ODYSSEE-MURE

Third meeting of the project "ODYSSEE-MURE, Monitoring EU Energy Efficiency First Principle and Policy Implementation"

Energy efficiency trends in the EU

Bruno Lapillonne, Laura Sudries, Estelle Payan – Enerdata

Zagreb, Croatia – November 15th 2021

Co-funded by the Horizon 2020 programme of the European Union

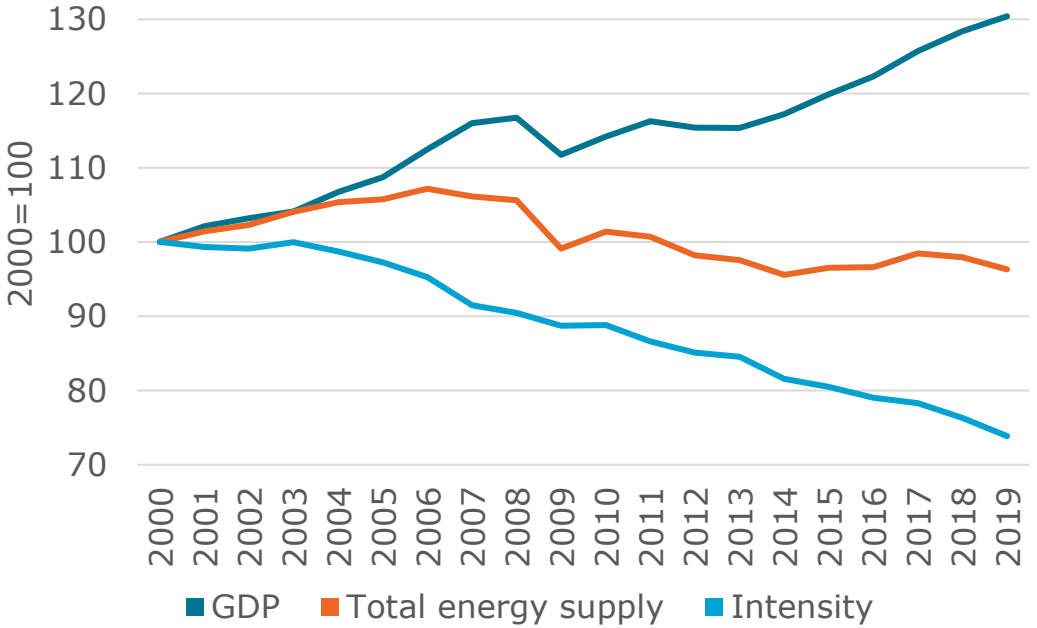
Outline

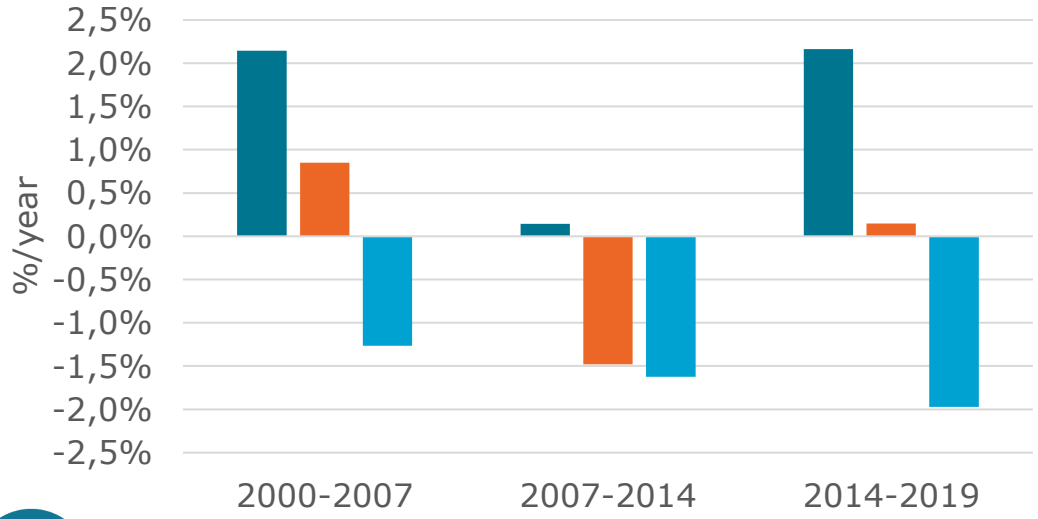
- Energy consumption trends
- Energy efficiency trends
- Conclusions

- *Sources of data for the EU 2000-2019: Eurostat when available. If not, sum of countries or average of representative countries, based on national data from ODYSSEE database.*
- *The EU excludes the UK.*
- *International air transport excluded from energy consumption.*

