *man-made fibres* (-45%), *refineries* (-55%) and *paper* (-20%).

- Energy intensity decreased for the vast majority of the less energy-intensive manufacturing sectors in the EU between 2011 and 2017. The decreases were small but important in relative terms for many sectors like *textiles*, *articles of paper*, *electrical equipment, computers, machinery* and *motor vehicles.*

- In *non-manufacturing,* energy intensity decreased in sectors like *land transport* and *air transport,* although it increased in *electricity-gas.* Amongst those with lower energy intensity, the results were mixed.

International comparisons

- The situation did not change too much with respect to the previous report (which covered the period between 2008 and 2017, while the current one is covering until 2019) [51].

- For the most energy-intensive sectors, in most of the cases, the EU energy costs shares in production costs are lower or similar to those in the US sectors, with the exception of *non-ferrous metals (aluminium)* which display lower energy costs shares in the US. The result of the comparison of the energy costs shares of the EU most energy-intensive sectors with Japanese sectors is mixed. The Korean sectors displays the lowest energy costs shares in production costs of the countries studied.

- The energy intensity (proxy of energy efficiency)[52] of EU sectors studied is consistently lower that in China. The EU sectors display an overall comparable energy intensity to those in the US, yet with differences across the specific sectors.

- Electricity prices for industry in the EU are lower than Japan, slightly higher than China and higher than US prices (US prices are half the EU levels). Amongst the other non-EU G20 countries studied, only Brazil and UK have higher prices than the EU while Canada, India, Russia, Mexico, South Korea and Saudi Arabia have lower prices. Turkey's prices are lower but converging to the EU average in the last years.

- Electricity prices for industry in the EU increased over the period (from 95 EUR/MWh in 2008 to 115 EUR/MWh in 2019). Prices peaked in 2013 (125 EUR/MWh) and were declining until 2017, before rising again..

- The electricity price gap of the EU with the US and China (which has been favourable for these two countries since 2011) has widened in recent years, marginally with the US and more significantly with China (where prices continuously declined since 2011). The gap with Japan (which is favourable for the EU) widened in recent years as Japanese prices stopped to converge to EU price levels and are rising since 2017. In recent years, prices in South Korea were decreasing, widening the unfavourable price gap for the EU, while prices in Turkey increased sharply, reducing the unfavourable price gap for the EU.

- Gas prices for industries in the EU are higher than in most of the non-EU G20, particularly gas producing countries (e.g. in the US, Canada, Russia, and Brazil prices are around half the EU prices) but lower than in Asian trade partners (Japan, South Korea, China).

- Gas prices for industries in the EU have declined over 25% over the whole period 2008-2017. They have fluctuated, rising at the start of the period and then falling, but have remained at around 24 EUR/MWh since 2016. Over the same period prices declined in most of the other G20 countries even further than in the EU.

[51] The latest data available is for the current period (2010-2019) was 2017. For the previous period (2008-2017) the latest data available was 2015.
[52] Data available across sectors and countries is rather limited

- The price gap developments were unfavourable for the EU when compared with the US and Canada (where prices due to the shale gas revolutions reached 10 EUR/MWh in 2016), South Korea and Brazil. Conversely, price gaps improved for the EU with China, Russia, Japan, Australia and Turkey as prices in some of these countries increased in recent years. It also improved with regards to Mexico, India, Saudi Arabia and South Africa were prices remained relatively stable over the last years.

- The evolution of nominal prices was significantly affected in some cases by inflation and exchange rate changes. Over the studied period, high inflation considerably pushed up prices in countries like Brazil and Indonesia while in Russia and Turkey the inflationary effects were mitigated by exchange rates depreciations. Overall appreciation of the Euro vs US dollar and Yuan since 2016 pushed down US and Chinese prices in recent years.

6.1 Energy costs and their impact at macroeconomic level

In this section we look at the overall impact of energy costs on the economy of the EU and its Member States. This is done by calculating the shares of energy costs in the total production value of the whole industry and services sectors in each Member State.

Energy costs are part of production costs of all sectors (we cannot produce without energy!). They represent a significant share of the production costs of energy-intensive sectors in manufacturing and services (see section **6.2**) and thereby they can also be significant for the production costs of countries where energy-intensive sectors account for an important part of their economies.

The calculated indicators will allow us to estimate that importance and also gauge the potential importance of energy costs for competitiveness. That said, energy costs make up just one of the many factors that contribute to the general competiveness of a country and its economy (see Box below).

Box - Energy costs and competitiveness

To understand the competitiveness of industrial sectors is complex. Their competiveness (i.e. their ability to compete in markets to sell or attract investments) depends on the prices and costs of their products (cost- competitiveness), the quality of their products and other characteristics beyond the products' costs and functionalities which correspond to consumers values (e.g. ecological impact, fair trade, human rights considerations, etc.).

The productivity of labour force (based on their skills and costs), the access to capital, and low costs of basic inputs (like energy) can contribute to reduce production costs and increase quality of products for a sector in a country or region.

However, other institutional factors of the country or region where the sector is located (access to big regional markets, lower barriers to trade, economic and political stability, legal certainty, reliability of energy supply, taxation, investment frameworks, etc.) are also important for producers to decide where to produce and invest or for consumers to decide from whom to buy final products or inputs.

Several international institutes and organisations have developed methodologies and composite indexes that measure the factors that influence the competitiveness of a given economy. Good examples of it are the *Global Competitiveness Indicator* of the World Economic Forum (WEF) [53], the *World Competitiveness Scoreboard* of the International Institute for Management Development (IMD)[54] and the *Economic Freedom of the World Index* of Fraser Institute (FI)[55]

This section will help us to position energy-related costs as part of the complex group of factors that impact competitiveness, productivity and economic decisions to invest. Energy is essential to produce but from the macro-economic perspective, as we will soon see, the importance of energy appears to be modest when compared to total production value.

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 the Box at the end of this section, but remains the only viable one in terms of harmonised and publically available data.

Figure 136 shows the evolution of the share of energy-related costs in total production value in the broad classes of industry and services[56]. At the EU level, and for the last decade of observed data, this share has decreased from 1.5-1.7% to around 1.0%-1.3%.

[53] World Economic Forum; Global Competitiveness Report 2017-2018. The Global Competitiveness Indicator of the World Economic Forum (WEF) https://www.weforum.org/reports/the-global-competitiveness-report-2017-2018

[54] The World Competitiveness Scoreboard of the International Institute for Management Development (IMD), https://www.imd.org/wcc/world-competitiveness-center-rankings/world-competitiveness-ranking-2018/

[55] Economic Freedom of the World indicator, Fraser institute, https://www.fraserinstitute.org/studies/economic-freedom

[56] Industry defined as the combination of 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) of NACE Rev. 2, the Statistical classification of economic activities. Services defined as the grouping of NACE Rev. 2 sections A (Agriculture, forestry and fishing), G (Wholesale and retail trade; repair of motor vehicles and motorcycles), H (Transportation and storage), I (Accommodation and food service activities), J (Information and communication), K (Financial and insurance activities), L (Real estate activities), M (Professional, scientific and technical activities) and N (Administrative and support service activities).

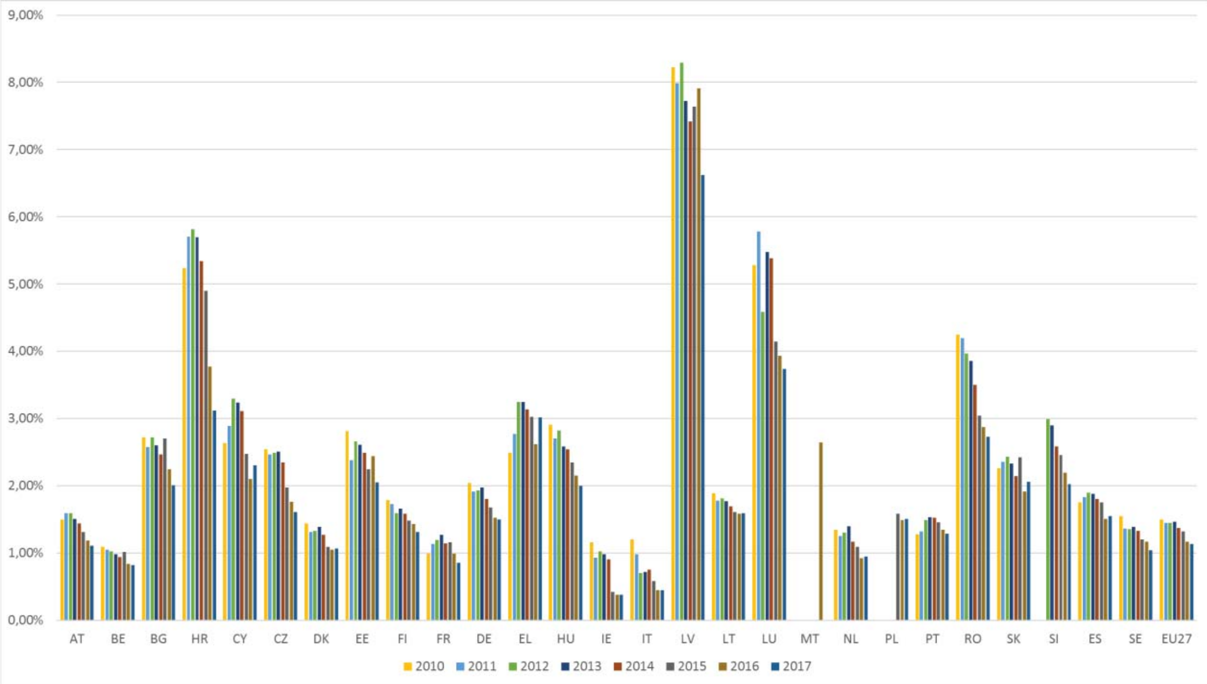


Figure 136- Evolution of energy costs shares in production value, industry and services

Source: Own calculations

Notes:
1. Data for Malta (prior to 2016 and for 2017), Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. Data for 2018 was missing at the time of extraction

Figure 137 represents the share of energy-related costs for the manufacturing sector and across the EU Member States. Throughout the 2008-2017 period, and where data is available, the energy share has gradually decreased for the majority of Member States. At the EU level, it went from 2.2%-2.5% at the beginning of the period to 1.5%-2.0% at the end. In 2017, the share represented for industry is 1.7% (2.0 % in 2014) and for services 1% (1.2% in 2014). Member States with relatively smaller size would typically present a higher and more oscillating share than average; probably pointing to the fact that these economies have a relatively less diversified portfolio of manufacturing industries centred mainly on more energy-intensive sectors.

Data shows that the share of energy related costs in the EU is on a consistent downward trend. Some Member States such as Belgium, France, Italy, and the Netherlands have decreased in 2017 a share of energy related costs in total production value, industry and services (lower than 1%). On the other hand, Cyprus, Denmark, Estonia, Germany, Greece, Lithuania, and Spain show in 2017 a stagnation (or even a slight increase) of this indicator. Finally, only Croatia, Cyprus, Greece, Hungary, Latvia and Luxembourg still show a share of 3% or more in 2017.

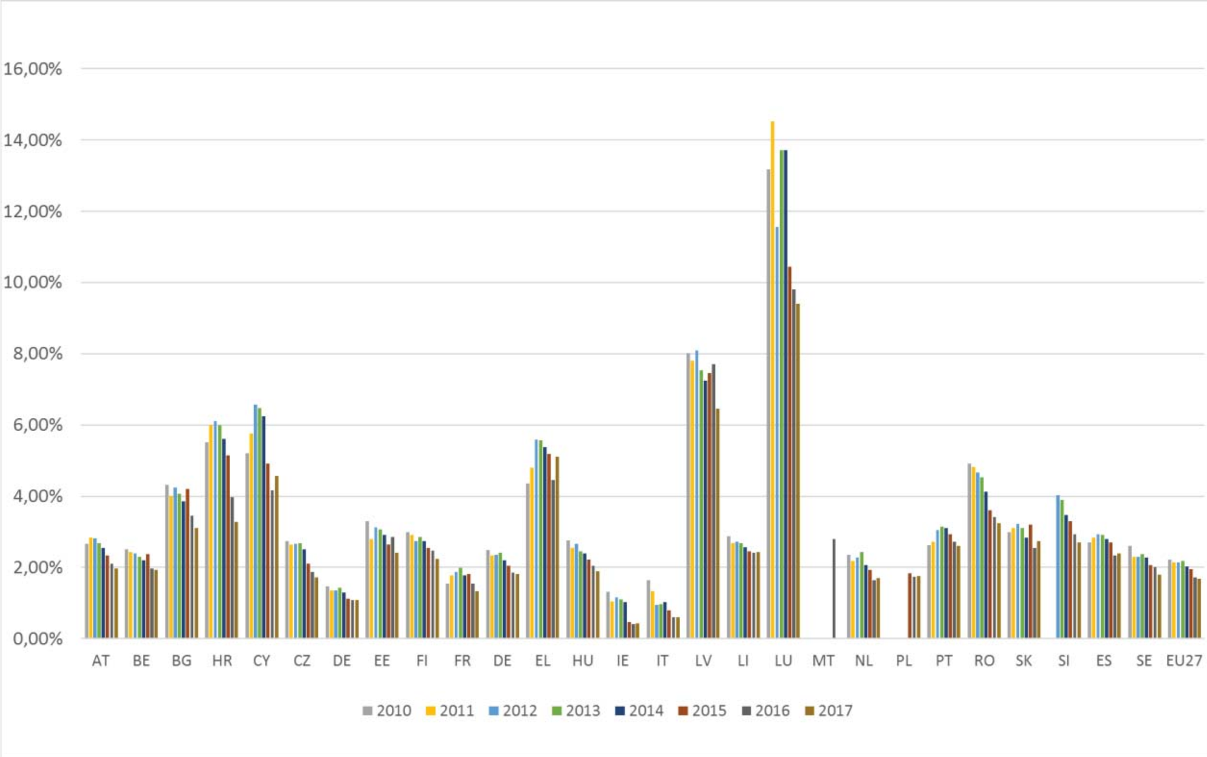


Figure 137: Evolution of energy costs shares in production value for Manufacturing

Source: Own calculations

Notes:
1. Data for Malta (prior to 2016), Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. Data for 2018 was missing at the time of extraction

It is to be noted that in 2017 large Member States such as France, Germany, Italy and Poland have a share of energy products in total production value in manufacturing which is under 2%, but not Spain, which is slightly above 2% and even sees this share increase in 2017 compared to 2016.

Box- Data limitations

- 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 sections such as Section F (Construction) and energy-intensive sections such as H (Transportation and storage). More importantly, it is not available for all services sectors. According to the 2015 Commission report on single market integration and competitiveness, 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 (such as crude oil) are excluded.

6.2 Energy costs for industry

Sources, scope and methodology

This chapter mainly relies on findings from studies commissioned by the European Commission to external consultants and the Commission's works. The study on *'Energy prices, costs and their impact on industry and households'* by *Trinomics et altri*[57] (2020), onwards *Trinomics (2020),* provides data and analyses of 43 sectors, mainly from manufacturing sectors but also including relevant sectors from agriculture, extractive industries and services. This information has been complemented by Commission staff direct inputs and studies (e.g. JRC Technical report on 'Production costs from the iron and steel industry in the EU and third countries' (2020) [58]).

The *study by Trinomics et altri* combines a *top-down approach* using aggregated statistical data (20 manufacturing sectors at NACE 3 level, 10 manufacturing sectors at NACE 2 level, 7 non-manufacturing level at NACE 2 level and 5 other non-manufacturing at NACE level 1) with a *bottom-up* approach, collecting plant data with questionnaires[59].

The use of these two methodological approaches is complementary and provides a comprehensive idea of the importance of energy prices and costs for the EU industries. Highly aggregated data (used in a top down approach) is useful for understanding long term trends. This data is available in official statistics, with stable methodologies and long time series. But aggregated data fails to capture the diversity of the subsectors contained in it, with different products and production processes. Plant data (bottom up approach) is much better for identifying targeted sub-sectors and represent their characteristics. There is however a caveat. Plant data is generally scarce and its 'representativity' of a sector depends critically on having a sufficiently large sample that properly replicates the structure and general characteristics of the subsector (geographic location of the plants, proportion of large or small firms, etc.)

Trinomics (2020) analysed energy costs and other indicators across 42 sectors (see **Table 11** and **Table 12**) of different levels of aggregation. The sectors studied were those which have been identified in the two previous editions of the energy prices and cost reports on the basis of i) the i*mportance of energy costs for the sector*, *proxied* by the energy cost per production value[60] ii) the sector's e*conomic relevance,* proxied by the share of sectoral value added in GDP of the country and its economic or strategic importance; and iii) the sector's *trade exposure,* proxied by the trade intensity of the sector[61].

[57] Consortium is made up by Trinomics B.V. in association with Enerdata, Cambridge Econometrics and Ludwig Bölkow systemtechnik.
[58] https://ec.europa.eu/jrc/en/publication/production-costs-iron-and-steel-industry-eu-and-third-countries
[59] This is similar to the approach used by in the previous edition of the Energy prices and cots report in which the study on 'Composition and drivers of Energy: case studies in selected Energy-intensive industries' by CEPS and Ecofys (2018) provided case studies of 8 energy-intensive subsectors.

[60] Calculated (where possible) by dividing purchases of energy by the total production value of each sector
[61] Trade intensity was calculated by dividing the sum of imports and exports of a product to and from the EU in total, by the size of the market which is represented by the sum of production value and imports

Table 11 - Coverage of manufacturing sectors

Coverage of Manufacturing of the *Study by Trinomics et altri (2020)*			
Aggregated data		*Plant data*	
Sector	Level of aggregation (NACE code)	Sector	Level of aggregation (NACE code)
Processing of **Fruits and vegetables**	C103		
Grain mill and starch products	C106		
Manufacturing of **Beverages**	C11		
Weaving of **textiles**	C132		
Sawmilling and planing of **wood**	C161		
Pulp, paper and paperboard	C171		
Articles of paper and paperboard	C172		
Refined petroleum products	C192	**Refineries**	C1920*
Basic chemicals and fertilisers	C201	**Nitrogen fertilisers**	C2015*
Man-made fibres	C206		
Basic pharmaceutical products	C21		
Plastics products	C222		
Glass and glass products	C231	**Flat glass**	C2311*
Refractory products	C232		
Clay building materials	C233		
Porcelain and ceramic products	C234		
Cement, lime and plaster	C235		
Cutting **stone**	C237		
Abrasive products and non-metallic	C239		
Basic **iron and steel** and of ferro-alloys	C241	**Iron and steel**	C2410+
Non-ferrous metals	C244	**Aluminium**	C2442+
		Lead, **zinc**, tin	C2443*
		Copper	C2444*
Casting of metals	C245		
Fabricated metal products (except	C25		
Computer, electronic and optical	C26		
Electrical equipment	C27		
Machinery and equipment n.e.c.	C28		
Motor vehicles, trailers and semi-trailers	C29		
Other transport equipment	C30		
Other manufacturing	C32		
Repair, installation of machinery	C33		

* The sector analysed is a subsector of the NACE code mentioned.
\+ The sector was contacted but unable to provide data due to COVID-related circumstances
Source: European Commission Services

Note: Shaded sectors are those most energy-intensive

Table 12 - Coverage of other sectors, excluding manufacturing

Coverage of other agriculture, mining, construction and services *Study by Trinomics et altri*	
Sector	Level of aggregation (NACE code)
Agriculture, forestry and fishing	A
Mining and quarrying	B
Extraction of crude petroleum and natural gas	B06
Mining of **metal ores**	B07
Other mining and quarrying	B08
Electricity, gas, steam and air-conditioning supply	D35
Water supply, sewerage, water management and remediation activities	E38
Construction	F
Wholesale and retail **trade**	G
Land Transport	H49
Air Transport	H51
Accommodation and food service activities	I
Information and communication	J
Data Centres - Data processing, hosting and related activities; web portals	J631

Source: European Commission Services

Energy costs shares

The share of energy costs in the total production cost is a good indicator of the impact that energy costs can have on the financial health and on price competitiveness of the various industrial sectors. Using 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)[62] plus personnel costs.

When interpreting the energy costs shares based on SBS data, we should keep in mind that results of aggregated sectors usually underestimate the importance of energy costs for the industrial segments with the highest energy intensity. This is particularly true for chemicals, cement, non-ferrous metals, steel and paper sectors which include highly energy-intensive primary producers together with producers of low energy-intensive secondary products. Self-consumption of energy (not rare in energy-intensive sectors) is also not captured by SBS data. The plant data complements aggregated data and can provide better insight of the prices and costs of industrial segments.

Results on energy costs shares

Table 13 shows the evolution of the *shares of energy costs in total production costs* for all the manufacturing and non-manufacturing sectors studied between 2010 and 2017.

The results of the analysis of the energy cost shares over the last decade do not differ much from the trends analyses of previous editions of the study:

- Energy costs for the selected manufacturing sectors continue to typically account for around 1-10% of total (operational) production costs, although for some sectors the costs significantly exceed 10% (e.g. *Cement, lime and plaster* and *Clay building materials*)

- Amongst the most energy-intensive manufacturing sectors (energy costs typically >3%), energy costs accounted for more than 10% of production costs in at least one year in the *pulp and paper*, *clay building materials*, *iron and steel* and in particular, the *cement, lime and plaster* sectors.

- Amongst the less energy-intensive manufacturing sectors (energy costs typically < 3%) many sectors displayed quite low energy costs shares. For example, *computers and electronics*, *electrical equipment*, *machinery*, *motor vehicles*, *other transport equipment* and *pharmaceuticals* have energy costs shares between 0.5% and 1% of total production costs. *Metal products*, *beverages*, *textiles*, *plastics* energy costs shares are around 2%.

[62] 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.

- Over the period 2010-2017, energy cost shares have fallen in all the manufacturing sectors studied. The largest declines in cost shares were observed in the most energy-intensive sectors like *cement* and *paper* (around -5%), *clay building materials* and steel (around -3%), *glass* and *chemicals* (-2%). Many other of the less energy-intensive sectors show smaller declines in absolute numbers but proportionally rather significant. For the vast majority of manufacturing sectors, energy costs fell while production costs rose between 2010 and 2017.

- Over the period, energy costs shares also fell for the majority of non-manufacturing sectors studied with the exception of *oil and gas* (+0.7), *air transport* (+2%) and other mining (+0.1%). The energy costs and production costs dynamics for non-manufacturing sectors were mixed.

Note on the sectors' energy costs and the fuel mix

Energy costs for industry are driven by energy prices and the quantities consumed of each product. In the short term, prices vary widely driving the changes in energy costs, while energy consumption tends to be more stable (as it depends on consumption patterns, the economic situation and energy efficiency). The consumption fuel mix of a sector tells us about the potential of price changes of each energy product to affect energy costs.

Figure 138 displays the average importance of fuels in terms of energy consumption by sector. We can observe that electricity and gas (depending upon the specific sector) are the most consumed energy products. Amongst the most energy-intensive sectors, gas is widely used in sectors like *glass, ceramics*, *refractory products* and *building materials,* while electricity is predominant in *non-ferrous metals, stone* and *metal products*. Amongst the less energy-intensive sectors, electricity tends to be the most consumed fuel, being particularly important for sectors like *computers, plastics, textiles electrical equipment, machinery, motor vehicles.* Gas is however relevant for the manufacturing of *grain, vegetables or beverages*. "Other energies", in particular biomass, represent an important consumption share in sectors like *sawmills* (>80% of consumption), *man-made fibres* (nearly 60%), *stone* (nearly 40%) and *paper* (nearly 30%).

Electricity is the most expensive product as compared to the other fuels and it has the proportionally largest impact on energy costs. Electricity costs shares are traditionally high for *non-ferrous metals* and less energy-intensive sectors like *computers or pharmaceuticals*. Natural gas has traditionally a major impact on sectors like *glass, ceramics* and *gas-intensive basic chemicals (e.g. fertilisers)*. Oil and coal have a small impact on the energy costs in most of the sectors. That said, oil costs are very important for *refineries* and significant for *cement, lime and plaster* and *basic chemicals.* Coal costs are relevant for *steel* and other sectors with a sizable coal consumption (e.g. *abrasive products, cement* and *casting of metals)*

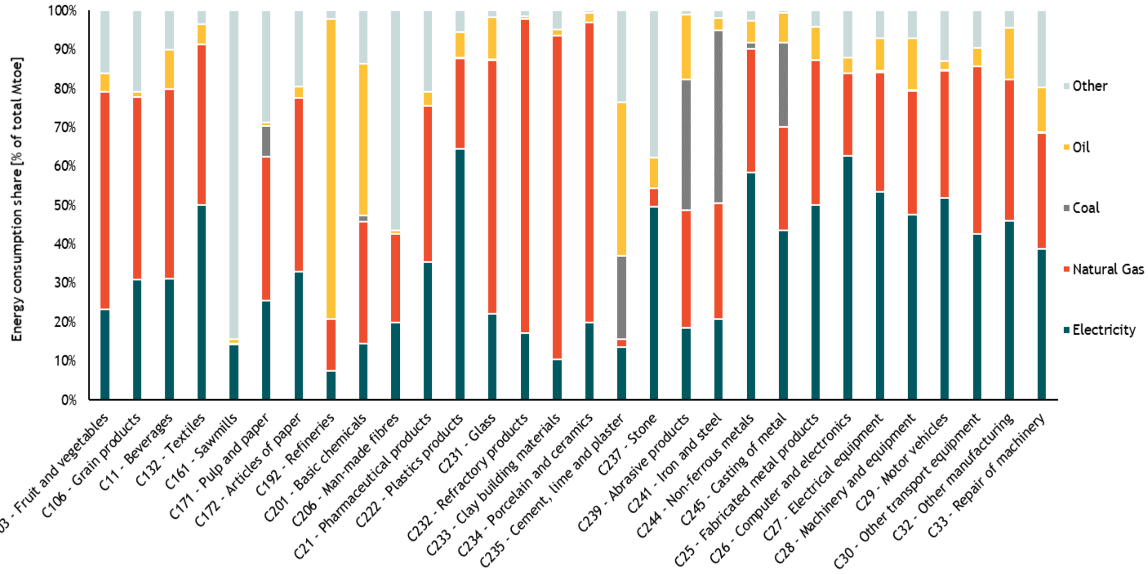


Figure 138 - Breakdown of the energy consumption per energy carrier, EU, 2008-2017 averages

Source: Trinomics et altri study (2020)
Note: “other” combines biomass and heat energy consumption

Table 13 - Energy costs shares in total production costs for manufacturing and non-manufacturing sectors, 2010-2017

Manufacturing (Section C0	2010	2011	2012	2013	2014	2015	2016	2017	Absolute change 2010-2013	Absolute change 2014-2017	Absolute change 2010-2017	Relative change 2010-2017	Average	Max. level
C103 - Fruit and vegetables	2.9%	2.9%	3.1%	2.9%	3.0%	2.5%	2.5%	2.3%	0.0%	-0.7%	-0.6%	-21.9%	2.8%	3.1%
C106 - Grain products	3.7%	3.4%	3.6%	3.4%	3.6%	3.3%	2.8%	2.6%	-0.4%	-1.0%	-1.1%	-30.5%	3.3%	3.7%
C132 - Textiles	3.7%	2.5%	2.7%	2.3%	2.2%	2.0%	2.1%	2.2%	-1.3%	0.0%	-1.5%	-40.4%	2.5%	3.7%
C161 - Sawmills	3.5%	4.0%	3.6%	3.5%	3.4%	3.1%	3.2%	3.1%	0.0%	-0.4%	-0.4%	-12.7%	3.4%	4.0%
C171 - Pulp and paper	11.4%	11.3%	10.7%	9.8%	9.0%	8.4%	6.9%	6.7%	-1.6%	-2.3%	**-4.7%**	-40.9%	9.3%	11.4%
C172 - Articles of paper	3.0%	2.7%	2.8%	2.9%	2.5%	2.4%	2.1%	2.1%	-0.1%	-0.4%	-0.9%	-29.3%	2.6%	3.0%
C192 - Refineries	2.2%	2.0%	2.2%	2.1%	2.0%	2.3%	1.8%	1.6%	0.0%	-0.5%	-0.6%	-28.0%	2.0%	2.3%
C201 - Basic chemicals	6.8%	7.1%	6.4%	6.4%	5.8%	5.5%	5.0%	4.6%	-0.4%	-1.2%	**-2.2%**	-32.7%	5.9%	7.1%
C206 - Man-made fibres	6.8%	6.8%	5.9%	8.5%	6.4%	6.2%	7.2%	5.3%	1.7%	-1.2%	-1.5%	-22.2%	6.6%	8.5%
C222 - Plastics products	2.9%	2.9%	2.7%	2.9%	2.7%	2.5%	2.3%	2.2%	0.0%	-0.5%	-0.7%	-23.1%	2.6%	2.9%
C231 - Glass	8.4%	8.4%	9.7%	9.5%	8.6%	8.0%	6.8%	6.6%	1.1%	**-2.0%**	-1.8%	-21.7%	8.2%	9.7%
C232 - Refractory products	6.5%	6.3%	7.0%	7.2%	6.3%	6.5%	6.8%	5.3%	0.7%	-1.0%	-1.2%	-18.6%	6.5%	7.2%
C233 - Clay building materials	12.1%	11.0%	12.4%	12.4%	11.2%	11.1%	9.6%	9.0%	0.3%	-2.2%	-3.0%	-25.1%	11.1%	12.4%
C234 - Porcelain and ceramics	5.2%	5.4%	5.6%	5.7%	5.3%	4.5%	4.4%	4.0%	0.5%	-1.3%	-1.2%	-22.6%	5.0%	5.7%
C235 - Cement, lime and plaster	20.3%	21.2%	19.1%	19.3%	18.6%	17.6%	15.4%	15.2%	-1.0%	**-3.4%**	**-5.1%**	-25.3%	18.3%	21.2%
C237 - Stone	3.5%	3.6%	2.9%	4.6%	3.1%	3.4%	2.6%	3.3%	1.1%	0.1%	-0.2%	-5.7%	3.4%	4.6%
C239 - Abrasive products	5.0%	4.8%	5.1%	5.2%	5.0%	5.0%	5.0%	4.6%	0.2%	-0.4%	-0.4%	-7.3%	5.0%	5.2%
C241 - Iron and steel	9.5%	7.5%	8.2%	8.2%	7.0%	7.5%	7.2%	6.6%	-1.3%	-0.4%	**-2.9%**	-30.8%	7.7%	9.5%
C244 - Non-ferrous metals	4.1%	4.0%	3.9%	4.1%	3.8%	3.8%	3.1%	3.1%	0.0%	-0.7%	-1.0%	-23.5%	3.7%	4.1%
C245 - Casting of metal	6.1%	5.3%	5.5%	5.5%	5.3%	4.9%	4.8%	4.6%	-0.6%	-0.7%	-1.5%	-24.4%	5.2%	6.1%
C11 - Beverages	2.6%	2.7%	2.7%	2.6%	2.6%	2.4%	2.2%	2.2%	0.0%	-0.4%	-0.4%	-15.8%	2.5%	2.7%
C21 - Pharmaceutical products	1.2%	1.2%	1.2%	1.2%	1.2%	1.1%	1.0%	1.0%	0.0%	-0.2%	-0.2%	-18.6%	1.1%	1.2%
C25 - Fabricated metal products	2.3%	1.9%	2.0%	2.1%	2.0%	1.9%	1.8%	1.7%	-0.2%	-0.3%	-0.6%	-24.9%	1.9%	2.3%
C26 - Computer and electronics	0.7%	0.7%	0.7%	0.8%	0.7%	0.7%	0.7%	0.6%	0.1%	-0.1%	0.0%	-0.5%	0.7%	0.8%
C27 - Electrical equipment	1.0%	1.0%	1.0%	1.0%	1.1%	0.8%	0.8%	0.7%	-0.1%	-0.3%	-0.3%	-27.7%	0.9%	1.1%
C28 - Machinery and equipment	1.0%	0.9%	0.9%	0.9%	0.9%	0.8%	0.8%	0.7%	0.0%	-0.2%	-0.2%	-24.0%	0.9%	1.0%

C29 - Motor vehicles	0.8%	0.8%	0.8%	0.8%	0.7%	0.7%	0.6%	0.6%	0.0%	-0.1%	-0.3%	-31.0%	0.7%	0.8%
C30 - Other transport equipment	0.9%	0.9%	0.9%	0.9%	0.7%	0.8%	0.6%	0.5%	0.0%	-0.2%	-0.3%	-38.8%	0.8%	0.9%
C32 - Other manufacturing	1.1%	1.1%	1.0%	1.0%	1.0%	0.9%	0.9%	0.8%	-0.1%	-0.2%	-0.3%	-29.5%	1.0%	1.1%
C33 - Repair of machinery	1.0%	1.1%	1.1%	1.1%	1.1%	0.9%	0.8%	0.8%	0.1%	-0.2%	-0.2%	-18.4%	1.0%	1.1%
Non- Manufacturing (Other sections)														
B - Mining and quarrying	2.9%	2.8%	2.8%	2.9%	2.9%	3.0%	3.1%	5.1%	0.0%	2.2%	**2.2%**	76.2%	3.2%	5.1%
B06 - Oil and gas	0.2%	0.2%	0.2%	0.2%	0.2%	0.3%	0.3%	0.9%	0.0%	0.6%	**0.7%**	380.6%	0.3%	0.9%
B07 - Mining of metal ores	19.7%	20.8%	19.6%	19.4%	17.7%	18.4%	16.7%	17.1%	-0.3%	-0.7%	-2.7%	-13.5%	18.7%	20.8%
B08 - Other mining	8.6%	9.6%	9.6%	9.7%	9.2%	8.9%	8.0%	8.7%	1.1%	-0.5%	0.1%	1.6%	9.0%	9.7%
D35 - Electricity, gas and steam	16.2%	15.8%	14.0%	12.7%	11.9%	11.9%	14.5%	13.0%	**-3.5%**	1.1%	**-3.2%**	-19.7%	13.7%	16.2%
E38 - Waste management	2.0%	1.9%	2.0%	2.3%	2.3%	2.0%	1.7%	1.7%	0.3%	-0.6%	-0.3%	-15.5%	2.0%	2.3%
F - Construction	1.2%	1.3%	1.2%	1.2%	1.2%	1.1%	1.1%	1.0%	0.1%	-0.2%	-0.2%	-18.0%	1.2%	1.3%
G - Wholesale and retail trade	0.4%	0.4%	0.4%	0.4%	0.4%	0.3%	0.4%	0.4%	0.0%	0.0%	-0.1%	-14.2%	0.4%	0.4%
H49 - Land transport	30.1%	36.3%	33.3%	31.4%	29.3%	24.8%	27.9%	26.7%	1.3%	**-2.6%**	**-3.4%**	-11.3%	30.0%	36.3%
H51 - Air transport	16.6%	18.7%	19.0%	16.3%	17.0%	15.3%	19.8%	18.6%	-0.4%	1.6%	**2.0%**	12.1%	17.7%	19.8%
I - Accommodation and restaurants	4.7%	4.3%	4.3%	4.2%	3.7%	3.4%	3.5%	3.3%	-0.5%	-0.4%	-1.4%	-29.6%	3.9%	4.7%
J - Information and communication	1.2%	1.0%	1.0%	0.9%	0.9%	0.8%	0.9%	0.9%	-0.3%	0.0%	-0.4%	-29.7%	0.9%	1.2%

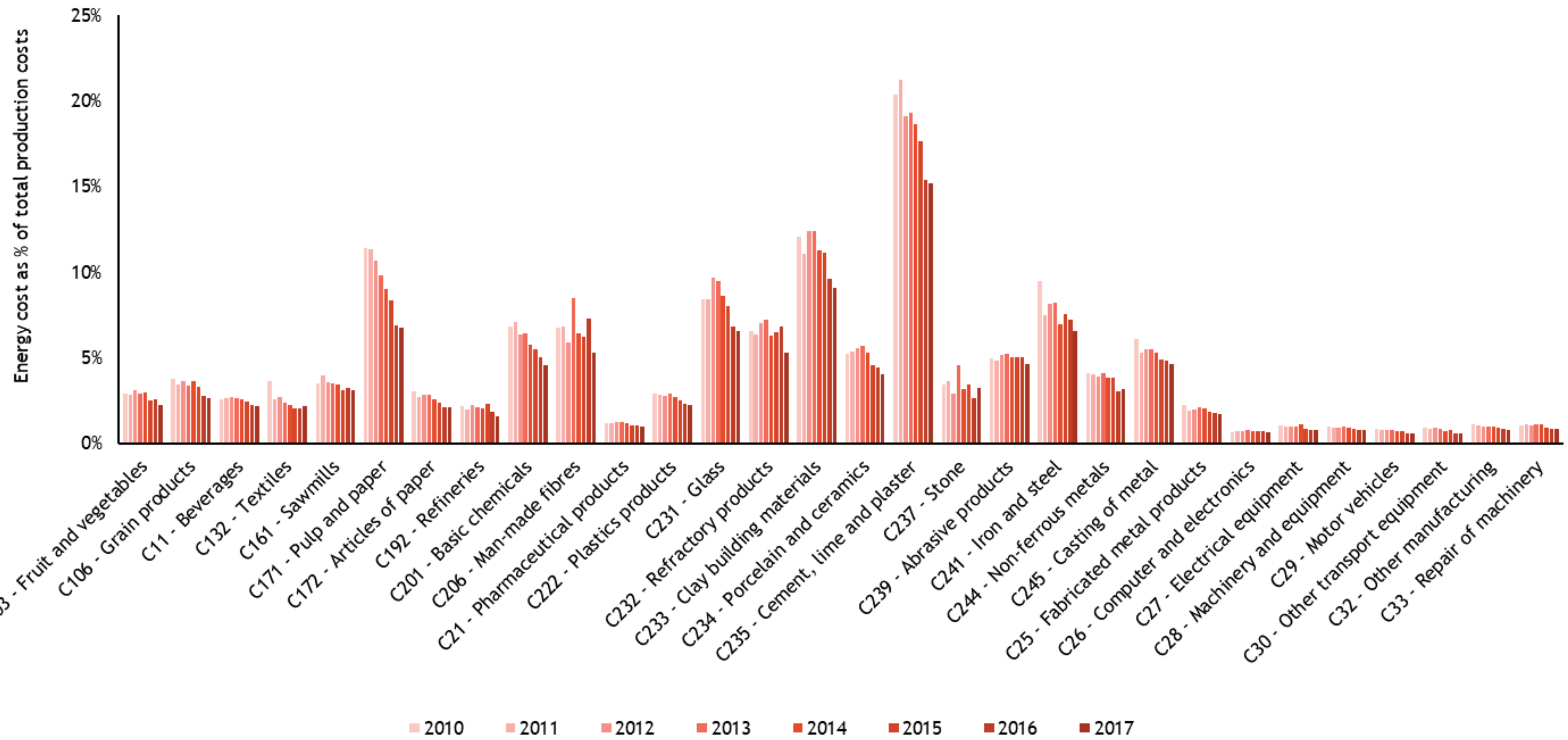


Figure 139 - Energy costs shares in total production costs in manufacturing sectors, 2008-2017

Source: Trinomics et altri study (2020)

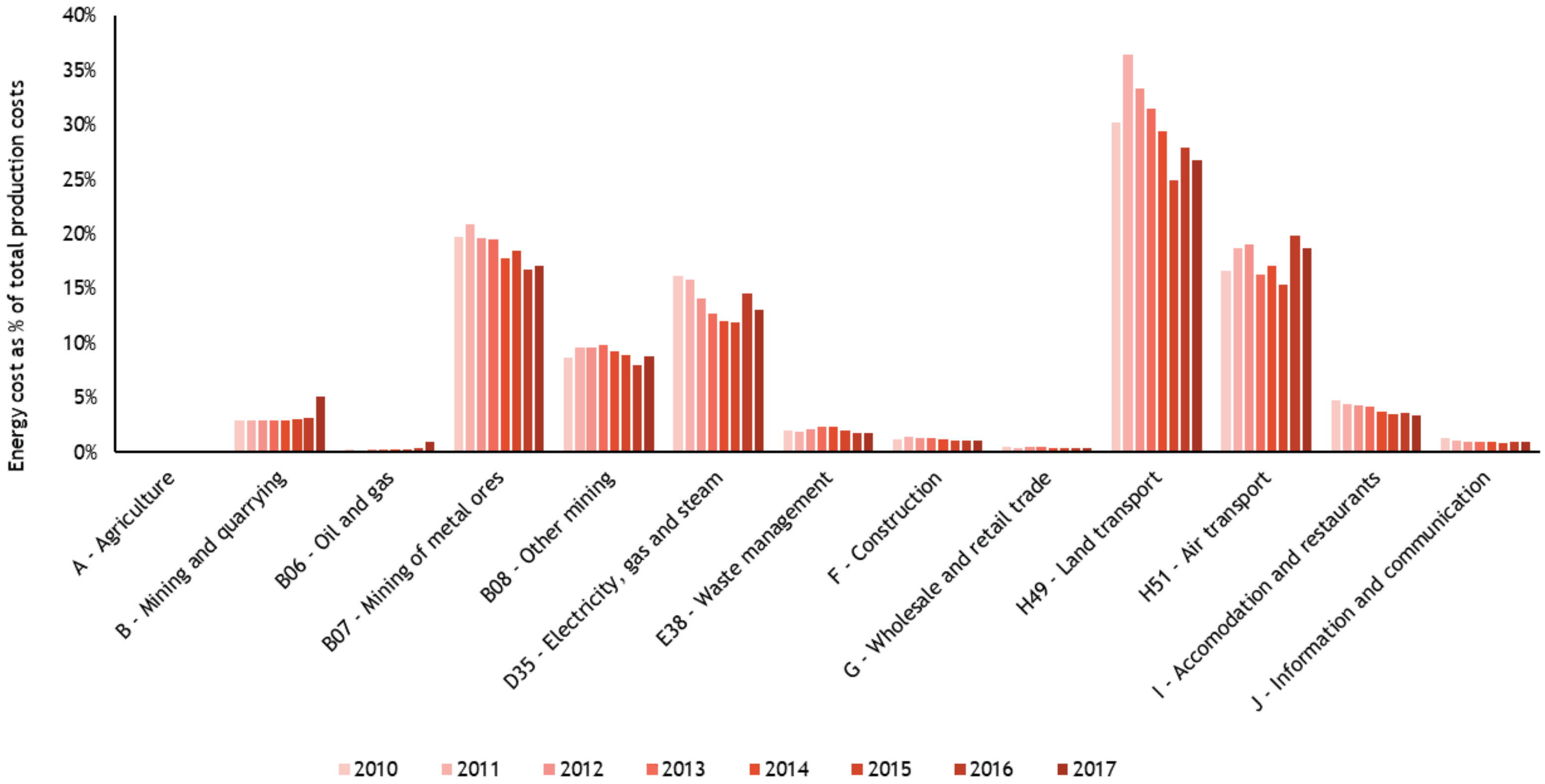


Figure 140 - Energy costs shares in total production costs in non-manufacturing sectors 2010-2017

Source: Trinomics et altri study (2020)

Amongst the non-manufacturing sectors for which data was available energy cost shares are particularly high in 5 sectors, being comparable to or higher than cost shares in the most energy-intensive manufacturing sectors. These 5 sectors are H49 Land transport (H49), Air transport (H51), Mining of metal ores (B07), Electricity, gas and steam (D36) and other mining (B08). Clearly fuel costs are important drivers of costs in the transport and electricity and gas sectors, whilst mining is also an energy-intensive activity. It is notable that energy cost shares in Waste management (E38) and Accommodation and restaurants (I) also have cost shares of 3-5%, which is comparable to many of the energy-intensive manufacturing sectors. Energy cost shares are negligible in the construction (F) and Wholesale and retail (G) sectors

Dynamics of the energy costs shares in total production costs

Energy costs shares in production costs changes result from the relative changes in energy costs and production costs. For instance, energy costs shares could fall if *energy costs* grow less than *production costs* over the period analysed. They could also rise when *energy costs* fall if *production costs* fall more. **Table 14** shows the change of each of these two variables for each sector in order to understand the costs dynamics that explain the evolution of the energy costs shares. We should bear in mind that the energy costs shares fell for all sectors studied except for a few non-manufacturing sectors (*air transport* and *mining & quarrying* and its subsectors of *oil and gas* and *other mining*).

Table 15 allows us to categorise the dynamics of the declines in energy costs shares. It shows that, between 2010 and 2017, for more than half of the sectors studied (22 out of 41), the energy costs fell while production costs grew, leading to a decrease in the energy costs shares. For about a quarter of sectors (9 out of 41), energy costs grew but less than the rise in production costs. In only one case, *air transport*, the energy costs grew more than the rise of production costs. For about another quarter of sectors (9 out of 41), both costs fell, but energy costs declined by more than production costs. Only in the case of *mining and quarrying* and its subsector *other mining*, the energy costs fell less than the production costs, leading to an increase in their energy costs shares. Finally, for only one sector (*oil and gas*), energy costs increased while production costs decreased, leading to an unavoidable increase of the energy costs shares indicator.

Table 14 – Drivers of energy costs shares in total production costs, manufacturing and non-manufacturing sectors (EU avrg)

Manufacturing sectors	Changes in total values across the EU27 2010-2017				Change in energy cost share 2010-2017 (simple average)	
	Absolute Δ Energy costs (M€)	Relative Δ Energy costs (%)	Absolute Δ Total production costs (M€)	Relative Δ Total production costs (%)	Absolute Δ energy costs as a share of total production costs (%)	Relative Δ energy costs as a share of total production costs (%)
C103 - Fruit and vegetables	38.9	4.0%	11080.4	24.9%	-0.6%	-21.9%
C106 - Grain products	-87.9	-10.9%	6049.1	22.0%	-1.1%	-30.5%
C132 - Textiles	-171.7	-41.8%	-268.5	-2.4%	-1.5%	-40.4%
C161 - Sawmills	-1.5	-0.2%	3333.7	12.5%	-0.4%	-12.7%
C171 - Pulp and paper	-2161.4	-33.6%	6955.3	11.0%	-4.7%	-40.9%
C172 - Articles of paper	-322.6	-19.0%	8194.2	12.6%	-0.9%	-29.3%
C192 - Refineries	-47.9	-37.9%	-805.9	-15.9%	-0.6%	-28.0%
C201 - Basic chemicals	-2014.9	-16.6%	42283.7	19.2%	-2.2%	-32.7%
C206 - Man-made fibres	-67.5	-18.8%	230.7	4.2%	-1.5%	-22.2%
C222 - Plastics products	-180	-4.7%	31704.2	19.3%	-0.7%	-23.1%
C231 - Glass	-393.8	-17.0%	1681.3	5.7%	-1.8%	-21.7%
C232 - Refractory products	-43.6	-18.6%	-0.5	0.0%	-1.2%	-18.6%
C233 - Clay building materials	-305.2	-20.2%	812.5	6.1%	-3.0%	-25.1%
C234 - Porcelain and ceramics	-44.5	-14.8%	577.3	9.1%	-1.2%	-22.6%
C235 - Cement, lime and plaster	-666.6	-27.7%	-381	-3.3%	-5.1%	-25.3%
C237 - Stone	-114.7	-28.0%	-2805.9	-30.9%	-0.2%	-5.7%
C239 - Abrasive products	33.8	4.3%	1957.6	11.1%	-0.4%	-7.3%
C241 - Iron and steel	-2769	-29.0%	2671.3	2.6%	-2.9%	-30.8%
C244 - Non-ferrous metals	-107.8	-3.4%	20126.7	20.8%	-1.0%	-23.5%
C245 - Casting of metal	-227	-14.5%	3388.4	11.6%	-1.5%	-24.4%
C11 - Beverages	-100.2	-6.8%	6084.7	9.7%	-0.4%	-15.8%
C21 - Pharmaceutical products	-83.3	-8.4%	10555.6	11.2%	-0.2%	-18.6%

C25 - Fabricated metal products	-792.4	-12.6%	45734.3	14.1%	-0.6%	-24.9%
C26 - Computer and electronics	-80.7	-7.1%	-11506.4	-7.1%	0.0%	-0.5%
C27 - Electrical equipment	-300	-15.2%	33430.4	14.8%	-0.3%	-27.7%
C28 - Machinery and equipment	64.1	1.6%	134079.4	25.2%	-0.2%	-24.0%
C29 - Motor vehicles	295.8	6.7%	287032	35.4%	-0.3%	-31.0%
C30 - Other transport equipment	-108.7	-16.0%	28488.1	27.1%	-0.3%	-38.8%
C32 - Other manufacturing	-72.6	-10.9%	15489	20.9%	-0.3%	-29.5%
C33 - Repair of machinery	-25.6	-3.3%	14038	15.6%	-0.2%	-18.4%
Other sectors						
B - Mining and quarrying	-320.4	-9.8%	-55231.7	-48.8%	**2.2%**	**76.2%**
B06 - Oil and gas	38.1	31.0%	-49815.4	-72.7%	*0.7%*	*380.6%*
B07 - Mining of metal ores	6.3	8.4%	96.5	25.3%	-2.7%	-13.5%
B08 - Other mining	-137.4	-7.6%	-1896.4	-9.0%	*0.1%*	*1.6%*
D35 - Electricity, gas and steam	-3388.1	-4.1%	98789.9	19.4%	-3.2%	-19.7%
E38 - Waste management	-16.8	-5.5%	1859.0	11.9%	-0.3%	-15.5%
F - Construction	-1815.2	-13.9%	54740.1	5.0%	-0.2%	-18.0%
G - Wholesale and retail trade	24.2	2.6%	43054.0	19.6%	-0.1%	-14.2%
H49 - Land transport	4594.7	15.1%	30085.9	29.8%	-3.4%	-11.3%
H51 - Air transport	155.6	22.5%	386.4	9.3%	**2.0%**	**12.1%**
I - Accommodation and restaurants	-18.5	-3.1%	4844.4	37.7%	-1.4%	-29.6%
J - Information and communication	-26.7	-13.7%	3668.1	22.8%	-0.4%	-29.7%

Table 15 – Categorisation of sectors according to the energy and production costs dynamics, 2010 -2017

	Reduced energy costs (2010-2017)	Increased energy costs (2010-2017)
Reduced production costs (2010-2017)	• C26 - Computer and electronics • C232 - Refractory products • C235 - Cement, lime and plaster • C237 - Stone • C192 - Refineries • C132 – Textiles • **B - Mining and quarrying** • B07 - Mining of metal ores • B08 - Other mining	• B06 - Oil and gas
Increased production costs (2010-2017)	• C33 - Repair of machinery • C244 - Non-ferrous metals • C222 - Plastics products • C11 - Beverages • C21 - Pharmaceutical products • C32 - Other manufacturing • C106 - Grain products • C25 - Fabricated metal products • C245 - Casting of metal • C234 - Porcelain and ceramics • C27 - Electrical equipment • C30 - Other transport equipment • C201 - Basic chemicals • C231 - Glass • C206 - Man-made fibers • C172 - Articles of paper • C233 - Clay building materials • C241 - Iron and steel • C171 - Pulp and paper • D35 - Electricity, gas and steam • I - Accommodation and restaurants • E38 - Waste management	• C29 - Motor vehicles • C239 - Abrasive products • C103 - Fruit and vegetables • C28 - Machinery and equipment • C161 – Sawmills • H49 - Land transport • G - Wholesale and retail trade • F - Construction • **H52 – Air transport**

Box - Energy costs of data centres

Data centres consist of a very large number of server computers concentrated in one location, that provide on-line services over the Internet, with a high availability and reliability which are part of the contract offered to the customer. This concentration enables the sharing of a common infrastructure, such as electric power supply, cooling, high-bandwidth Internet access, security, redundancy, data storage. The servers themselves often are custom-designed and manufactured for the operator of the data centre, to achieve high performance and low energy consumption. The main energy consuming units are

- the servers, which contain the central processor (CPU) and the memory (RAM): 41.3% of total energy consumption of the sector in the EU27 in 2018 (in an upward trend since 2010, when they represented only 33.7% of the total);
- the cooling, which prevents the damaging of the servers by evacuating their excess heat: 28.9% of total energy consumption of the sector in the EU in 2018 (in an downward trend since 2010, when they represented only 32.8% of the total);
- the uninterrupted power supply – UPS – which ensure that the servers are permanently fed with electric power, including in case of micro-interruptions of the network supply: 11.3% of total energy consumption of the sector in the EU in 2018 (in a slow downward trend since 2010, when they represented only 15.0% of the total);
- the data storage (generally as hard disk drives): 12% of total energy consumption of the sector in the EU (constant over time);
- the connection to the network: 3.7% of total energy consumption of the sector in the EU (constant over time).

The evolution over time shows an increased technical efficiency of data centres, whereby a growing fraction of the energy consumption is used by the productive units (the servers, the storage and the communication network), and a decreasing part by the ancillary services that address the inefficiencies of the system, namely overheating and power interruptions (respectively: the cooling system and the UPS).

Electricity costs of the sector of Data Centres in the EU27 has been rising sharply over the years 2010 – 2015 (from 3,600 M€ in 2010 to 5,020 M€ in 2015), and has remained stable over the years 2015 to 2018. This evolution is essentially related to the evolution of the prices for electricity for large industrial users, which followed the same pattern. Electricity costs in the UK display similar evolutions.

The estimated **electricity costs** represent a significant **share of the overall production costs** of the EU27 sector of data centres, comparable to that of the other energy-intensive industries: between **10.8 and 14.7%** over the years 2010 – 2017. They also represent a small, but significant fraction of the production value of the sector: between 9.1 and 12.0%. These fractions have reached their peak in 2014 and decreased between then and 2018. The details of electricity costs and electricity costs as a share of production costs per Member State are presented in Annex D (4.1) of the Trinomics (2020).

Results on Gross Operating Surpluses shares

Profit margins add on production costs to make up final sales prices. Profits play an important role in the cost-competitiveness of firms in the short run (when setting prices). But they are also fundamental for the competitiveness in the long run as they attract and enable investment.

It is thus important to know the trends of Gross operating surplus[63] (GOS, a proxy for profits) for the sectors studied. **Figure 141** shows the average GOS as a share of production costs for the manufacturing sectors between 2010 and 2017. There has not been much changes in the overall picture over the last years. For most of the sectors, the share was between 5-15%, higher for sectors like *pharmaceuticals*; *cement, beverages, other manufacturing* and particularly lower for *refineries* and *steel* (although growing strongly at the end of the period up to 10% and recovering from negative numbers in 2009 and close to zero in 2011-2012, due to the crisis in Hungarian and Greek steel sectors).

The GOS as a share of production costs increased in most of the sectors, between 2010 and 2017. The relative higher increases were in *steel* (103%), *textiles* (52%), and *casting of metals (*41%), while the decreases were proportionally important is some sectors, including *man-made fibres* (-43%), *cement* (-23%), and *refineries* (-22%).

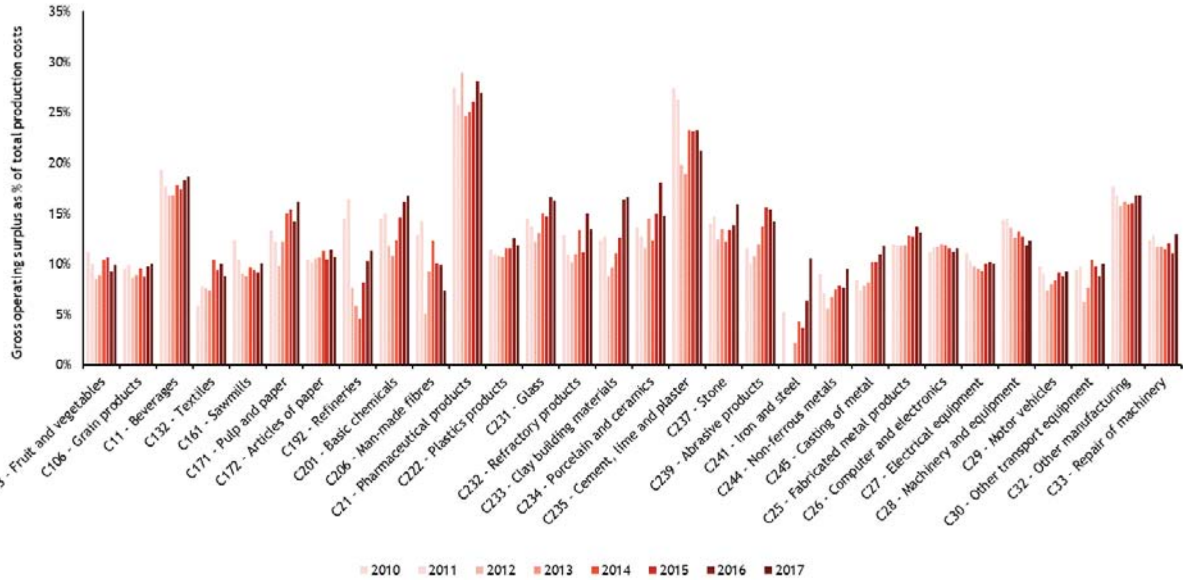


Figure 141 - Gross Operating Surplus in manufacturing sectors (average 2008-2015)

Source: Trinomics et altri study (2020)

Note: Average of for the sector based on the MS for which total production cost and GOS data available for all years

Across Member States (see **Figure 142**), GOS as a share of production costs were in most cases in the range of 10-14% between 2010 and 2017. Shares were over 14% in Ireland, Bulgaria, Cyprus, Denmark, Hungary, Latvia, Malta and Romania and close or slightly below 10% in Belgium, Germany, Italy and the lowest (6%) in France.

[63] Gross operating surplus presented are the result of subtracting personnel costs from value added using Eurostat SBS statistics

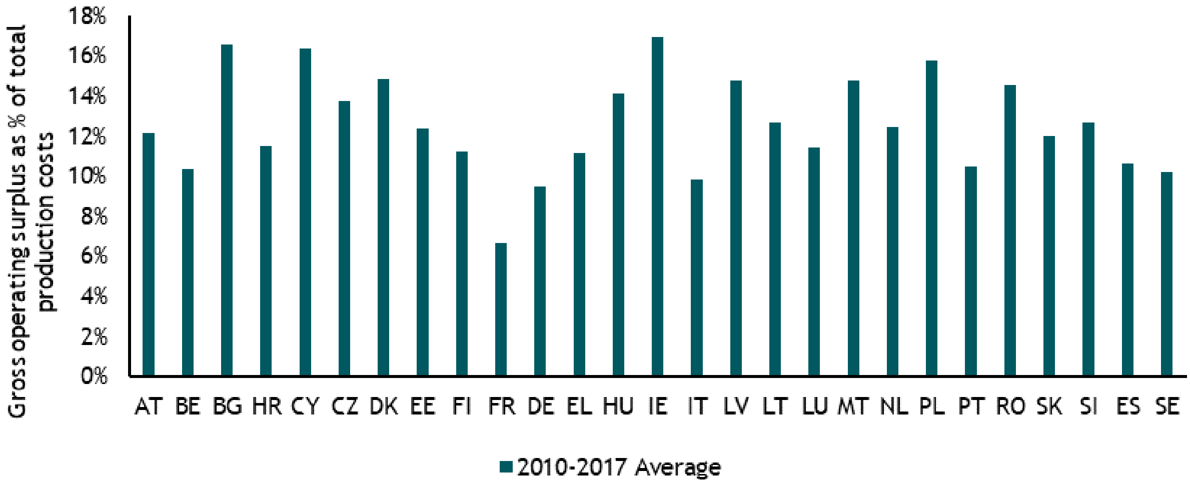


Figure 142 - Gross Operating Surplus in manufacturing in the EU and Member States, 2008-2015

Source: Trinomics et altri study (2020)

International comparisons of Gross Operating Surpluses

This section compares *Gross Operating Surpluses (GOS) shares in total production value* (proxy of profitability) across *manufacturing and non-manufacturing sectors* in the EU, its trade partners, and G20 countries (excluding Iceland for which data was insufficient).

Profitability of manufacturing sectors: EU vs G20

The results of the analysis shows that the EU displays average profitability of a similar magnitude that Japan, China, the US, Norway and Switzerland, higher than in Brazil but significantly lower than the rest of the G20 countries. The average profitability in the EU manufacturing sectors is however less volatile than in most of the G20 countries

When compared with its most important international trade partners, the EU manufacturing sectors show a similar profitability to those in China but lower levels than those in Japan and the United States. Between 2015 and 2017, the profitability increased in many countries, including in the EU. This rise in profitability was however not experienced in China (where it dropped in 2016), the US (where it dropped in 2016 and then rose slightly in 2017) or Japan (where it remained stable).

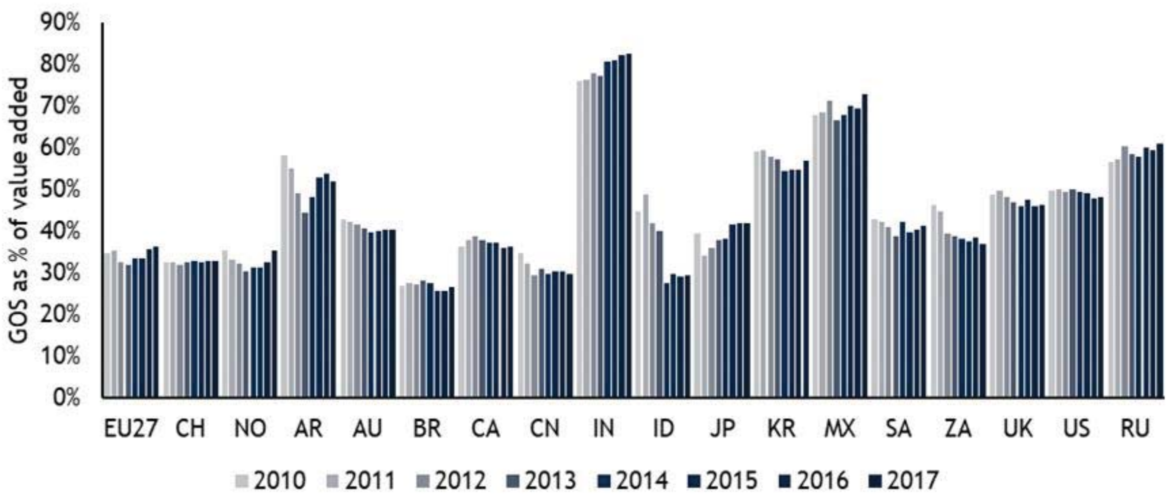


Figure 143 – Gross Operating Surplus shares of value added in manufacturing, EU vs G20

Source: Trinomics et altri study (2020)

Profitability of non- manufacturing sectors: EU vs G20

EU non-manufacturing displays on average a slightly lower profitability than in most of the G20 countries, yet comparable to the US and Japan and higher than in Switzerland and China. The highest average profitability of non-manufacturing sectors appears in Mexico, Saudi Arabia, and Russia

In the EU, the profitability of non-manufacturing sectors is slightly (2-3%) higher than that of manufacturing, while in Japan and in the US, the profitability in manufacturing sectors is higher than in non-manufacturing sectors.

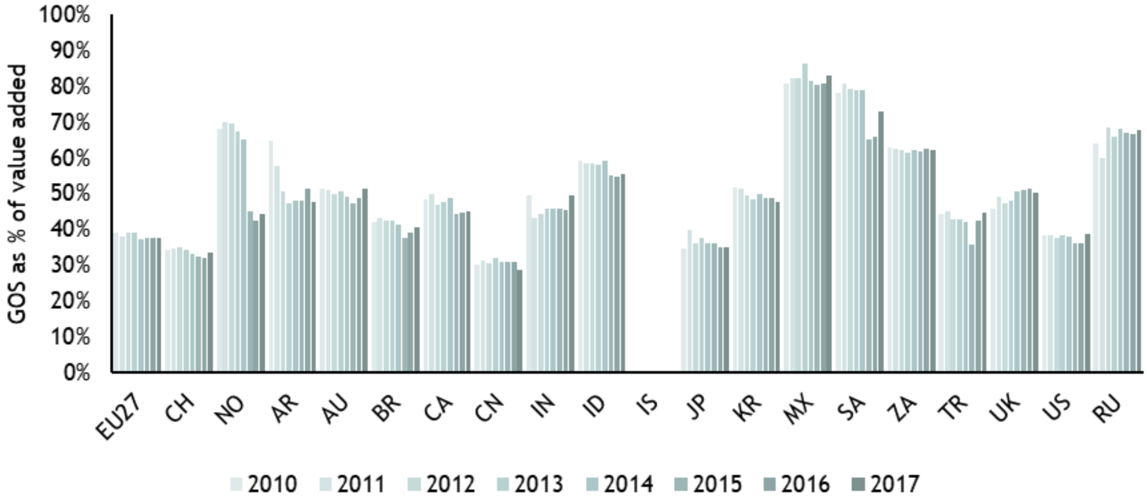


Figure 144 - Gross Operating Surplus shares of value added in non-manufacturing, EU vs G20

Source: Trinomics et altri study (2020)

6.3 Exploring energy intensities

Energy intensity is the result of dividing the energy consumption by the Gross Value Added (GVA). Although energy intensity is not a direct measure of energy efficiency of production (which could be measured by dividing the energy consumption by the volume of production), it is used as proxy of it. This is because comparable production volume data is not easily available.

When using energy intensity as proxy for energy efficiency it should be borne in mind that energy intensity is influenced by changes in the value added of the production, i.e. prices can change due to demand, exchange rates or other issues increasing or decreasing the value added in a way not necessarily proportional to changes in production volumes.

Figure 145 and **Figure 146** (see next page/s) display the energy intensity of selected sectors in the period 2010-2017 showing that:

- Energy intensity varies considerably across sectors in accordance to the various production processes. *Steel* and *cement* have the highest energy intensities (>2 toe/1000 Euro) followed by *refineries* and *paper* (> 1 toe/1000 thousand Euro) and *basic chemicals* (close to 1 toe/1000 Euro).
- Energy intensity varied widely during the period of study in the case of *refineries, steel, clay building materials* and *man-made fibres* probably reflecting price effects on the value added of production, with important spikes between 2014 and 2016
- Energy intensity decreased in absolute terms in most of the energy-intensive sectors like *non-ferrous metals* (-3.6%/year between 2011 and 2017), *steel* (-1,9%/y), *refineries* (-11%/y) and *paper* (-3.5%/y*)* and *glass* (-0.6%/y) although it increased in *cement* (by around 2%/year between 2011 and 2017), *clay building materials* (+1.1%/y)*, sawmills* (+6%/y), *basic chemicals* (+0.5%/y) and *grain products* (+0.2%/y). In proportional terms the energy intensity indicator fell the most in *stone* (-60%), *man-made fibres* (-45%), *refineries* (-55%) and *paper* (-20%)
- Energy intensity decreased for the vast majority of the less energy-intensive manufacturing sectors in the EU between 2011 and 2017. The decrease were small in absolute numbers but important in relative terms for many of these sectors like were also proportionally significant decreases like in *textiles (-20% relative fall of energy intensity indicator)*, *articles of paper (-20%)*, *electrical equipment (-27%), computers (-23%), machinery (-30%)* and *motor vehicles (-45%)* (although for the energy intensity of theses is very low and ranges between 0.2 and 0.01 toe/1000 euros)
- In <u>non-manufacturing</u>, energy intensity decreased in high energy intensity like *land transport* and *air transport*, but increased for *electricity-gas*. Amongst those with lower energy intensity, energy intensity increased in *agriculture*, *oil and gas*, *waste management*, decreased for *other mining* and *accommodation and restaurants* and remained relatively stable or with very small increases or decreases in absolute terms for the rest of sectors.

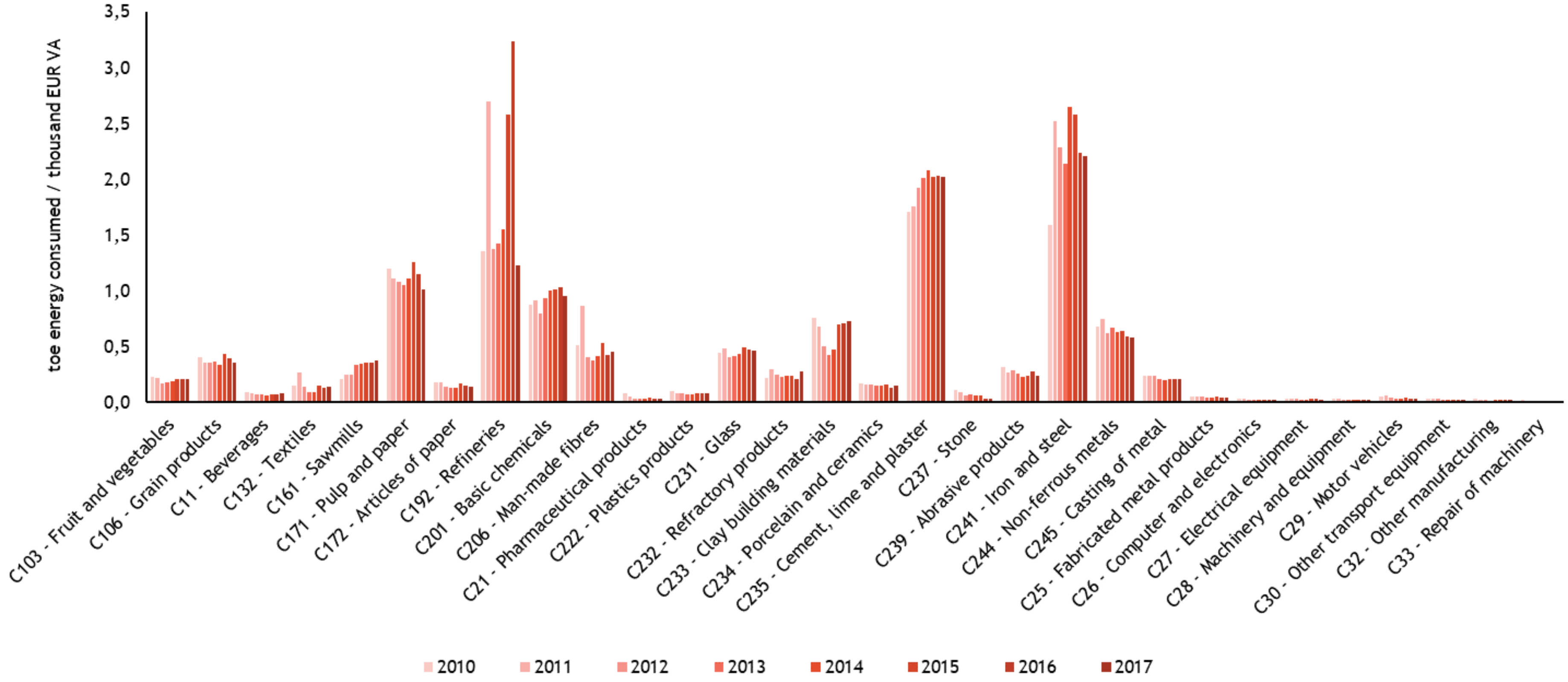


Figure 145 - Energy intensity (consumption/value added in nominal terms) for the most energy-intensive manufacturing sectors (average of available countries)[64]

Source: Trinomics et altri study (2020)

[64] The energy intensity change includes both change due to energy efficiency of production and change due to price effects

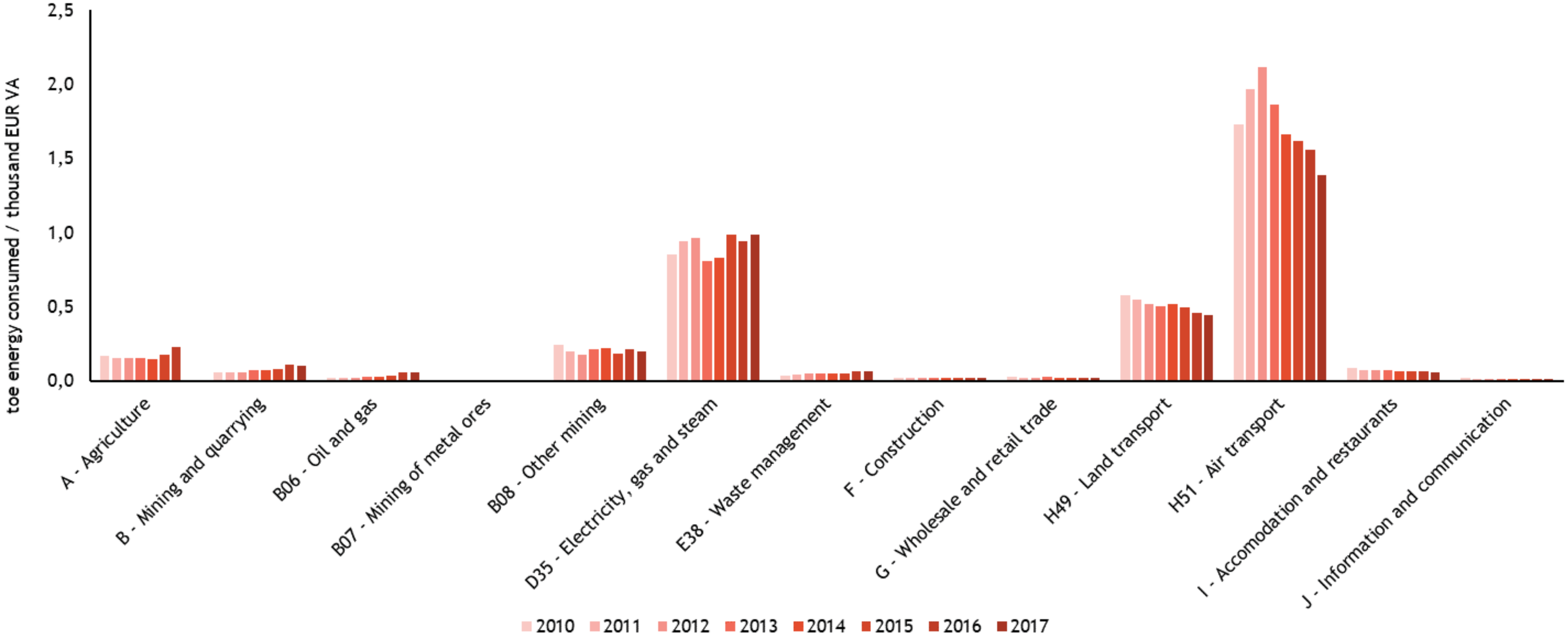


Figure 146 - Energy intensity (consumption/value added in nominal terms) for non- manufacturing sectors (average of available countries)[65]

Source: Trinomics et altri study (2020)

[65] The energy intensity change includes both change due to energy efficiency of production and change due to price effects

6.4 Energy costs drivers

In this section we estimate how changes on energy prices, output and energy intensity impact energy costs. It also looks at the drivers of changes in output (domestic demand vs external demand) and energy intensity (physical energy efficiency, structural changes or fuel switching) to have a more comprehensive picture of the ultimate drivers of energy costs changes.

The section relies on the decomposition analyses undertaken in the *Trinomics* (2020) which assesses the extent to which these three factors and the underlying drivers affected the energy costs of selected energy-intensive sectors in the EU and in G20 countries over 2010-2017. The specific sector scope of the decomposition analysis can be found below in **Table 16** and **Table 17.** The analysis of the decomposition analysis of sectors is undertaken at more aggregated (NACE 2) level in order to get more complete datasets. This makes that the results of the decomposition analysis are not directly comparable with the analysis of energy costs shares (section 6.2) which generally looks at a sectors with a more disaggregated (NACE 3) level.

The decomposition was carried out using the *Log Mean Divisia Index (LMDI)* which shows for a given percentage change in energy costs over the period, the extent to which this change is attributable to changes in each driver over the same period. To make that analysis it was necessary to estimate the prices and the consumption by sector. The purchases of energy resulting from multiplying the estimated prices and consumption were not always similar to the results from historical data coming from 'purchases of energy' collected in Eurostat. A residual (the difference between the two) was therefore introduced in the analysis to take into account for these data discrepancies and ensure a coherent approach in the analysis of the energy costs in this document[66]. As compared with the previous report, there were improved methodological efforts to reduce the residual and present information and analyses of the sectors where a high residual does not convey excessive uncertainty of the results. For the G20 countries there was no residual (since there is no a similar dataset as SBS).

[66] Energy price data was based on the prices from the consumption band from Eurostat relevant for each sector; energy consumption data came from the ODYSEE/MURE database and national data sources; gross output data from the Eurostat SBS. The difference between the estimated purchases of energy and the 'Purchases of Energy Products' data from the Eurostat SBS was attributed to a residual term, which captures data discrepancies which include *inter alia* the effect of fuel switching over the period (as the decomposition calculations assume fixed fuel shares over 2010-2015).

Table 16 - Sector scope of the EU27 decomposition analysis

Section	Code (NACE 2)	Description
C - Manufacturing	C10_C12	Manufacture of food products; beverages and tobacco products
	C13_C15	Manufacture of textiles, wearing apparel, leather and related products
	C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
	C17	Manufacture of paper and paper products
	C19	Manufacture of coke and refined petroleum products
	C20	Manufacture of chemicals and chemical products
	C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
	C22	Manufacture of rubber and plastic products
	C23	Manufacture of other non-metallic mineral products
	C24	Manufacture of basic metals
	C25	Manufacture of fabricated metal products, except machinery and equipment
	C26	Manufacture of computer, electronic and optical products
	C27	Manufacture of electrical equipment
	C28	Manufacture of machinery and equipment n.e.c.
	C29	Manufacture of motor vehicles, trailers and semi-trailers
	C30	Manufacture of other transport equipment
	C31_C32	Manufacture of furniture; other manufacturing
	C33	Repair and installation of machinery and equipment

Table 17 - Sector scope of the G20 decomposition analysis

Section	Code (NACE 2)	Sector Description
C - Manufacturing	C10_C12	Manufacture of food products; beverages and tobacco products
	C13_C15	Manufacture of textiles, wearing apparel, leather and related products
	C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
	C17	Manufacture of paper and paper products
	C19_C21	Manufacture of coke, refined petroleum products, chemicals and chemical products, basic pharmaceutical products, and pharmaceutical preparations
	C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
	C22_C23	Manufacture of rubber, plastic products, and other non-metallic mineral products
	C24	Manufacture of basic metals
	C25	Manufacture of fabricated metal products, except machinery and equipment
	C26	Manufacture of computer, electronic and optical products
	C27	Manufacture of electrical equipment
	C28	Manufacture of machinery and equipment n.e.c.
	C29	Manufacture of motor vehicles, trailers and semi-trailers
	C29_C30	Manufacture of motor vehicles, trailers and semi-trailers, and other transport equipment
	C30	Manufacture of other transport equipment
	C33	Repair and installation of machinery and equipment

6.4.1 Drivers of energy costs

Using the LMDI decomposition, the key drivers of energy costs can be identified.

$$Energy\ costs = Output(constant) \times \frac{Energy}{Output\ (constant)} \times Price\ of\ energy$$

The analysis in this section aims to use LMDI decomposition to explain the behaviour of the energy costs observed as energy purchases of energy from SBS data. Thus, a residual is introduced in the analysis to account for the difference between estimated energy costs and the SBS data for energy *purchases of energy*. For the purposes of this analysis, the change in energy costs over time is defined as follows:

$$\Delta Energy\ Costs = (real)\ output\ effect + (real)\ energy\ intensity\ effect + price\ effect + residual$$

Where

- **Output effect:** the effect of changes in real production (GVA), this could be due to increases in domestic and/or external demand;
- **(Real) Energy intensity effect:** the effect of changes in energy per unit of real output (GVA) over time due to energy efficiency measures, behavioural changes and industry structural change;
- **Price effects:** the effect of changes in coal, gas and electricity prices.
- The **residual,** which includes the effect of unexplained data discrepancy with Eurostat SBS data on 'purchases of energy'.

Box – Interpretation of results

The interpretation of some of these effects is complex and requires additional explanations.

The unexplained **residual** likely arises from missing data, in particular, on energy consumption. In these cases, data gaps were filled using sectoral energy-intensity figures for those countries where data is available. In some cases, that meant relying on trends of very few countries (Germany and few others) to predict the wider sectoral trends at the EU27 level. Therefore it is possible that the residual is partly reflecting some energy intensity effects that were impossible to identify from the limited energy consumption data available. On the other hand, the residual was calculated as the difference from the Eurostat SBS data in order to ensure a coherent analysis in this section in line with the analysis on the previous sections of the chapter. However Eurostat SBS data could also present some inconsistencies as it is based on surveys which might also be partially incomplete.

The interpretation of the **price effect** is complex. The price effect captures the effect of changes in weighted-average energy prices on energy costs faced by firms. The prices used are nominal and exclude all recoverable tax and levies (such as VAT). The price effects are estimated by combining estimates of the energy mix at a sectoral level and estimates of energy prices (by fuel) over the period 2010-2017. Energy price for each sector and fuel is estimated by using the Eurostat price band in which most industrial production would fall into[67]. Therefore the price effect does not capture the behaviour of other fuel prices (price of biomass or heat) which are assumed to behave in line with the weighted average from coal, gas and electricity prices. Finally, price for each industry sector at the EU27 level, the Member State level prices are weighted by the total value of production (by Member State). Thus, the EU27 results for each industry sector reflect a double-weighting of price: (i) (relatively stable) fuel shares used to derive a representative weighted-average fuel price for each industry and each Member State (ii) (dynamic) Member State production shares used to weight the Member State -level price effects, to derive an EU average price effect for each industry sector. This means that prices changes can be due to changes on the production structure of the sector at EU level (shifts of production across Member States) which results on changes on the weights used for calculating the prices.

[67] Allocating industry sectors specified at the NACE 2 level to energy consumption bands specified by gross annual energy consumption is not straightforward; for many industries there is variation in total energy consumption at the plant level, so it is highly likely that different manufacturing plants will face different energy prices, even if they belong to the same industry sector and are located in the same Member State. The decomposition analysis is interested in changes in energy prices (and costs) over time so the mapping from industry sector to consumption band does not have a large bearing on the results in so far as the energy consumption bands usually reflect similar energy price trends over time.

A - Results of the analysis of energy cost drivers at EU level

The aggregate energy costs of all the manufacturing sectors fell by 13% between 2010 and 2017.

This was the result of the following combined effects:

- lower **energy-intensity** contributed to energy savings that reduced energy costs by 15%.
- **real output changes** contributed to an increase of 11% in energy costs;
- energy **price increases** contributed to an increase of 2% in energy costs;
- Still, the **residual** (unidentifiable factors) was responsible for driving the energy costs down by an additional 11%

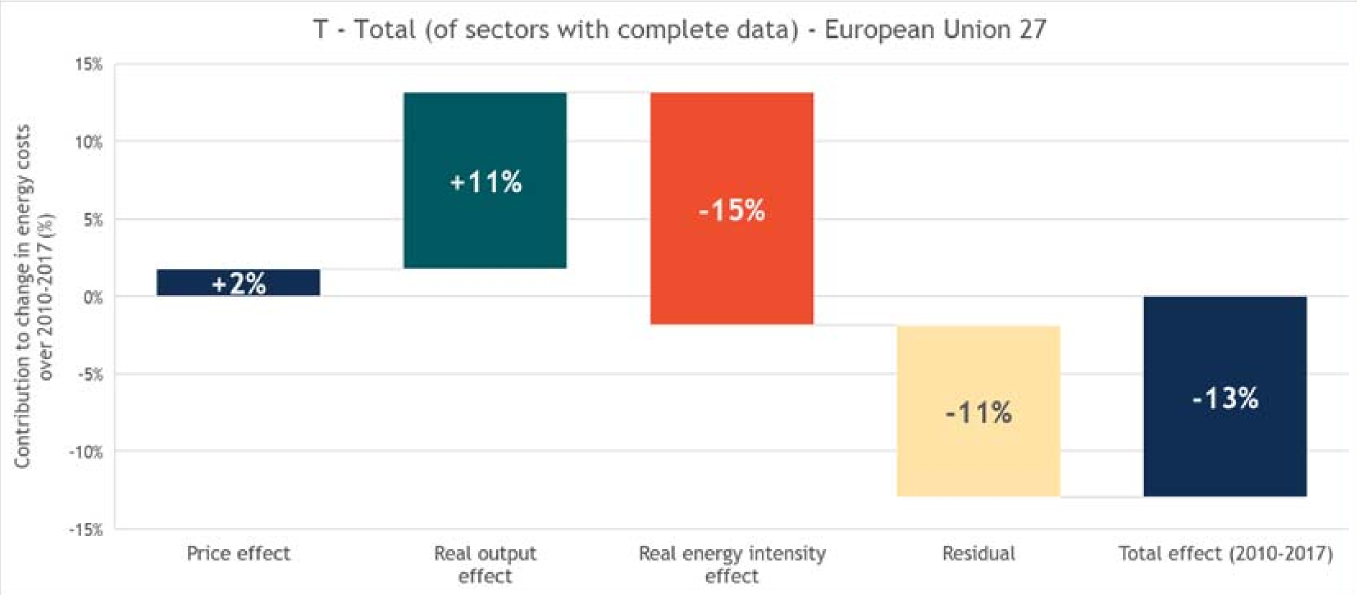


Figure 147 - Drivers of energy costs of the total of sectors

Source: Trinomics et altri (2020)

Real energy intensity effects (-15%)

For aggregated industrial sectors in the EU27, **an improvement in energy intensity contributed to a reduction in energy costs** between 2010 and 2017. This trend is reflected in all but two industry sectors (coke & petroleum and wood products).

The **largest reduction in energy intensity was observed in the less energy-intensive sectors**. This reduction in energy intensity typically happened in sectors where output had increased. There are two plausible explanations for this. First, the reduction in energy intensity came through economies of scale. Second, fast output growth might have also led to investments in new, more efficient, industrial equipment and factories.

The **most energy-intensive industries** saw much smaller improvements in energy intensity over the period. This could be because these industries have already invested heavily in energy efficiency to maintain international competitiveness.

The energy intensity effect was analysed further to see the extent to which **industry structural change** or **fuel switching** contributed the improvements in energy intensity observed over the period. Overall, neither structural change nor fuel switch was found to be a substantial driver of the energy intensity effect. This suggests that **real energy efficiency improvements drove the reduction in energy intensity over the period.**

As in the EU27, industrial sectors in the US, and China have generally experienced improvements in energy intensity that have driven down energy costs over time.

Real output effect (+11%)

Output increased in most EU27 sectors contributing to increasing industrial energy use and costs (in absolute terms). Energy-intensive sectors had the lowest output growth, while sectors with lower energy intensity generally saw higher output growth.

For most industry sectors, output growth was driven by **growth in demand within the EU27 (domestic demand)**, implying that the EU's international competitiveness in manufacturing has remained relatively unchanged over the period.

A few industry sectors saw an improvement due to **external demand** that contributed to the increase in sector output i) *Pharmaceuticals,* where net exports grew substantially over the period and ii) *Motor vehicles and transport equipment*, where exports growth outweighed import growth. Conversely, a few sectors saw a reduction in the net external trade such as *computers and electronics* and *textiles* where imports grew faster than both exports and domestic demand, suggesting a loss of EU competitiveness despite increasing domestic demand and export growth.

Sectoral output has generally increased over time in the **EU's main trading partners**, driving up energy demand and therefore costs with the exception of the UK where industrial output has contracted since 2010

Fuel price effects (+2%)

In most EU27 industry sectors, **increases in average energy prices** have contributed to an increase in energy costs over the period 2010-2017. This is **largely driven by increases in industrial electricity prices**.

Sectors where oil, coal or gas make up a larger share of the energy mix have seen smaller impact of energy prices on energy costs, as prices have fallen for these fuels over the period.

Within the EU27, large relative increases in output are evident in countries where the average prices has decreased and large decrease in output are evident in countries where the average price has increased between 2010-2017. This suggests that energy prices impacted output growth for some industry sectors.

Average energy prices increased over the period for most country-sector combinations in the EU27's major trading partners (US, UK and China)

For most sectors, there is a positive price effect and a negative energy intensity effect. This suggests that **higher prices might have been an important element in driving down energy costs through improved real energy efficiency improvement**.

Residual effects (-15%)

Comparing the EU27 energy costs estimated from its components (price and energy consumption) with the Eurostat SBS purchase of energy products shows there is a residual effect contributing to the evolution of energy costs. The residual effect for most sectors shows a negative bias implying we are not capturing some factor reducing energy cost over the period.

This residual effect encapsulates some known limitations of the analysis:

- **Price trends of other fuels –** energy price data is only available for the four main fuels (coal, electricity, gas, oil). Some sectors have large shares of alternative fuels (biomass, waste & heat) in their fuel mix which we cannot capture in the price effect. Examples include *wood & paper* (high use of biomass and waste) and *chemicals* (High use of heat)
- **Addition exemptions from taxes & levies –** In the analysis we use average industry prices for each fuel (excluding VAT and recoverable taxes) however for some **energy-intensive industries**, there are specific exemptions from taxes and levies. These could include sectors such as the manufacture of *Chemicals* and *Basic Metals*.
- **Issues with the underlying data** – This includes missing data or inconsistencies in the Eurostat SBS data, which is based on a survey of businesses.

Regression analysis shows that across the whole manufacturing sector and EU27, the individual drivers of turnover, average energy prices and energy intensity do explain a reasonable proportion of the variance in SBS energy cost data.

Energy costs contribution to production costs

At the EU27-level, an increase in total industry production costs over the period is almost entirely explained by increases in other (non-energy) costs. **Energy costs have contributed to a very small, almost insignificant, reduction in total production costs**.
Furthermore, the share of energy costs as a proportion of total production costs is lower in 2017 when compared to the share in 2010 for most industrial sectors.
Estimated **energy costs in the EU's main trading partners (US, UK, and China) have generally increased** over the past years.

B- Results of the analysis energy costs drivers in the EU at sector level

Table 18 shows the effect of the various energy cost drivers (prices, real output, real energy intensity) vary widely across the EU sectors. The residual also varies significantly across sectors signalling which sectors have the most robust estimates. A detailed analysis of the effects by sector can be found in Annex F of the Trinomics (2020).

Table 18 - Decomposition of energy cost drivers by sectors in the EU between 2010 and 2017

Sector Code	Sector (Description)	Price effect	Real output effect	Real energy intensity effect	Residual	Total effect	2017 EU27 Energy Intensity (toe per million €)
	High energy-intensive sectors						
C20*	Manufacture of chemicals and chemical products	-4.2%	2.0%	-6.8%	-5.6%	-14.6%	190.8
C17*	Manufacture of paper and paper products	0.7%	7.9%	-9.6%	-27.7%	-28.7%	182.3
C24*	Manufacture of basic metals	4.7%	12.7%	-12.8%	-24.2%	-19.6%	174.1
C19	Manufacture of coke and refined petroleum products	-6.3%	-34.4%	37.6%	-5.4%	-8.6%	158.8
C23	Manufacture of other non-metallic mineral products	1.3%	0.8%	-15.3%	-3.1%	-16.4%	158.2
C16*	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	10.2%	-2.2%	11.0%	-25.7%	-6.7%	75.5
	Lower energy-intensive sectors						
C10_C12	Manufacture of food products; beverages and tobacco products	6.7%	10.2%	-6.0%	-13.0%	-2.1%	26.9
C22	Manufacture of rubber and plastic products	2.4%	10.4%	-37.1%	22.0%	-2.3%	22.4
C13_C15	Manufacture of textiles, wearing apparel, leather and related products	8.1%	-1.4%	-9.9%	-48.7%	-51.8%	21.5
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	11.6%	14.7%	-32.3%	-3.8%	-9.8%	19.3
C25	Manufacture of fabricated metal products, except machinery and equipment	10.1%	9.3%	-14.5%	-13.2%	-8.4%	17.5
C31_C32	Manufacture of furniture; other manufacturing	2.2%	4.4%	-10.9%	-4.0%	-8.3%	11.0
C33	Repair and installation of machinery and equipment	16.7%	-5.4%	-5.7%	0.3%	5.9%	10.1
C28	Manufacture of machinery and equipment n.e.c.	13.6%	16.6%	-26.0%	-2.0%	2.1%	9.5
C27	Manufacture of electrical equipment	10.1%	4.6%	-15.3%	-14.8%	-15.4%	8.3
C26	Manufacture of computer, electronic and optical products	11.4%	14.7%	-11.1%	-23.8%	-8.9%	6.5
C29	Manufacture of motor vehicles, trailers and semi-trailers	6.9%	40.4%	-36.7%	-3.5%	7.0%	6.1
C30	Manufacture of other transport equipment	12.3%	42.0%	-60.5%	-3.0%	-9.2%	4.3
T	**Total (Of sectors with complete data)**	**1.8%**	**11.4%**	**-15.0%**	**-11.1%**	**-13.0%**	**50.6**

Source: Own estimates based on the LMDI methodoloy and sorted according to energy intensity in 2017

The **energy intensity effects** contributed to a very significant reduction of the energy costs for the majority of manufacturing sectors analysed. The sectors that have seen the largest energy cost savings due to energy intensity improvements were *transport equipment* (-60%), *motor vehicles* (-37%) *plastics* (-37%), *pharmaceuticals* (-32%) and *machinery* (-26%) while the sectors where a positive energy intensity effect has contributed to an increase in energy costs were *refineries* (11%) and *wood* (10%).

Energy consumption has mostly decreased in industry sectors over the period whereas gross output has mostly increased, driving down energy intensity over time and reducing energy costs. Energy efficiency can improve due to a number of factors such as i) changes in the fuel mix ii) structural changes within each industry sector iii) and actual energy efficiency improvements (behavioural changes or investment in energy efficient equipment in response to higher prices or policies[68]). Further analysis shows that most of the energy efficiency observed is mainly due to real energy efficiency rather than structural change or fuel switching, which appeared to have a negligible effect on the changes of energy intensity of the sectors (Trinomics study section 4.4.5).

All the sectors with the highest decreases in energy intensity have registered an increase in gross output and a decrease in energy consumption between 2010 and 2017. Sectors *transport equipment* and *motor vehicles*, two low energy-intensity sectors, have had some of the highest relative increase in gross output over the period. Apart from the reasons mentioned above (recent investments in energy efficient processes), low energy-intensive sectors may be benefiting from economies of scale.

It is also interesting to see that reduction in (real) energy intensity was almost systematically higher among the ‘less energy-intensive’ sectors as compared with the 'most energy-intensive sectors'. **Figure 148** and **Figure 149** show examples that support this assessment. These results have however to be taken with certain precaution as, in many cases, they are reliant on consumption data (or estimations) from very few countries[69]. And structural changes within sectors are difficult to interpret (as there can be considerable heterogeneity at the level of aggregation studied, i.e. NACE 2-digit level[70]).

---

[68] Policies such as the carbon price, energy efficiency loans and grants, energy audit or energy management systems and a package of other measures that have been offered to energy-intensive industry sectors can incentivise energy efficient investments and reduce energy cost pressures.

