Energy Efficiency Trends for households in the EU

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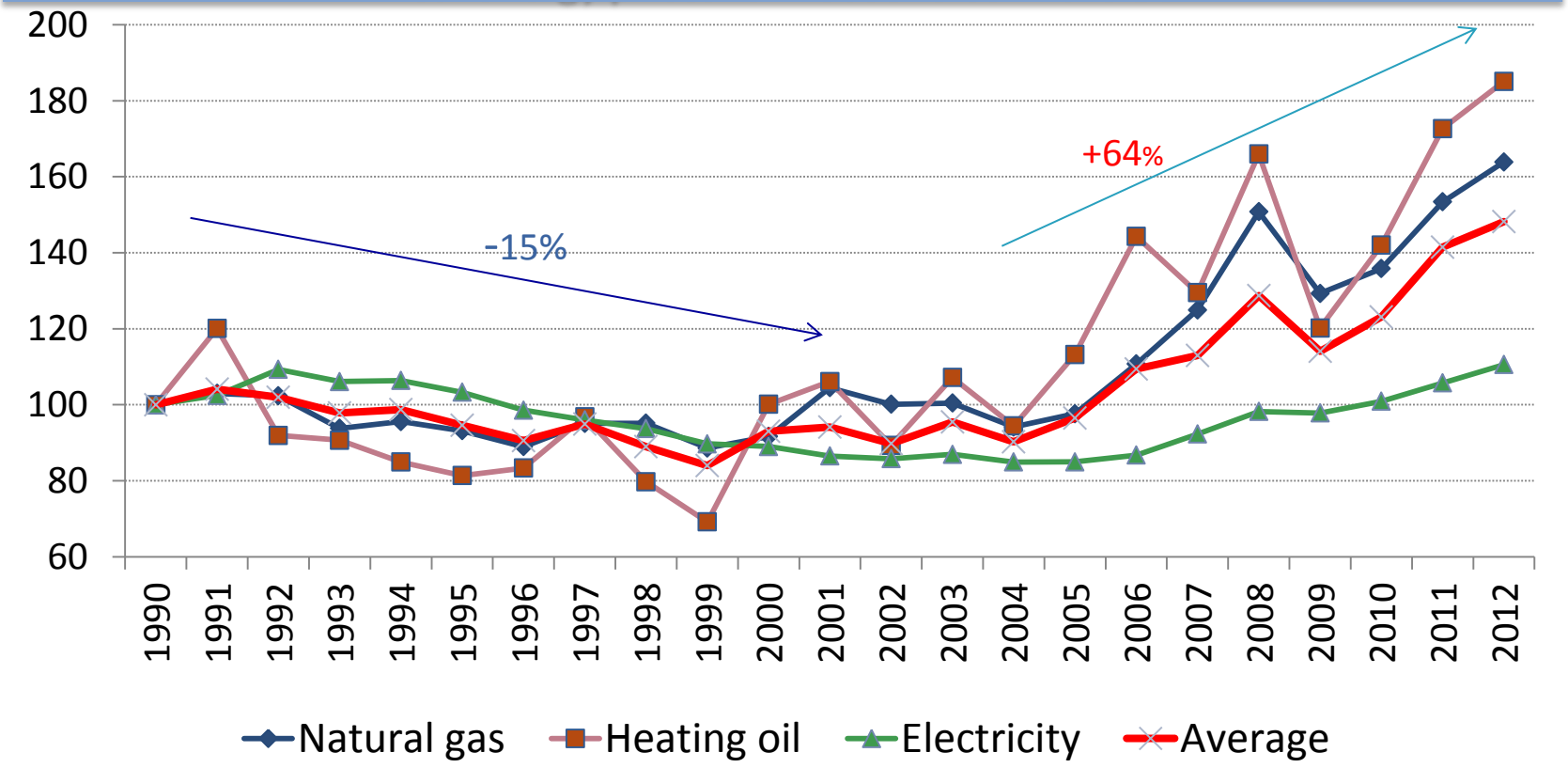
Outline

1. **Overall energy consumption and drivers**
2. Heating and water heating (solar)
3. Electrical appliances and lighting
4. Large appliances
5. Lighting
6. Air conditioning
7. Energy efficiency trends

Energy prices for households have increased by 64% between 2004 and 2012 (6.4%/yr).
Regular decline before 1999 (- 10%) followed by a relative stability until 2004.
In 2009 energy prices dropped by 11% with the economic crisis (of which -28% for heating oil, -14% for gas).