Energy consumption trends

Total energy supply and intensity VS GDP



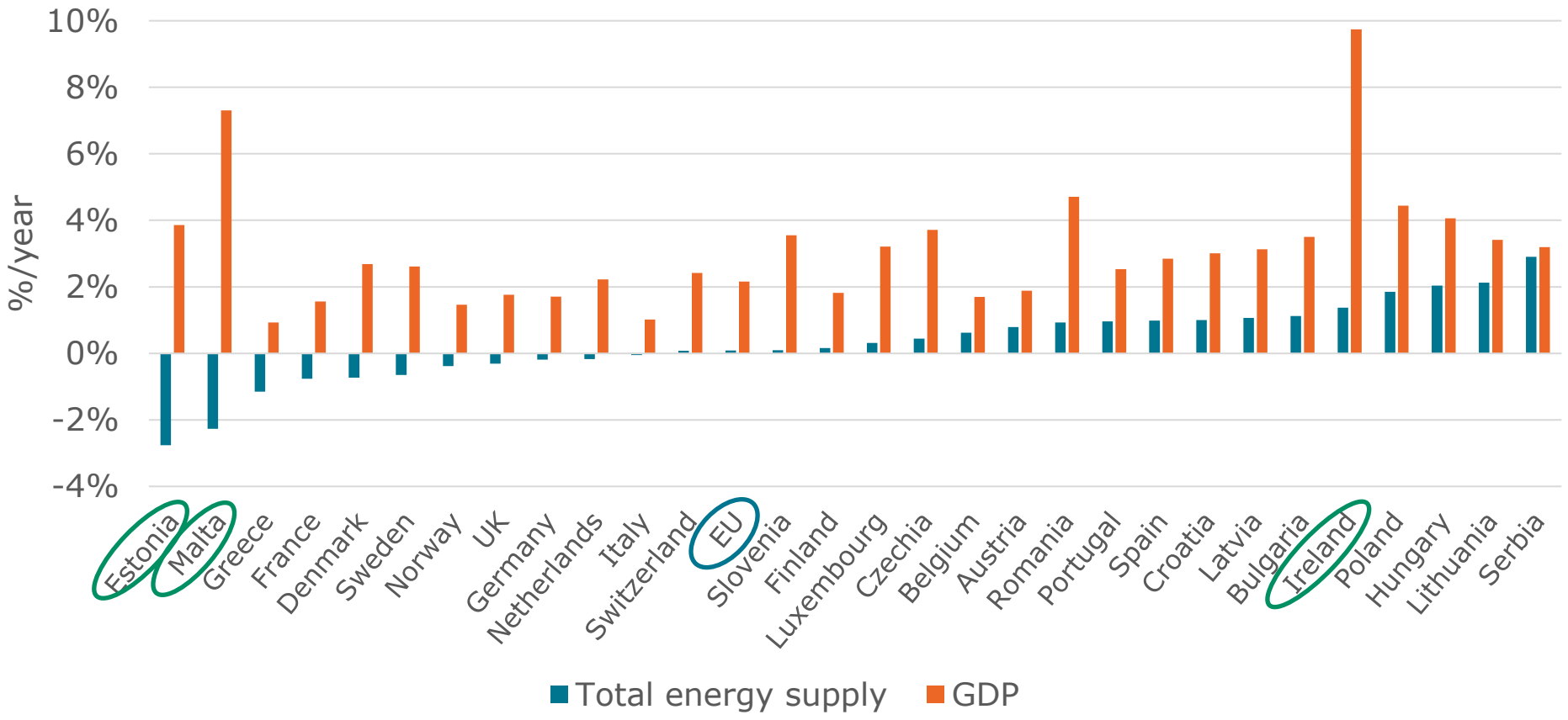


- Relative stability of EU total energy supply between 2014 and 2019, although GDP increased by 2.2%/year with the return to economic growth.
- More rapid decrease of the primary energy intensity over 2014-2019 (2%/yr), slightly faster than over 2007-2014 (+0.35pt).