[69] From around five countries, where both energy consumption and gross output data is available, and used to proxy trends in energy-intensity at the EU level. In addition the unexplained residual component captures changes in energy intensity due to fuel switching and could also be partly capturing other energy intensity effects. See Table 4-12 of Trinomics et altri study (2020)

[70] Structural changes within sectors can be important and difficult to interpret as regards the most energy-intensive sectors that could be part of the aggregated and considerably heterogeneous NACE 2-digit level. There could also be different industrial process, with different energy consumption levels, combined in the same sector. For example, steel production in the EU uses either the Basic Oxygen Furnace (BOF) or Electric Arc Furnace (EAF) process. While both production processes are energy-intensive, the energy requirements are very different. The main energy costs to the BOF process is coking coal, while electricity is the primary energy cost for the EAF process. Changes to the structure of the steel manufacturing sector therefore could substantially affect energy intensity and energy costs

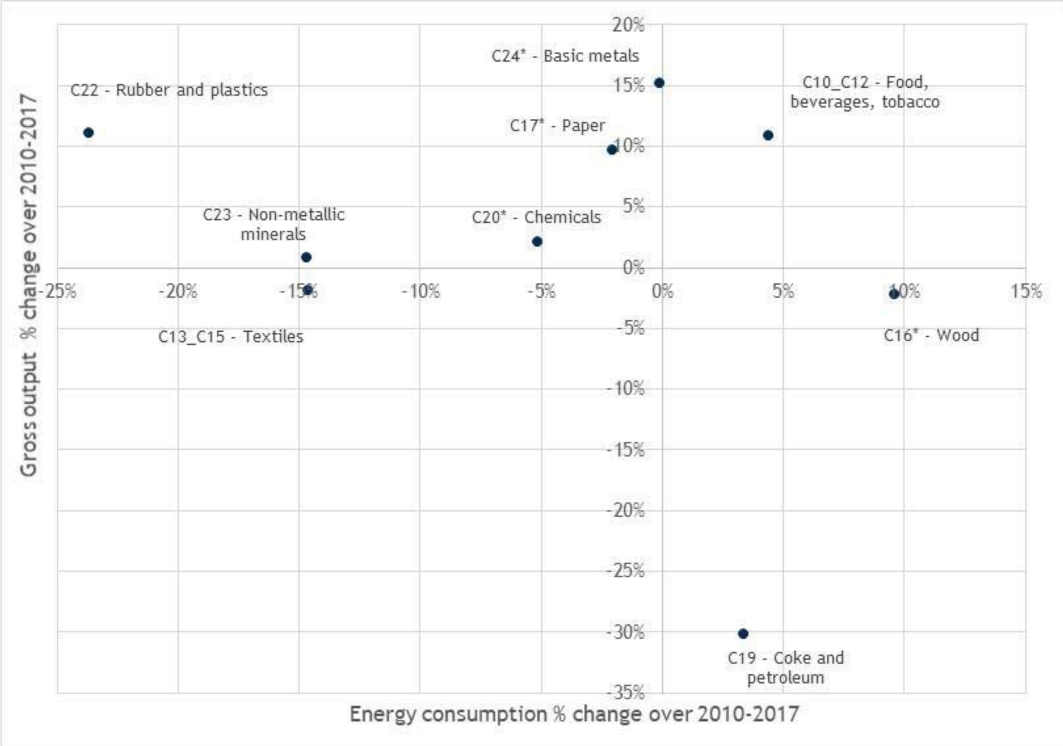


Figure 148 - Changes in gross output and energy consumption in high energy-intensity sectors, 2010-2017

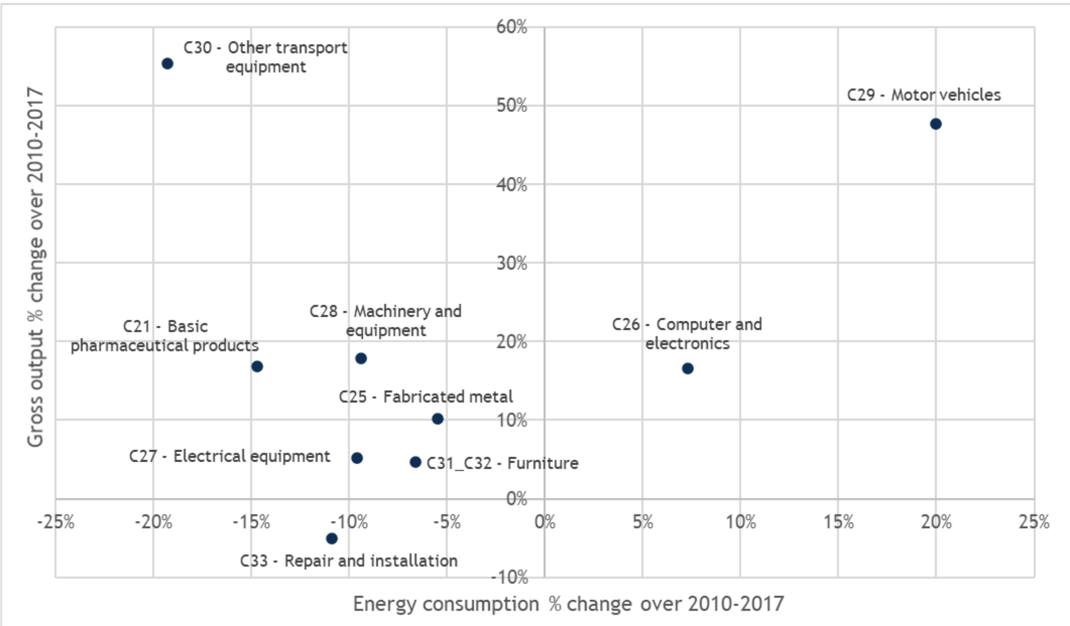


Figure 149 - Changes in gross output and energy consumption in low energy-intensity sectors, 2010-2017

The **price effect** was small although positive in most of the industry sectors analysed. The price change was driven by the combined effect of higher electricity prices and lower gas and oil prices over the period 2010-2017. Energy price increases also contributed to small changes in energy costs due to the fact that energy cost represent a rather small part of total production costs, especially in the less energy-intensive sectors.

The price effect was the highest in less energy-intensive sectors such as *repair of machinery (17%)*, *machinery (14%)*, *transport equipment (12%)* and *pharmaceuti*cals (12%). The price effects in the high energy-intensive industries were overall low or modest such as in the case of *paper* (+0.7%) and *non-metallic mineral products* (+1.3), *basic metals* (+5%) or even negative in the case of *chemicals (-4%)* and *refineries* (-7%). Low or negative price effects appeared in the sectors which importantly rely on oil and gas, the prices of which declined over the period.

The relatively small price effect in sectors in which electricity plays an important is largely because production took place in Member States where energy price rises were modest and/or because production shifted to Member States where energy prices are lower. For instance, for the highly energy-intensive of *paper,* production moved away from Italy (with a high sectoral average energy price in 2017) while increased in countries with lower average energy prices, such as Finland, Germany, the Netherland, and Poland. In the case of *non-metallic mineral products*, the growth in output was highest in France, Germany, and Poland in absolute terms. This was paired with a decrease in average energy prices decreased in both Germany and Poland over the time

The **real output effect** was positive for most sectors and contributed significantly to increase energy costs at EU level.

The growth in real output contribute to rise energy cost particularly in the manufacturing of *transport equipment* (+42%), *motor vehicles* (40%), *computers* and *pharmaceuticals* (+15%), *basic metals* (+12%), *plastics* and *beverages* (+10%). Few sectors, with sector specific economic dynamics, like *refineries* (-34%) and *textiles* (-1%) saw a reduction of real output over the period 2010-2017.

The increase in *transport equipment* and *motor vehicles* represented more than 40% of the contribution of output growth to the rise in total energy costs in the EU. The sectors' increase was due to large increase in activity in Germany, France, and Italy (in absolute terms). These sectors have experienced an increase in economic activity even though there is a positive price effect on energy costs. However, both sectors have experienced significant reduction in energy intensity, suggesting that international competitiveness has partially improved because of improved energy efficiency.

The **residual term** isolates the unexplained component of changes in energy costs (based on available price and energy consumption data). This residual arises because there are (sometimes large) discrepancies between the calculation of energy costs and the 'Purchases of Energy Products' data from Eurostat SBS.

The residual factor can be due to known data limitations: i) *Uncaptured fuel switching effects* as a result of other fuels not accounted for in the analysis. These include renewables, bioenergy, and heat which are very important in some of analysed sectors like wood and paper; ii) *Uncaptured industry specific price effects* such as tax and levy exemptions which are likely to affect the results of some of the analysed energy-intensive sectors such as chemical and basic metals iii) issues with the underlying data such as missing data leading to some country-sector combinations heavily relying on data filling techniques or inconsistencies in the Eurostat SBS data. This issue is not sector-specific and will be explored further in the regression-based analysis.

The results of the sectors with proportionally higher residual effects should be looked at with certain caution.

C- Results of the analysis of energy costs drivers at G20 countries

The analysis of the effects driving energy costs of industrial sectors in G20 countries covers the 2010-2016 period and focuses on China (CN), the United Kingdom (UK), Mexico (MX) and the United States (US). These were the G20 countries and time span for which available data was complete across industry sectors. For each of the sectors, the G20 results available are ranked based on each country's energy intensity, with the most energy-intensive G20 country ranked first for each sector. The analysis of the impact of the different effects on energy costs responds to very diverse international dynamics of sectors and countries. A detailed description of these can be found in the Trinomics et altri study (2020).

Table 19- Decomposition of energy cost drivers for G20 countries over the period (2010-2016)

Country	Sector Code	Sector (Description)	Price effect	Real output effect	Real energy intensity effect	Total effect	2016 Energy Intensity (toe per million €)
US*	C10_C12	Manufacture of food products; beverages and tobacco products	5.0%	33.6%	-22.5%	16.1%	34.5
TR			-36.1%	19.9%	23.4%	7.1%	31.6
CN			61.9%	112.6%	-121.2%	53.4%	23.4
UK			24.9%	6.7%	-11.8%	19.8%	21.0
UK	C13_C15	Manufacture of textiles, wearing apparel, leather and related products	24.1%	-11.9%	-2.6%	9.6%	48.5
TR			-52.9%	20.1%	42.3%	9.5%	37.4
US*			19.8%	45.6%	-41.6%	23.7%	31.9
CN			68.7%	96.8%	-100.8%	64.7%	29.2
MX*			-26.4%	-14.5%	31.9%	-9.0%	0.3
TR	C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	-41.0%	23.8%	68.6%	51.4%	82.1
US*			-2.0%	48.9%	-43.5%	3.4%	51.2
UK			39.8%	-42.0%	80.5%	78.3%	22.7
CN			73.3%	110.8%	-137.0%	47.0%	14.5
US*	C17	Manufacture of paper and paper products	20.0%	28.8%	-28.4%	20.4%	268.8
UK			44.7%	-12.3%	23.1%	55.5%	169.4
TR			-40.1%	22.8%	57.2%	39.9%	86.1
CN			74.4%	87.1%	-112.2%	49.3%	65.0
CN	C19_C21	Manufacture of coke, refined petroleum products, chemicals and chemical products, basic pharmaceutical products, and pharmaceutical preparations	31.7%	110.3%	-77.6%	64.5%	70.9
TR			-34.5%	19.4%	50.9%	35.7%	57.6
US*			-2.2%	31.3%	-28.3%	0.8%	52.5
UK			28.4%	-41.5%	15.2%	2.1%	33.0
CN	C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	-0.6%	129.2%	-74.1%	54.5%	33.5

D- Drivers of output effect in the EU and G20

The EU, the US, and China have experienced increases in total industrial gross output over time driven by increased domestic demand. Although higher exports in all three areas have contributed moderately to gross output although this was generally compensated by increasing imports.

The UK experienced a negative output effect driven by a strong growth of imports that were bigger than exports and the small growth in domestic demand. A detailed account of the varied sectorial developments can be found in the Trinomics (2020)

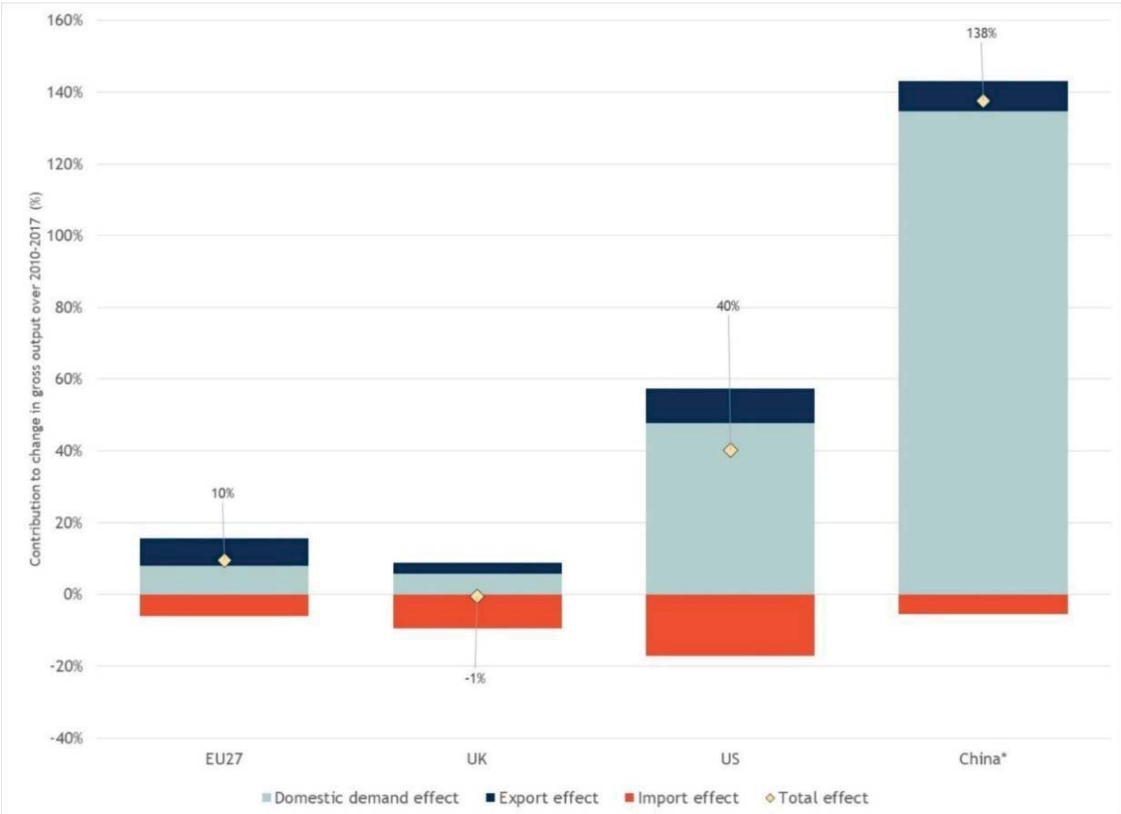


Figure 150- Decomposition of output effect in EU, UK, US and China

Table 20 - Decomposition of output drivers for the EU27 and main G20 trade partners, 2010-2017

Area	Sector Code	Sector Description	Domestic demand effect	Export effect	Import effect	Total effect (2010-2017)
EU27	C10_C12	Manufacture of food products; beverages and tobacco products	3.3%	4.3%	-1.7%	5.9%
UK			13.9%	4.2%	-6.6%	11.5%
US			34.6%	2.8%	-5.1%	32.3%
CN			171.8%	2.9%	-4.0%	170.7%
EU27	C13_C15	Manufacture of textiles, wearing apparel, leather and related products	6.9%	14.5%	-20.9%	0.4%
UK			-36.4%	12.3%	8.8%	-15.3%
US			98.6%	6.8%	-48.2%	57.1%
CN			118.7%	14.8%	-1.8%	131.7%
EU27	C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	-2.5%	3.0%	-0.4%	0.0%
UK			-28.3%	-1.7%	6.4%	-23.5%
US			67.7%	5.6%	-13.8%	59.5%
CN			175.2%	2.7%	-5.6%	172.3%
EU27	C17	Manufacture of paper and paper products	1.3%	0.7%	0.4%	2.3%
UK			-7.6%	-5.6%	15.2%	2.1%
US			26.5%	1.9%	-1.4%	26.9%
CN			122.6%	6.1%	-5.7%	123.0%
EU27	C19	Manufacture of coke and refined petroleum products	-29.9%	-6.6%	7.6%	-28.9%
UK			-33.7%	-22.7%	7.1%	-49.3%
US			17.0%	19.5%	-3.5%	33.0%
CN			123.1%	2.4%	-0.4%	125.1%
EU27	C20	Manufacture of chemicals and chemical products	1.1%	4.8%	-5.1%	0.9%
UK			-23.5%	-25.8%	24.9%	-24.5%
US			25.4%	6.0%	-5.6%	25.7%
CN			164.3%	7.0%	-7.4%	164.0%
EU27	C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	-8.4%	47.4%	-18.2%	20.8%
UK			16.4%	-8.0%	-21.6%	-13.2%
US			84.1%	5.7%	-23.8%	66.0%
CN			227.3%	2.8%	-11.2%	218.8%
EU27	C22	Manufacture of rubber and plastic products	15.0%	5.8%	-5.0%	15.8%
UK			8.6%	0.7%	-5.3%	4.0%
US			50.8%	6.4%	-13.1%	44.1%
CN			115.0%	14.3%	-1.0%	128.3%
EU27	C23	Manufacture of other non-metallic mineral products	1.2%	3.5%	-1.9%	2.8%
UK			12.0%	0.4%	-4.5%	7.9%
US			51.4%	2.9%	-9.1%	45.2%
CN			168.1%	5.5%	-1.5%	172.1%

Source: Trinomics (2020)

E- Drivers of energy intensity effect in the EU

Table 21 shows the key drivers of the structural change, the range of changes in shares of turnover and the range of energy cost shares for subsectors.

The analysis shows that the **structural change in subsectors at a NACE 3 level, had a relatively small impact on overall energy cost share of the aggregate sector relative to other factors**. This reflects that **despite substantial variation in energy intensity between subsectors** for some industries, there is no indication that there was a **sufficient shift in production between subsectors to drive the changes in energy costs shares observed.**

The **differences in energy cost shares can be quite large for subsectors within a NACE 2 level sector**. For example, in Non-metallic minerals, the least intensive sub sector is a fifth as intensive as most intensive sub sector. However, over the period, the change in turnover shares was only between -1.8% and 1% so the *net structural change* effect is only 2%. For other sectors, where the difference in energy cost share in subsectors is very small, and this limits the scope of structural change to impact energy intensity (for instance *leather* and *printing,* in which there *was a* shift in shares of 4.9% and 3.2% respectively, the structural intensity effect was only 1% and 0%). The largest structural change effect is observed for *other transport equipment* which shows a particularly large structural change effect in turnover between sectors to a lower energy-intensive sector.

Table 21- Structure intensity effect for EU27 for Manufacturing sub sectors at 2 digit level

Sector code	Sector	Structural intensity effect	Other energy intensity effects	Total energy intensity effect	Minimum change in turnover share	Maximum change in turnover share	Minimum Energy cost share	Maximum Energy cost share
C10	Food products	-1%	-21%	-22%	-1.2%	0.8%	1.1%	2.5%
C13	Textiles	-3%	-31%	-34%	-2.3%	3.8%	1.7%	4.9%
C14	Wearing apparel	-1%	-65%	-66%	-0.8%	0.9%	0.5%	1.0%
C15	Leather and related products	1%	-83%	-82%	-4.9%	4.9%	0.4%	0.5%
C16	Wood and wood products	0%	-15%	-14%	-1.9%	1.9%	2.3%	2.7%
C17	Paper and paper products	-1%	-37%	-38%	-1.4%	1.4%	2.0%	6.1%
C18	Printing and reproduction of recorded media	0%	-5%	-5%	-3.2%	3.2%	1.6%	1.8%
C19	Coke and refined petroleum products	0%	49%	49%	-0.1%	0.1%	0.0%	1.8%
C20	Chemicals and chemical products	0%	-27%	-28%	-0.4%	1.1%	0.7%	4.7%
C21	Pharmaceuticals	-1%	-24%	-26%	-0.8%	0.8%	0.6%	1.8%
C22	Rubber and plastic products	0%	-19%	-19%	-0.1%	0.1%	1.5%	2.0%
C23	Other non-metallic mineral products	2%	-22%	-20%	-1.8%	1.1%	2.6%	11.4%
C24	Basic metals	-1%	-25%	-26%	-1.7%	3.7%	1.6%	6.0%
C25	Metal products	2%	-24%	-22%	-2.4%	2.5%	0.7%	2.0%
C26	Computer, electronic and optical products	4%	-11%	-7%	-12.4%	8.6%	0.3%	1.0%
C27	Electrical	1%	-29%	-28%	-2.5%	0.9%	0.5%	1.3%

	equipment							
C28	Machinery and equipment n.e.c.	-1%	-23%	-24%	-2.3%	1.0%	0.5%	0.9%
C29	Motor vehicles etc	0%	-30%	-30%	-0.3%	0.5%	0.3%	1.0%
C30	Other transport equipment	-14%	-36%	-49%	-7.8%	19.5%	0.3%	0.6%
C32	Other manufacturing	-1%	-25%	-26%	-1.7%	4.4%	0.4%	1.2%
C33	Repair and installation	1%	-7%	-6%	-2.4%	2.4%	0.5%	0.8%

Source: Trinomics (2020)

6.4.2 Impact of energy costs on total production costs

This section assesses the results of the decomposition of total production costs in order to understand the extent to which total production costs were driven by changes in energy costs.

$$Total\ production\ costs = Energy\ costs + Other\ costs\ of\ production$$

$$\Delta Total\ production\ costs = \Delta Energy\ costs + \Delta Other\ costs\ of\ production$$

The result of the analysis by *Trinomics et altri* (2020) estimates that, at aggregated level, energy costs continue to have an almost negligible impact (-0.3%) on reducing total production costs over the period of study (2010-2017). Total production costs increased by 22% driven by non-energy energy production costs.

At sector level, the impact of energy costs changes on total production costs was not very diverse (See **Table 22**), ranging from -2% to 0%. The most important negative impacts on energy costs took place in *paper* (-2%) *basic metals* (-1%) and *non-metallic* minerals (-1%).

Table 22- Drivers of total production costs in manufacturing sectors, EU27, 2010-2017

Sector Code	Sector	Energy cost effect	Non-energy costs effect	Total effect (2010-2017)	2017 EU27 Energy Intensity (toe per million €)
C20	Manufacture of chemicals and chemical products	-0.7%	14.8%	14.1%	190.8
C17	Manufacture of paper and paper products	-2.0%	15.8%	13.8%	182.3
C24	Manufacture of basic metals	-1.2%	7.7%	6.5%	174.1
C19	Manufacture of coke and refined petroleum products	-0.2%	-20.6%	-20.8%	158.8
C23	Manufacture of other non-metallic mineral products	-1.1%	4.0%	2.9%	158.2
C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	-0.2%	7.2%	7.0%	75.5
C10_C12	Manufacture of food products; beverages and tobacco products	0.0%	27.3%	27.3%	26.9
C22	Manufacture of rubber and plastic products	-0.1%	18.8%	18.8%	22.4
C13_C15	Manufacture of textiles, wearing apparel, leather and related products	-1.3%	4.2%	2.9%	21.5
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	-0.1%	13.5%	13.4%	19.3
C25	Manufacture of fabricated metal products, except machinery and equipment	-0.2%	15.6%	15.4%	17.5
C31_C32	Manufacture of furniture; other manufacturing	-0.1%	16.5%	16.4%	11.0
C33	Repair and installation of machinery and equipment	0.0%	12.5%	12.5%	10.1
C28	Manufacture of machinery and equipment n.e.c.	0.0%	34.2%	34.2%	9.5
C27	Manufacture of electrical equipment	-0.2%	18.9%	18.7%	8.3
C26	Manufacture of computer, electronic and optical products	-0.1%	2.7%	2.6%	6.5
C29	Manufacture of motor vehicles, trailers and semi-trailers	0.1%	52.6%	52.6%	6.1
C30	Manufacture of other transport equipment	-0.1%	83.6%	83.5%	4.3
T	**Total (Of sectors with complete data)**	**-0.3%**	**22.2%**	**21.9%**	**50.6**

Source: Trinomics et altri study (2020), 2017 data

6.5 International comparisons

In this section we compare indicators which can influence the international competitiveness in terms of costs of the EU sectors with regard to its trading partners. We directly compare the international energy costs shares in production costs and production value of sectors. We also look at the underlying reasons for these energy costs differentials. First, we compare differences in energy efficiency indicators, which can influence the relative differences in energy consumption and therefore be one of the reasons explaining differences in energy costs. Second, we also look at the international differences in the prices of energy products, as they usually are the main drivers of the energy costs in the short term and thereby of costs differentials. Data on international prices is relatively robust while data on energy costs and energy efficiency is rather limited and the results of the latter should be taken with caution.

The section compares retail industrial prices for electricity and gas between sectors in the EU and in non-EU G20 countries as these two energy carriers tend to be the most relevant for industrial energy costs. The section relies on the results of the *Trinomics et altri* study (2020).

International comparisons on oil products prices can be found in **section 3.3.7** as they are relevant for the energy costs in some specific manufacturing sectors and non-manufacturing sectors.

6.5.1 Energy costs vs other G20 countries

In this section energy costs of EU sectors are compared with those in main EU trading partners. These comparisons could give indications of the international competitiveness of EU industries in terms of costs. Specific data on energy cost shares of non-EU G20 partners is scarce and limited the scope of comparisons that could be made. In addition, the aggregated sectors compared are made of various sub-sectors, the importance of which within the aggregated sectors may vary across countries.

Figure 151 shows a comparison of energy costs shares in production costs for highly energy-intensive sectors and countries for which equivalent energy cost and production cost data were found.

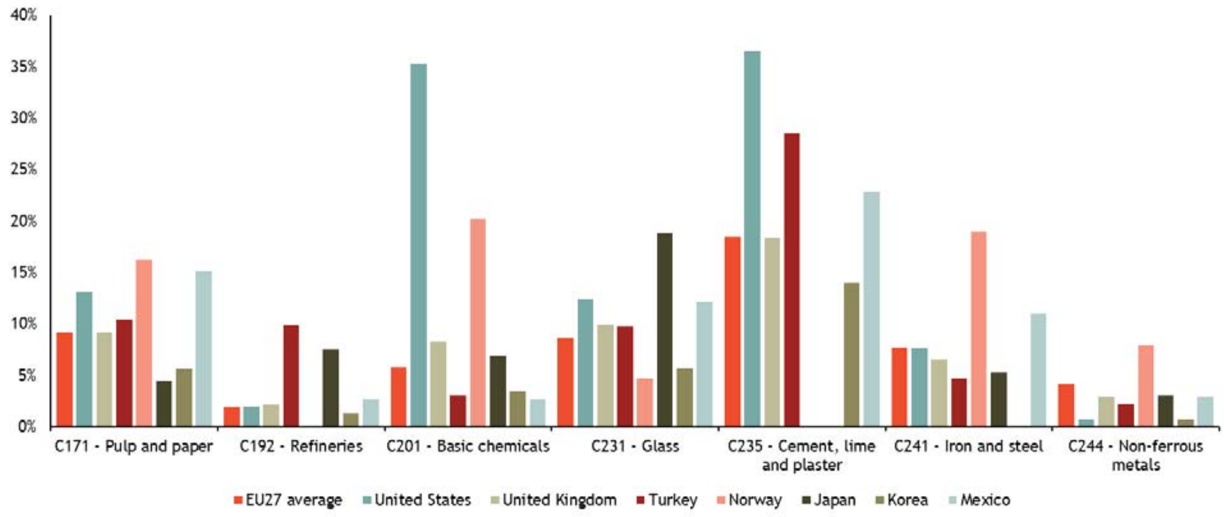


Figure 151 - International comparision of energy costs shares for selected highly energy-intensive sectors

Source: Trinomics et altri study (2020)

The available data for the highly energy-intensive sectors show that shares of energy costs in production costs in the EU are lower than in the US for *paper*, *basic chemicals, glass* and *cement*, comparable for *refineries* and *steel* but higher for *non-ferrous metals*. This would point to overall comparable or lower energy costs shares in production costs in the EU than in the US for the highly energy-intensive sectors studied. As compared to Japan, EU's energy costs shares in production costs are lower in *refineries*, *glass* and *basic chemicals* but higher in *steel*, *non-ferrous metals* and *paper*. The results, in comparison to what was found in the two previous (2016 and 2018) editions of the energy prices and costs report, show an overall more mixed picture, no longer pointing to EU costs shares being generally higher than in Japan (it depends on the sector).

That said, from the point of view of the sectors subjected to highest international competitive pressures (*refineries*, *steel*, *non-ferrous metals*), the share of energy costs in production costs for these industries in the EU are comparable or higher in the US and Japan (with the exception of refineries).

For the other highly energy-intensive sectors, the energy cost shares in production costs in the EU were lower than those in the US and Japan for *basic chemicals* and *glass*. For *paper*, they were also lower in the EU than in the US but higher than in Japan. The situation is similar for *cement*, for which the EU energy costs shares in production costs are lower than in the US but higher than in Korea (there is no data for Japan for this sector)

Korea displays lower energy costs shares in production costs than the EU, the US and Japan, in almost all the highly energy-intensive sectors studied for which data was available (*paper*[71], *basic chemicals*, *glass, cement* and *non-ferrous metals*)

From the point of view of the main fuels used by the studied highly energy-intensive sectors, the numbers suggest that, as compared to US and Japan, the energy costs shares in production costs in the EU tend to be higher in electro-intensive sectors (*non-ferrous metals*) and

[71] *Paper* is the only exception for which Korea does not show the lowest energy costs shares in production costs in highly energy-intensive industries when compared with the EU, Japan, and the US. For paper, Japan displays the lowest energy costs share, followed by Korea, the EU and the US.

comparable or lower in fossil-fuel intensive sectors (*refineries*, *basic chemicals*, *glass*). The picture is mixed for *paper* (which relies importantly in biomass energy in addition to gas and electricity) and *cement.*

When looking at a broader picture of energy-intensive sectors (See **Figure 152**) the pattern changes. The energy cost shares in production value of less energy-intensive sectors in the EU tend to be lower than those in the US and Japan. They are lower in the case of *machinery, casting of metals* and *computers* and significantly lower in *other manufacturing* and *electrical equipment.* Energy cost shares for *motor vehicles* are lower than in Japan, but higher than in the US.   They are also lower than in the US and Japan for a bit more energy-intensive sectors like *grain* and *pharmaceuticals* and for the very energy-intensive sector of *cement, lime and plaster*.

The energy cost shares in production value in the EU are similar to those in the US for *beverages* and *stone.* They are lower than in the US (but higher than in Japan) for *abrasive products* and *ceramics.*

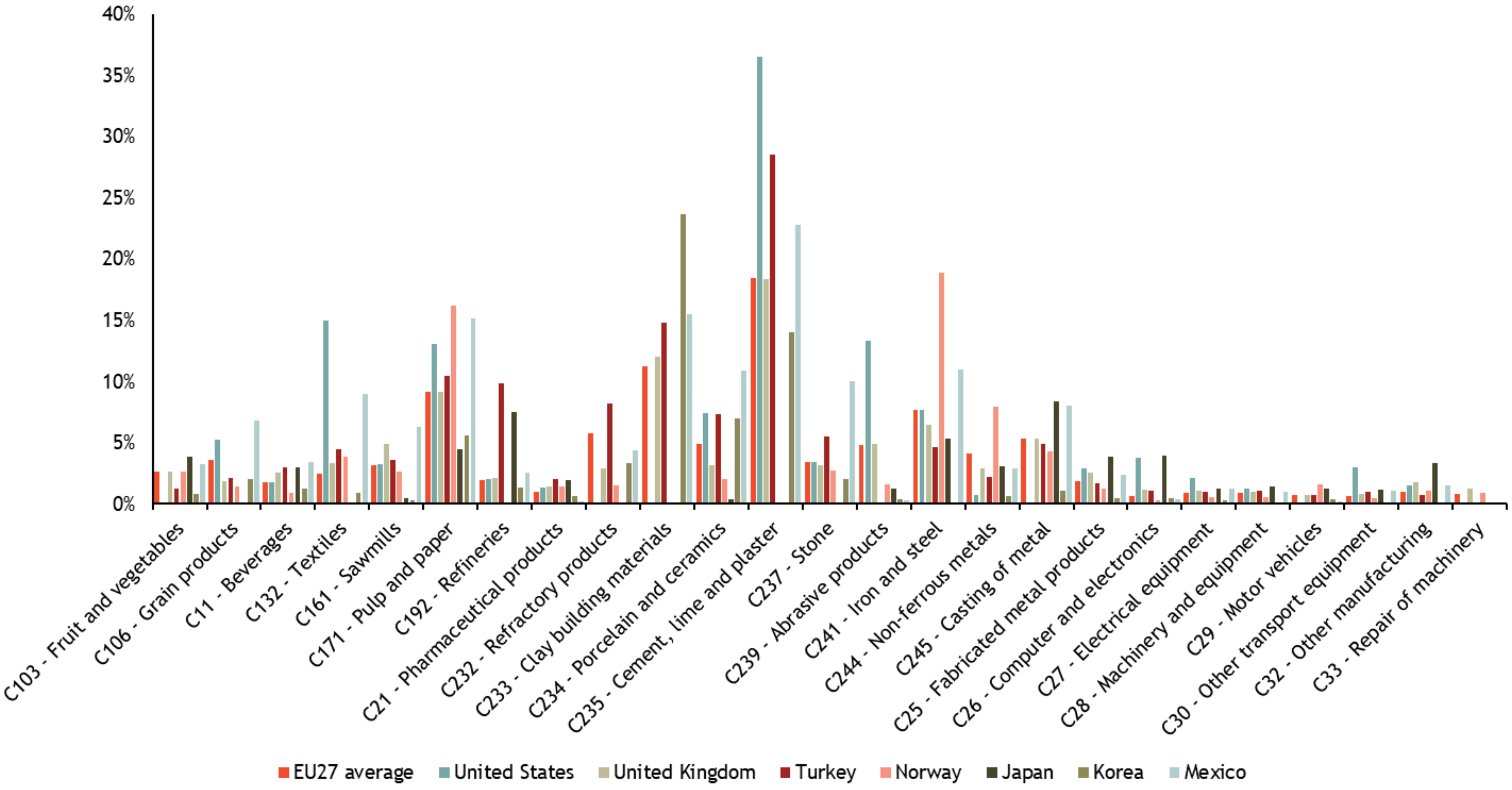


Figure 152 - Energy costs shares in production value for manufacturing sectors, 2008-2017

Source: Trinomics et altri study (2020)

As to Norway, the result of the comparison with the EU is mixed. For highly energy-intensive sectors, the energy cost shares in the EU are lower than in Norway in *steel*, *non-ferrous metals*, *chemicals* and *paper* but higher in gas intensive sectors like *grain*, *glass*, *refractory products* and *ceramics*. As to the less energy-intensive products the results are also mixed, with the energy costs shares in the EU being higher in sectors like *stone*, *abrasive products* and *metals products, machinery, computers* and *electric equipment*, comparable in *other manufacturing* and lower in *motor vehicles* and *pharmaceutical* products.

With regard to Turkey, as regards the most energy-intensive sectors, the EU's energy cost shares were significantly higher in *basic chemicals*, *non-ferrous metals* and *steel*, slightly lower in *paper* and *glass*, and much lower in *cement*. In most of the other less energy-intensive sectors, the EU's energy shares were lower than in Turkey, with the exception of *motor vehicles, metal products* (in which they were comparable or slightly higher) and *grain*, *fruit* and *other manufacturing* (in which they were higher).

Some additional general observations can be drawn across sectors:

- Norway displays the highest energy cost shares in the *paper* and *non-ferrous metals* in spite of lower electricity and natural gas prices than the EU's, due to their relatively higher energy consumption
- Turkey has the highest energy cost share in the refineries, followed by Japan
- Japan has the highest energy cost share in *glass*
- The US has the highest energy cost shares in *basic chemicals* and *cement.*
- On average, the EU has energy cost shares comparable to those of most international trade partners, with relatively high energy cost shares in *steel* and *non-ferrous metals,* and comparable or lower shares for the less energy-intensive sectors. The EU has a relatively low energy cost shares in refineries.

6.5.2 Energy intensity of EU sectors vs other G20

Energy efficiency can also be factor for international competitiveness (the more energy efficient a firm is, the lower its relative consumption and energy costs). By comparing energy intensities across sectors one can have an indication of the different energy efficiency in these sectors and countries (bearing in mind that other factors, such as countries with specialisation in products of high added value, will also have an impact on decreasing the carbon intensity of a particular sector). This complements the understanding of the role of energy cost shares. One should also be aware that the international data on energy intensity is rather limited (with often only one or two other international comparators available) and that these results should be taken with caution.

Figure 153 and **Figure 154** display the trends in energy intensity on the available sectors and countries. Although it is difficult to draw any general conclusions it can be observed that that:

- Energy intensities in the EU compared to those in the US show considerable variation per sector for which data is available, with the EU being less energy-intensive in *glass*, *fabricated metal products*, *abrasive products and electrical equipment;* and the US being less energy-intensive in *refineries*, *beverages*, *basic chemicals*, *pharmaceutical products* and *computers and electronics*.

— The EU continues to be less energy-intensive than China in every sector for which data is available (but for *refineries* for which the EU have the highest energy intensity of the countries for which data was available). The EU is however more energy-intensive than Japan for the most energy-intensive sectors and comparable or lower for the less energy-intensive sectors.

By sector, the EU's energy intensity relative position to other countries varies importantly. In *paper*, the EU's energy intensity is higher (double) than in Japan and Korea. In *refineries*, it is the highest in particular as compared with Switzerland, Brazil, China and Japan. In *basic chemicals,* the EU27 has a lower than average energy intensity, lower than China, Japan and Brazil. In *steel* and *non-ferrous metals*, the EU27 has higher intensity levels than Switzerland and Japan but lower levels than Norway. In *glass*, it is lower than in Mexico and the United States, but higher than Norway and Canada. In *abrasive products*, it is the lowest across all international counterparts, though intensity in Japan and the US are only slightly higher than in the EU. For other less intensive energy sectors, the EU27 has generally lower than average intensity and, as compared with the US, lower in sectors like *metal products*, *electrical equipment, machinery and equipment*, and *motor vehicles*, comparable in *computers* and higher in *beverages*, *pharmaceuticals*. China has consistently the highest comparative energy intensities in these sectors.

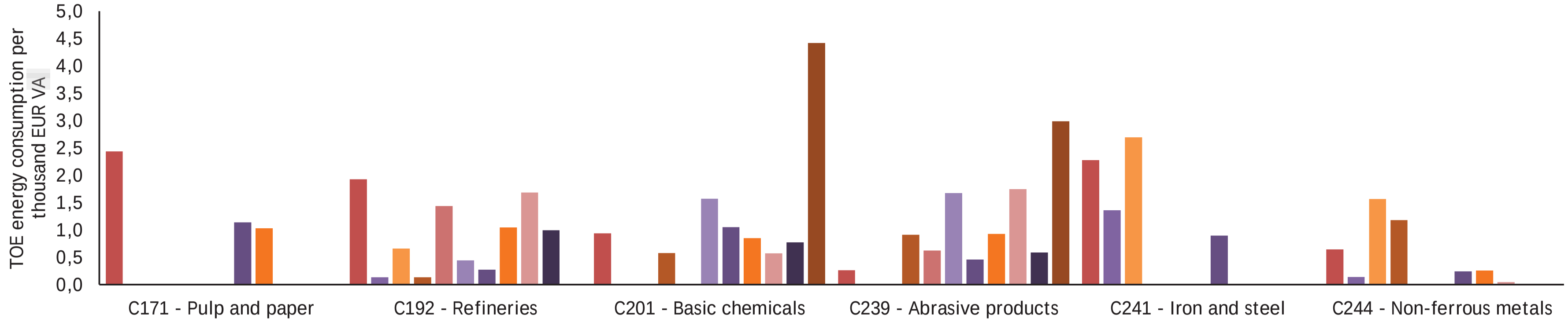


Figure 153 - Energy intensity international comparisons for the most energy-intensive manufacturing sectors

Source: Trinomics et altri study (2020)
Note: data limited for available sectors and countries

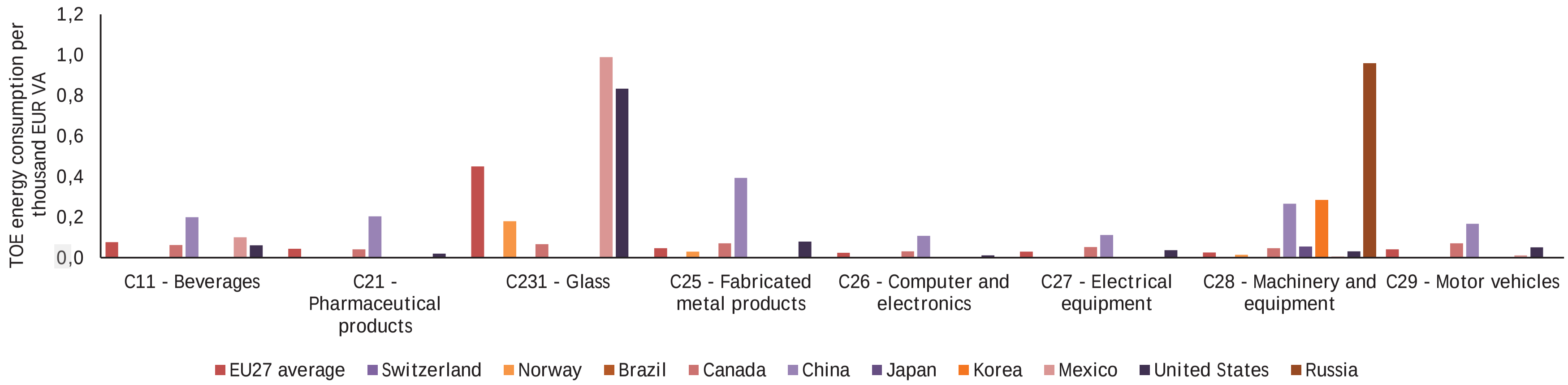


Figure 154 - Energy intensity international comparisons for other manufacturing sectors

Source: Trinomics et altri study (2020)
Note: data limited for available sectors and countries

6.5.3 Industrial electricity prices: EU vs G20 countries

In this section retail electricity industrial prices in the EU industry and in G20 Members are compared. The comparisons are mainly based on the results of the *Trinomics et altri* study. Electricity prices gaps between international trade partners can be relevant for an assessment of cost competitiveness of sectors. Electricity is in many cases the energy carrier with most potential to impact the energy costs differential between energy-intensive sectors in manufacturing.

Retail electricity prices for industry have relatively complete datasets. The price data covers EU27 and G20 countries from 2008-2019. EU27 prices are based on consumption band assumptions (mainly Eurostat consumption band ID) while data for non-EU G20 countries is usually relying on the average of the countries (not based on consumption bands). The price data is however widely comparable (i.e. comparability checks were undertaken can be found in the study by *Trinomics et altri*). Finally, prices are exclusive of VAT and recoverable taxes and levies but include (non-recoverable) excise taxes and levies.

The main conclusions that can be drawn from this data are:

— EU27 average real electricity prices rose from around 110 EUR/MWh in 2008 to 125 EUR/MWh by 2013-2014; they declined until 2018 to 110 EUR/MWh and rose until 2019 to 115 EUR/MWh.

— US prices are around half the EU average levels and have not changed significantly between 2008 and 2019.(See **Figure 155)**

— Prices in Japan are higher than the EU27 average, they converged between 2012-2015 but the differential remained broadly stable since.(See **Figure 155**)

— Prices in China began at a comparable level to EU prices but declined in 2011 to levels below the EU price levels. They have declined further since 2018 increasing the divergence with the EU prices. (See **Figure 155**)

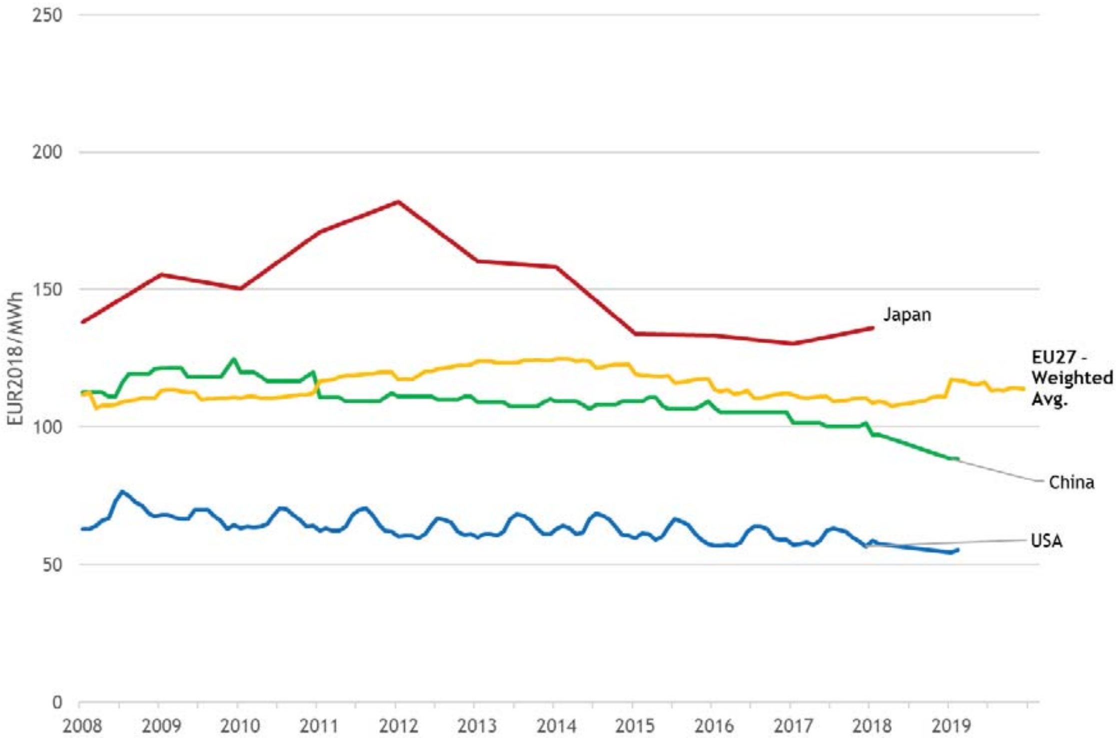


Figure 155 – Retail electricity prices for industry: EU vs China, Japan & US, 2008-2019

Sources: Eurostat, CEIC and IEA

— Most other non-EU G20 countries (Canada, India, Russia, Mexico, South Korea, Saudi Arabia, and Turkey) also have lower prices than the EU average. Only Brazil has higher prices. Prices in Turkey fluctuate importantly but they were rapidly converging in the last years. Prices in South Korea also show a converging trend to EU levels (as prices do in Saudi Arabia and South Africa but from much lower levels). Mexico significantly decreased since 2014 and continue diverging from the EU prices. (See **Figure 156**)

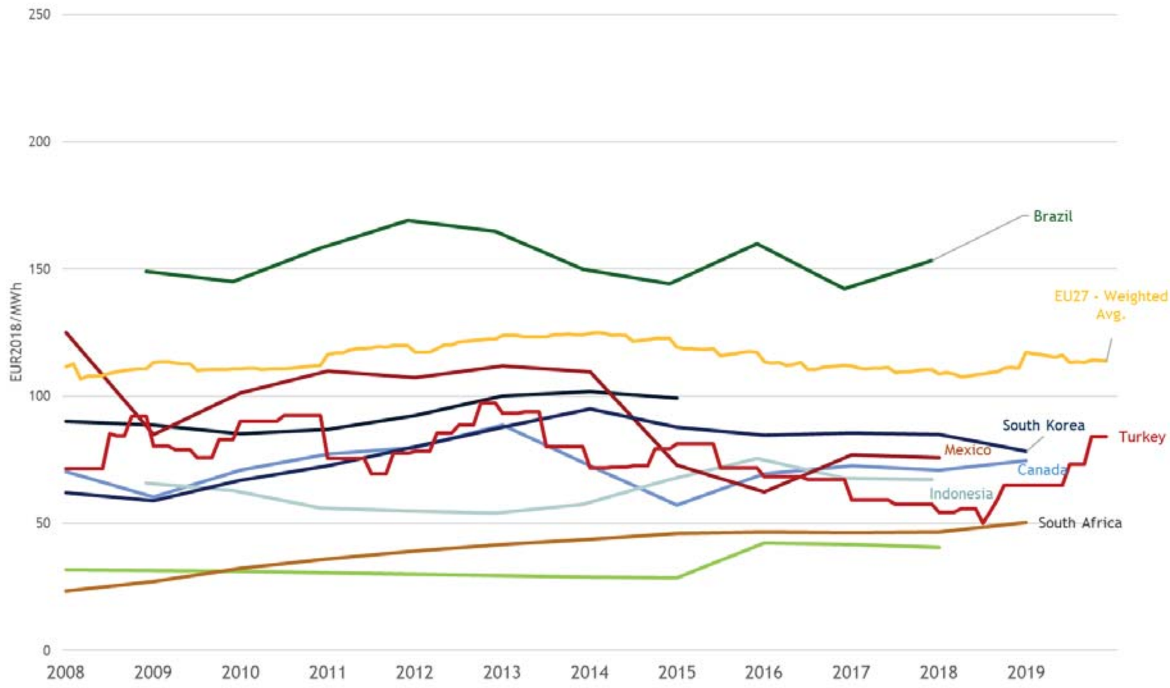


Figure 156 - Retail electricity prices for industry: EU vs other G20, 2007-2019

Sources: Eurostat, CEIC, IEA, ERRA

For Argentina, Australia, India there is only information from price indices (and not absolute price data). The indices' evolution show that average prices have rose by 20% since 2008 (+1.1%/year) while real price indices fell in Argentina and, to a lesser extent, in India. The Australian price index rose in real terms by more than 60%, moving in a similar way as wholesale prices in that country. – See **Figure 157**

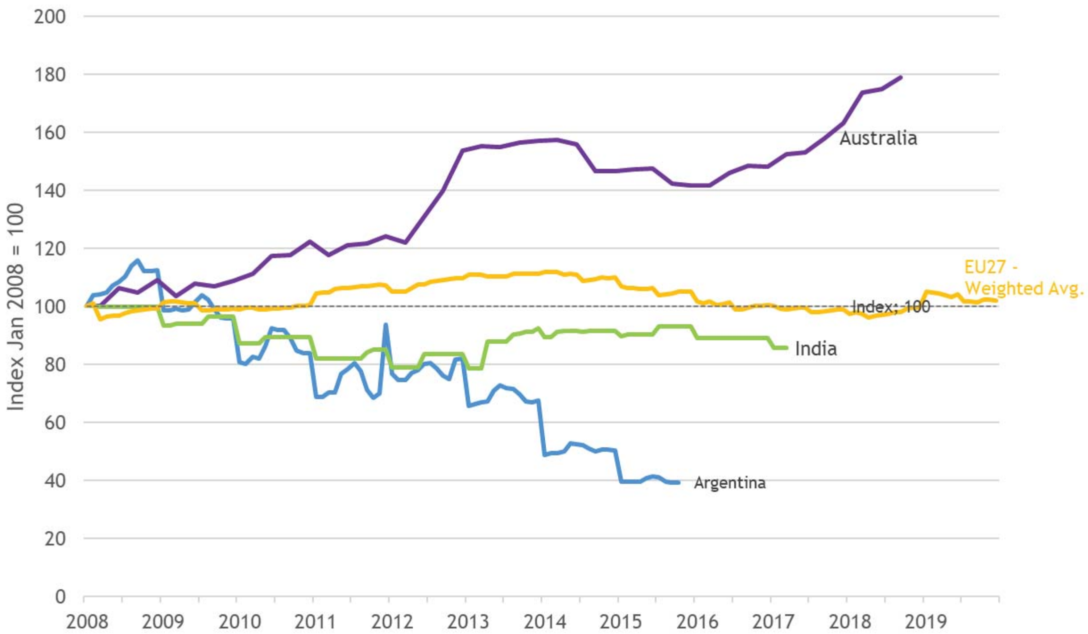


Figure 157 – Retail electricity indexes prices for industry: EU vs Argentina, Australia & India, 2008-2019

Sources: Eurostat, CEIC and IEA

- In 2008, the EU weighted average price was higher than prices in 11 countries, while in 2019 it was higher than 13 countries. Price gaps (in constant real prices 2018) did not evolve favourably for the EU with its most important trade partners as EU prices increased (by around 20%) while prices decreased in many non-EU G-20 countries. The price gap with the US and China (which was favourable for these two countries at the start of the period analysed) has widened slightly while the gap with Japan (which was favourable for the EU) has decreased. Over the whole period (2008-2019), the evolution of the price gap with non-EU G-20 countries was mixed, it was favourable (positive) with Argentina, Australia, Saudi Arabia, South Korea, South Africa and Turkey. It was not favourable (negative) with Brazil, Canada, Indonesia, India and Mexico– See **Table 23**

Table 23 - Changes in retail industrial electricity prices compared to EU prices, constant 2018 EUR/MWh

Country	Start price [EUR2018]	End price [EUR2018]	Change EUR	Change %	Start Gap [EUR]	End Gap [EUR]	Difference [EUR]	Relative for EU
EU27	111.72	116.25	4.53	4.1%				
Argentina	15.86	37.96	22.11	139.4%	-95.87	-78.28	17.58	Positive
Australia	74.66	142.14	67.48	90.4%	-37.06	25.89	62.96	Positive
Brazil	149.09	153.38	4.29	2.9%	37.37	37.14	-0.23	Negative
Canada	70.39	74.74	4.35	6.2%	-41.33	-41.51	-0.17	Negative
China	112.73	88.35	-24.38	-21.6%	1.01	-27.90	-28.90	Negative
India	90.19	99.20	9.01	10.0%	-21.53	-17.05	4.48	Positive
Indonesia	65.76	67.29	1.53	2.3%	-45.96	-48.96	-3.00	Negative
Japan	138.27	135.98	-2.28	-1.7%	26.54	19.74	-6.81	Negative
Mexico	125.07	75.78	-49.29	-39.4%	13.35	-40.47	-53.82	Negative
Russia								
Saudi Arabia	31.76	40.63	8.86	27.9%	-79.96	-75.62	4.34	Positive
South Africa	23.36	50.35	26.98	115.5%	-88.36	-65.90	22.46	Positive
South Korea	61.94	78.35	16.41	26.5%	-49.78	-37.89	11.89	Positive
Turkey	71.43	84.19	12.77	17.9%	-40.29	-32.05	8.24	Positive
USA	62.83	55.28	-7.56	-12.0%	-48.89	-60.97	-12.08	Negative

Source: Trinomics et altri study.

Note: a positive impact for the EU is recorded if the price gap has improved over time, e.g. that if a country had lower prices initially the gap is now smaller or prices are higher than the EU average, or if a country had higher prices and that the gap has increased. A negative impact is recorded if a country had lower prices than the EU, and that the gap has now increased, or if the country had higher prices than the EU but this gap has narrowed or the country now has lower prices.

— The analysis of the drivers of international prices (see **Table 24**) shows that beyond the evolution of domestic prices, monetary effects (inflation and exchange rate changes) also played a significant role in the evolution of nominal prices.

— High inflation played a key role in pushing up prices in countries like Brazil (+75%) and Turkey (+65%) as well as Indonesia and Mexico (>= +30%). In Turkey the effects of high inflation and rises in domestic prices were significantly mitigated by the exchange rates depreciations. In China and US domestic prices fell and inflation and in particular exchange appreciations of the domestic currencies against the Euro, pushed prices up.

Table 24 - Factors in observed industrial retail electricity price changes per country, nominal prices per MWh

Country	Start date	End date	Nominal Start price EUR	Change due to inflation [EUR]	Change due to price change in national currency [EUR]	Exchange rate effect [EUR]	Total change [EUR]	Nominal End price EUR	Change due to inflation [%]	Change due to real price change in national currency [%]	Exchange rate effect [%]	Total change [%]
EU27	2008-1	2019-12	**100.55**	12.39	2.90	0.00	**15.29**	**115.84**	12.3%	2.9%	0.0%	**15.2%**
Argentina	2008-1	2019-1	**10.85**	34.91	320.44	-325.95	**29.40**	**40.25**	321.7%	2952.5%	-3003.3%	**270.9%**
Australia	2008-1	2019-1	**57.99**	12.80	66.27	6.17	**85.24**	**143.24**	22.1%	114.3%	10.6%	**147.0%**
Brazil	2008-12	2017-12	**111.68**	74.25	-5.54	-30.92	**37.79**	**149.47**	66.5%	-5.0%	-27.7%	**33.8%**
Canada	2008-1	2019-1	**48.18**	7.23	25.61	-1.78	**31.06**	**79.24**	15.0%	53.2%	-3.7%	**64.5%**
China	2008-1	2019-2	**62.87**	19.44	-15.69	26.20	**29.95**	**92.83**	30.9%	-25.0%	41.7%	**47.6%**
India	2008-1	2015-1	**72.52**	33.38	18.38	-24.81	**26.95**	**99.47**	46.0%	25.3%	-34.2%	**37.2%**
Indonesia	2008-12	2017-12	**40.72**	22.75	7.81	-3.43	**27.13**	**67.84**	55.9%	19.2%	-8.4%	**66.6%**
Japan	2008-1	2018-1	**94.64**	-1.35	18.95	19.44	**37.04**	**131.69**	-1.4%	20.0%	20.5%	**39.1%**
Mexico	2008-1	2018-1	**85.61**	37.79	-17.91	-32.10	**-12.22**	**73.38**	44.1%	-20.9%	-37.5%	**-14.3%**
Russia	No data											
Saudi Arabia	2008-1	2018-1	**21.74**	3.62	7.56	6.42	**17.60**	**39.34**	16.6%	34.8%	29.5%	**80.9%**
South Africa	2008-1	2019-1	**19.97**	12.55	46.72	-27.58	**31.69**	**51.64**	62.9%	234.0%	-138.1%	**158.7%**
South Korea	2008-1	2019-1	**42.40**	7.66	26.65	6.36	**40.67**	**83.07**	18.1%	62.9%	15.0%	**95.9%**
Turkey	2008-1	2019-12	**64.29**	65.24	192.00	-235.87	**21.37**	**85.66**	101.5%	298.7%	-366.9%	**33.2%**
USA	2008-1	2019-2	**43.01**	7.96	-5.52	13.48	**15.92**	**58.94**	18.5%	-12.8%	31.3%	**37.0%**

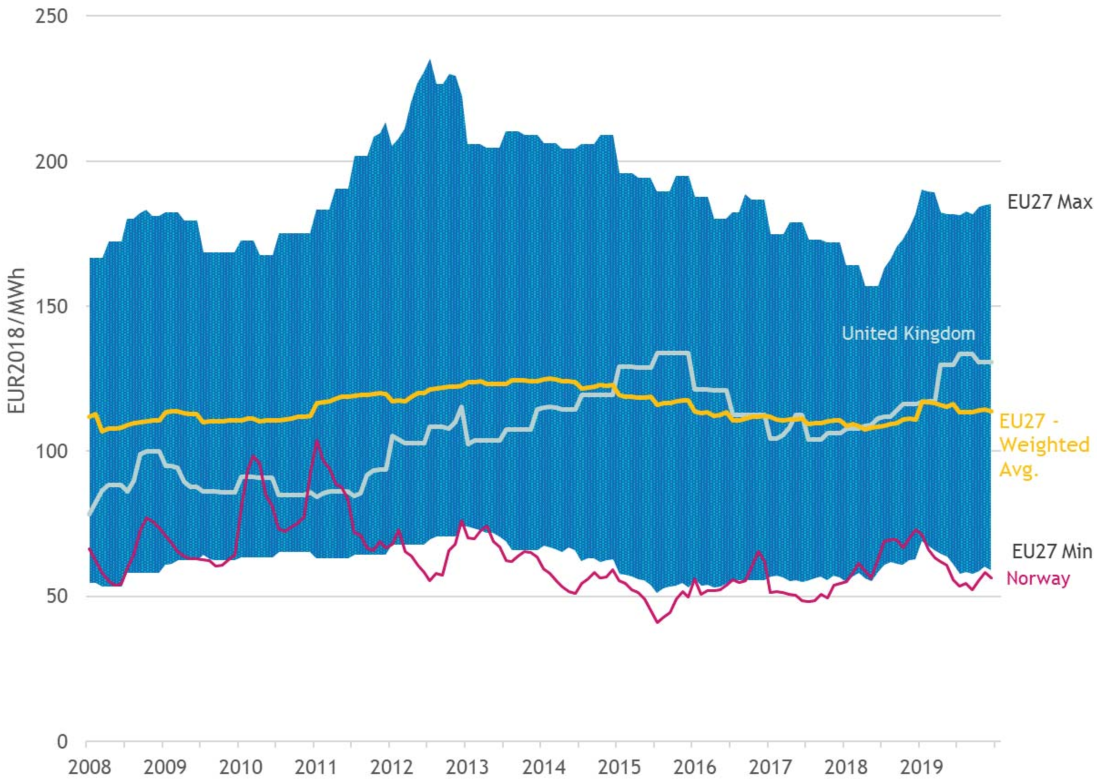
Source: Trinomics et altri.study

Explanation: this table shows the different components of the observed nominal price change, decomposed into inflation, price change and exchange rate effects. By summing the components between the Nominal start price EUR and Total change [EUR] the total change can be calculated, this corresponds to the difference between the Nominal Start price EUR and the Nominal End price EUR.

Note: this table presents nominal prices, differences can be observed with the previous table which used constant prices, the start prices differ due to application of the currency deflator for the constant price calculation, whilst the end prices differ due to small differences in the conversions used in the two calculations, this latter difference is typically less than +/- 5% of the price.

Note on the range and dispersion of electricity prices for industry in the EU

The industrial electricity prices in the EU Member States have spanned a range of 50-230 EUR/MWh between 2008 and 2019 (see figure below looking at the maximum and minimum prices registered in MS between 2008–2018)



.

Figure 158 - Range of retail electricity prices for industry in the EU

Source: Eurostat, Trinomics et altri (2020)

The wide range in prices does not necessarily mean that there is big dispersion in Member States prices. It reflects steady price differentials between Member States/regions (i.e. Members with consistently higher or lower prices than the EU average) but also short lived or temporary price divergences (e.g. price spikes) in some countries. The dispersion of EU prices can be better assessed by the Box plot figure below (in which the square shows the range of the prices of the 25% of the Member States being above the average and 25% of the Member States being below the average price (i.e. 50 of the sample))

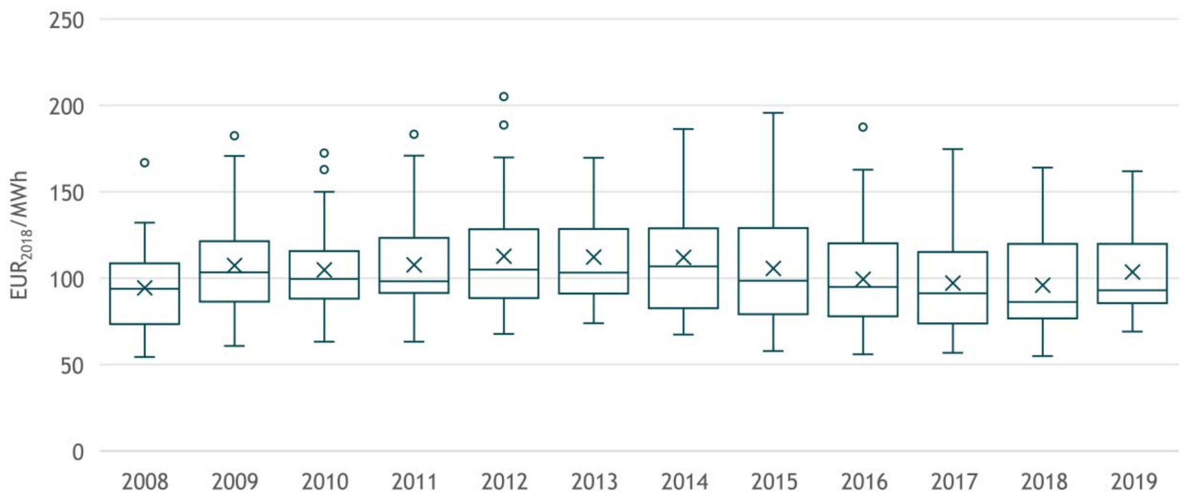


Figure 159 - Box plot of EU27 industrial retail electricity prices 2008-2019

Source: Trinomics et altri (2020)

The figure below helps to identify the Member States with prices close to the maximum and minimum range and those showing significant steady deviations from the average.

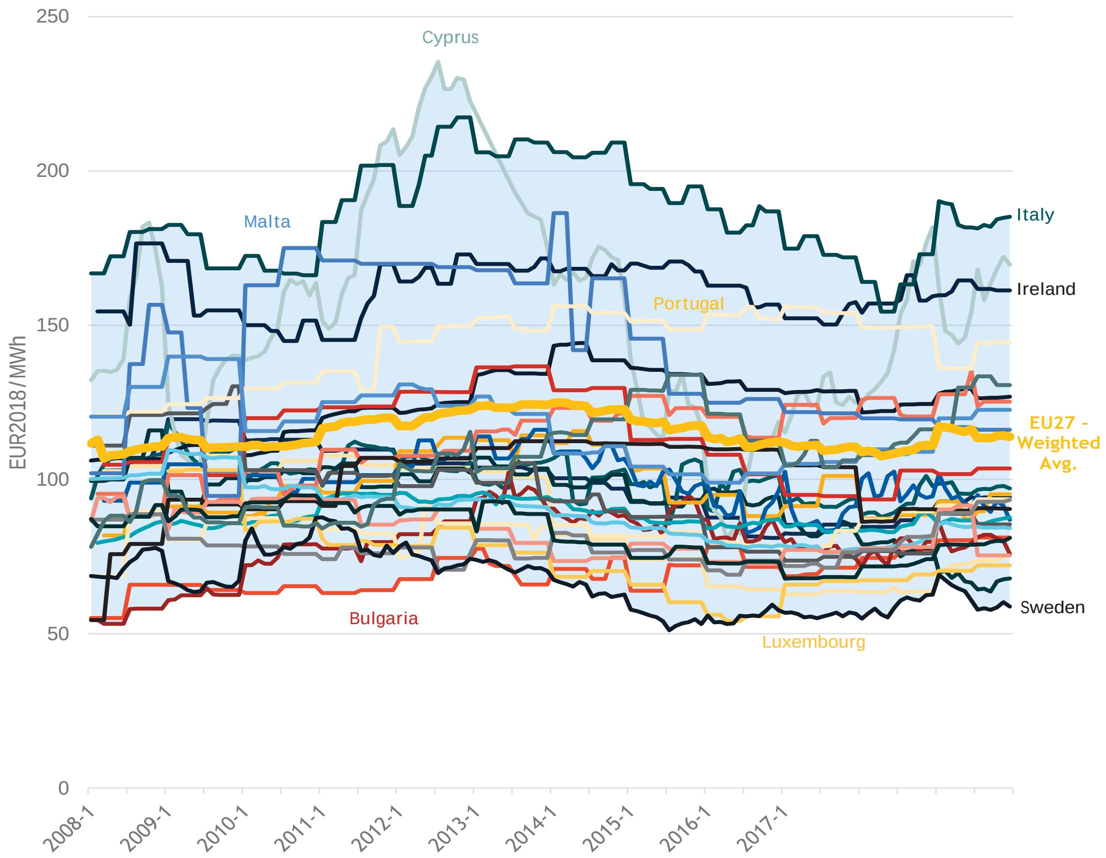


Figure 160 - EU27 industrial retail electricity prices 2008-2019, individual Member States lines visible, outliers named

Source Trinomics et altri (2020)

6.5.4 Industrial gas prices: EU vs G20 countries

In this section the retail gas prices for industries of the EU27 are compared with G20 countries over the period 2008-2019. Retail gas prices for industries also have relatively complete datasets until 2019. Prices exclude VAT and all recoverable taxes and levies. The main highlights of the period are:

— EU prices were in the range of 25-40 EUR/MWh until 2019. Since 2016 they have declined to a level below 25 EUR/MWh (marking a fall of around 20-25% over the 2008-2017). In 2020, amid the crisis triggered by COVID, prices fell to historical lows (e.g. 3 EUR/MWh in the Dutch gas price hub)

— Industry gas prices in the **US** (and **Canada**) are considerably lower than the EU average. They were similar to those of the EU in 2008 (around 30 EUR/MWh), but then declined to 10 EUR/MWh in 2016 and remained around that level until 2019. Prices in **China** have declining since 2015 reaching 35 EUR/MWh at the end of 2019. Prices in **Japan** prices increased between 2009 and 2014 (diverging from the EU average), declined strongly between 2014-2016 (to just above EU levels) but have been increasing during the last two year for which data is available (until 2018). – See **Figure 161**

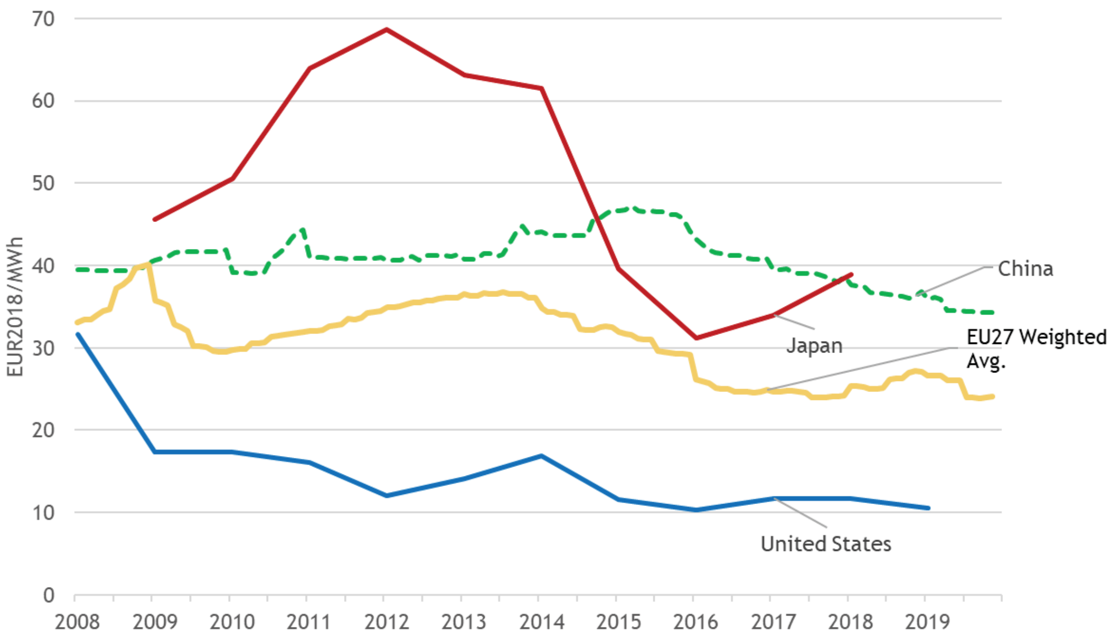


Figure 161 - Retail gas prices for industry: EU vs China, Japan and the US, 2008-2019

Sources: Trinomics (2020) based on Eurostat, CEIC

Note: the Chinese wholesale price is an assumed proxy price based on Usage Price: 36 City Avg: gas for Industrial users. Actual wholesale prices, to the extent they exist in China, are likely to be lower

— Prices in **Turkey** fluctuate while overall displaying a similar trend to the EU average, to which they have been converging since 2018. **South Korean** prices followed similar evolution of other Asian countries but they were relatively stable since 2016. Prices in **Brazil, Mexico** continue to be around half the EU levels, comparable to those in the US (and Canada). Prices in **Saudi Arabia** and **Argentina** are the lowest of all (below 5 EUR/MWh), possibly kept at those low levels by policy regulation (although they have been increasing since 2015-2016). – See **Figure 162**

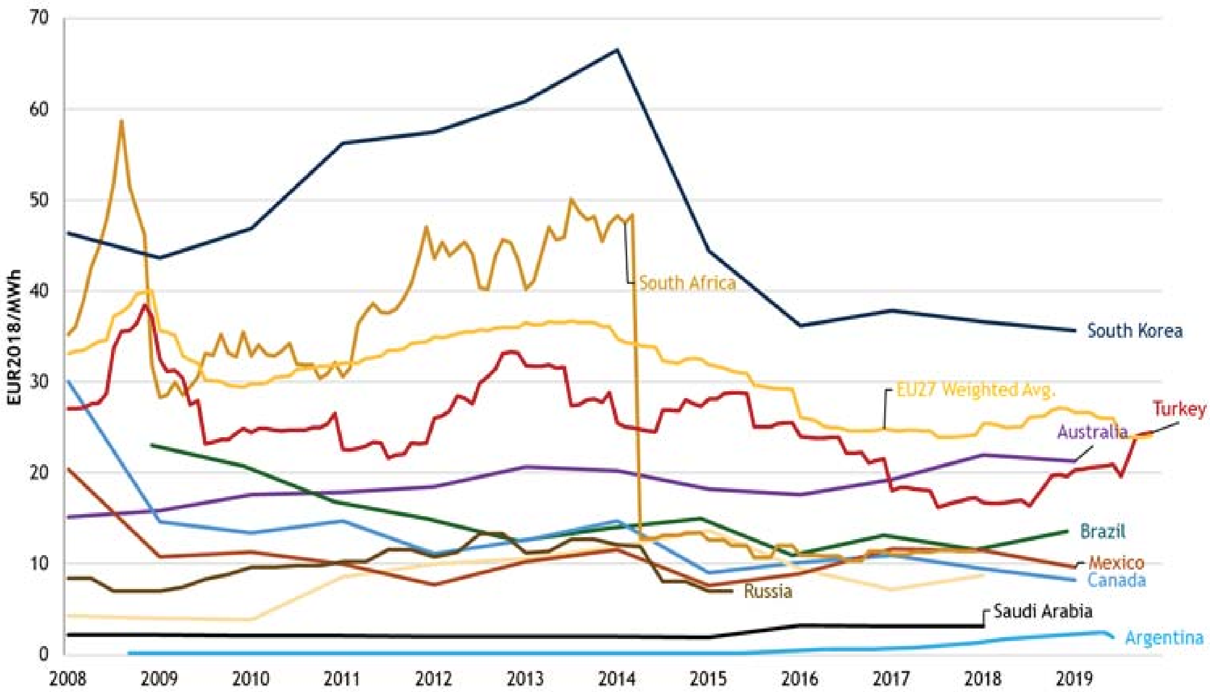


Figure 162 - Retail gas prices for industry: EU vs other non-EU G20 countries, 2008-2019

Sources: Trinomics (2020) based on Eurostat, CEIC, ERRA, IEA

— Price differential (in 2018 euros) did evolve favourably for the EU with regard to more than half of the countries including important trade partners such as China, Turkey, Japan and Russia (and also India, Australia and Saudi Arabia). The price gap evolved unfavourably with the US and Canada (in which prices fell more than the EU average). The price gap with, China, Turkey, Japan and Russia evolved positively for the EU as the prices in these countries fell less than in the EU. (see **Table 25**)

Table 25 - Changes in the industry retail natural gas price differential compared to EU prices between 2008-2019 (constant 2018 euros per MWh)

Country	Start price [EUR2018]	End price [EUR2018]	Change EUR	Change %	Start Gap [EUR]	End Gap [EUR]	Difference [EUR]	Relative for EU
EU27	33.14	24.07	-9.07	-27.4%				
Argentina	0.20	1.94	1.75	891.1%	-32.94	-22.13	10.81	Positive
Australia	15.18	21.35	6.17	40.6%	-17.95	-2.72	15.23	Positive
Brazil	23.06	13.60	-9.46	-41.0%	-10.07	-10.47	-0.40	Negative
Canada	30.07	8.24	-21.83	-72.6%	-3.07	-15.83	-12.77	Negative
China	39.52	34.27	-5.25	-13.3%	6.39	10.20	3.81	Positive
India	4.33	8.80	4.47	103.4%	-28.81	-15.27	13.54	Positive
Indonesia								
Japan	45.61	38.93	-6.68	-14.7%	12.47	14.85	2.38	Positive
Mexico	20.44	9.61	-10.84	-53.0%	-12.69	-14.46	-1.77	Negative
Russia	8.44	7.00	-1.44	-17.1%	-24.69	-17.07	7.62	Positive
Saudi Arabia	2.17	3.12	0.95	43.9%	-30.96	-20.95	10.02	Positive
South Africa	35.27	11.39	-23.88	-67.7%	2.13	-12.68	-14.81	Negative
South Korea	46.38	35.68	-10.71	-23.1%	13.25	11.61	-1.64	Negative
Turkey	27.07	24.43	-2.64	-9.8%	-6.06	0.36	6.42	Positive
USA	31.69	10.58	-21.11	-66.6%	-1.44	-13.49	-12.04	Negative

Source: Trinomics et altri study (2020)

Note: a positive impact for the EU is recorded if the price gap has improved over time, e.g. that if a country had lower prices initially the gap is now smaller or prices are higher than the EU average, or if a country had higher prices and that the gap has increased. A negative impact is recorded if a country had lower prices than the EU, and that the gap has now increased, or if the country had higher prices than the EU but this gap has narrowed or the country now has lower prices.

Between 2008 and 2019, the analysis of the factors driving price differential (see **Table 26**) shows that:

- EU nominal prices in Euros decreased by 9% over the period. Nominal prices in national currency decreased very significantly in South Africa (-30%), significantly in the US, Canada and Mexico (around -15%), similarly to the EU in Brazil (-8%) and technically in China and South Korea (- 3%). Prices, increased in all other non-EU G20 countries, especially in Turkey (+40%).
- Inflation pushed prices up especially in Turkey (+25%), South Africa (17%), Brazil (+11%) and Mexico (10%), moderately in China (7%), South Korea (6%) and mildly in the US (4%) and Canada (3%). Prices decreased in Japan (only technically, -0.3%)
- Exchange rate played important role in pushing prices downwards in Turkey (-66%), Argentina (-15%) and moderately in countries like South Africa, Brazil, Mexico, Japan, Russia and India (- 3-6%). Exchange rates appreciations against the Euro were important as regards China (+10%) and moderately as regards the US and South Korea (+3%).

Table 26 - Factors in observed industrial retail natural gas price changes per country, nominal prices, per MWh

Country	Start date	End date	Nominal Start price EUR	Change due to inflation [EUR]	Change due to price change in national currency [EUR]	Exchange rate effect [EUR]	Total change [EUR]	Nominal End price EUR	Change due to inflation [%]	Change due to real price change in national currency [%]	Exchange rate effect [%]	Total change [%]
EU27	2008-1	2019-11	**29.82**	3.68	-9.01	0.00	**-5.34**	**24.49**	12.3%	-30.2%	0.0%	**-17.9%**
Argentina	2008-9	2019-6	**1.49**	4.30	10.23	-14.55	**-0.02**	**1.48**	288.4%	686.2%	-975.9%	**-1.3%**
Australia	2008-1	2019-1	**11.79**	2.60	6.19	0.93	**9.72**	**21.51**	22.0%	52.5%	7.9%	**82.4%**
Brazil	2008-12	2018-12	**17.55**	10.95	-8.54	-5.05	**-2.64**	**13.64**	62.4%	-48.7%	-28.8%	**-15.0%**
Canada	2008-1	2019-1	**20.58**	3.09	-14.74	-0.20	**-11.85**	**8.73**	15.0%	-71.6%	-1.0%	**-57.6%**
China	2008-1	2019-11	**22.04**	6.82	-3.02	9.66	**13.46**	**35.50**	30.9%	-13.7%	43.8%	**61.1%**
India	2008-1	2018-1	**4.98**	2.85	4.47	-3.14	**4.18**	**9.15**	57.2%	89.7%	-63.0%	**83.9%**
Indonesia	No data											
Japan	2009-1	2018-1	**34.97**	-0.29	7.90	-4.89	**2.72**	**37.70**	-0.8%	22.6%	-14.0%	**7.8%**
Mexico	2008-1	2019-1	**18.78**	9.23	-13.75	-3.80	**-8.32**	**10.46**	49.1%	-73.2%	-20.2%	**-44.3%**
Russia	2008-1	2015-4	**5.78**	4.07	1.61	-4.18	**1.50**	**7.27**	70.4%	27.9%	-72.3%	**26.0%**
Saudi Arabia	2008-1	2018-1	**1.49**	0.25	0.80	0.49	**1.54**	**3.02**	16.8%	53.8%	33.0%	**103.7%**
South Africa	2008-1	2017-12	**30.14**	16.58	-30.12	-5.62	**-19.16**	**10.98**	55.0%	-99.9%	-18.6%	**-63.6%**
South Korea	2008-1	2019-1	**31.75**	5.74	-2.83	3.17	**6.08**	**37.82**	18.1%	-8.9%	10.0%	**19.2%**
Turkey	2008-1	2019-11	**24.37**	24.73	41.90	-66.14	**0.49**	**24.85**	101.5%	171.9%	-271.4%	**2.0%**
USA	2008-1	2019-1	**21.69**	4.02	-17.01	2.52	**-10.47**	**11.22**	18.5%	-78.4%	11.6%	**-48.3%**

Source: Trinomics et altri (2020)

Note on the range and dispersion of retail gas prices for industry in the EU

The max-min range of gas prices in the EU Member States was roughly between slightly less than 15 EUR/MWh to close to 60 EUR/MWh. The dispersion in gas is thus much lower than for electricity with most of the countries being much closer to the average price.

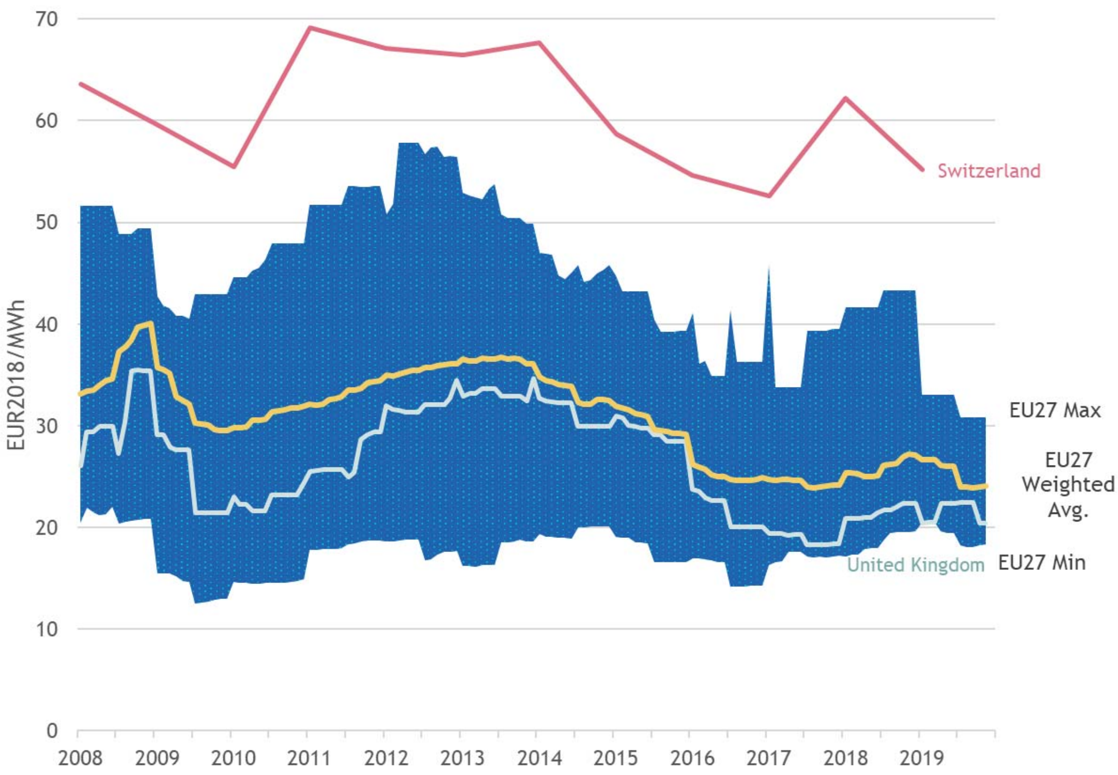


Figure 163 - Max-min range of retail gas prices for industry in the EU, 2008-2019

Sources: Eurostat

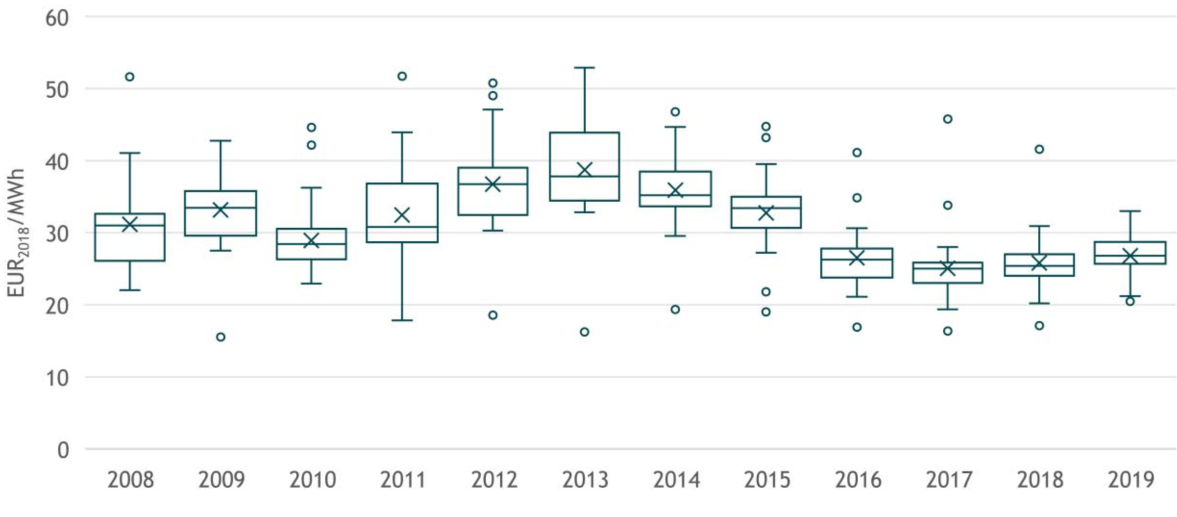


Figure 164 - Box plot of industrial gas prices, 2008-2019

Source: Trinomics et altri study

Note: the square represents the range of the prices for the 25% of countries above and below the average (50% of the sample)

The figure below identifies the Member States which are close to the maximum and minimum price levels in the range of EU price as well as those with significant deviations from the EU27 average.

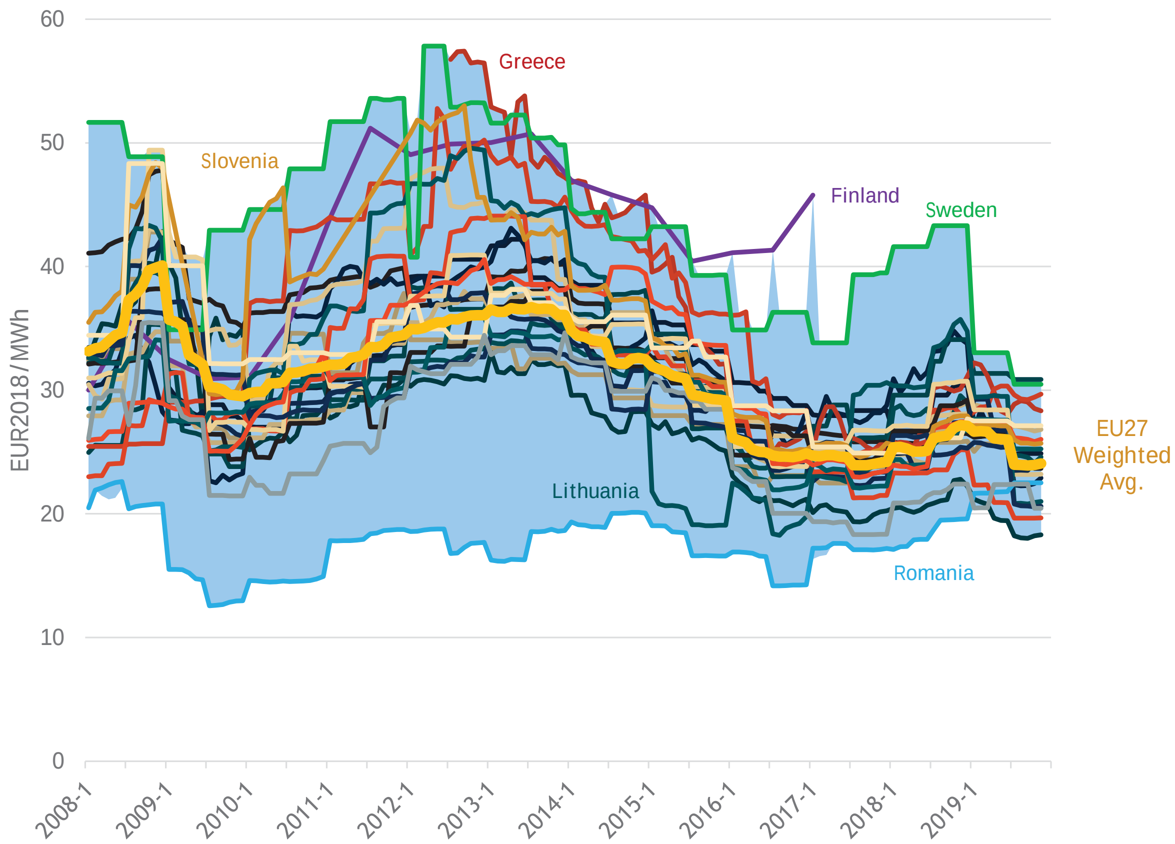


Figure 165 - EU27 industrial retail natural gas prices 2008-2019, Member States lines visible, outliers named

Source: Trinomics et altri (2020)

6.6 Overview of selected Energy-intensive Industries

In the previous sections and chapters we have analysed energy prices and costs for industry from highly aggregated statistical information (top-down approach). In this section, based on data collected from production plants (bottom-up approach), we analyse the evolution of energy prices and costs and the impact on the competitiveness of selected energy-intensive industries. This analysis at a more disaggregated level, aims at capturing the specificities of (sub-)sectors which are not reflected by the aggregated sectorial data. The results presented are based on the study commissioned by the European Commission to Trinomics et altri (2020). Primary data were collected at plant level via dedicated questionnaires.

Scope and samples

The bottom-up analysis covers the entire EU over from 2010 to 2017. It focusses on the following five sectors: *flat glass*, *zinc*, *ferro-alloys and silicon*, *refineries* and *fertilisers*.

The selection of these sectors covers various features of EU energy-intensive industries:

- Natural gas-intensive sectors (e.g. *fertilisers*, *flat glass*, *refineries*) and electricity-intensive sectors (e.g. *zinc*);
- Sectors purchasing additional energy carriers, including crude oil (e.g. *refineries*);
- Sectors concentrated in European regions (e.g. *zinc* is mainly located in Central Eastern and South Europe) and sectors geographically dispersed in Europe (e.g. *flat glass*);
- Sectors dominated by large companies (e.g. *refineries*) and sectors including many SMEs (e.g. *flat glass*);
- Net importer sectors (e.g. *ferro-alloys and silicon*) and net exporter sectors (e.g. *flat glass*) with different levels of exposure to international competition.

Table 27 shows the representativeness at EU level (share of the sample in the EU turnover or production capacity) and geographical scope of the sample over four European regions.[72] The EU representativeness of the surveyed plants samples ranges from 12% (refineries) to 97% (*zinc*) of their sector's turnover or production capacity. The results of the bottom-up analysis are based on data collected from 96 plants across six industrial sectors; participating plants reflected the average features of EU installations.

[72] Sectorial results had to be aggregated at a regional level to respect confidentiality.

Table 27 - Plants participating in the study

Sector	Number of plants by geographical region (1)					Representativeness in 2018 (2)
	Central Eastern Europe	North Western Europe	Southern Europe	Non-EU North Western Europe	Total	Share of turnover (T) or production capacity (C)
Flat glass	7	19	10	4	40	74% C
Zinc	5	1	2	-	8	97% T
Ferro-alloys and silicon	2	3	2	-	7	*NA*
Refineries	4	8	8	3	23	12% T
Fertilisers	7	3	3	-	13	90% C

Source: Trinomics (2020)

(1) **Central-Eastern Europe:** Bulgaria, Croatia, Czechia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, Slovenia; **North-Western Europe:** Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Luxembourg, the Netherlands, Sweden, the UK; **Southern Europe:** Cyprus, Greece, Italy, Malta, Portugal, Spain. Non-EU; **Non-EU North Western Europe**: UK, Norway, Iceland

(2) For illustrative purpose, figures are shown for 2018. Estimates of the representativeness may vary from year to year although with a similar order of magnitude.

Cross-sectorial findings

The straightforward relationship between high electricity consumption levels and low average prices is well established and had been already confirmed by CEPS-Ecofys[73] study (2018) which fed into the previous (2018) Report on energy prices and costs report[74]. The relation is explained by various factors: i) larger consumers of electricity are directly connected to the grids and thus do not have to pay the distribution fees ii) larger consumer have more bargaining power to negotiate their prices iii) larger consumers of electricity are sometimes exempted from specific taxes and levies on electricity prices iv) larger consumers of some industries can adapt their manufacturing processes to better exploit cheaper, baseload electricity (e.g. produce at night when prices are lower).

The new data collected by Trinomics (2020) is in line with those previous findings. It shows that the above mentioned inverse relation between prices and consumption also holds (and is possibly grounded) when the sectors' energy intensities are compared with electricity and gas prices they pay. **Figure 166** and **Figure 167** display this inverse relation.

[73] CEPS and Ecofys (2018), Composition and Drivers of Energy Prices and Costs: Case Studies in Selected Energy-intensive industries – 2018.

[74] COM(2019) 1

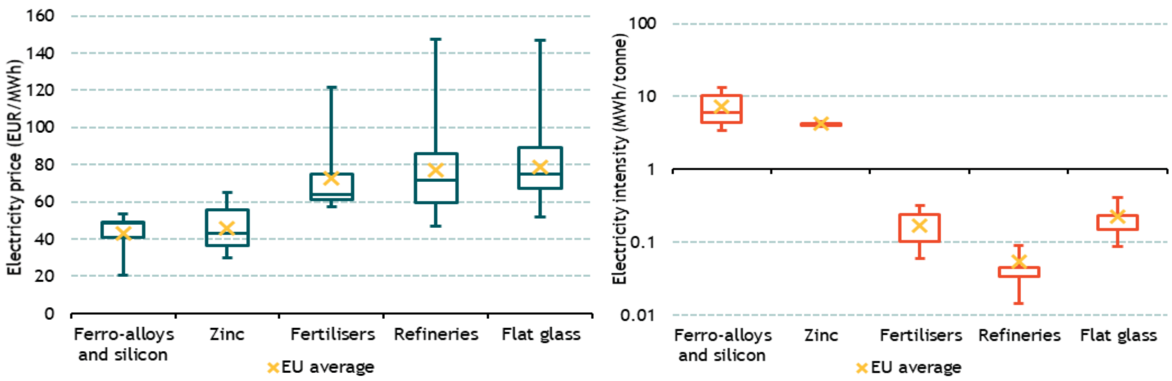


Figure 166 - Electricity prices vs energy intensity by sector (based on plant's data)

Source: Trinomics (2020)

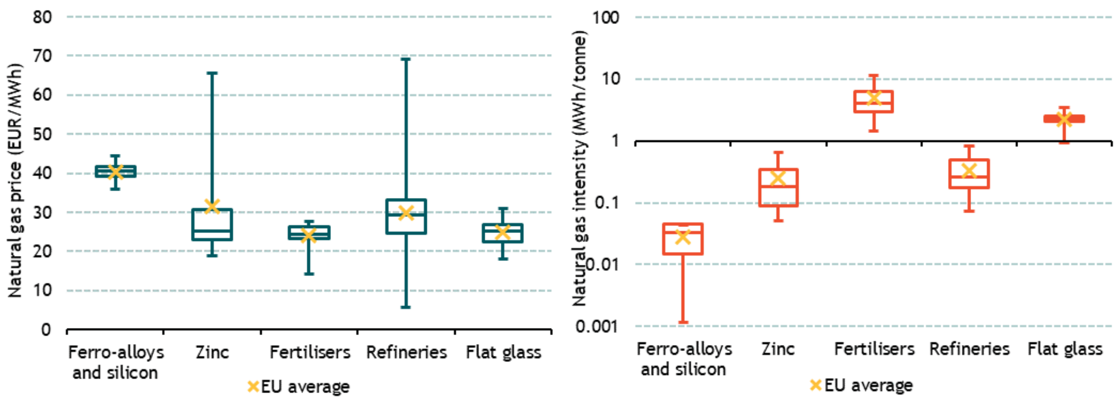


Figure 167 – Gas prices vs energy intensity by sector (based on plant's data)

Source: Trinomics (2020)

Overview of the results of selected EU energy-intensive sectors

Table 28 shows average energy prices and costs as well as energy costs shares in production costs of the selected Energy-intensive industries in Europe. Figures are presented for 2018 only, the latest year for which data was collected from all sectors. Note that natural gas costs in particular reached higher levels in 2018 than in previous years.

Electricity prices range from 40-45 EUR/MWh in the sectors with plants consuming very large amounts of electricity (*ferro-alloys and silicon*, *zinc*) to 70-80 EUR/MWh in sectors with plants with relatively smaller electricity consumption (*flat glass*, *refineries*, *fertilisers*). Similarly, sectors with large gas consuming plants (*fertilisers*, *flat glass*) appear paying much less for their gas (around 25 EUR/MWh) than the other sectors.

The energy costs shares in production costs vary widely across sectors. The highest energy costs share amongst the sectors studied was found in the very gas intensive sector of *fertilisers* (71%), followed by electro intensive sectors such as *zinc* (31%) and *ferro-alloys and silicon* (28%) and the gas intensive sector of *flat glass* (25%). Refineries, for which the sample is rather small, displayed lower energy costs shares (estimated at ~15%).

To better understand the potential impact of energy costs on the financial balances and competitiveness of the sectors studied, it is important to know about the sector's external exposure to international trade. The higher the exposure (because of exports or imports), the more relevant that the effect of the changes of the energy costs (and any other relevant production costs) could be. **Table 29** indicates the exposure of most of the sectors studied is *medium* or *high* highlighting the potential significance of energy costs for affecting the competiveness and profitability of these sectors.