Real energy prices for households in the EU



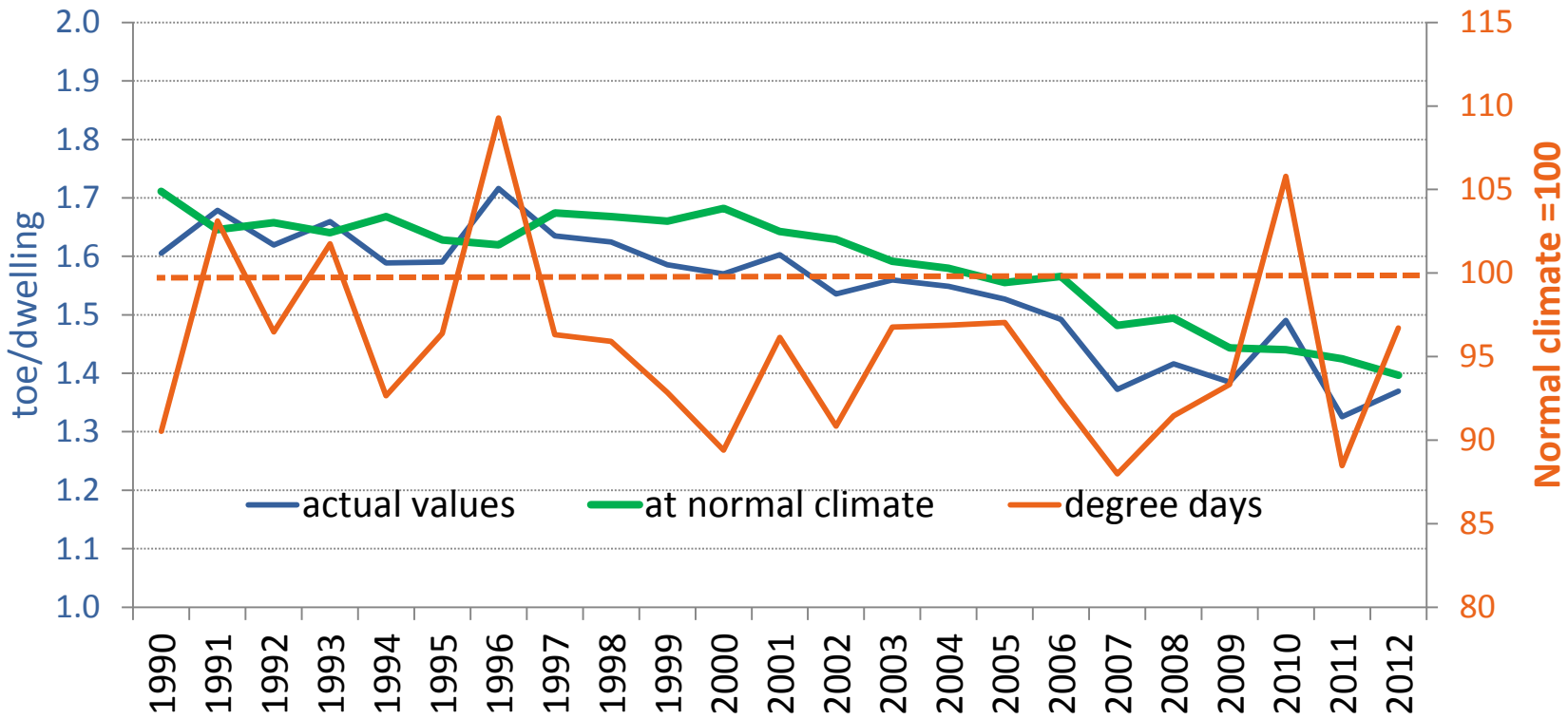
*Price index at constant prices calculated from nominal prices for the EU (source: DG-TREN Statistical Pocketbook 2010 for 1990-2008; 2009-2012 Enerdata) ; average price weighted on the basis of energy market shares

Odyssee

Enerdata

- 2 winters **much colder** than a normal winter (**2010** and 1996) and 4 winters **much warmer** (2011, 2007, 2000 and 1990) ➔ very strong reduction in number of degree days between 2010 and 2011 (-16%).
- This shows the importance of analysing energy consumption trends at normal climate (i.e. with climatic corrections) (**green line**) ➔ in ODYSSEE all indicators are **at normal climate**
- Smoother variation of the household energy consumption per dwelling at normal climate, with a regular decrease since 2000