Total energy supply and intensity at normal climate.
Source: ODYSSEE

Total energy supply and GDP trends over 2014-2019

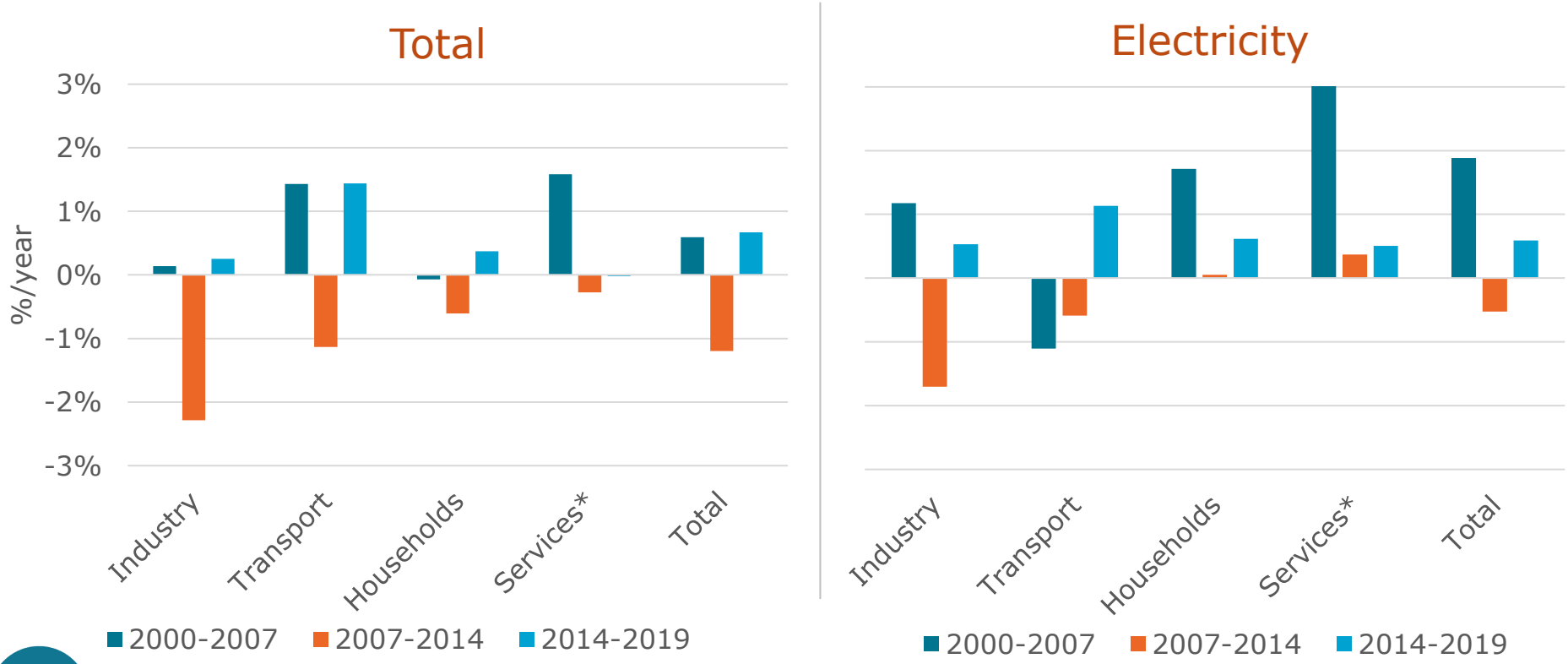
- Over 2014-2019, decreasing total energy supply in 9 EU Member States, notably in France, Germany and Italy.
- Everywhere the consumption progressed much slower than the GDP, implying a decreasing energy intensity, especially significant in Malta, Ireland and Estonia (more than 6%/year decrease).



Total energy supply at normal climate.
Source: ODYSSEE

Final energy consumption trends

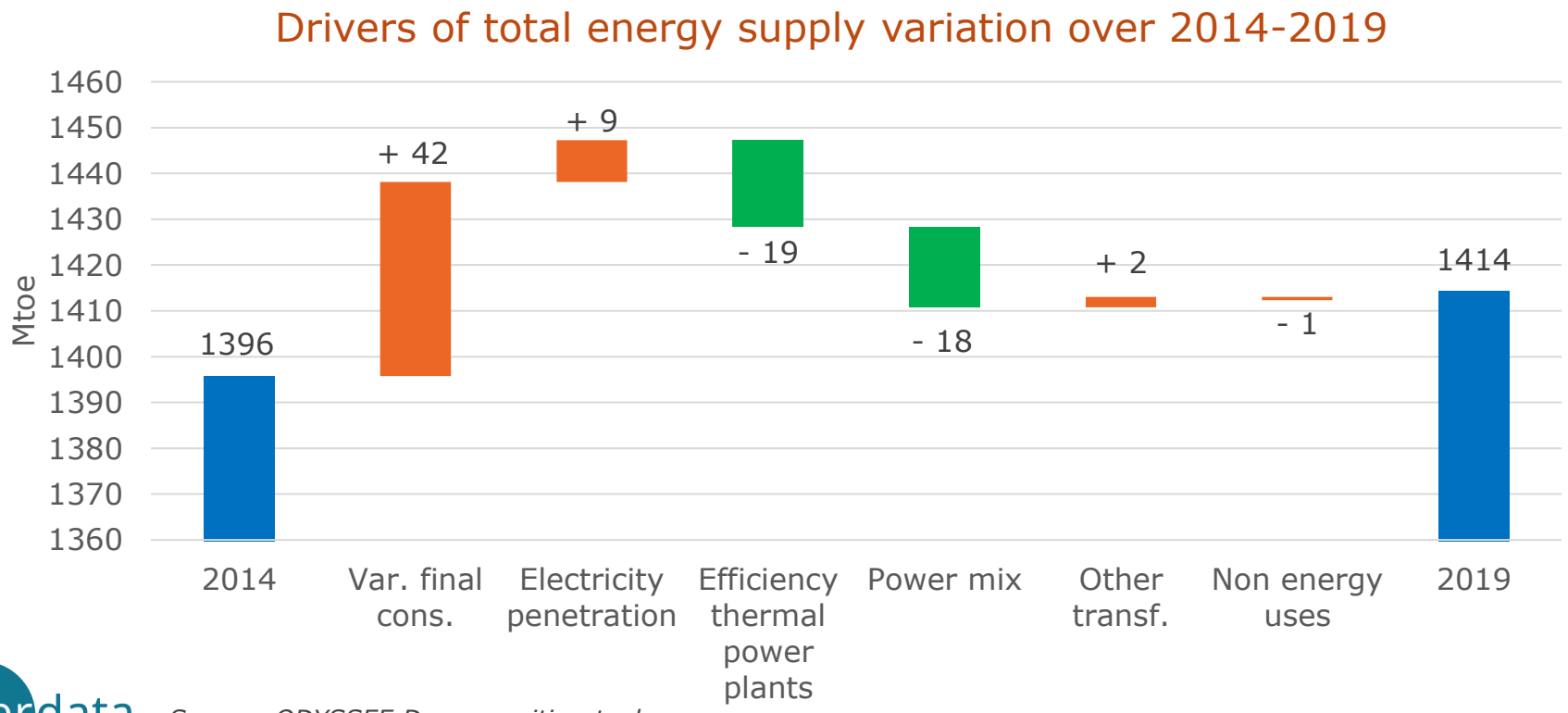
- Final energy consumption grew again between 2014 and 2019 with the economic rebound (+0.7%/yr), in sharp contrast with total energy supply trends.
- Electricity consumption growth was 3 times slower (0.6%/yr) than before the financial crisis.
- Transport was the most dynamic sector over 2014-2019 and was back to the trend before 2007 (1.4%/yr).
- Industry had the lowest progression (0.3%/yr).