Having said that, the actual impact of energy costs on the competiveness and trade balances of industrial sectors will depend on many factors, in particular the existence of divergences with competitors as regards the evolution of other relevant production costs (e.g. labour costs, non-energy raw material related costs, etc.). Indeed, competiveness is relative and depends on the developments of competitors (e.g. energy costs could fall for a sector but they would not increase its competiveness if the energy costs of the competitors fall more). A detailed analysis of energy costs and the sectors' market and trade developments can be found in the Annex of the Trinomics et altri study (2020). The analyses by sector show that overall, energy costs developments, despite being important part of production costs, did not play a decisive role in increasing or decreasing the trade balances (i.e. an indicator that 'reveals' the actual competitiveness) of the sectors studied. In recent years (2014-2016), decreases in gas costs in *fertilisers* and *flat glass* helped to increase or restore these sectors' profitability but had a limited impact on their trade balances and competiveness. In fertilisers' plants, when the share of energy costs out of total production costs plants rose again in 2018, the export/import amounts remained roughly steady. Similarly, for *ferro-alloys and silicon,* the steady increase in electricity prices and costs for the sector between 2016 and 2019 reduced its profitability but did not meaningfully impact the sector's trade balance or competitiveness. For other sectors, the impact of energy costs on profitability and competiveness is difficult to assess (*zinc*) or other factors are identified as the key factor for sector's profitability and competiveness (e.g. for *refineries* profitability is closely linked to crude oil prices; high when crude oil prices are high and low or negative with low crude oil prices)

COVID pandemic and its impact on industrial energy costs

Finally, through interaction and discussion with industry representatives during the data collection and analyses for producing the Trinomics et altri (2020) study, informal feedback has been gathered on the possible impact of COVID's pandemic on energy costs and their economic consequences for industry. COVID's pandemic has curbed significantly demand for products, reducing the sales revenues of industrial sectors and triggering reductions of production output in plants. That said, in this context of low production and sales, energy costs are not expected to play an important role in aggravating the economic situation of most energy-intensive industries. This is because COVID's induced economic crisis and mobility restrictions have also prompted a very significant fall in energy prices during the first half of 2020 (as signalled in the first chapters of this document). This sudden and notable fall in energy prices is very likely not being followed by equivalent declines in the prices of other non-energy production inputs (salaries, fees for services or prices for manufactured goods) which tend to be more stable. Moreover, while energy consumption usually declines with lower output, the use or consumption of other non-energy inputs and services (e.g. labour force, renting of offices, plants, payments of interests) tends to be more stable and difficult to reduce despite lower output of the firms. All this implies that that the purchases of energy (the energy costs) should be falling much faster than the expenditure related to other non-energy production costs, resulting in lower shares of energy costs in production costs.

That said, in certain cases, energy costs might still have a role in eroding profits in certain energy-intensive sectors. This is the case for sectors which have an important amount of their energy consumption that is fixed or cannot be reduced along with the decline in output. In these cases, the firm could be suffering a disproportionate increase in the share of their energy costs in production costs. This would apply, for instance, to sectors that have to run their furnaces 24/h despite the level of output. This information has to be taken with caution given that the sector's actual data on the recent consumption of energy and other production inputs will only be fully accounted in the coming months[75].

Table 28 Energy prices & costs in selected EU energy-intensive sectors – simple average EU, 2018.

Sector	Electricity prices (€/MWh)	Electricity costs per production quantity (€/tonne)	Electricity costs as a share of production costs	Electricity intensity (MWh/tonne)	Natural gas price (€/MWh)	Natural gas costs per production quantity (€/tonne)	Natural gas costs as a share of production costs	Natural gas intensity (MWh/tonne)
Flat glass	79	18	6%	0.23	25	54	19%	2.19
Zinc	46	191	31%	4.18	32	6.5	0.3%	0.25
Ferro-alloys and silicon	43	304	28%	7.38	40	1.1	0.1%	0.03
Refineries	77	3.7	5%	0.05	30	7	9%	0.33
Fertilisers	73	11	7%	0.17	24	114	64%	5.01

Source: Trinomics (2020).

Table 29 - Exposure of EU selected energy-intensive industris to international trade – 2017/2018

Sector	Gross exports (M€)	Gross imports (M€)	Production value (M€)	Internal consumption (M€)	IMPORT EXPOSURE (1)	EXPORT EXPOSURE (2)	EXPOSURE TO INTERNATIONAL TRADE
Flat glass[3,4]	466	270	2828	2632	10%	17%	**Medium**
Zinc[5]	1030	1152	5136	5258	22%	20%	**High**
Ferro-alloys[3,4]	657	2950	4471	6763	44%	15%	**High**
Silicon[3,4]	55	500	1456	1902	26%	4%	**Low**
Refineries[3,4]	76667	94228	123947	141509	67%	62%	**Very high**
Fertilisers[3,4]	1376	2364	18061	19050	12%	7%	**Medium**

Source Trinomics 2020
(1) Share of internal consumption served by extra-EU imports
(2) Share of production dedicated to extra-EU exports
(3) COMEXT
(4) PRODCOM
(5) Eurostat SBS

[75] Statistical data on industry consumption and other indicators becomes available with much important lag than energy price data. For instance, the latest available data in this report on industry indicators goes back to 2017 while energy price data is complete for 2019 and available for some prices for the first months of 2020.

PART III

Government revenues from energy products and taxes and levies on energy products

7 The role of energy for government revenues and inflation

7.1 Government revenues from the energy sector[76]

Main findings

- In 2018, energy taxes collected by EU Member States amounted to EUR 294 billion, equivalent to 1.85% of EU GDP. As a percentage of GDP and total tax revenue, energy tax revenue has been rather stable since the 2008 economic crisis.

- In individual Member States, the role of energy taxes in government revenues and GDP shows a significant variety: Member States with a lower GDP/capita typically have a higher share of energy taxes in both total tax revenue and from GDP.

- The energy tax revenue per 1 tonne of oil equivalent of gross inland energy consumption was EUR 177 in 2018. In real terms, this average calculated tax rate increased by 21.1% between 2010 and 2018.

- Excise duties constitute the largest part of energy taxes, amounting to around EUR 247.7 billion in 2018. When adjusted for inflation, excise duty revenues have been rather stable in 2011-2014 but increased by 2-3%/year in 2015-2018.

- Oil products (mineral oils) continue to dominate excise duty revenues, with a share consistently above 80%, although this share has slightly decreased over the last decade, at the benefit of gas and electricity. In 2018, the share of petroleum products was more than 50% in all Member States and more than 90% in 19 Member States.

- For the main oil products, the nominal excise duty revenue is gradually growing, driven by increasing excise duty rates and, in the last few years, rising consumption. In 2013-2015, growing excise duty revenues were 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 and increasing in the last couple of years.

7.1.1 Energy taxes

Taxes and duties imposed on energy products are becoming an important source of government revenue in EU Member States. In 2018, energy taxes[77] collected by EU Member States amounted to EUR 294 billion. This was equivalent to 1.85% of EU GDP and 4.59% of total revenues from taxes and social contributions (including imputed social contributions).

---

[76] This chapter analyses EU-28.

[77] Energy-related environmental taxes as defined in "Environmental taxes – A statistical guide" (http://ec.europa.eu/eurostat/documents/3859598/5936129/KS-GQ-13-005-EN.PDF/706eda9f-93a8-44ab-900c-ba8c2557ddb0?version=1.0); this category includes taxes imposed on energy production and on energy products used for both transport and stationary purposes, as well as on greenhouse gases but does not include VAT imposed on energy products

While nominal energy tax revenues increased by 27% between 2009 and 2016 (on average by 3.5%/year), as a percentage of GDP and tax revenue they remained relatively stable, showing only a marginal increase in this period.

According to the estimations of the Commission's Taxation and Customs Union Directorate-General, around 70% of energy tax revenues come from transport fuels.[78]

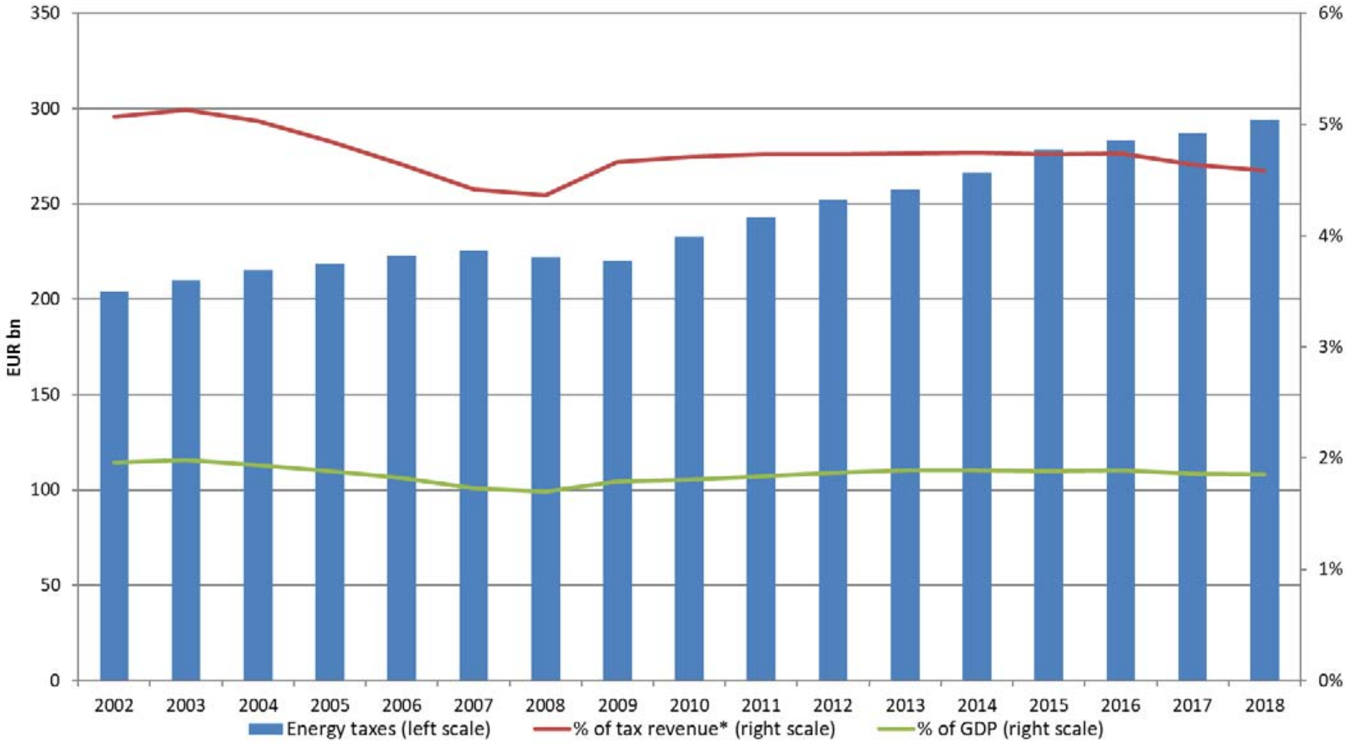


Figure 168 - Energy taxes in the EU-28

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 2018, energy taxes in Latvia made up 9.1% of total revenues from taxes and social contributions (including imputed social contributions) while this share was only 3.3% in Austria. When compared to the GDP, energy tax revenue was highest in Slovenia (3.0%) and lowest in Ireland (1.0%). Typically, Member States with a lower GDP/capita have a higher share of energy taxes from both total tax revenue and from GDP.

[78] Taxation Trends in the European Union (2018); https://ec.europa.eu/taxation_customs/sites/taxation/files/taxation_trends_report_2018.pdf

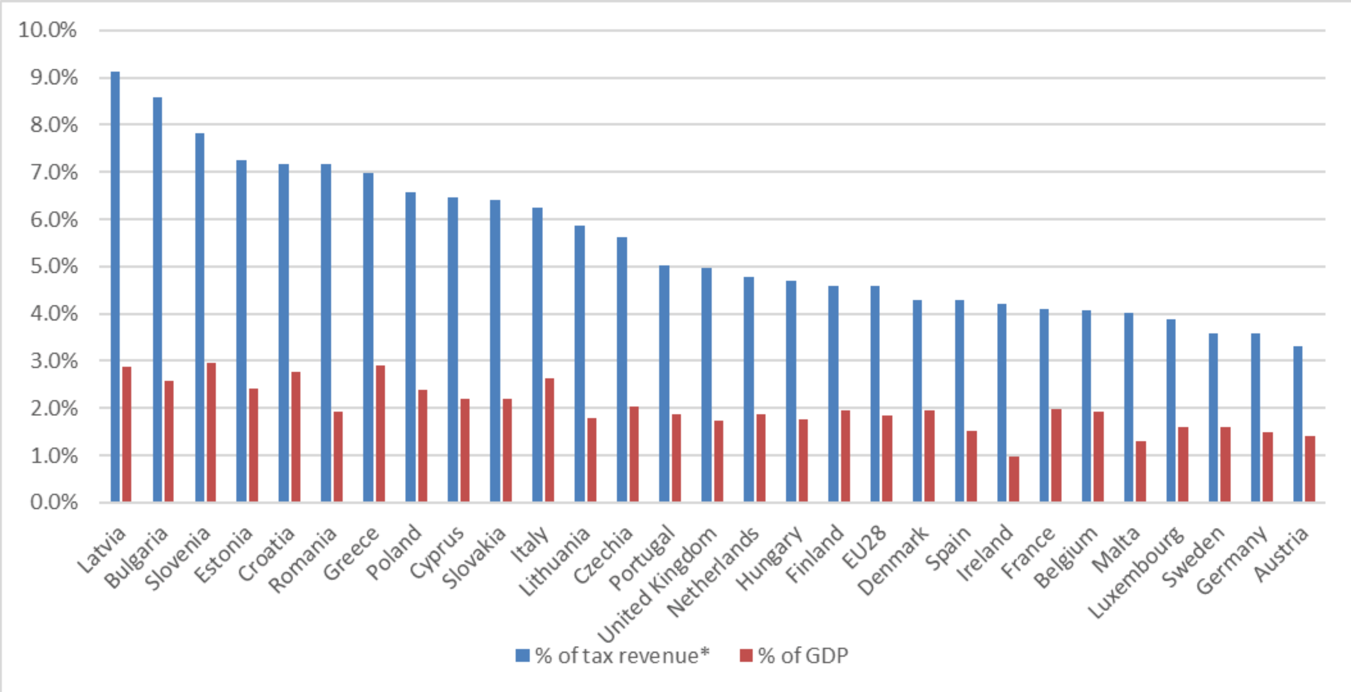


Figure 169 - Energy taxes as a percentage of tax revenue and of GDP in 2018

Source: Eurostat (data series env_ac_tax)

*percentage of total revenues from taxes and social contributions (including imputed social contributions)

Households are the main contributors to energy tax revenues: in 2018, they payed 51% of total energy taxes. This represents a small decrease compared to 2008/2009 when this share reached 53%/54%. From other economic activities, transportation, manufacturing and other services are only second in paying energy taxes with their share 10%, 11% and 11% of total energy taxes, respectively.

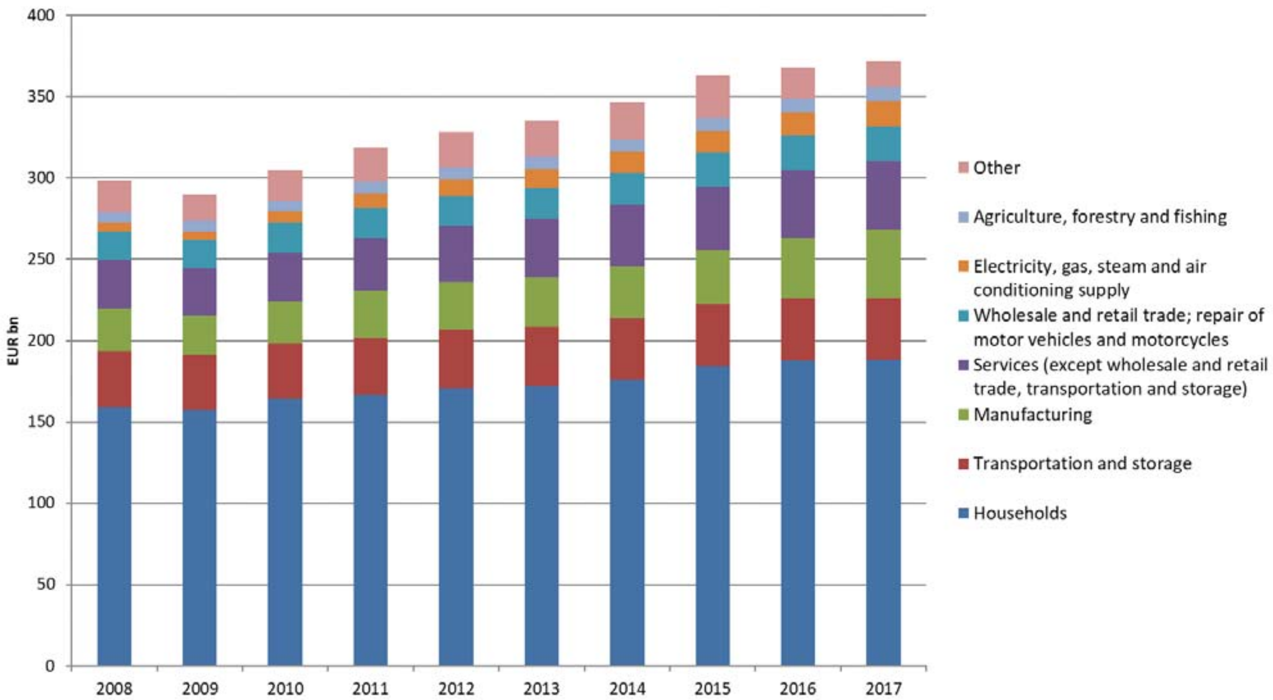


Figure 170 - Energy taxes by economic activity

Source: Eurostat (data series env_ac_taxind2)

The underlying tax base of energy taxes declined in the last decade: the EU's gross inland energy consumption decreased by 12.6% between 2006 and 2014, followed by a slight increase between 2015 and 2018 (+3.0%). This decline was more than offset by the increase of the average calculated tax rate which increased from EUR 121 per 1 tonne of oil equivalent (toe) of gross inland energy consumption in 2006 to EUR 177/toe in 2018.

When allowing for inflation, the average calculated 'real' tax rate decreased between 2002 and 2010 (with a dip in 2008) but increased afterwards. Between 2010 and 2018, the 'real' tax burden increased by 21% (by 3%/year), from EUR 142/toe to EUR 171/toe (both measured in 2015 euros).

Figure 171 – Average energy tax for 1 toe of gross inland energy consumption in the EU-28

Source: DG Energy calculation based on Eurostat data (data series env_ac_tax, nrg_100a and prc_hicp_aind)

On average, the energy tax revenue per 1 toe of gross inland energy consumption was EUR 171 in 2018, but there was a huge variation across Member States, from EUR 76 in Bulgaria to EUR 322 in Denmark. Member States with higher GDP and a higher share of oil in the energy mix tend to have higher energy taxes per 1 toe of gross inland energy consumption.

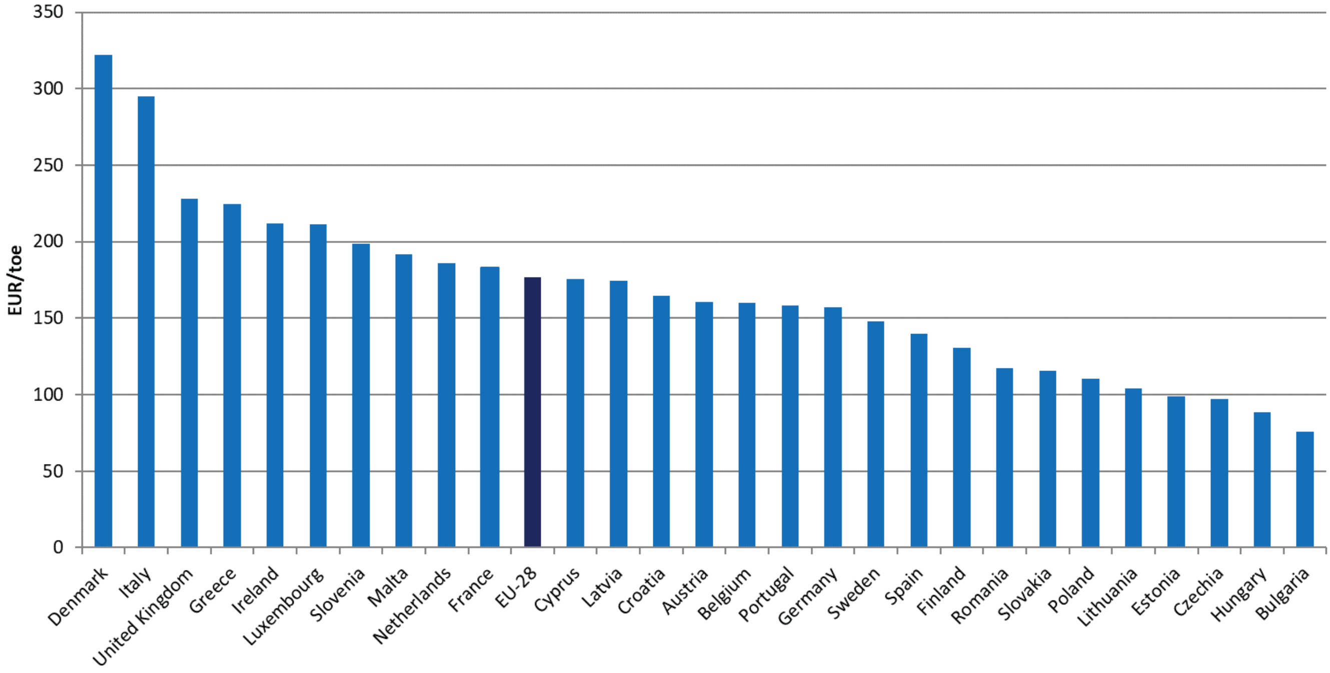


Figure 172 – Average energy tax for 1 toe of gross inland energy consumption in 2018

Source: DG Energy calculation based on Eurostat data (data series env_ac_tax and nrg_100a)

7.1.2 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 do not 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/EC174[79] (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[80] and the revenue from excise duties[81].

---

[79] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:283:0051:0070:EN:PDF

[80] https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/taxation/excise_duties/energy_products/rates/excise_duties-part_ii_energy_products_en.pdf

[81] https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/taxation/excise_duties/energy_pro

As far as revenues are concerned, the latest available data relate to 2018. According to these data, excise duty revenues amounted to EUR 247.7 billion in 2018. From 2009, total revenue shows an increasing trend.

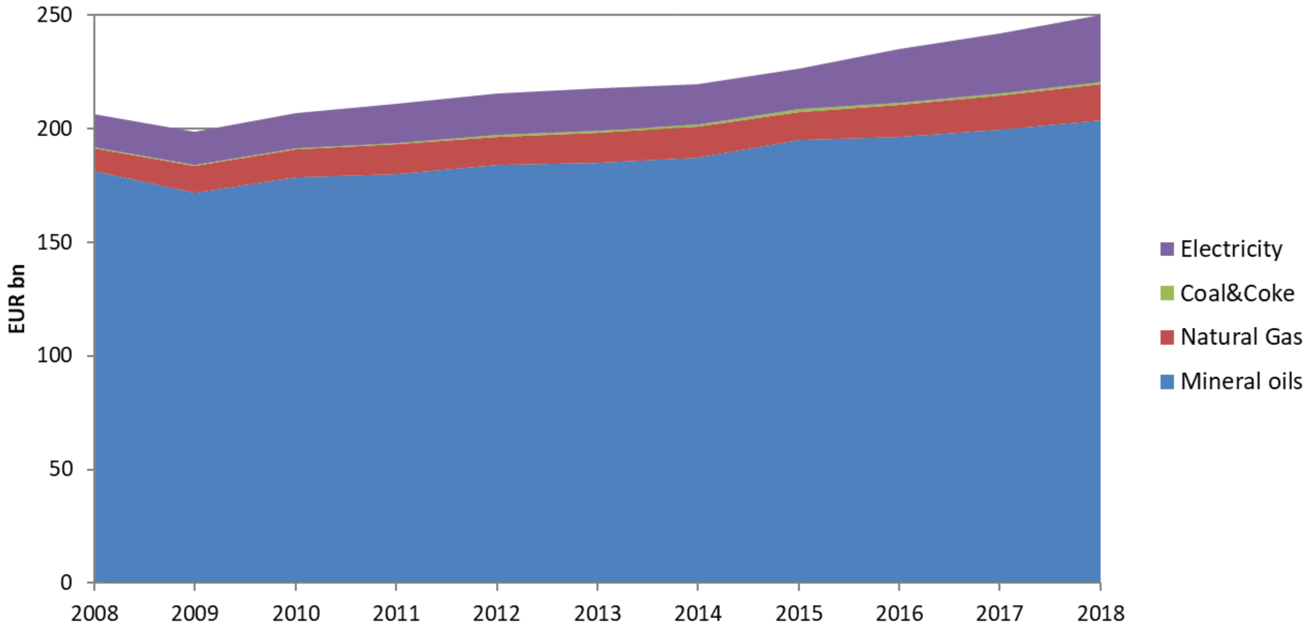


Figure 173 - Excise duty revenues from energy consumption

Source: DG Taxation and Customs Union

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 220 billion in 2014. In the last here years (2015-2018), however, real revenues increased by 3.4%, 3.5%, 1.2% and 0.5%, respectively, reaching EUR 239 billion.

ducts/rates/excise_duties_energy_products_en.pdf (at the time of writing the report, this document included revenue data for the period 2008-2018)

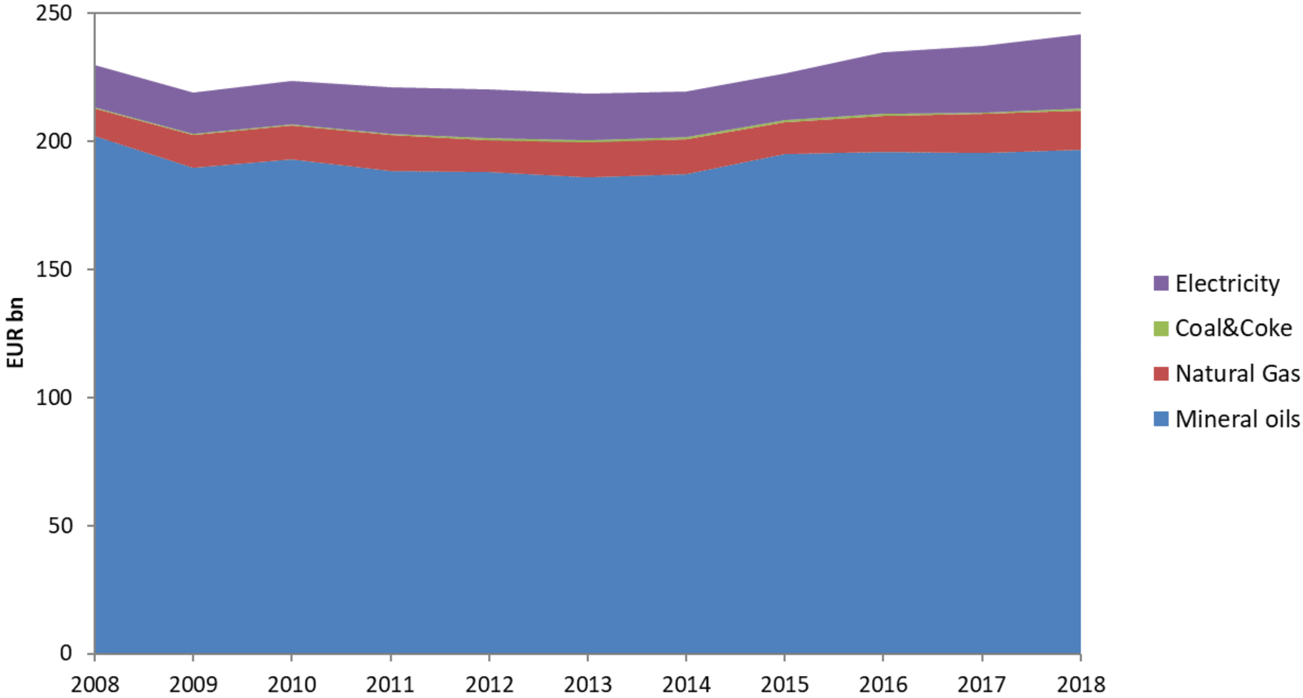


Figure 174 - Exercise duty revenues from energy consumption, adjusted for inflation (in 2015 euros)

Source: DG Taxation and Customs Union, adjusted by HICP

In 2018, oil products were the main source of excise duty revenue, covering 81.4% of all excise duty revenue from energy products. The rest was shared by electricity (11.9%), gas (6.4%) and coal (0.3%).

The share of oil products from total revenues decreased from 87.8% in 2008 to 81.4% in 2018 mainly at the benefit of gas and electricity.

Between 2008 and 2018, revenues from taxes on oil products increased by 12.3%, on gas by 62.4%, on electricity by 79.5% and on coal by 101%. In this 11-year period, inflation measured by the Harmonised Index of Consumer Prices (HICP) was 15.3%.

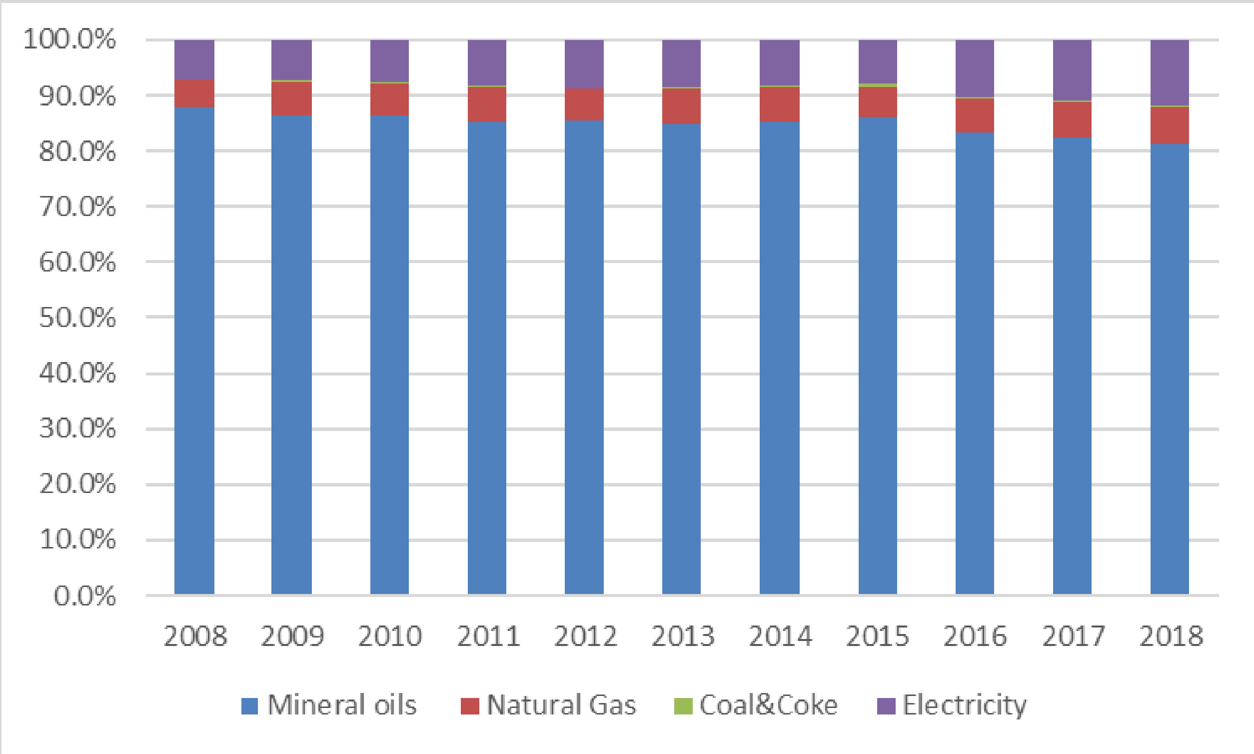


Figure 175 - The share of excise duty revenues by energy product

Source: DG Taxation and Customs Union

Oil products make up majority of the excise duty revenue in all Member States except Malta. In 17 Member States they make up more than 90%.

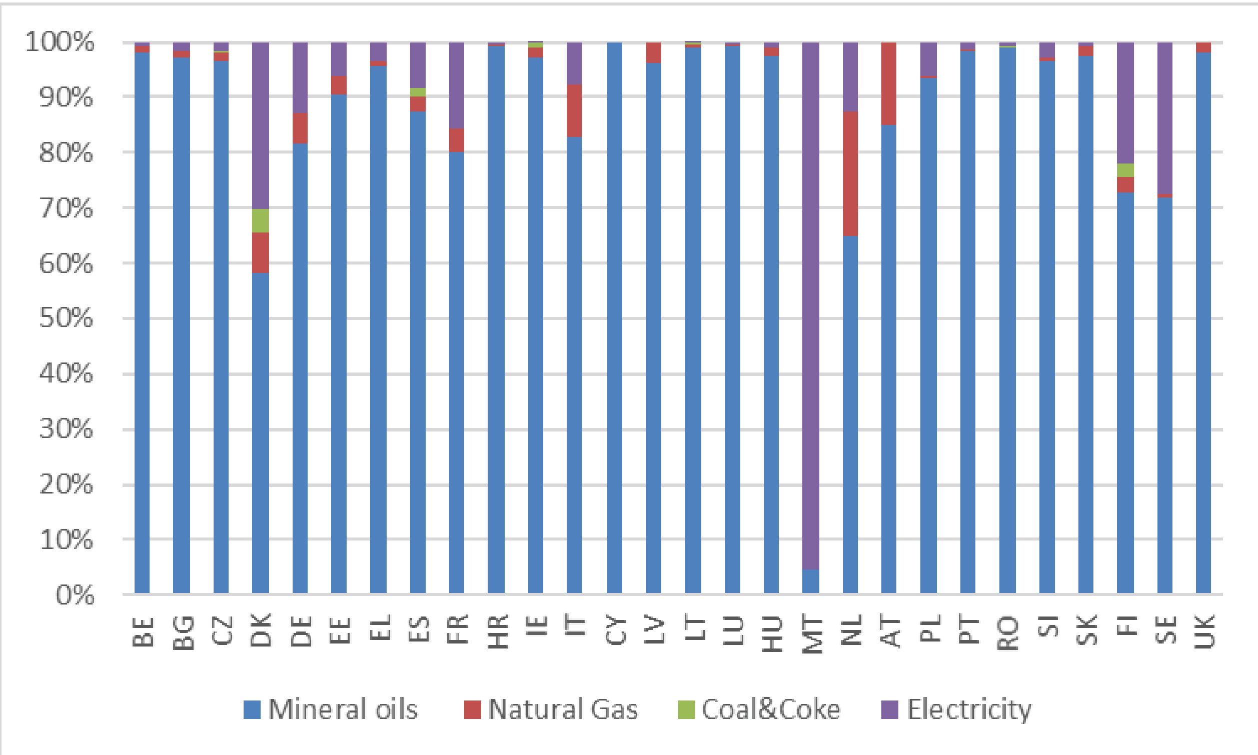


Figure 176 - The share of excise duty revenues by energy product, 2018

Source: DG Taxation and Customs Union

7.1.3 Value added tax (VAT)

VAT imposed on energy products is another important source of government revenue. However, unlike for excise duties, there is no publicly available data for VAT revenues from energy products.

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)[82] 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) for certain (including energy) products.

The EU-28 average standard VAT rate increased by 2 percentage points between 2008 and 2015 but has been rather stable since then: it was 21.5% in 2016 and 2017 and also at the start of 2018. Hungary has the highest VAT standard rate (27 %), followed by Croatia, Denmark and Sweden (all 25%). Luxembourg (17%) and Malta (18%) apply the lowest standard rate.

Figure 177 - The average standard VAT rate in the EU

Source: DG Taxation and Customs Union

[82] https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:347:0001:0118:en:PDF

About half of the Member States use reduced VAT rates for certain energy products, mainly gas, electricity, district heating, firewood and heating oil. Of course, this has an impact on household retail prices and partly explains the price differences across Member States. For example, the applicable VAT rate for gas and electricity ranges from 5% to 27%. DG TAXUD regularly publishes the VAT rates applied by Member States for different product groups/services.[83]

As a follow-up of the Action Plan on VAT[84], the Commission adopted a number of legislative proposals related to the VAT system with the objective of working towards the completion of a single EU VAT area. On 18 January 2018, a proposal was adopted to introduce more flexibility for Member States to change the VAT rates they apply to different products. According to the proposal, the current list of goods and services to which reduced rates can be applied would be abolished and replaced by a new "negative" list to which the standard rate of 15% or above would always be applied. The proposed "negative list" contains most oil products, requiring the application of the standard rate. On the other hand, Member States would continue to be able to apply a reduced rate for electricity, gas, LPG, district heating and firewood.[85]

7.1.4 Tax revenues from oil products

Oil products, especially motor fuels, are the main source of tax revenue from the energy sector for government budgets. Data from the Weekly Oil Bulletin[86] allows a more detailed analysis of tax revenues from petroleum products, including an estimation of VAT revenues (assuming that no VAT is reclaimed).

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 2005-2019.

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, weighted by consumption. For last year (2019), we used the same consumption as the previous one (2018) as the weight since the figures on 2019 consumption were not ready at the time of this study.

Based on the development of consumption, consumer prices and their components, we estimated the tax revenues collected by Member States by multiplying average yearly prices with consumption of each fuel converted to litres[87]. 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 be significantly lower.

---

83 https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/taxation/vat/how_vat_works/rates/vat_rates_en.pdf
https://ec.europa.eu/taxation_customs/sites/taxation/files/resources/documents/taxation/vat/how_vat_works/rates/vat_rates_en.xlsx

84 https://ec.europa.eu/taxation_customs/sites/taxation/files/com_2016_148_en.pdf

85 http://europa.eu/rapid/press-release_IP-18-185_en.htm

86 https://ec.europa.eu/energy/en/statistics/weekly-oil-bulletin

87 Since consumption is in kt (kilotons), we were using a factor 1135.07 to convert 1 ton of Gasoline into litre of Gasoline and 1129.94 to convert 1 ton of Diesel and Heating oil into litres.

The estimated revenue from excise duties shows an increasing trend between 2005 and 2018. Although the combined consumption of the three product groups decreased between 2008 and 2014, 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. Supported by the low oil prices and the economic recovery, fuel consumption increased in 2015-2018, giving a boost to excise duty revenues.

As the VAT is an ad valorem tax, the estimated (theoretical) VAT revenue is fluctuating in line with the net price. Accordingly, it decreased from 95.2 billion euros in 2012 to 73.8 billion euros in 2016 (a decrease of 22%). In the same period, the estimated excise duty revenue increased from EUR 188.2 billion to EUR 191 billion (an increase of 7%). In line with rising fuel prices, estimated VAT revenues increased in period 2017-2019 and estimated excise duty revenue was picking up but not as much as VAT compared to 2016.

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 offset the decrease of the VAT revenue in 2012-2018, resulting in a relatively stable tax revenue from petroleum products. When adjusted for inflation, this means the value of the tax revenue has slightly decreased.

Figure 178 - Estimated tax revenue from gasoline, diesel and heating oil, EUR bn

Source: DG Energy calculation

7.1.5 Energy taxes, prices and incentives

In a recent study (Trinomics 2020b[88]), analysis of taxes, subsidies and other levies on energy were considered. Key findings are the following[89]:

Reported tax rates on energy consumption in the EU27

— Tax rates on energy use increased by 29% between 2008 and 2018, in real terms. The total reported tax rate on energy consumption in the EU27 was EUR 25/MWh in 2018. Member states total tax rates ranged from EUR 9/MWh (Hungary) to EUR 34/MWh in 2018 (Germany), with a median of EUR 19/MWh;

— There is now more differential tax treatment by sector than there was in 2008. Rates increased the most, in absolute terms, in the non-energy-intensive industry ('non-EII'), services and construction sectors, while rate changes in the passenger road and water transport sectors were small;

— Tax rates on EIIs are three times less than on non-EIIs. And the median tax rate on EIIs is half that of non-EIIs;

— Tax rates on liquid fuels used for road transport are the highest and rates on petroleum coke and coal are the lowest. The median tax rate levied by EU MS on gasoline is EUR 60/MWh and EUR 37/MWh on diesel, while the median tax rate on solid fossil fuels (i.e. coal) is EUR 1/MWh, EUR 2/MWh on natural gas, and EUR 4/MWh on electricity.

Estimated tax revenues from taxes on energy consumption in the EU27

— Total revenues from taxes on energy consumption increased 23% between 2008 and 2018 (from EUR 219 billion in 2008 to EUR 263 billion in 2018). 47% of the revenue in 2018 was accounted for by Germany and France, and another 28% by Italy, Spain and the Netherlands. Road transport accounts for 60% of tax revenue, followed by residential (15%), then services (12%);

— Three-quarters of revenues in the EU27 were from excise taxes in 2018, and 20% were for renewables support. Between 2008 and 2018 revenues increased by EUR 50 billion, out of which EUR 40 billion were for renewable support;

— Energy-intensive industries and agriculture paid the least taxes relative to the amount of energy they consumed in 2018, whereas the road transport sectors paid the most. EIIs account for 18% of energy consumption and 2% of tax revenue, and agriculture accounts for 3% of energy use and 0.5% of tax revenue while road transport accounts for 29% of energy consumption and 60% of tax revenue;

— Revenues from taxes on electricity rose while those on gasoline fell. Taxes on diesel account for the largest share of tax revenues in 2018 (41%), as they did in 2008. Electricity accounted for 30% of tax revenues in 2018, up 15 percentage points from 2008, while the gasoline share decreased from 30% to 20%, corresponding to a drop of a fifth in gasoline consumption between 2008 and 2018.

---

[88] Trinomics et.al., (2020), ENER/2018-A4/2018-471, "Final Report: Energy Taxes: Energy costs, taxes and the impact of government interventions on investments".

[89] Some numbers can differ from Eurostat as data gathering methods and methodology is different.

Taxes on energy production and infrastructure in the EU27

— Revenues from taxes on energy production fell from EUR 21 billion in 2008 to EUR 5 billion in 2018, while taxes on infrastructure doubled to EUR 5 billion.

Taxes on energy consumption in G20 countries

— Total tax rates on passenger road transport within 11 G20 countries (including the United Kingdom, but excluding Germany, France and Italy) are, on average, half that in the EU27. The US tax rate is 40% that of the lowest EU MS tax rate (Bulgaria) and a quarter of the total EU27 rate. The rate in Japan is 20% lower than the EU27 total and equivalent to the rates in Austria, Romania, and Latvia;

— Tax rates on energy-intensive industries in Japan are twice that of the EU27 (EUR 12/MWh versus EUR 6/MWh), but tax rates on non-energy-intensive industries are a third lower (EUR 12/MWh versus EUR 18/MWh).

It could be interesting to compare the EU average prices of MWh of electricity, gas, and three main oil fuel types (gasoline, diesel and heating oil) available to the consumer on retail level[90] to get a glimpse into the rationale of the consumer choices between different energy carriers in the everyday pursue to satisfy their energy needs. The most expensive is the MWh of electricity compared to gas and fuel, which is discouraging electrification in the household sector. Relatively cheaper gas is providing incentive to heat with gas as opposed to heating oil. Of course, mobility needs are most frequently addressed by transport means fuelled by gasoline and diesel, although gas and electricity (EV) are becoming increasingly used in transport. Across the energy carriers available to households, in MWh terms, gas is the cheapest fuel, followed by oil fuels and electricity[91]. This ranking of prices applies both to nominal net prices and price with taxes included – oil fuels have the highest share of taxes (VAT, excise taxes, other indirect taxes) in the retail price compared to electricity and gas, even when we add in network fee for electricity and gas (which is 27 and 23%, respectively).

[90] Electricity price is retail price for Household DC band from Chapter 1. Gas price is retail price for Household D2 band from Chapter 2. Fuel prices for gasoline, diesel and heating oil are retail prices from Chapter 3.
[91] These are by no means perfect substitutes for number of reasons.

Table 30 – Comparison of retail prices and taxes of different energy carriers (2019)

	Electricity		Gas		Gasoline		Diesel		Heating oil	
Consumer type	Household (DC)		Household (D2)							
Component	Price 2019 per MWh	Share 2019	Price 2019 per MWh	Share 2019	Price 2019 per MWh	Share 2019	Price 2019 per MWh	Share 2019	Price 2019 per MWh	Share 2019
Energy/Gas/Fuel net price	68.5	32%	30.2	45%	60.9	40%	58.4	44%	55.8	49%
Network	57.8	27%	15.4	23%						
Taxes	87.7	41%	21.4	32%	92.2	60%	75.6	56%	57.3	51%
Total	214.0		67.0		153.1	100%	133.9	100%	113.1	100%

Source: DG ENER in-house data collection. Eurostat data. DG ENER calculation

PART IV

Prices and Costs and Future Investments

8 Realised prices and profitability in the power market

Main Messages

- Realised electricity prices have fluctuated for all technologies in the time period considered (2012-2018). Revenues obtained on European electricity markets were the highest in 2018.
- PV generated electricity was selling for a higher price than baseload power in earlier years. This price premium has been almost completely eroded over time. However, the rise in electricity prices between 2016 and 2018 has also increased the relative value of PV generated electricity. Falling prices for PV generators have led to PV reaching small but positive IRRs in some markets
- Wind power traded at a lower price than baseload power for most of the years and in most of the EU markets considered. The price discount is higher for wind onshore than for wind offshore. Investments in both wind onshore and wind offshore, in general, require support payments for reaching economic viability.
- Investments in gas-fired power generation and in coal-fired power generation face difficulties, if the plants' running hours are further eroded, as suggested by the electricity system projections used in the study.

8.1 Introduction

The significant variation of electricity prices within one day and on longer time scales is reflected in the structure of the European generation portfolio. Power stations are technically designed and economically optimised to run a given number of hours per year, during which the margin obtained needs to allow paying back the investment. This plants' margins will be largely determined by the power prices "realised"[92] at the moment of dispatch. The impact on 'realised' prices for the various generation technologies of increasing penetration of wind and solar electricity generation requires to be carefully assessed for a number of reasons.

Firstly, as PV and wind power generation is determined by meteorology and correlated over larger regions, an increasing penetration of these sources might lead to falling electricity prices at the moment of production. This can affect either the generator's profitability, if remunerated based on electricity market or the costs of the support scheme if the renewable energy resource is benefitting from a guaranteed selling price.

Secondly, conventional sources of power generation such as gas, coal, nuclear or hydropower dams will be confronted with different hourly price patterns, changing the economically optimal dispatch of these technologies. Conventional power plants may run fewer hours per year and realise lower prices as a result of an increasing penetration of wind and PV generation, eventually losing profitability.

8.2 Methodology

This report assesses the realised prices and the resulting profitability for wind, PV and conventional electricity generation technologies. It looks at both the time period 2008 -2018 and extrapolates into the future based on projections. The analysis is based on the Trinomics et altri study (2020), in which more details, and results for non-EU regions can be found.

This study determines realised prices as the annual average of hourly electricity prices weighted over the hourly generation of the respective technology within a given market (generally a country or a price zone within a country). It also collects information on payments through support schemes.

The primary metric used for measuring the economic viability of an asset is the internal rate of return (IRR), which is defined as the discount rate at which the net present value (NPV) of all cash flows related to the asset equals zero. The internal rate of return needs to exceed an investor's weighted average costs of capital (WACC) for an investment to become profitable.

---

[92] Annual "captured" or "realised" price means: sum over all hours of the total production level for a technology at every hour *multiplied* by the price at every hour divided by the total annual production for this technology.

$$p_c = \frac{\sum_{i=1}^{8760} p_i q_i}{\sum_{i=1}^{8760} q_i}$$

With p_c = annual captured electricity price; p_i = electricity price for hour i; q_i = electricity produced during hour i

This study determines the profitability of investments based on market based remuneration and on support schemes.

Hourly electricity prices and generation profiles for the different technologies were gathered from publically available sources where possible. Given the long lifetime of power generation investments, assumptions need to be made on future developments of electricity prices and plant dispatch. Such time series were obtained with the help of projections, generated with the METIS energy model[93]. Those projections are compatible with energy scenarios reaching the EU 2030 targets greenhouse gas neutrality in 2050[94].

8.3 Realised prices and business cases of key technologies

8.3.1 Solar PV

Table 31 –Maximum profitability observed for Solar PV

Country	Price	IRR (market)	IRR (support)
DE	44 EUR/MWh	-2%	6%
ES	59 EUR/MWh	- 3%	7%
FR	51 EUR/MWh	- 0%	6%
IT	58 EUR/MWh	- 2%	10%

The realised prices for solar PV generators on the EU's markets with the largest installed capacities show a significant variability over time and between different regions as can be seen in **Figure 179.** Average prices are higher on the Spanish electricity market than in France and Germany throughout the period considered. Germany, which has the highest installed PV capacity in the EU sees systematically the lowest realised prices for this form of energy. The realised prices follow the development of baseload prices shown in **Figure 4** and discussed in section 1.1 of this report. On all markets, the highest prices were obtained in 2018.

[93] More information on the METIS model can be found here: https://ec.europa.eu/energy/data-analysis/energy-modelling/metis_en

[94] See the in-depth analysis in support of COM(2018) 77, A Clean Planet for all - A European long-term strategic vision for a prosperous, modern, competitive and climate neutral economy

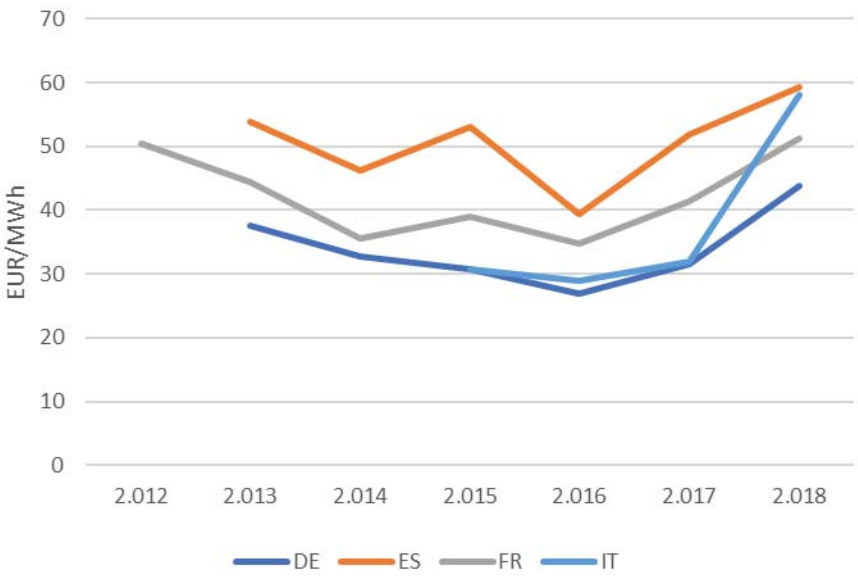


Figure 179 - Realised electricity price in EUR/MWh for solar PV

Source: Trinomics et al. 2020

The realised electricity price for PV generators as expressed in percentages of the baseload price have been fallen consistently over time (see **Figure 180**). Relative prices significantly above 100% have been falling to levels close to baseload remuneration. This trend was interrupted in the years 2017 and 2018 when relative price started rising again.

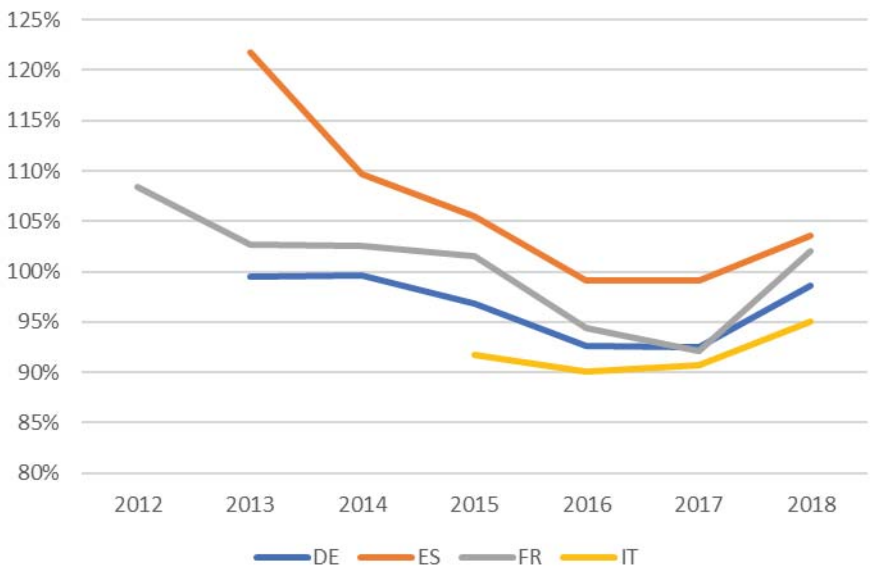


Figure 180 - Realised electricity price as percentage of baseload price for solar PV

Source: Trinomics et al. 2020

Costs for centralised PV generation have dropped by a factor of three between 2009 and 2018 and now stand below 1 000€/kW for most European countries. Yet, market based remunerations has so far not been sufficient for achieving a break-even of the investment in solar PV generation. If only considering revenues on electricity markets, the internal rate of return (IRR) for projects commissioned in 2018 ranges between -2% (Germany) and 3% (Spain) according to Trinomics et al. (2020). Market revenues are complemented by support intervention, increasingly determined by tenders as the technology is getting more mature. Taking additional revenues into account, the IRR increases to 3 - 4% for Germany and France respectively, given the assumptions on costs and market developments made.

8.3.2 Wind onshore

Table 32 – Maximum profitability observed for wind onshore

Country	Price	IRR (market)	IRR (support)
DE	47 EUR/MWh	3%	4%
ES	53 EUR/MWh	5%	10%
FR	48 EUR/MWh	4%	9%
IT	57 EUR/MWh	5%	18%

The realised electricity prices for wind onshore show similar characteristics as for the case of solar PV. Realised prices differ both over time and between regions, as can be seen from **Figure 181**, which shows the realised prices for wind onshore in the EU Member States with the highest installed capacities. As for wholesale electricity prices in general, realised prices for wind onshore electricity showed a strong increase up to 2018. The relative price of wind onshore remains below the baseload price for all regions considered. Values range between 80% (Germany average in 2017) and 99% (France average in 2017) of baseload prices.

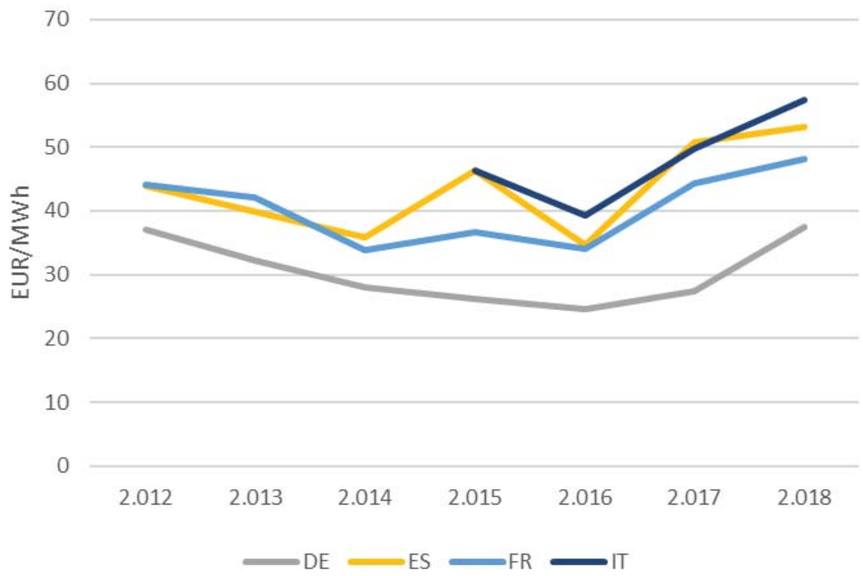


Figure 181 – Realised electricity price in EUR/MWh for wind onshore

Source: Trinomics et al. 2020

As shown in **Figure 182**, costs for wind onshore have shown a decreasing tendency between 2008 and 2018 which has, however slowed down in recent years, showing even some rebound for the case of Spain. Consequently, the internal rate of return for on-shore wind projects remunerated entirely by the electricity market has stayed rather constant over the last years, reaching 3 - 4% in 2018. Higher rates of return could be achieved when support schemes were granted, ranging between 3 - 4% in the case of Germany and 14 – 18% in case of Italy.

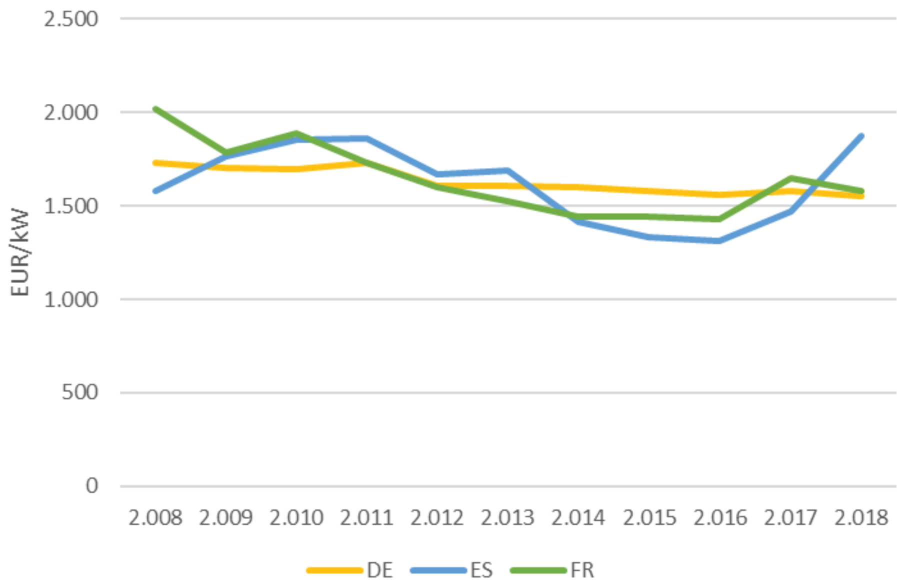


Figure 182 - CAPEX for wind onshore in EUR/kW

Source: Trinomics et al. 2020

8.3.3 Wind offshore

Table 33 – Maximum profitabvility observed for wind offshore

Country	Price	IRR (market)	IRR (support)
BE	52 EUR/MWh	3%	11%
DE	47 EUR/MWh	1%	9%
NL	50 EUR/MWh	5%	6%

Figure 183 shows the development of realised prices for wind offshore during the period of 2012 and 2018. Wind offshore sells for consistently higher prices then wind on-shore as can be seen on the example of Germany, where the average premium is 2-5 EUR/MWh. Overall, wind offshore trades at a discount (between 1 and 13% during 2015 -2018) to baseload prices. Significant differences can be observed between EU Member States with realised prices in Belgium exceeding those in Denmark by 14 EUR/ MWh in 2018.

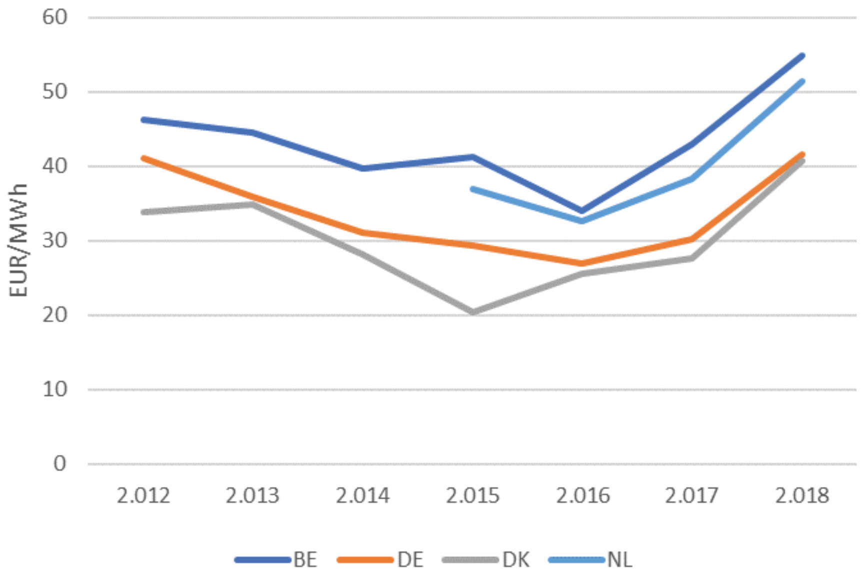


Figure 183 - Realised electricity price per as percentage of baseload price for wind offshore

Source: Trinomics et al. 2020

There is no easily identifiable trend for costs of wind offshore projects as these depend on location, distance from shore, water depth and other factors (see **Figure 184**). The variation observed from one year to another is mainly due to the low number of actual projects, which do not provide a meaningful average. The other factor is the nature of projects: distance from shore, depth of installations, location, etc. Annual averages can be influenced by individual projects.

Based on a remuneration on electricity markets, IRRs of wind offshore projects during the period of 2008 – 2018 are between -4 and 5%. Based on support remuneration, IRRs of up to 9% could be achieved for projects started in the year 2018 in Belgium or Germany.

As further elaborated in Trinomics et al. (2020), auction results of renewable energy projects seem to suggest that even offshore wind projects can be realised without subsidies. There are, however, several caveats when interpreting auction results, which may point to a higher cost and subsidy requirement if properly accounted for.

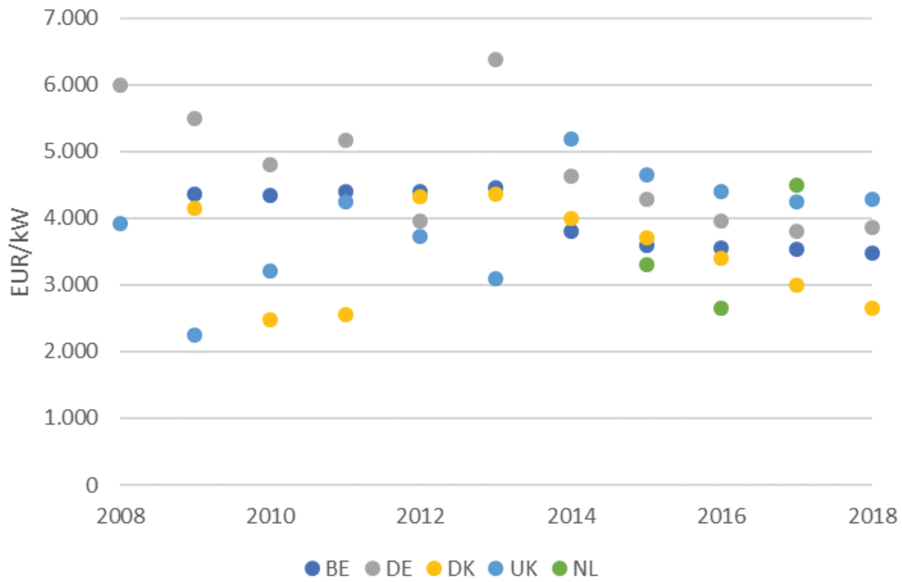


Figure 184 – CAPEX for wind offshore for selected countries

Source: Trinomics et al. 2020

8.3.4 Gas fired power generation

As opposed to wind and solar generation, gas-fired power plants realise higher than baseload power prices as they can adapt their output to changes in demand. These generators take the decision to produce electricity based on price signals, seeking to produce when market revenues cover the costs of producing an additional unit of electricity. As can be seen from **Figure 185**, realised prices for gas fired power plants are higher and vary less over time than realised prices of meteorologically driven sources. The general increase of electricity wholesale prices in the years 2017 and 2018 can be observed in the case of gas fired generation. Realised prices vary between Member States: annual averaged were between 51 and 68 EUR/MWh in 2018.

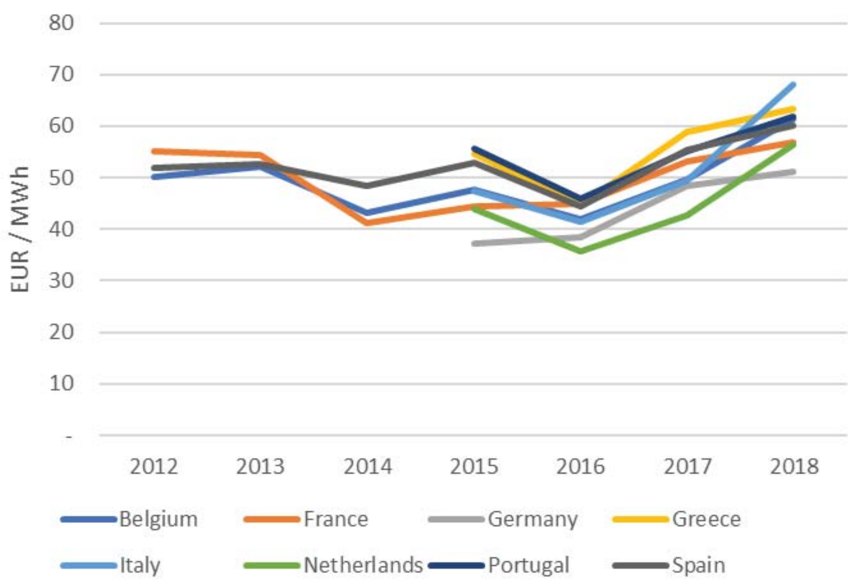


Figure 185 – Realised price for gas-fired power

Source: Trinomics et al. 2020

As a result of their flexibility, gas-fired power plants can provide system services (or ancillary services) such as frequency reserve. These provide additional revenues worth between 5-15% of the sales on electricity markets. In some cases, gas fired power plants receive capacity payments for their availability. Costs of gas fired power stations include the investment, fixed operating costs, fuel cost and costs for emission rights. These increase the number of uncertainties in the determination of profitability as a gas fired power plant built in 2018 with a life-span of 30 years could operate up to 2048 or even beyond. According to the projections used for the economic analysis, gas-fired power plants remain in the European energy mix but load factors will decrease substantially, leading to an erosion of revenues from electricity markets as shown in **Figure 186**. Costs are, however, pushed upwards by an anticipated increase in the prices for fuel and emissions rights, which are assumed to reach a price of 350 EUR/t in 2050. Based on the projections this results in relatively low and negative IRR rates for gas fired power generation.

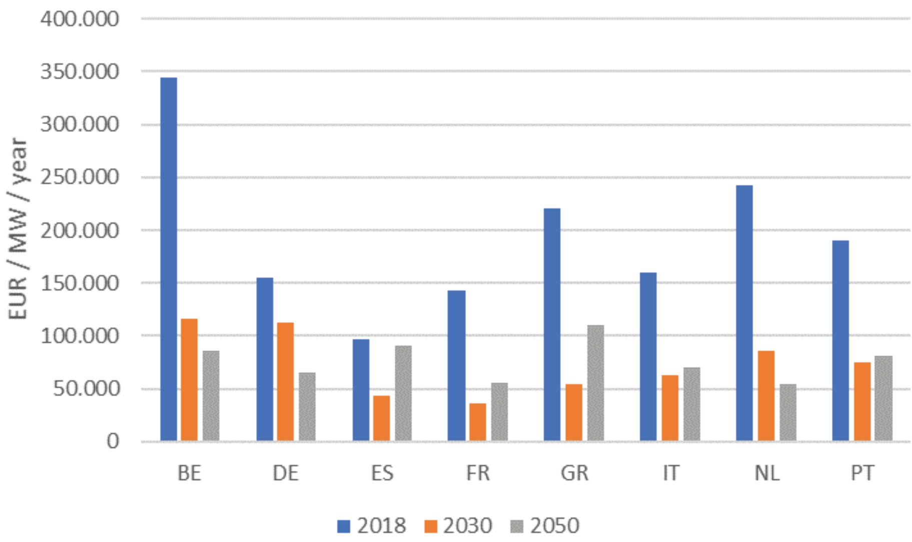


Figure 186 – Revenue for gas fired generation by installed MW

Source: Trinomics et al. 2020

8.3.5 Coal fired power generation

Coal fired power plants share technical and economic features of gas fired plants. They are dispatched based on price signals as they can largely adapt their output to demand. Depending on the plant's vintage, the key flexibility parameters such as minimum load and ramping capability of coal fired power plants might limit the load following capability. Coal fired power plants may also provide ancillary services, which generate additional revenues. The "marginal" costs of producing an additional unit of electricity depends largely on the price of the fuel and of emission rights. During the time period considered, coal fired power plants generally have lower marginal costs than gas fired plants, which leads to lower realised prices as can be seen when comparing **Figure 187** with **Figure 185**.

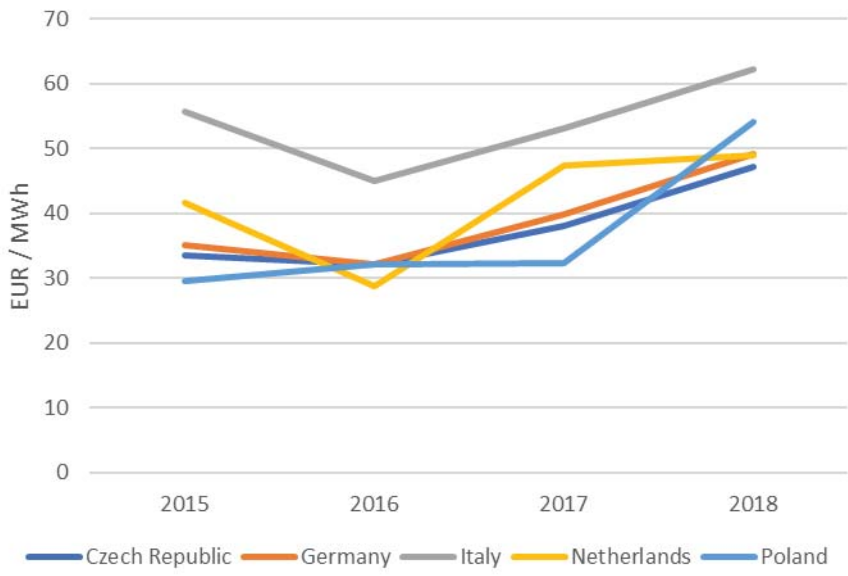


Figure 187 - Realised price for coal-fired power

Source: Trinomics et al. 2020

Coal fired power plants are more expensive to build than gas fired plants. In order to become profitable, these will have to run for a higher number of hours per year. Given a plant lifetime of 40 years, units built after 2010 could run well into the 2050s, if profitable. In the absence of carbon capture and storage, the assumed increasing costs of emission allowances drives up the marginal costs of coal fired power, reducing running hours at which producing is profitable and thus possible revenues. In the scenarios considered the revenues will not be sufficient to yield a positive IRR in Europe.

8.3.6 Nuclear Energy

The economics of nuclear power plants are mainly driven by their relatively high capital costs but low marginal costs. While nuclear power plants can ramp and produce electricity at part-load, baseload operation remains the natural economic choice, complemented by ancillary services. As a result, the realised prices of nuclear power plants have been very close to baseload electricity prices.

In future, the increasing penetration of wind and solar power is expected to reduce the running hours to a degree but, due to the absence of carbon emissions and the associated costs, existing nuclear power plants are expected to stay in the money in the projections considered. As no new nuclear power plants went online in Europe during the 2010s, data on possible project costs in Europe remains to be validated.

EUROPEAN
COMMISSION

Brussels, 14.10.2020
SWD(2020) 951 final

PART 5/6

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(2020) 951 final}

Content

This annex contains country *energy prices and costs* factsheets of the 27 EU Member States, Norway and the United Kingdom. Where available, each factsheet displays information about the level of electricity, gas and oil prices (2019 and recent evolution) as well as about the main components of such prices, including a detailed breakdown of the taxes and levies charged to gas and electricity prices. The factsheets also contain an account of the evolution of the importance of energy costs for households, industry and services in recent years.

Details

The purpose of this annex is to provide an overview of gas and electricity prices and costs for each country analysed.

In the first two pages, electricity and gas prices for each country are compared with neighbour countries and the EU average. We show the electricity and gas prices in 2019, first for households and subsequently for industry. At the bottom of the page the evolution of electricity and gas prices of the country from 2010 to 2019 is presented. The main data sources used are Eurostat latest data and DG ENER in-house data collection of the previous Energy Prices and Costs reports.

In the second page, the amount of the different taxes and levies included in electricity and natural gas prices across consumption bands in 2019 are also listed for each country analysed. The main data source is Eurostat latest data.

In the third page, oil prices (in €/litre) are presented, showing the evolution for gasoline, diesel and heating oil prices at national level from 2008 to 2019 and compared to the EU average. VAT and other indirect taxes affecting the country's total prices are also displayed. The main data source for this is the weekly oil bulletin published by the European Commission Directorate-General for Energy.

In the fourth page, the shares of energy in total household expenditure across income deciles are displayed for some specific years over the last decade according to the available data. This data comes from the European Commission Directorate-General for Energy ad hoc data collection on household consumption expenditures, voluntarily sent by mainly Member States National Institutes for Statistics (NIS). Then, energy costs shares in total production value costs for industry and services from 2010 to 2017 are shown and compared to the EU average. The main data sources for this own calculations made by European Commission Directorate-General for Energy were Eurostat SBS and Primes model data.

Methodology

Prices

In order to understand the price codes used for the graphs in the country sheets, please refer to the table below. Each code corresponds to a specific product (electricity or natural gas), which is related to the household or industry sectors and to a level of annual consumption.

Code	Product	Type	Annual consumption	Description
DC	Electricity	Household	2.5 - 5 MWh	median
IB	Electricity	Industry	20-500 MWh	small
ID	Electricity	Industry	2000-20000 MWh	median
IF	Electricity	Industry	70000-150000 MWh	large
D2	Natural Gas	Household	20-200 GJ	median
I3	Natural Gas	Industry	10000-100000 GJ	median
I5	Natural Gas	Industry	1 mil - 4 mil GJ	large

Share of energy costs in industry and services

The shares of energy costs in industry and services were calculated by dividing the best available estimation of the energy costs (purchases of energy) by the best available estimation of the total production value (gross operating surplus *plus* personnel costs *plus* total purchases of goods and services) for industry and services, respectively. In the case of industry, the data is sourced only from SBS economic indicators. In the case of services, not all information is available in SBS. To calculate the share of energy costs in services, a combination of data from Primes Model and SBS data was used.

Besides, it is important in this methodological approach to bear in mind that:

— There is no one-on-one mapping between the economic indicators of SBS and the profit and loss account of real companies.

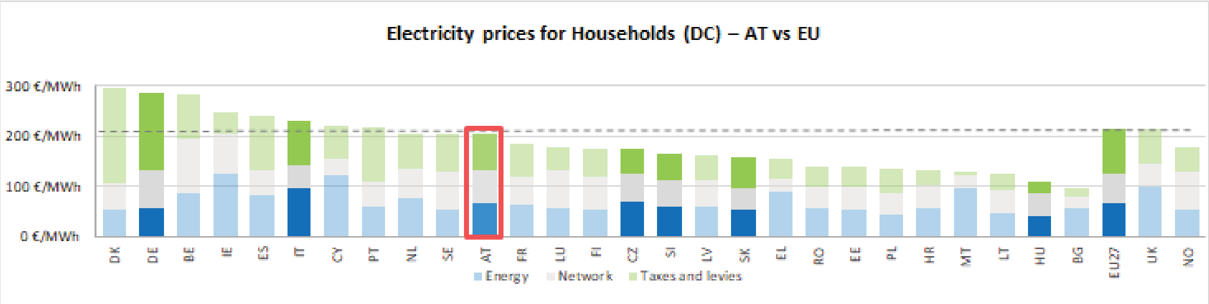
— Capital expenditure (CAPEX) is difficult to collect in SBS, forcing the estimation of the energy component to rely solely on operating expenditure (OPEX); as a result the provided estimation is not assessing the long term investment and cannot determine the relative share of investment in improved 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 such as Section F (Construction) and energy intensive sections such as H (Transportation and storage). More importantly, it is not available for all services sectors. According to the 2015 Commission report on single market integration and competitiveness, 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.

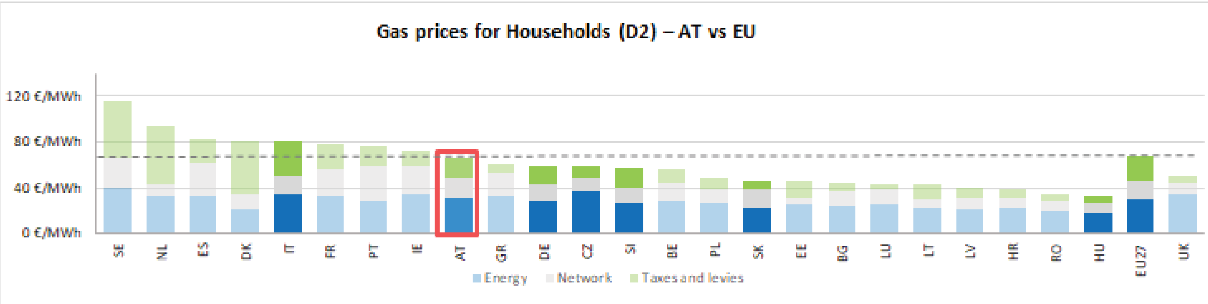
— Based on the definition of the Commission Regulation (EC) No 250/2009, the structural business statistics (SBS) code "20 11 0 Purchases of energy products" includes only energy products which are purchased to be used as a fuel. Energy products purchased as a raw material or for resale without transformation (such as crude oil) are excluded.

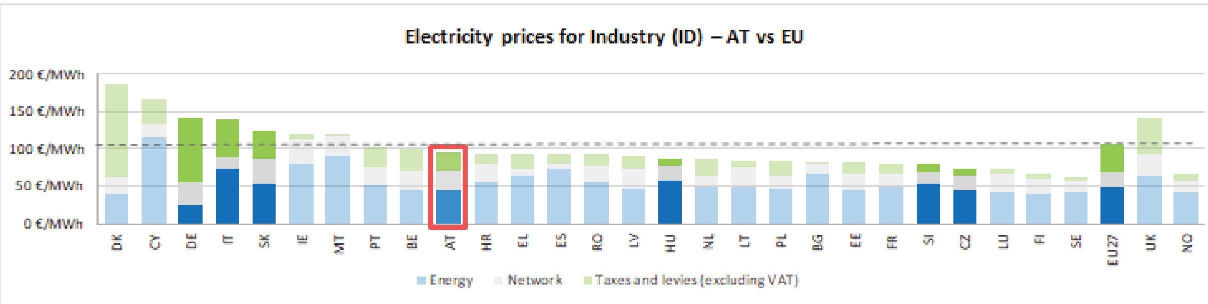
Austria

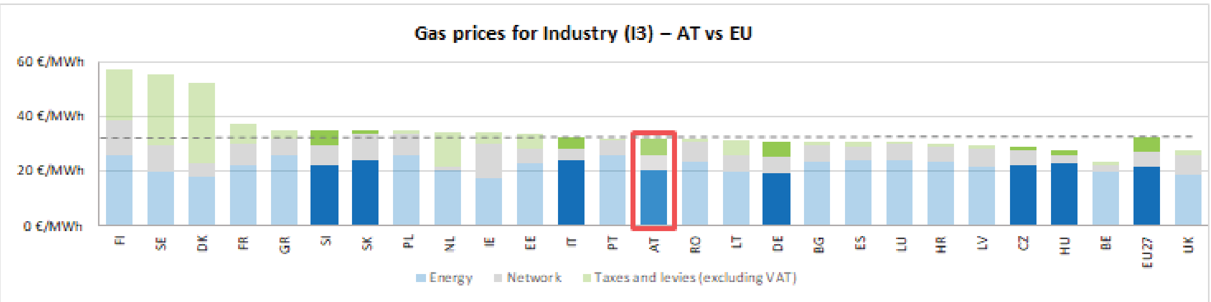
Prices (2019 and recent evolution)



See footnote[1]





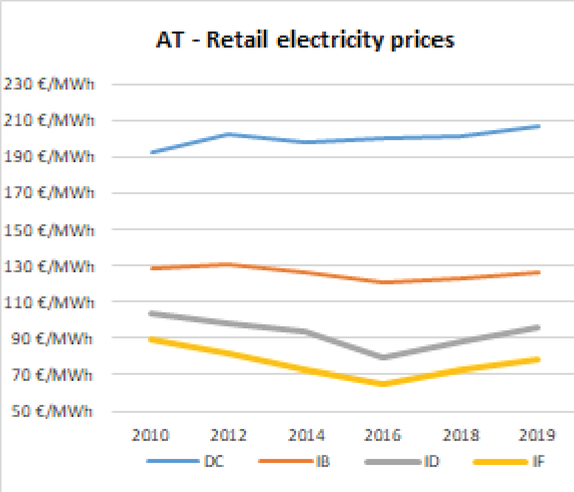


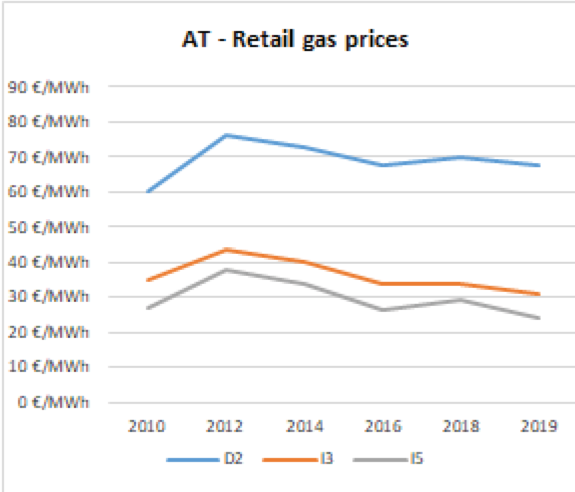
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

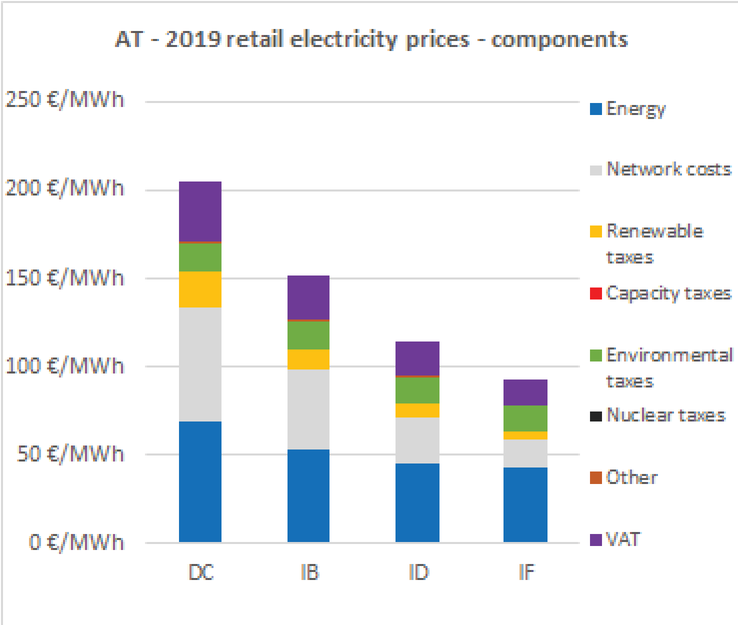
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

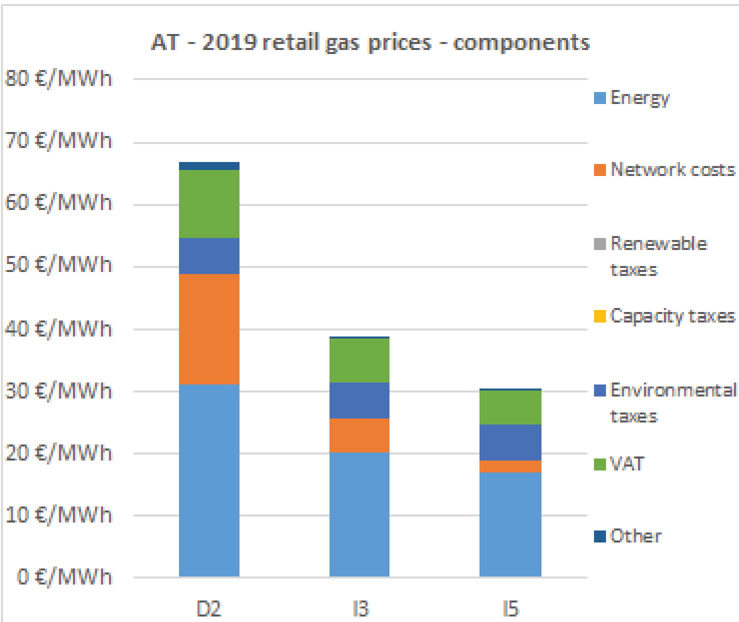
See footnote[2]

[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

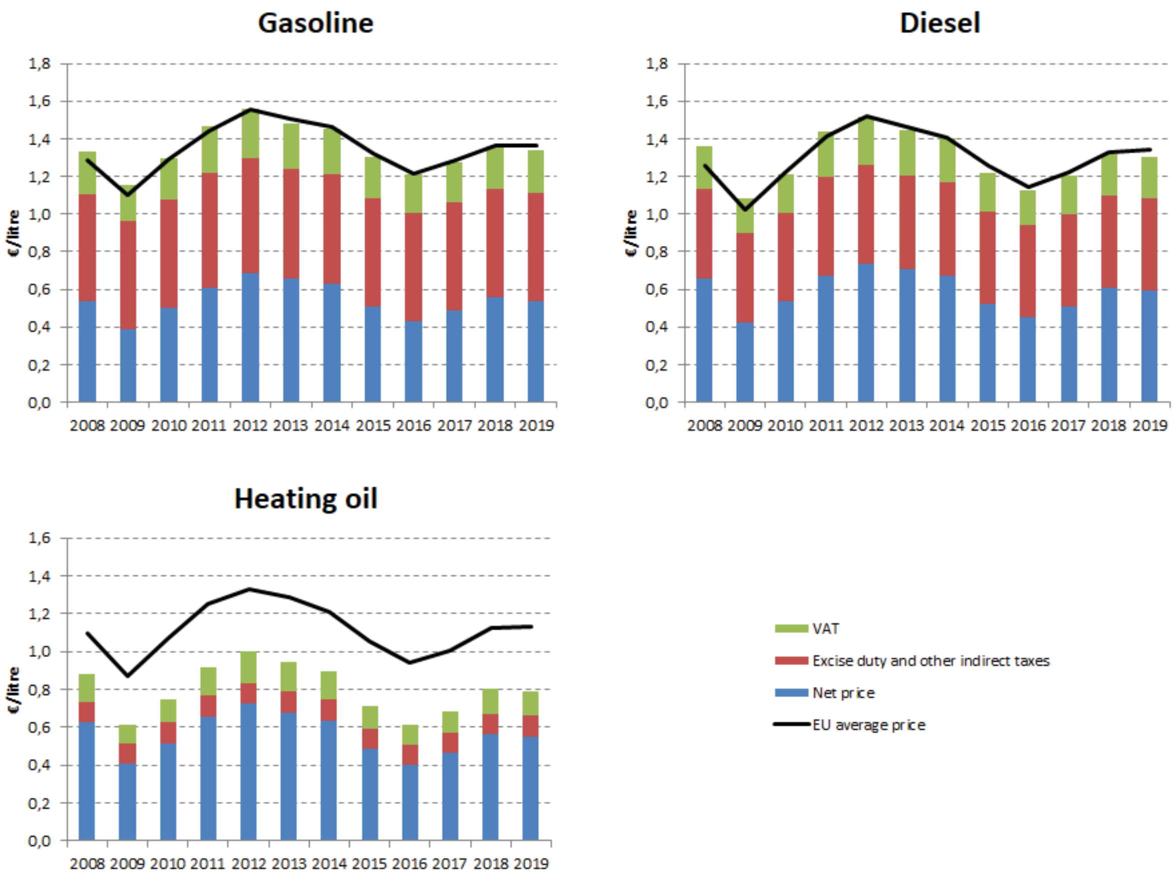

AT - Retail electricity prices
230 €/MWh
210 €/MWh
190 €/MWh
170 €/MWh
150 €/MWh
130 €/MWh
110 €/MWh
90 €/MWh
70 €/MWh
50 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF


AT - Retail gas prices
90 €/MWh
80 €/MWh
70 €/MWh
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5


AT - 2019 retail electricity prices - components
250 €/MWh
200 €/MWh
150 €/MWh
100 €/MWh
50 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT

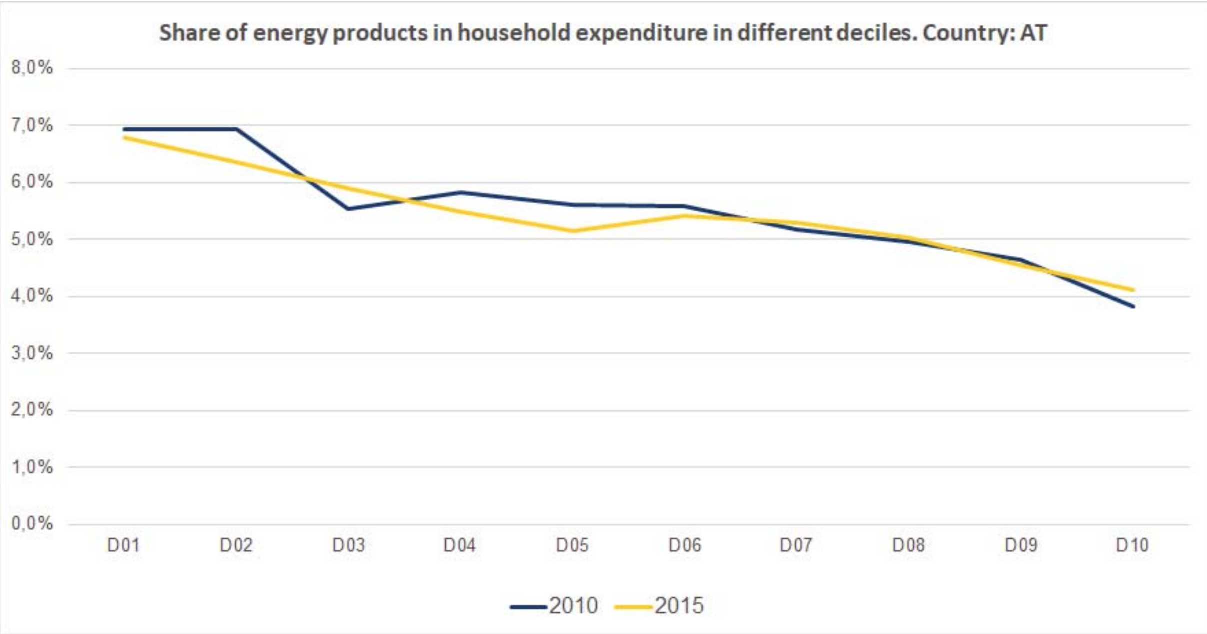

AT - 2019 retail gas prices - components
80 €/MWh
70 €/MWh
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
D2
I3
I5
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
VAT
Other

Oil prices


Gasoline
Diesel
Heating oil
€/litre
2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019
VAT
Excise duty and other indirect taxes
Net price
EU average price

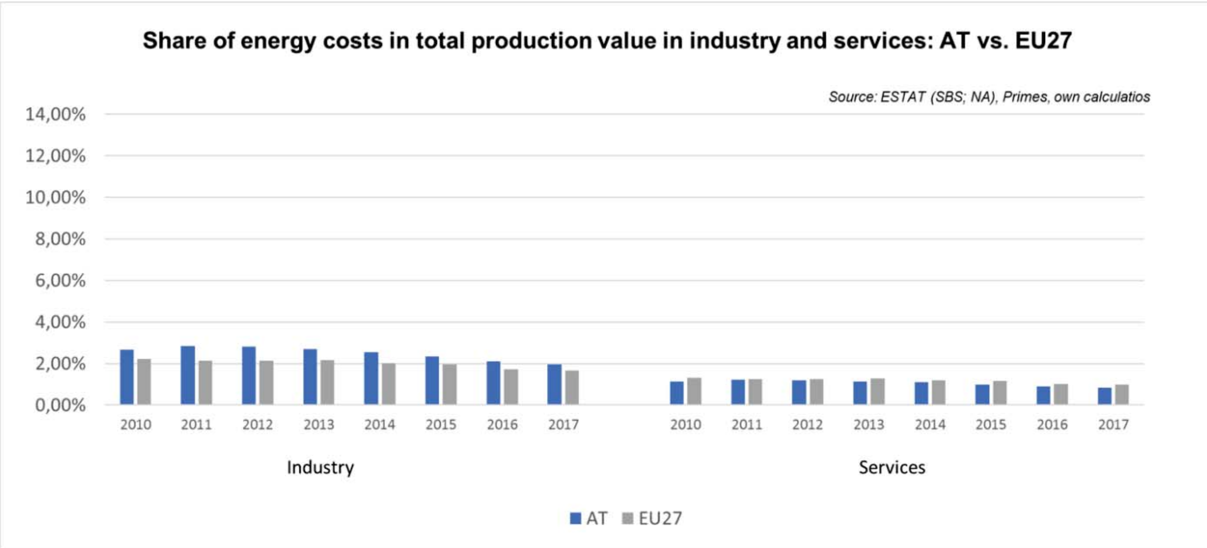
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2010 in Austria (dark blue line) the poorest households (Decile 1) had to spend 6.9% of their total expenditures on energy products. In 2015 (yellow line) the share of energy remained practically unchanged. In the case of middle income households (Decile 5), in 2010 they spent 5.6% of their total expenditure on energy, while in 2015 this value decreased to 5.1%. See footnote [1]

Energy costs shares in total production costs

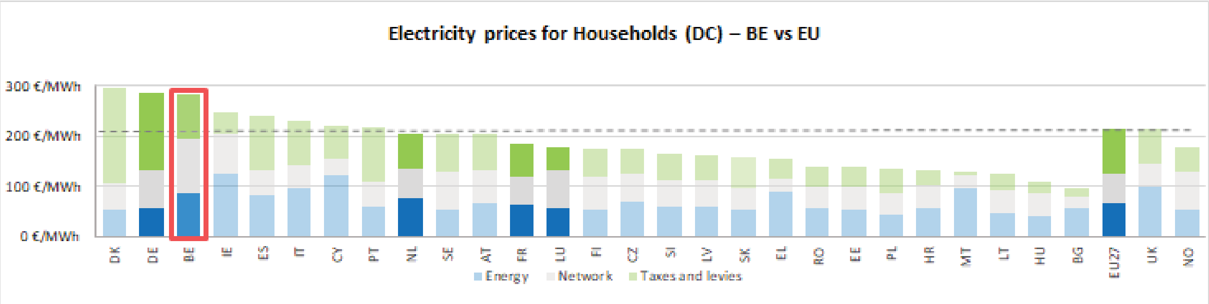


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

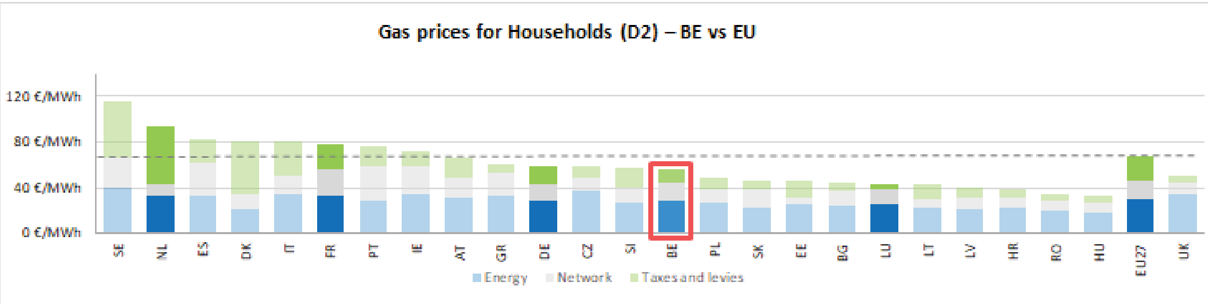
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

