Sectoral Profile - Industry

Energy consumption

Energy consumption trends in EU

- There is a regular decrease in energy consumption since 2003, although there was growth in industrial activity from 2003 to 2007 and since 2013.
- Since 2007, electricity follows the same declining trend as total consumption, while it was increasing regularly before.
- In 2015, industry consumed around 20% less than in 2000.

Change in fuel mix in EU industry

- Electricity and natural gas now have a similar market share (32% each).
- The penetration of electricity is only very partly linked to electrification: ~10% of the electricity used in 2015 is linked to replacement of fuels by electricity since 2000.
- Decreasing share for oil (-6 points) and coal (-2 points) since 2000.
Industry absorbs a declining share of final consumption

In most EU countries, the share of industry in the final energy consumption is declining (by 4 points at EU level since 2000). This decline was very significant in Bulgaria, Romania, Spain, Poland, Czech Republic and Italy (by around 10 points). In 5 countries (Latvia, Germany, Austria, Slovakia and Hungary), the share of industry is increasing by 2 to 3 points. There are large discrepancies in the share of industry in final consumption among countries: around 40% in Finland and Slovakia to less than 20% in UK, Croatia, Luxembourg and Denmark (25% for the EU on average).

Energy consumption trend by industrial branch

- Chemicals and steel are the largest energy consumers in industry (about 20% each in 2015), followed by paper and non-metallic minerals (12% each).
- Strong reduction for non-metallic minerals and steel (-24% and -20% respectively).
- Around 2/3 of consumption remain concentrated in 5 energy intensive branches (chemicals, steel, non-metallic, paper and non-ferrous)
Variation of electricity consumption of industry by branch

- Since 2007, electricity consumption has decreased in most branches.
- Until 2007, it was increasing in almost all branches.
- Chemical is the largest electricity intensive branch (16%) followed by machinery, paper and food (~10% each)
Specific consumption

Energy efficiency trends in steel industry

- Apparent deterioration of energy efficiency in steel production since 2007 in half of countries (and EU), as shown by the increase in the specific consumption per ton of steel: this is mainly a result of the deep recession in this sector.

- Decreasing specific consumption over years for the other countries: Poland, Austria, France, Sweden, UK and Czech Republic.

- Different performances partly explained by a share of the electric process, the less intensive process, in steel production.

The energy performance of the steel industry should be considered in relation to the share of electric steel: the higher this ratio, the higher the specific consumption. For Slovenia, Portugal, Italy and Spain, the high share of electric process mix can explain part of the high specific consumption.
Energy efficiency trends in paper industry

- Regular decrease of the specific consumption per ton of paper in most countries (-0.4%/year at EU level from 2000 to 2015).
- Largest reduction in Netherlands, Poland, Spain (> 2%/yr since 2000).
- These trends are influenced by energy efficiency but also by variation of the share of pulp produced in the country.
- Differences among countries also depend on the level of pulp production.

**Specific consumption of paper**

- Decreasing share of the ratio pulp production over paper production in almost all countries over time.
- The lower the pulp/paper ratio, the lower the average energy consumption per ton of paper.
- A ratio >100% means that countries export pulp - this is for instance the case of Finland, Norway and Sweden.
- Comparison among countries of specific energy consumption per tonne of paper should be made at similar level of pulp/paper ratio.

**Ratio pulp/paper production in EU countries**
Energy efficiency trends in cement industry

- Slight decrease of the specific consumption of cement since 2000 in Italy, Germany, Sweden, France, Croatia and Poland.

- Since 2007, increase in this specific consumption, in countries hit by the recession (e.g. Portugal, Spain and UK), as well as at EU level (-0.2%/year on average for the EU).

- Differences among countries are explained by differences in the efficiency of clinker production, the energy intensive component of cement, as well as in the ratio clinker to cement production: the higher this ratio, the higher the specific energy consumption.

![Specific consumption of cement chart]
Energy efficiency and savings

Slower energy efficiency progress since 2007

- Energy efficiency index in industry is calculated as a weighted average of sub-sectoral indices of energy efficiency progress at the level of 10 branches:
  - 4 main branches: chemicals, food, textile & leather and equipment goods;
  - 3 energy intensive branches: steel, cement and pulp & paper;
  - 3 residual branches: other primary metals (i.e. primary metals minus steel), other non-metallic minerals (i.e. non-metallic mineral minus cement) and other pulp, paper and printing (i.e. mainly printing).

- Sub-sectoral indices are expressed in terms of energy used per ton produced for energy intensive products (steel, cement and paper) and in terms of energy used related to the production index for the other branches.

- Energy efficiency in EU industry improved by 1.5%/year since 2000.

- The rate of progress has been twice slower since 2007 (1%/yr since 2007) because of a slower progress in some branches and even no more energy efficiency improvement for others because of the recession (e.g. cement, machinery, steel).

- Since 2007, the deterioration of energy efficiency is observed in almost all countries due to the recession.

Energy savings more than twice lower since 2007

- In 2015, energy savings reached around 70 Mtoe compared to 2000: without energy efficiency improvement, energy consumption would have been higher by 70 Mtoe.

- Energy savings is derived from the ODEX indicator.

Energy savings in industry - EU
Structural changes

Relative levels of energy intensities by branch (machinery = 1) in the EU

- Primary metals, the most energy intensive branch, require around 25 times more energy to produce one unit of value added than machinery, the branch with the lowest intensity (machinery = 1 in the graph).
- Non metallic minerals (15 times more intensive) and paper (12 times)
- A reduction in the share of energy intensive branches in the industrial value added with an increase in the share of equipment and machinery will result, all things being equal, in a reduction of the average energy intensity of manufacturing.

Energy intensities by branch (EU)

Marginal impact of structural changes (less than 25%) in manufacturing industry

- Energy intensity at constant structure reflects the variation of the energy intensity assuming a constant structure of value added, between the various branches or sub-branches, for a reference year, so as to leave out the influence of structural changes (the difference in the variations of the intensity and the intensity at constant structure can approximate the structural changes).
- For the period 2000-2015, structural changes explain around 23% of the intensity decrease (25% during the years 2000-2007, 20% for the years 2007-2015).  

Intensity trends and structural changes in manufacturing (EU)
**Decomposition of energy consumption**

**Drivers of energy consumption variation**

- Industrial energy consumption decreased by around 60 Mtoe between 2000 and 2015.
- This is mainly due to energy savings (70 Mtoe) and to a lesser extent to a structural effect (10 Mtoe), i.e. the fact that less intensive branches increased their contribution in industrial value added.
- Change in industrial activity (measured with the production index) had a limited effect (10 Mtoe).

**Drivers of energy consumption variation in industry at EU level**

**CO2 emissions**

**CO2 emissions from fuel combustion**

Decreasing CO2 emissions from fuel combustion since 2000 in almost all countries except Ireland and Norway: around -30% at EU level.

**CO2 emissions from fuel combustion in industry**

Source: EEA