Households and services at normal climate. *Services include non-specified.
Source: ODYSSEE

Drivers of total energy supply variation

- Between 2014 and 2019, total energy supply increased less than final consumption: 17 Mtoe compared to 42 Mtoe.
- This lower progression was explained by changes in the power mix:
  - A higher share of renewables (+4 pts) and a lower share of nuclear (-2 pts) and thermal (-2 pts) reduced the total energy supply increase by 18 Mtoe.
  - Improved efficiency of thermal generation (+2.2 pts) with a shift from coal to gas contributed to a reduction of 19 Mtoe.



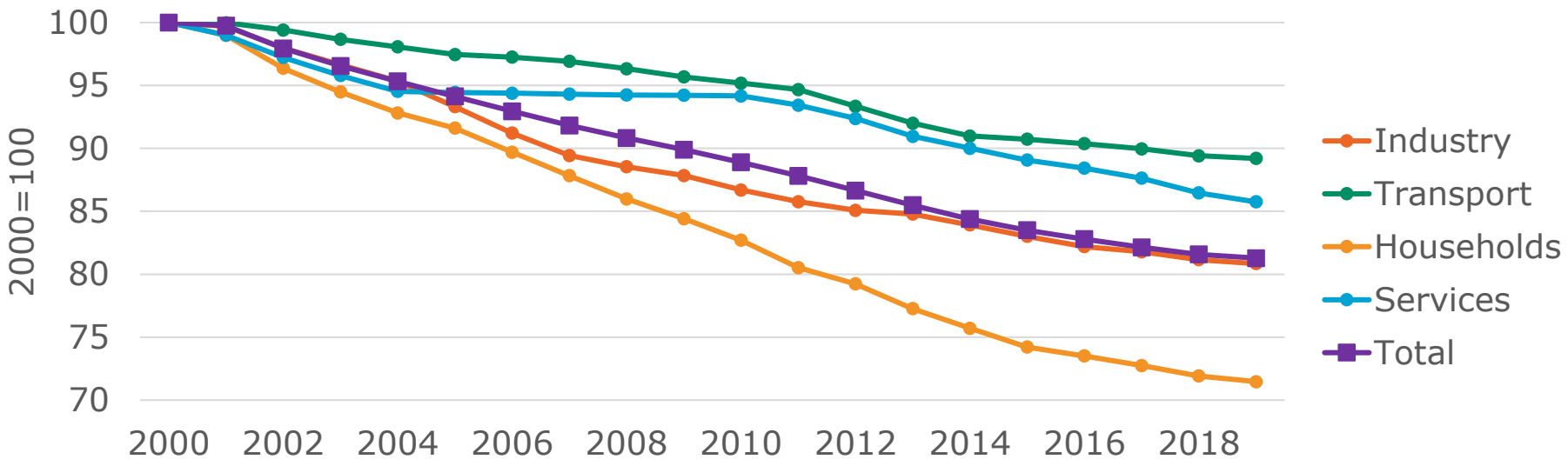
Source: ODYSSEE Decomposition tool

Energy efficiency trends

Declining progress in most sectors since 2014

- Efficiency of final consumers increased by 0.7%/yr over 2014-2019, compared to 1.2%/yr between 2000 and 2014.
- Larger gains for buildings: over 2014-2019, 1%/yr for services, and 1.1%/yr for households (which is twice lower than between 2000 and 2014).
- Strong slow down in industry since 2007 (0.7%/yr since 2014; down from 1.6%/year before 2007 and 0.9%/yr over 2007-2014).
- Lower improvement in transport (0.4%/yr since 2014), twice less than over 2007-2014 because of no more progress for cars (penetration of SUV) and a reverse trend for dieselisation.