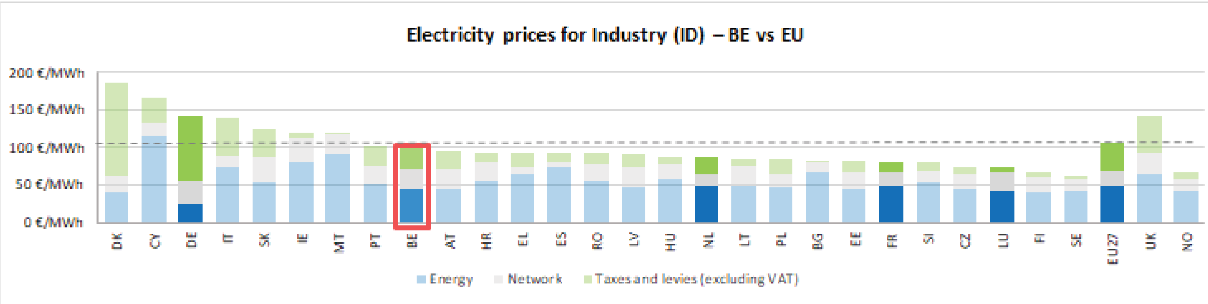
Belgium

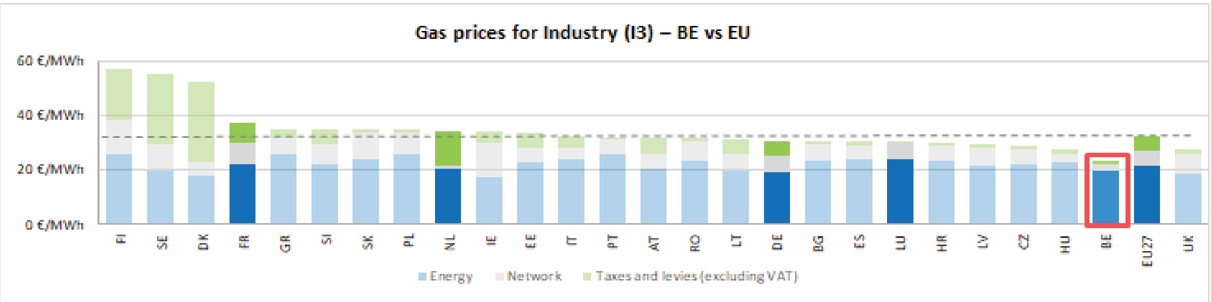
Prices (2019 and recent evolution)



See footnote [1]





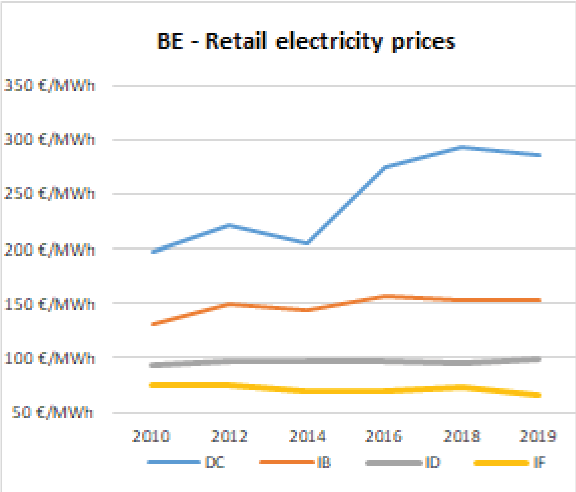


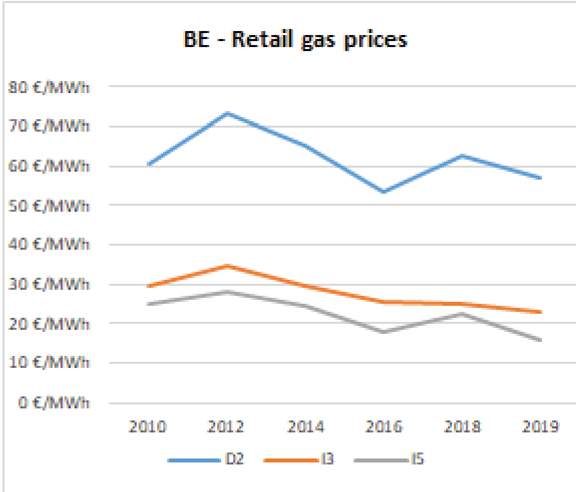
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

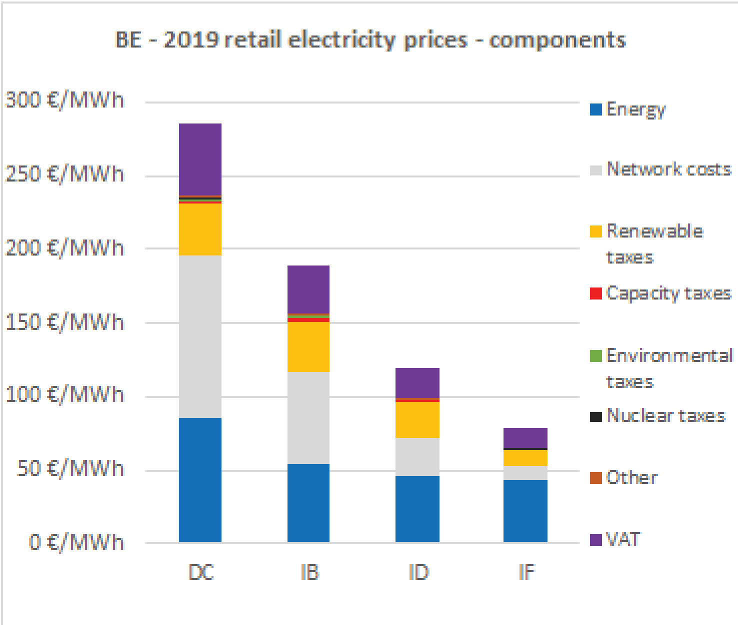
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

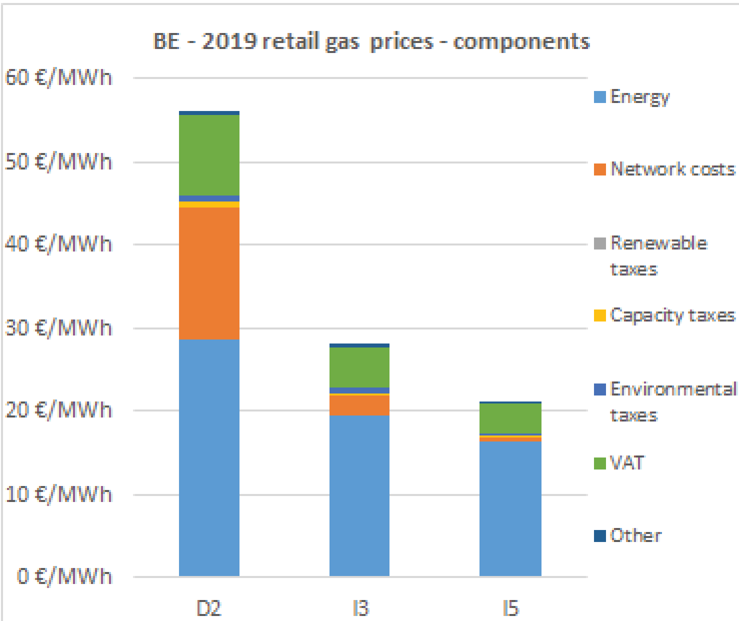
See footnote [2]

[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

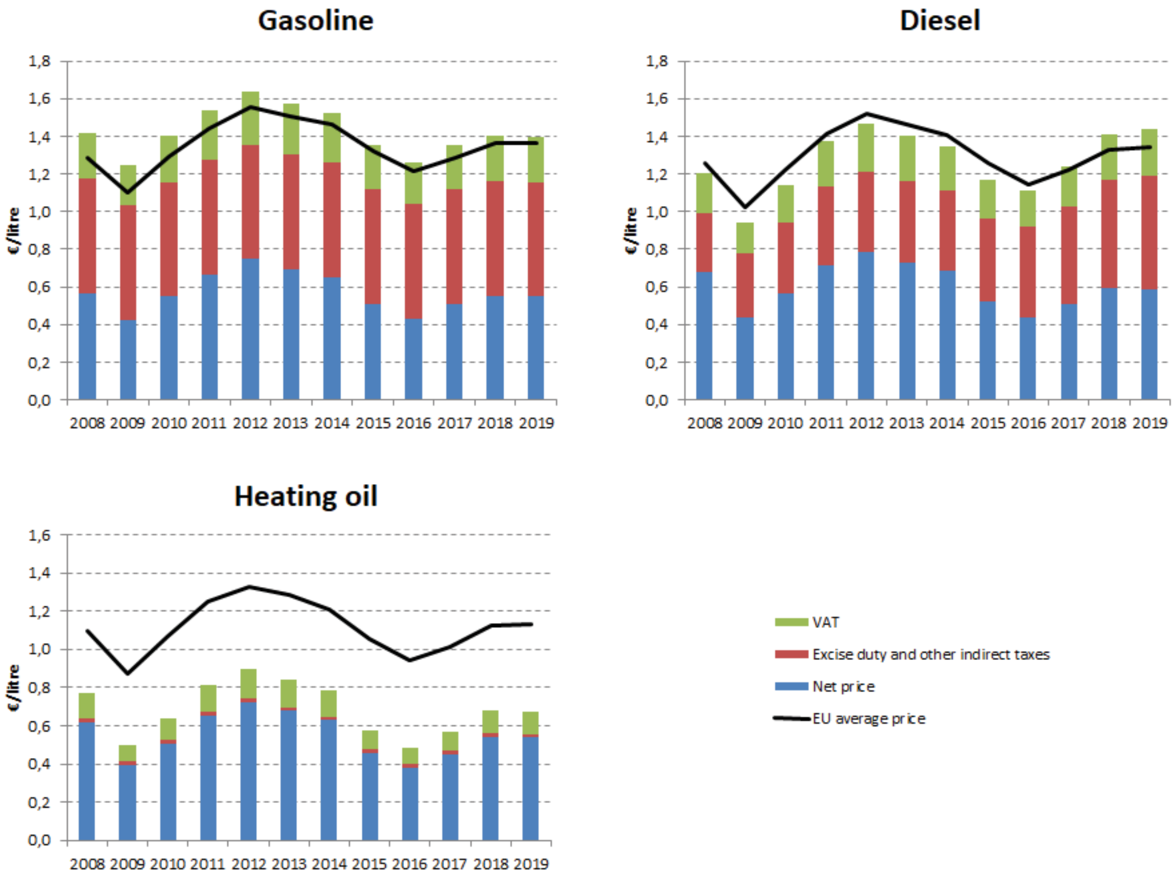

BE - Retail electricity prices
350 €/MWh
300 €/MWh
250 €/MWh
200 €/MWh
150 €/MWh
100 €/MWh
50 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF


BE - Retail gas prices
80 €/MWh
70 €/MWh
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5


BE - 2019 retail electricity prices - components
300 €/MWh
250 €/MWh
200 €/MWh
150 €/MWh
100 €/MWh
50 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT

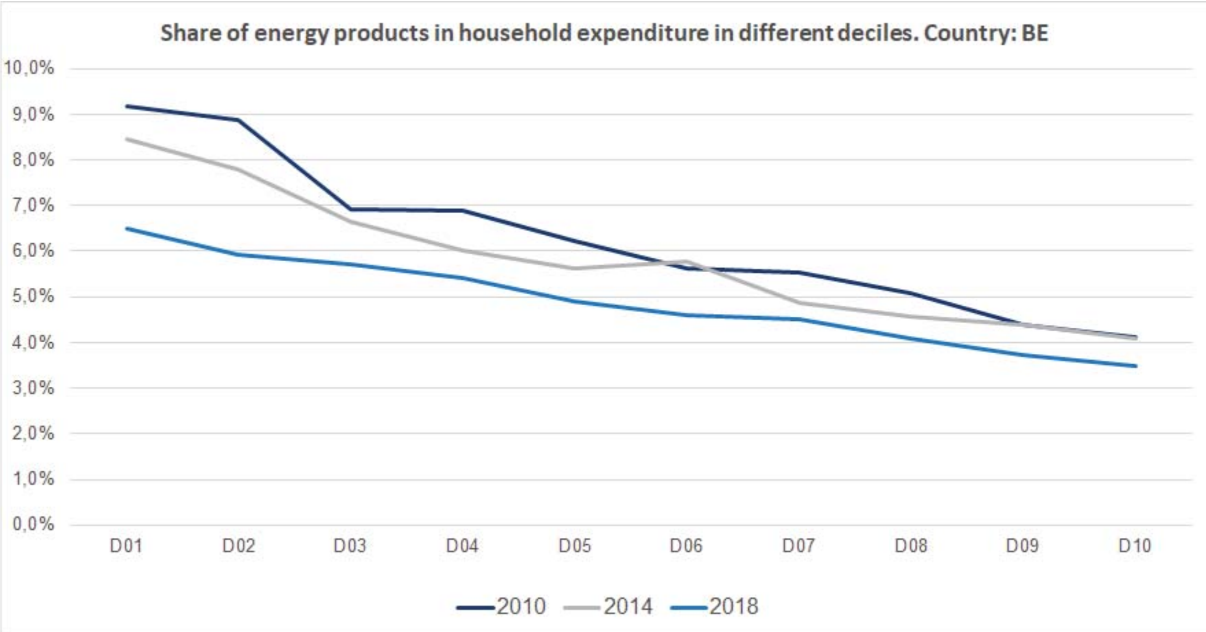

BE - 2019 retail gas prices - components
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
D2
I3
I5
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
VAT
Other

Oil products prices



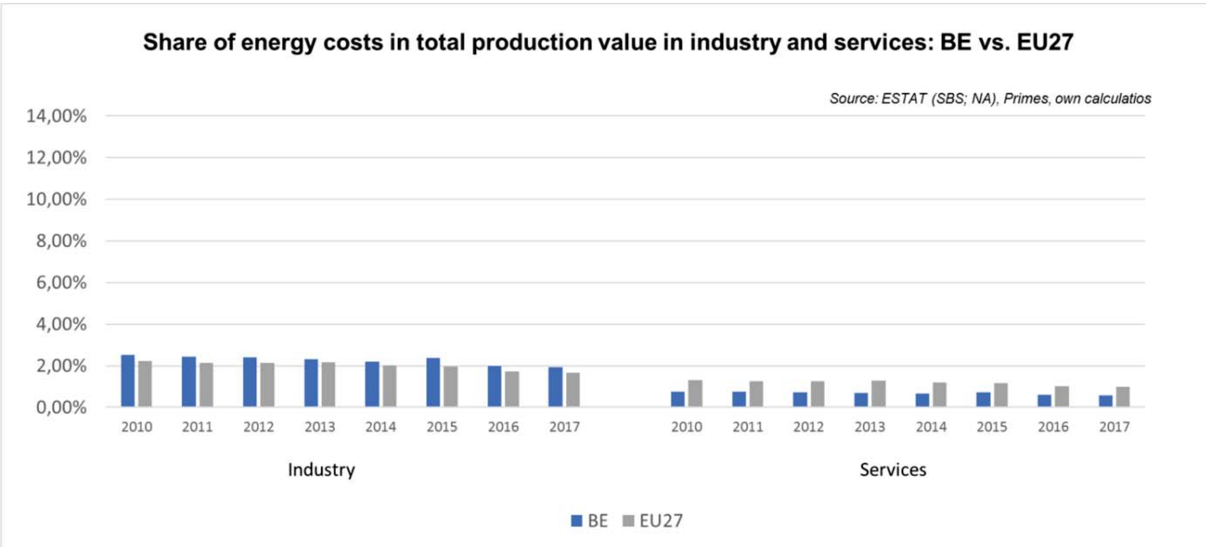
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2010 in Belgium (dark blue line) the poorest households (Decile 1) had to spend 9.2% of their total expenditures on energy products. In 2018 (blue line) the share of energy decreased to 6.5%. In the case of middle income households (Decile 5), in 2010 they spent 6.2% of their total expenditure on energy, while in 2018 this value decreased to 4.9%. See footnote [1]

Energy costs shares in total production costs

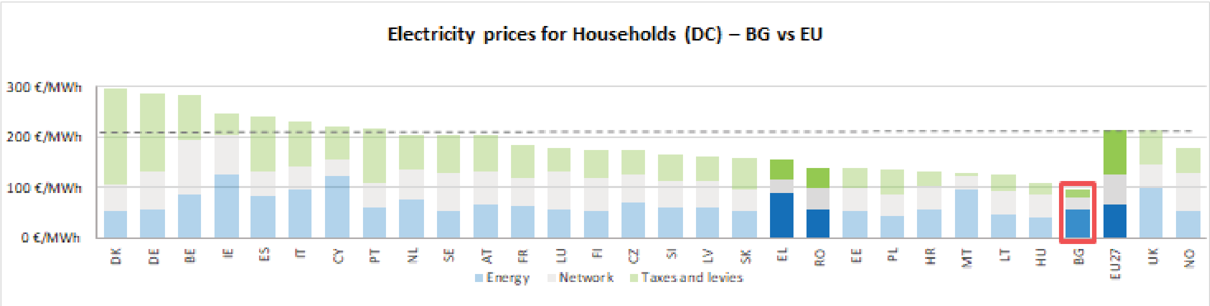


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

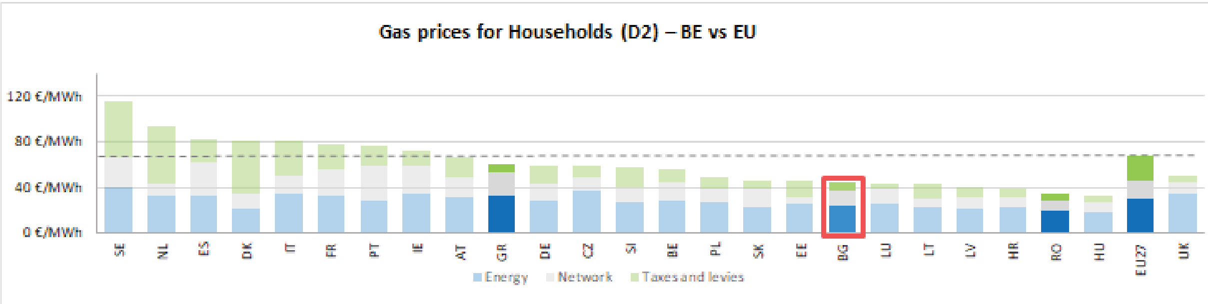
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

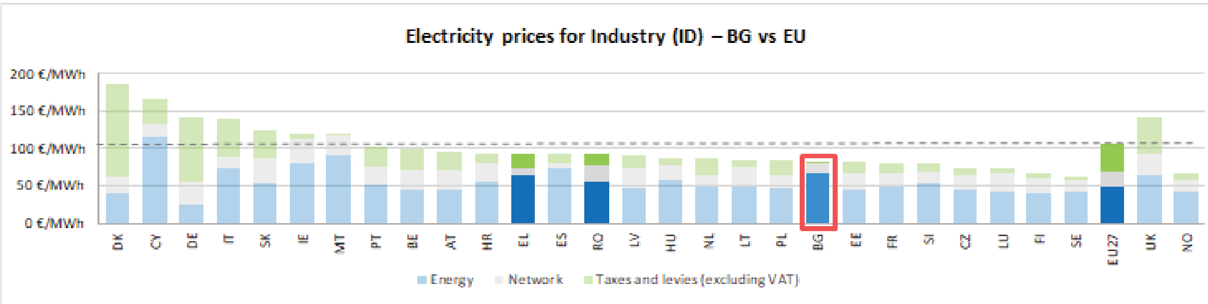
Bulgaria

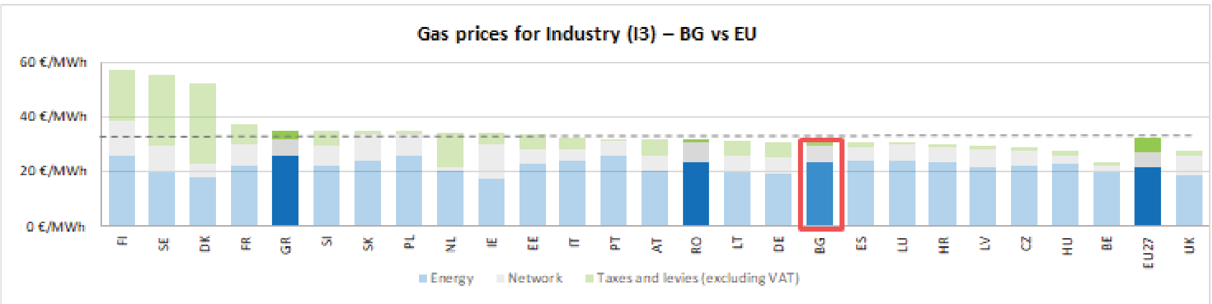
Prices (2019 and recent evolution)



See footnote [1]





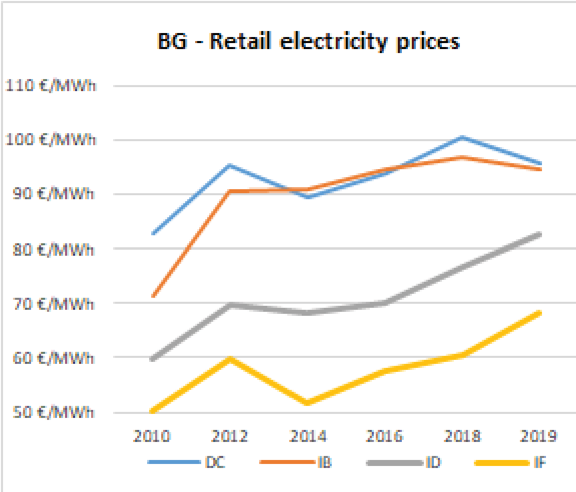


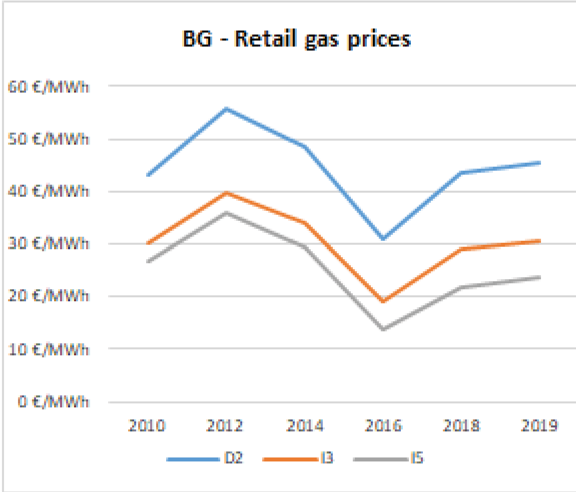
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

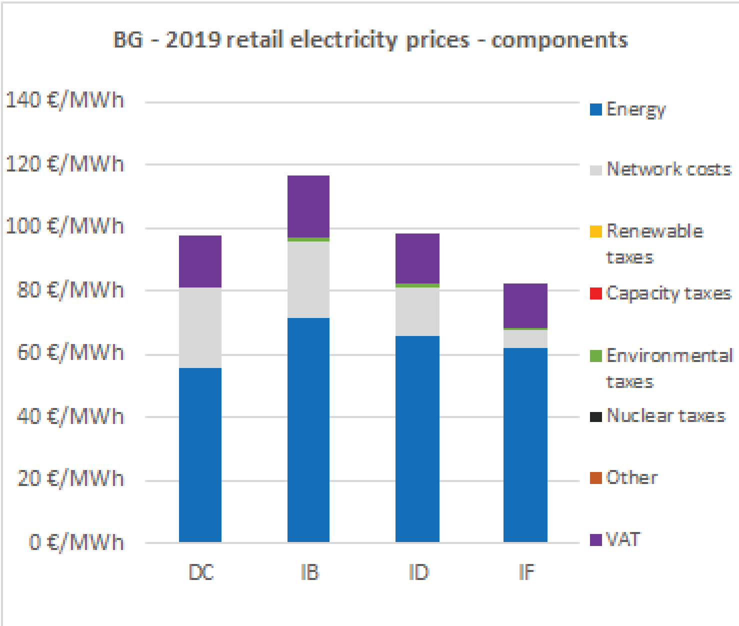
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

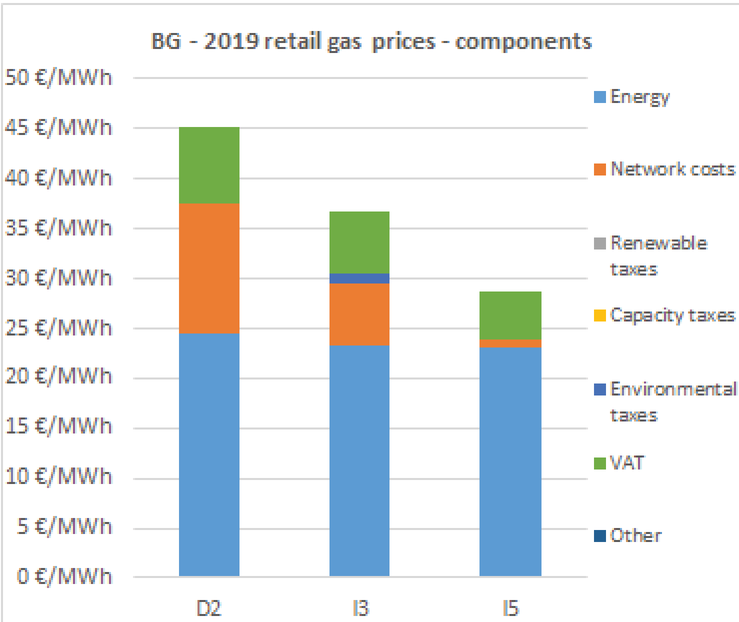
See footnote [2]

[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2]Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

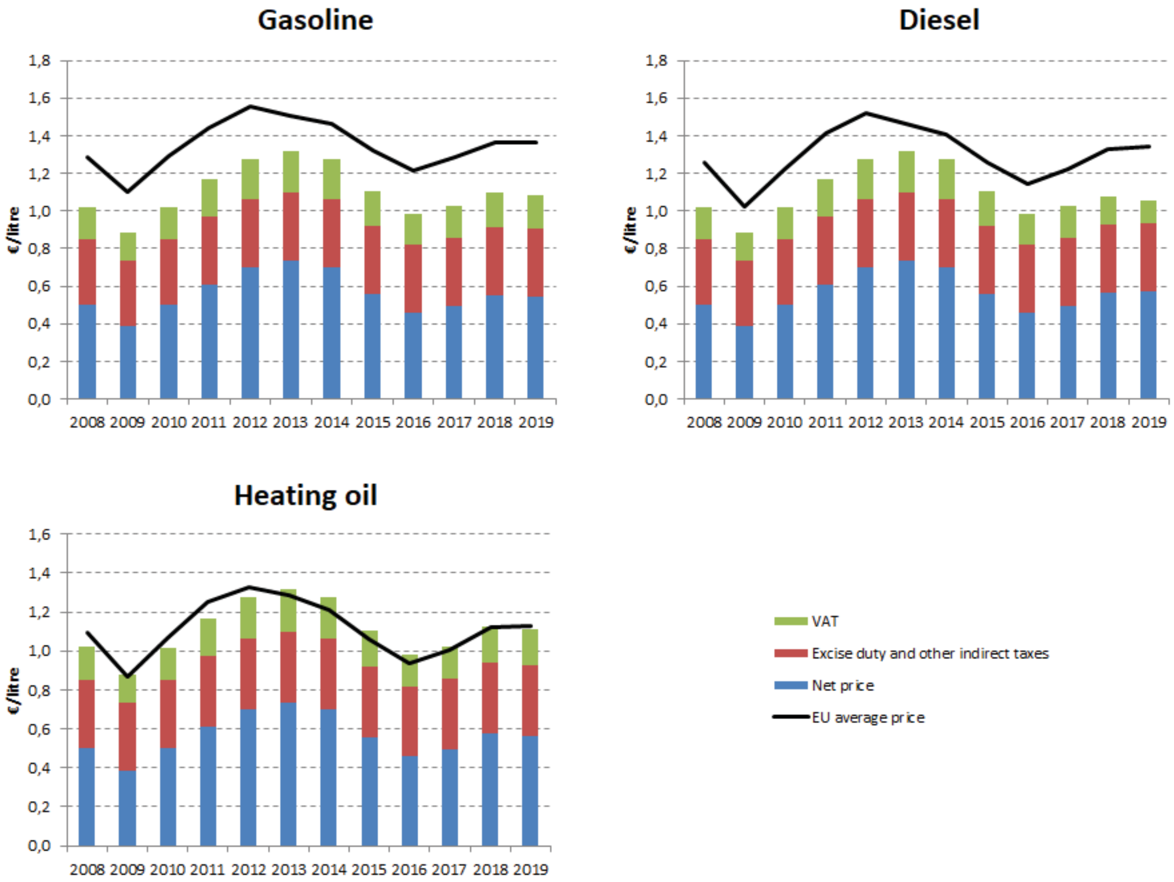






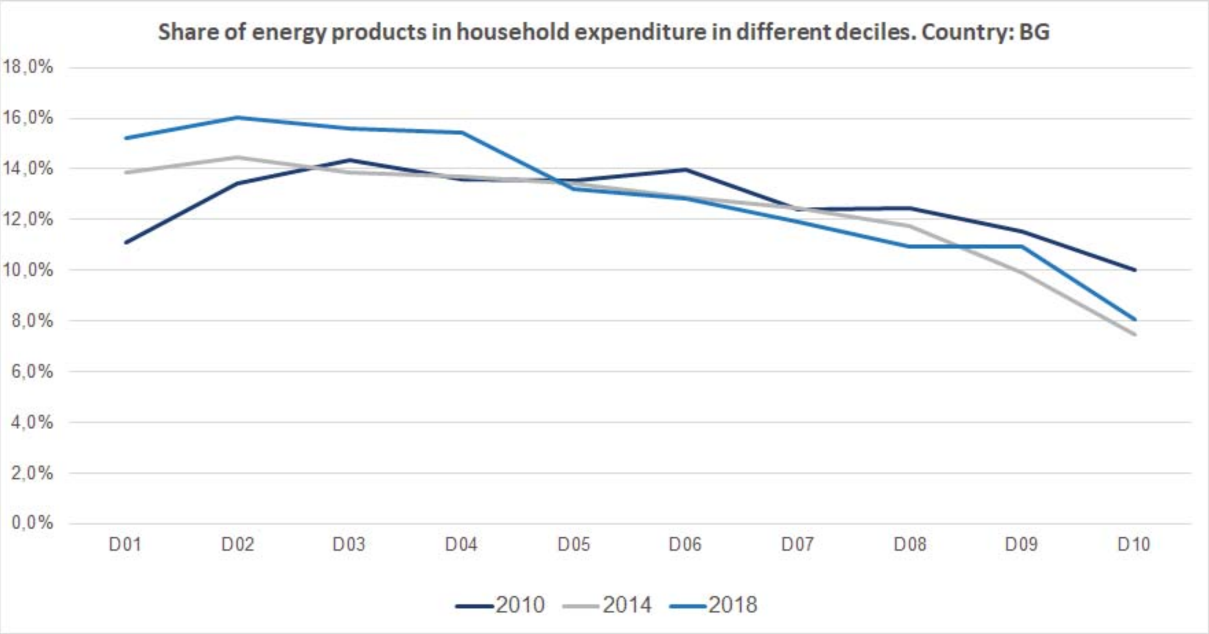


Oil products prices


Gasoline
Diesel
Heating oil
€/litre
0,0
0,2
0,4
0,6
0,8
1,0
1,2
1,4
1,6
1,8
2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019
VAT
Excise duty and other indirect taxes
Net price
EU average price

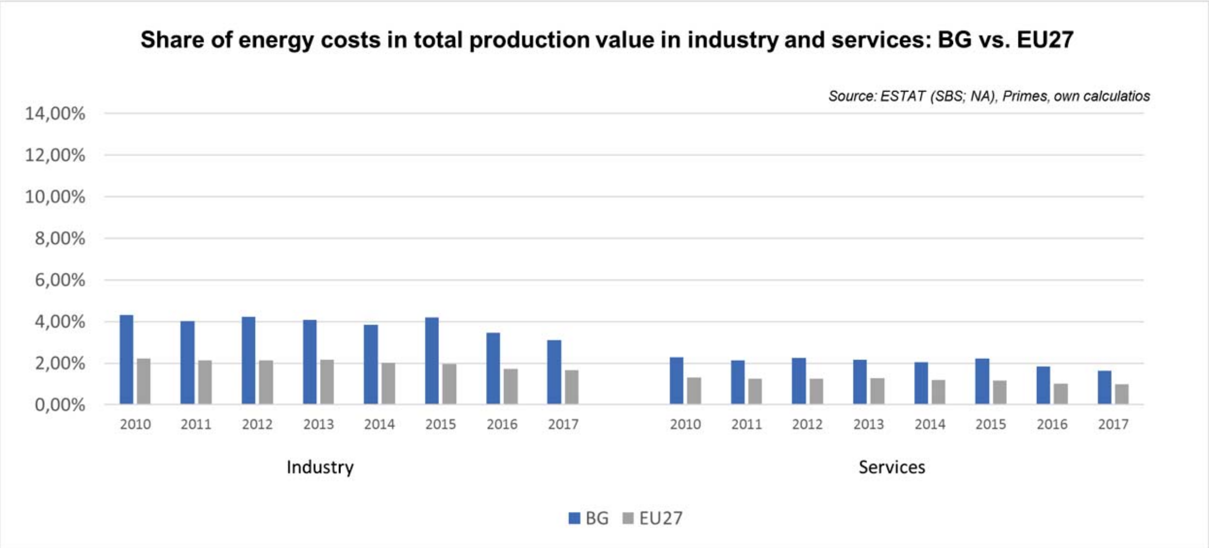
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2010 in Bulgaria (dark blue line) the poorest households (Decile 1) had to spend 11.1% of their total expenditures on energy products. In 2018 (blue line) the share of energy increased to 15.2%. In the case of middle income households (Decile 5), in 2010 they spent 14.2% of their total expenditure on energy, while in 2018 this value remained almost unchanged. See footnote [1]

Energy costs shares in total production costs

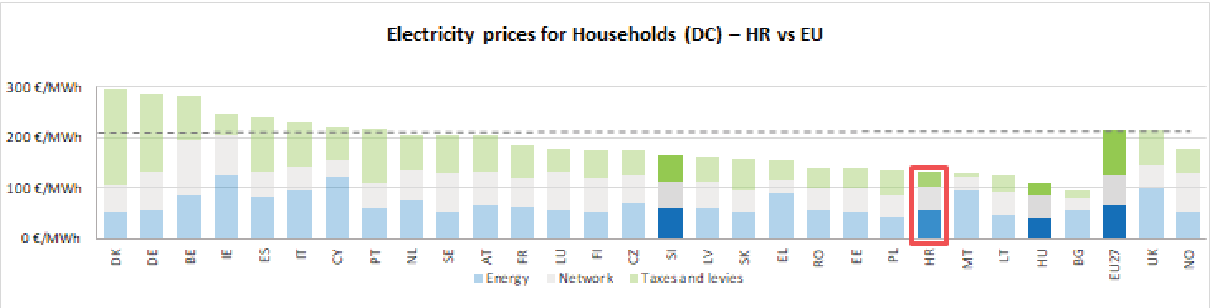


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available

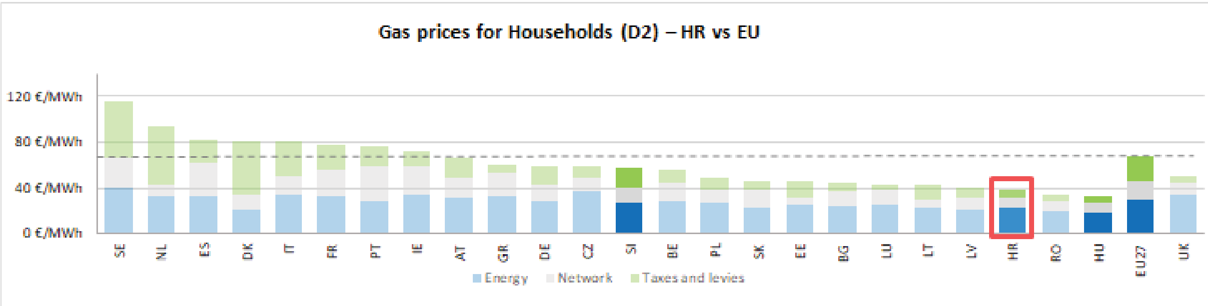
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

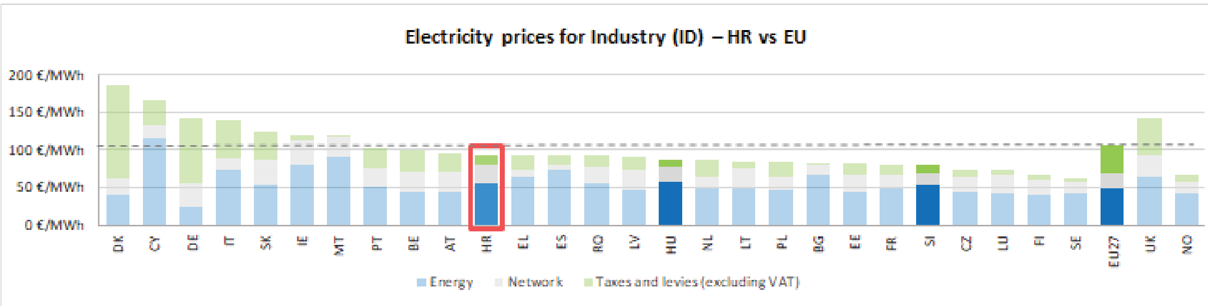
Croatia

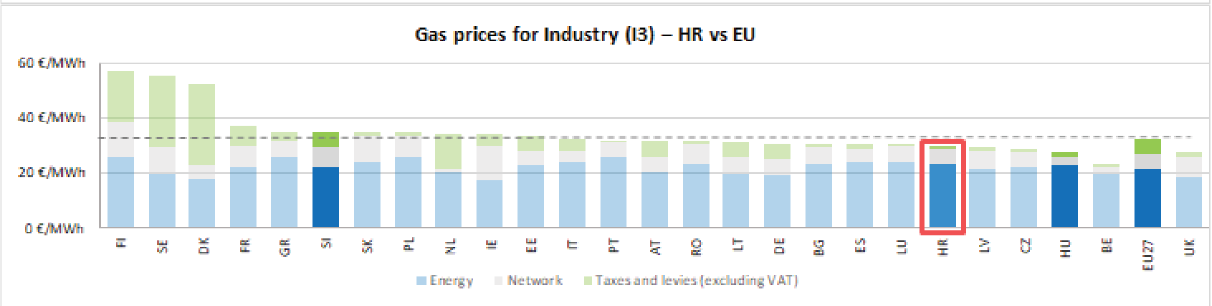
Prices (2019 and recent evolution)



See footnote[1]





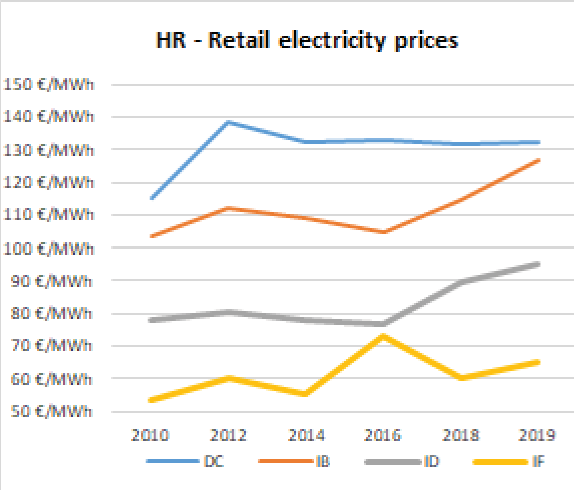


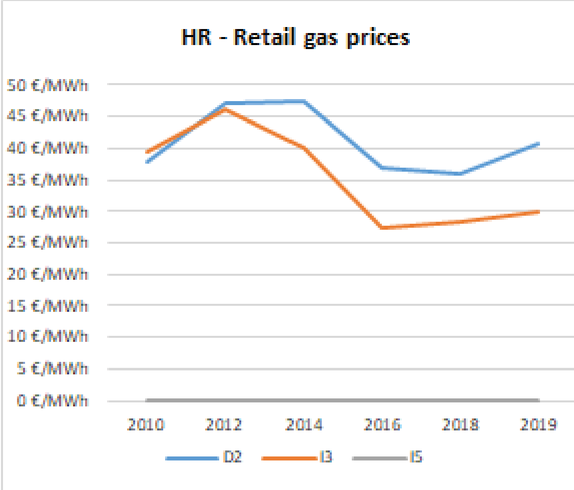
See footnote[2]

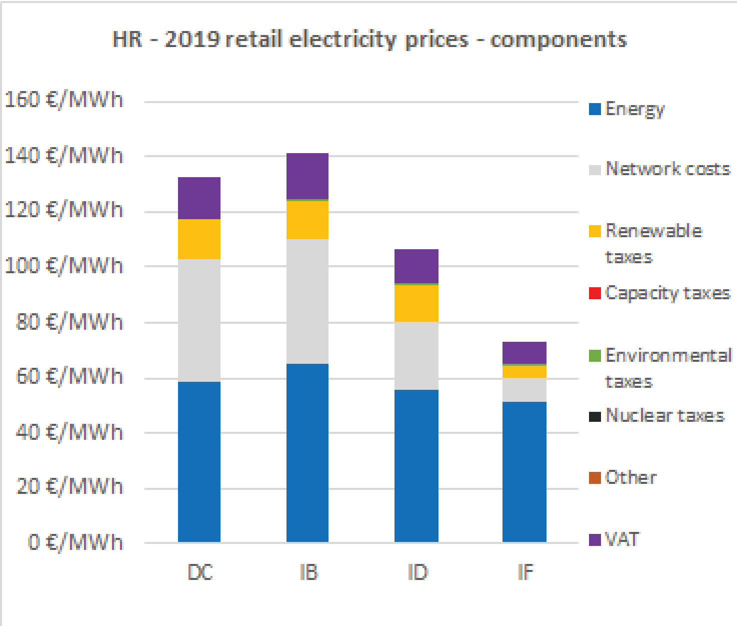
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

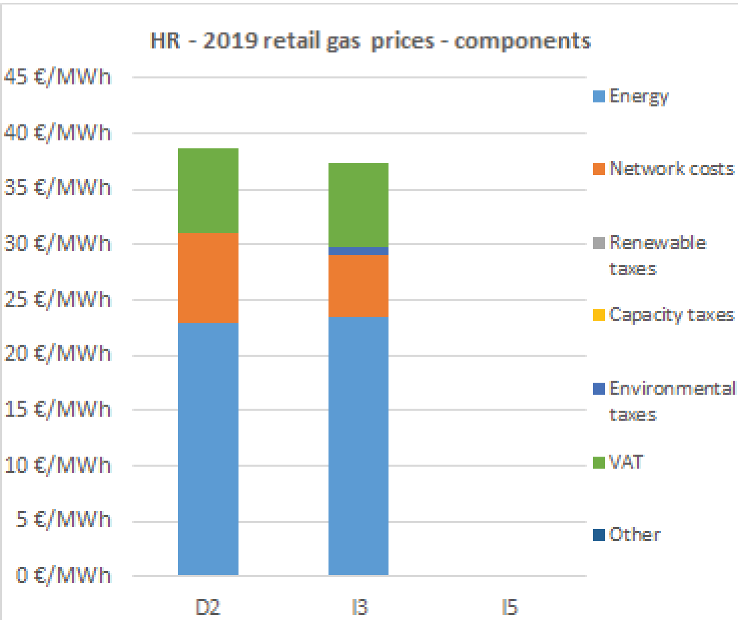
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

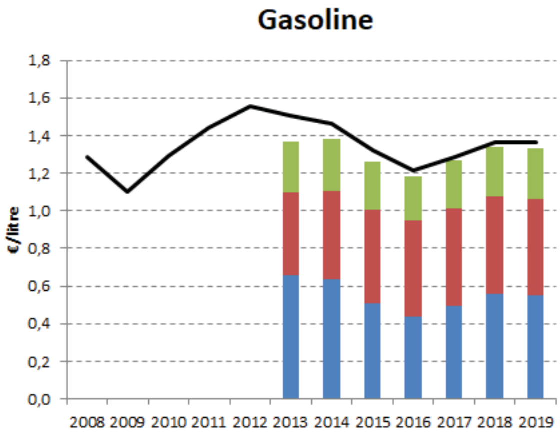


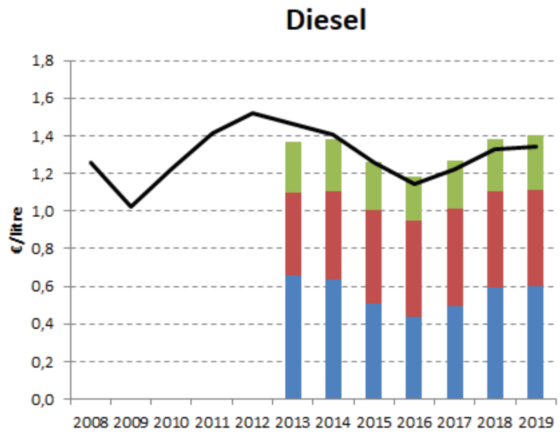


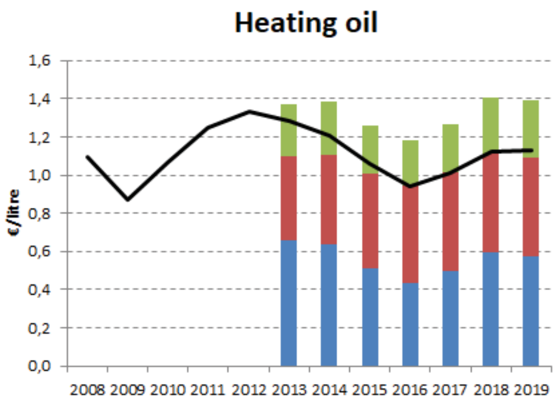


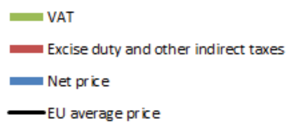


Oil product prices





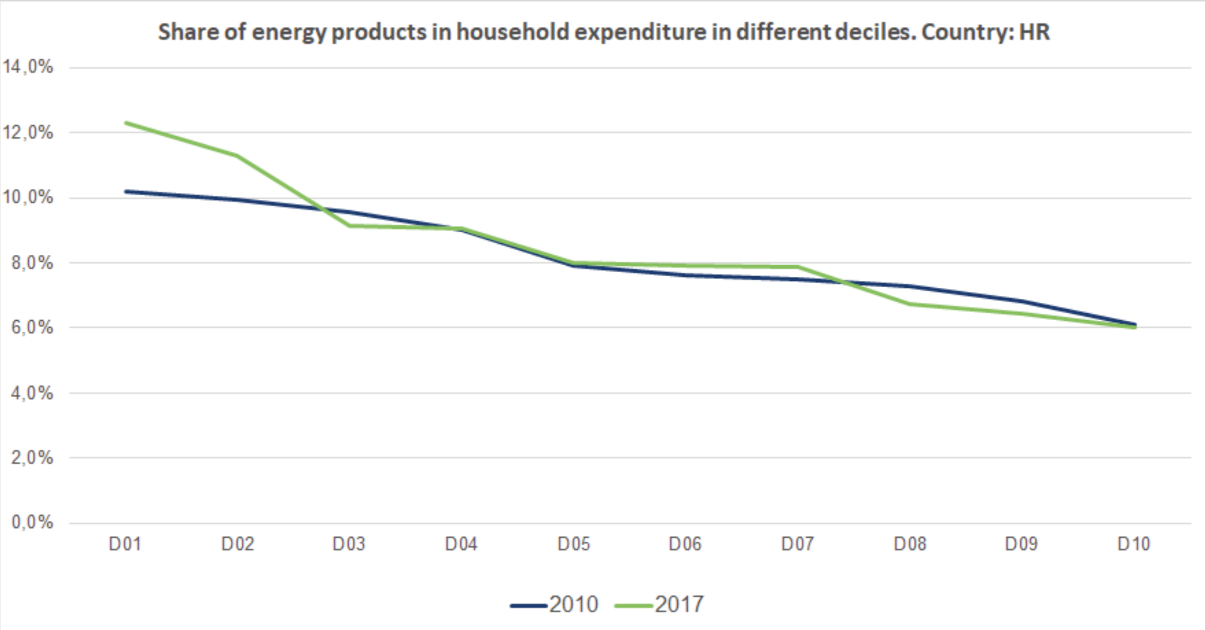




Note: Croatia started reporting oil product prices from 2013

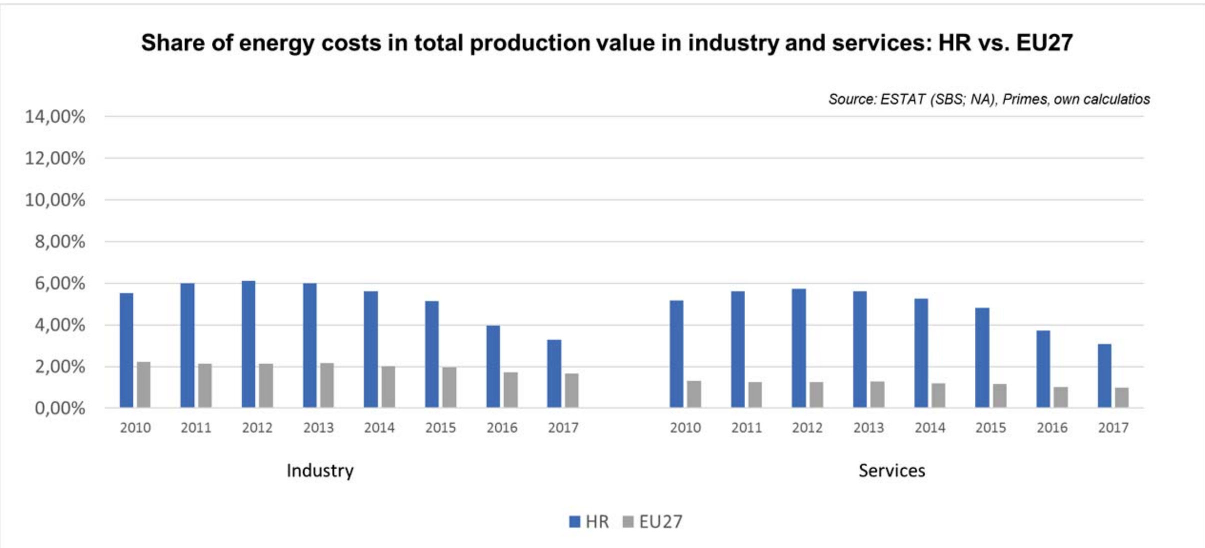
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2010 in Croatia (dark blue line) the poorest households (Decile 1) had to spend 10.2% of their total expenditures on energy products. In 2017 (green line) the share of energy increased to 12.3%. In the case of middle income households (Decile 5), in 2010 they spent 7.9 % of their total expenditure on energy, while in 2017 this value remained almost unchanged. See footnote [1]

Energy costs shares in total production costs

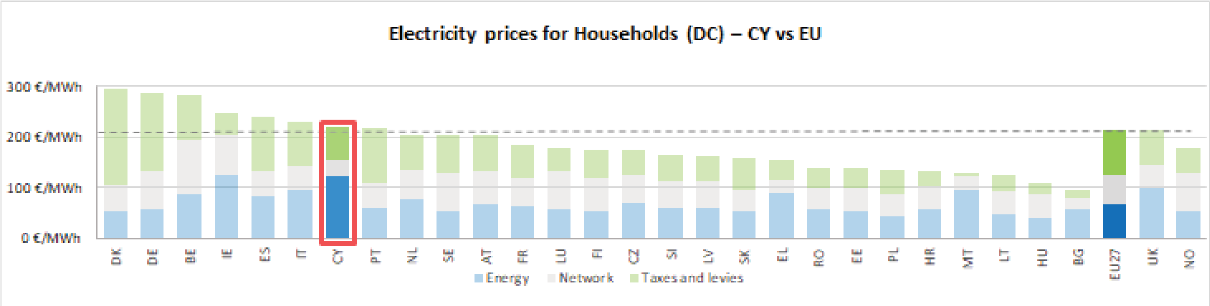


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available

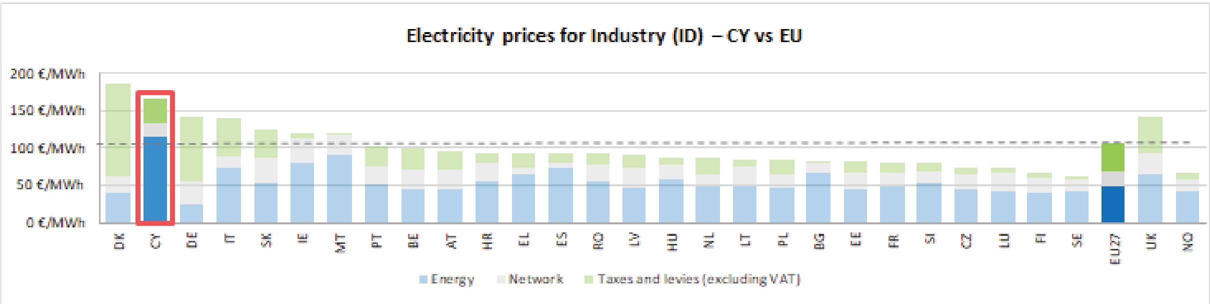
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

Cyprus

Prices (2019 and recent evolution)



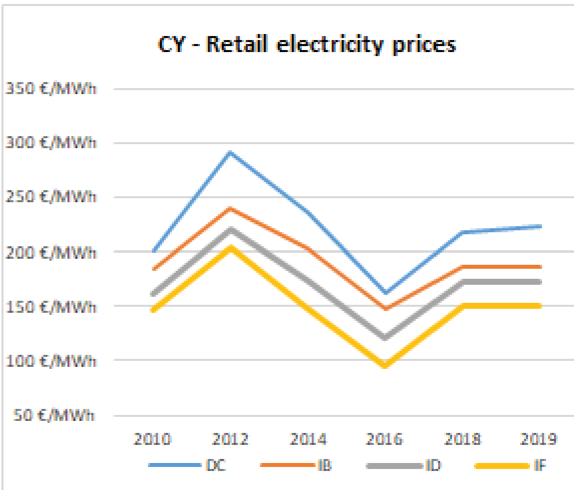
See footnote [1]



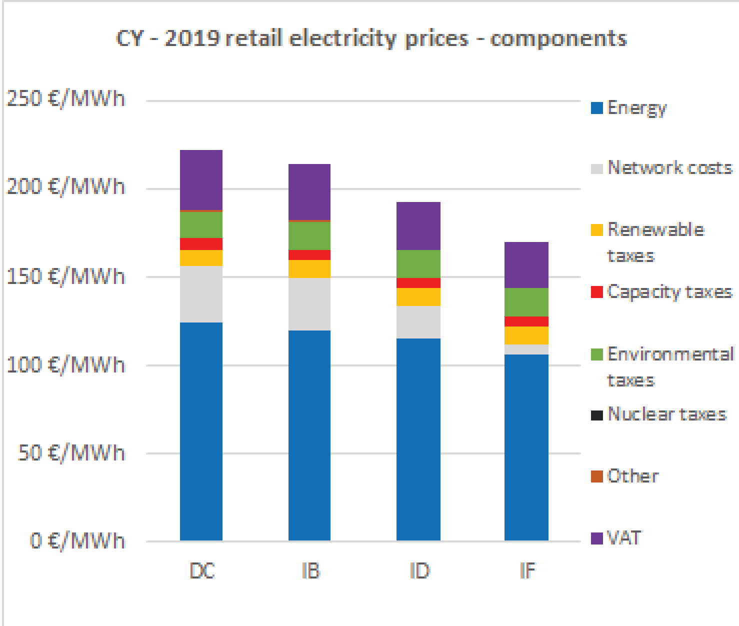
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

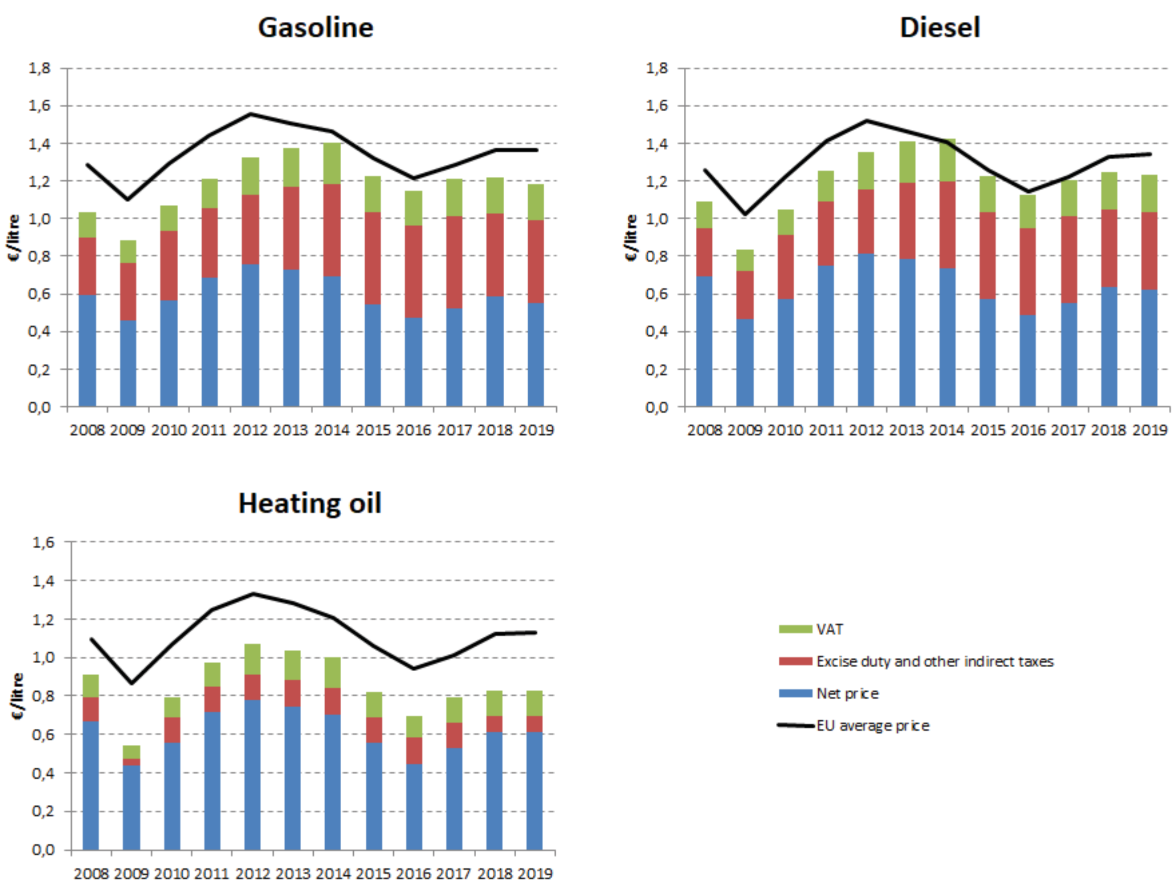
See footnote [2]



[1]The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2]Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

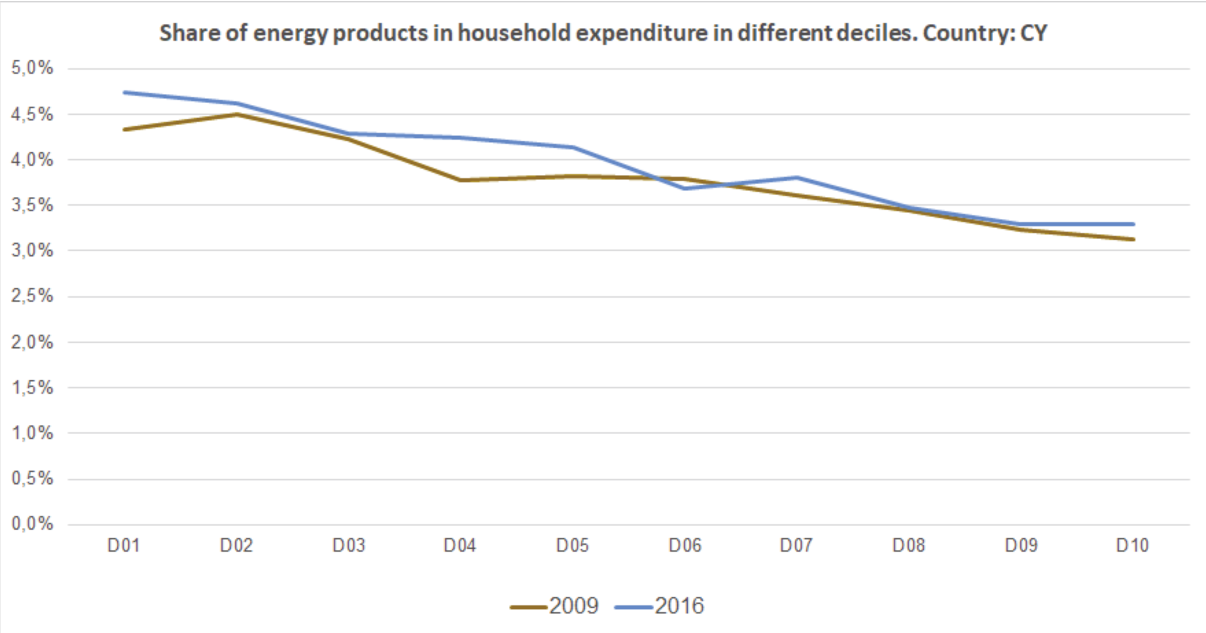


Oil products prices



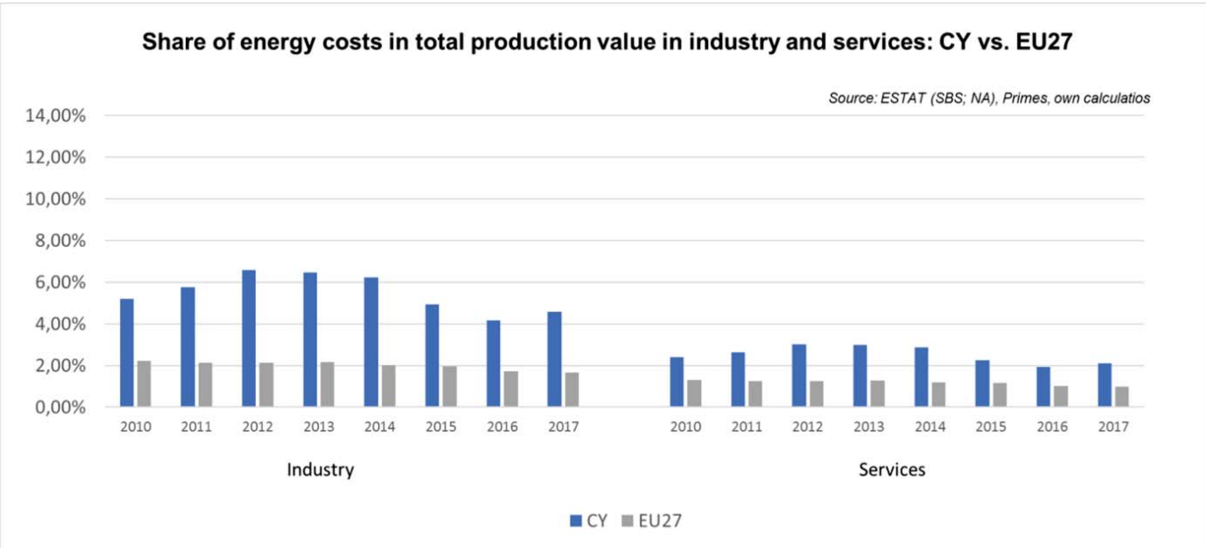
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2009 in Cyprus (brown line) the poorest households (Decile 1) had to spend 4.3% of their total expenditures on energy products. In 2016 (blue line) the share of energy increased slightly to 4.7%. In the case of middle income households (Decile 5), in 2009 they spent 3.8 % of their total expenditure on energy, while in 2017 this value increased to 4.1%. See footnote [1]

Energy costs shares in total production costs

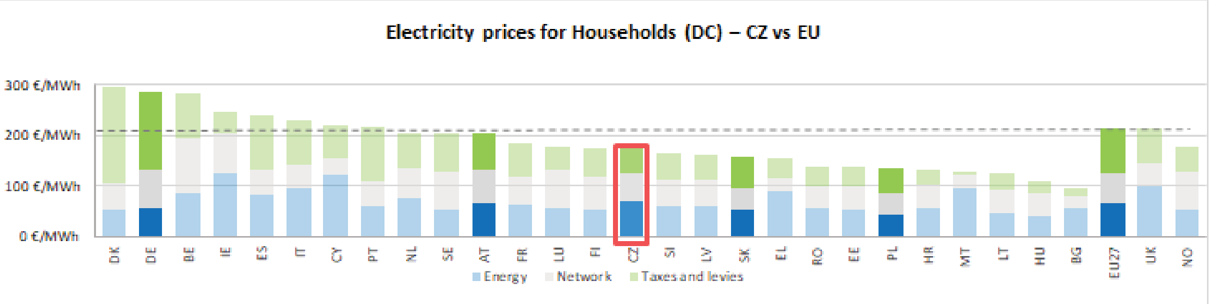


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available

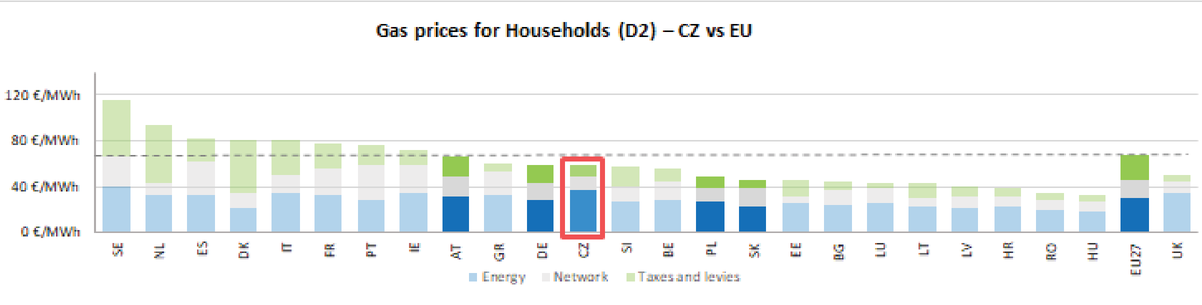
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

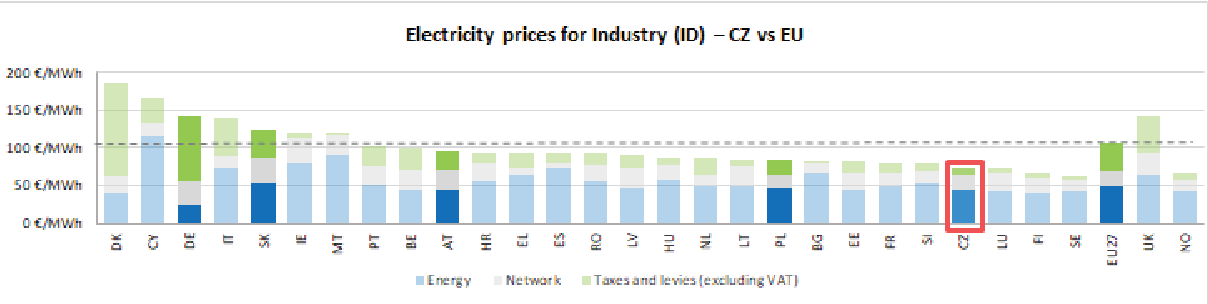
Czechia

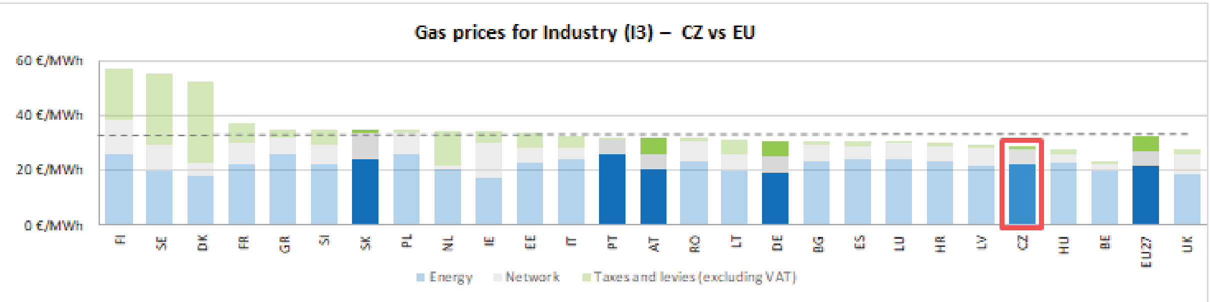
Prices (2019 and recent evolution)



See footnote [1]





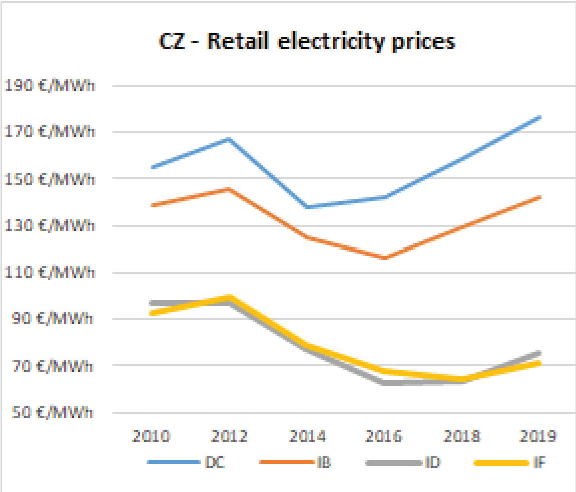


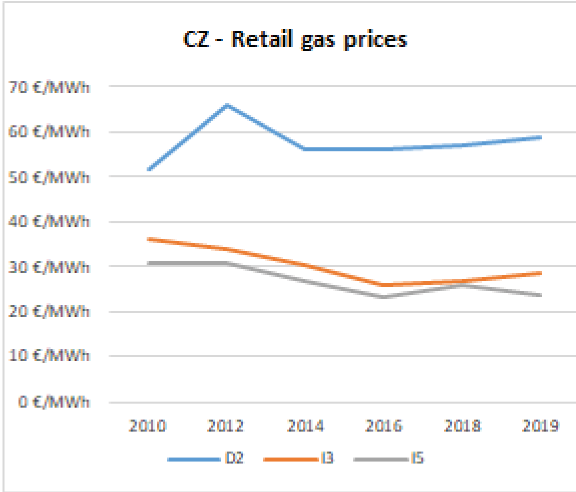
See footnote [2]

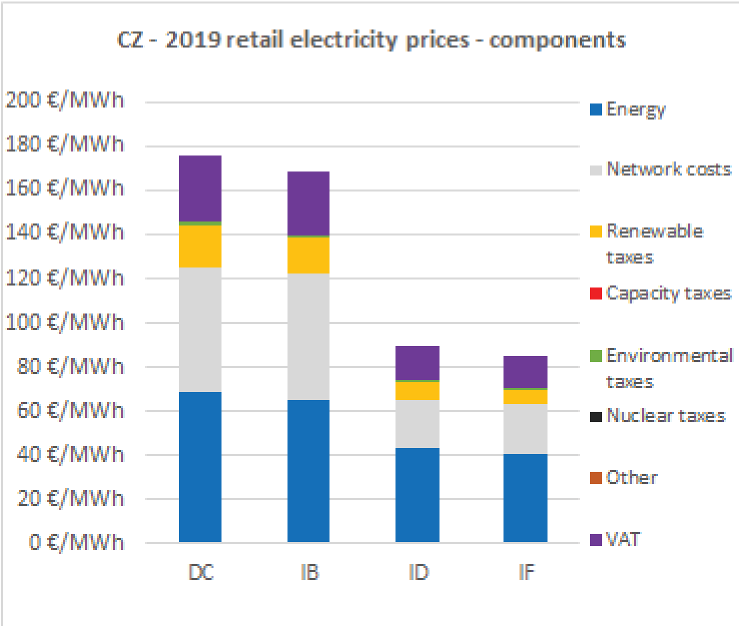
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

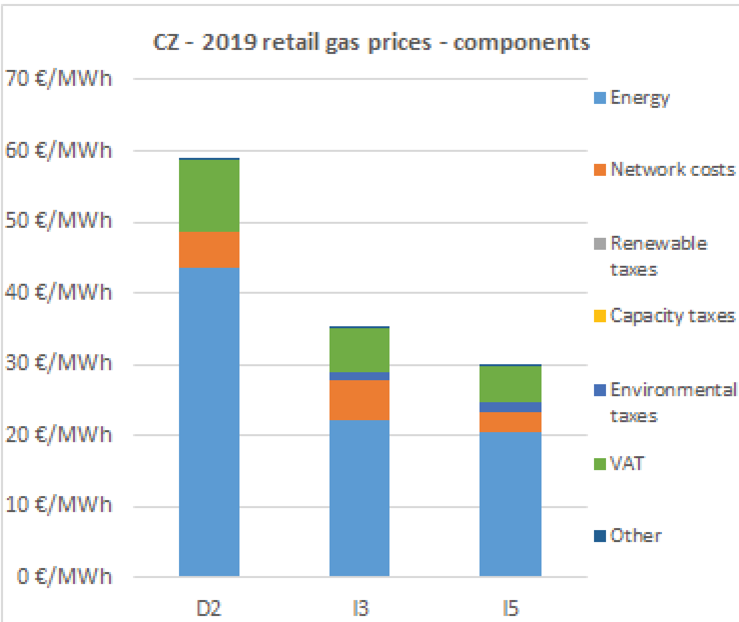
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

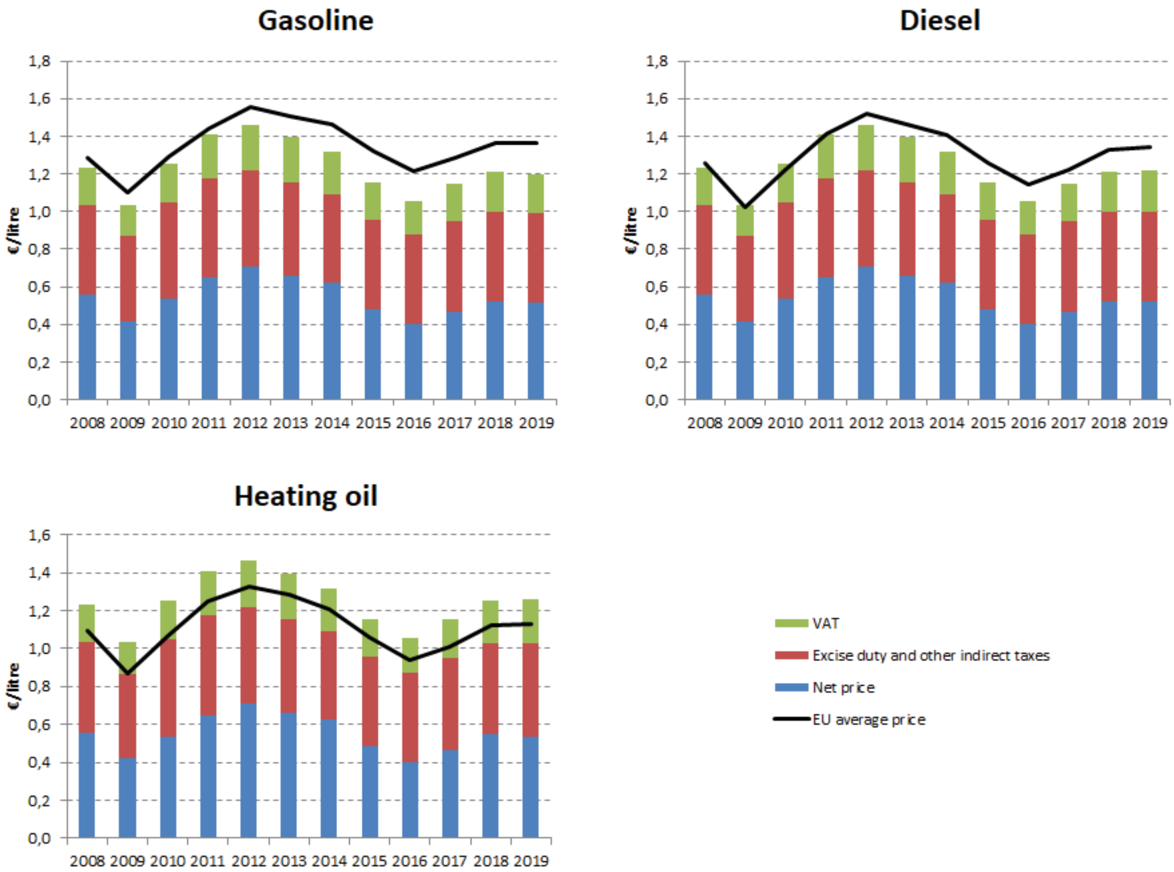

CZ - Retail electricity prices
190 €/MWh
170 €/MWh
150 €/MWh
130 €/MWh
110 €/MWh
90 €/MWh
70 €/MWh
50 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF


CZ - Retail gas prices
70 €/MWh
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5


CZ - 2019 retail electricity prices - components
200 €/MWh
180 €/MWh
160 €/MWh
140 €/MWh
120 €/MWh
100 €/MWh
80 €/MWh
60 €/MWh
40 €/MWh
20 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT

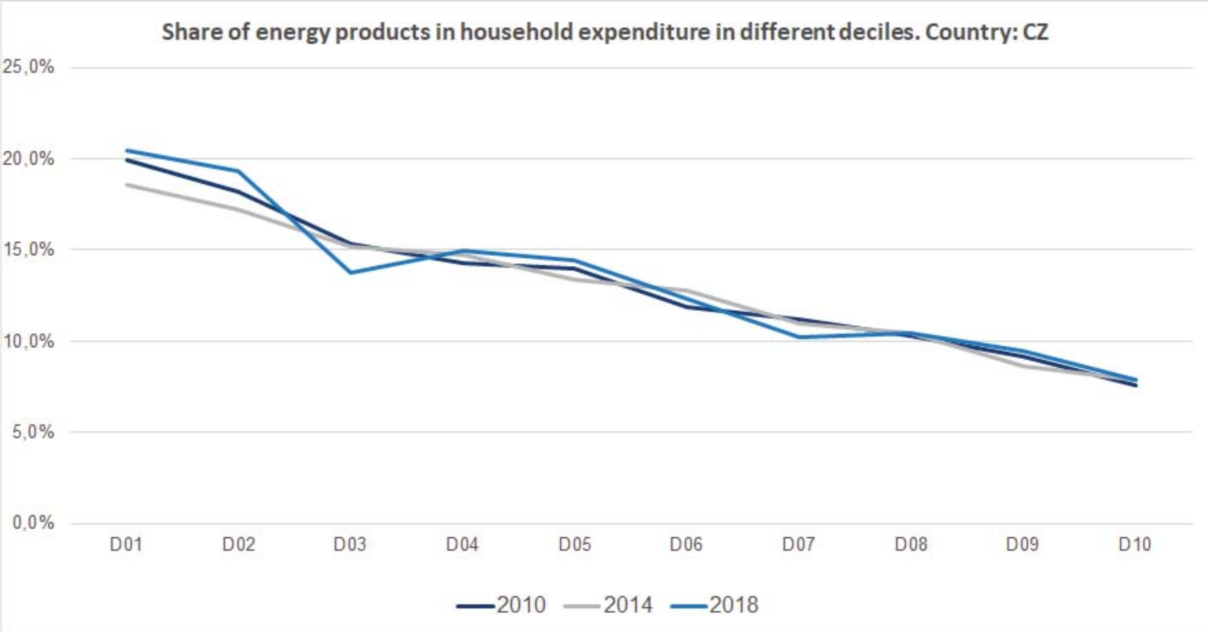

CZ - 2019 retail gas prices - components
70 €/MWh
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
D2
I3
I5
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
VAT
Other

Oil products prices



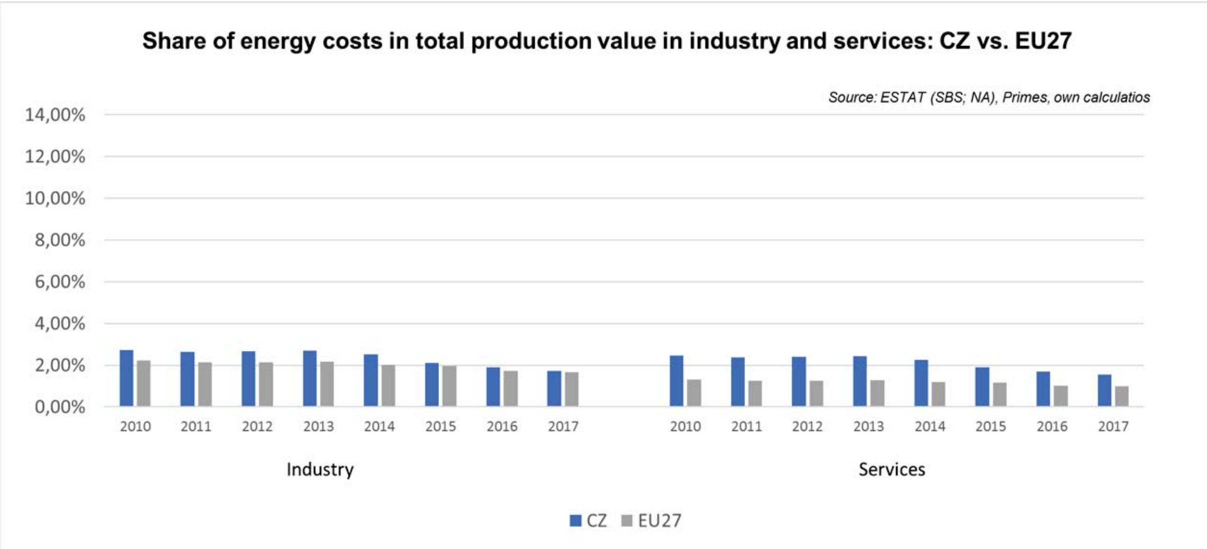
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2010 in Czechia (dark blue line) the poorest households (Decile 1) had to spend 20.0% of their total expenditures on energy products. In 2018 (blue line) the share of energy increased marginally to 20.4%. In the case of middle income households (Decile 5), in 2010 they spent 13.9 % of their total expenditure on energy, while in 2018 this value increased to 14.4%. See footnote [1]

Energy costs shares in total production costs

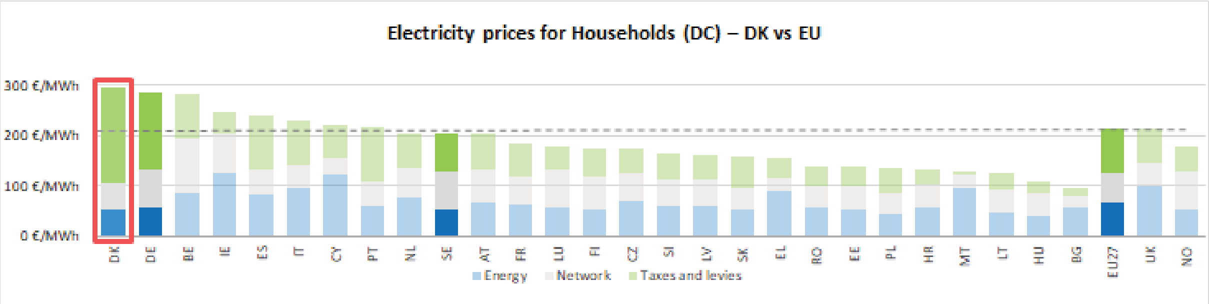


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available

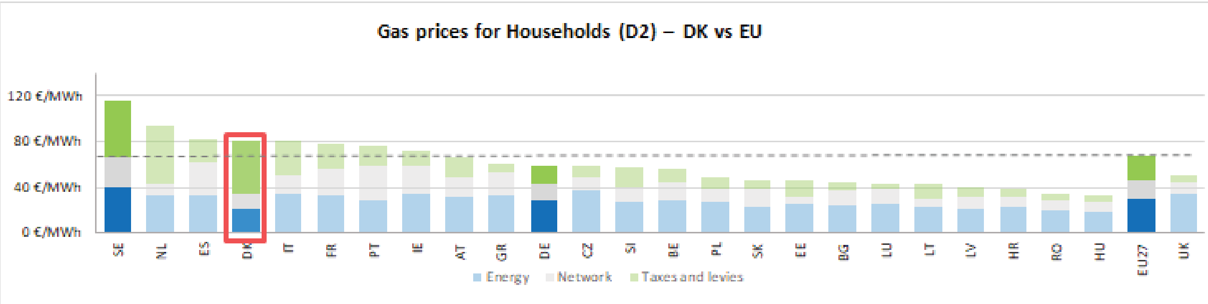
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

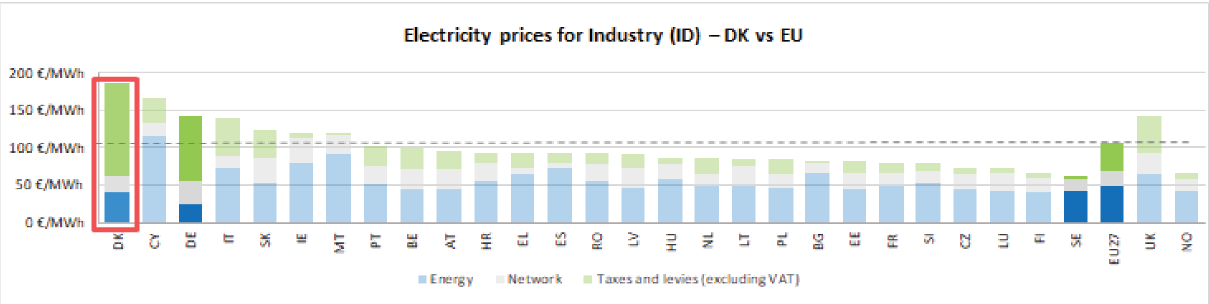
Denmark

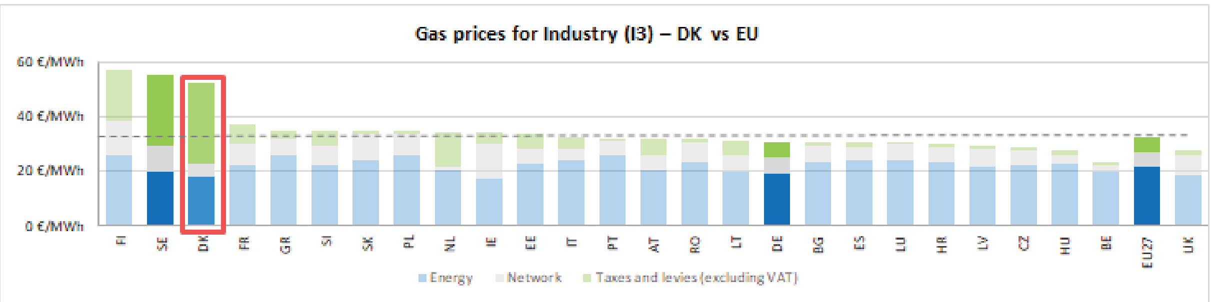
Prices (2019 and recent evolution)



See footnote [1]





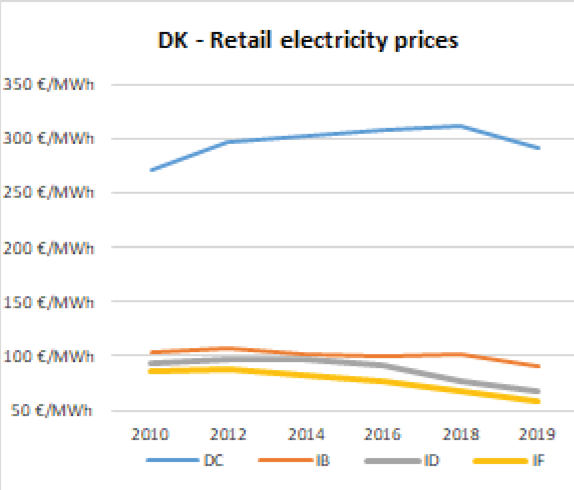


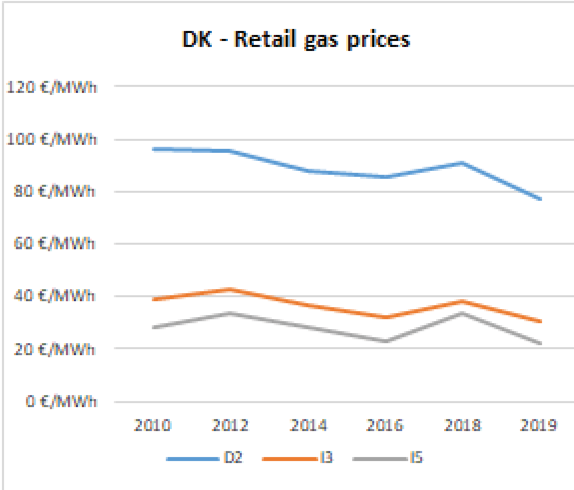
See footnote [2]

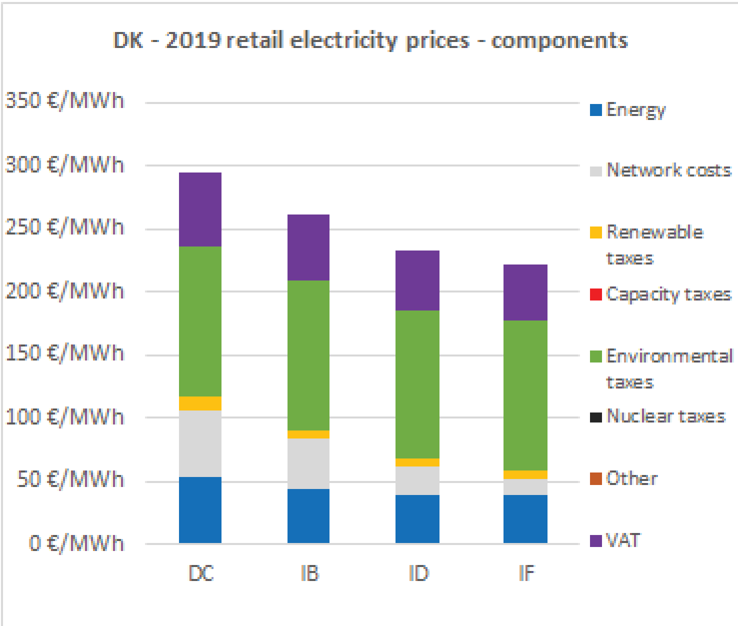
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

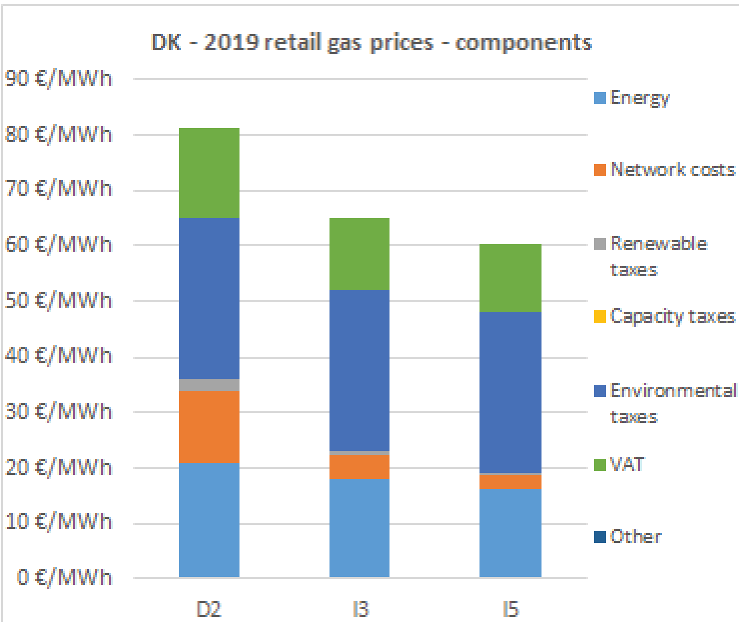
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

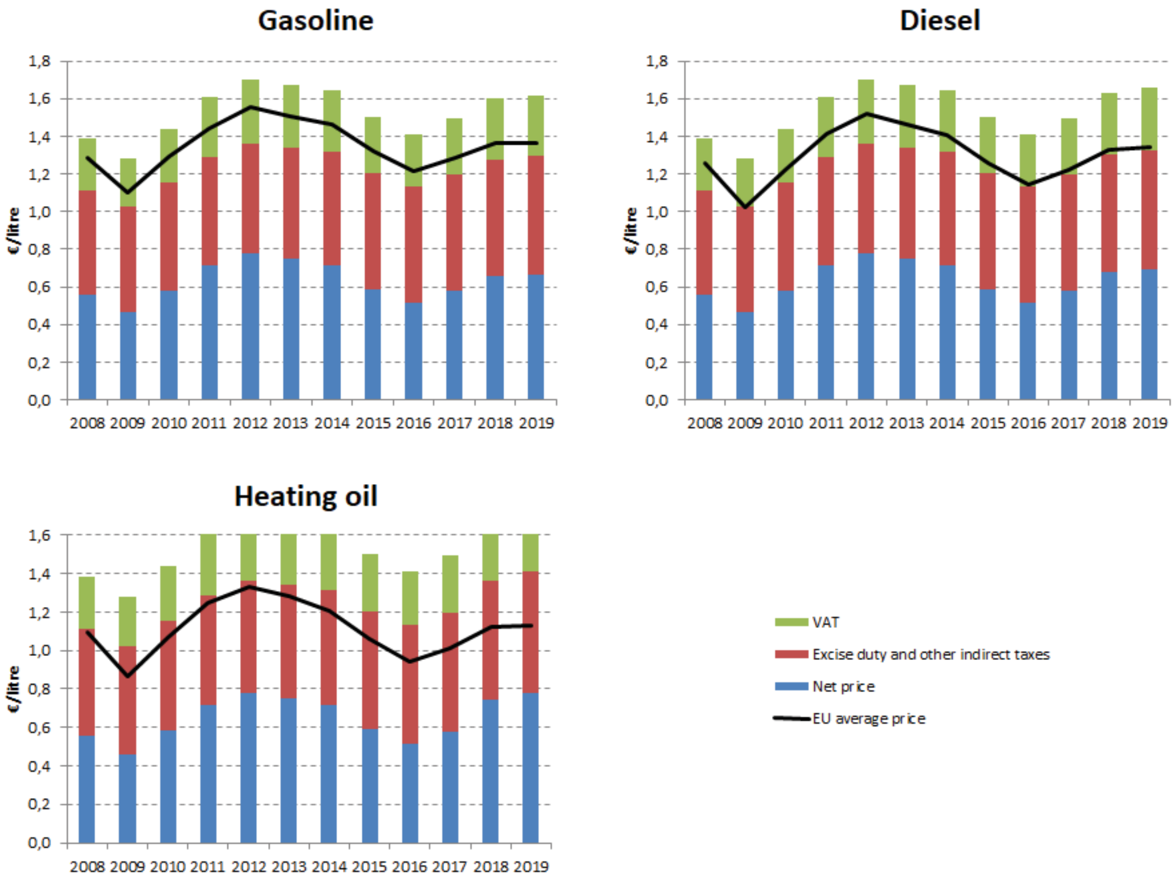

DK - Retail electricity prices
350 €/MWh
300 €/MWh
250 €/MWh
200 €/MWh
150 €/MWh
100 €/MWh
50 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF


DK - Retail gas prices
120 €/MWh
100 €/MWh
80 €/MWh
60 €/MWh
40 €/MWh
20 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5


DK - 2019 retail electricity prices - components
350 €/MWh
300 €/MWh
250 €/MWh
200 €/MWh
150 €/MWh
100 €/MWh
50 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT

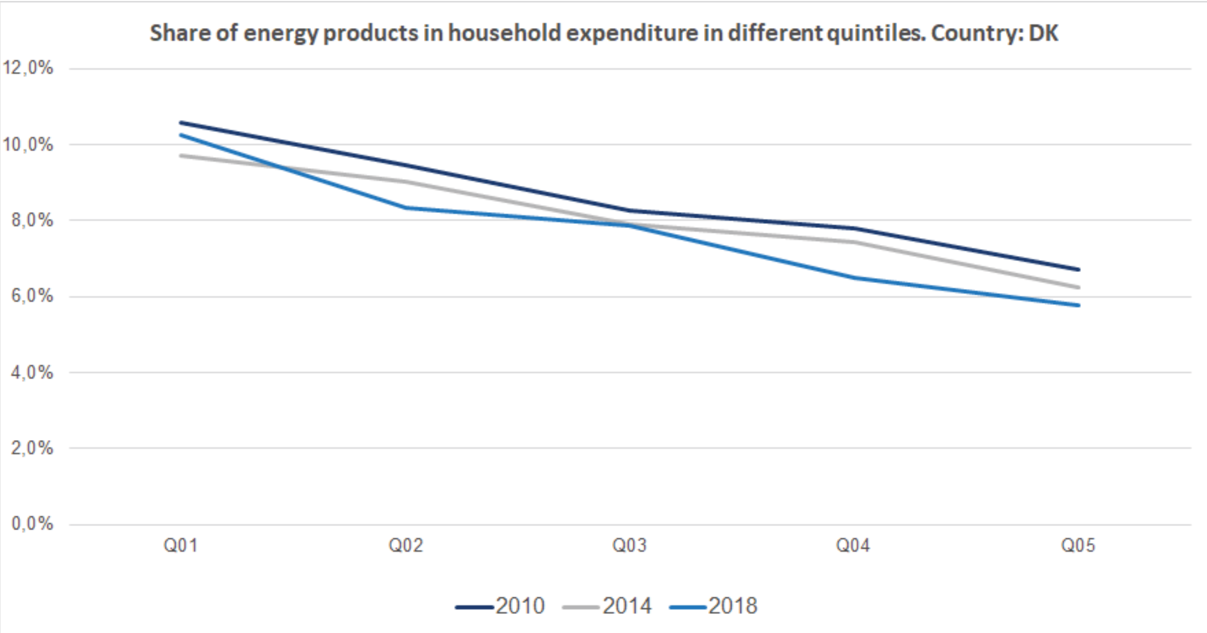

DK - 2019 retail gas prices - components
90 €/MWh
80 €/MWh
70 €/MWh
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
D2
I3
I5
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
VAT
Other

Oil products prices



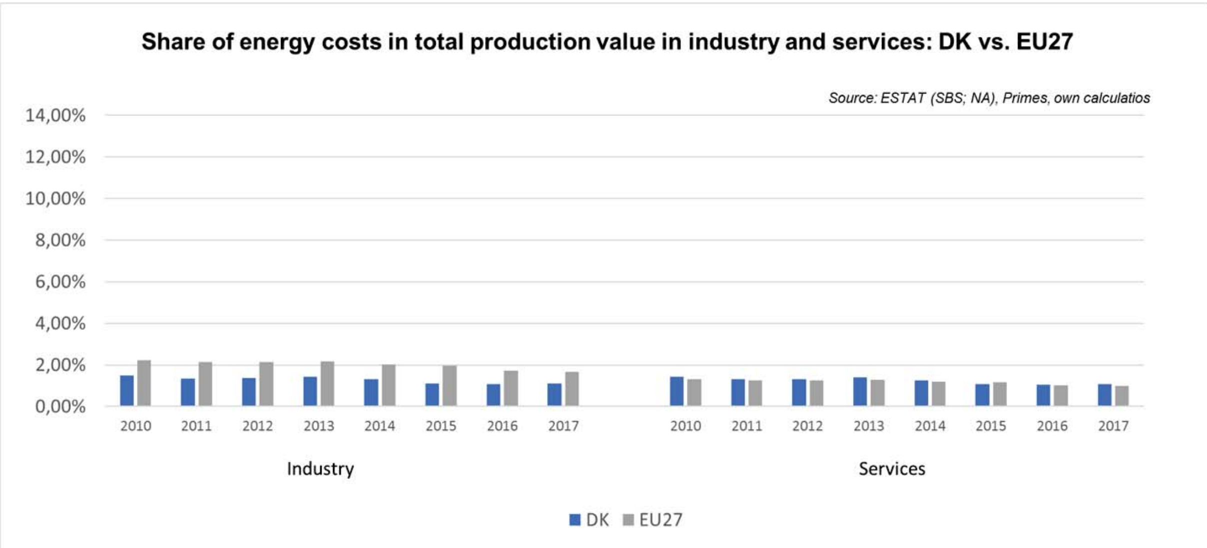
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2010 in Denmark (dark blue line) the poorest households (Quintile 1) had to spend 10.6% of their total expenditures on energy products. In 2018 (blue line) the share of energy remained practically unchanged. In the case of middle income households (Quintile 3), in 2010 they spent 8.2 % of their total expenditure on energy, while in 2018 this value decreased slight to 7.9%. See footnote [1]

Energy costs shares in total production costs

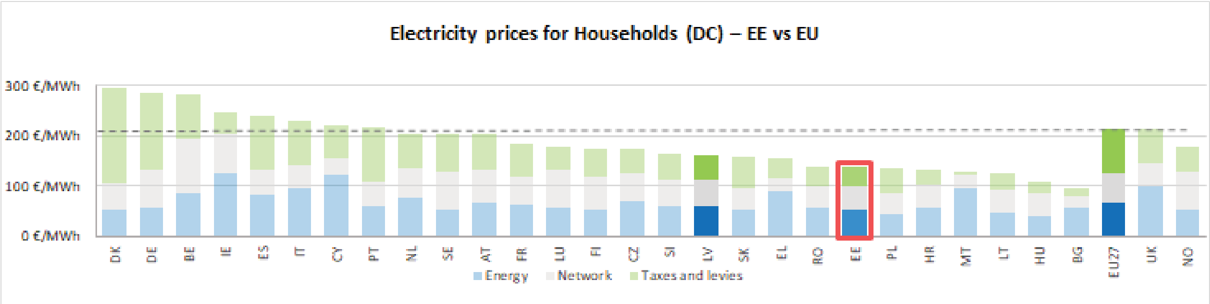


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available

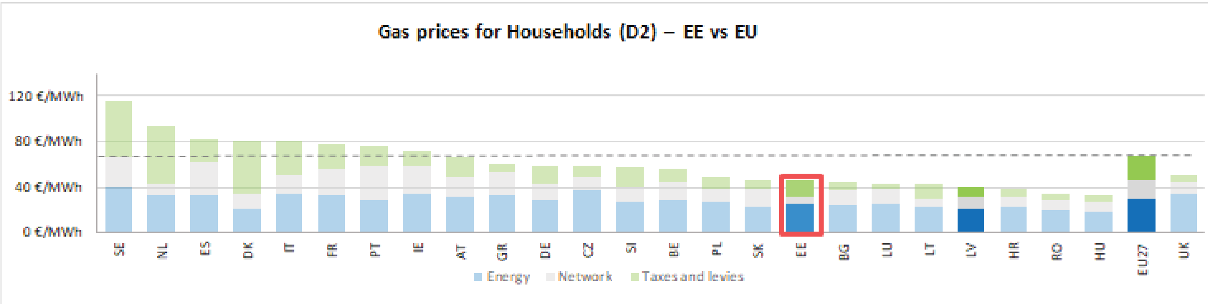
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

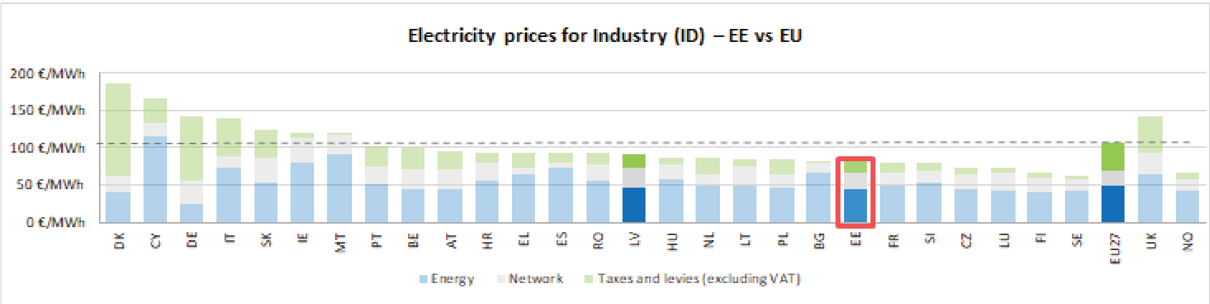
Estonia

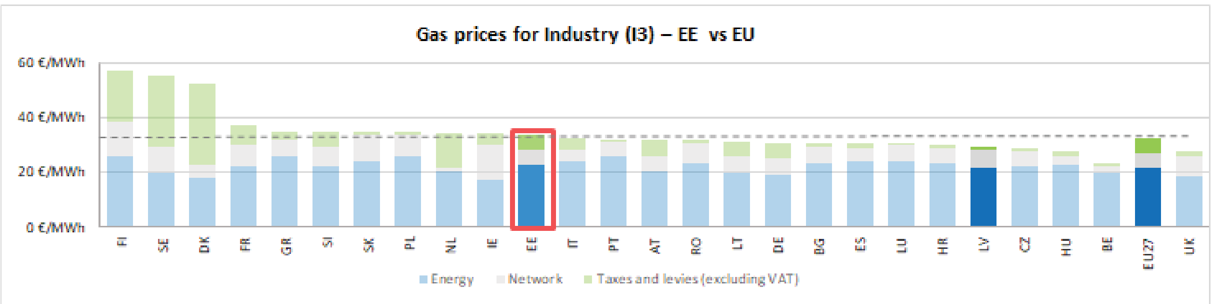
Prices (2019 and recent evolution)



See footnote [1]





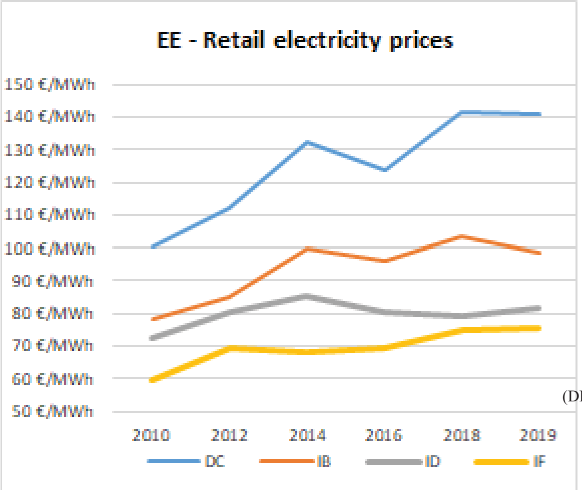


Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

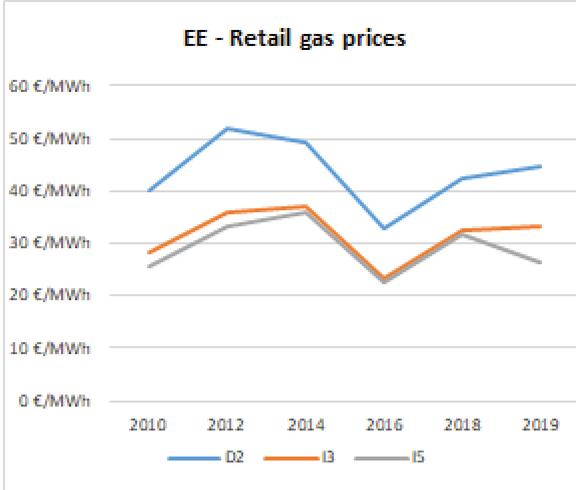
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

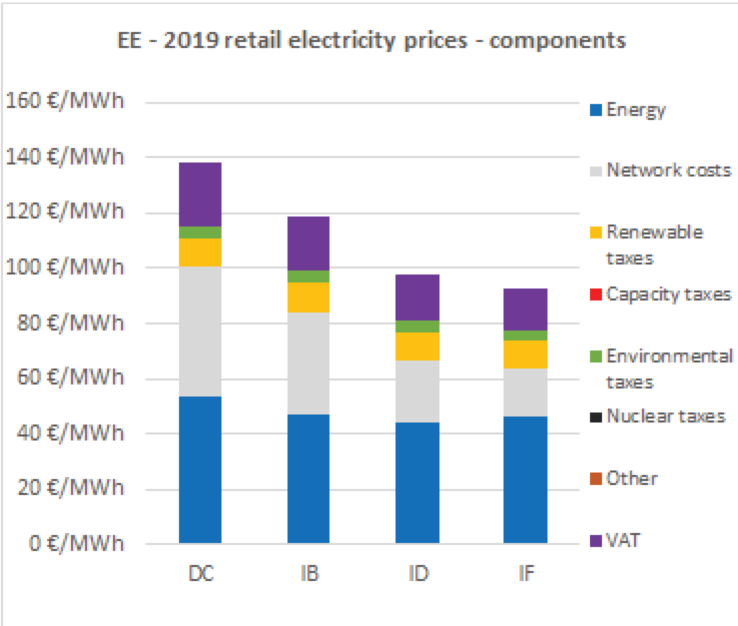
See footnote [2]

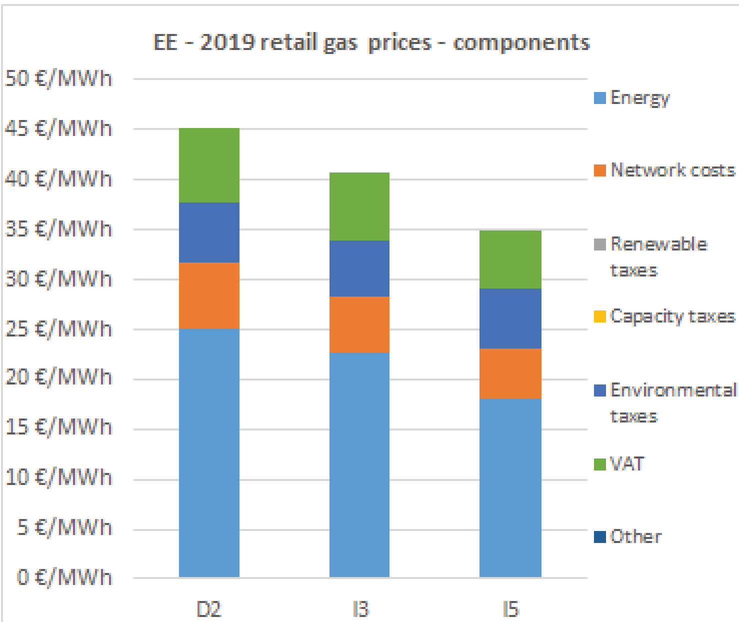
[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.