Energy efficiency improvements for final consumers (EU)

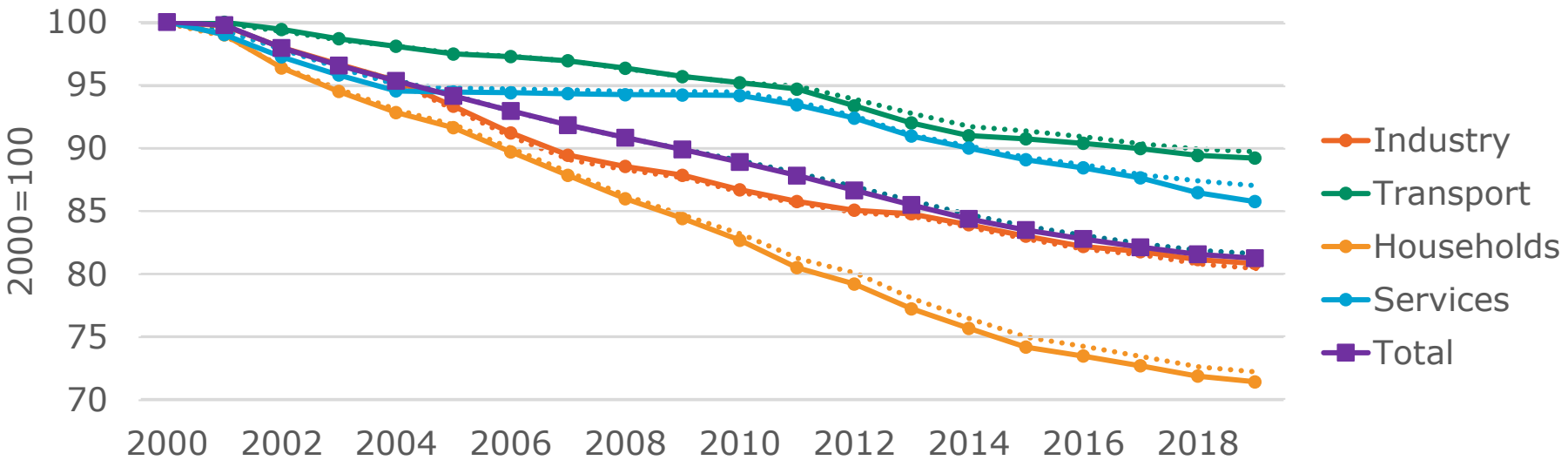


Source: ODYSSEE, measured with ODEX (Odyssee Energy Efficiency Index).
ODEX=81.3 in 2019 ➔ 18.7% energy efficiency improvement since 2000

2020 update with early estimates VS 2021 update

- ODEX for 2021 update are very close to the ones we calculated with early estimates for 2020 update
- The gap in 2019 little bit higher for households → big effort made to improve the quality of data on space heating unit cons
- Gap for historical years due to data revisions by country

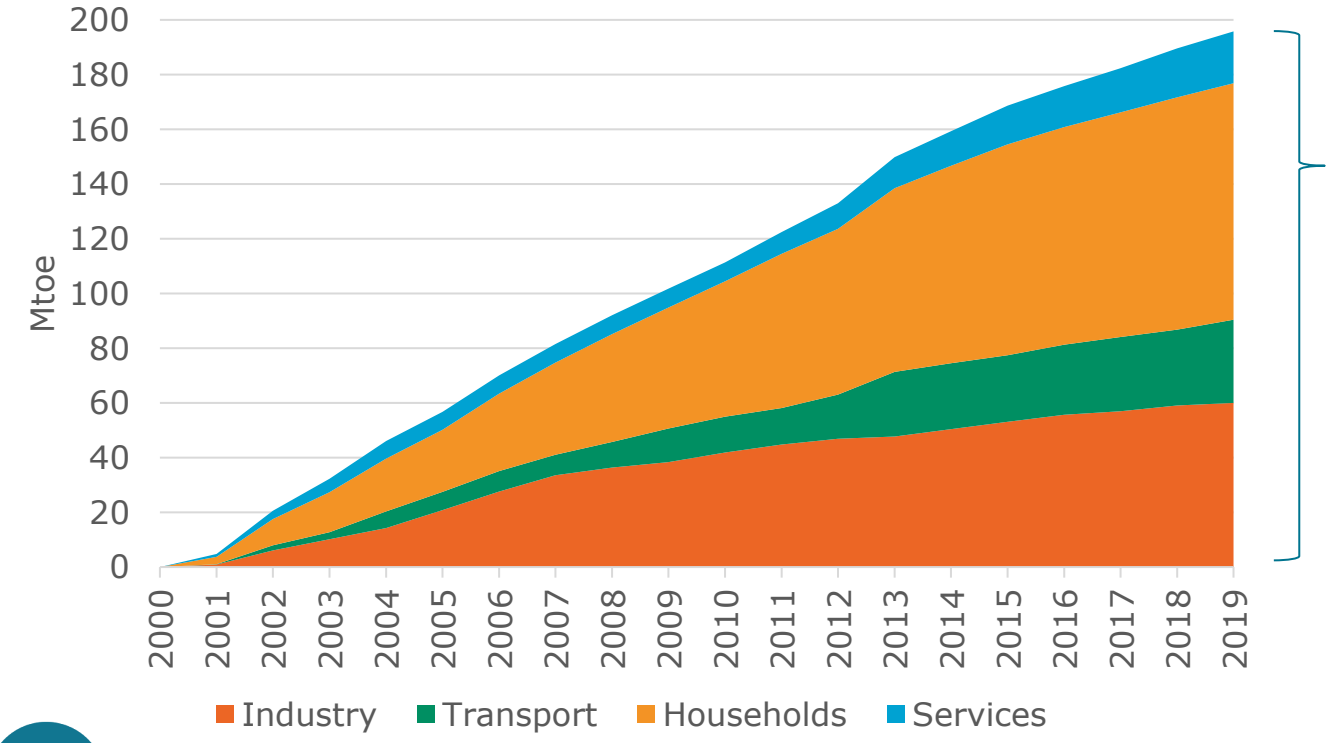
Comparison of ODEX between 2020 (dotted lines) and 2021 updates



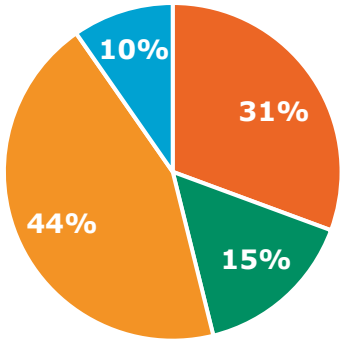
Source: ODYSSEE, measured with ODEX (Odyssee Energy Efficiency Index).
ODEX=81.3 in 2019 → 18.7% energy efficiency improvement since 2000

Energy savings vs. consumption

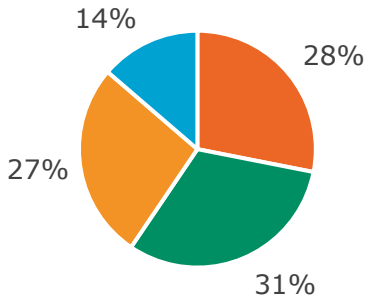
- The cumulated annual energy savings since 2000 represented the equivalent of 21% of final energy consumption in 2019: without these savings the final consumption would have been 21% higher.
- Households, the sector with the highest number of regulations and financial measures, was over represented, with a share of total savings (44%) much higher than its share in consumption (27%).
- On the other hand, savings in transport were twice lower than their share in consumption (15% vs 31%).