EE - Retail electricity prices
150 €/MWh
140 €/MWh
130 €/MWh
120 €/MWh
110 €/MWh
100 €/MWh
90 €/MWh
80 €/MWh
70 €/MWh
60 €/MWh
50 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF

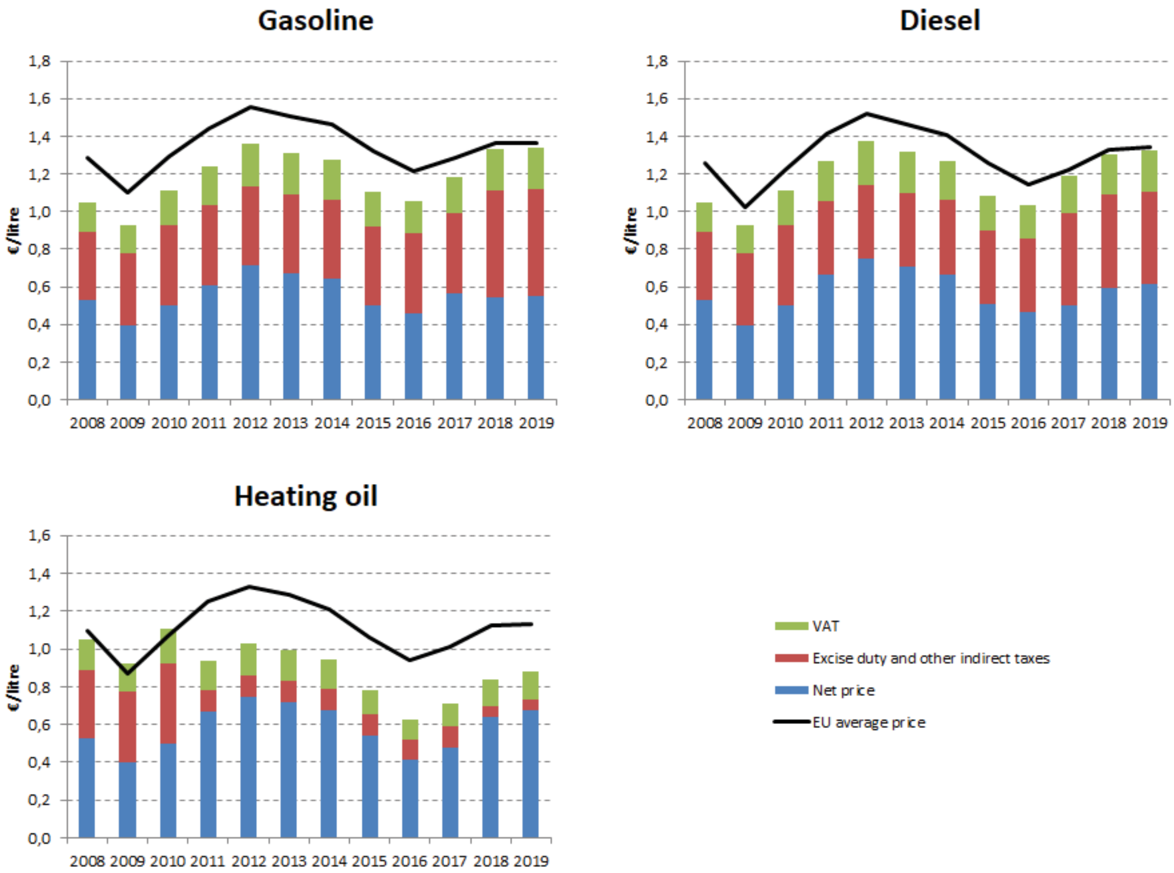
(DD)


EE - Retail gas prices
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5


EE - 2019 retail electricity prices - components
160 €/MWh
140 €/MWh
120 €/MWh
100 €/MWh
80 €/MWh
60 €/MWh
40 €/MWh
20 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT

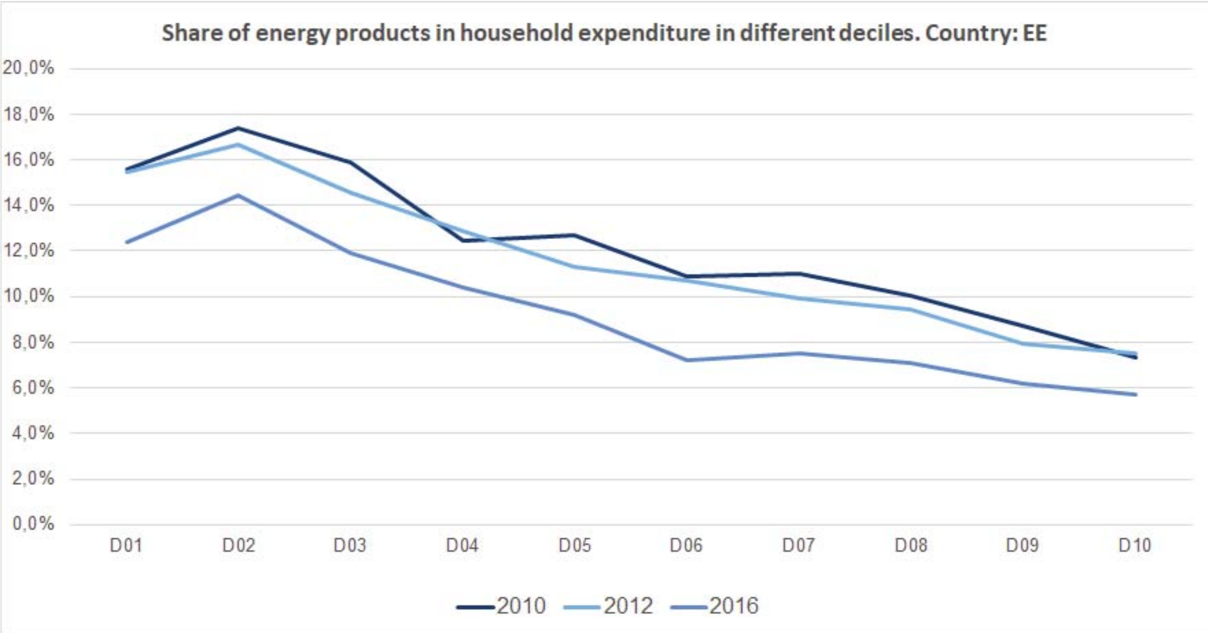

EE - 2019 retail gas prices - components
50 €/MWh
45 €/MWh
40 €/MWh
35 €/MWh
30 €/MWh
25 €/MWh
20 €/MWh
15 €/MWh
10 €/MWh
5 €/MWh
0 €/MWh
D2
I3
I5
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
VAT
Other

Oil prices


Gasoline
Diesel
Heating oil
€/litre
0,0
0,2
0,4
0,6
0,8
1,0
1,2
1,4
1,6
1,8
2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019
VAT
Excise duty and other indirect taxes
Net price
EU average price

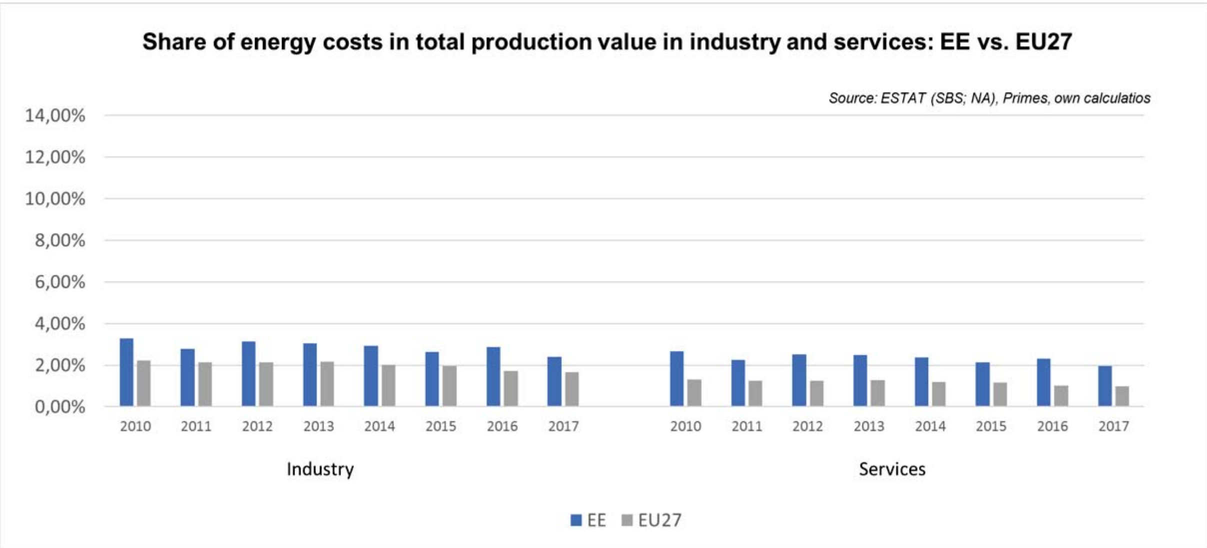
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2010 in Estonia (dark blue line) the poorest households (Decile 1) had to spend 15.6% of their total expenditures on energy products. In 2016 (blue line) the share of energy decreased to 12.4%. In the case of middle income households (Decile 5), in 2010 they spent 12.7 % of their total expenditure on energy, while in 2018 this value decreased to 9.1%. See footnote [1]

Energy costs shares in total production costs

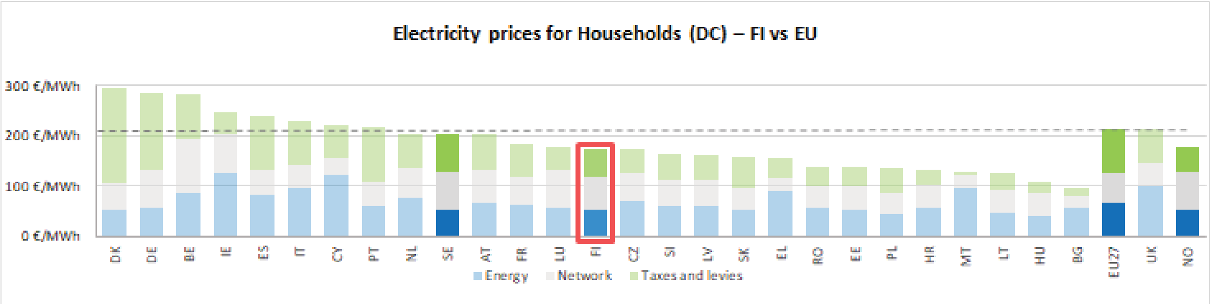


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available

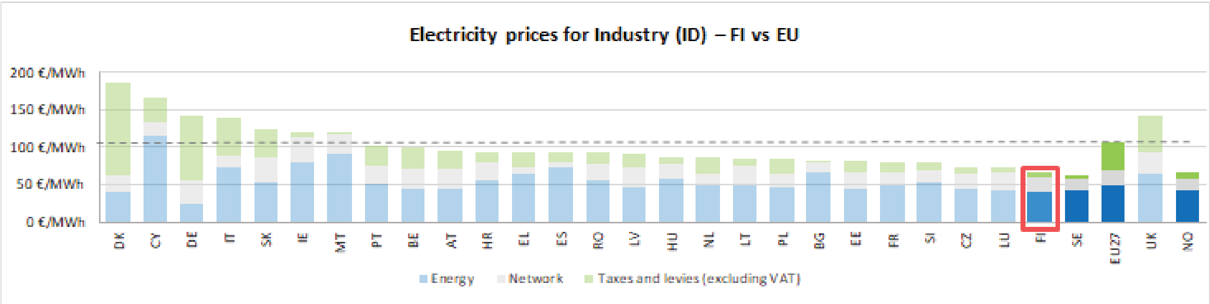
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

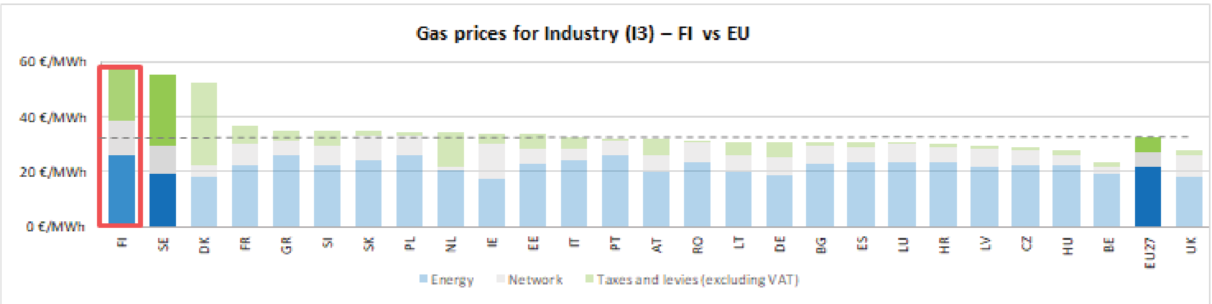
Finland

Prices (2019 and recent evolution)



See footnote [1]



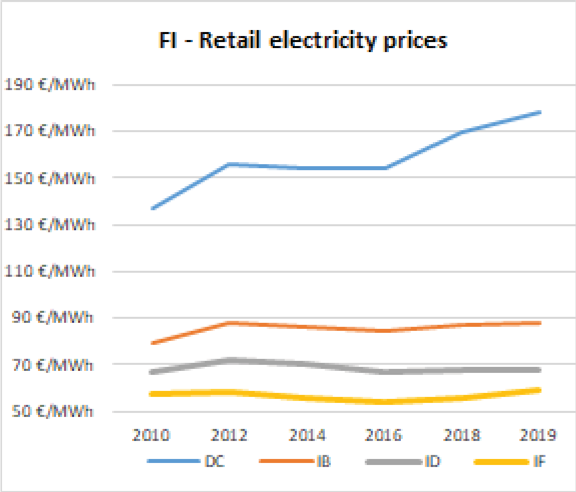


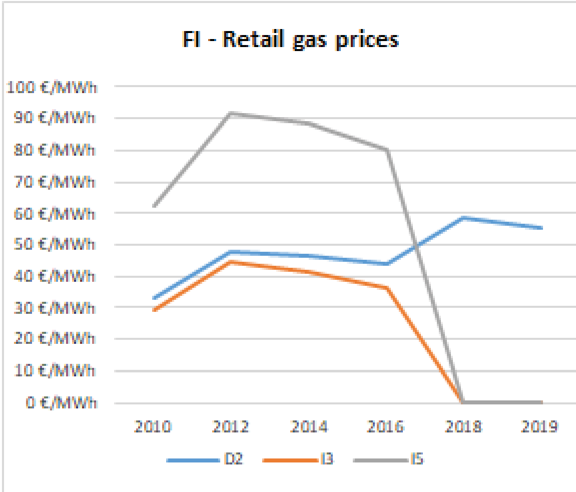
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

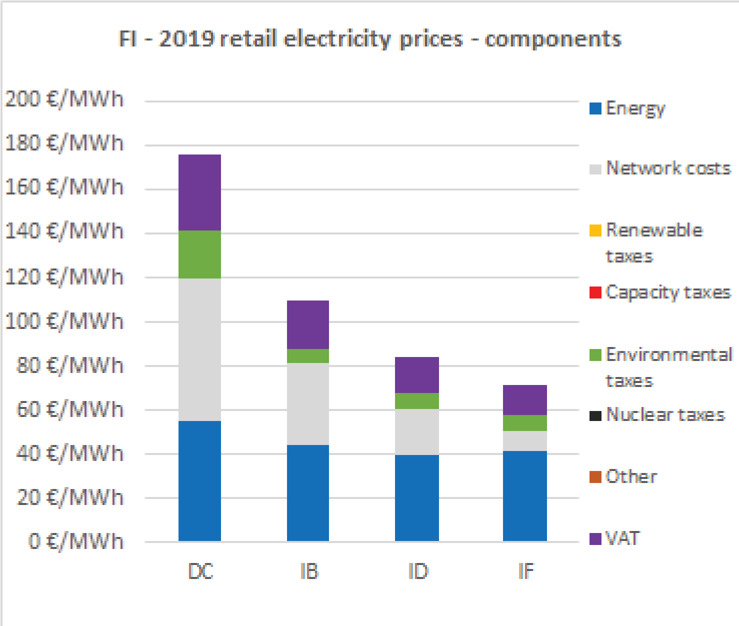
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

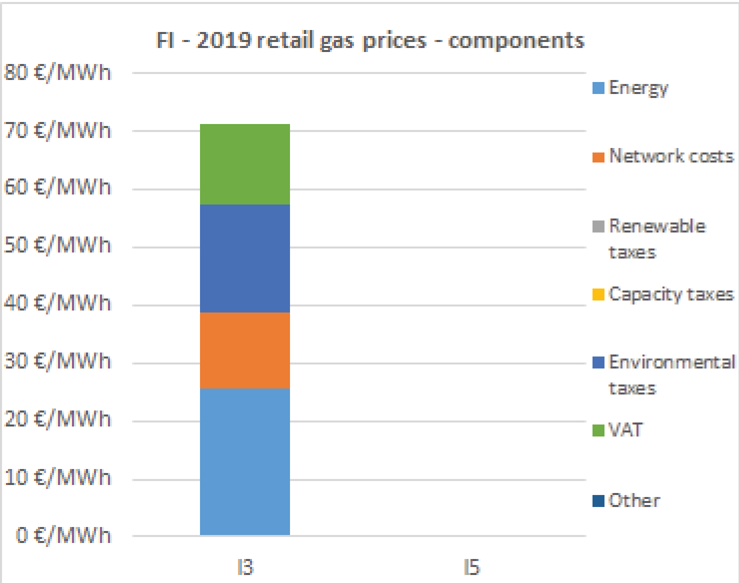
See footnote [2]

[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

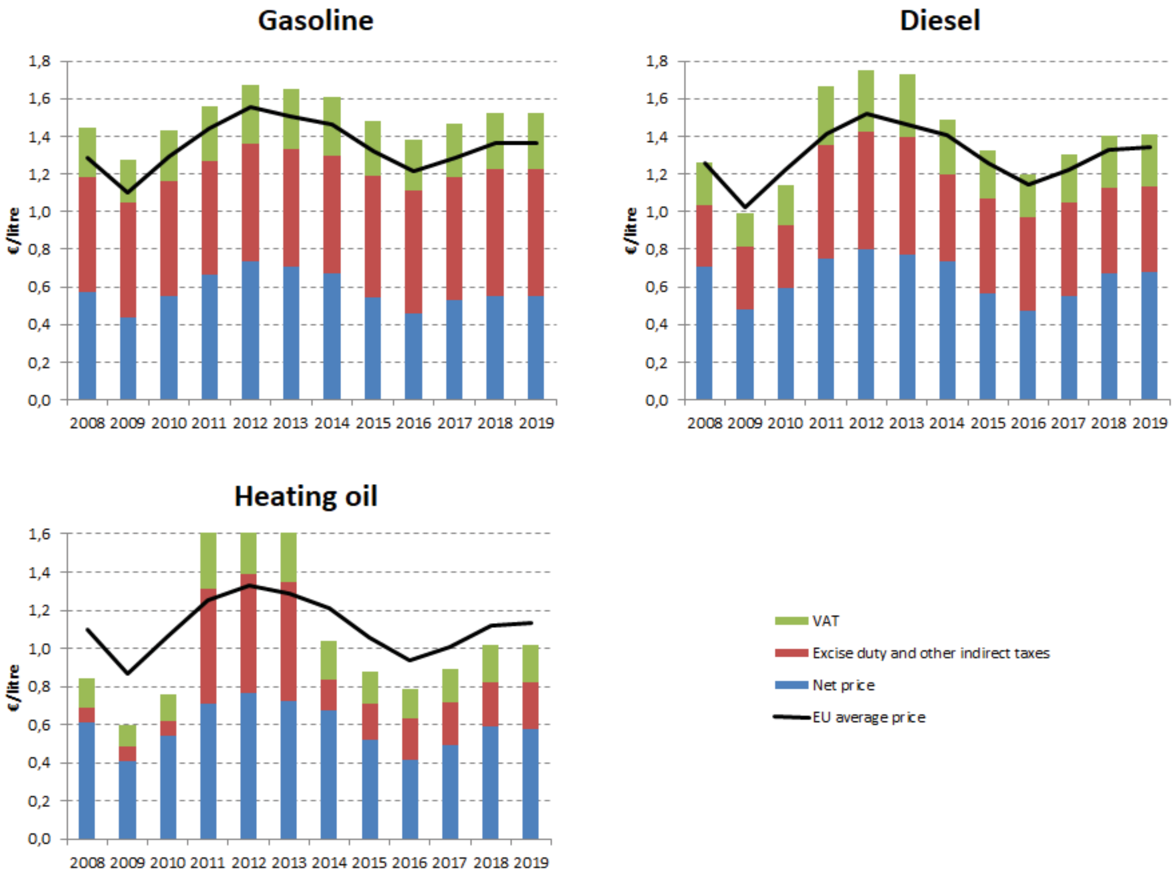

FI - Retail electricity prices
190 €/MWh
170 €/MWh
150 €/MWh
130 €/MWh
110 €/MWh
90 €/MWh
70 €/MWh
50 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF


FI - Retail gas prices
100 €/MWh
90 €/MWh
80 €/MWh
70 €/MWh
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5


FI - 2019 retail electricity prices - components
200 €/MWh
180 €/MWh
160 €/MWh
140 €/MWh
120 €/MWh
100 €/MWh
80 €/MWh
60 €/MWh
40 €/MWh
20 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT

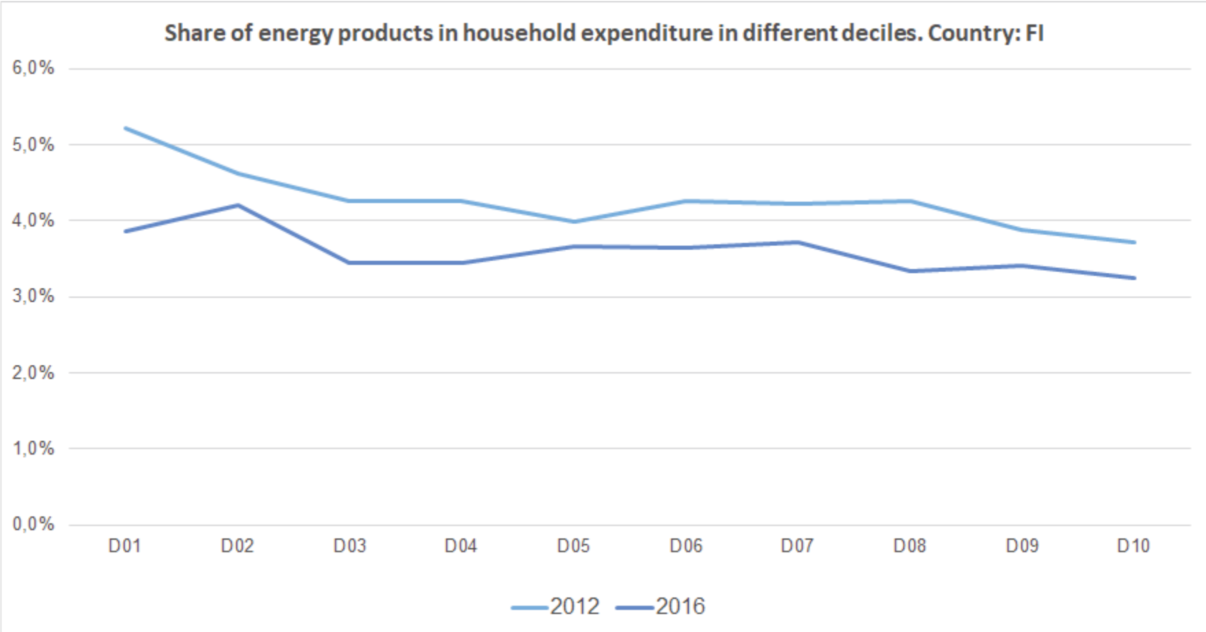

FI - 2019 retail gas prices - components
80 €/MWh
70 €/MWh
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
I3
I5
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
VAT
Other

Oil products prices



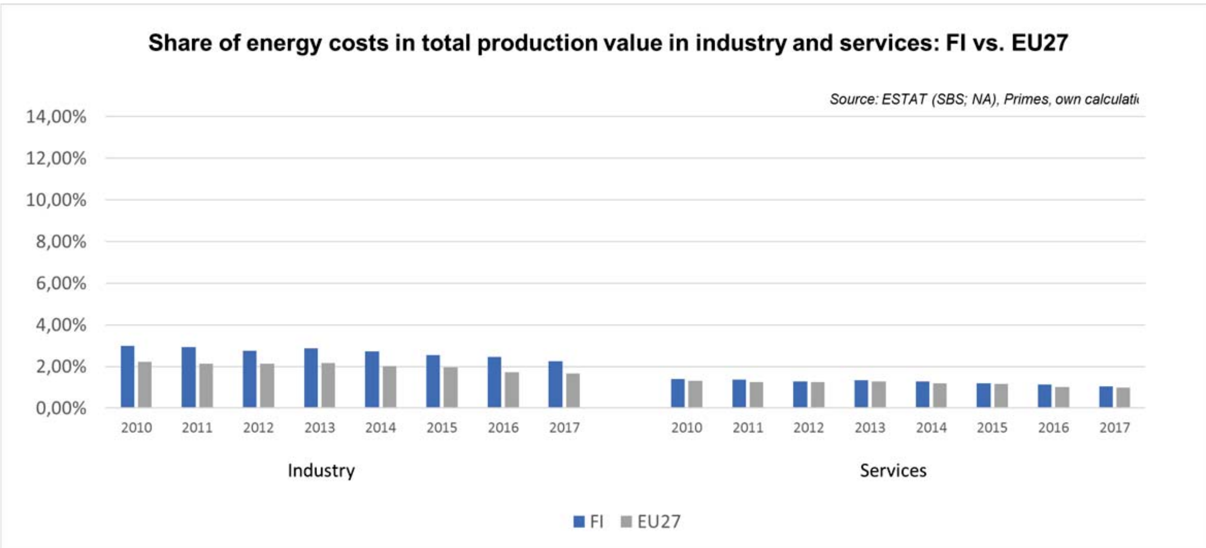
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2012 in Finland (light blue line) the poorest households (Decile 1) had to spend 5.2% of their total expenditures on energy products. In 2016 (blue line) the share of energy decreased to 3.9%. In the case of middle income households (Decile 5), in 2012 they spent 4.0 % of their total expenditure on energy, while in 2016 this value decreased to 3.7%. See footnote [1]

Energy costs shares in total production costs

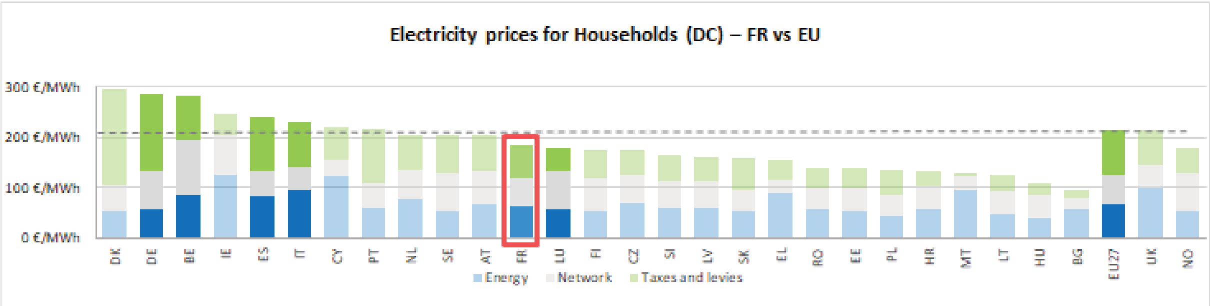


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

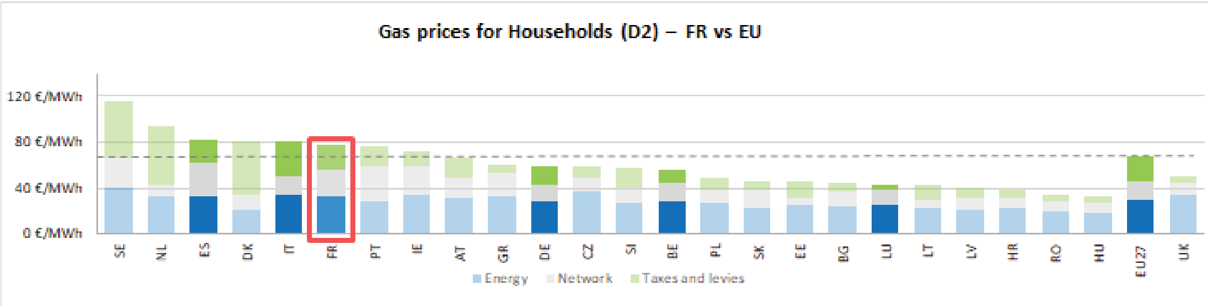
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

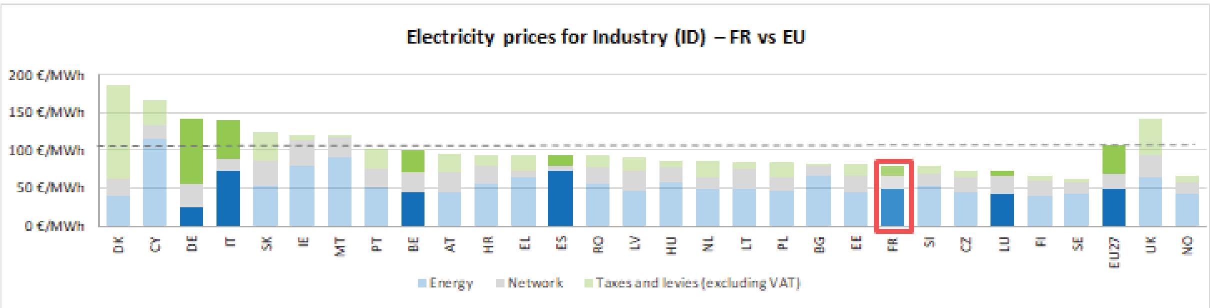
France

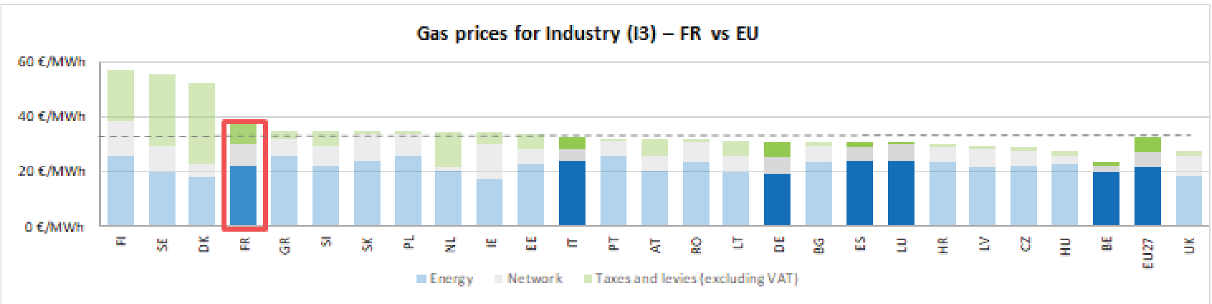
Prices (2019 and recent evolution)



See footnote [1]





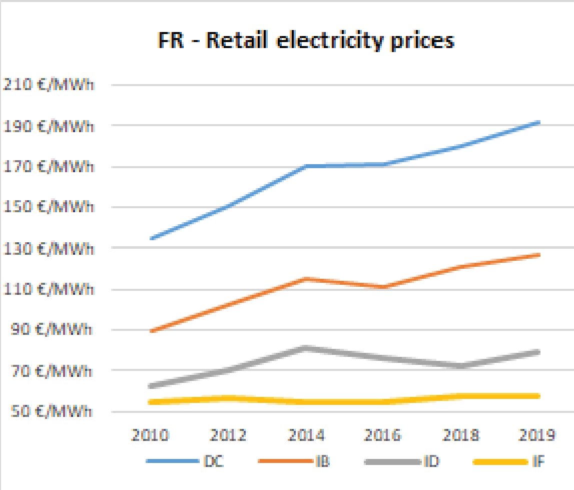


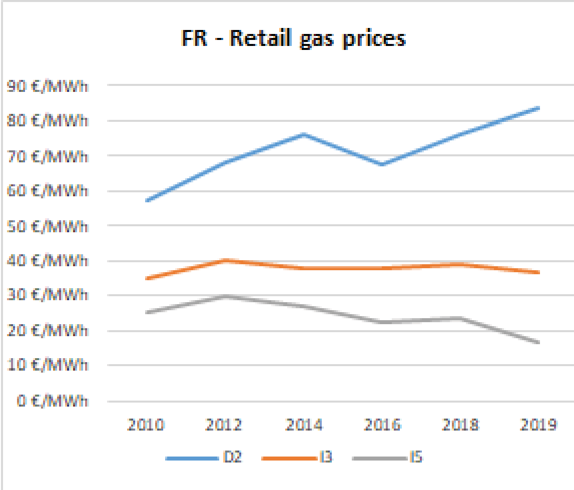
See footnote [2]

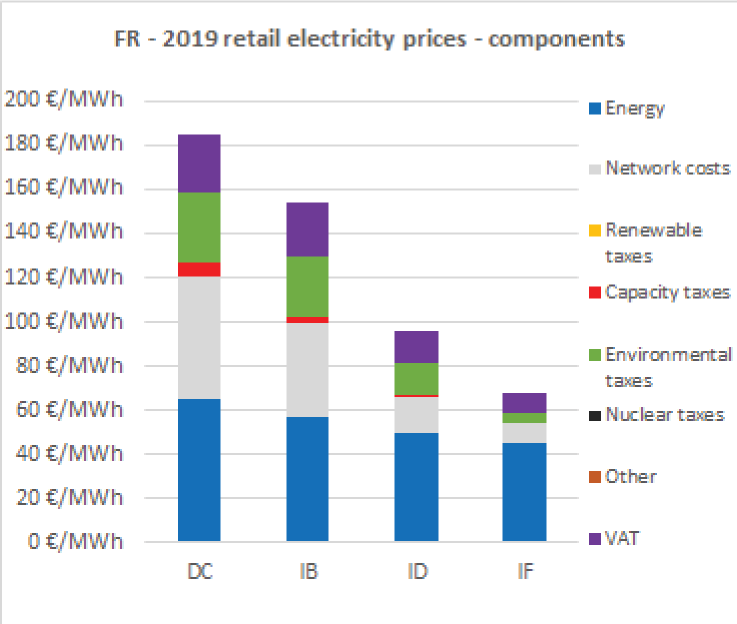
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

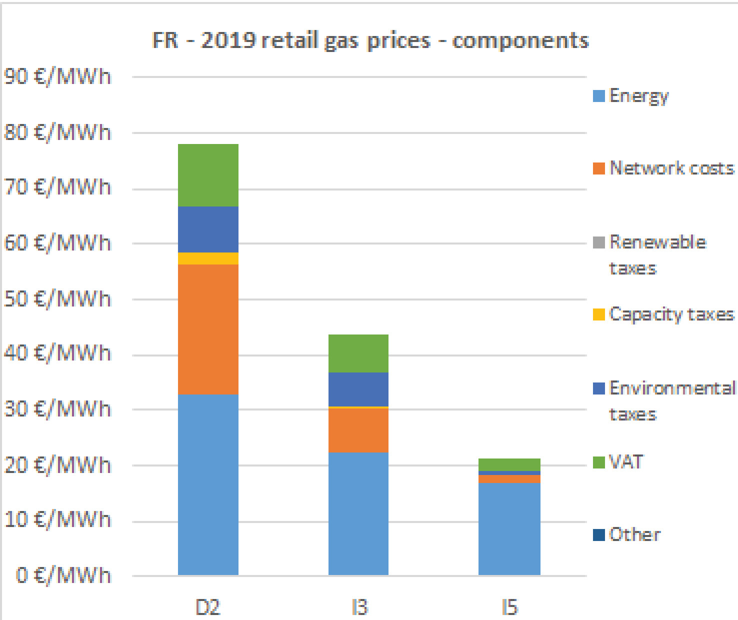
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

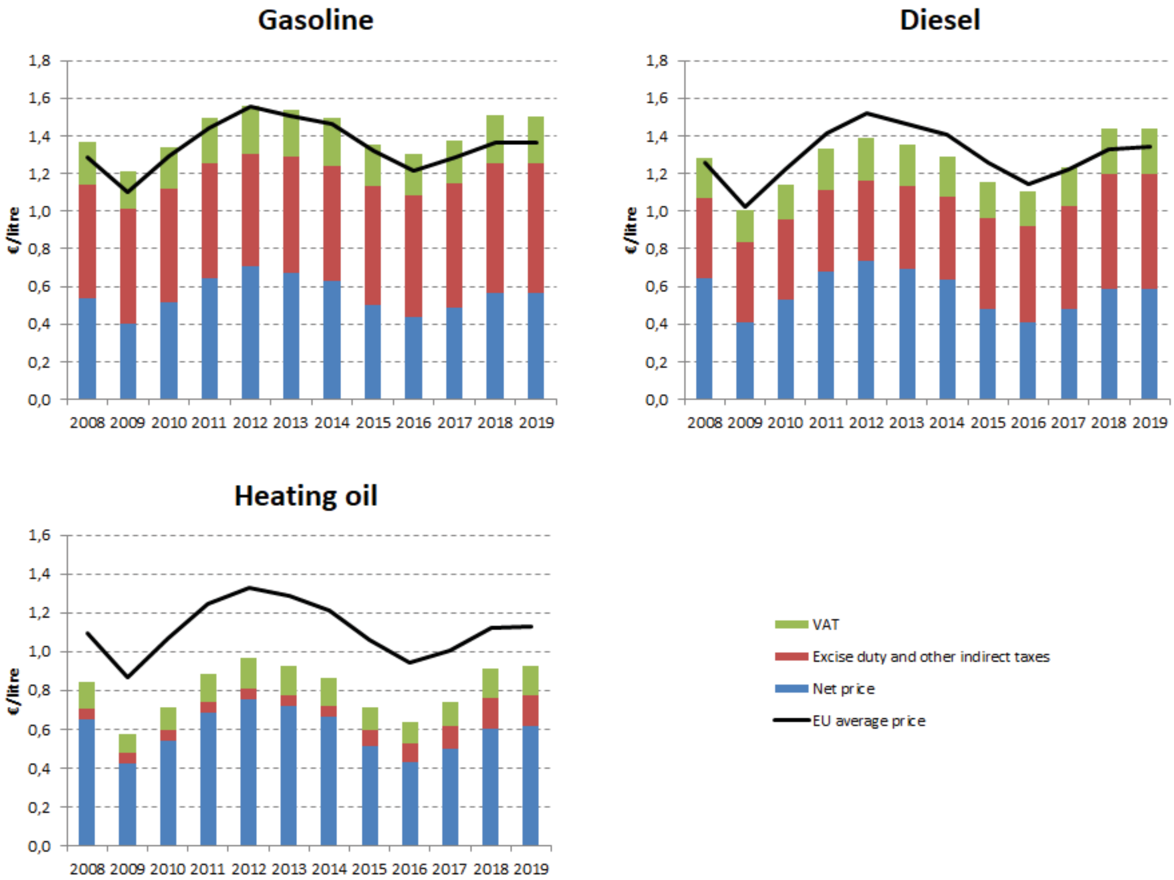






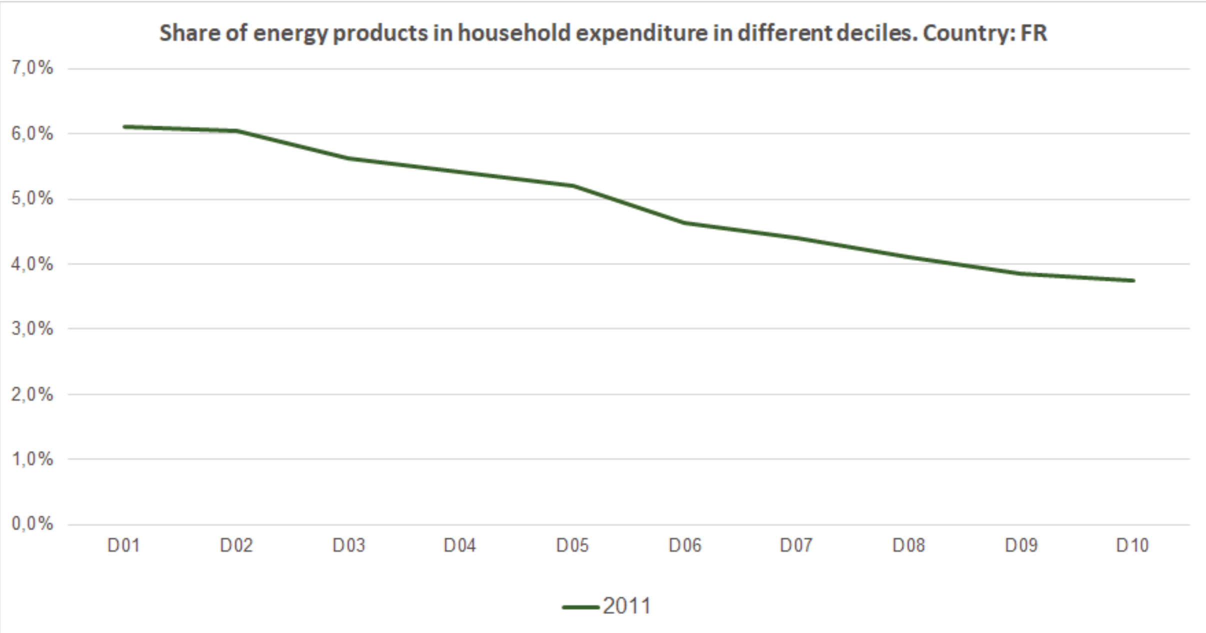


Oil product prices


Gasoline
Diesel
Heating oil
€/litre
2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019
VAT
Excise duty and other indirect taxes
Net price
EU average price

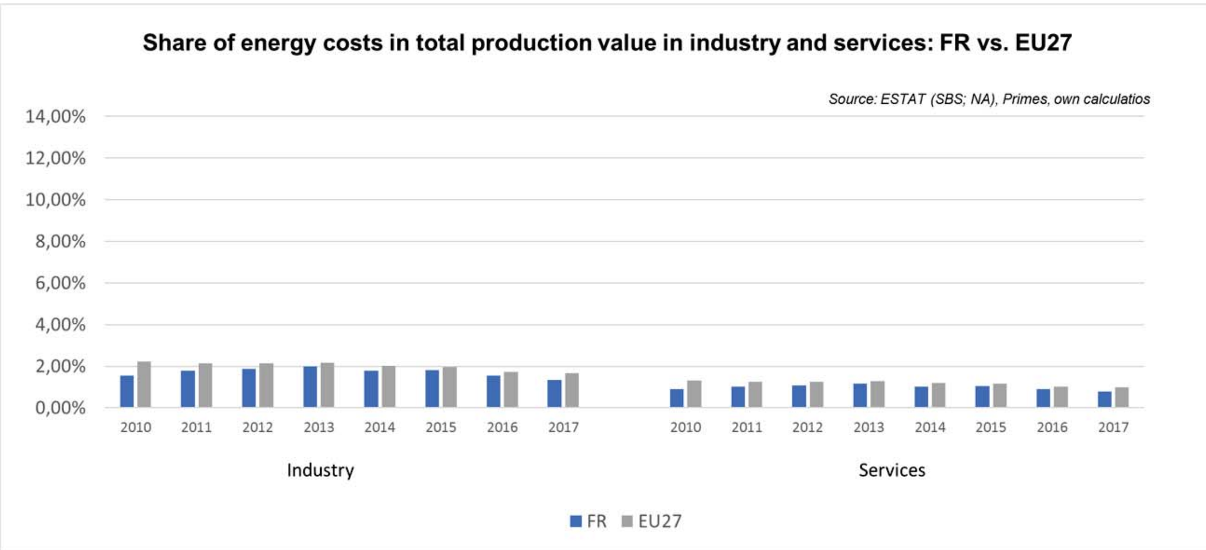
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2011 in France (dark green line) the poorest households (Decile 1) had to spend 6.1% of their total expenditures on energy products. In the case of middle income households (Decile 5), in 2011 they spent 5.2 % of their total expenditure on energy. See footnote [1]

Energy costs shares in total production costs

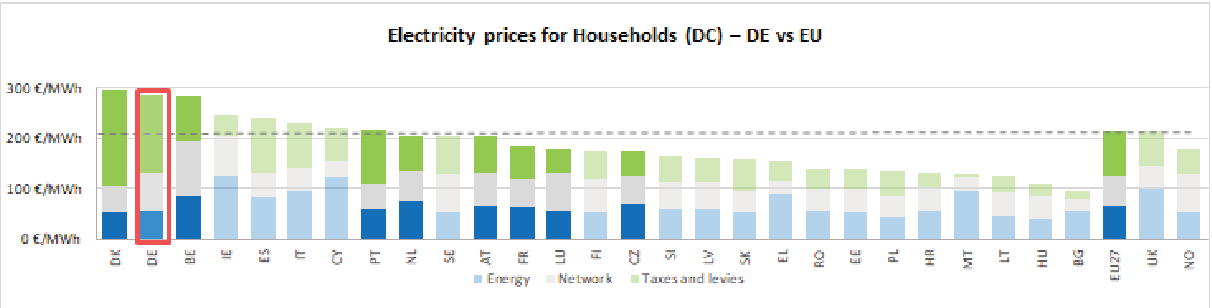


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available

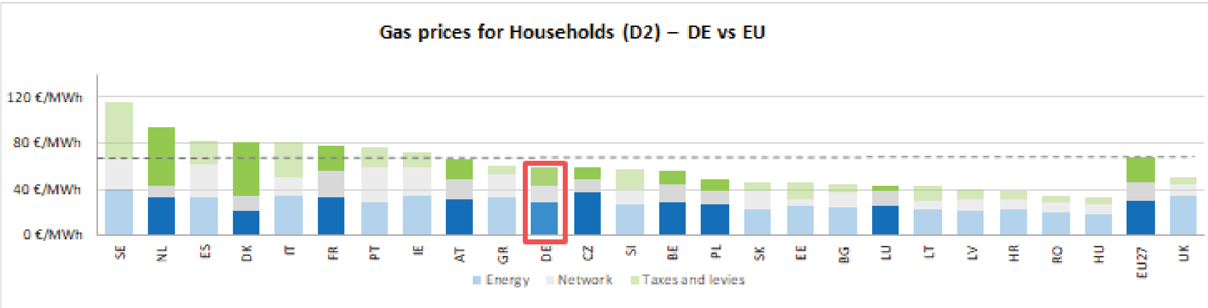
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

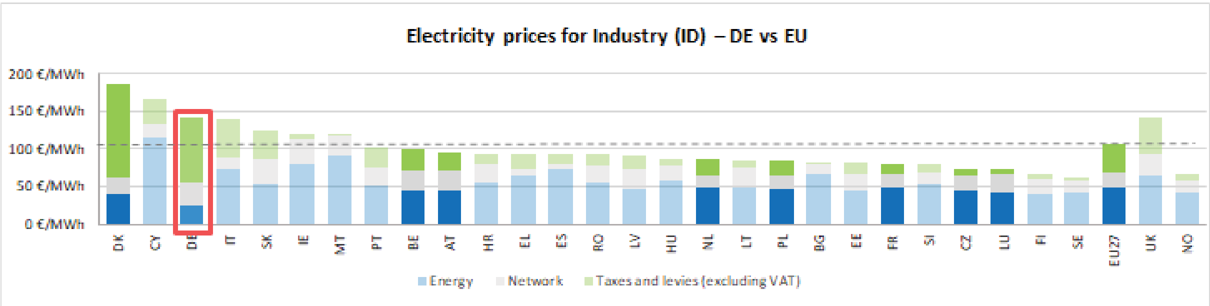
Germany

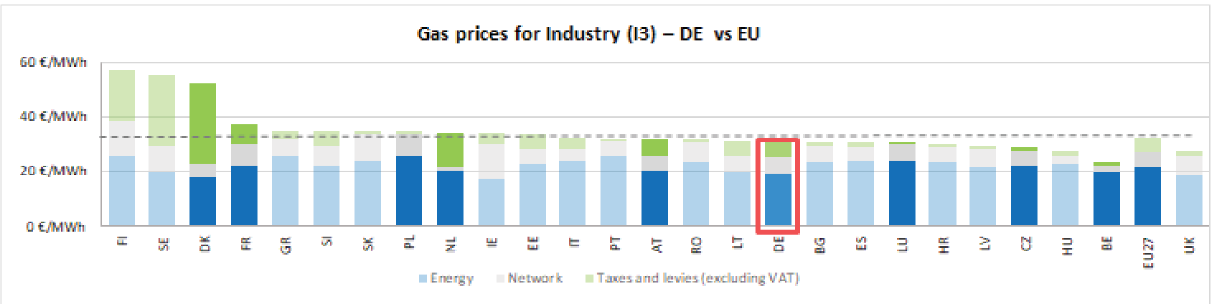
Prices (2019 and recent evolution)



see footnote[1]





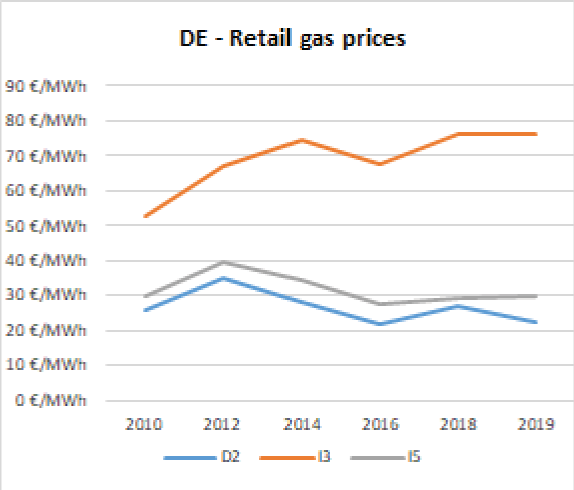


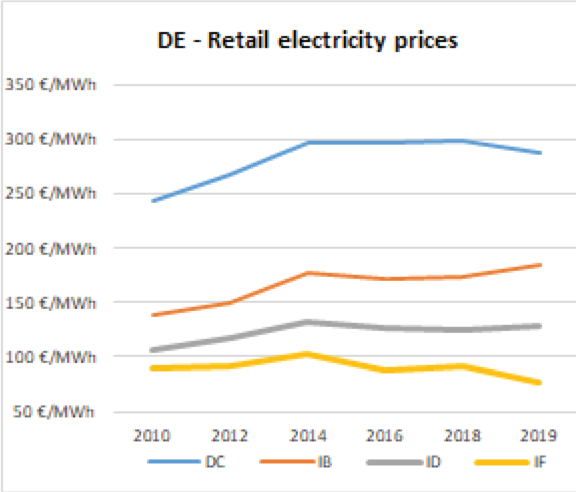
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

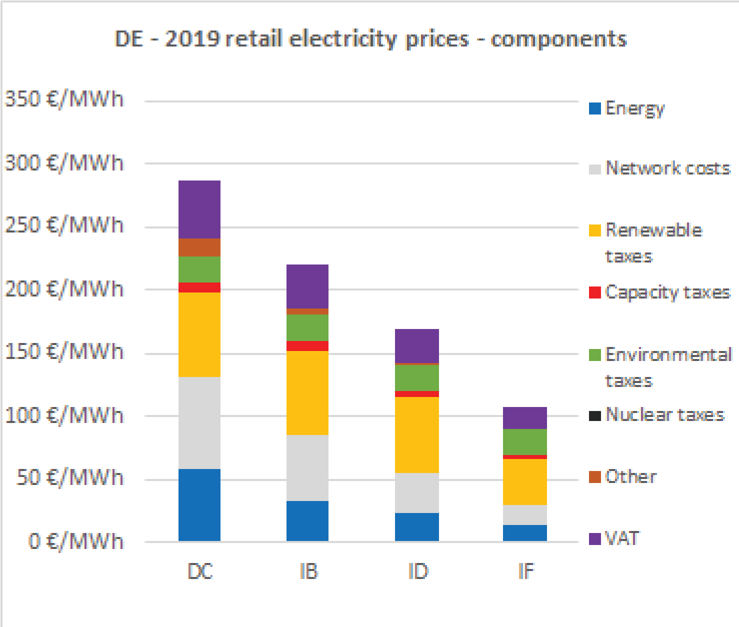
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

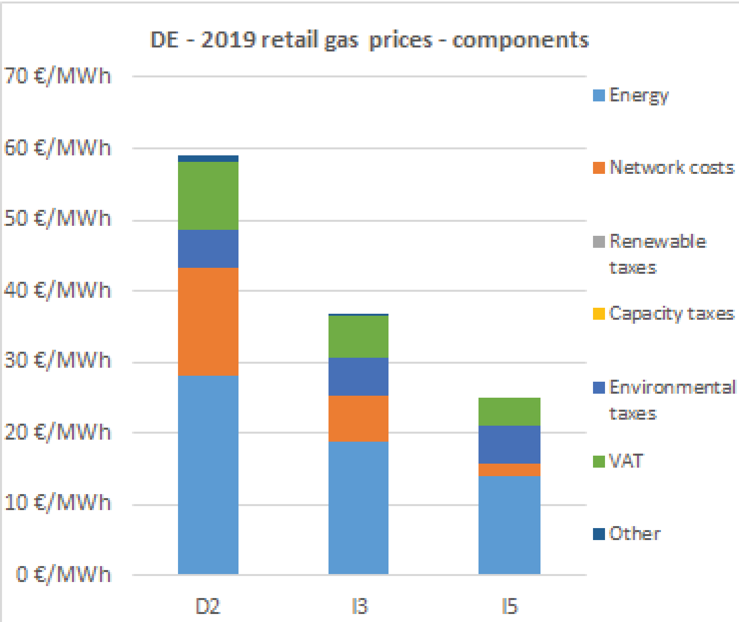
See footnote[2]

[1]The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

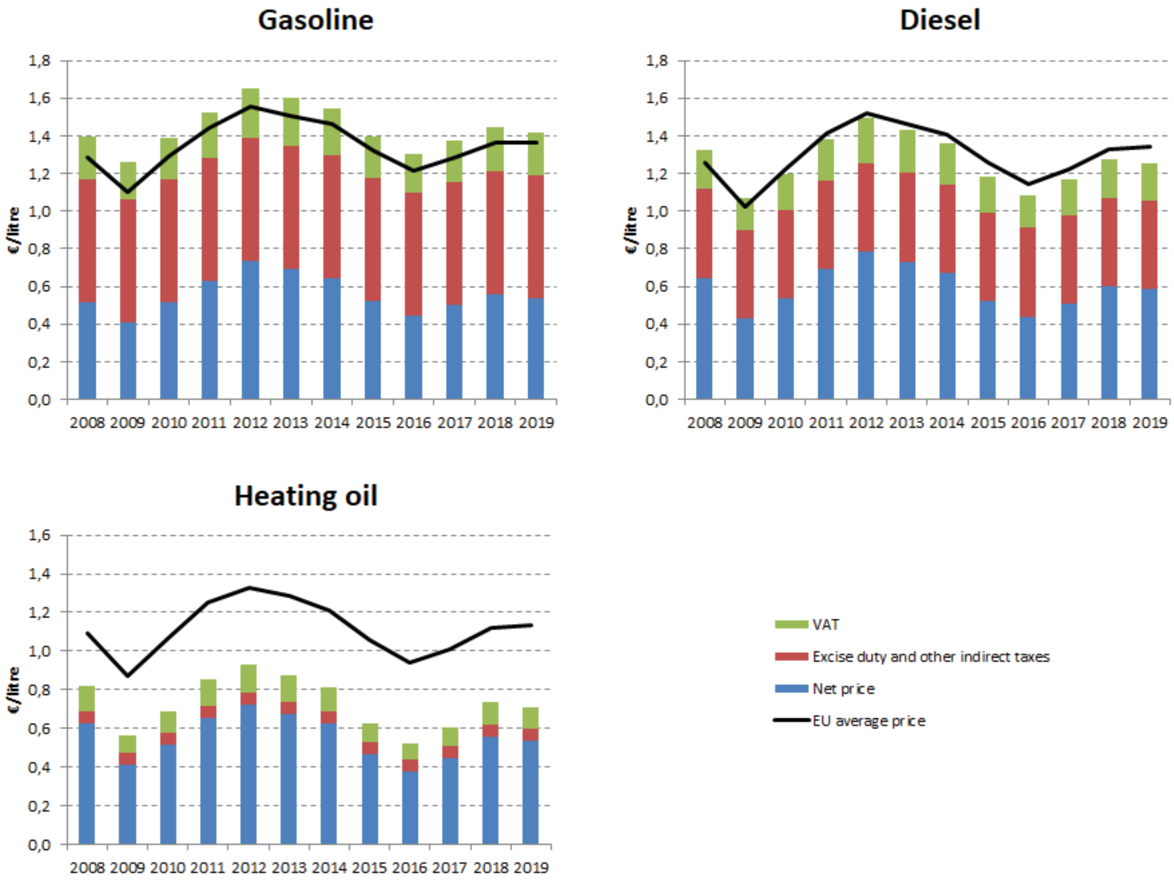






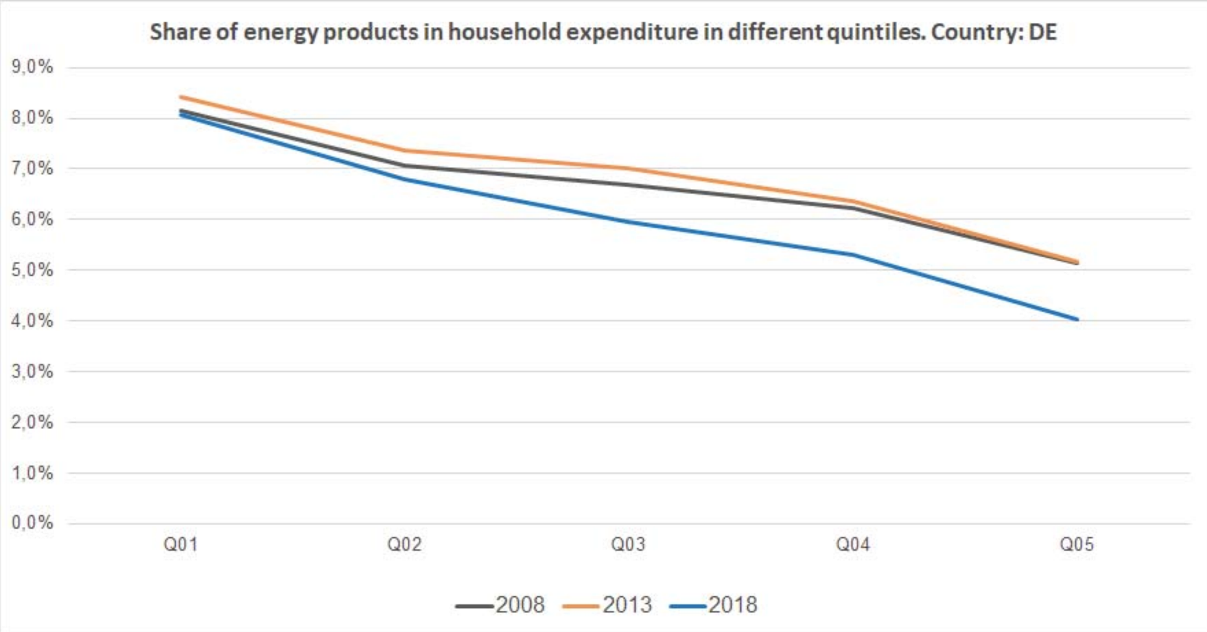


Oil products prices


Gasoline
Diesel
Heating oil
€/litre
2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019
VAT
Excise duty and other indirect taxes
Net price
EU average price

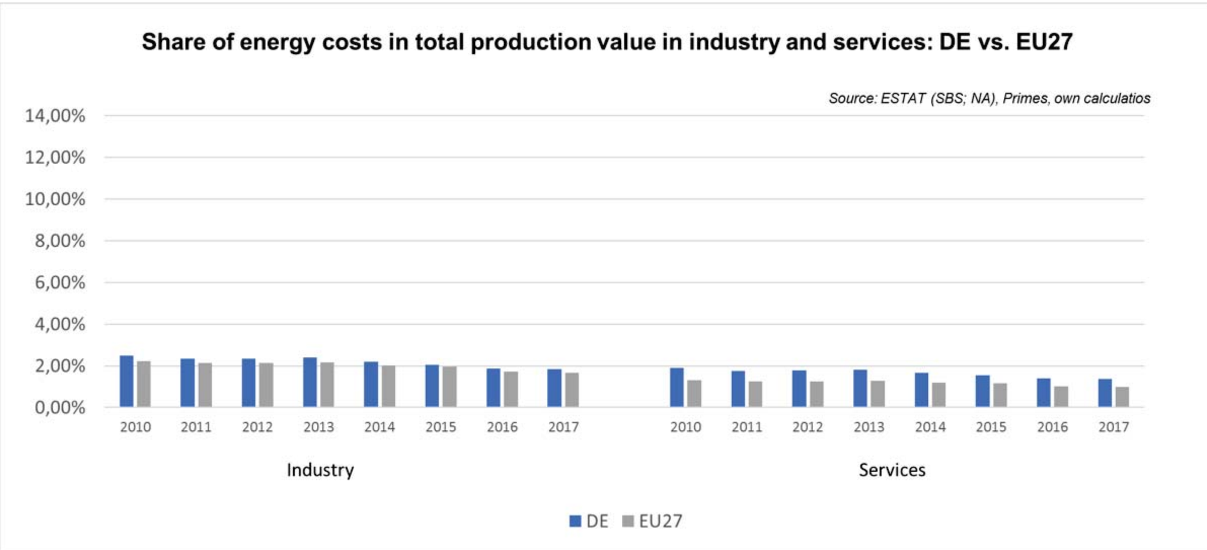
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2008 in Germany (dark grey line) the poorest households (Quintile 1) had to spend 8.1% of their total expenditures on energy products. In 2018 (blue line) the share of energy remain almost unchanged. In the case of middle income households (Quintile 3), in 2008 they spent 6.7 % of their total expenditure on energy, while in 2018 this value decreased to 5.9%. See footnote [1]

Energy costs shares in total production costs

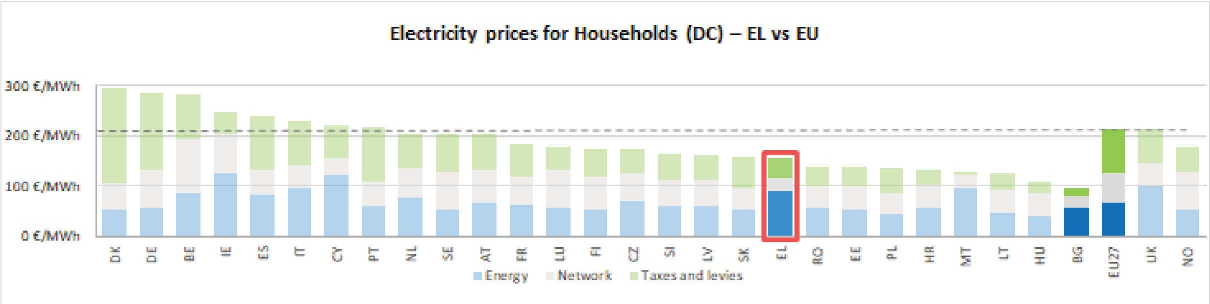


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

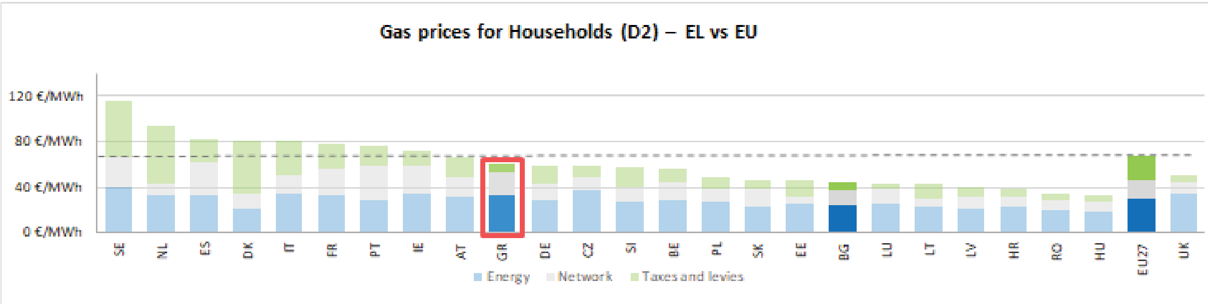
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

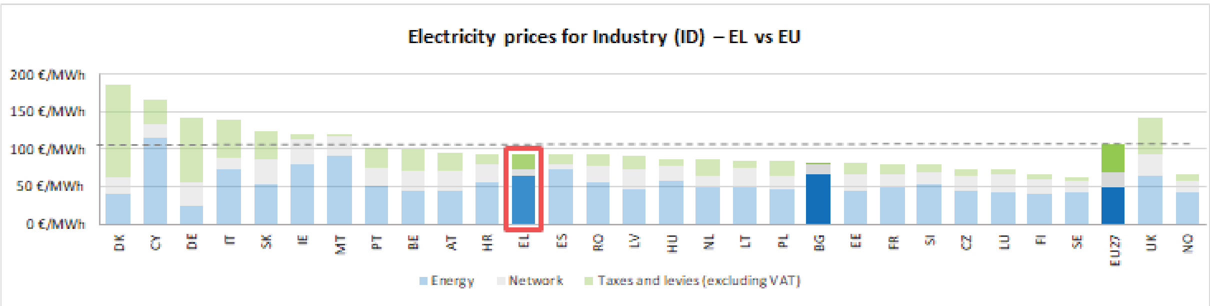
Greece

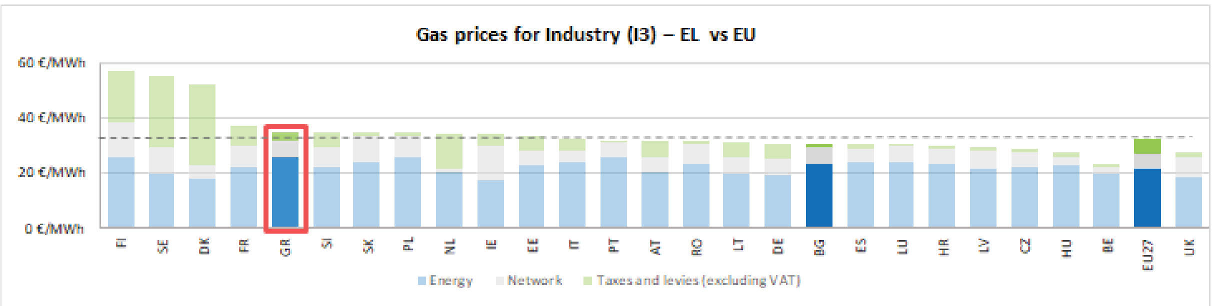
Prices (2019 and recent evolution)



See footnote [1]





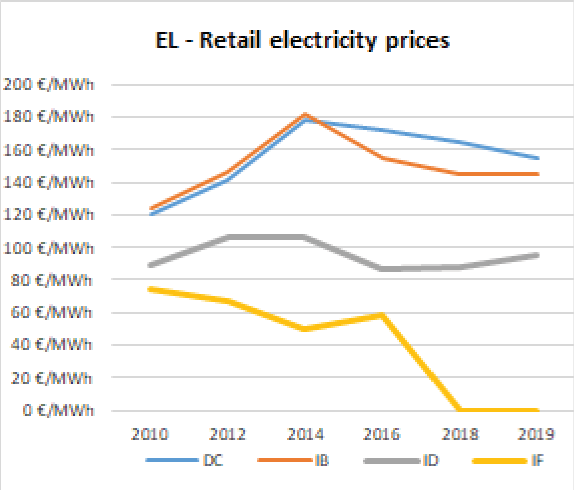


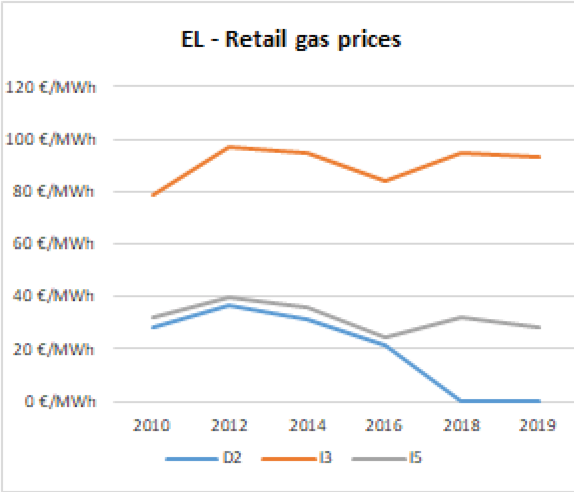
See footnote [2]

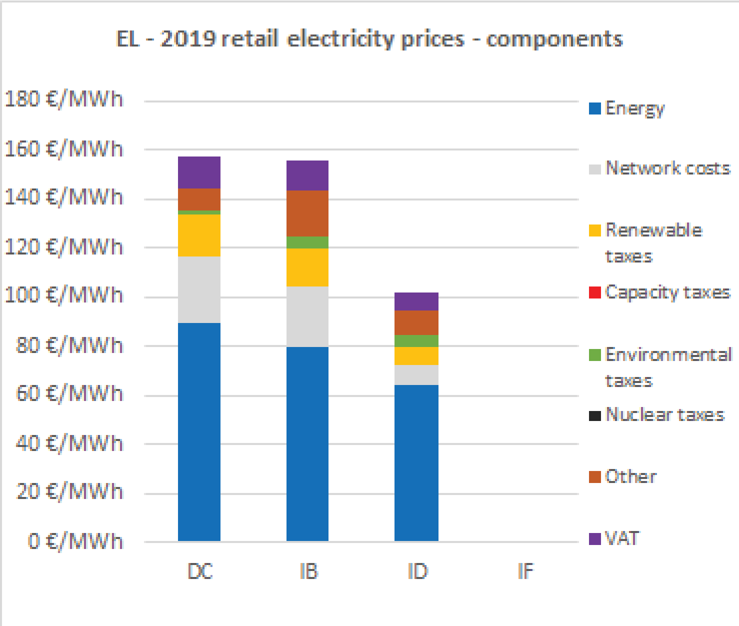
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

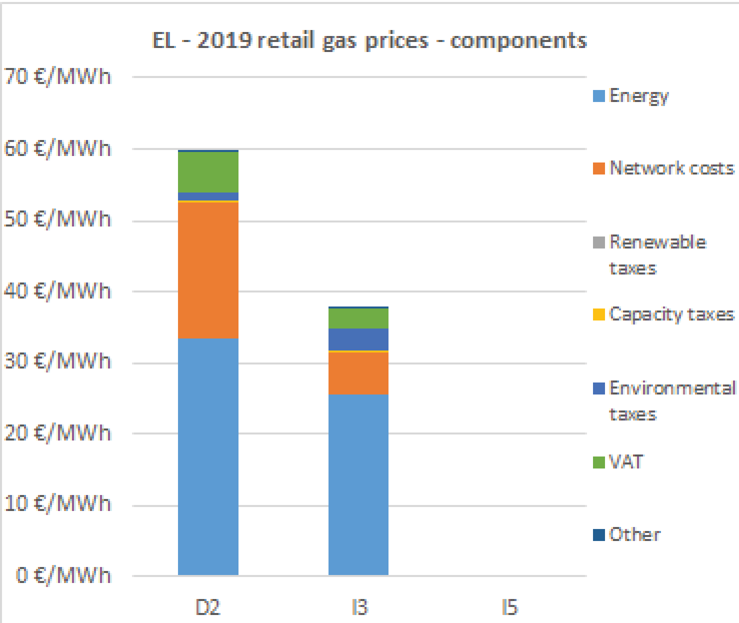
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

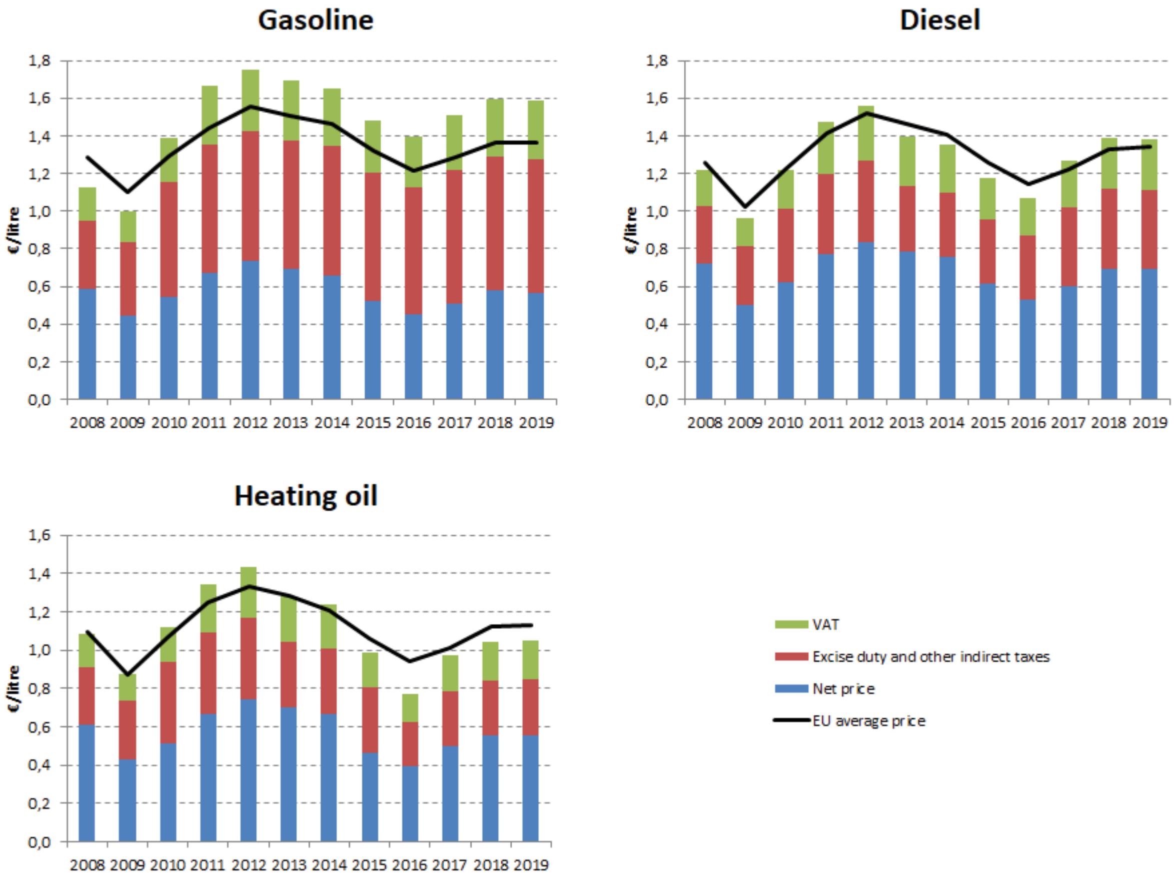






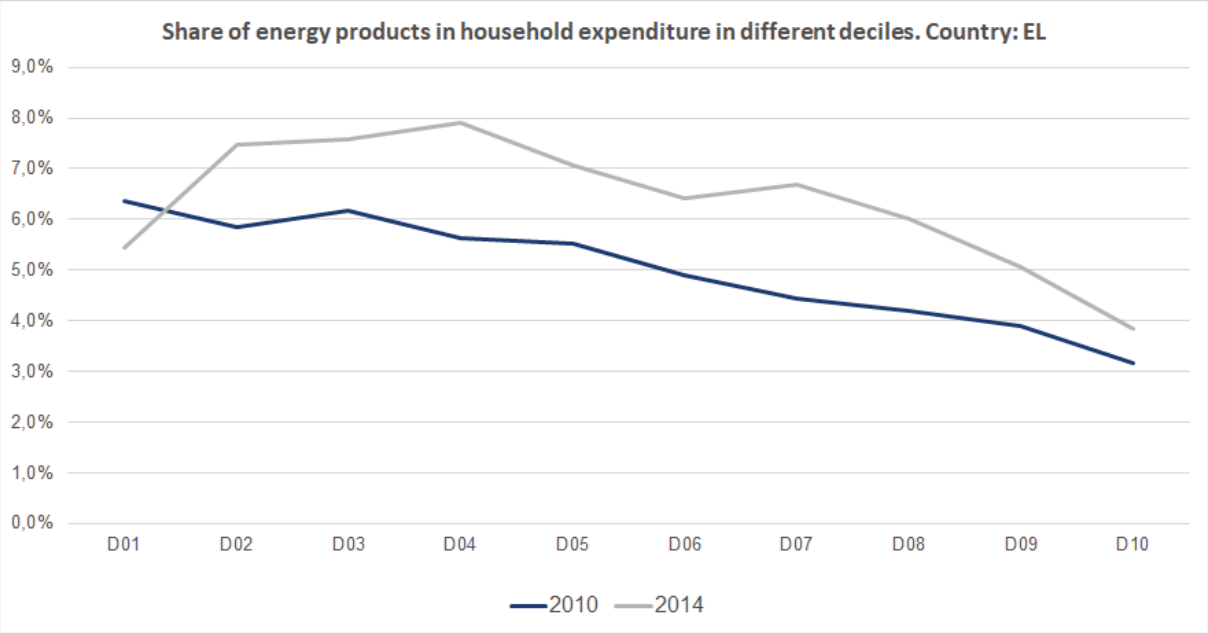


Oil products prices


Gasoline
Diesel
Heating oil
€/litre
1,8
1,6
1,4
1,2
1,0
0,8
0,6
0,4
0,2
0,0
2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019
VAT
Excise duty and other indirect taxes
Net price
EU average price

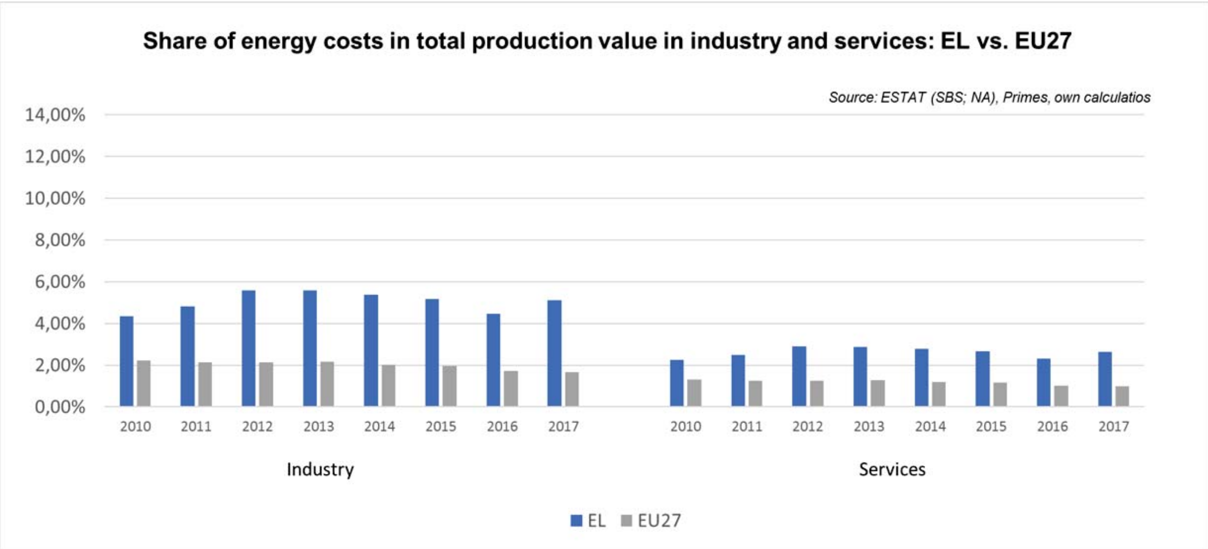
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2010 in Greece (dark blue line) the poorest households (Decile 1) had to spend 6.3% of their total expenditures on energy products. In 2014 (grey line) the share of energy decreased to 5.4%. In the case of middle income households (Decile 5), in 2010 they spent 5.5 % of their total expenditure on energy, while in 2014 this value increased to 7.0%. See footnote [1]

Energy costs shares in total production costs

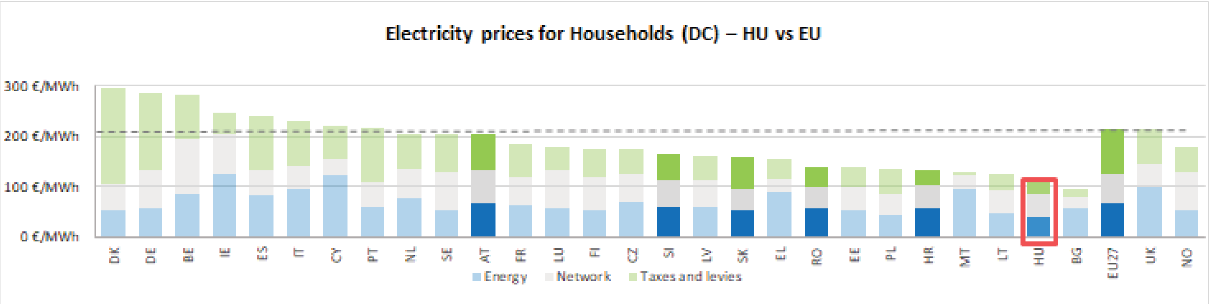


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

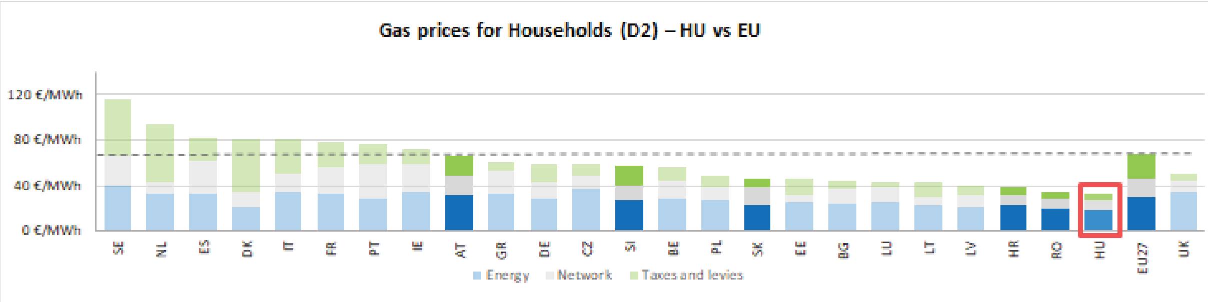
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

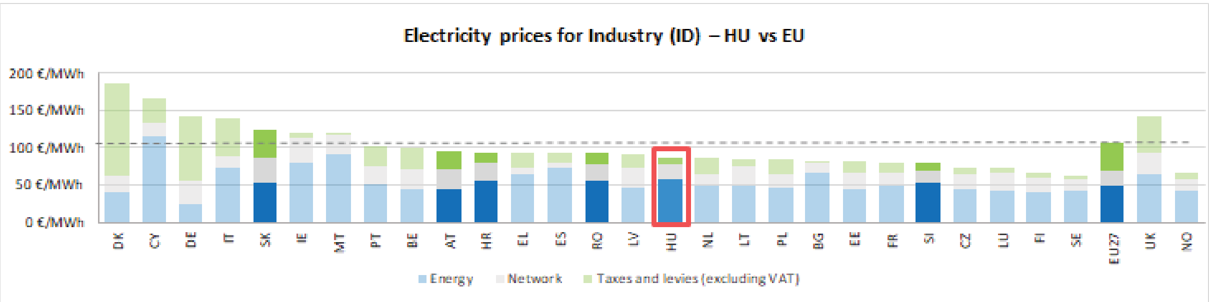
Hungary

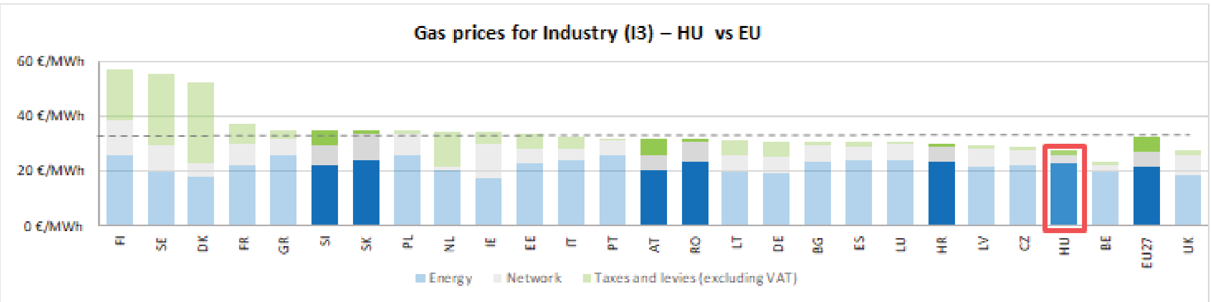
Prices (2019 and recent evolution)



See footnote[1]





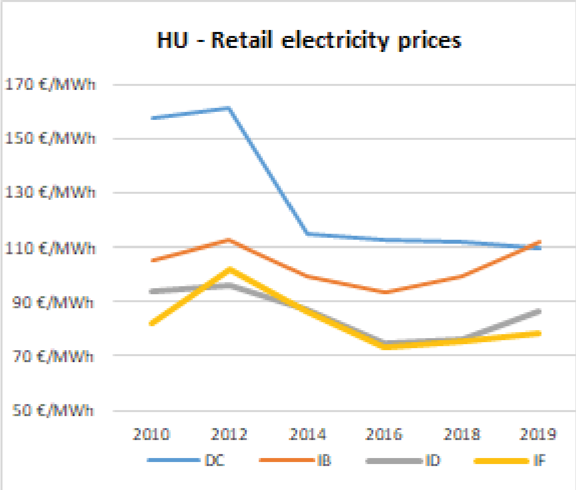


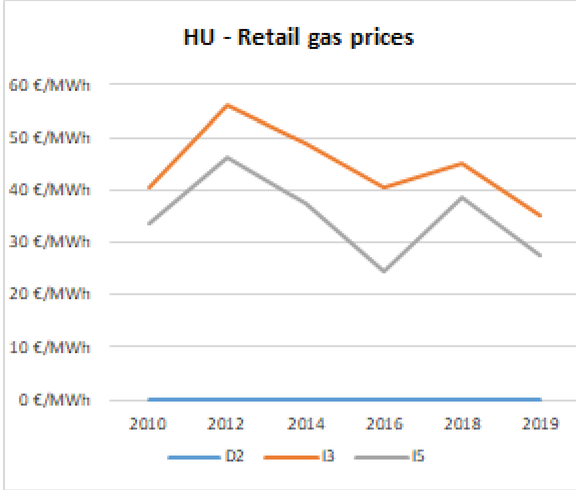
See footnote[2]

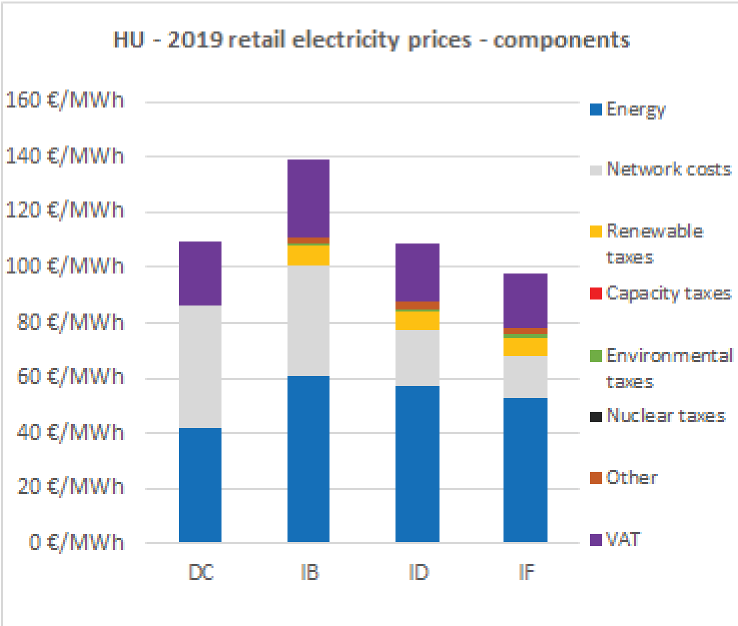
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

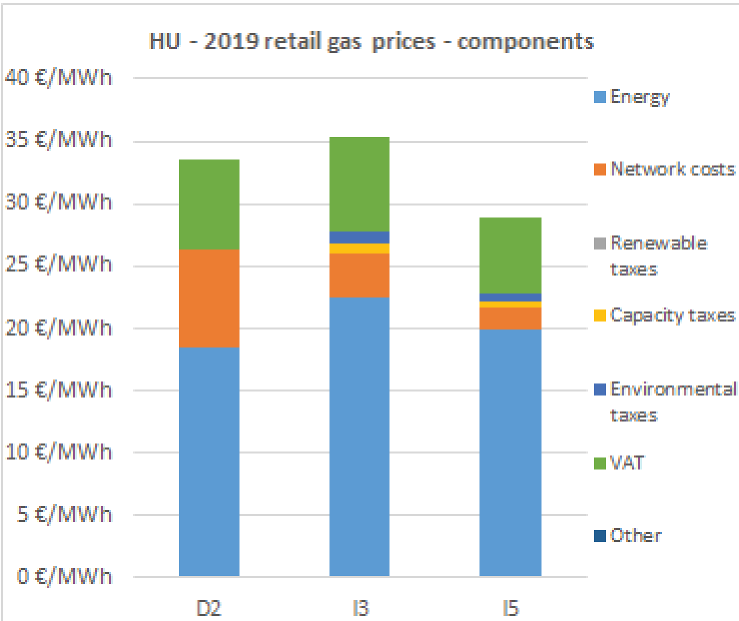
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

[1]The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure..
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

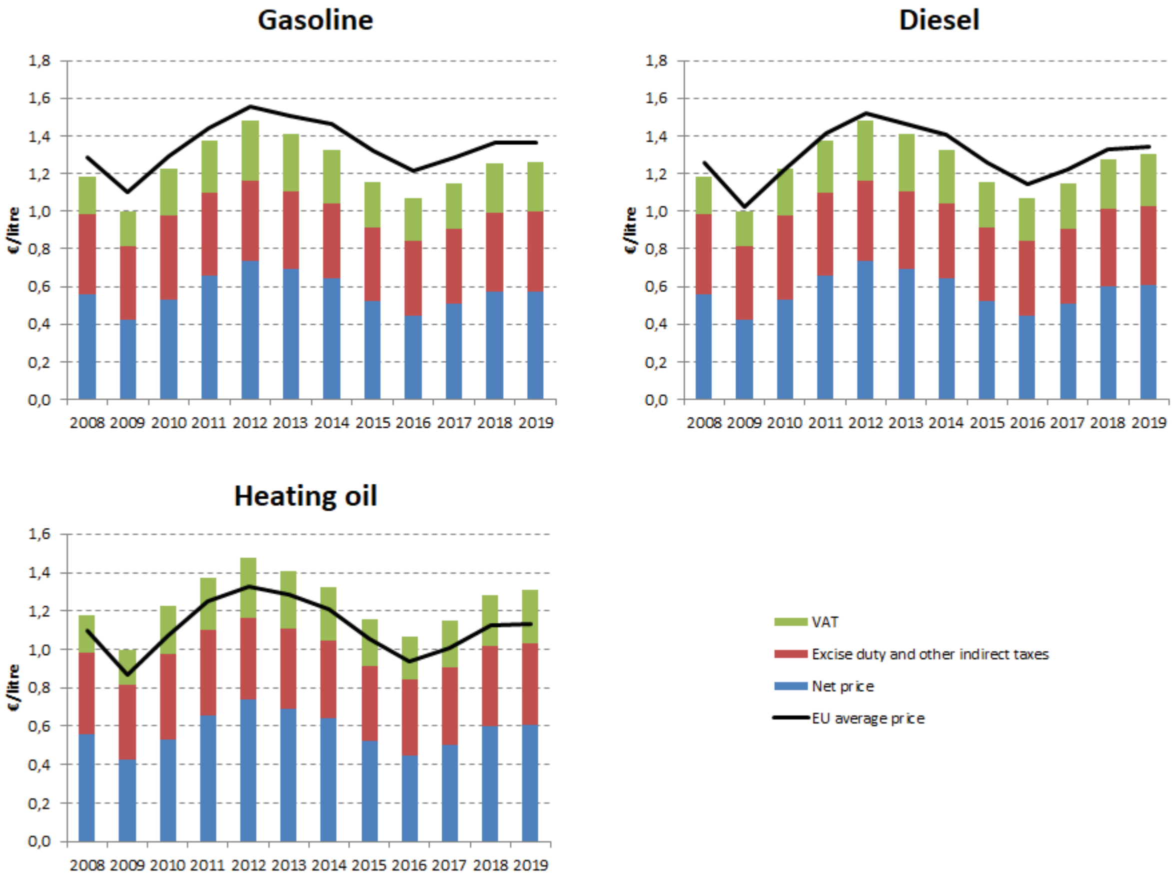






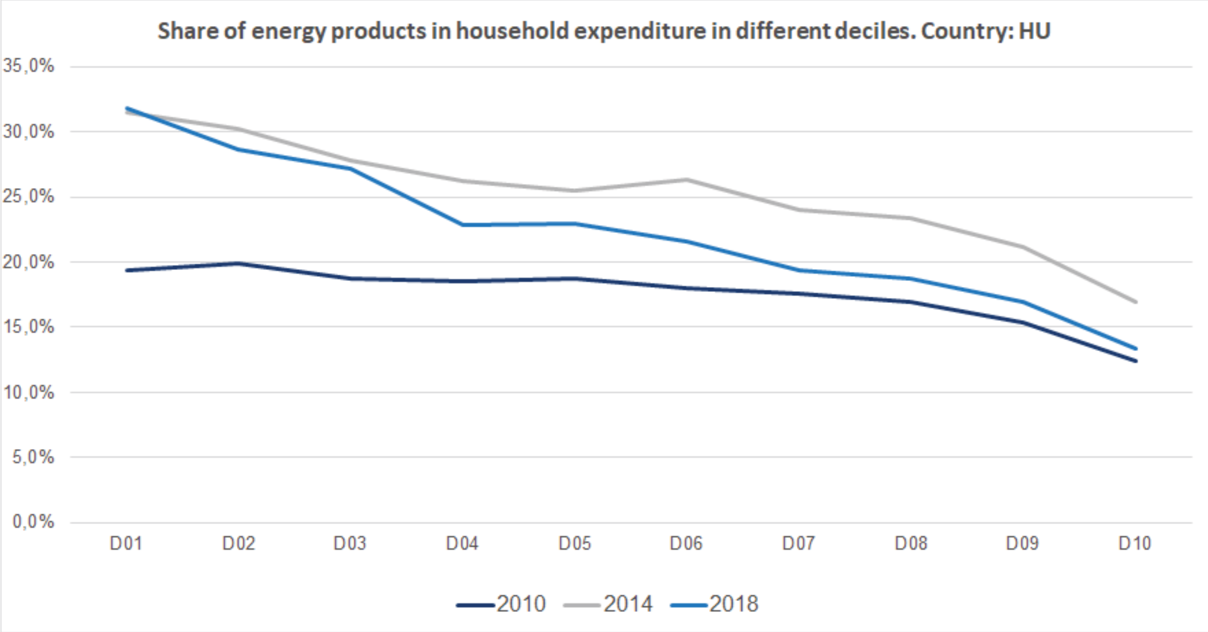


Oil product prices


Gasoline
Diesel
Heating oil
€/litre
1,8
1,6
1,4
1,2
1,0
0,8
0,6
0,4
0,2
0,0
2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019
VAT
Excise duty and other indirect taxes
Net price
EU average price

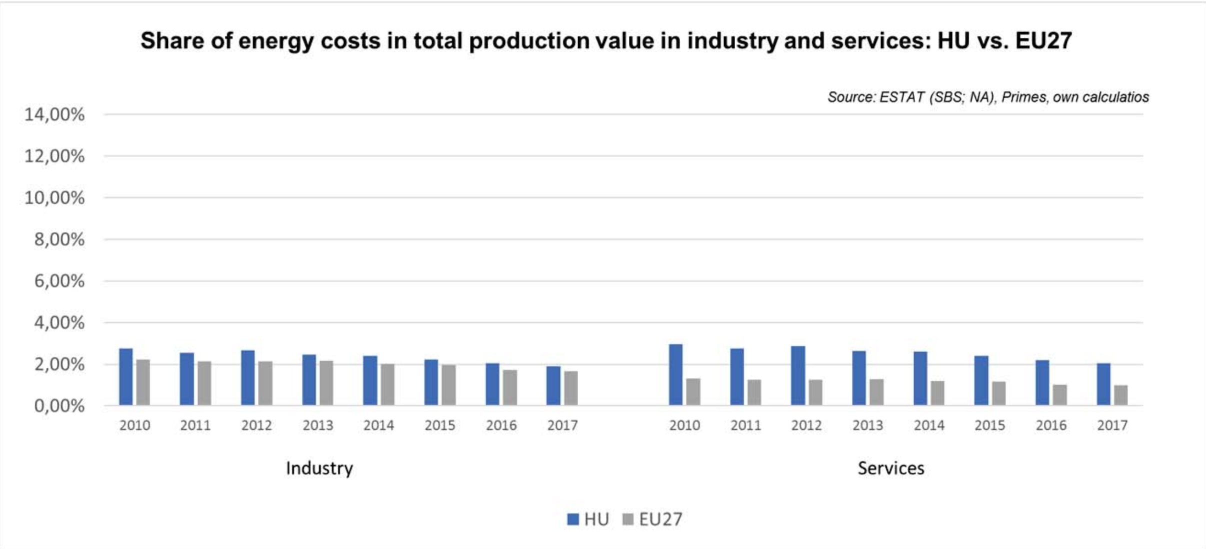
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2010 in Hungary (dark blue line) the poorest households (Decile 1) had to spend 19.4% of their total expenditures on energy products. In 2018 (blue line) the share of energy increased to 31.2%. In the case of middle income households (Decile 5), in 2010 they spent 18.7 % of their total expenditure on energy, while in 2018 this value increased to 22.3%. See footnote [1]

Energy costs shares in total production costs



Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

EUROPEAN
COMMISSION

Brussels, XXX
[…](2020) XXX draft

PART 5/5

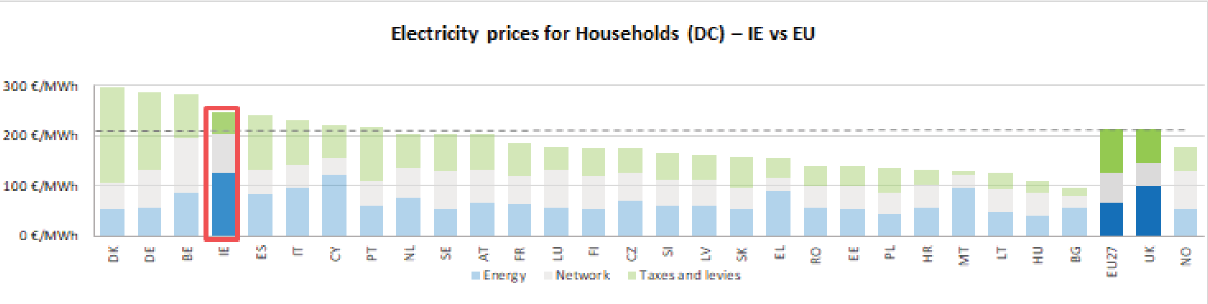
COMMISSION STAFF WORKING DOCUMENT
Accompanying the document

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

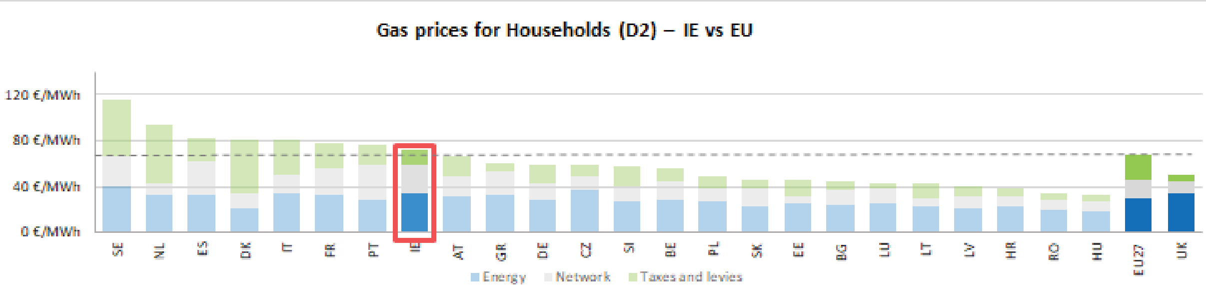
Energy prices and costs in Europe

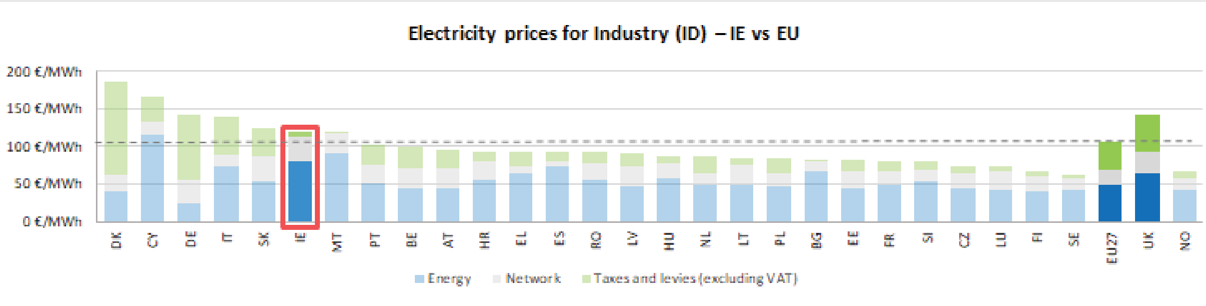
Ireland

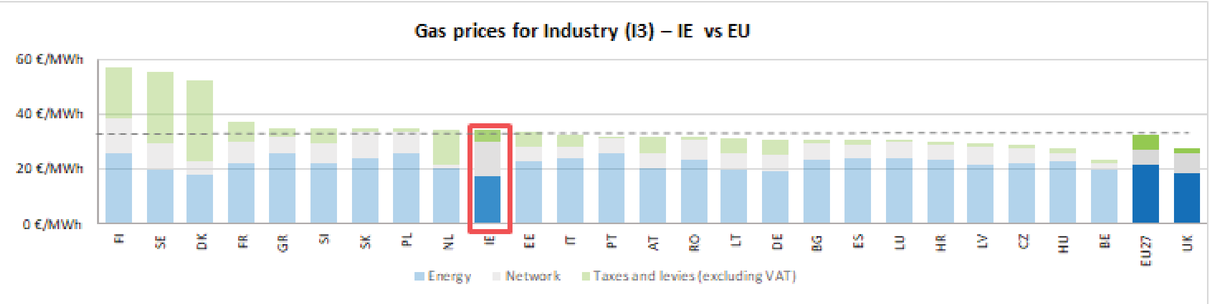
Prices (2019 and recent evolution)



See footnote [1]





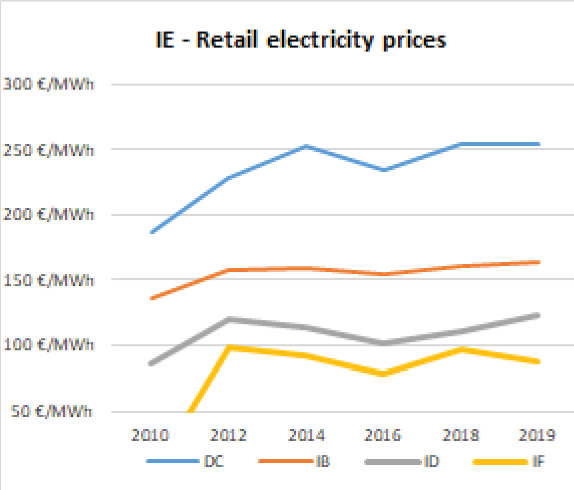


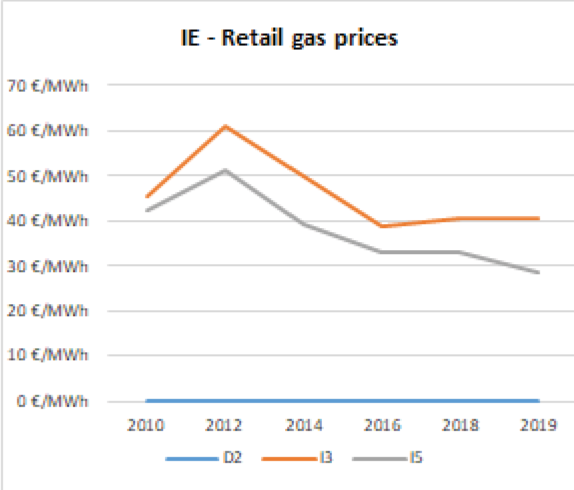
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

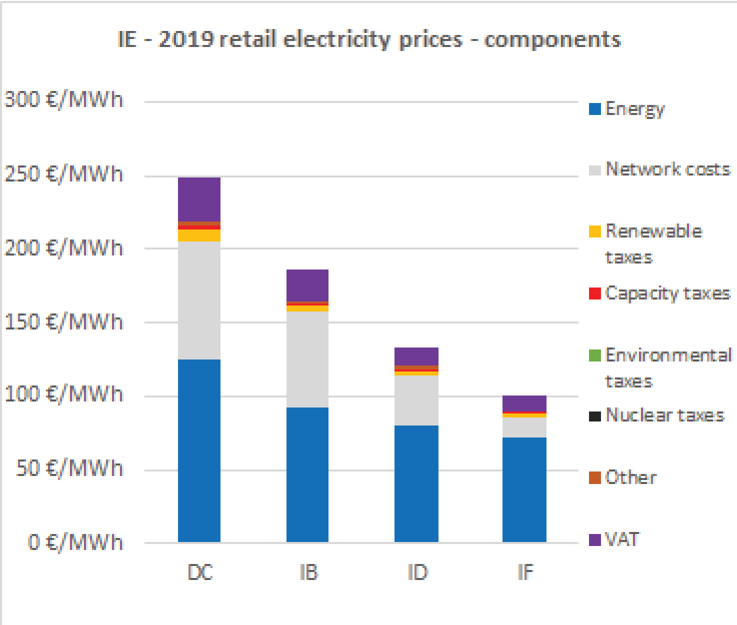
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

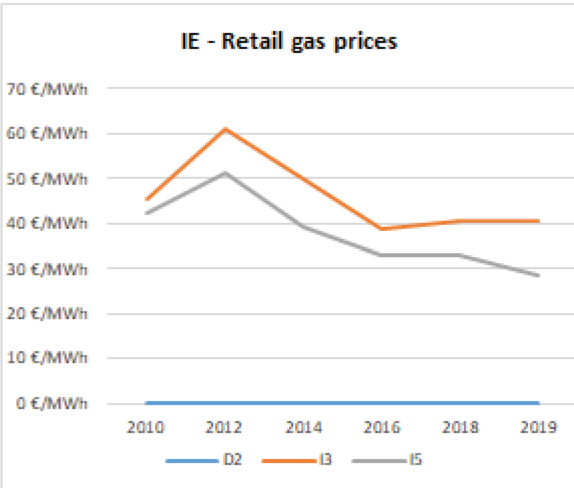
See footnote [2]

[1]The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

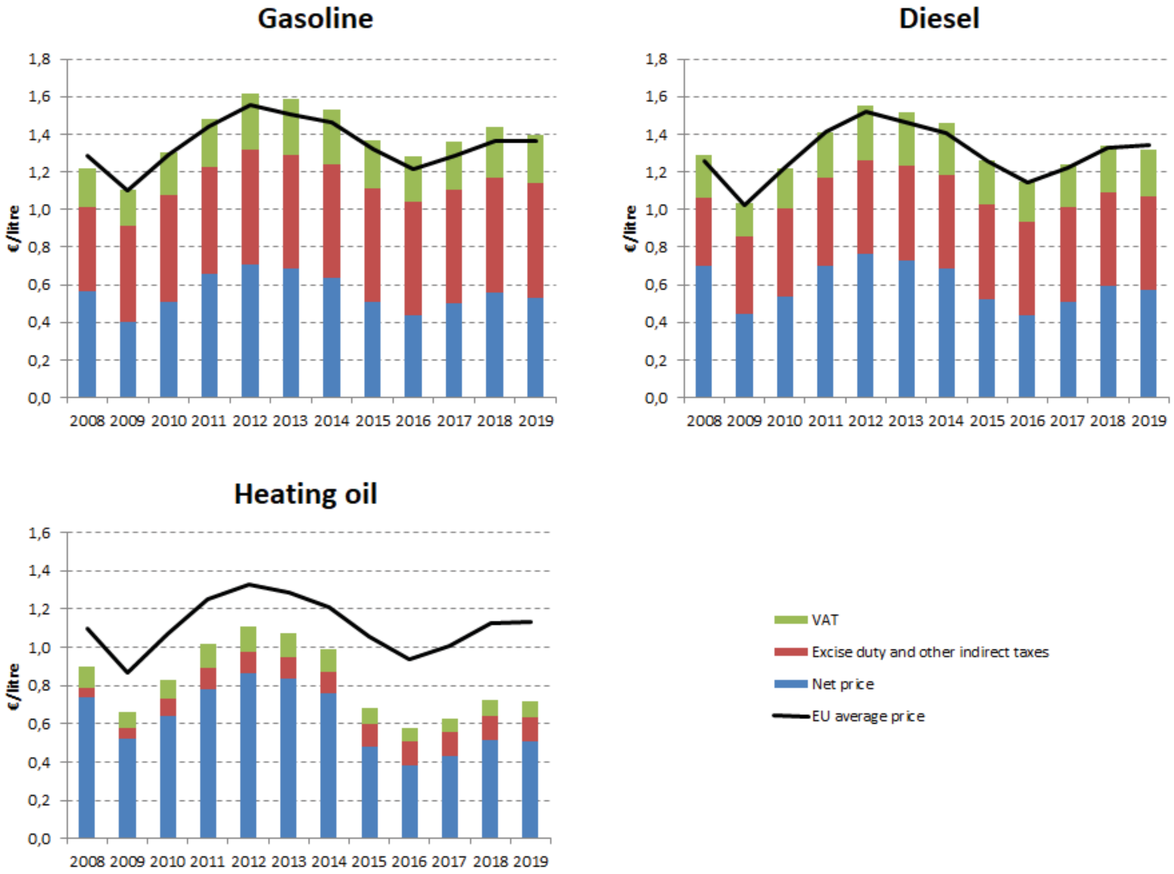

IE - Retail electricity prices
300 €/MWh
250 €/MWh
200 €/MWh
150 €/MWh
100 €/MWh
50 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF


IE - Retail gas prices
70 €/MWh
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5


IE - 2019 retail electricity prices - components
300 €/MWh
250 €/MWh
200 €/MWh
150 €/MWh
100 €/MWh
50 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT

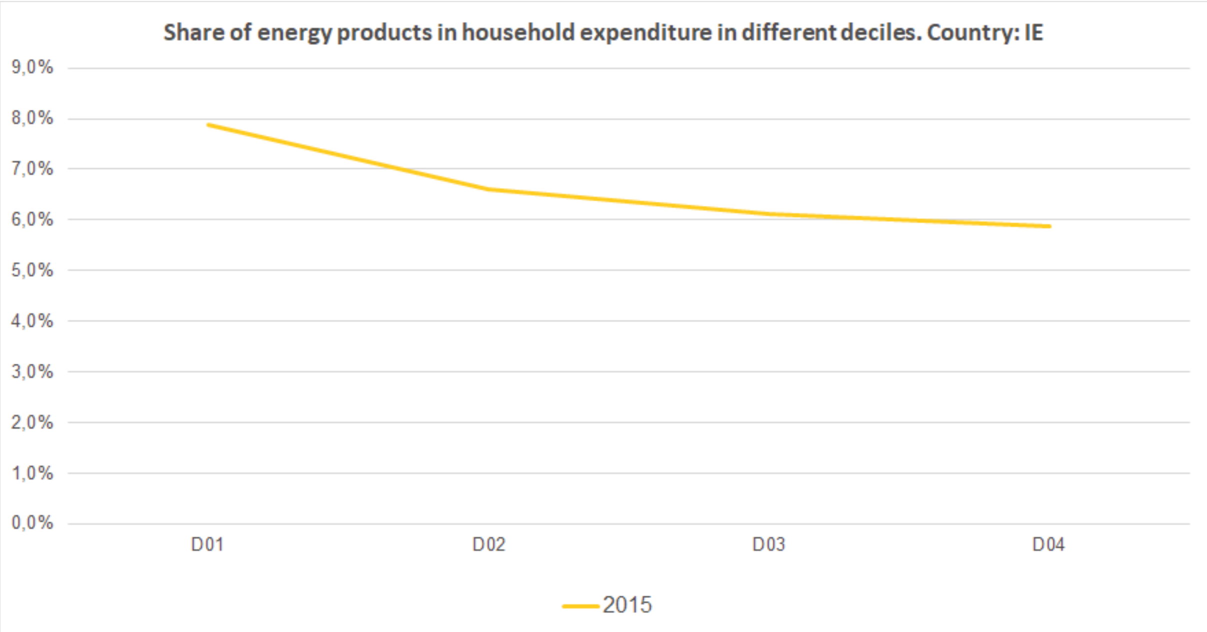

IE - Retail gas prices
70 €/MWh
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5

Oil products prices



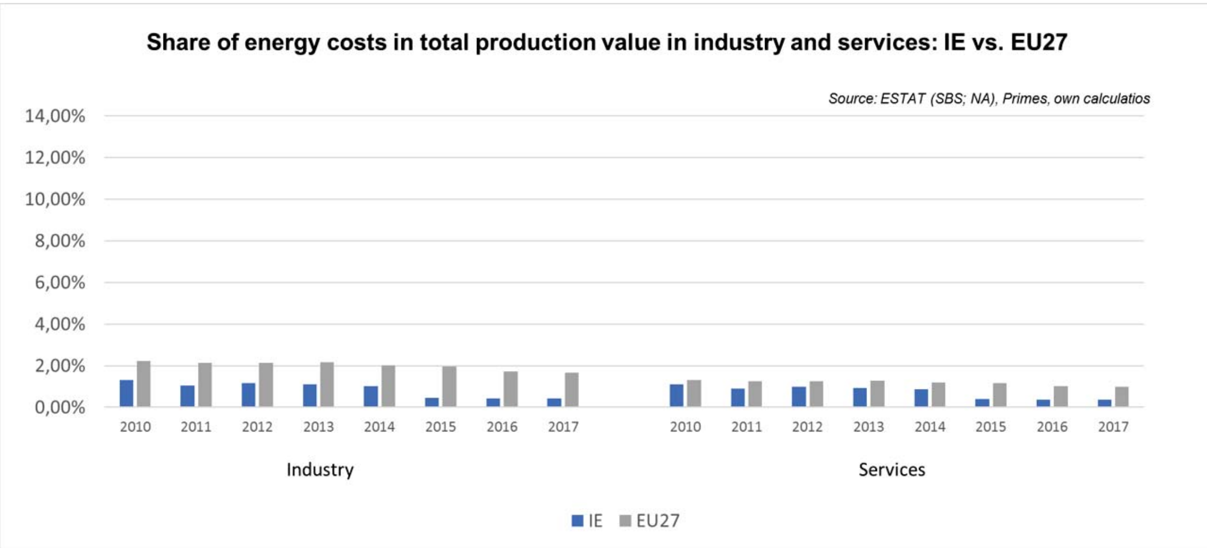
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2015 in Ireland (yellow line) the poorest households (Decile 1) had to spend 7.9% of their total expenditures on energy products. In the case of lower-middle income households (Decile 3), in the same year they spent 6.12 % of their total expenditure on energy. See footnote [1]

Energy costs shares in total production costs



Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

EUROPEAN
COMMISSION

Brussels, 14.10.2020
SWD(2020) 951 final

PART 6/6

COMMISSION STAFF WORKING DOCUMENT
Accompanying the document

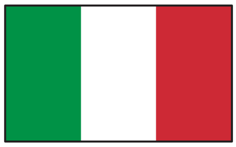
REPORT FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

Energy prices and costs in Europe

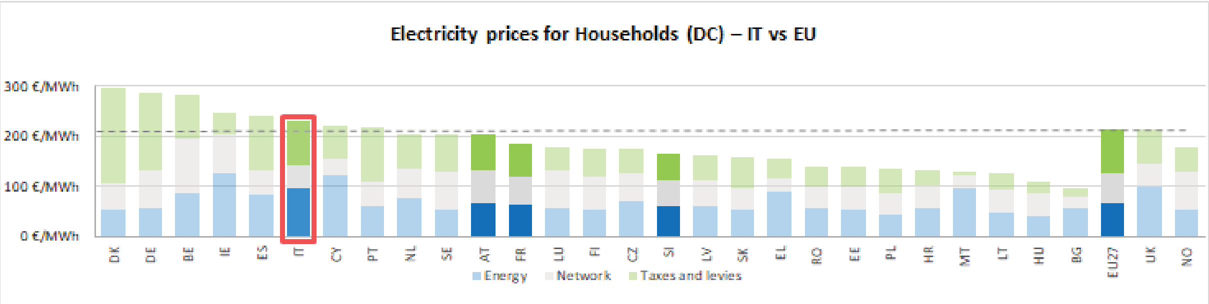
{COM(2020) 951 final}

EN EN

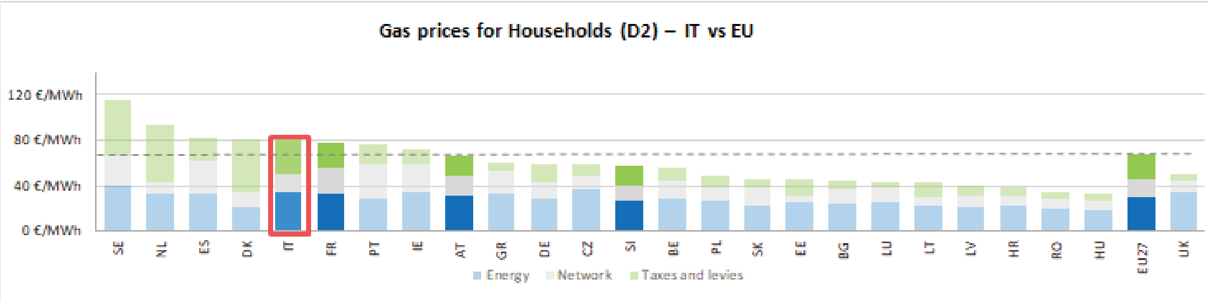
Italy

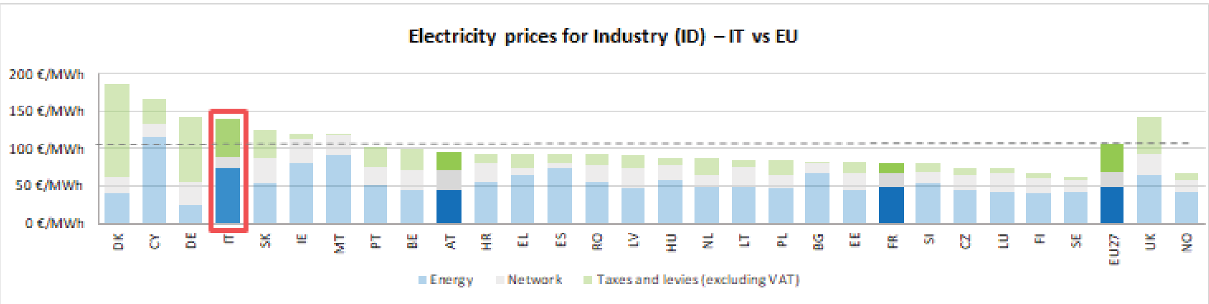


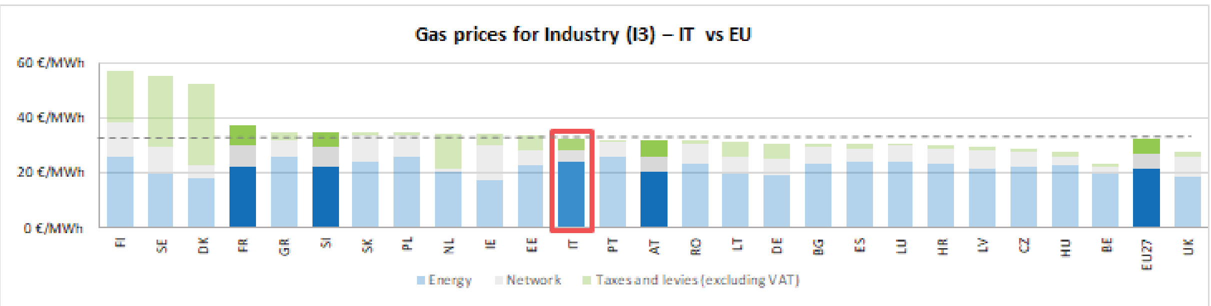
Prices (2019 and recent evolution)



see footnote[1]







Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

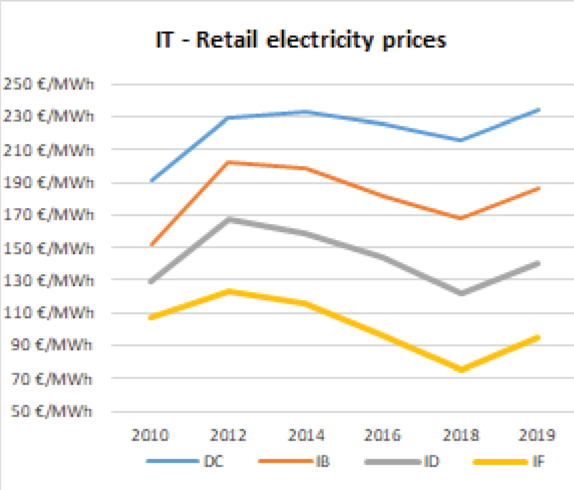
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

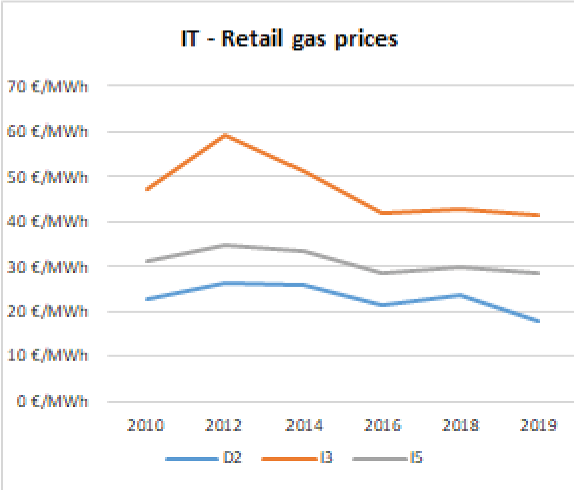
See footnote[2]

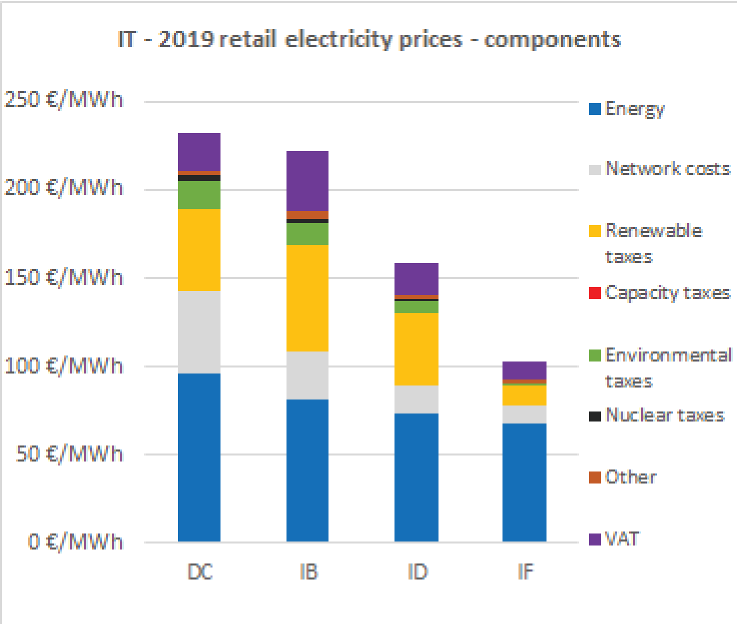
---

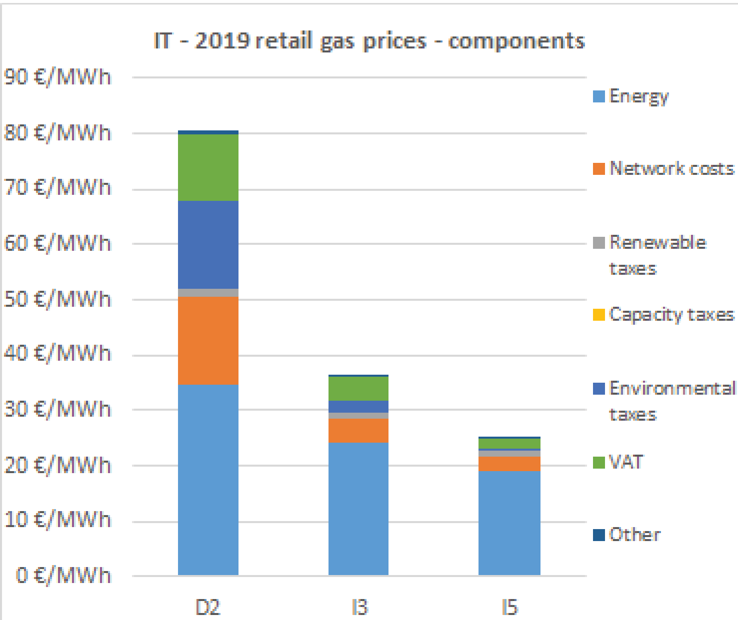
[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.

[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

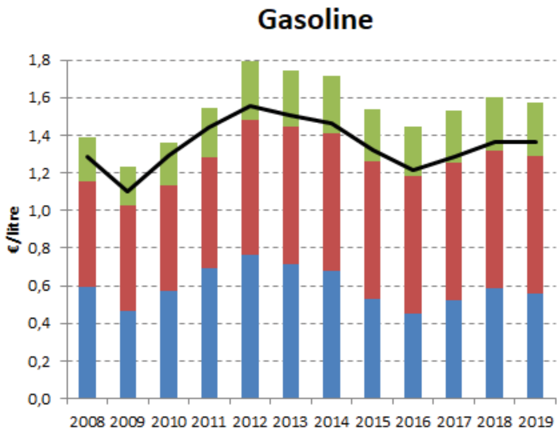

IT - Retail electricity prices
250 €/MWh
230 €/MWh
210 €/MWh
190 €/MWh
170 €/MWh
150 €/MWh
130 €/MWh
110 €/MWh
90 €/MWh
70 €/MWh
50 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF

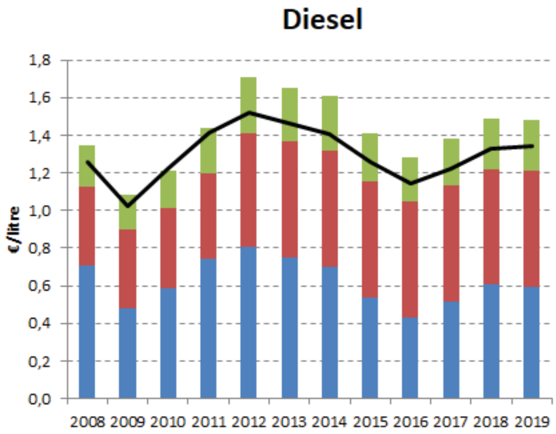

IT - Retail gas prices
70 €/MWh
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5

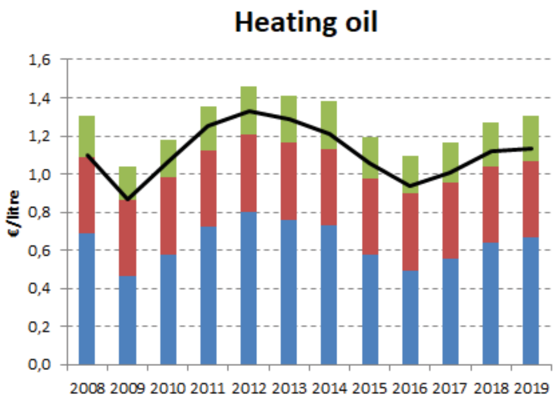

IT - 2019 retail electricity prices - components
250 €/MWh
200 €/MWh
150 €/MWh
100 €/MWh
50 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT

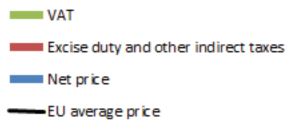

IT - 2019 retail gas prices - components
90 €/MWh
80 €/MWh
70 €/MWh
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
D2
I3
I5
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
VAT
Other

Oil products prices



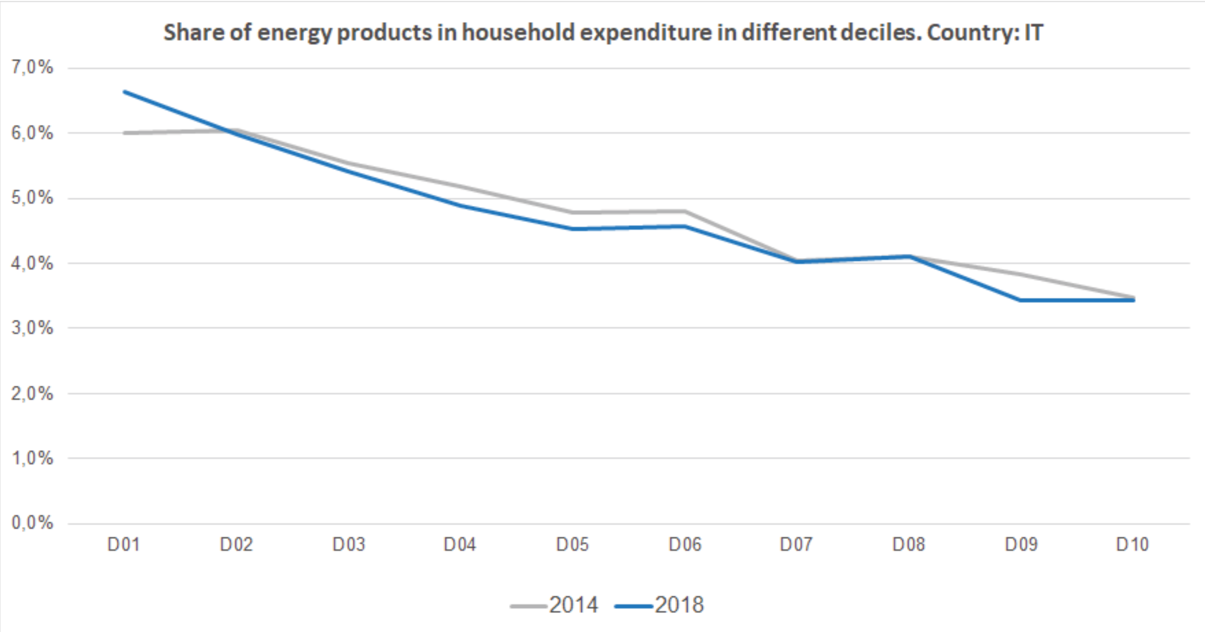






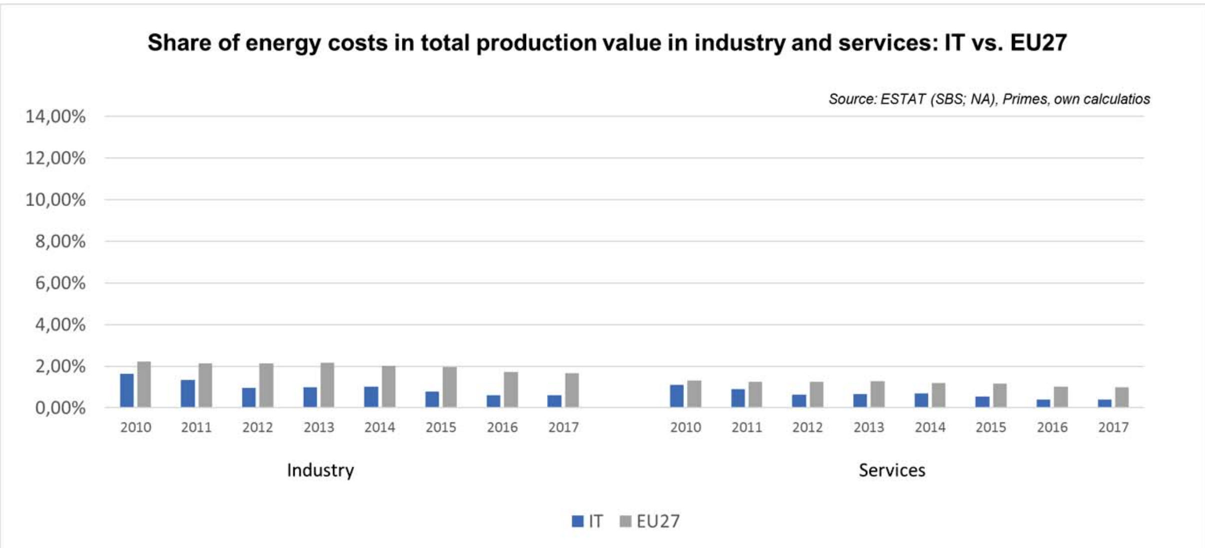
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2014 in Italy (grey line) the poorest households (Decile 1) had to spend 6.0% of their total expenditures on energy products. In 2018 (blue line) the share of energy increased to 6.6%. In the case of middle income households (Decile 5), in 2014 they spent 4.8 % of their total expenditure on energy, while in 2018 this value decreased to 4.5%. See footnote [1]

Energy costs shares in total production costs

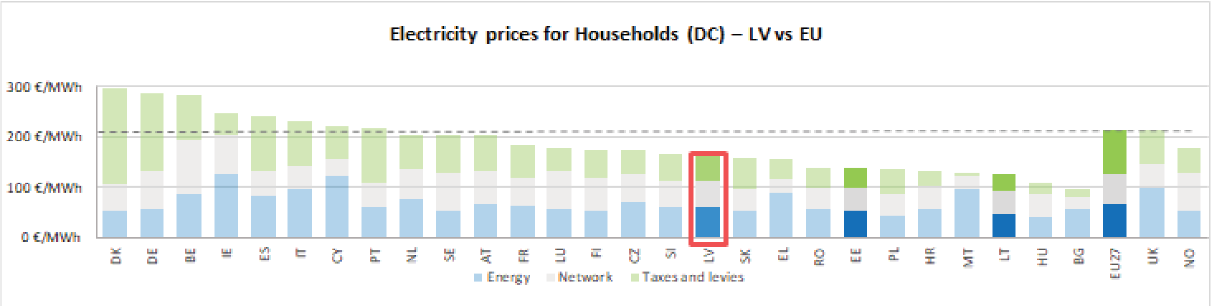


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

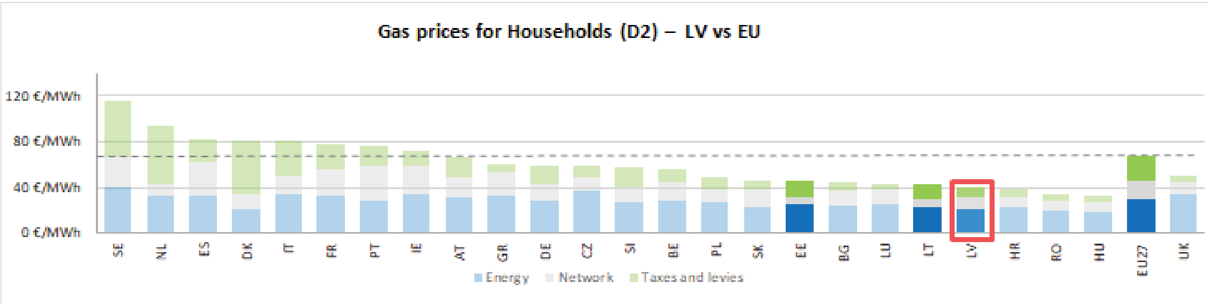
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

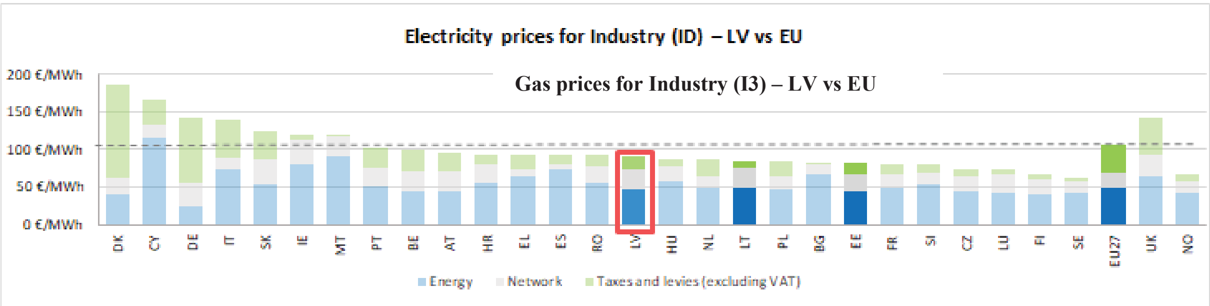
Latvia

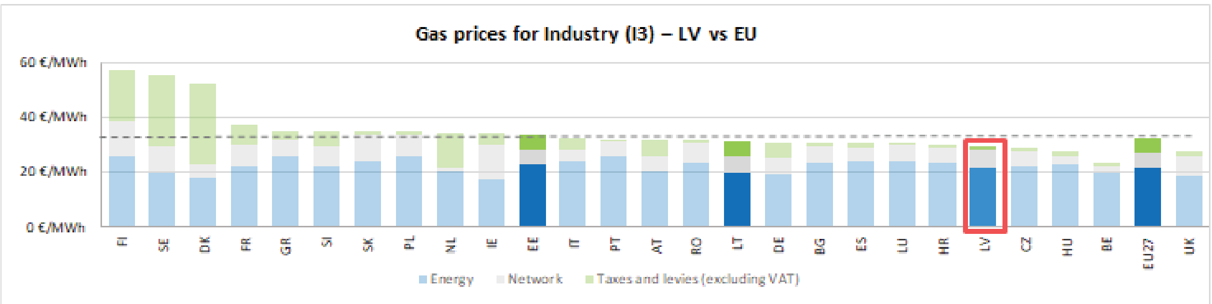
Prices (2019 and recent evolution)



See footnote[1]





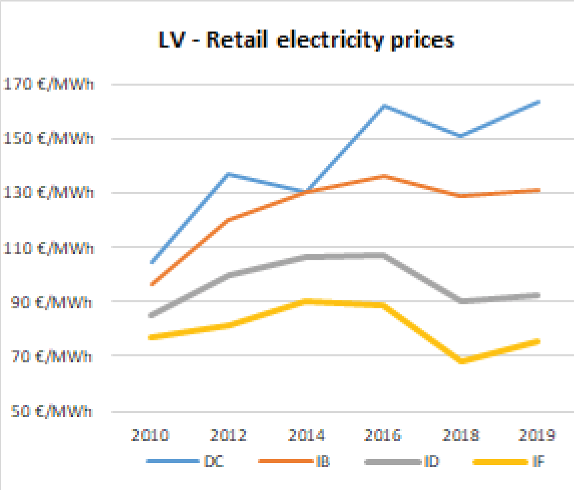


Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

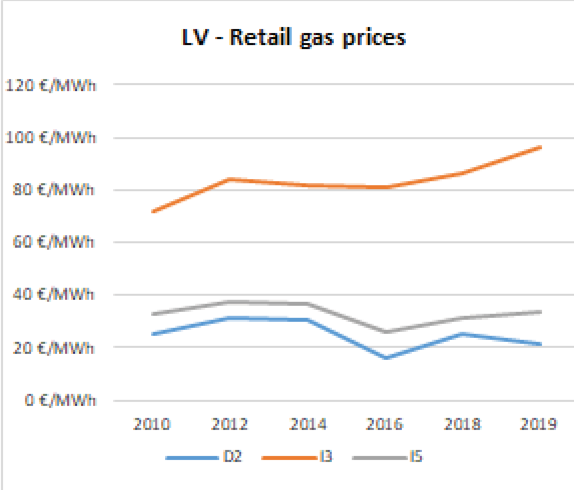
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

See footnote[2]

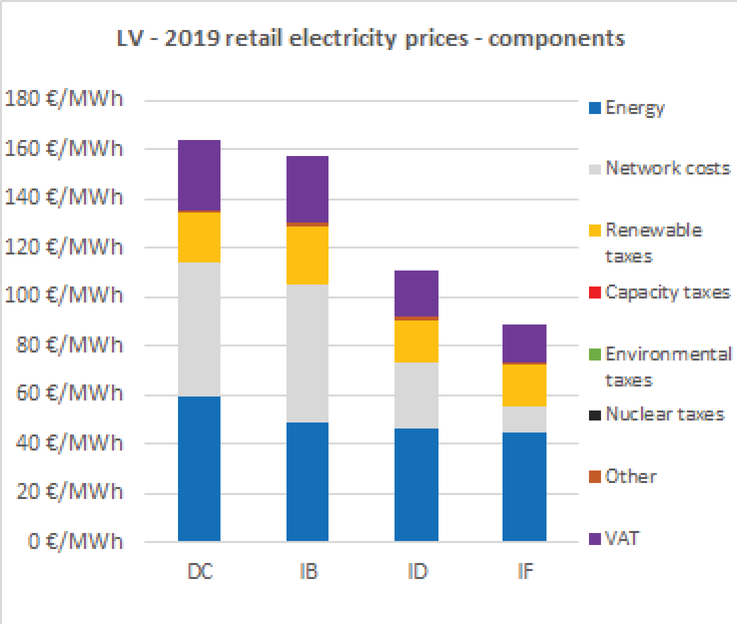
[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.



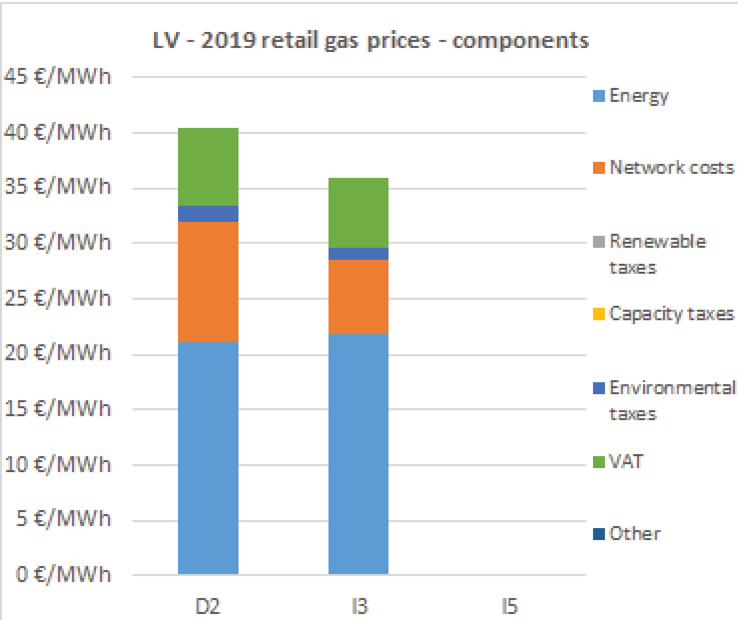
LV - Retail electricity prices
170 €/MWh
150 €/MWh
130 €/MWh
110 €/MWh
90 €/MWh
70 €/MWh
50 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF



LV - Retail gas prices
120 €/MWh
100 €/MWh
80 €/MWh
60 €/MWh
40 €/MWh
20 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5

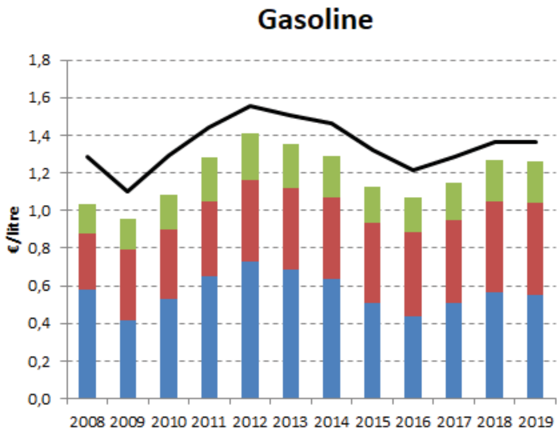


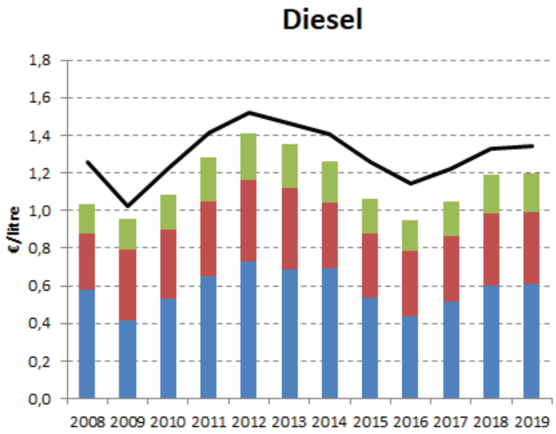
LV - 2019 retail electricity prices - components
180 €/MWh
160 €/MWh
140 €/MWh
120 €/MWh
100 €/MWh
80 €/MWh
60 €/MWh
40 €/MWh
20 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT

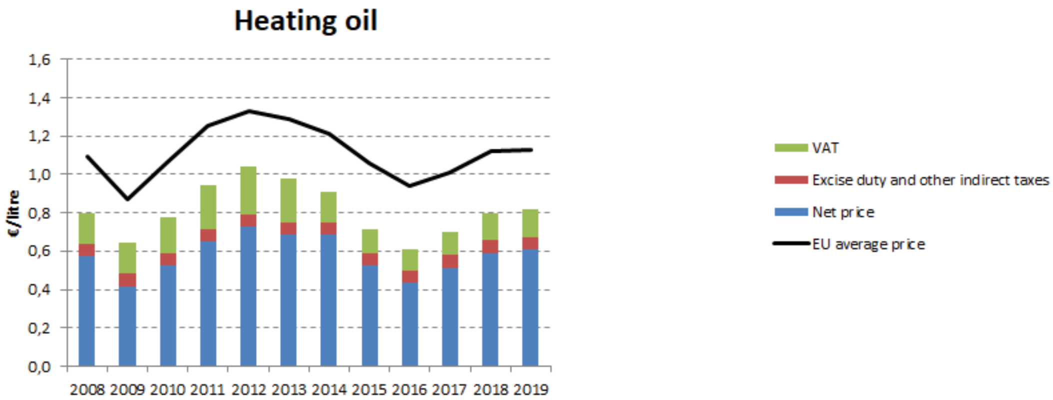


LV - 2019 retail gas prices - components
45 €/MWh
40 €/MWh
35 €/MWh
30 €/MWh
25 €/MWh
20 €/MWh
15 €/MWh
10 €/MWh
5 €/MWh
0 €/MWh
D2
I3
I5
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
VAT
Other

Oil products prices

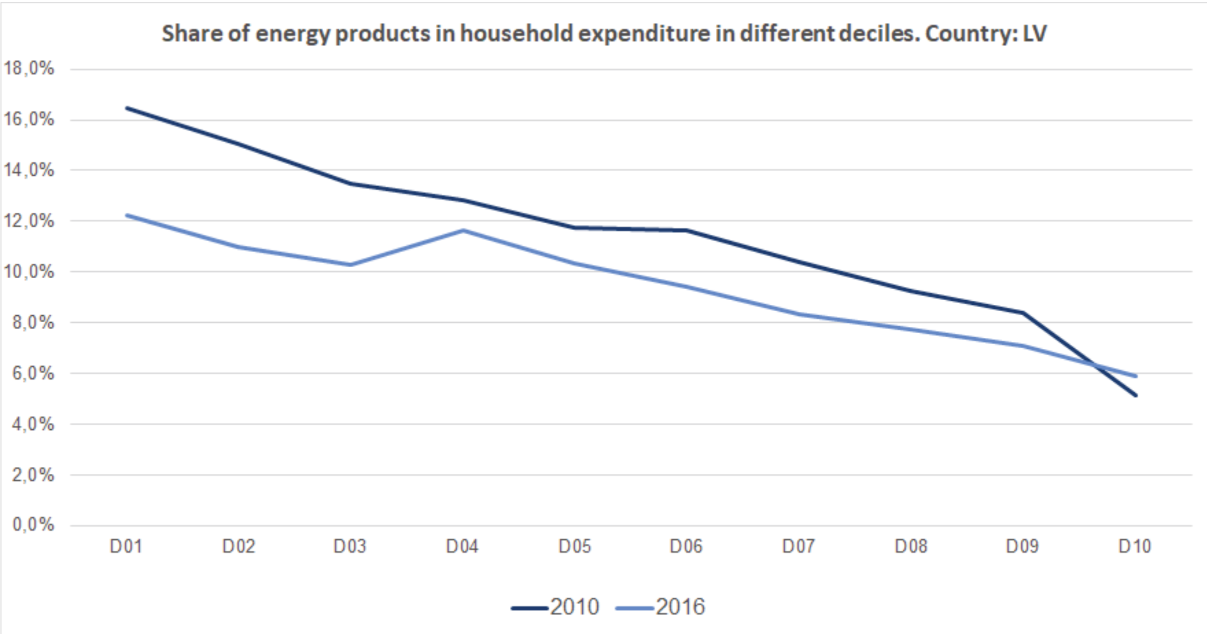






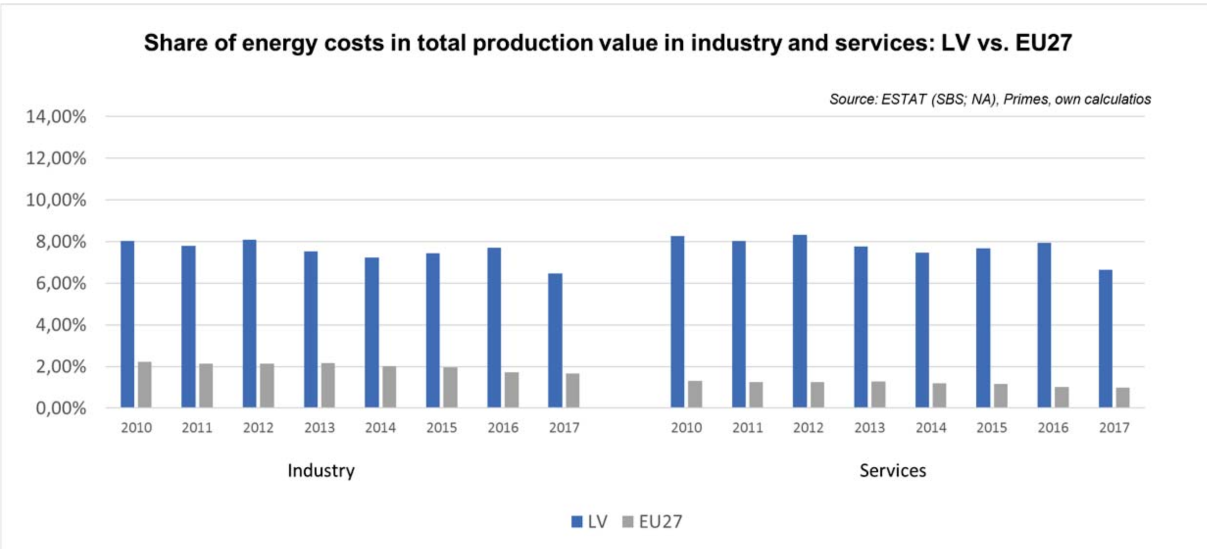
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2010 in Latvia (dark blue line) the poorest households (Decile 1) had to spend 16.4% of their total expenditures on energy products. In 2016 (blue line) the share of energy decreased to 12.2%. In the case of middle income households (Decile 5), in 2010 they spent 11.8 % of their total expenditure on energy, while in 2016 this value decreased to 10.4%. See footnote [1]

Energy costs shares in total production costs

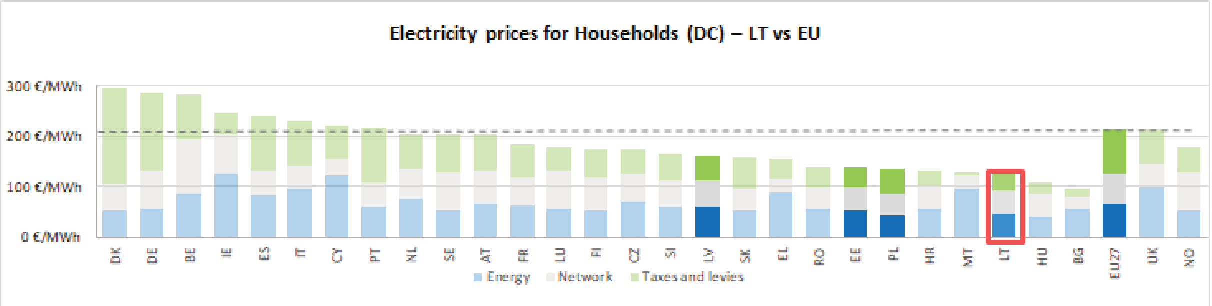


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

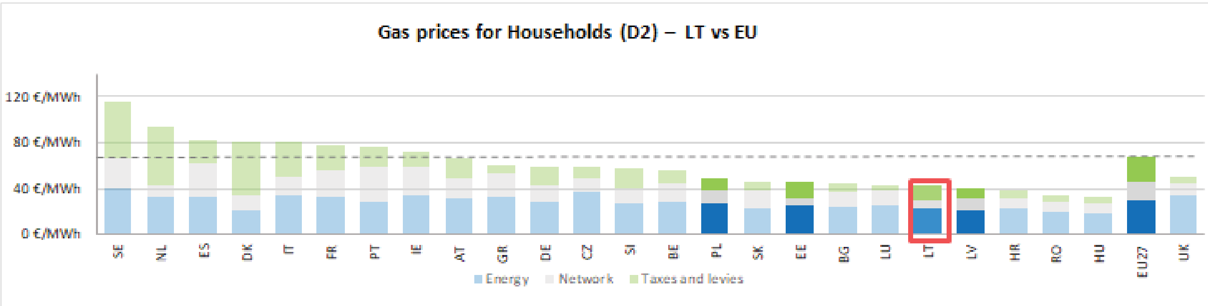
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

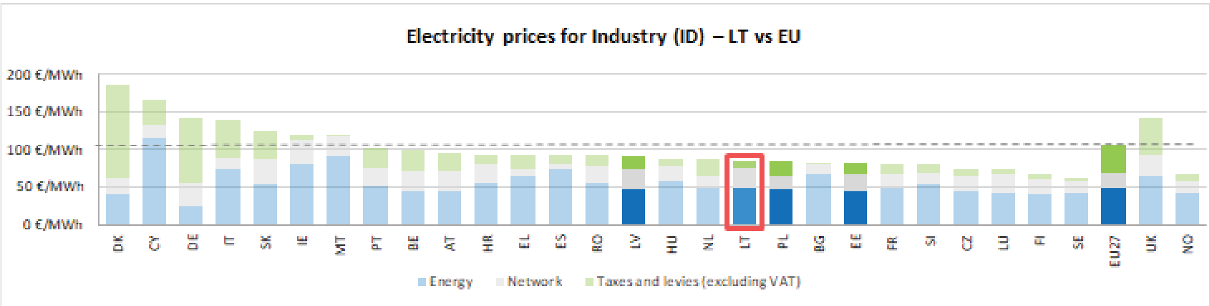
Lithuania

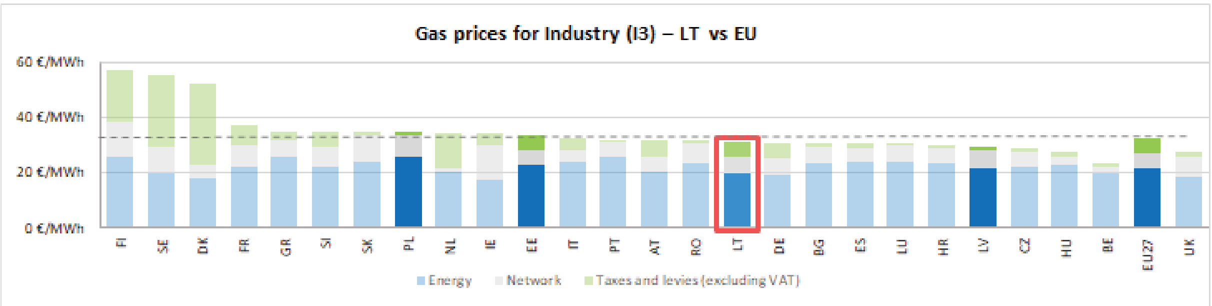
Prices (2019 and recent evolution)



see footnote [1]







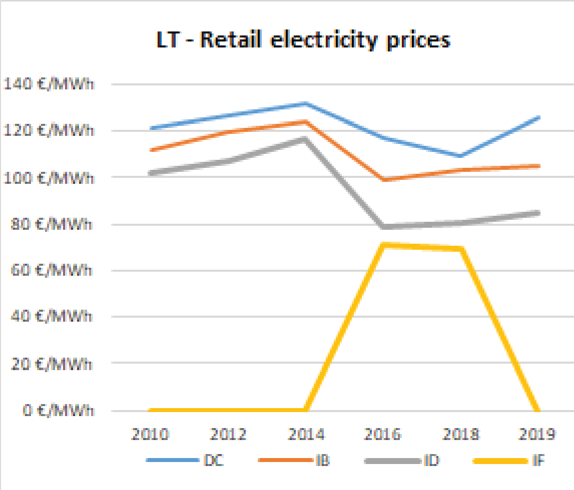
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

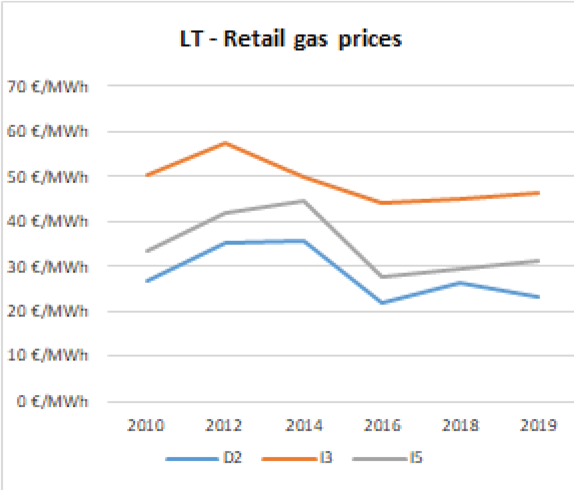
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

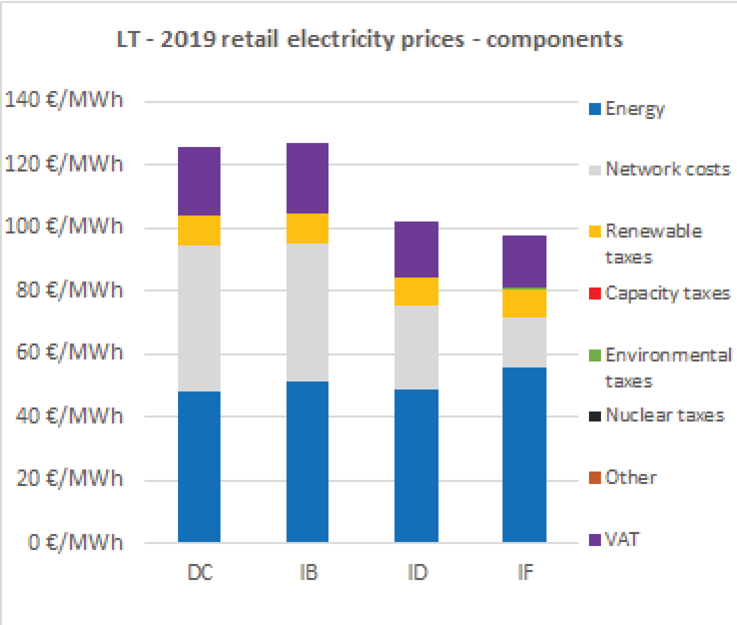
See footnote [2]

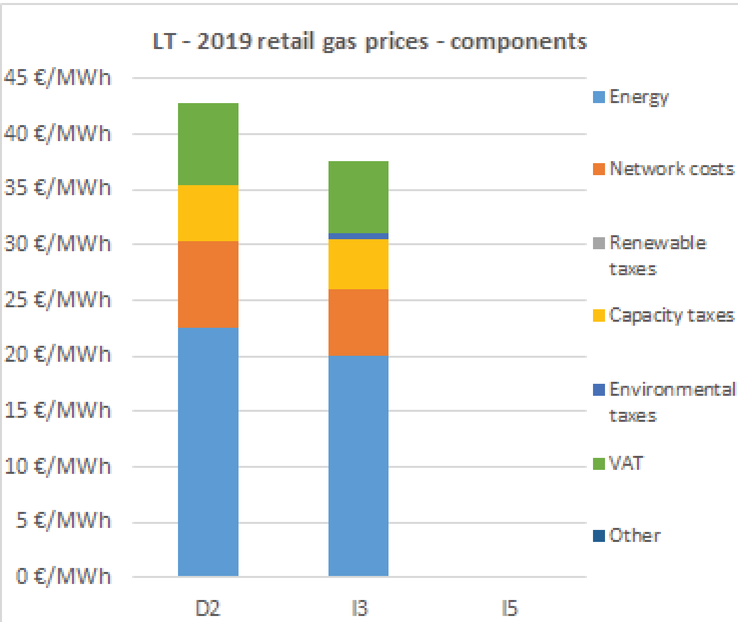
[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.

[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

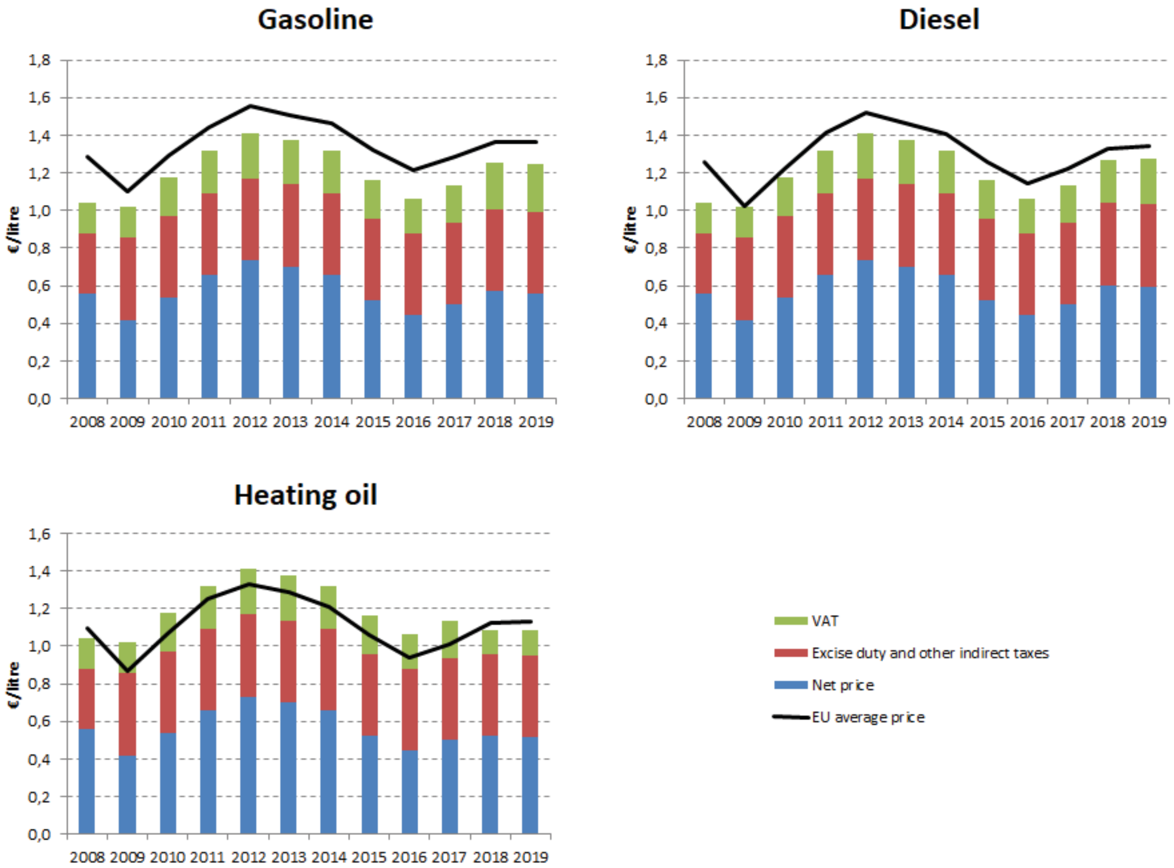

LT - Retail electricity prices
140 €/MWh
120 €/MWh
100 €/MWh
80 €/MWh
60 €/MWh
40 €/MWh
20 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF


LT - Retail gas prices
70 €/MWh
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5


LT - 2019 retail electricity prices - components
140 €/MWh
120 €/MWh
100 €/MWh
80 €/MWh
60 €/MWh
40 €/MWh
20 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT

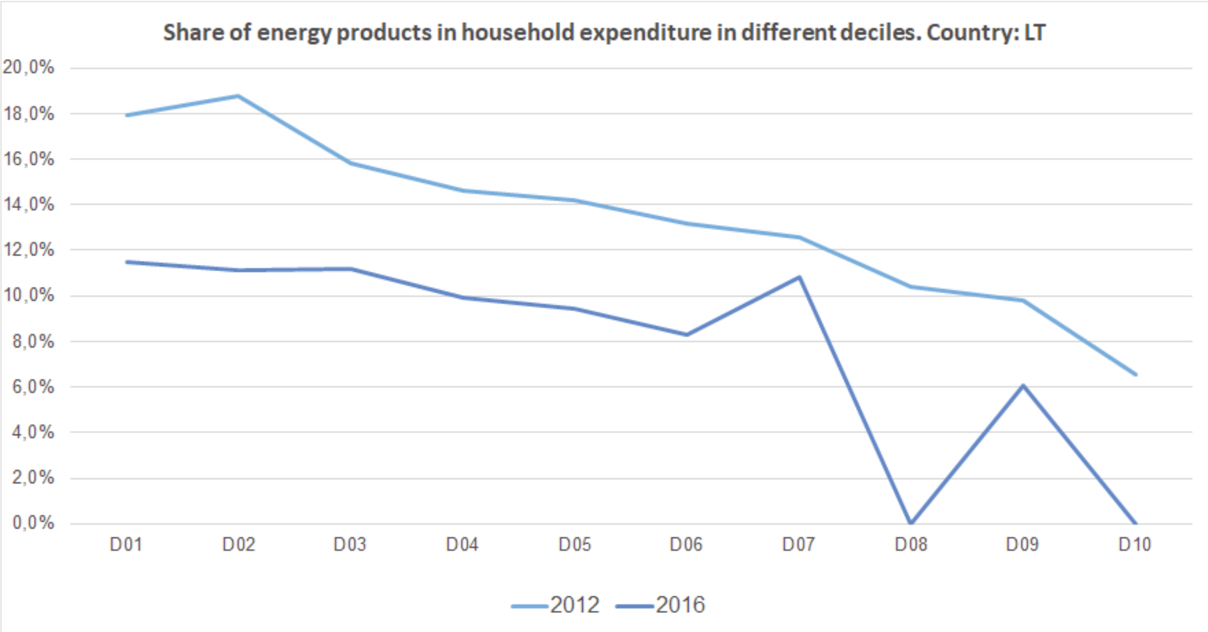

LT - 2019 retail gas prices - components
45 €/MWh
40 €/MWh
35 €/MWh
30 €/MWh
25 €/MWh
20 €/MWh
15 €/MWh
10 €/MWh
5 €/MWh
0 €/MWh
D2
I3
I5
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
VAT
Other

Oil products prices



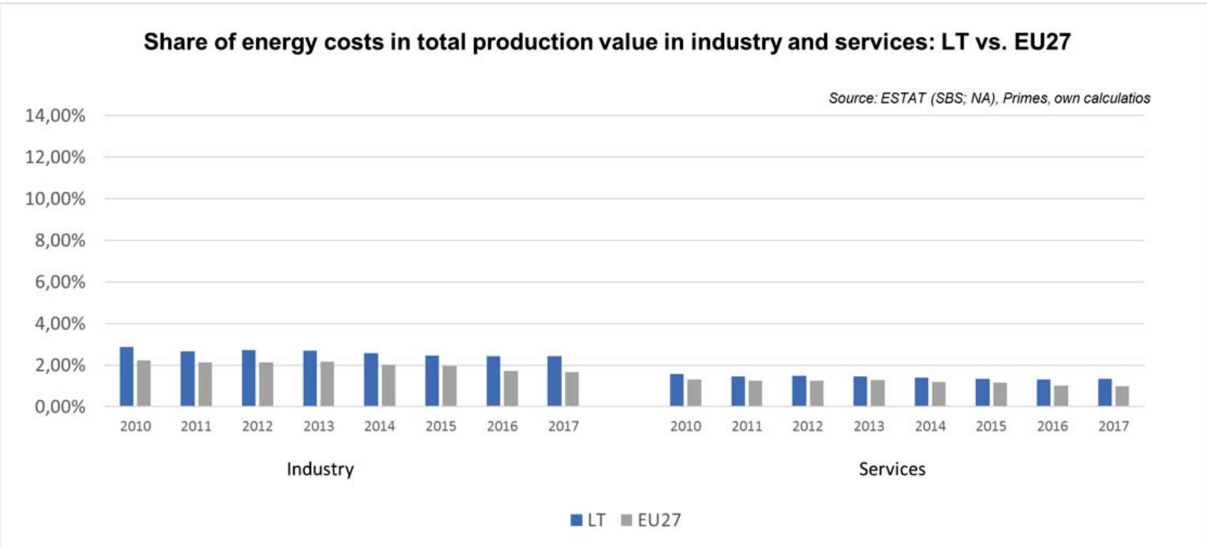
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2012 in Lithuania (light blue line) the poorest households (Decile 1) had to spend 17.9% of their total expenditures on energy products. In 2016 (blue line) the share of energy decreased to 11.5%. In the case of middle income households (Decile 5), in 2012 they spent 14.2 % of their total expenditure on energy, while in 2016 this value decreased to 9.4%. See footnote [1]

Energy costs shares in total production costs

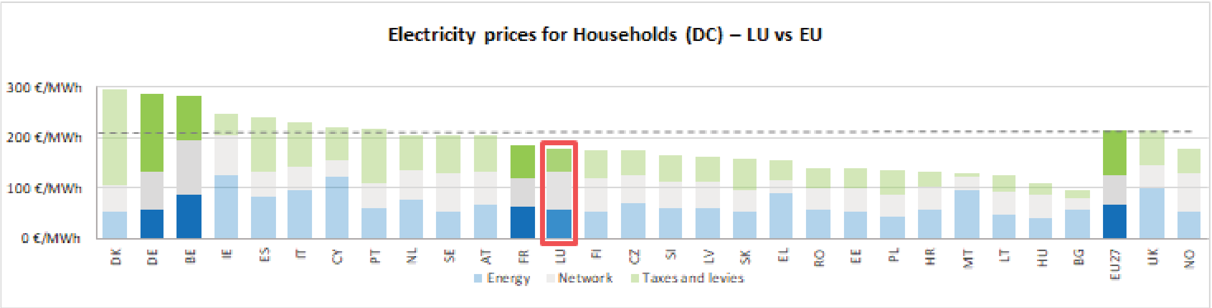


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

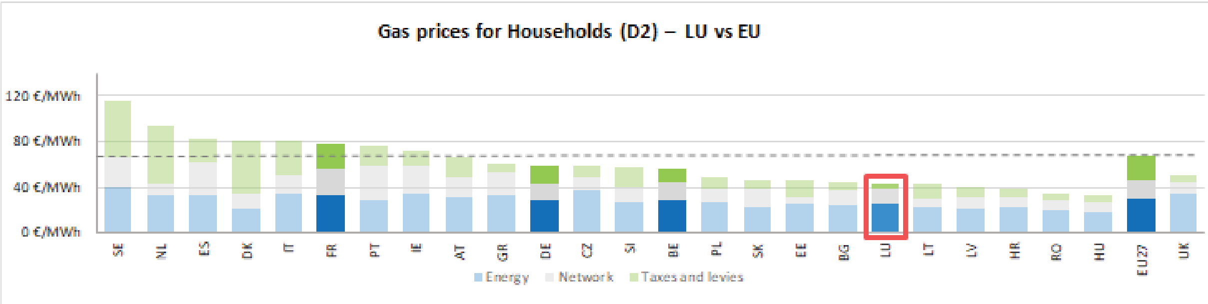
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels). Data not available for Deciles 8 and 10.