% in energy savings



% in final consumption

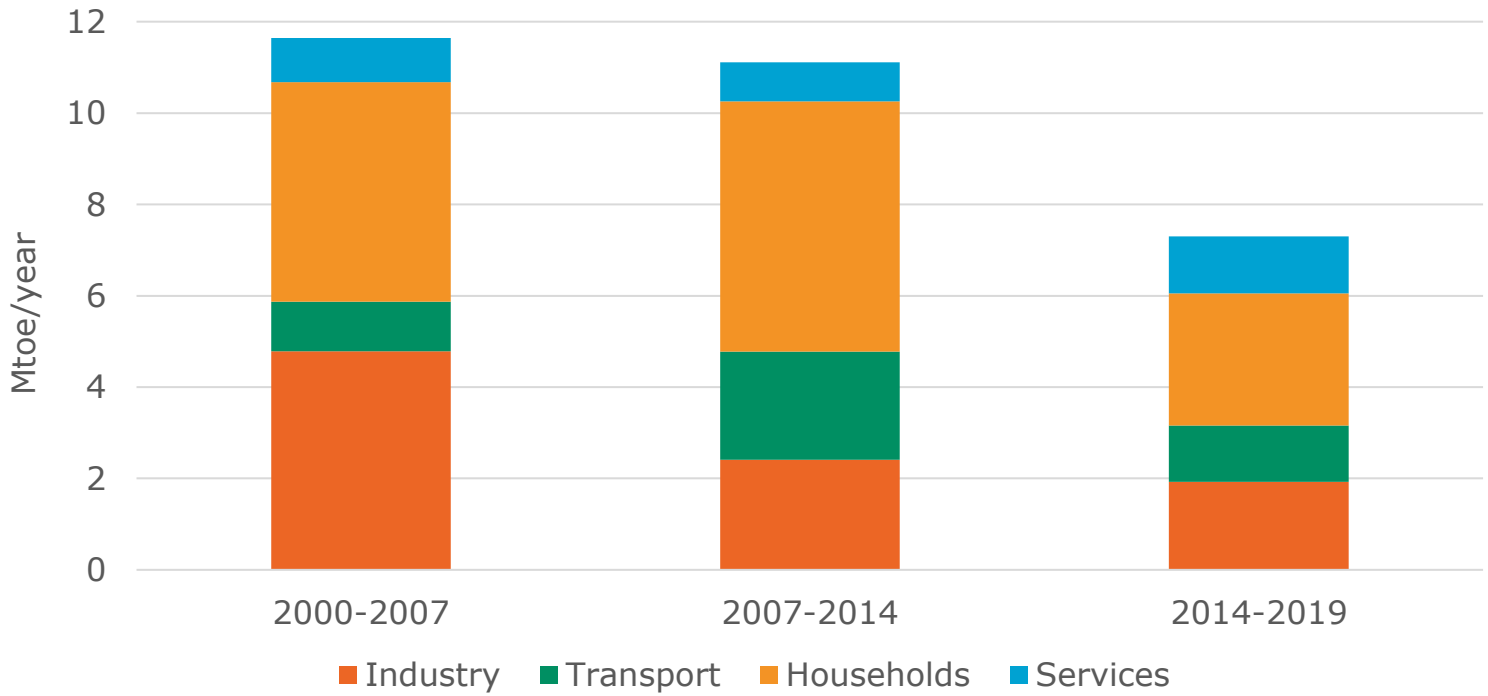


Enerdata *Source: ODYSSEE*

Regular decrease in energy savings

- Because of the slowing pace of energy efficiency improvement, the annual additional savings decreased over 2014-2019: from an average volume of 11.4 Mtoe/year over 2000-2014 to 7.3 Mtoe/year over 2014-2019.
- They have been divided by 2.5 since 2007 in industry and by 2 since 2014 in transport and for households.

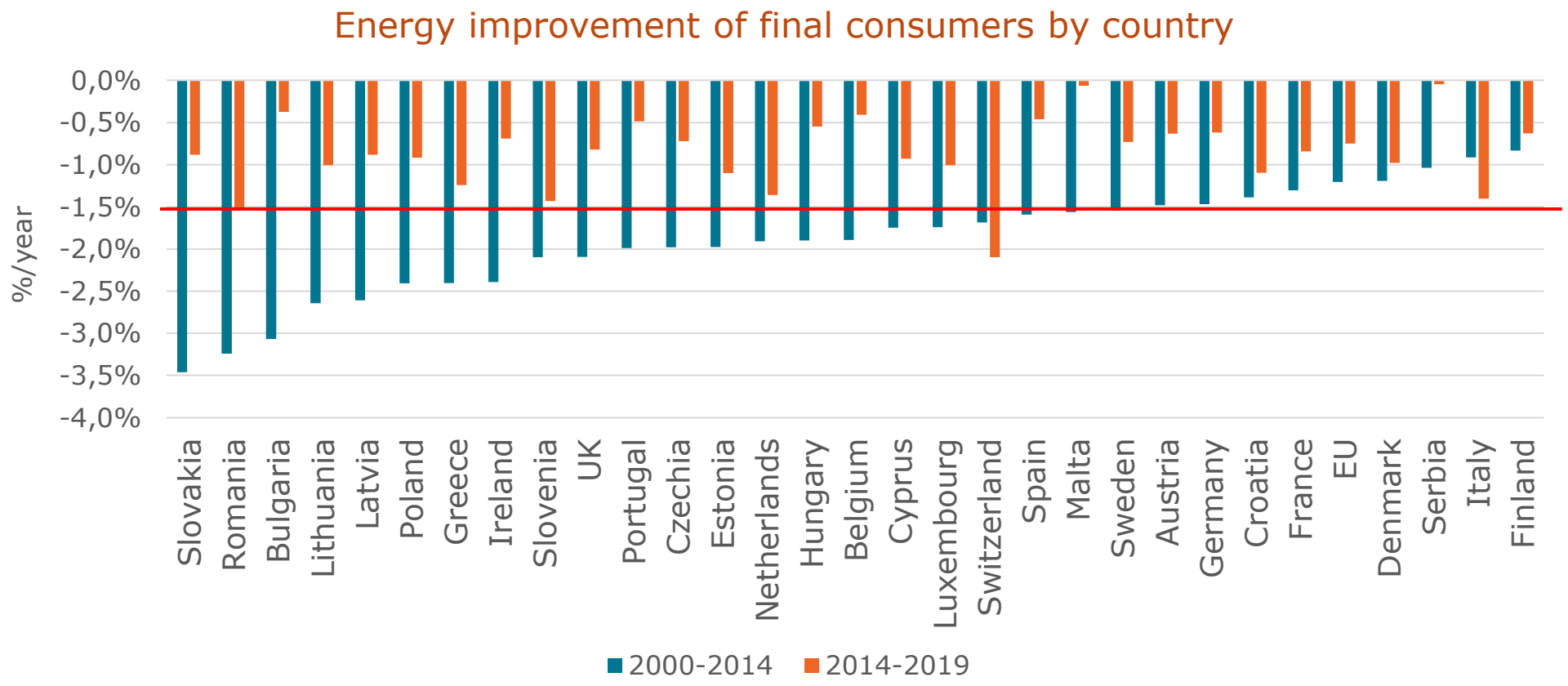
Average annual additional savings by sector



Source: ODYSSEE

Lower energy efficiency improvements since 2014

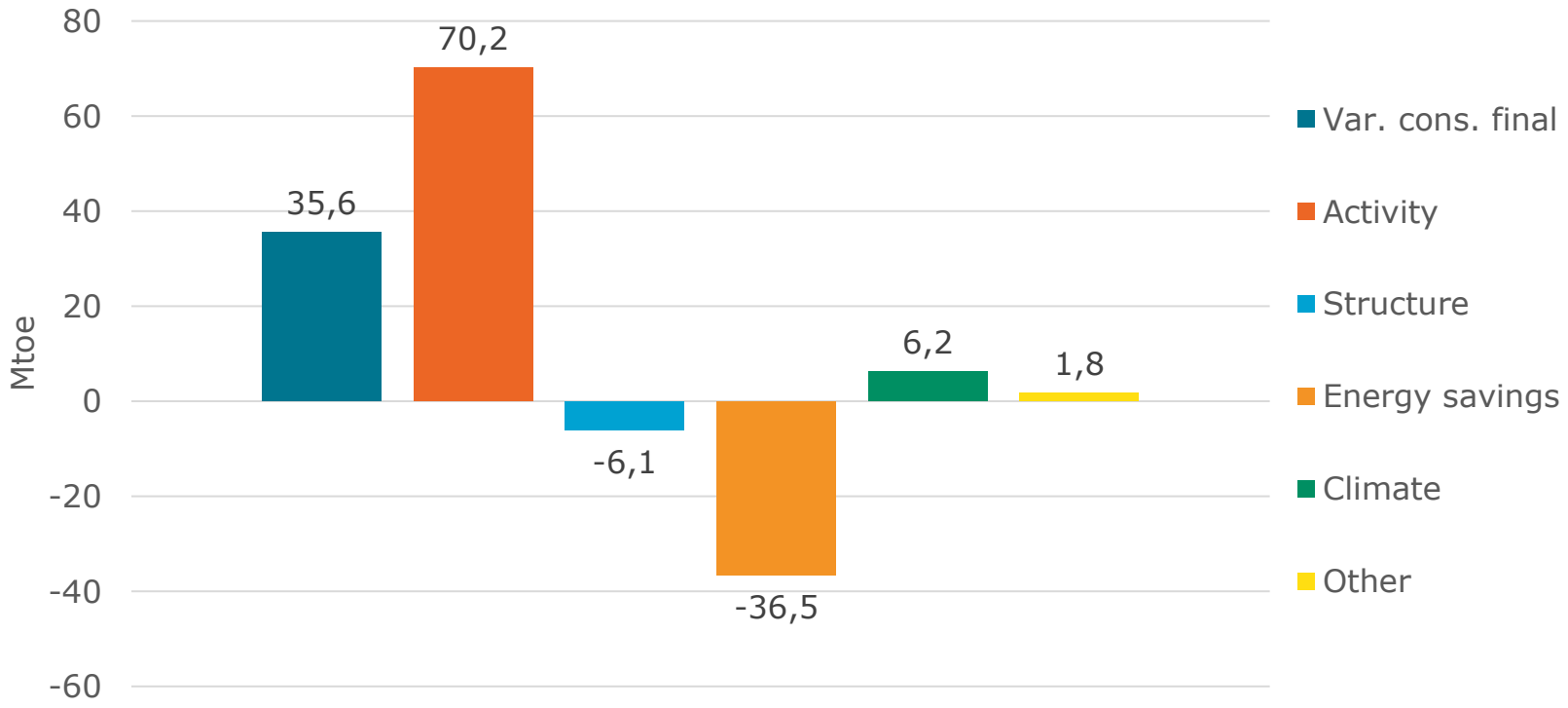
- In most countries, energy efficiency was progressing much slower over 2014-2019.
- Romania, Slovenia, Italy and the Netherlands show the steadiest progress since 2014, higher than 1.3%/yr compared to the EU average of 0.7%/yr.



Source: ODYSSEE, measured with ODEX (Odyssee Energy Efficiency Index).

Drivers of final energy consumption variation

- Between 2014 and 2019, final consumption increased by 36 Mtoe.
- The "activity" effect contributed to raise final consumption by 70 Mtoe.
- Energy savings offset around half of this effect by reducing consumption by 37 Mtoe.



Activity effect : mainly economic growth, plus demography and lifestyle changes (appliances ownership and larger dwellings).

Final consumption at real climate.
Source: ODYSSEE Decomposition tool

Final energy intensity and energy efficiency trends

- Since 2014 energy efficiency only explains 40% of the final energy intensity reduction.
- Different types of structural changes (towards less energy intensive sectors (services) and industrial branches) but above all other effects (e.g. saturation effects, higher value-added products…) had a higher contribution to the reduction (20% and 40% respectively).

GDP structure: effect of variation in the share of industry, services and agriculture in the GDP;
Households structure: effect of a variation of the share of the private consumption of households in the GDP;
Industry structure: effect of a variation of the share of the various industrial branches in the total value added of industry.
Source: ODYSSEE

Conclusions

- Since 2014, the growing share of renewables and natural gas in the power mix has offset 85% of the increase in final consumption.
- Energy efficiency improvement of final consumers has been much slower since 2014 (40% slower).
- Over 2014-2019, energy savings offset half of the effect of economic growth.
- Since 2014, various types of structural changes have contributed more to the reduction of final energy intensity than energy efficiency.