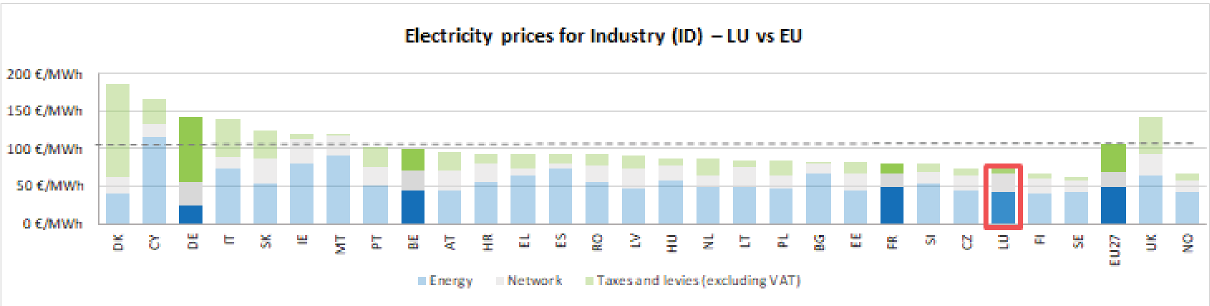
Luxembourg

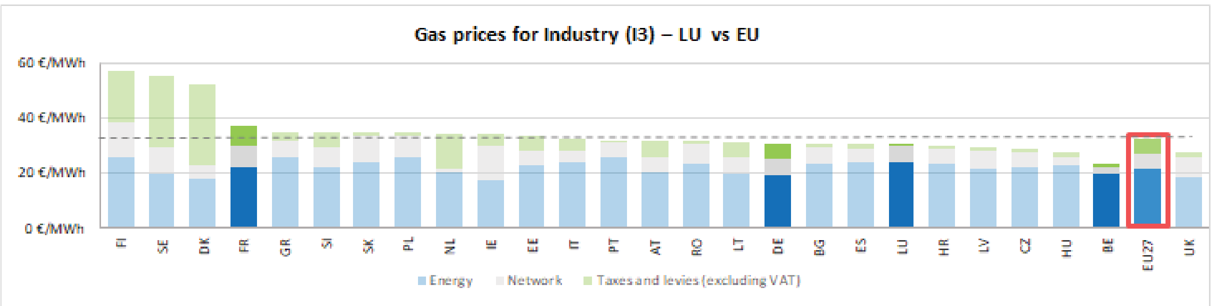
Prices (2019 and recent evolution)



see footnote[1]





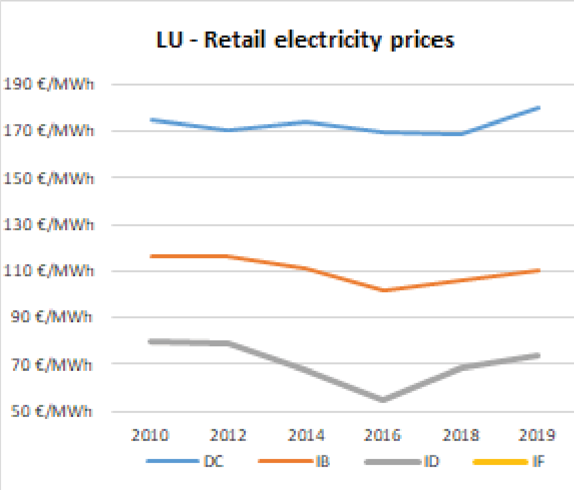


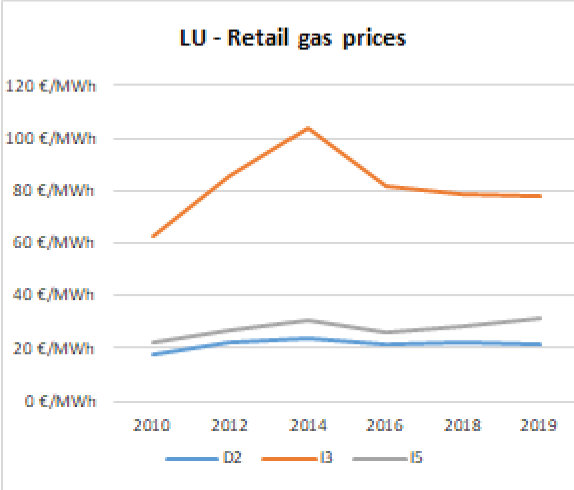
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

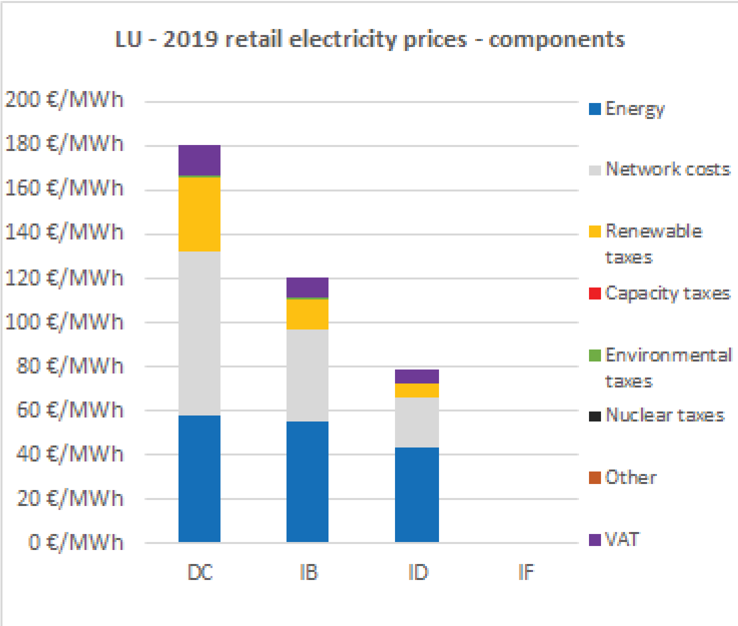
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

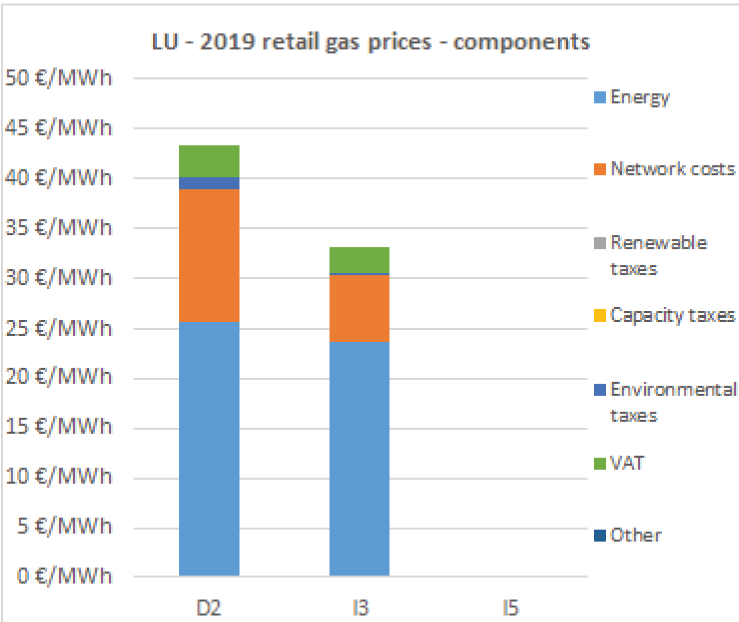
See footnote[2]

[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

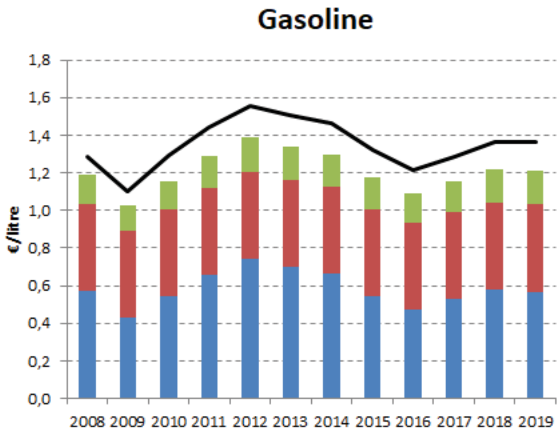

LU - Retail electricity prices
190 €/MWh
170 €/MWh
150 €/MWh
130 €/MWh
110 €/MWh
90 €/MWh
70 €/MWh
50 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF

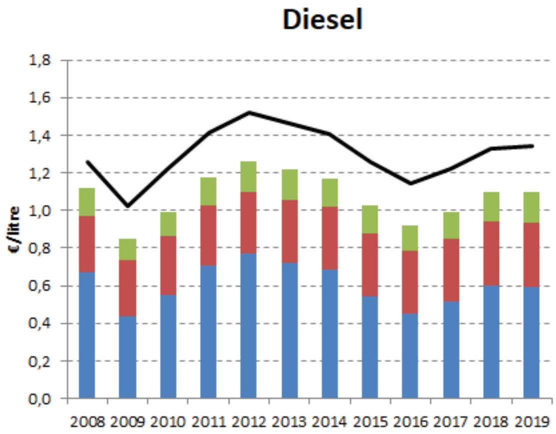

LU - Retail gas prices
120 €/MWh
100 €/MWh
80 €/MWh
60 €/MWh
40 €/MWh
20 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5

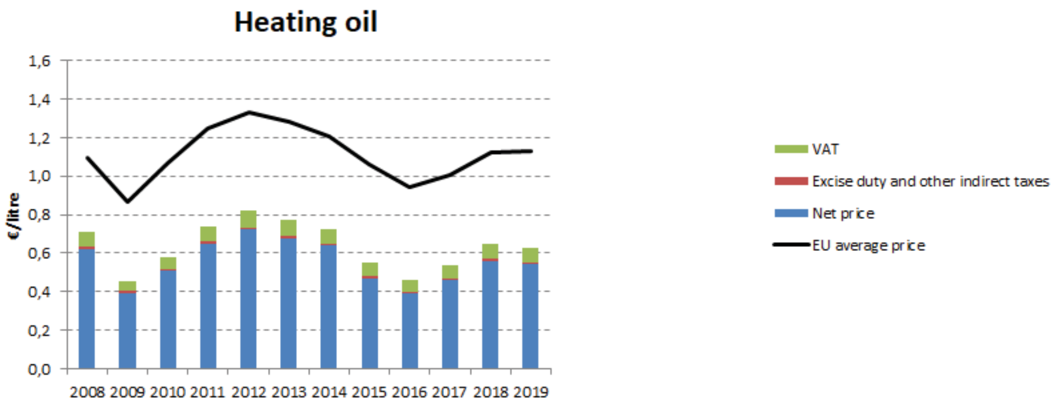

LU - 2019 retail electricity prices - components
200 €/MWh
180 €/MWh
160 €/MWh
140 €/MWh
120 €/MWh
100 €/MWh
80 €/MWh
60 €/MWh
40 €/MWh
20 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT


LU - 2019 retail gas prices - components
50 €/MWh
45 €/MWh
40 €/MWh
35 €/MWh
30 €/MWh
25 €/MWh
20 €/MWh
15 €/MWh
10 €/MWh
5 €/MWh
0 €/MWh
D2
I3
I5
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
VAT
Other

Oil products prices

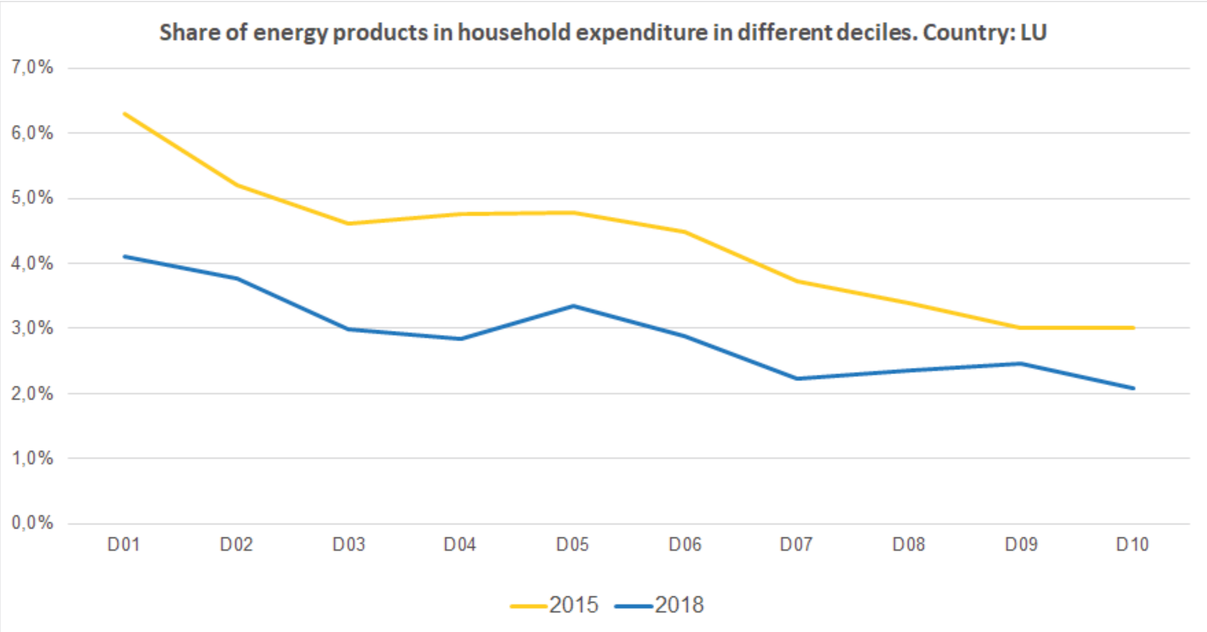






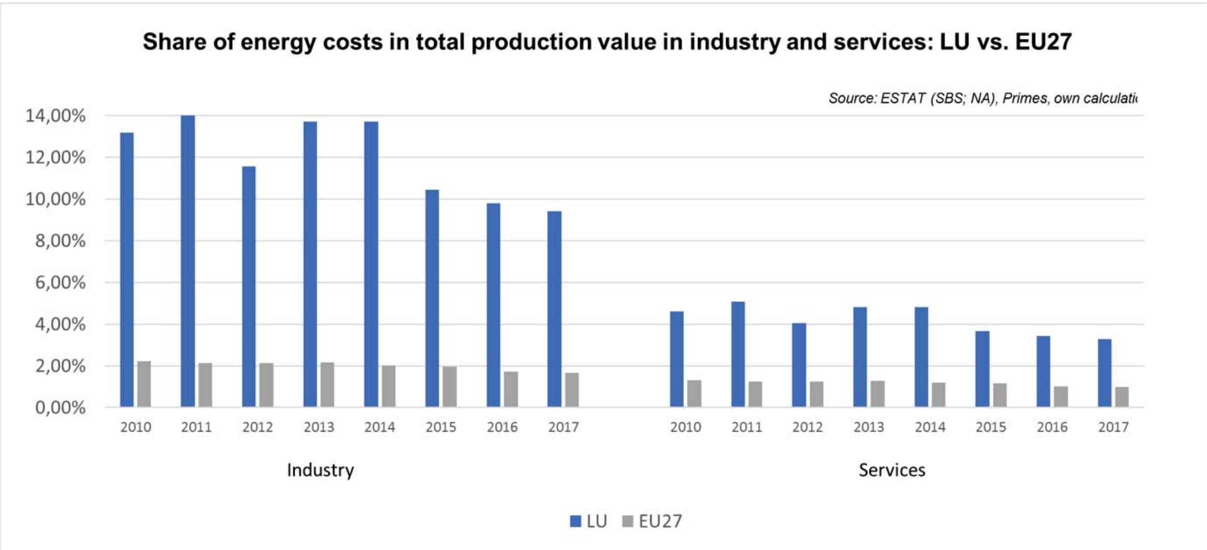
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2015 in Luxembourg (yellow line) the poorest households (Decile 1) had to spend 6.3% of their total expenditures on energy products. In 2018 (blue line) the share of energy decreased to 4.1%. In the case of middle income households (Decile 5), in 2015 they spent 4.8 % of their total expenditure on energy, while in 2018 this value decreased to 3.4%. See footnote [1]

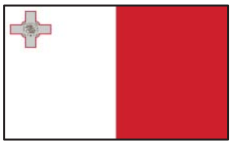
Energy costs shares in total production costs



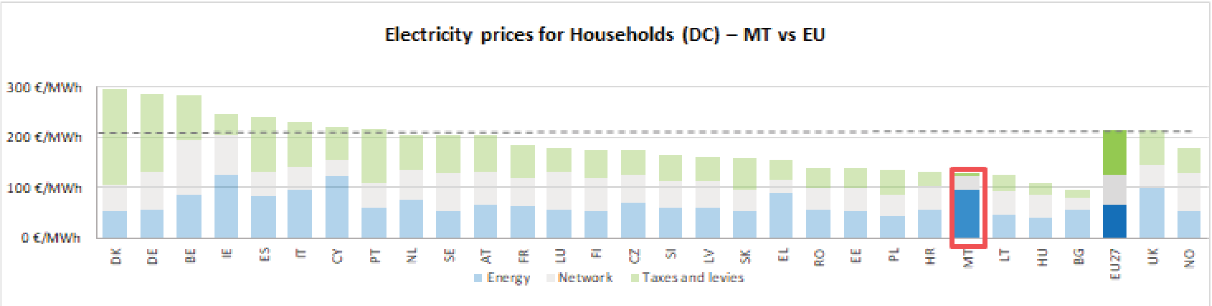
Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

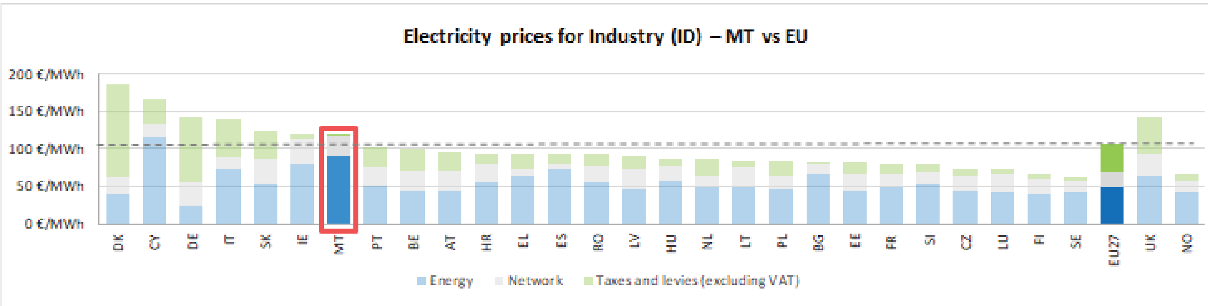
Malta



Prices (2019 and recent evolution)



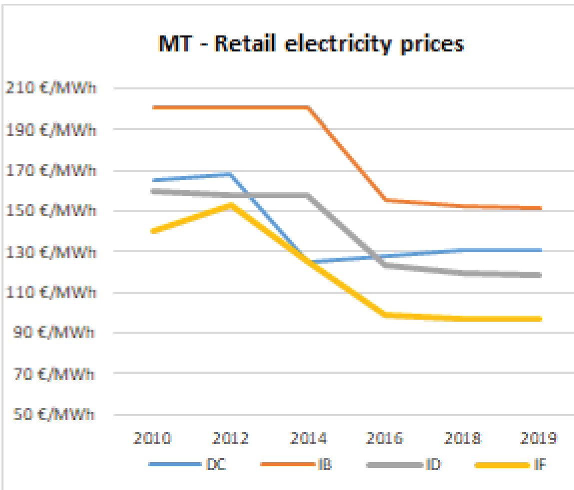
see footnote[1]



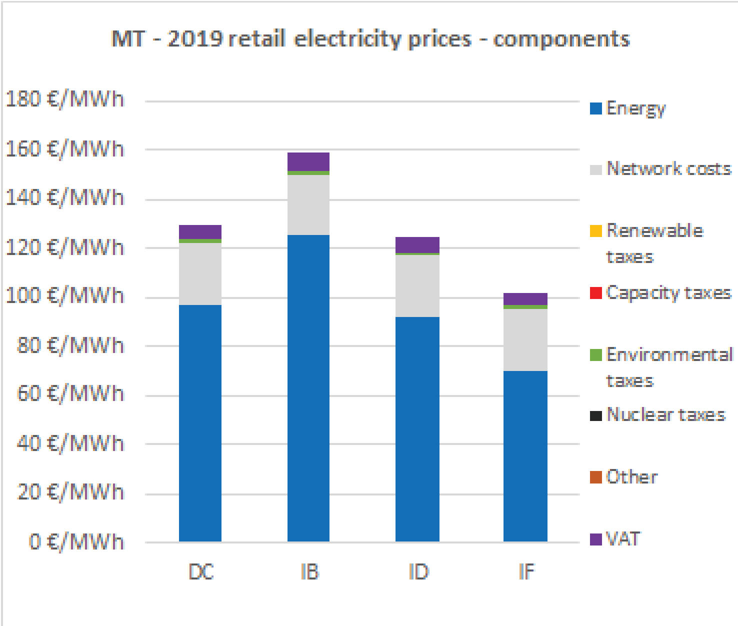
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

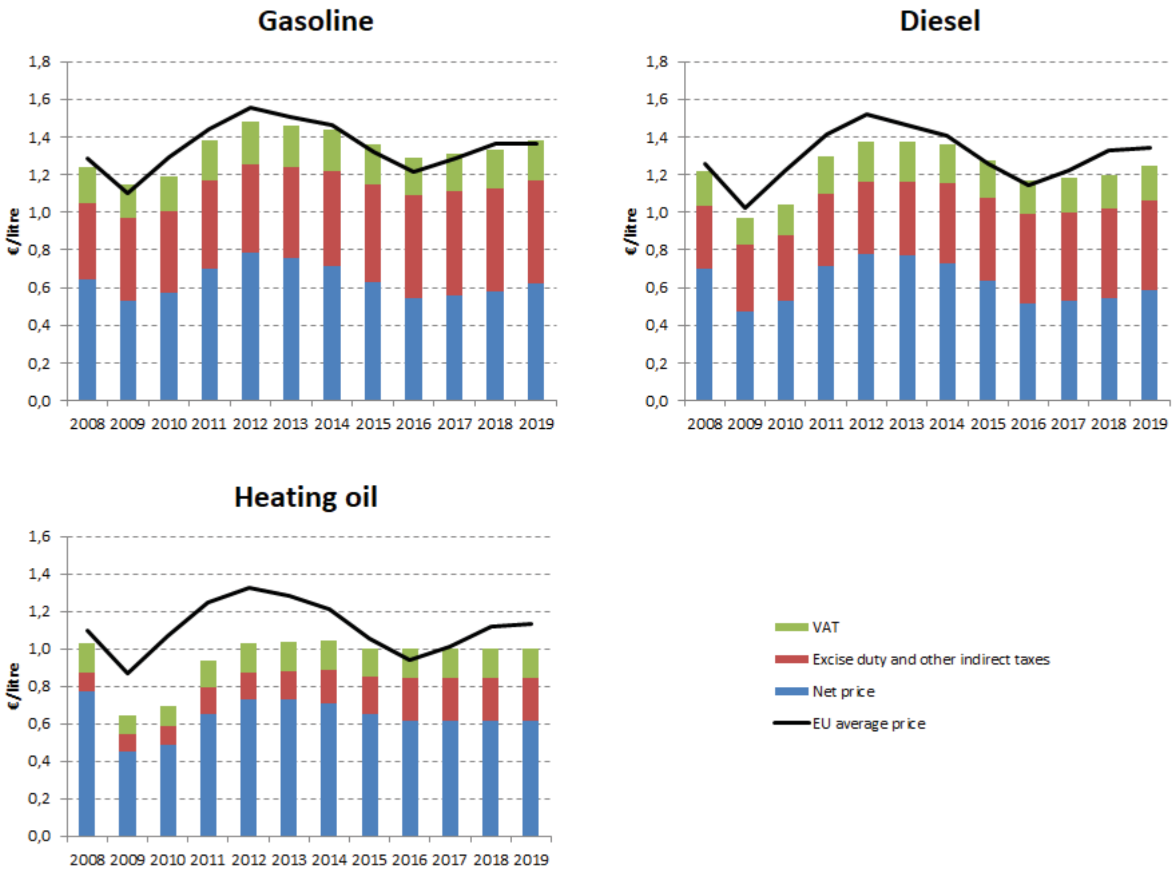
See footnote [2]



[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

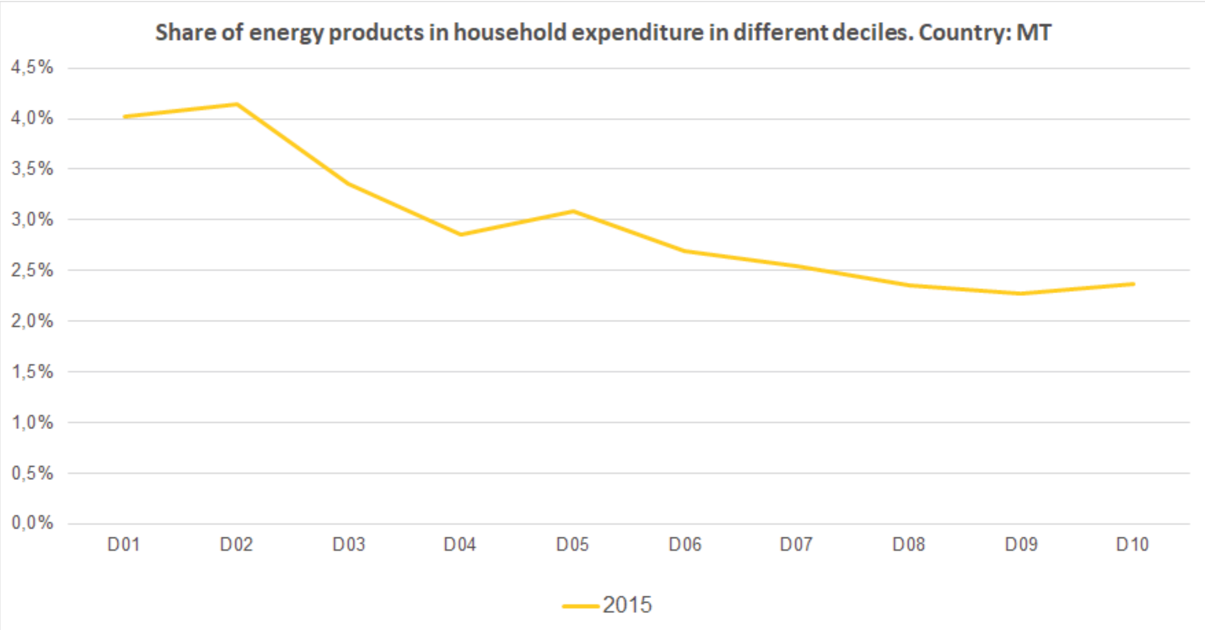


Oil products prices



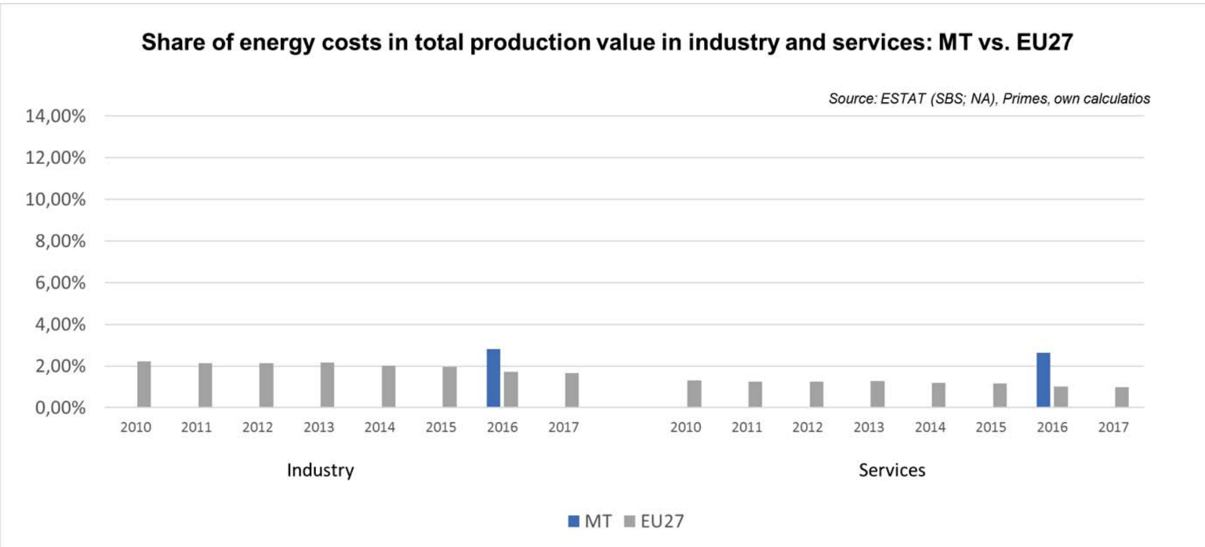
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2015 in Malta (yellow line) the poorest households (Decile 1) had to spend 4.0% of their total expenditures on energy products. In the case of middle income households (Decile 5), in the same year they spent 3.1% of their total expenditure on energy. See footnote [1]

Energy costs shares in total production costs

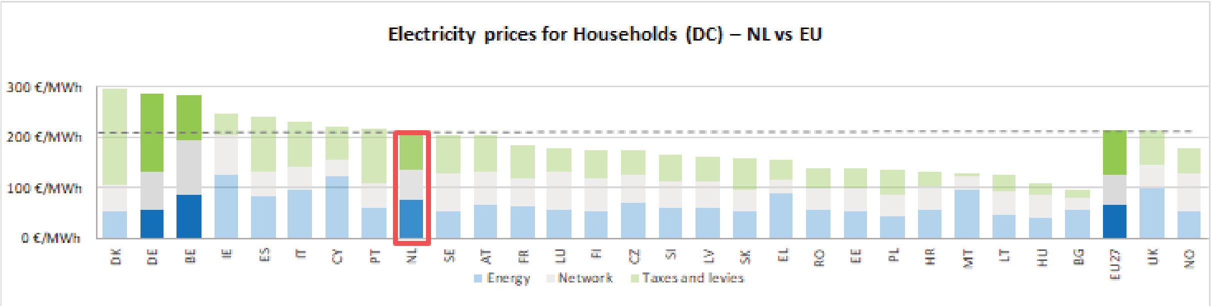


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

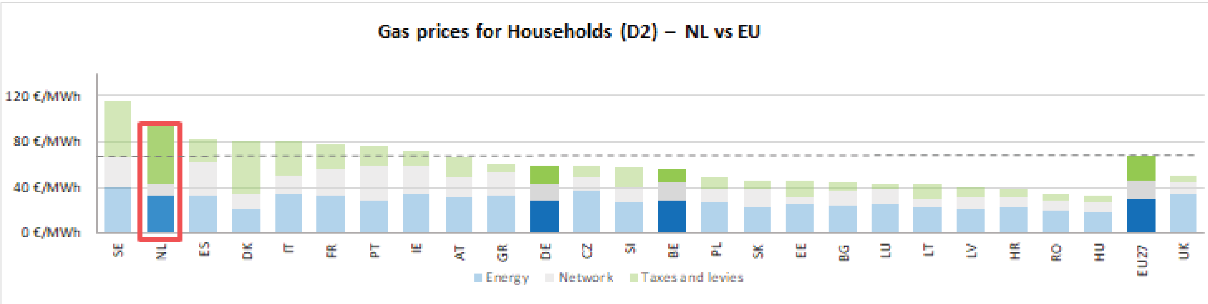
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

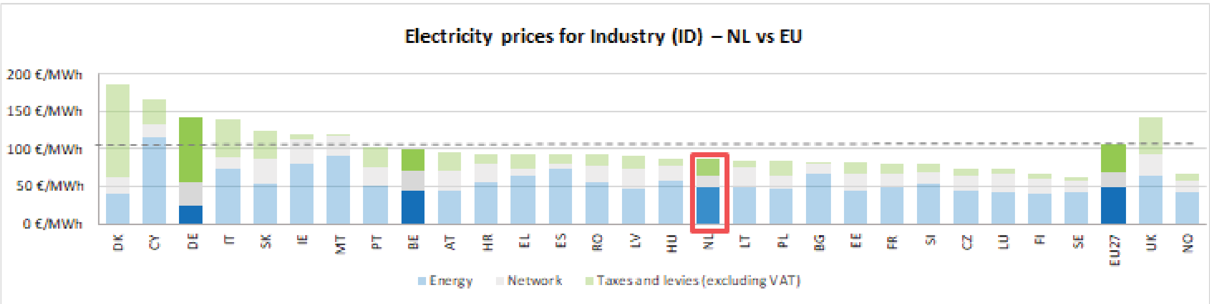
Netherlands

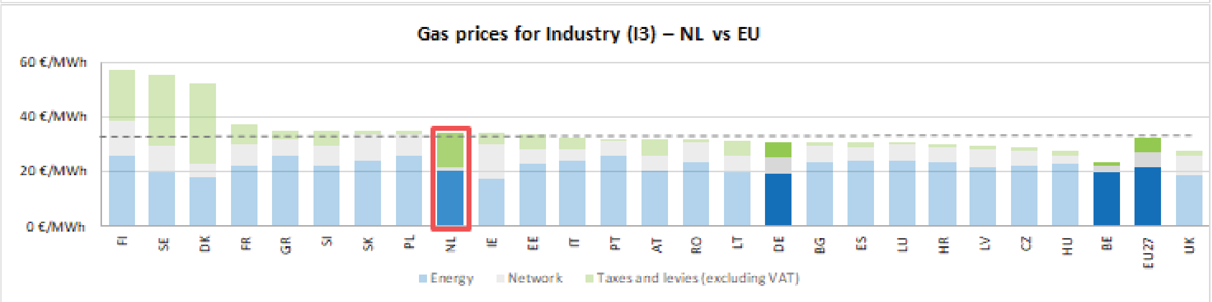
Prices (2019 and recent evolution)



see footnote[1]





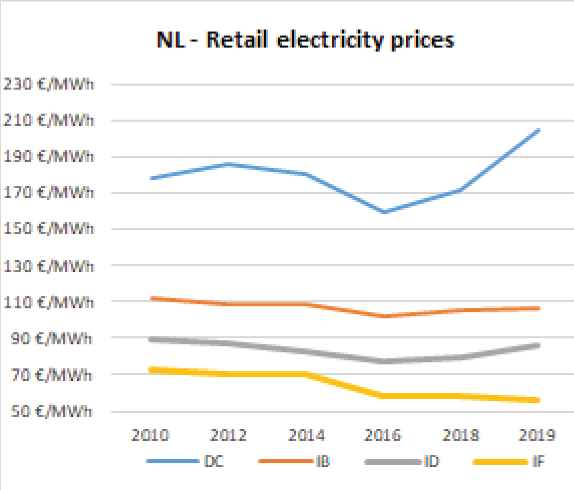


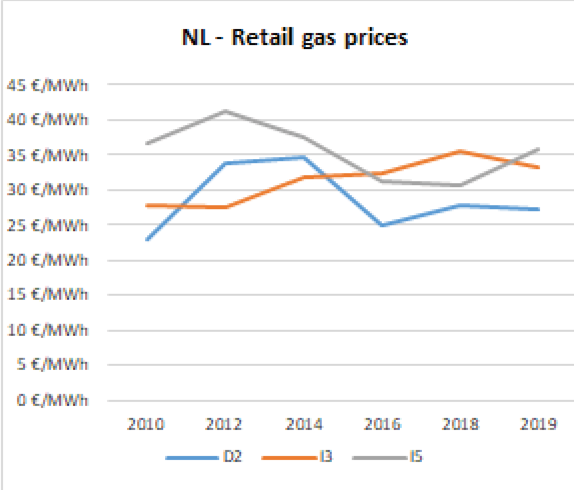
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

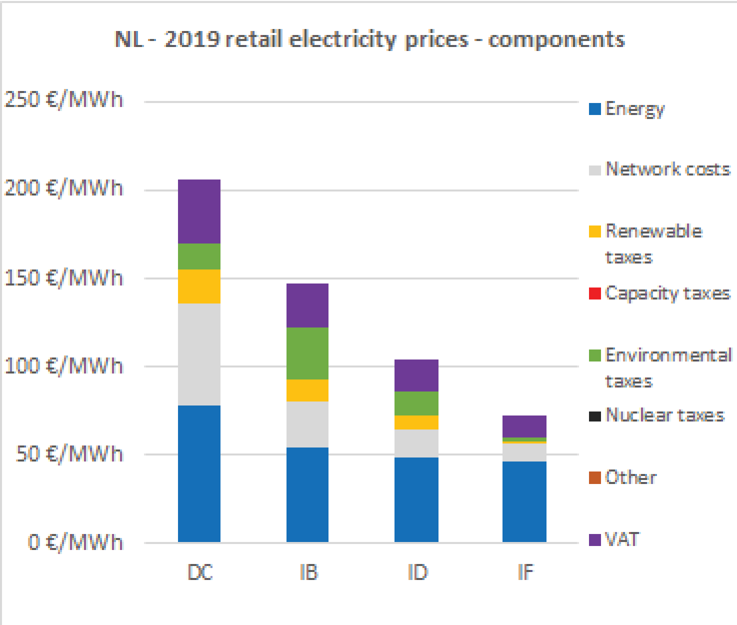
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

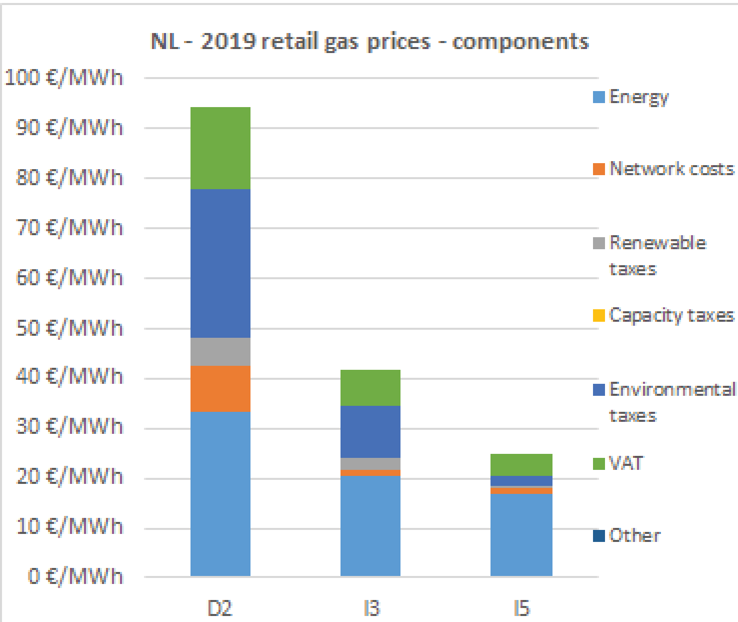
See footnote[2]

[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

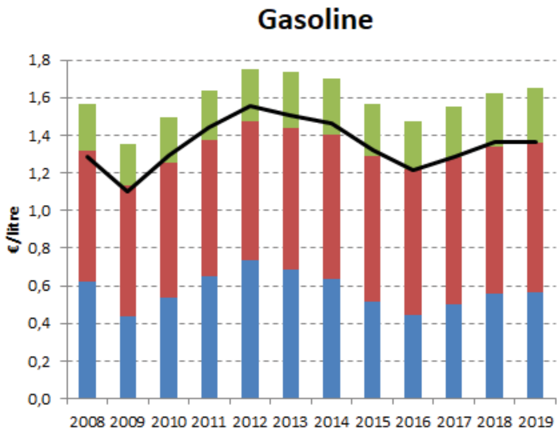

NL - Retail electricity prices
230 €/MWh
210 €/MWh
190 €/MWh
170 €/MWh
150 €/MWh
130 €/MWh
110 €/MWh
90 €/MWh
70 €/MWh
50 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF

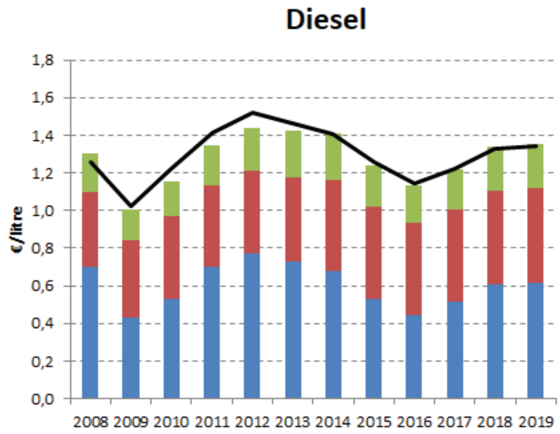

NL - Retail gas prices
45 €/MWh
40 €/MWh
35 €/MWh
30 €/MWh
25 €/MWh
20 €/MWh
15 €/MWh
10 €/MWh
5 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5

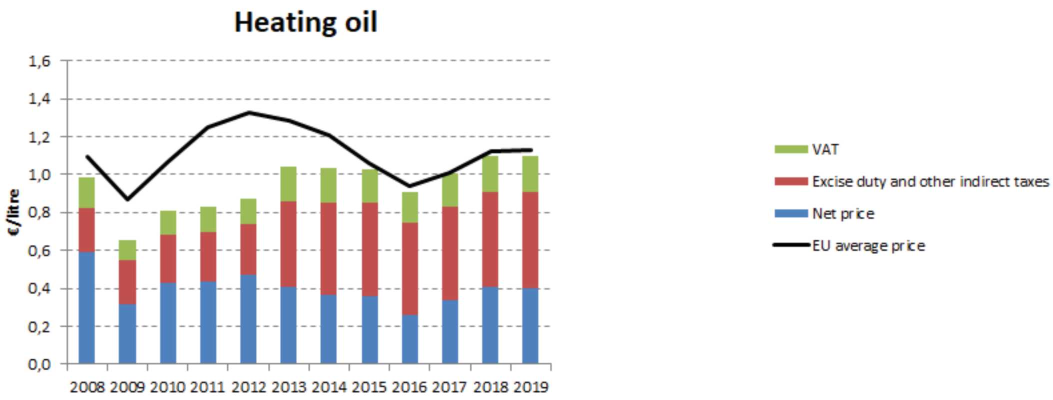

NL - 2019 retail electricity prices - components
250 €/MWh
200 €/MWh
150 €/MWh
100 €/MWh
50 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT


NL - 2019 retail gas prices - components
100 €/MWh
90 €/MWh
80 €/MWh
70 €/MWh
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
D2
I3
I5
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
VAT
Other

Oil products prices

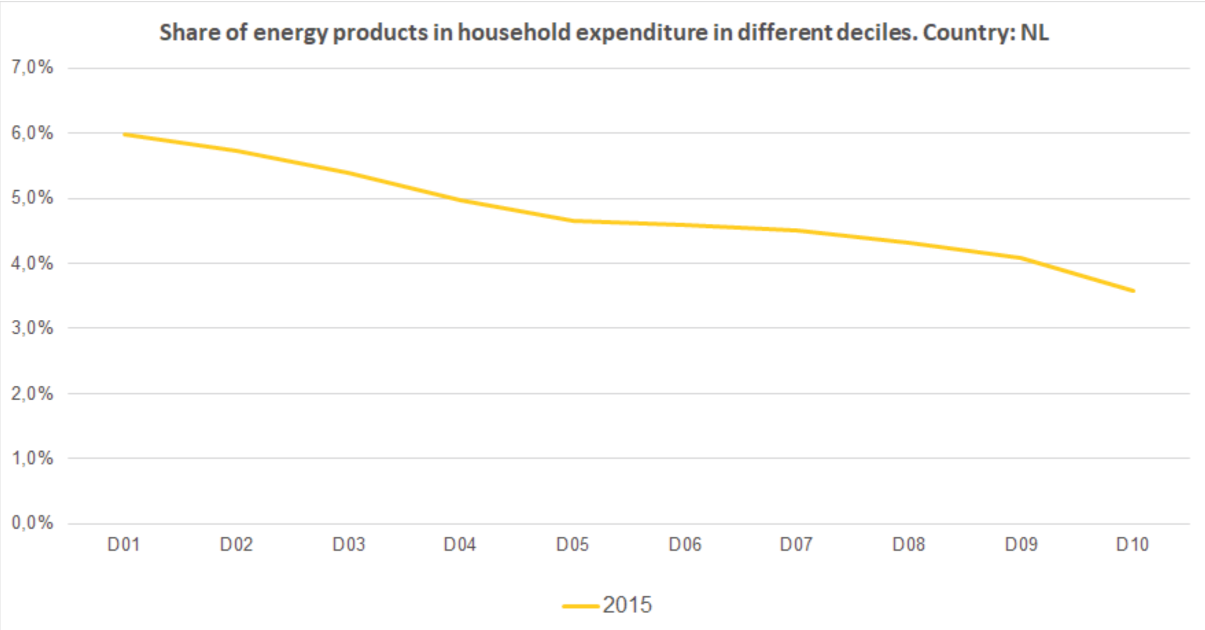






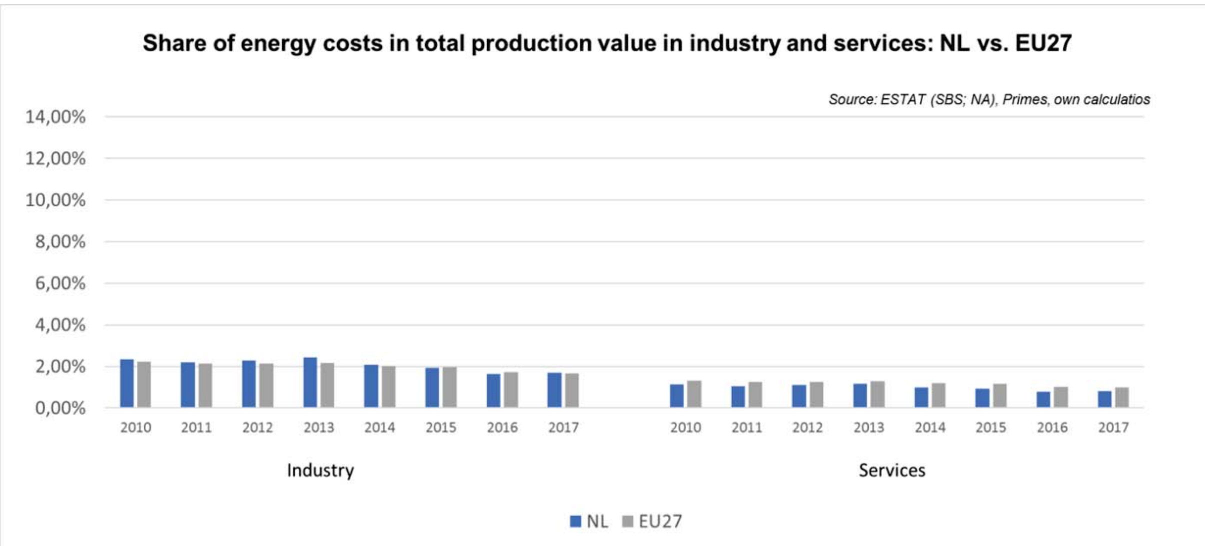
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2015 in the Netherlands (yellow line) the poorest households (Decile 1) had to spend 6.0% of their total expenditures on energy products. In the case of middle income households (Decile 5), in the same year they spent 4.7% of their total expenditure on energy. See footnote [1]

Energy costs shares in total production costs

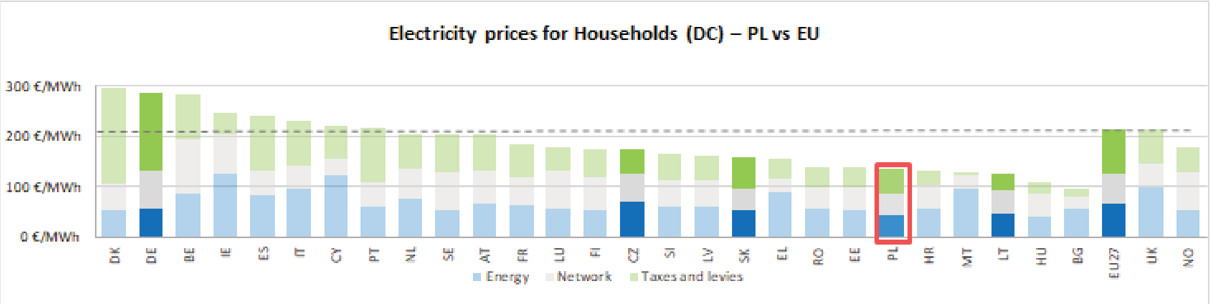


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

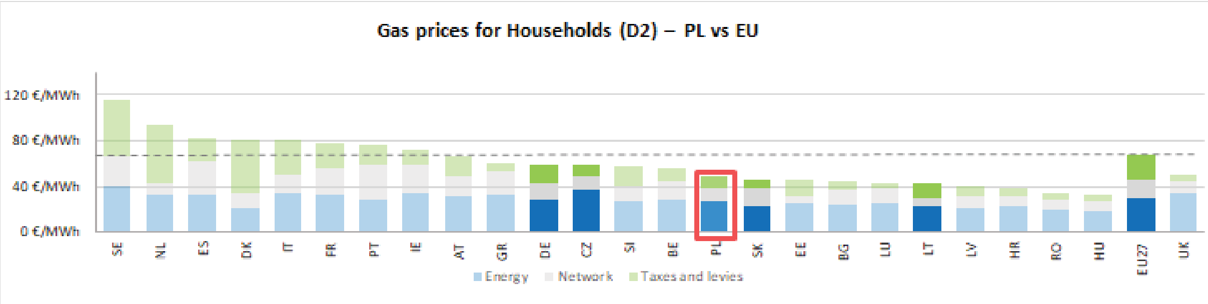
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

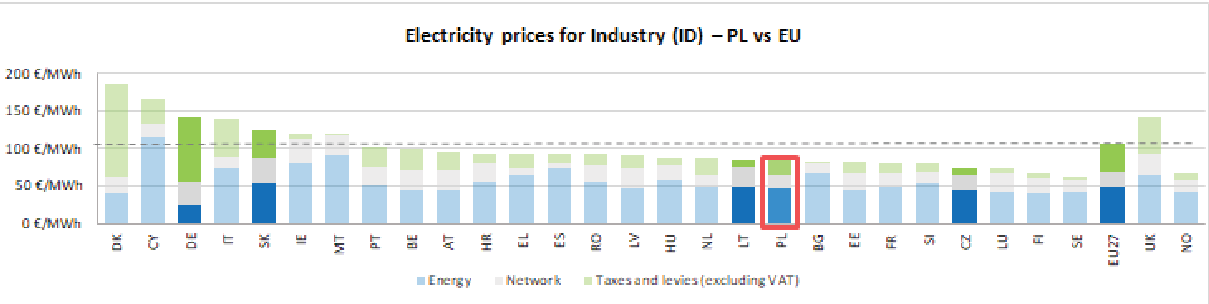
Poland

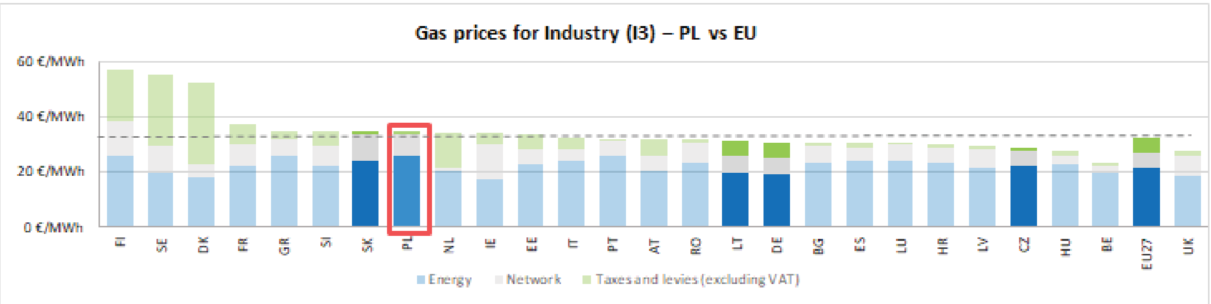
Prices in 2019



see footnote[1]





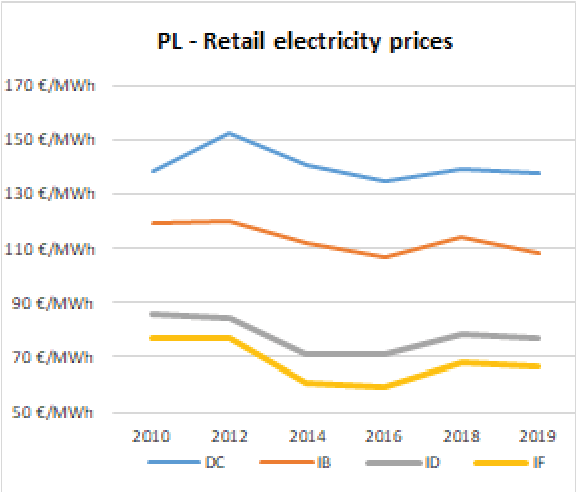


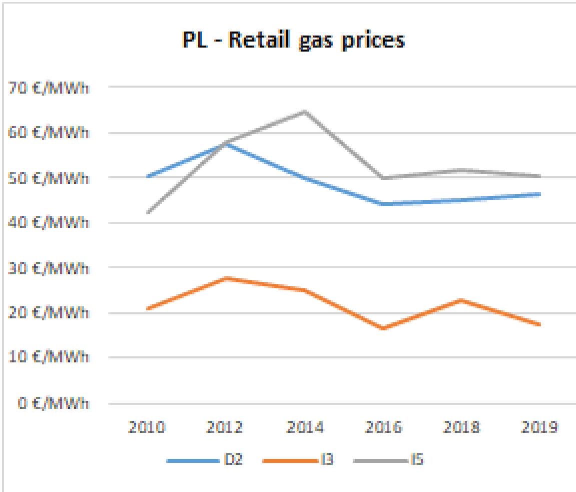
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

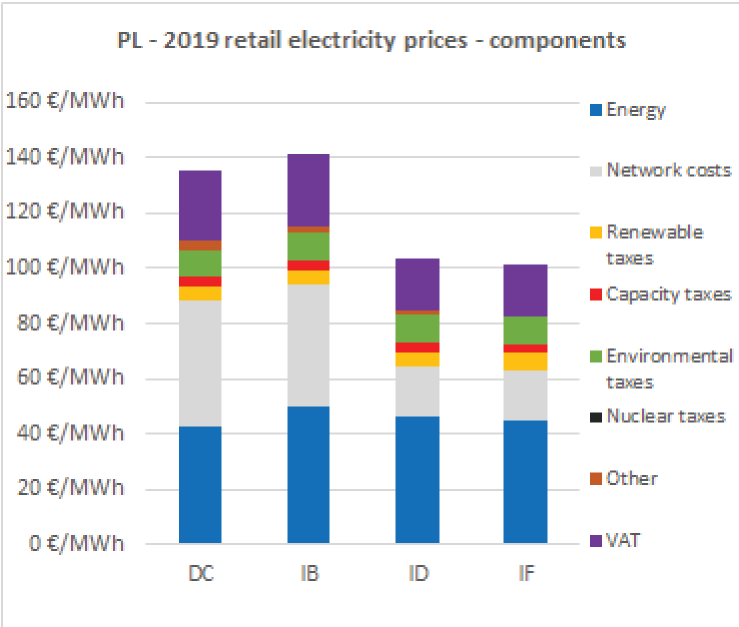
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

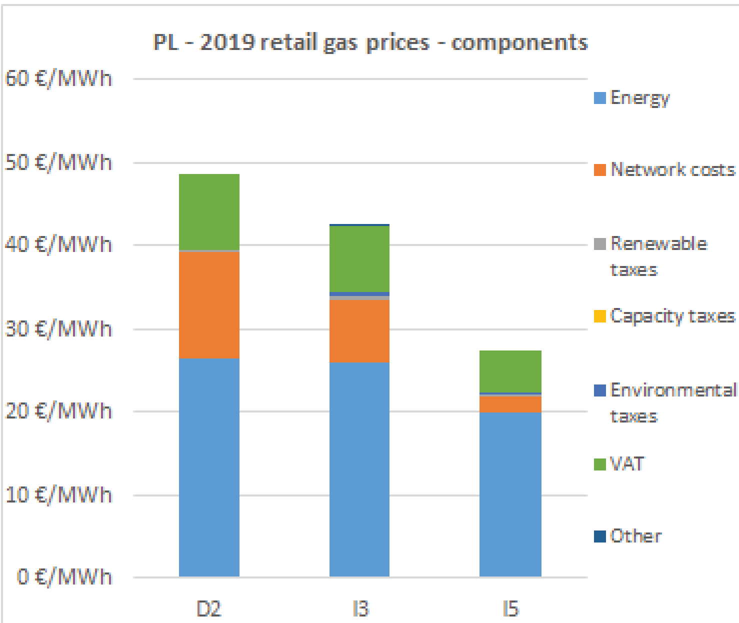
See footnote[2]

[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

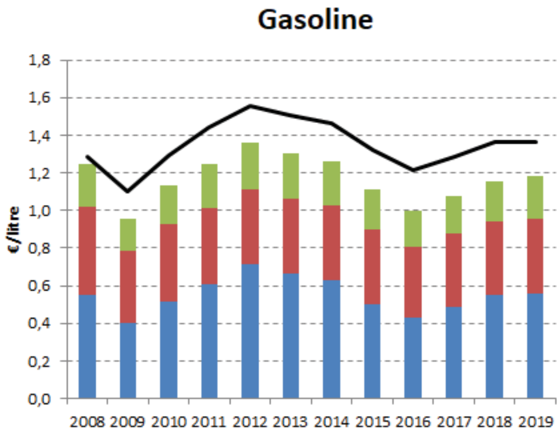

PL - Retail electricity prices
170 €/MWh
150 €/MWh
130 €/MWh
110 €/MWh
90 €/MWh
70 €/MWh
50 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF

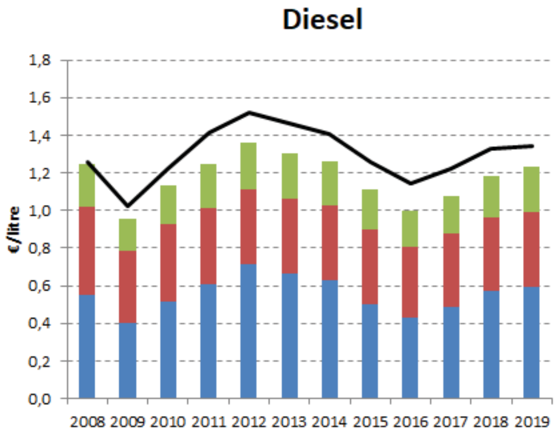

PL - Retail gas prices
70 €/MWh
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5

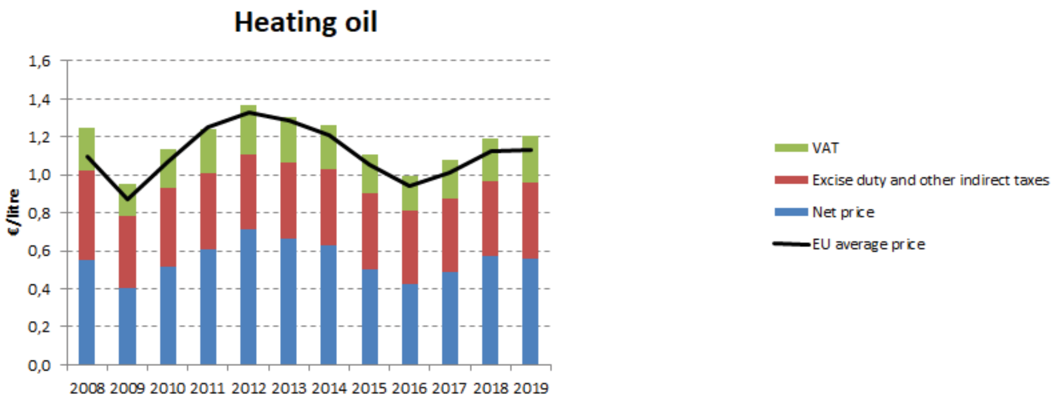

PL - 2019 retail electricity prices - components
160 €/MWh
140 €/MWh
120 €/MWh
100 €/MWh
80 €/MWh
60 €/MWh
40 €/MWh
20 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT


PL - 2019 retail gas prices - components
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
D2
I3
I5
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
VAT
Other

Oil products prices

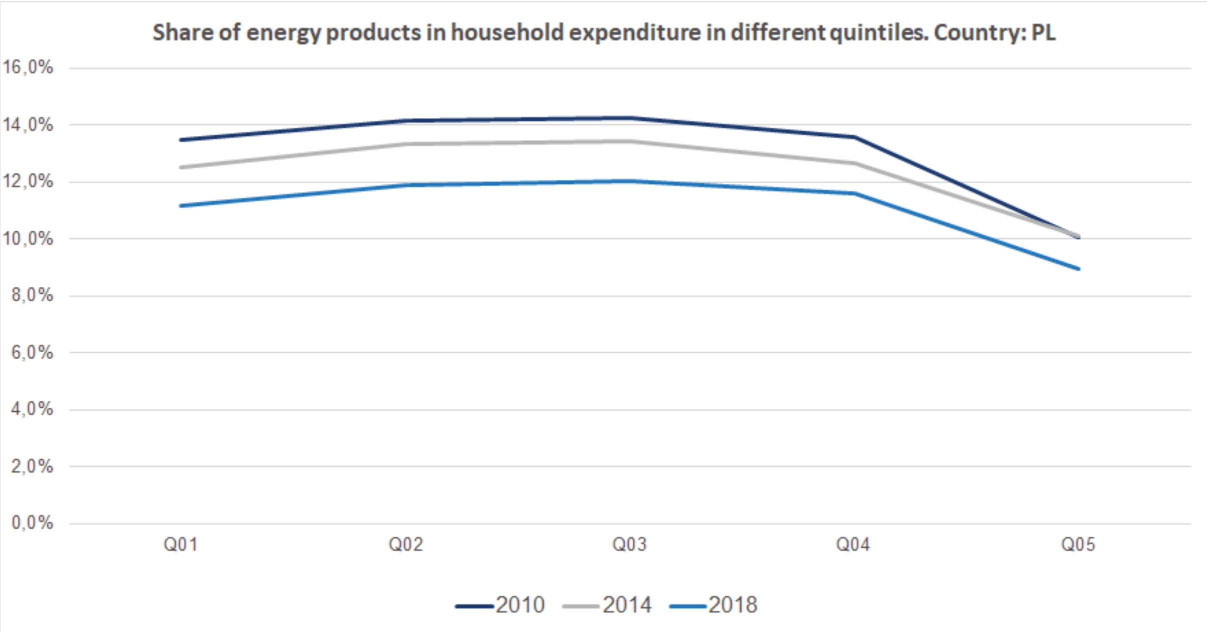






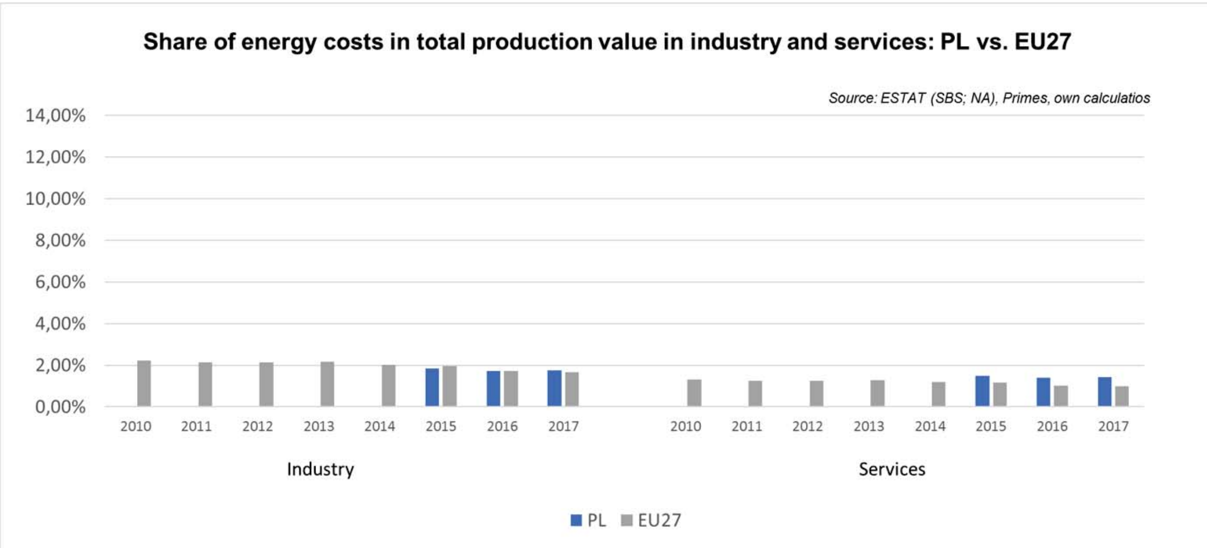
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2010 in Poland (dark blue line) the poorest households (Quintile 1) had to spend 13.5% of their total expenditures on energy products. In 2018 (blue line) the share of energy decreased to 11.2%. In the case of middle income households (Quintile 3), in 2010 they spent 14.2% of their total expenditure on energy, while in 2018 this value decreased to 12.0%. See footnote [1]

Energy costs shares in total production costs

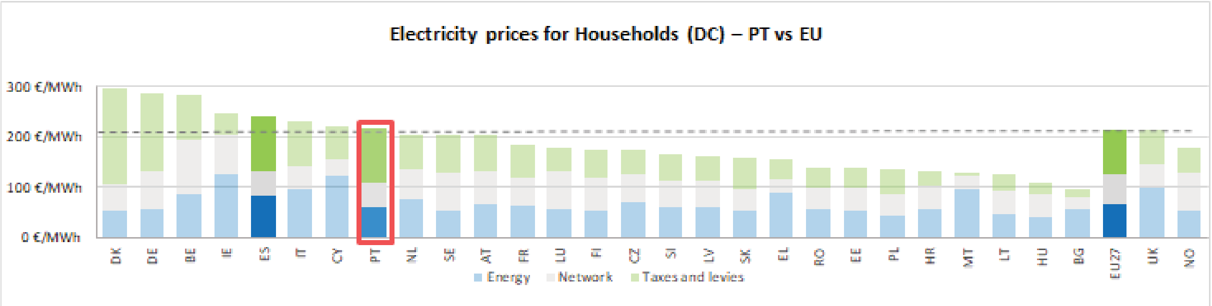


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

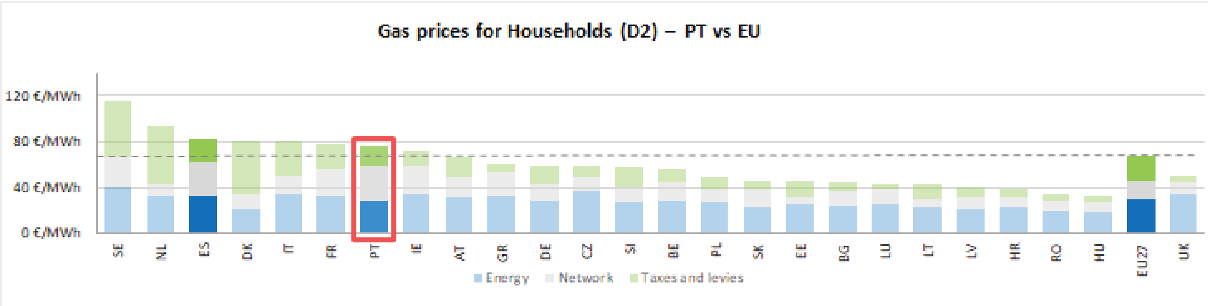
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

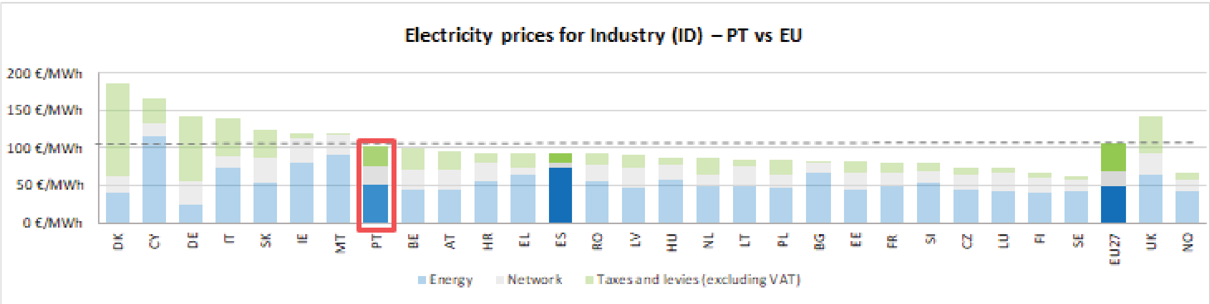
Portugal

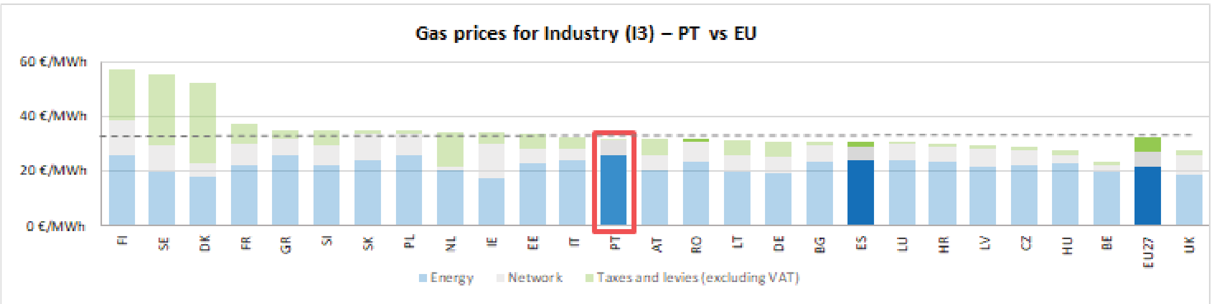
Prices (2019 and recent evolution)



see footnote[1]







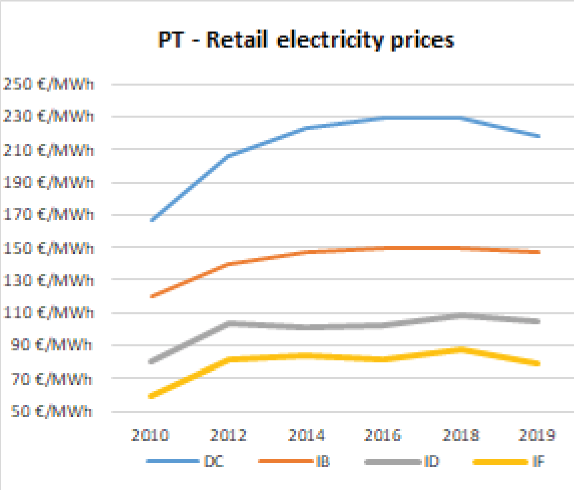
See footnote[2]

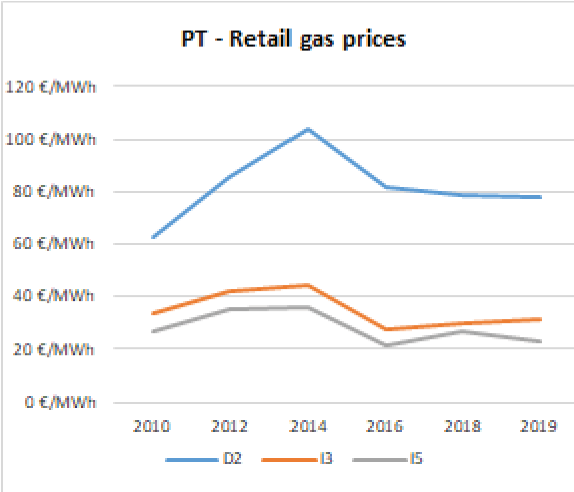
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

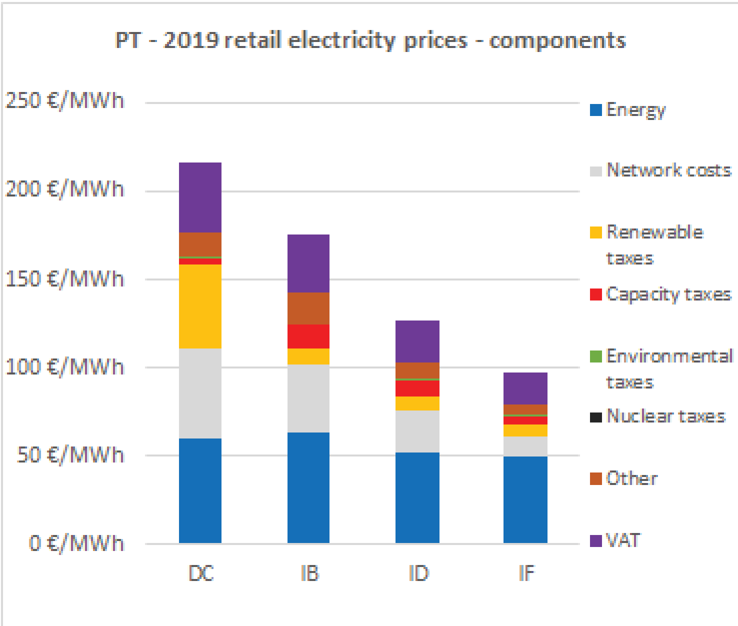
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

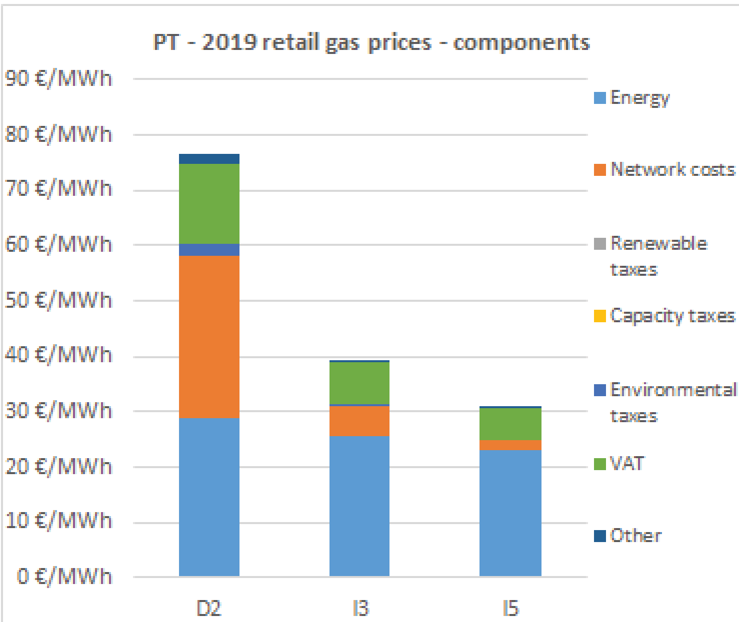
[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.

[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

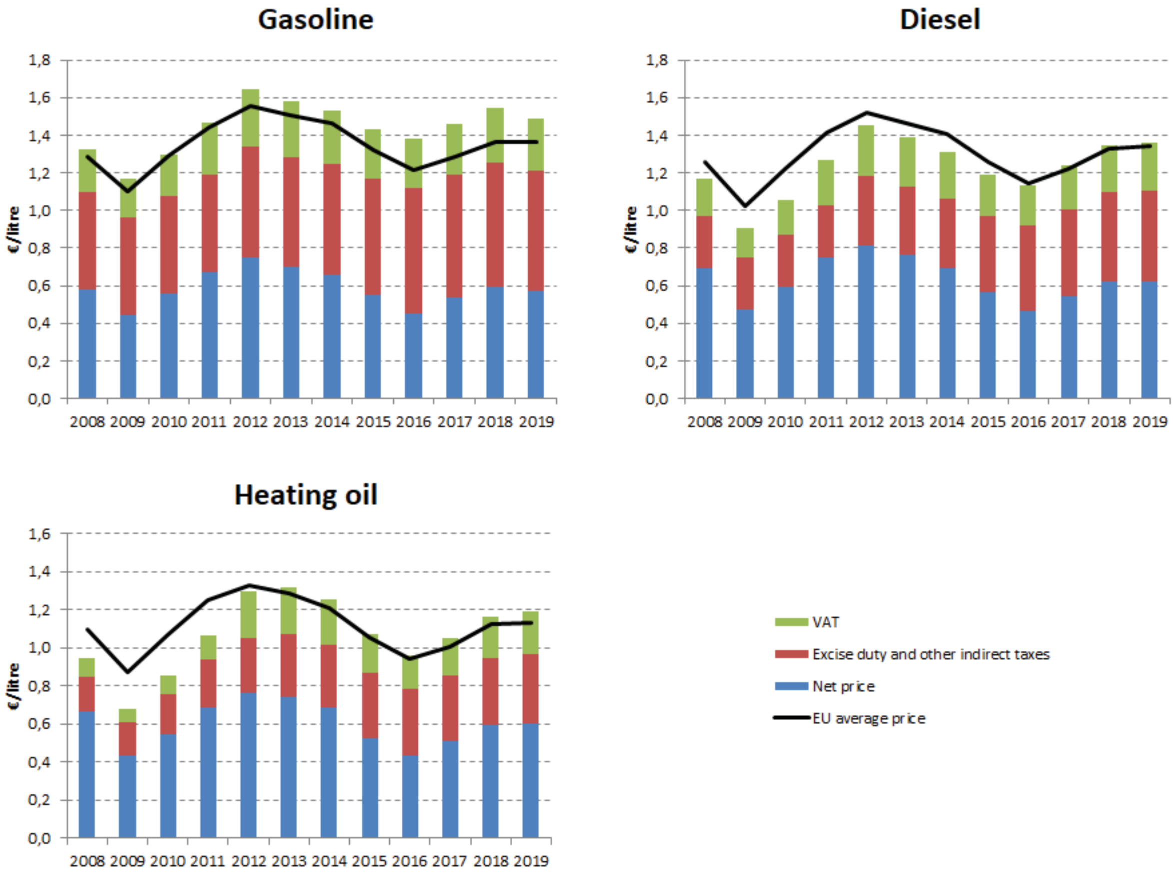

PT - Retail electricity prices
250 €/MWh
230 €/MWh
210 €/MWh
190 €/MWh
170 €/MWh
150 €/MWh
130 €/MWh
110 €/MWh
90 €/MWh
70 €/MWh
50 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF


PT - Retail gas prices
120 €/MWh
100 €/MWh
80 €/MWh
60 €/MWh
40 €/MWh
20 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5


PT - 2019 retail electricity prices - components
250 €/MWh
200 €/MWh
150 €/MWh
100 €/MWh
50 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT

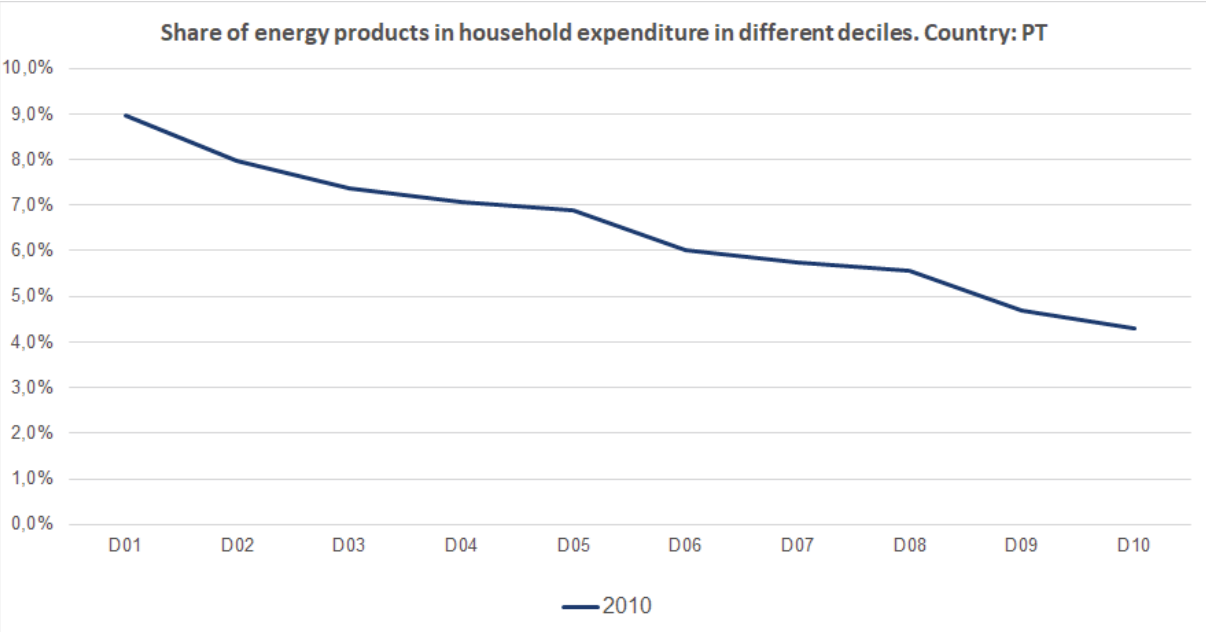

PT - 2019 retail gas prices - components
90 €/MWh
80 €/MWh
70 €/MWh
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
D2
I3
I5
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
VAT
Other

Oil products prices



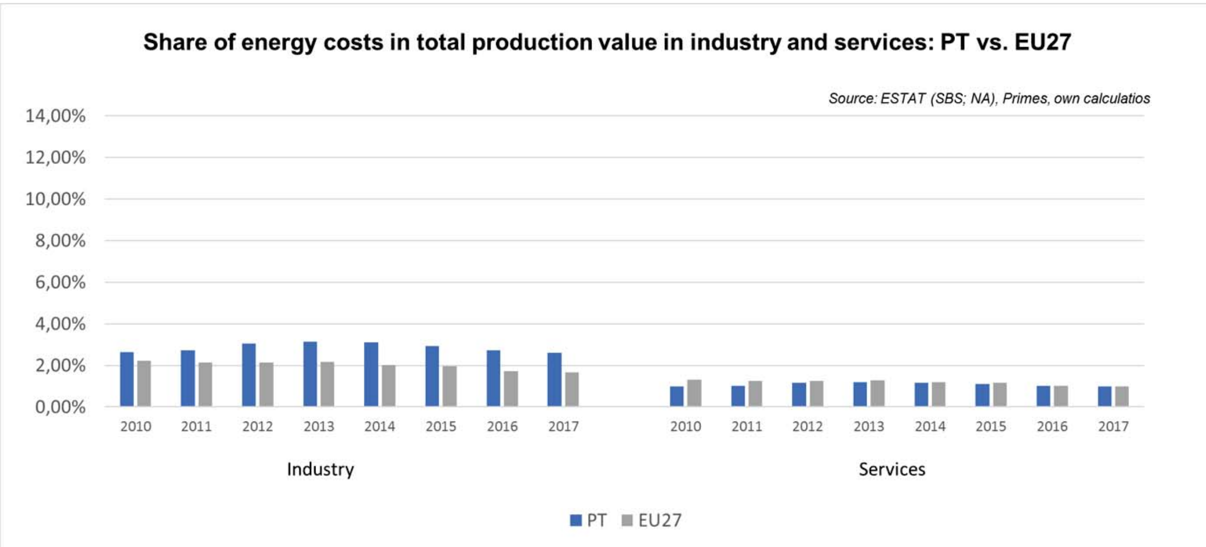
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2010 in Portugal (blue dark line) the poorest households (Decile 1) had to spend 9.0% of their total expenditures on energy products. In the case of middle income households (Decile 5), in the same year they spent 6.9% of their total expenditure on energy. See footnote [1]

Energy costs shares in total production costs

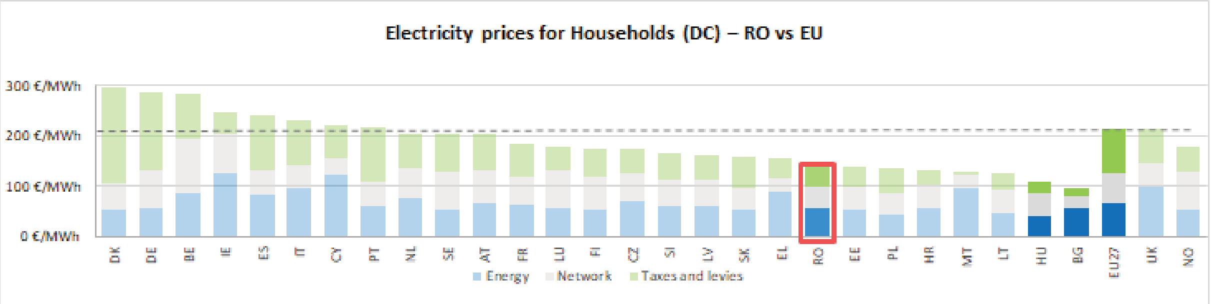


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

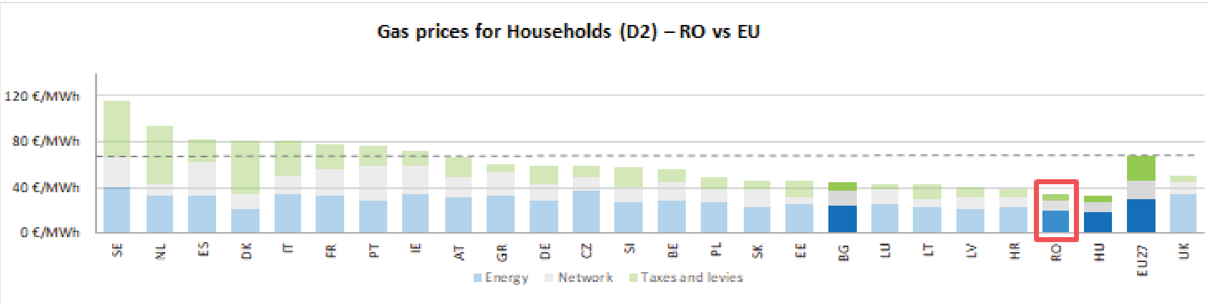
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

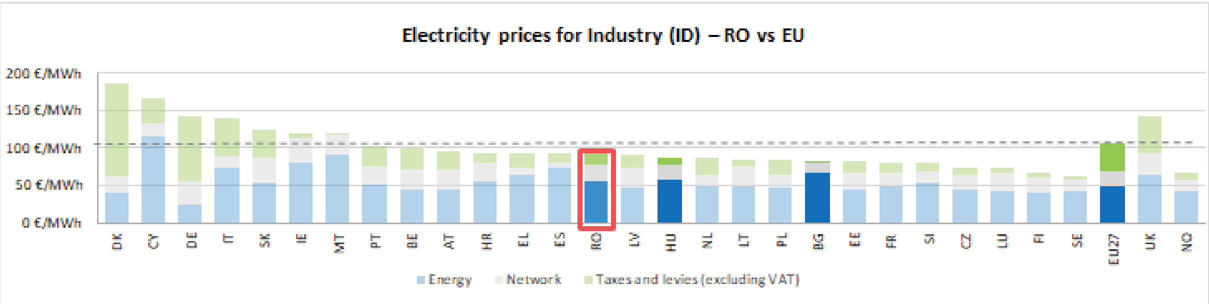
Romania

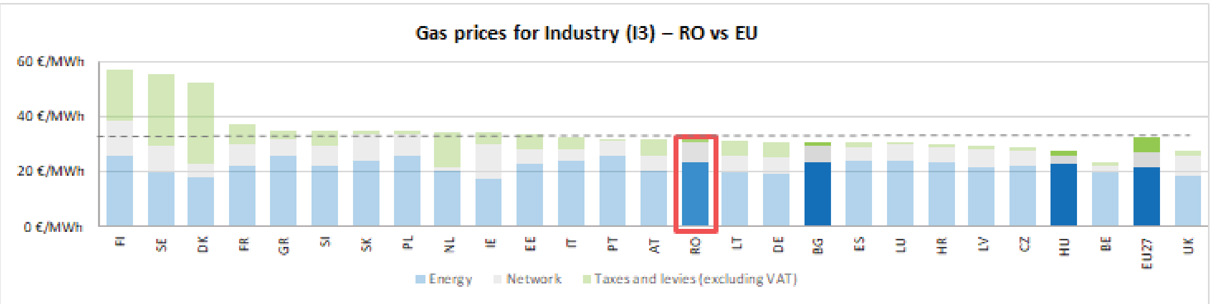
Prices (2019 and recent evolution)



see footnote[1]







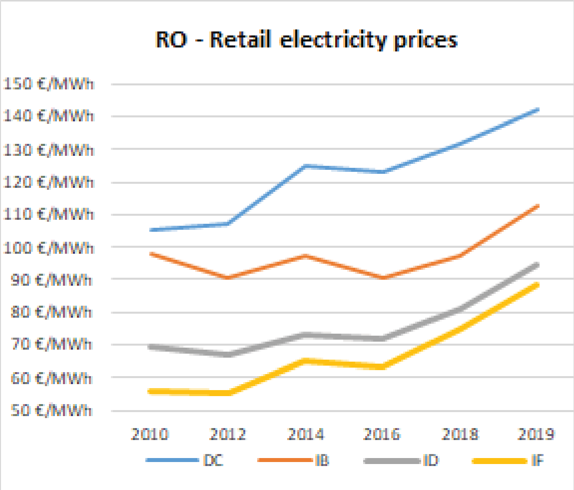
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

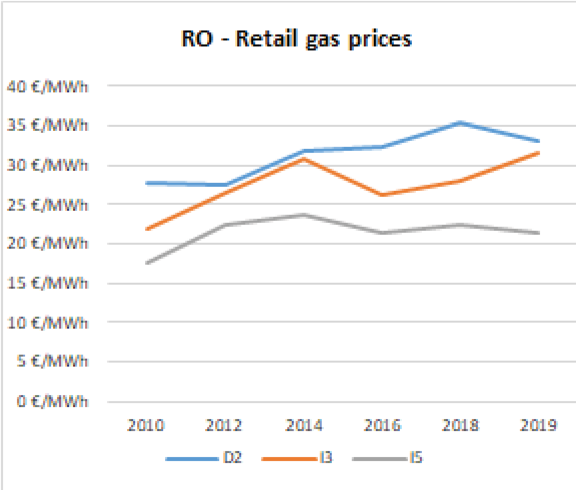
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

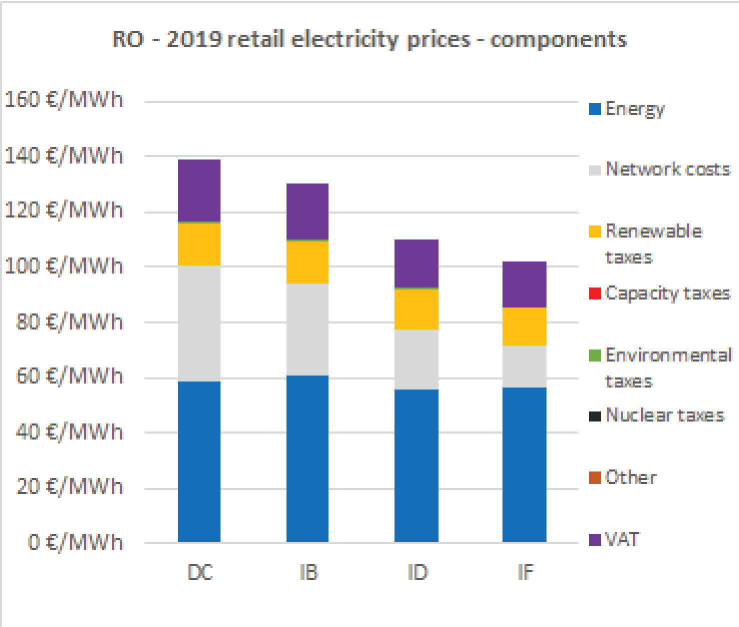
See footnote[2]

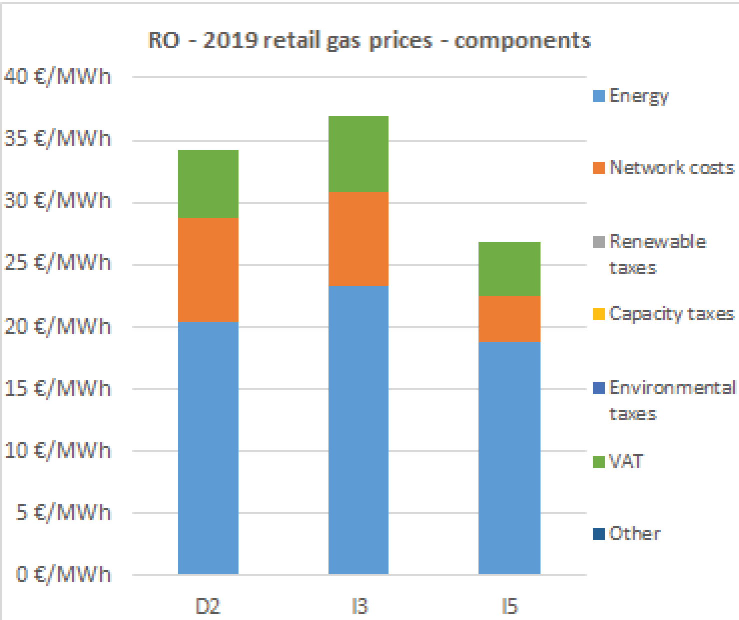
[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.

[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

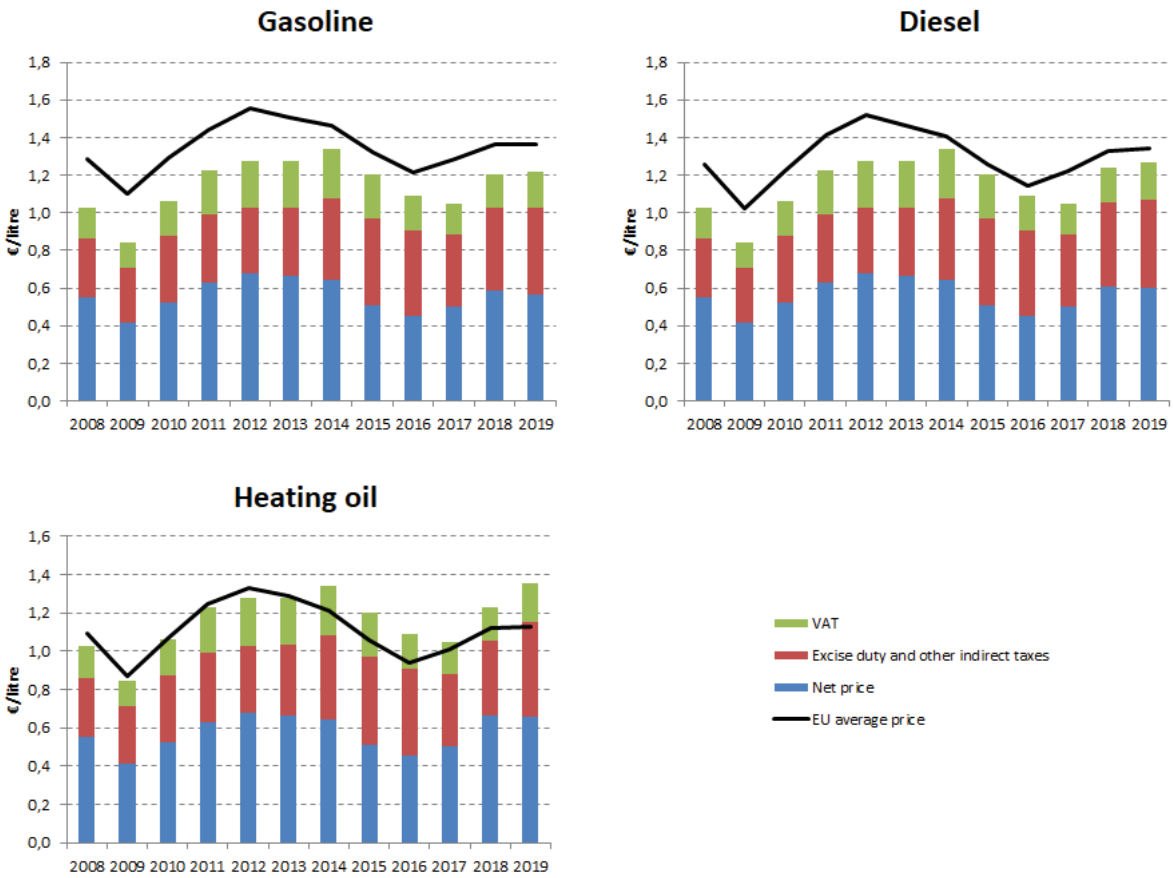

RO - Retail electricity prices
150 €/MWh
140 €/MWh
130 €/MWh
120 €/MWh
110 €/MWh
100 €/MWh
90 €/MWh
80 €/MWh
70 €/MWh
60 €/MWh
50 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF


RO - Retail gas prices
40 €/MWh
35 €/MWh
30 €/MWh
25 €/MWh
20 €/MWh
15 €/MWh
10 €/MWh
5 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5


RO - 2019 retail electricity prices - components
160 €/MWh
140 €/MWh
120 €/MWh
100 €/MWh
80 €/MWh
60 €/MWh
40 €/MWh
20 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT

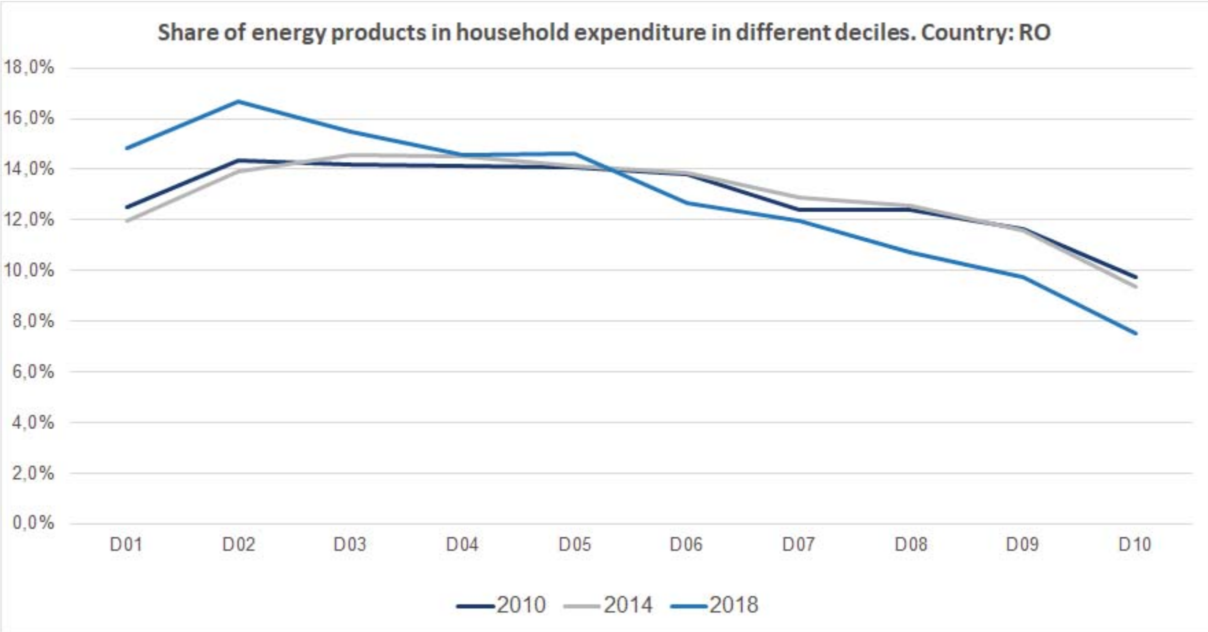

RO - 2019 retail gas prices - components
40 €/MWh
35 €/MWh
30 €/MWh
25 €/MWh
20 €/MWh
15 €/MWh
10 €/MWh
5 €/MWh
0 €/MWh
D2
I3
I5
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
VAT
Other

Oil products prices



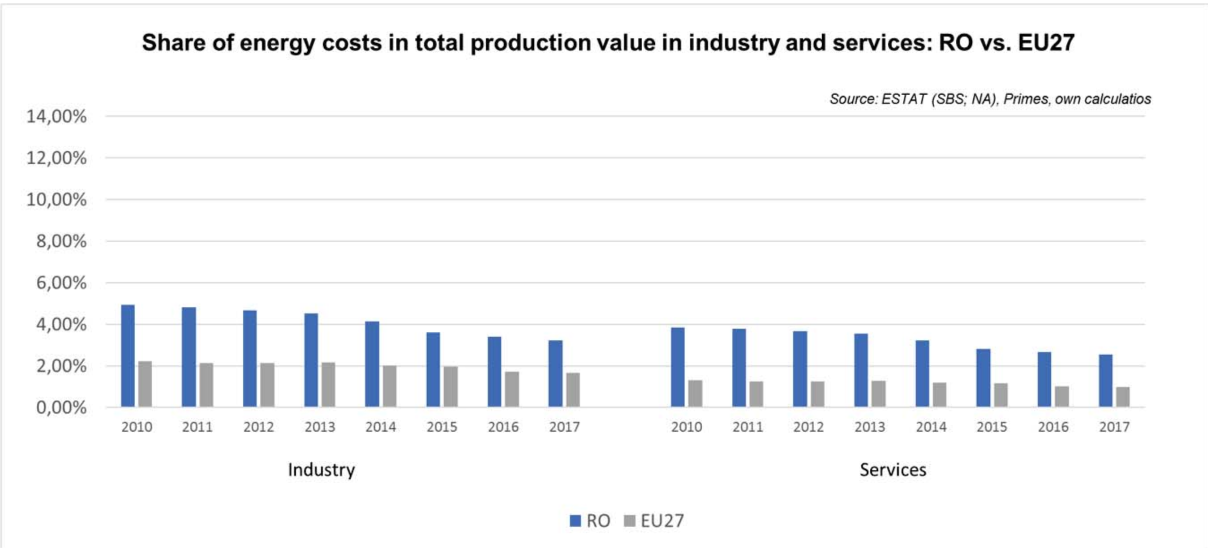
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2010 in Romania (dark blue line) the poorest households (Decile 1) had to spend 12.5% of their total expenditures on energy products. In 2018 (blue line) the share of energy increased to 14.8%. In the case of middle income households (Decile 5), in 2010 they spent 14.1% of their total expenditure on energy, while in 2018 this value increased marginally to 14.6%. See footnote [1]

Energy costs shares in total production costs

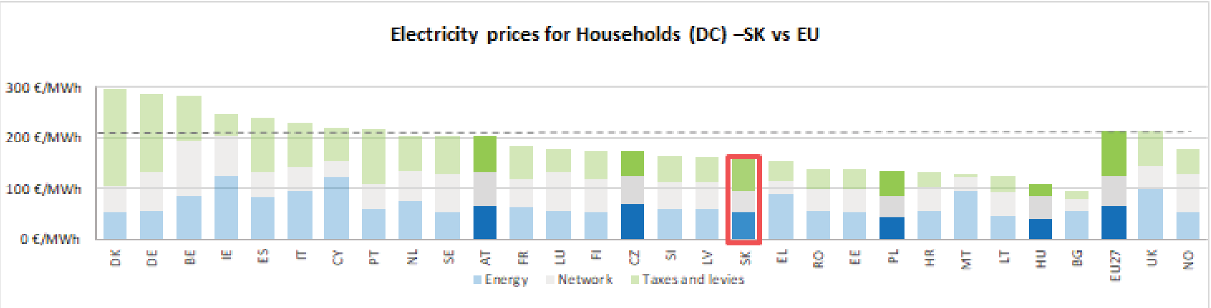


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

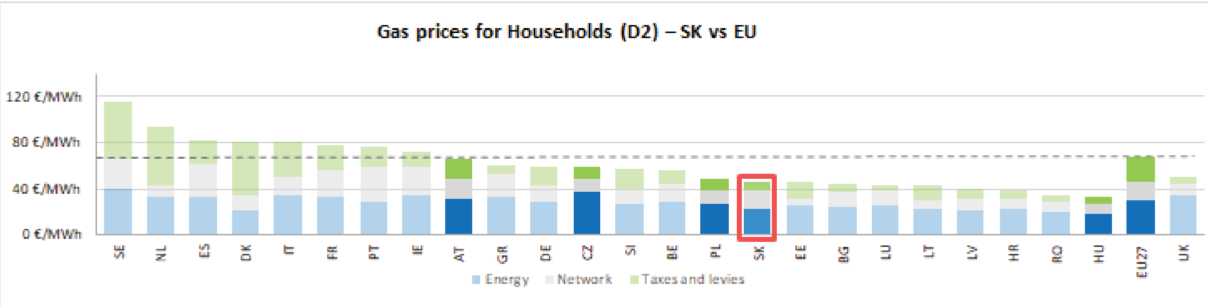
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

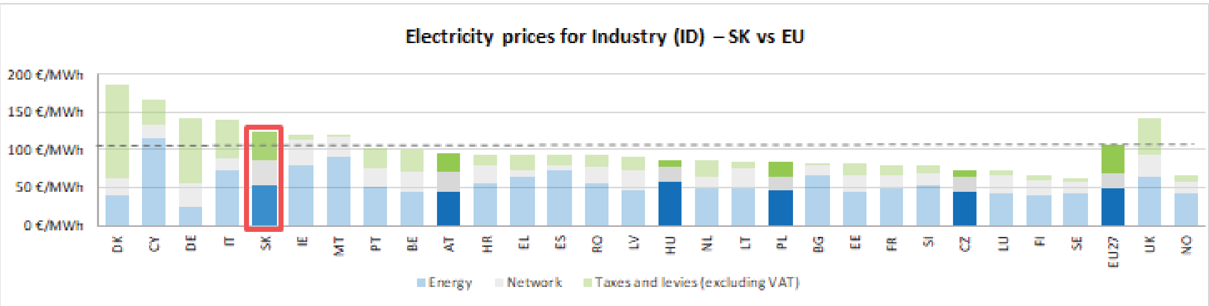
Slovakia

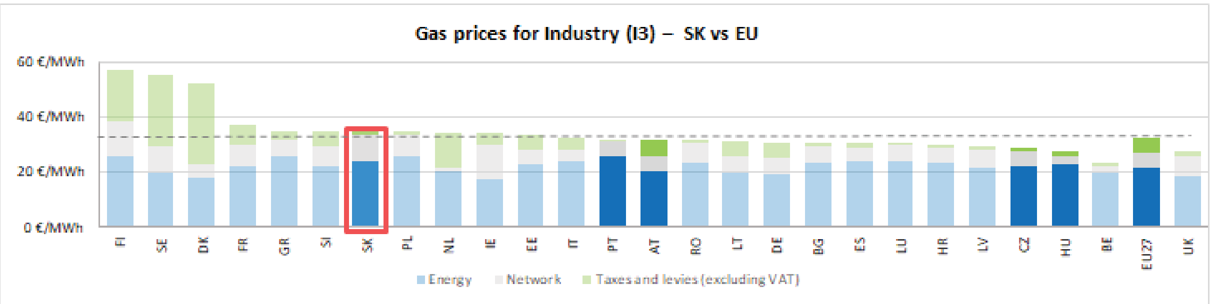
Prices (2019 and recent evolution)



see footnote[1]







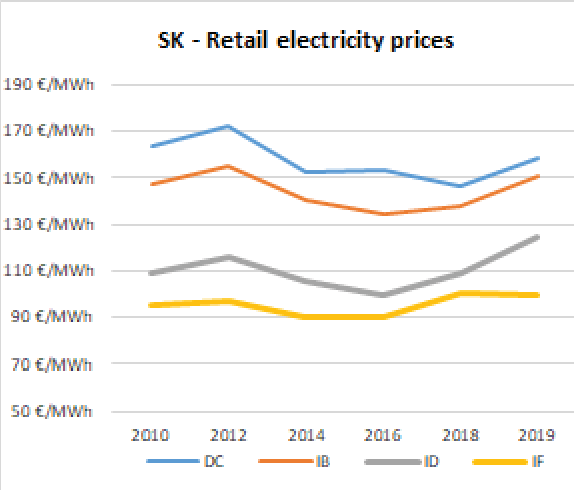
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

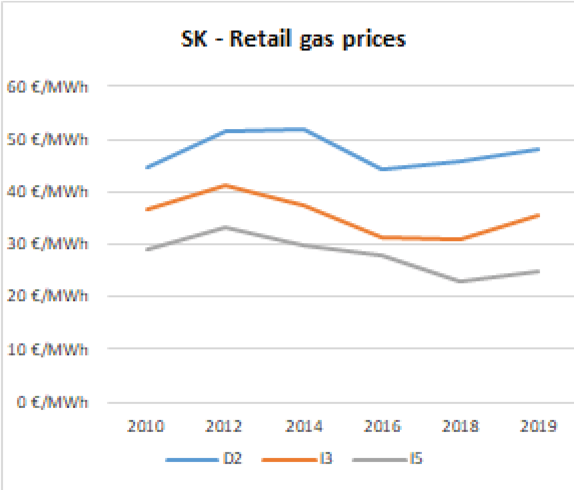
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

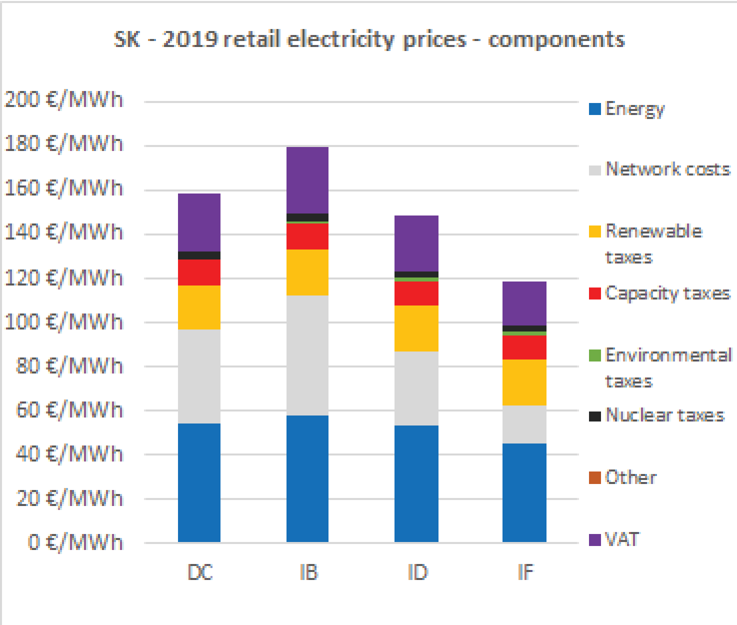
See footnote[2]

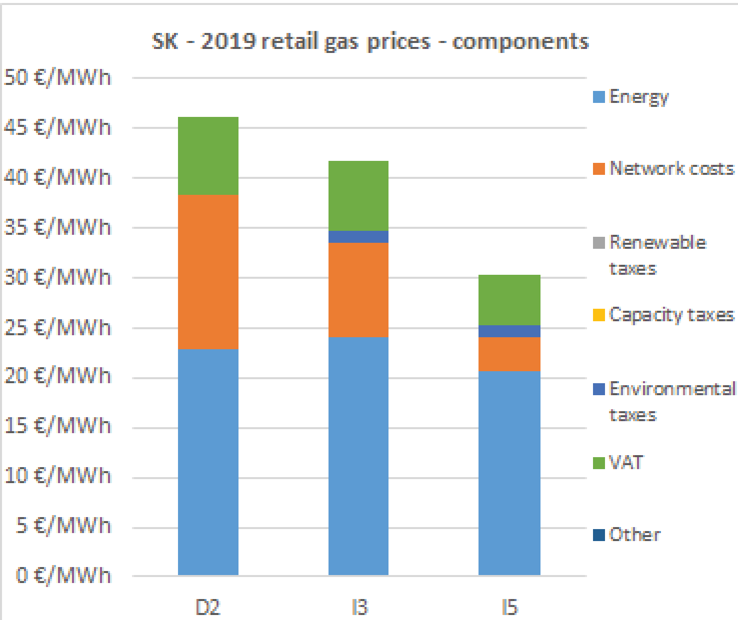
[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.

[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

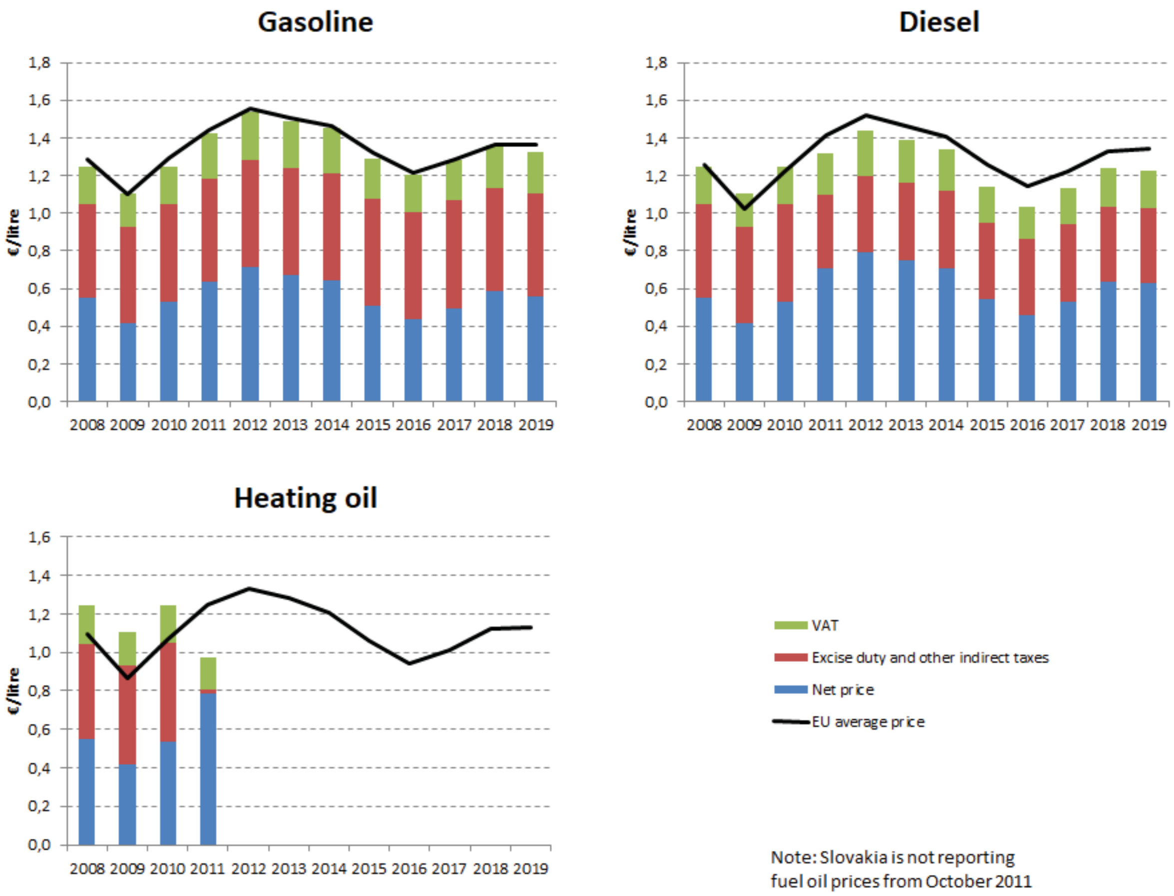

SK - Retail electricity prices
190 €/MWh
170 €/MWh
150 €/MWh
130 €/MWh
110 €/MWh
90 €/MWh
70 €/MWh
50 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF


SK - Retail gas prices
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5


SK - 2019 retail electricity prices - components
200 €/MWh
180 €/MWh
160 €/MWh
140 €/MWh
120 €/MWh
100 €/MWh
80 €/MWh
60 €/MWh
40 €/MWh
20 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT


SK - 2019 retail gas prices - components
50 €/MWh
45 €/MWh
40 €/MWh
35 €/MWh
30 €/MWh
25 €/MWh
20 €/MWh
15 €/MWh
10 €/MWh
5 €/MWh
0 €/MWh
D2
I3
I5
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
VAT
Other

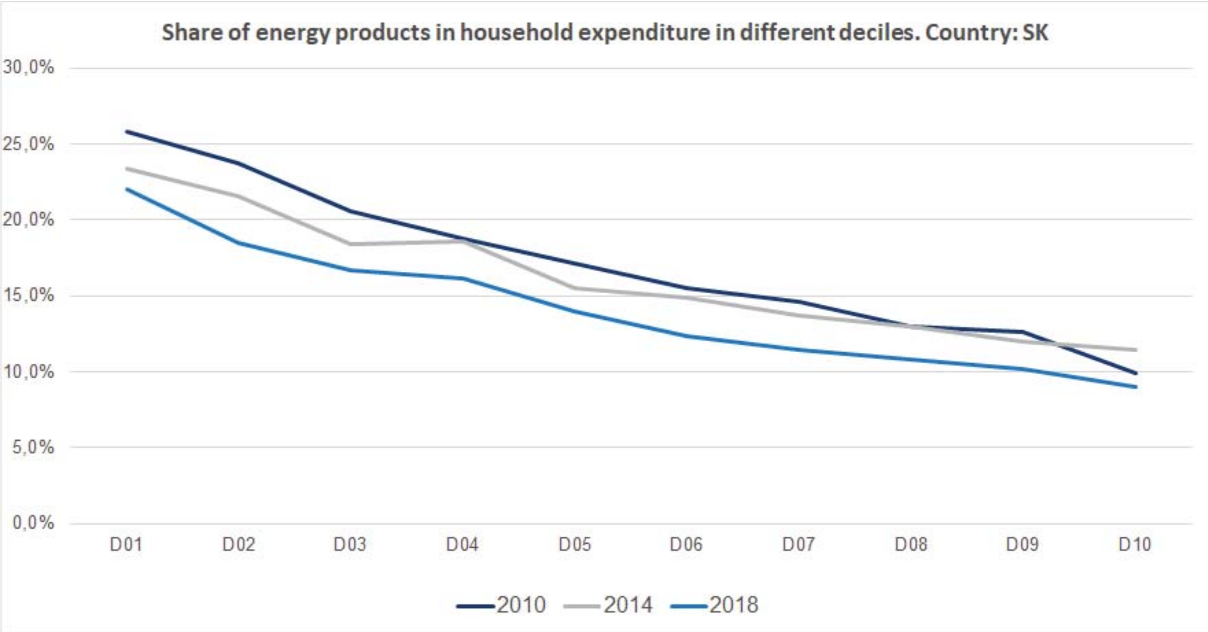
Oil products prices



Note: Slovakia is not reporting fuel oil prices from October 2011

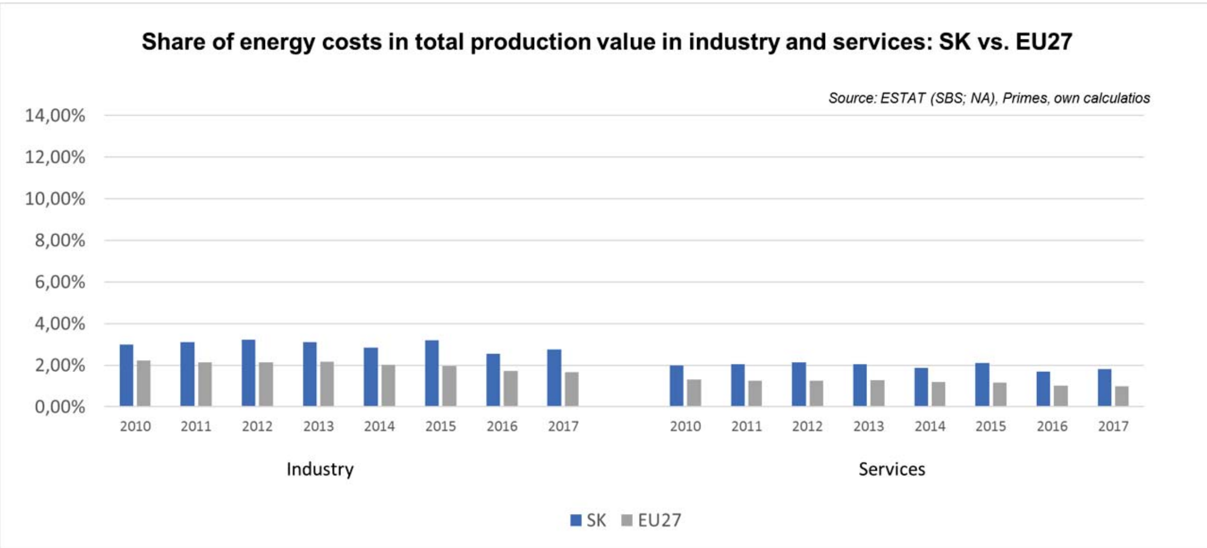
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2010 in Slovakia (dark blue line) the poorest households (Decile 1) had to spend 25.8% of their total expenditures on energy products. In 2018 (blue line) the share of energy decreased to 22.1%. In the case of middle income households (Decile 5), in 2010 they spent 17.1% of their total expenditure on energy, while in 2018 this value decreased to 13.9%. See footnote [1]

Energy costs shares in total production costs

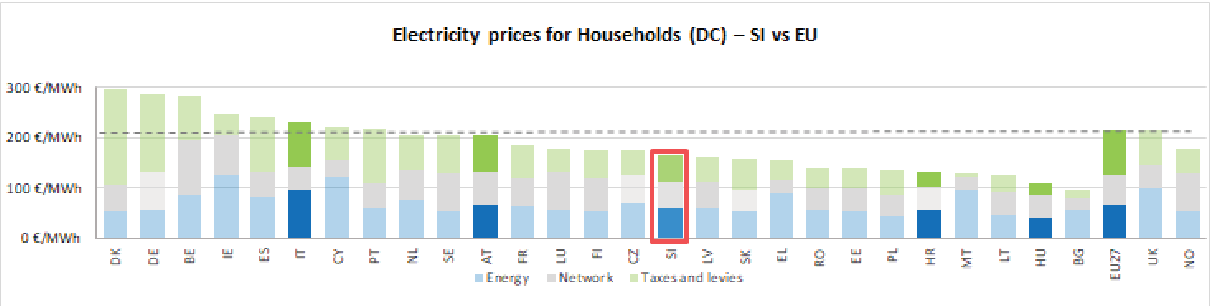


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

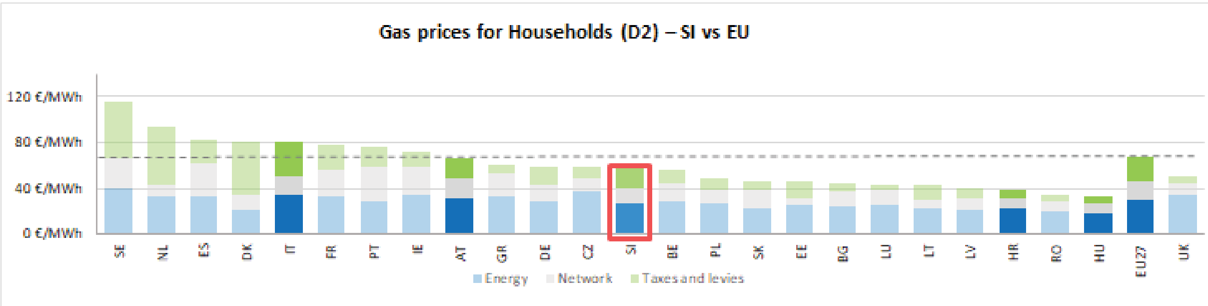
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

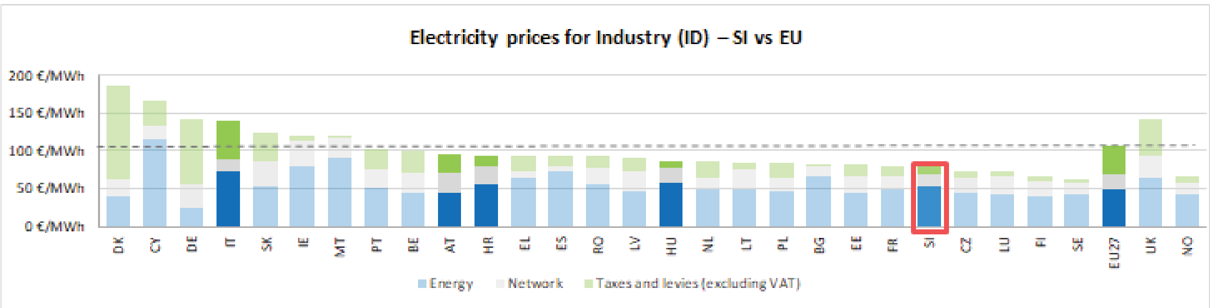
Slovenia

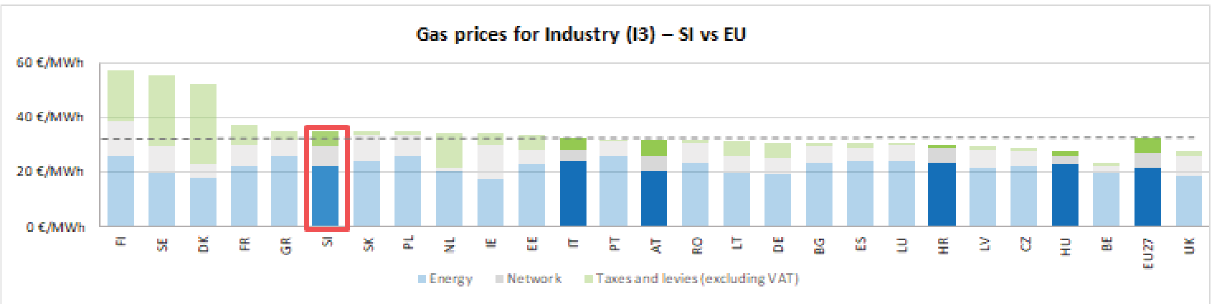
Prices (2019 and recent evolution)



see footnote[1]





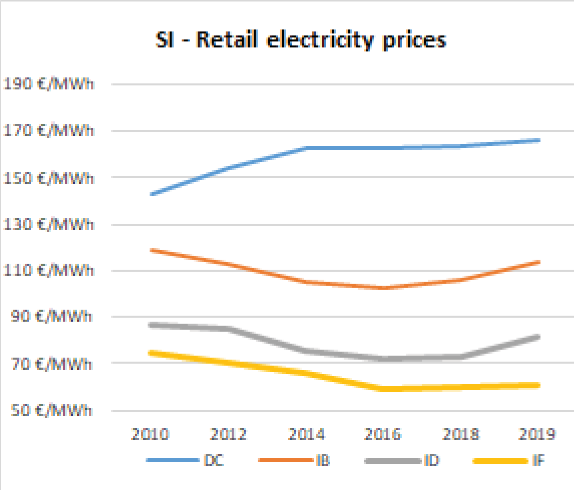


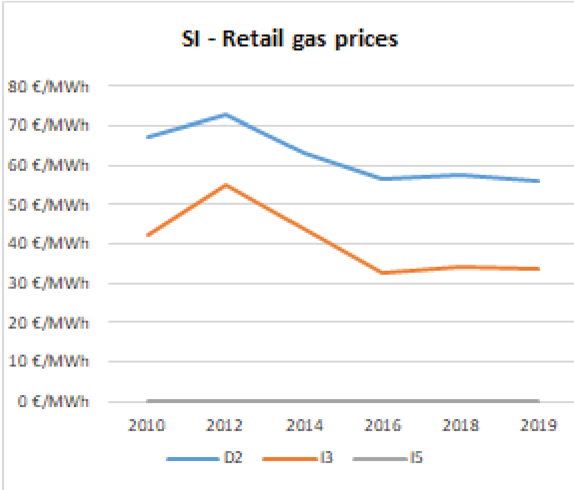
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

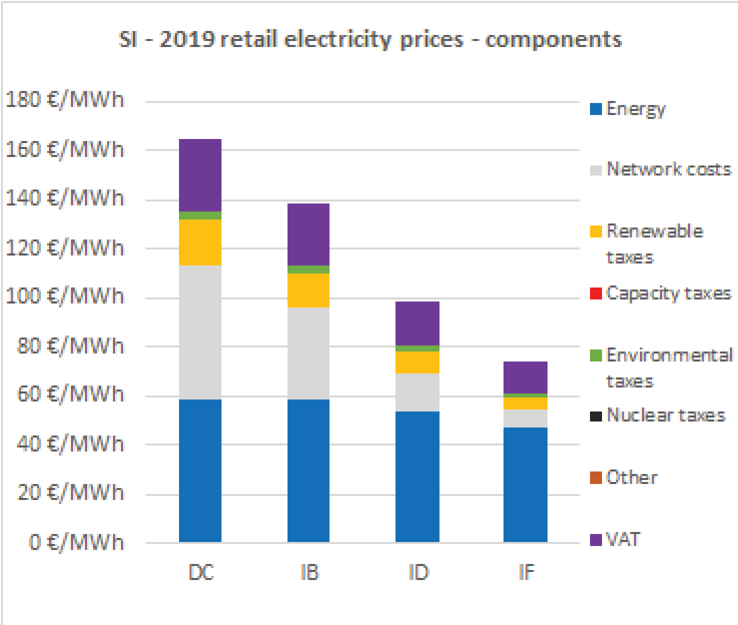
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

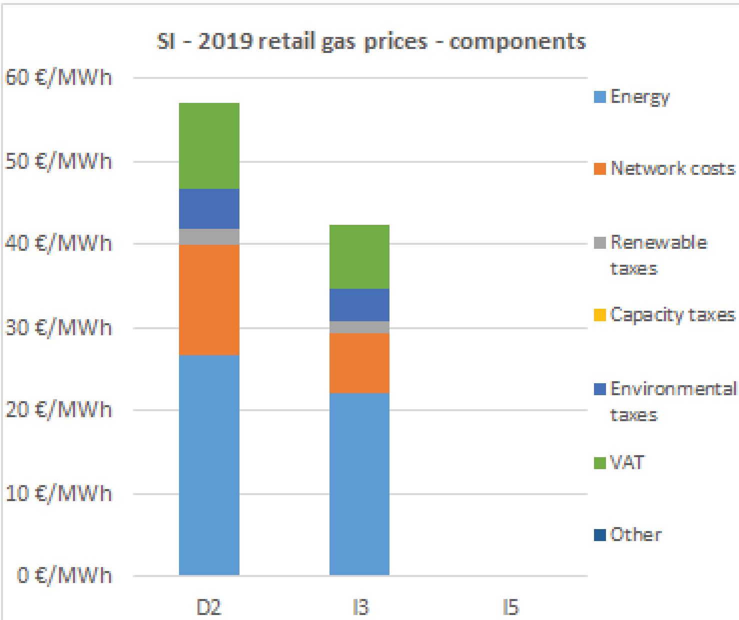
See footnote[2]

[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

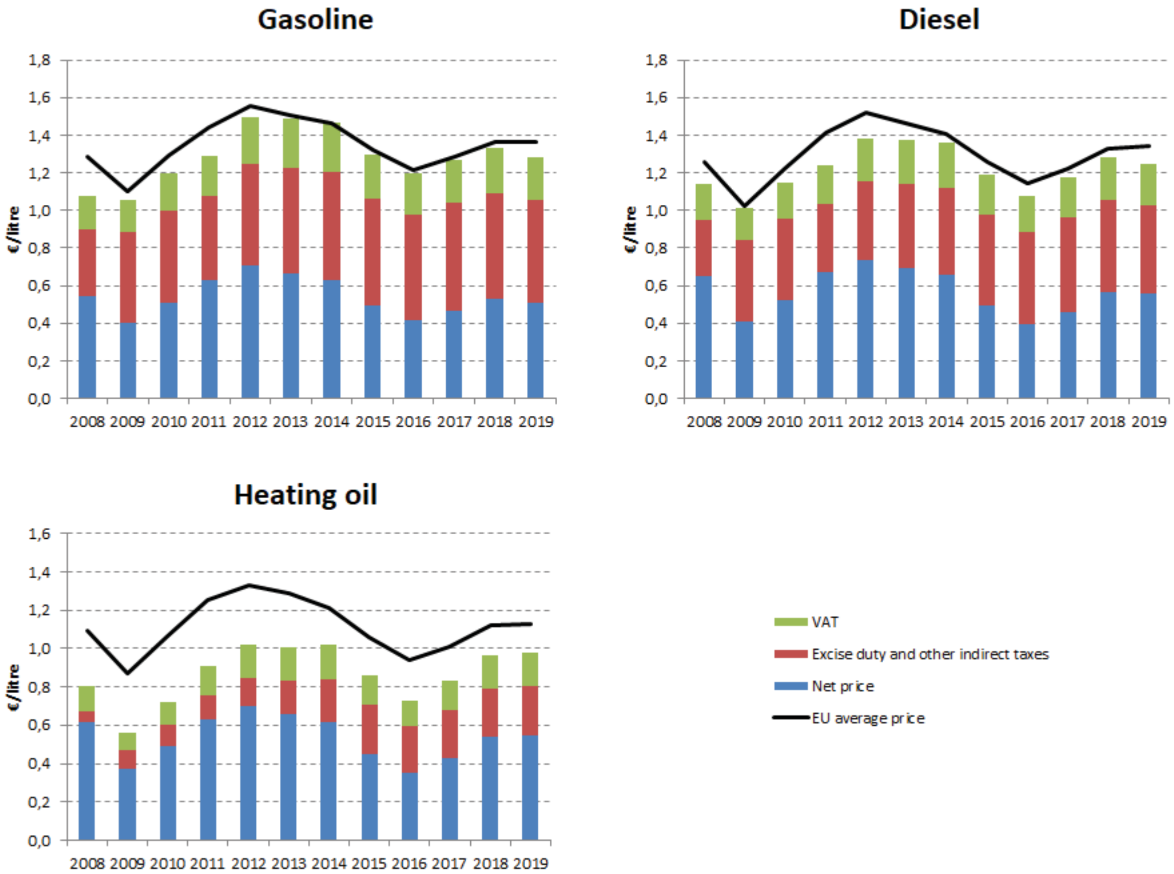

SI - Retail electricity prices
190 €/MWh
170 €/MWh
150 €/MWh
130 €/MWh
110 €/MWh
90 €/MWh
70 €/MWh
50 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF


SI - Retail gas prices
80 €/MWh
70 €/MWh
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5


SI - 2019 retail electricity prices - components
180 €/MWh
160 €/MWh
140 €/MWh
120 €/MWh
100 €/MWh
80 €/MWh
60 €/MWh
40 €/MWh
20 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT

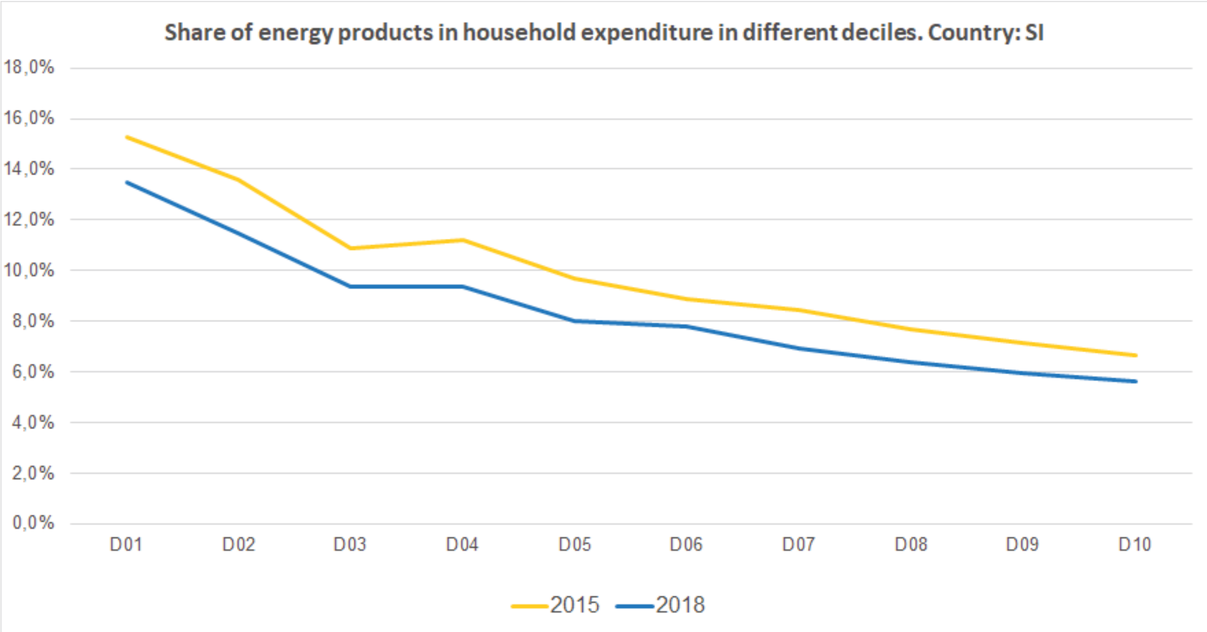

SI - 2019 retail gas prices - components
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
D2
I3
I5
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
VAT
Other

Oil products prices



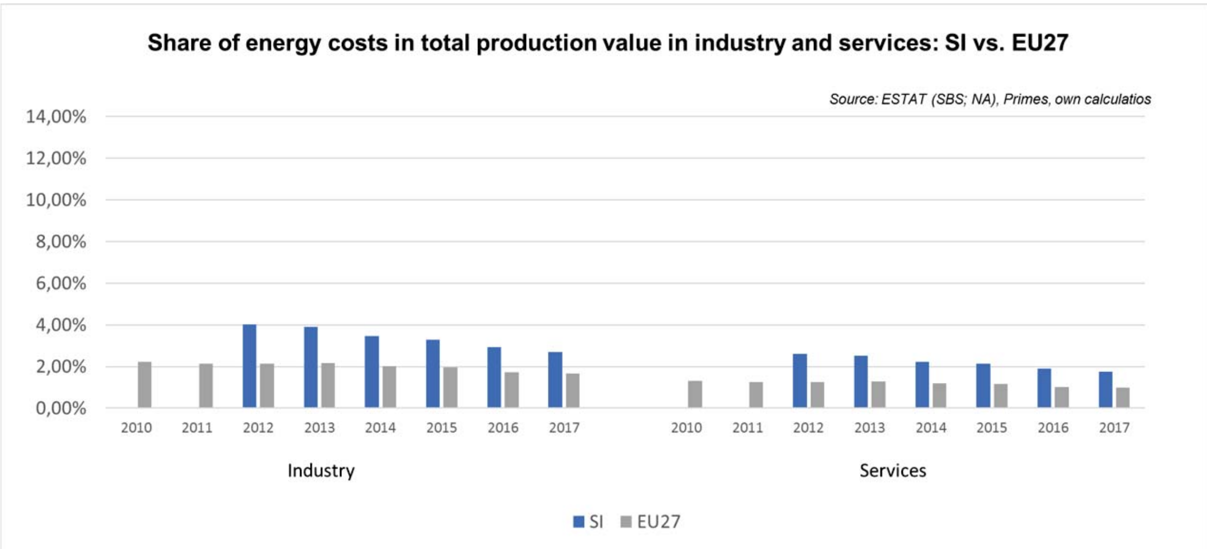
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2015 in Slovenia (yellow line) the poorest households (Decile 1) had to spend 15.3% of their total expenditures on energy products. In 2018 (blue line) the share of energy decreased to 13.4%. In the case of middle income households (Decile 5), in 2015 they spent 10.0% of their total expenditure on energy, while in 2018 this value decreased to 8.0%. See footnote [1]

Energy costs shares in total production costs

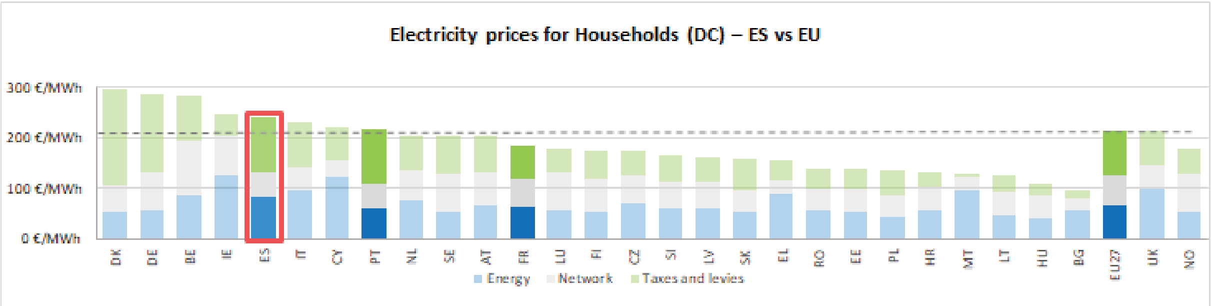


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

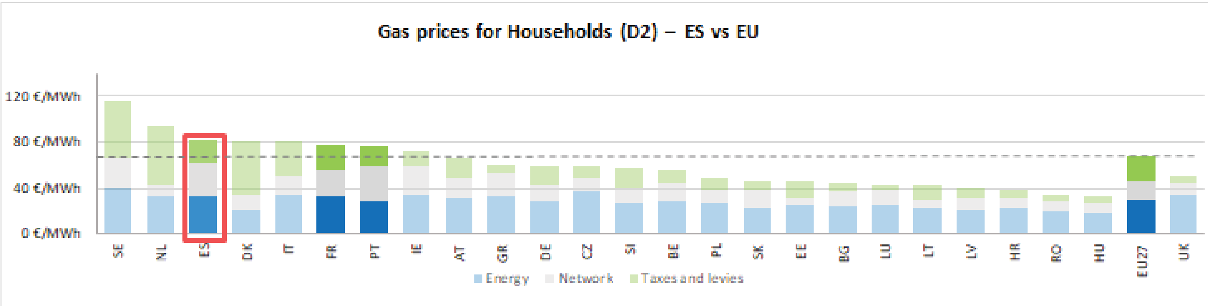
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

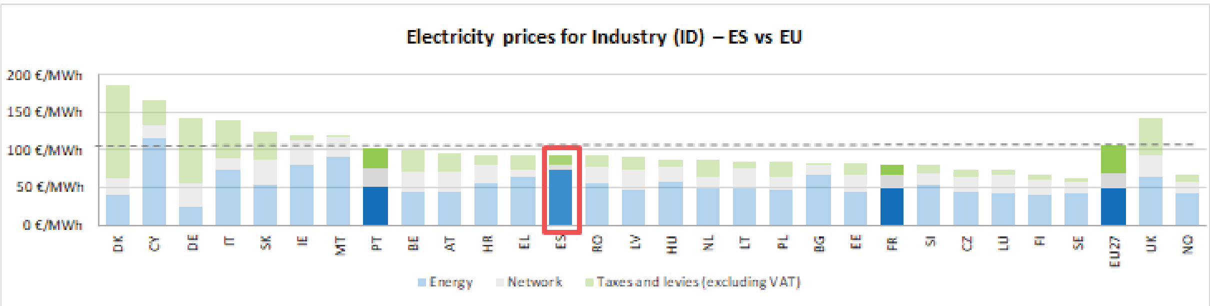
Spain

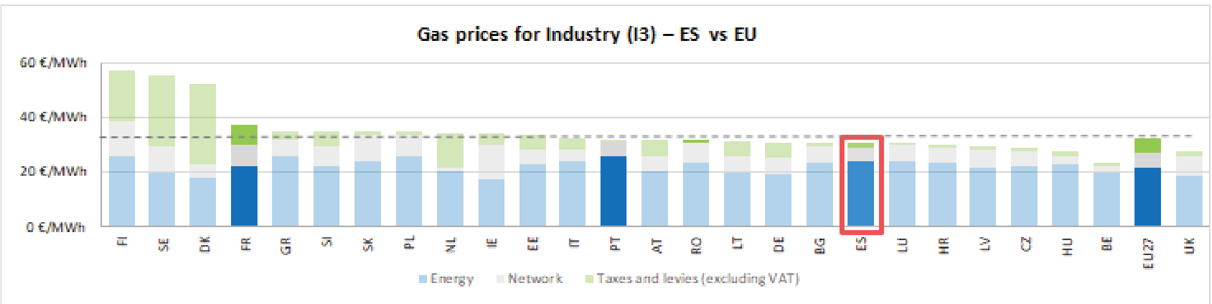
Prices (2019 and recent evolution)



see footnote[1]





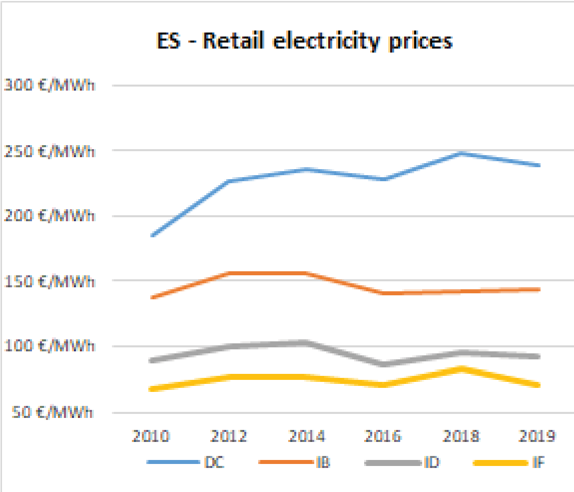


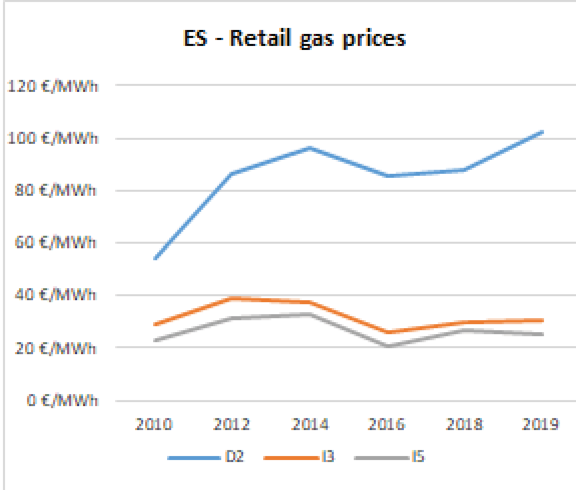
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

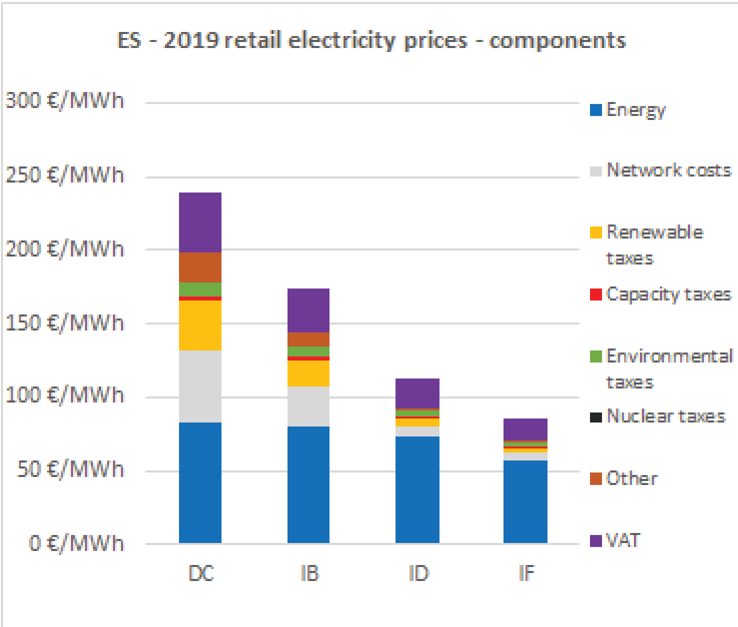
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

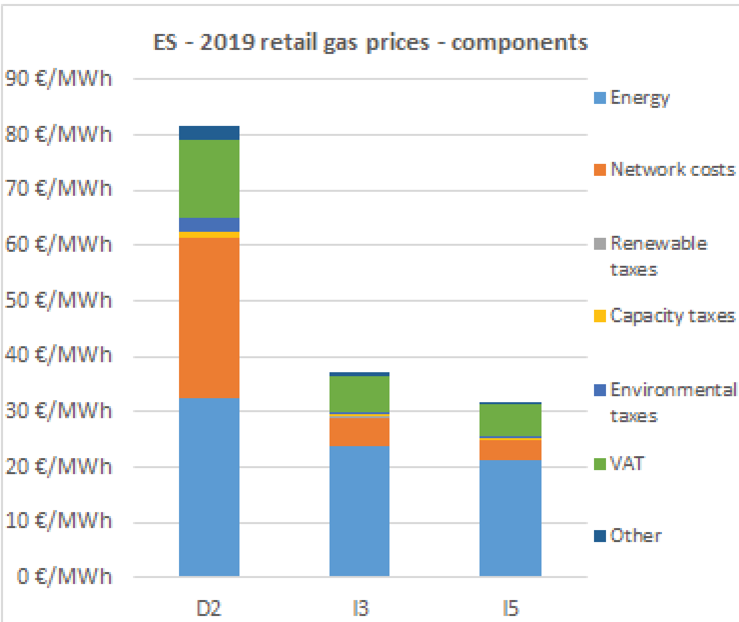
See footnote[2]

[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

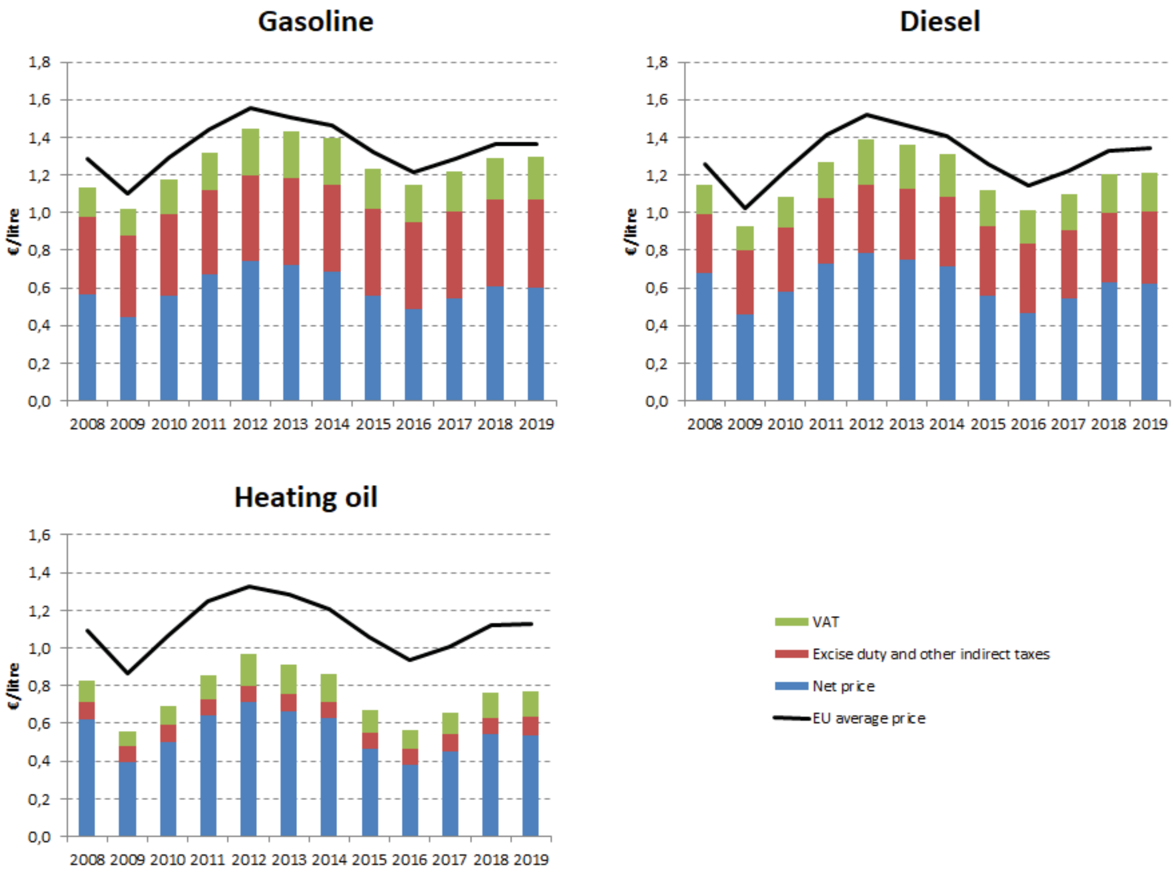

ES - Retail electricity prices
300 €/MWh
250 €/MWh
200 €/MWh
150 €/MWh
100 €/MWh
50 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF


ES - Retail gas prices
120 €/MWh
100 €/MWh
80 €/MWh
60 €/MWh
40 €/MWh
20 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5


ES - 2019 retail electricity prices - components
300 €/MWh
250 €/MWh
200 €/MWh
150 €/MWh
100 €/MWh
50 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT

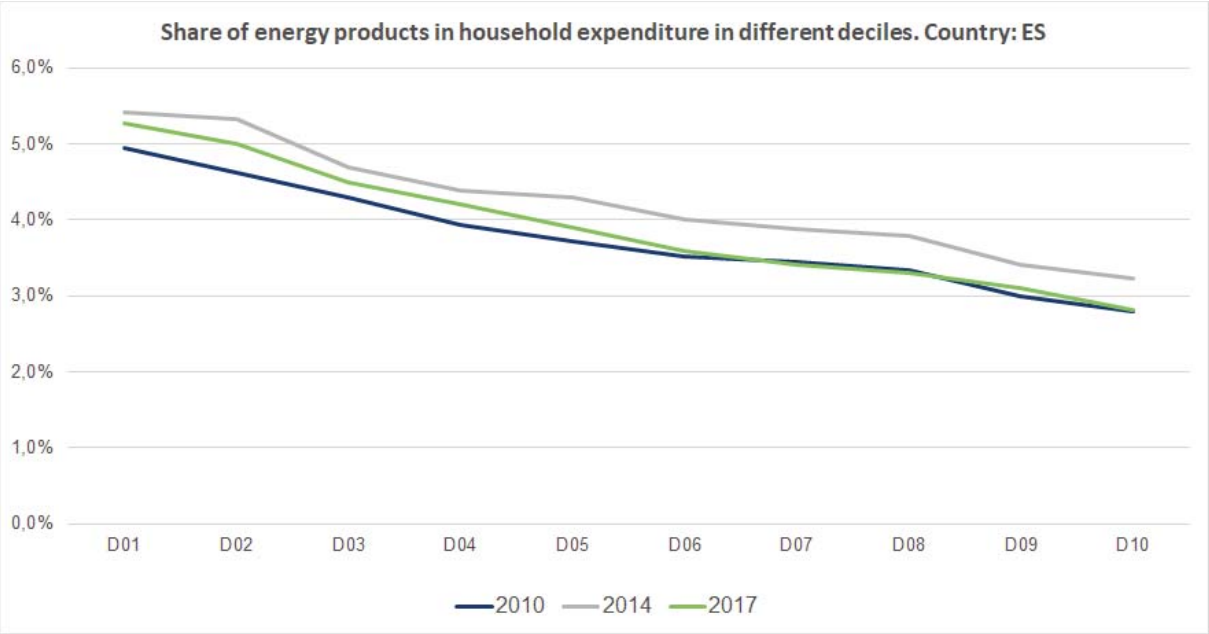

ES - 2019 retail gas prices - components
90 €/MWh
80 €/MWh
70 €/MWh
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
D2
I3
I5
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
VAT
Other

Oil products prices



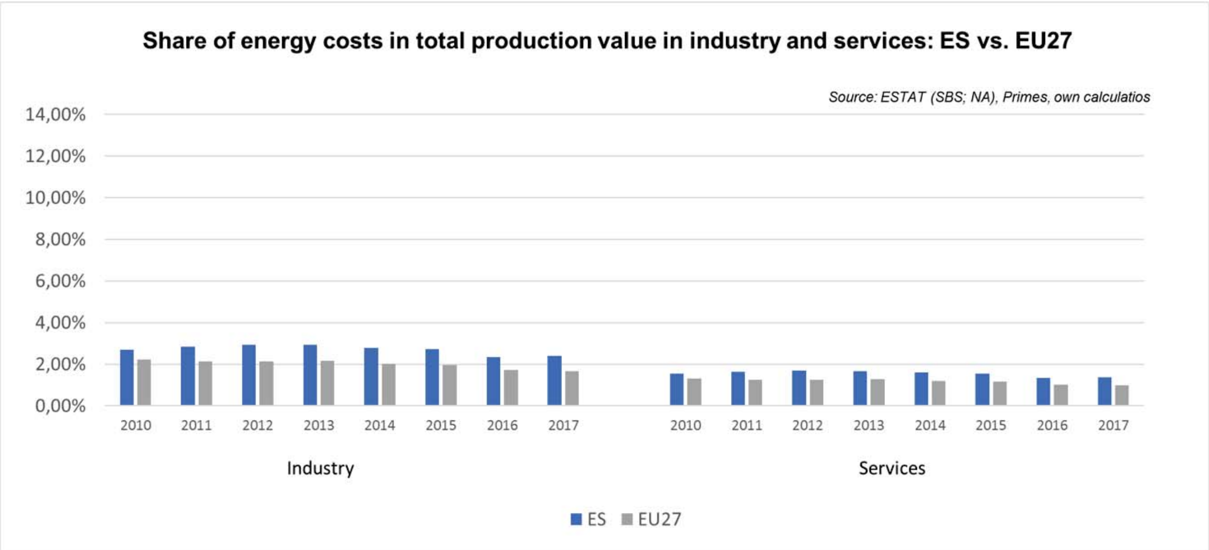
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2010 in Spain (dark blue line) the poorest households (Decile 1) had to spend 5.0% of their total expenditures on energy products. In 2017 (grey line) the share of energy increased marginally to 5.3%. In the case of middle income households (Decile 5), in 2010 they spent 3.7% of their total expenditure on energy, while in 2017 this value remained almost unchanged. See footnote [1]

Energy costs shares in total production costs

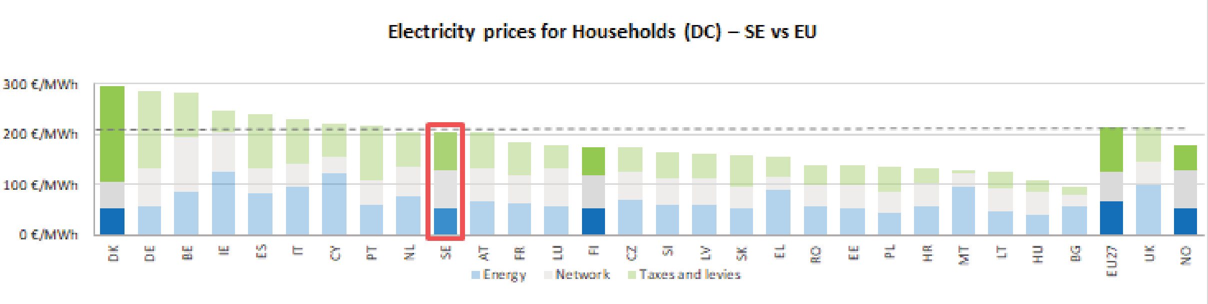


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

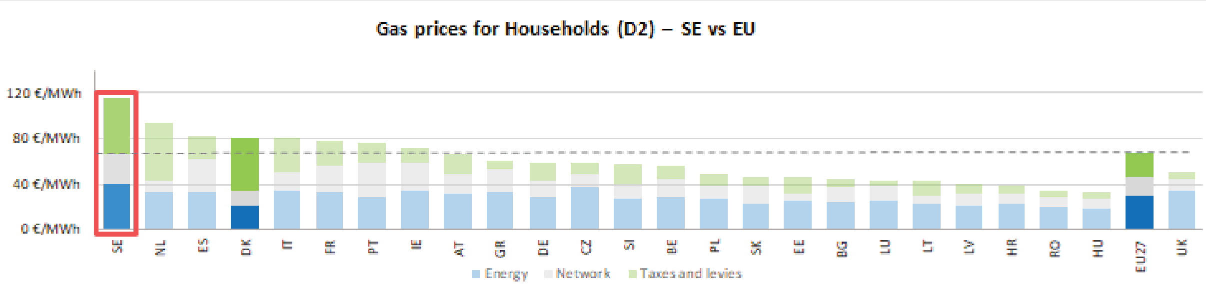
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

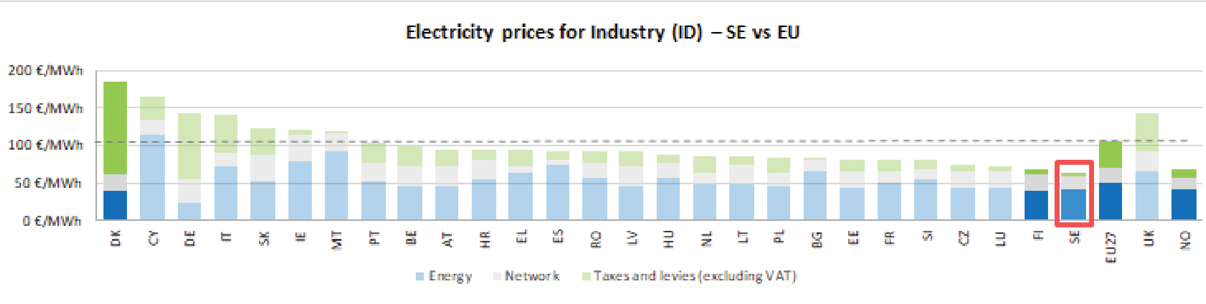
Sweden

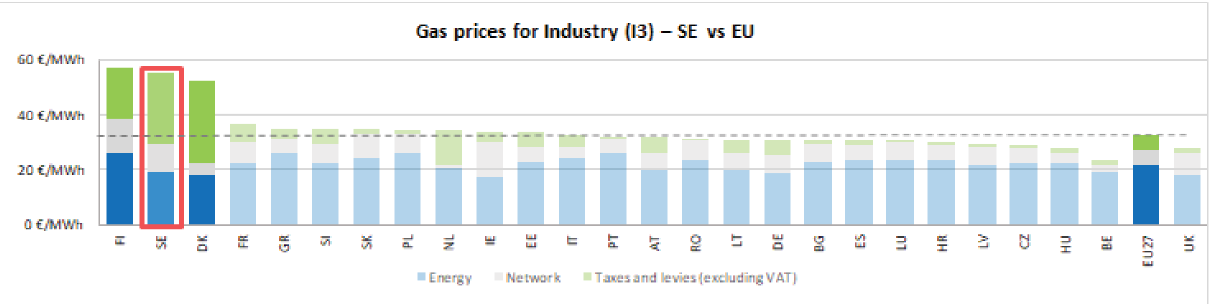
Prices (2019 and recent evolution)



see footnote[1]





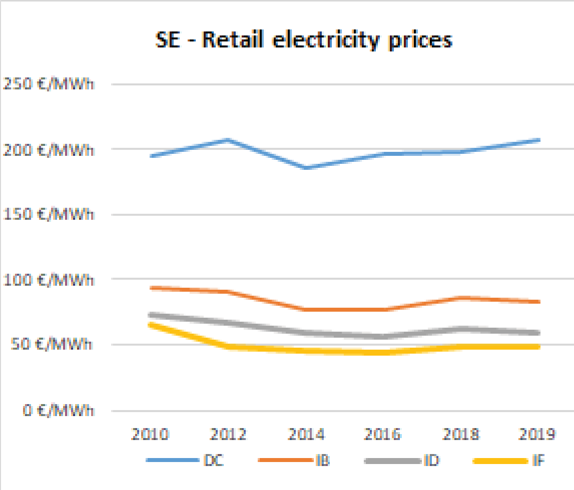


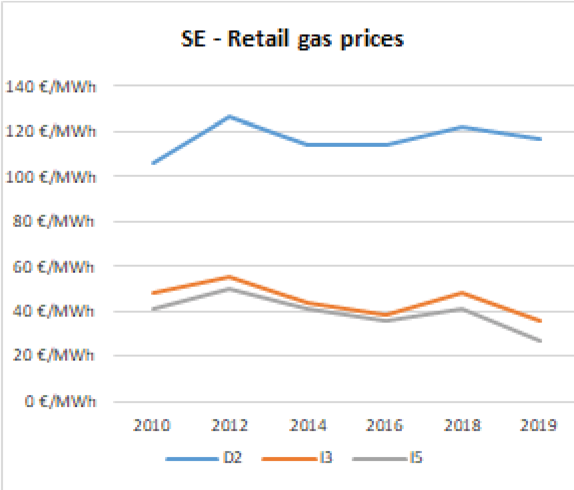
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

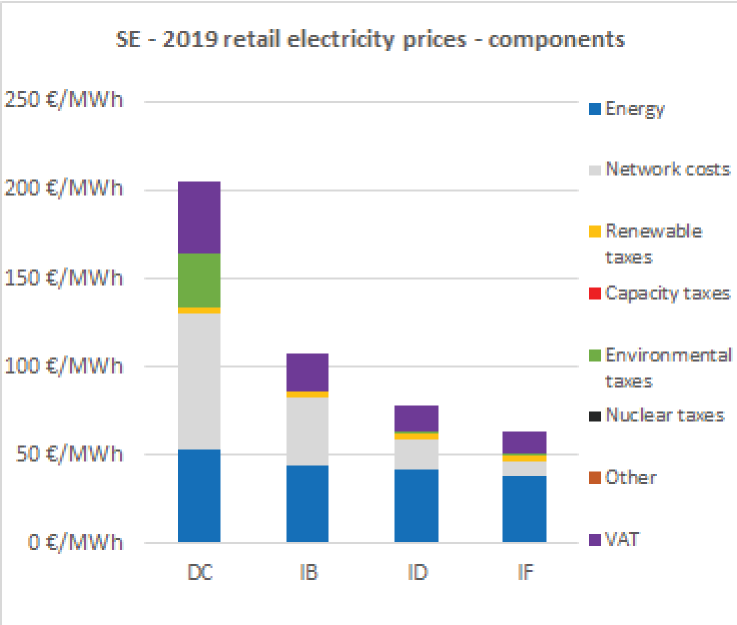
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

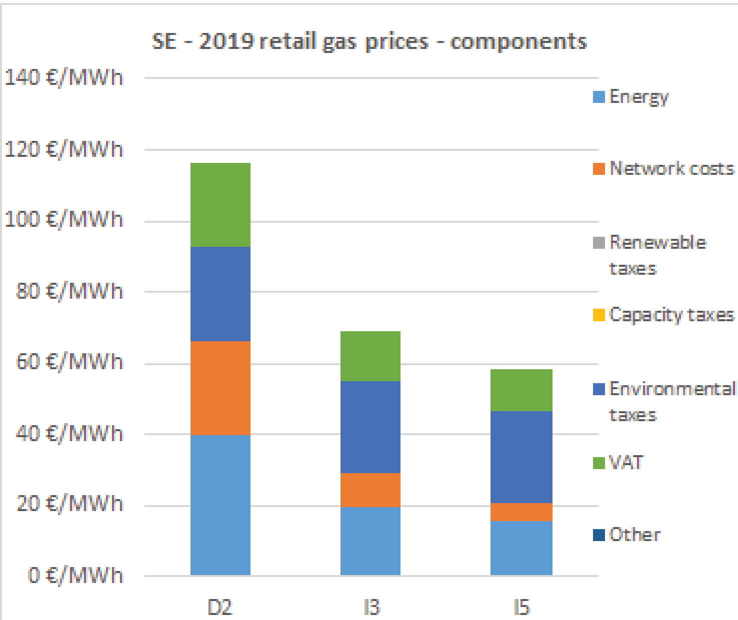
See footnote[2]

[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

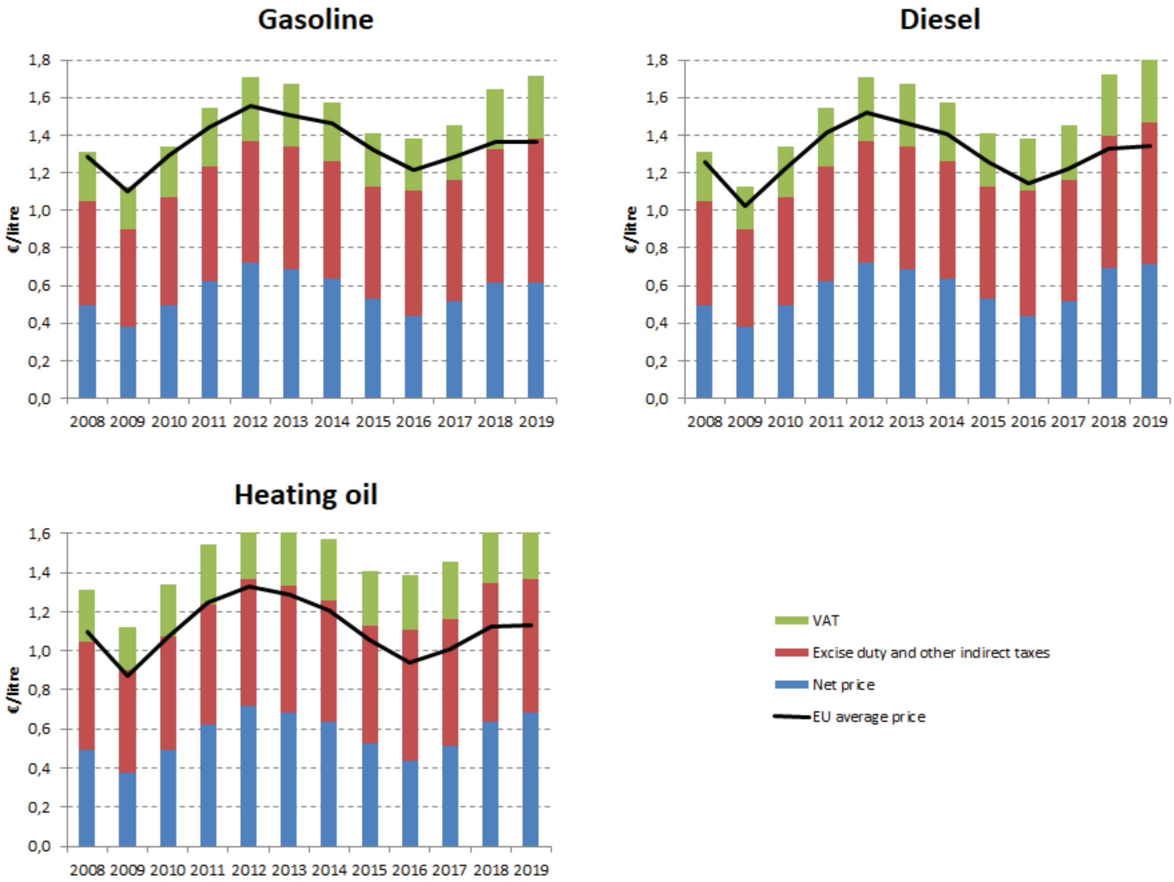

SE - Retail electricity prices
250 €/MWh
200 €/MWh
150 €/MWh
100 €/MWh
50 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF


SE - Retail gas prices
140 €/MWh
120 €/MWh
100 €/MWh
80 €/MWh
60 €/MWh
40 €/MWh
20 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5


SE - 2019 retail electricity prices - components
250 €/MWh
200 €/MWh
150 €/MWh
100 €/MWh
50 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT

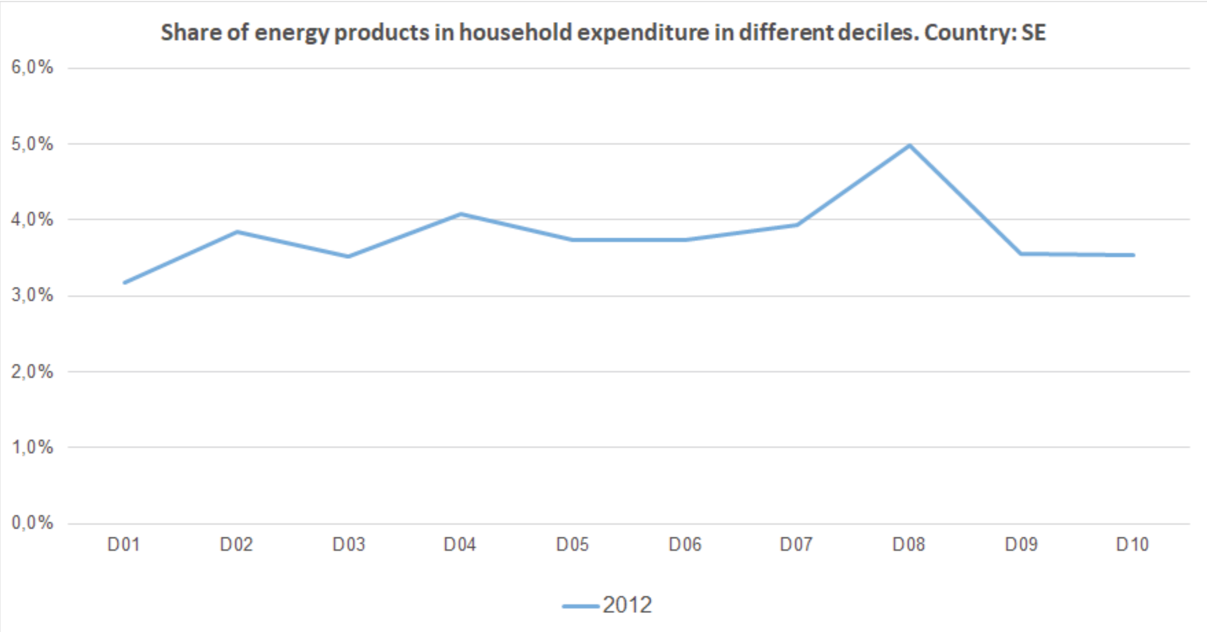

SE - 2019 retail gas prices - components
140 €/MWh
120 €/MWh
100 €/MWh
80 €/MWh
60 €/MWh
40 €/MWh
20 €/MWh
0 €/MWh
D2
I3
I5
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
VAT
Other

Oil products prices



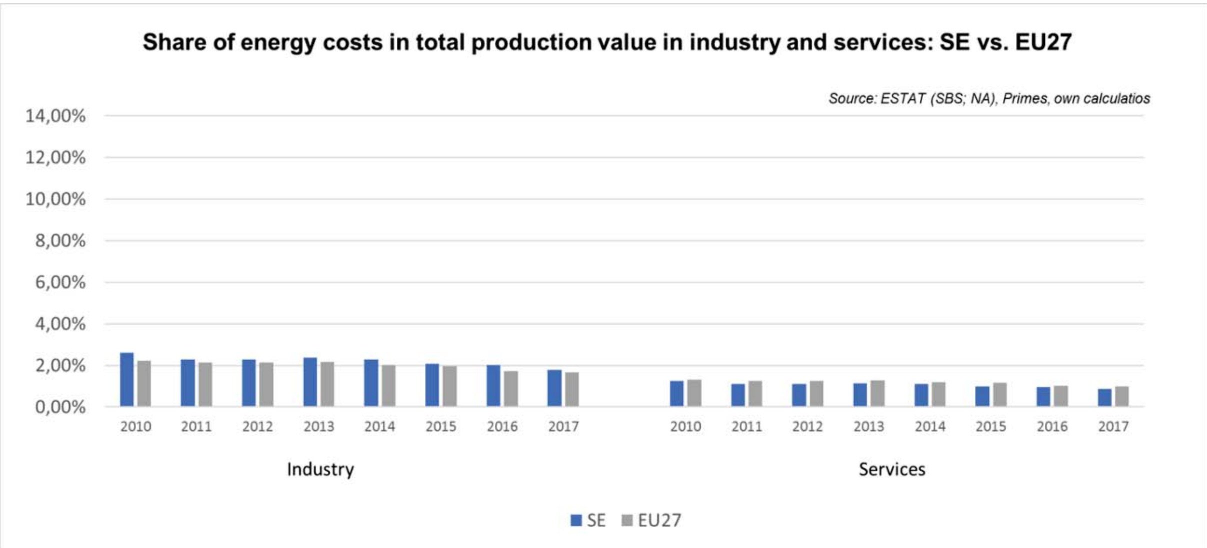
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2012 in Sweden (blue line) the poorest households (Decile 1) had to spend 3.2% of their total expenditures on energy products. In the case of middle income households (Decile 5), in the same year they spent 3.7% of their total expenditure on energy. See footnote [1]

Energy costs shares in total production costs

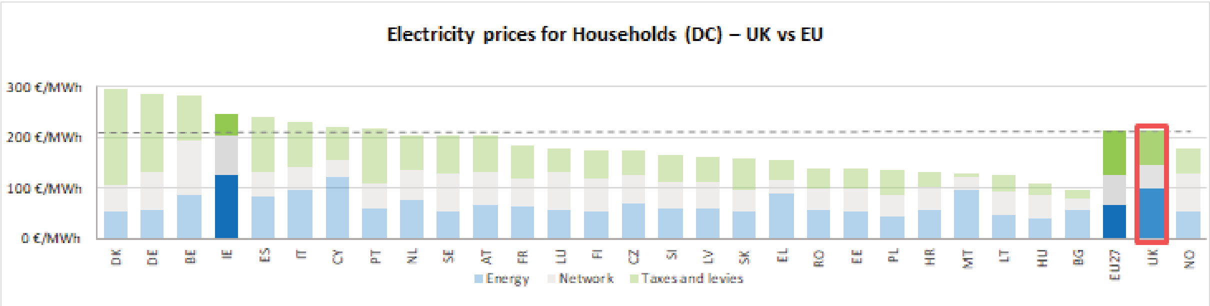


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

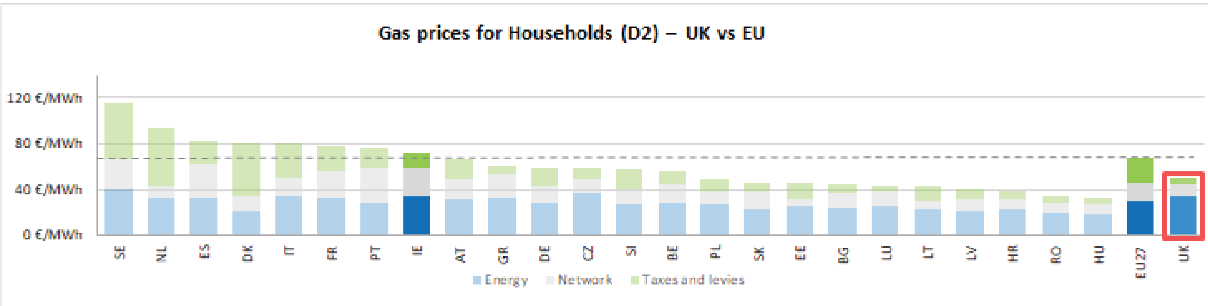
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

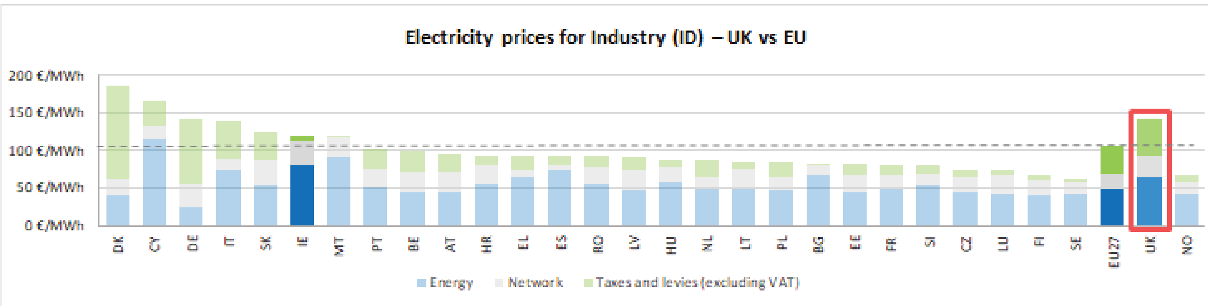
United Kingdom

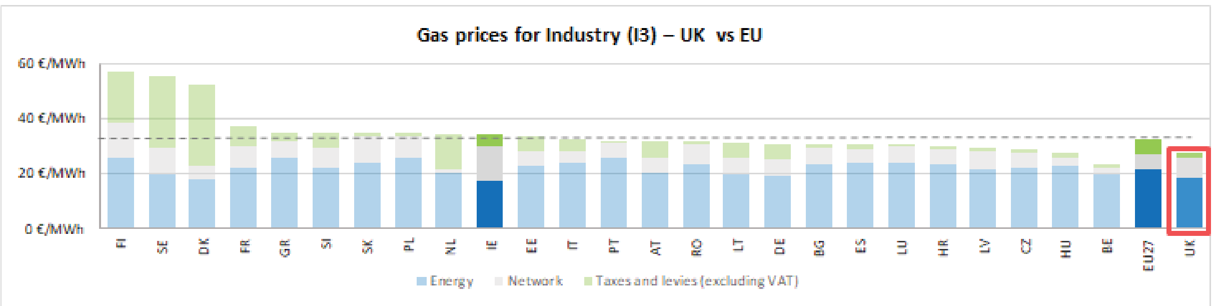
Prices (2019 and recent evolution)



see footnote[1]





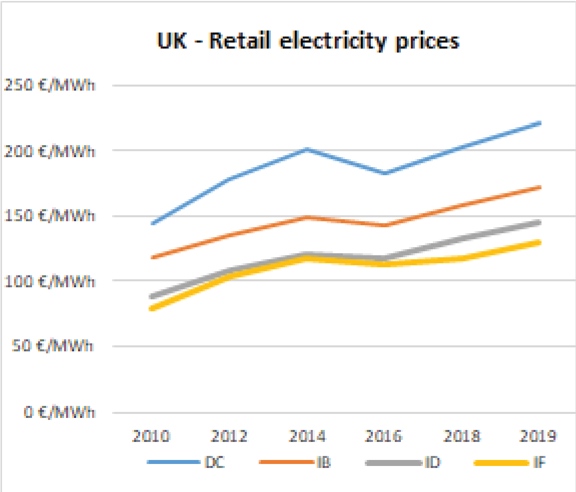


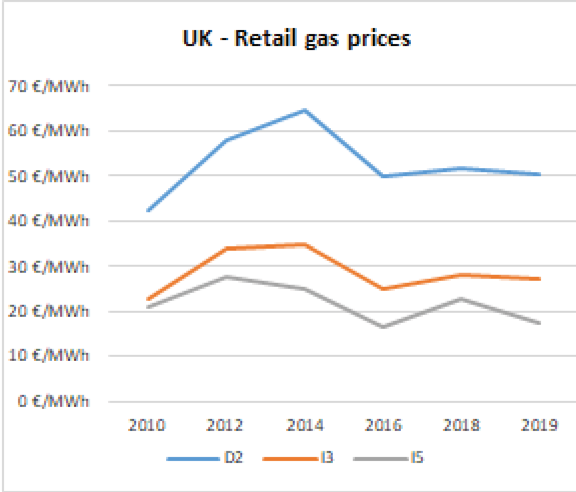
Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

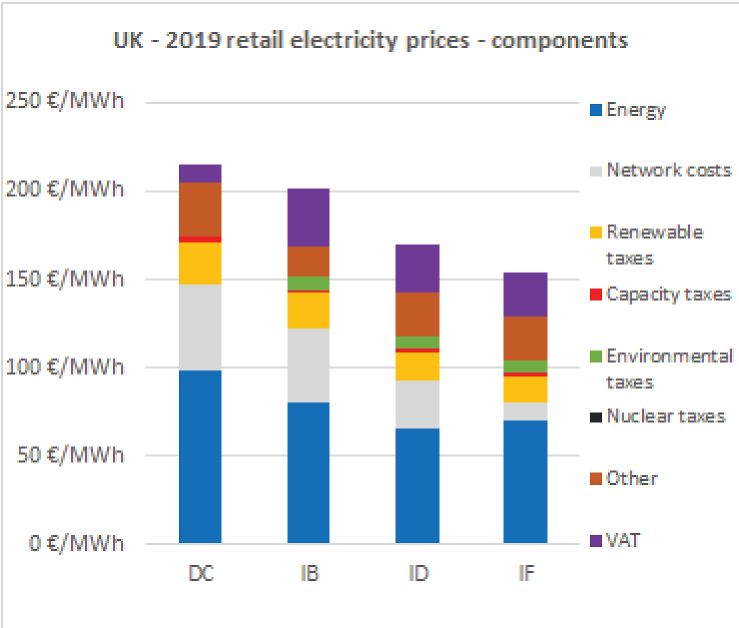
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

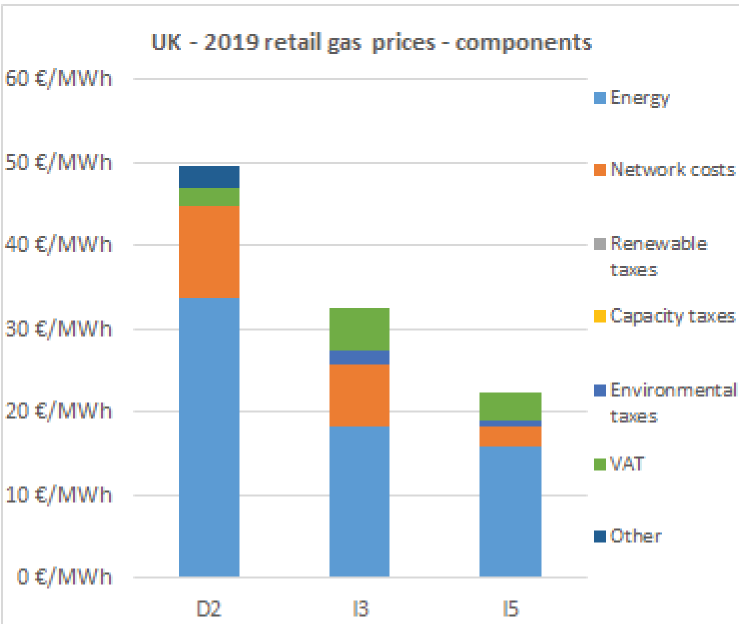
See footnote[2]

[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.
[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.

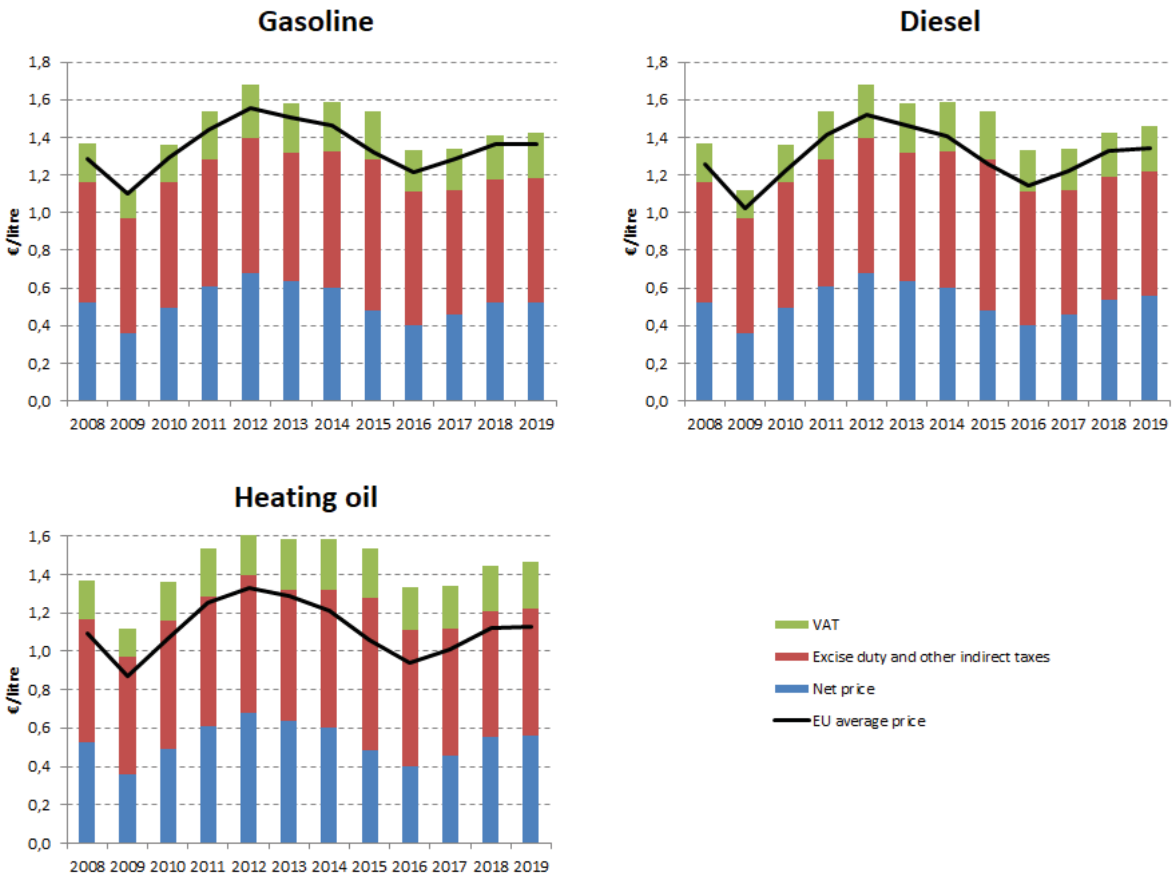

UK - Retail electricity prices
250 €/MWh
200 €/MWh
150 €/MWh
100 €/MWh
50 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
DC
IB
ID
IF


UK - Retail gas prices
70 €/MWh
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
2010
2012
2014
2016
2018
2019
D2
I3
I5


UK - 2019 retail electricity prices - components
250 €/MWh
200 €/MWh
150 €/MWh
100 €/MWh
50 €/MWh
0 €/MWh
DC
IB
ID
IF
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
Nuclear taxes
Other
VAT

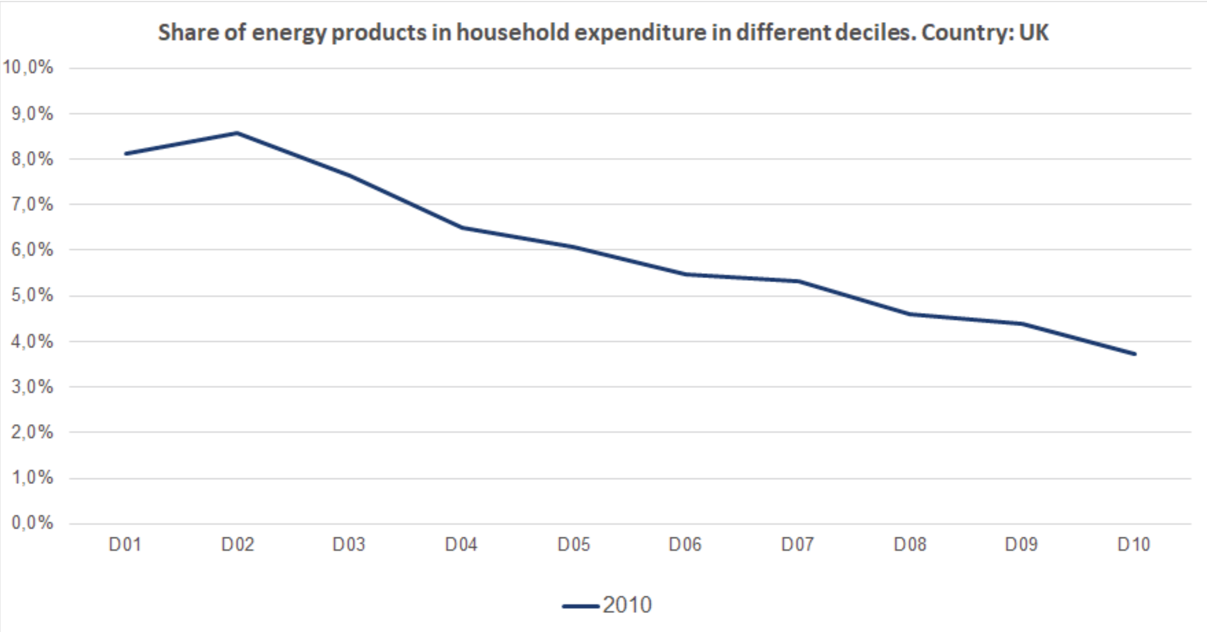

UK - 2019 retail gas prices - components
60 €/MWh
50 €/MWh
40 €/MWh
30 €/MWh
20 €/MWh
10 €/MWh
0 €/MWh
D2
I3
I5
Energy
Network costs
Renewable taxes
Capacity taxes
Environmental taxes
VAT
Other

Oil products prices



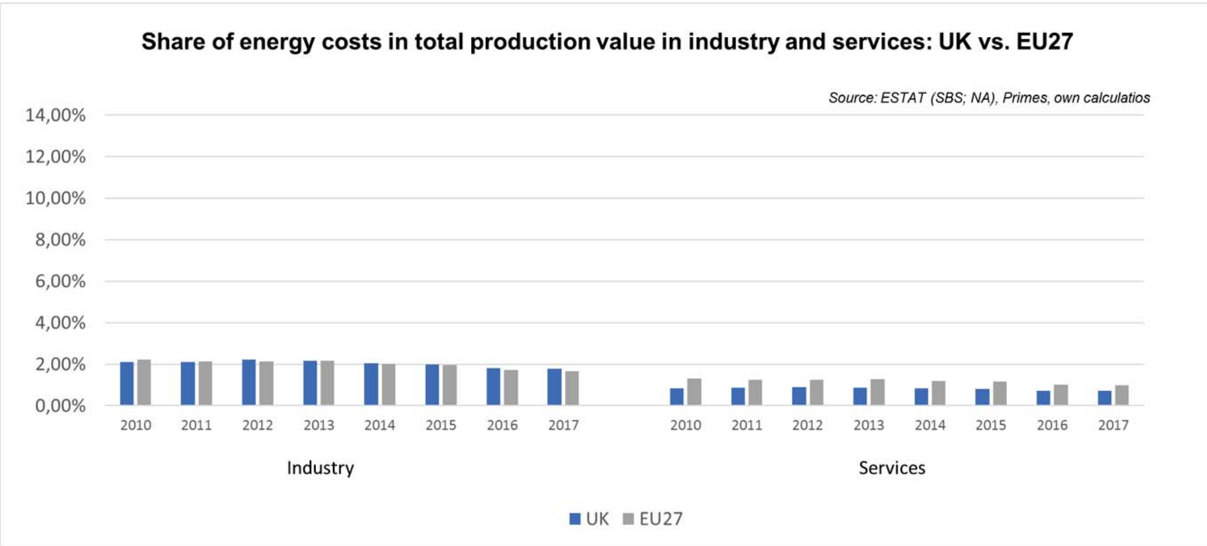
Energy costs for households, industry and services

Energy in Household budgets



Notes: In 2010 in the United Kingdom (dark blue line) the poorest households (Decile 1) had to spend 8.1% of their total expenditures on energy products. In the case of middle income households (Decile 5), in the same year they spent 6.1% of their total expenditure on energy. See footnote [1]

Energy costs shares in total production costs

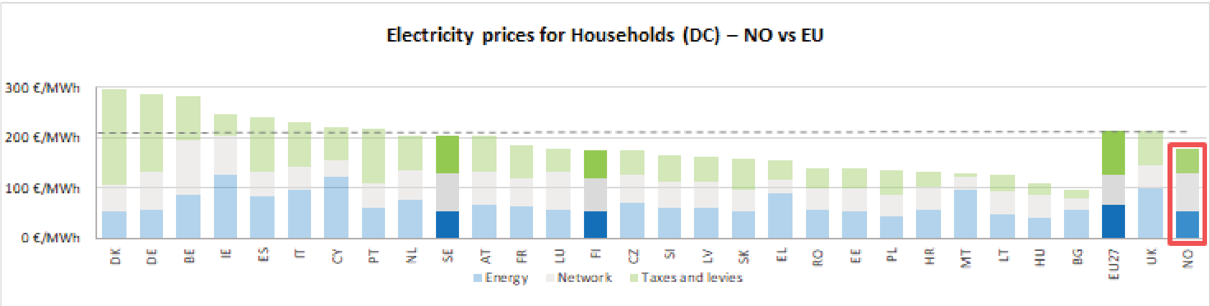


Notes: Data for Malta is only available for 2016. Data for Poland (prior to 2015), Slovenia (prior to 2012) and Greece (prior to 2008) is not available. At the time of extraction, the data for 2018 was not available.

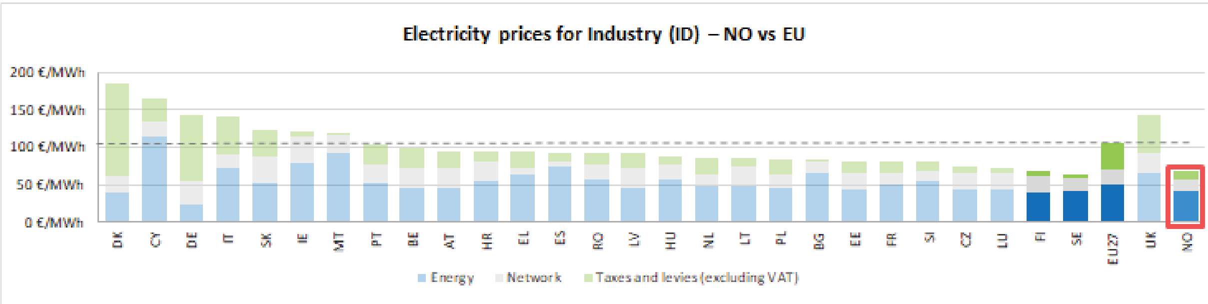
[1] This graphic includes energy expenditure per different household deciles, excluding transport energy expenditure (transport fuels).

Norway

Prices (2019 and recent evolution)



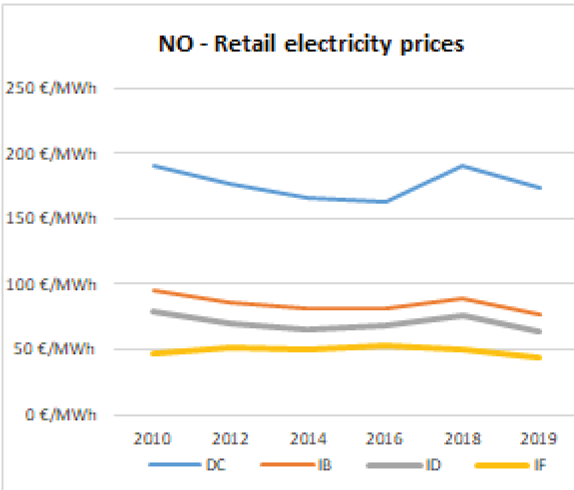
see footnote [1]



Electricity	DC	IB	ID	IF
	Household	Small Industry	Medium Industry	Large Industry

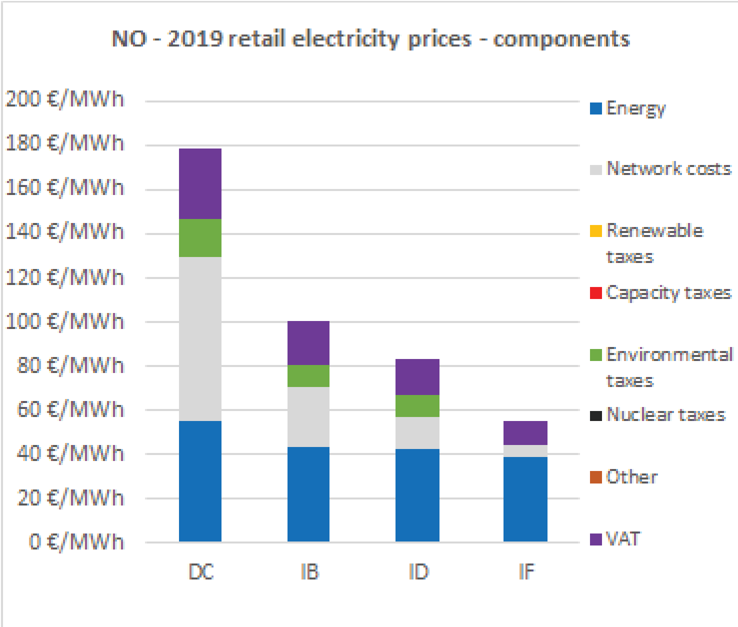
Gas	D2	I3	I5
	Household	Medium Industry	Large Industry

See footnote [2]



[1] The country of study, its neighbours and the EU average are highlighted with brighter colours in the figure.

[2] Annual electricity consumption: DB 1 - 2.5 MWh, DC 2.5 - 5 MWh, DD 5 - 15 MWh, DE above 15 MWh, IB 20-500 MWh, ID 2000-20000 MWh, IF 70000-150000 MWh. Annual Gas consumption: D2 20-200 GJ, I3 10000-100000 GJ, I5 1 mil - 4 mil GJ.



Oil product prices and Energy costs shares are not available for this country