Specific consumption per dwelling : actual value vs climatic corrected



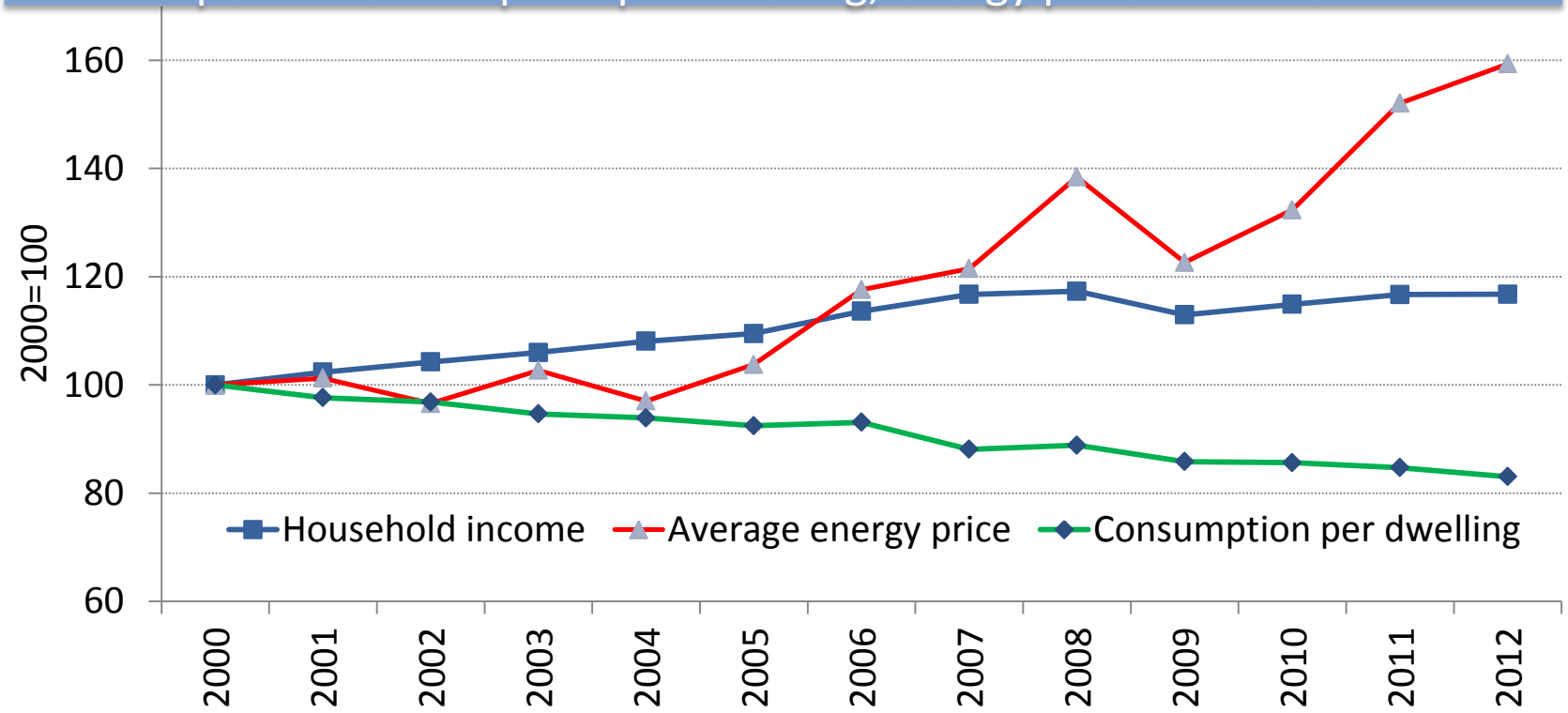
The number of heating degree-days measures the winter severity ; normal climate (30 years long term average)

Odyssee

Enerdata

- Regular decrease of the household energy consumption per dwelling (normal climate) since 2000: -1.5%/year.
- Trend explained by energy efficiency measures, higher energy prices since 2004 (+64%) and by the recession since 2008 (stability of income at EU level)

Specific consumption per dwelling, energy price and income



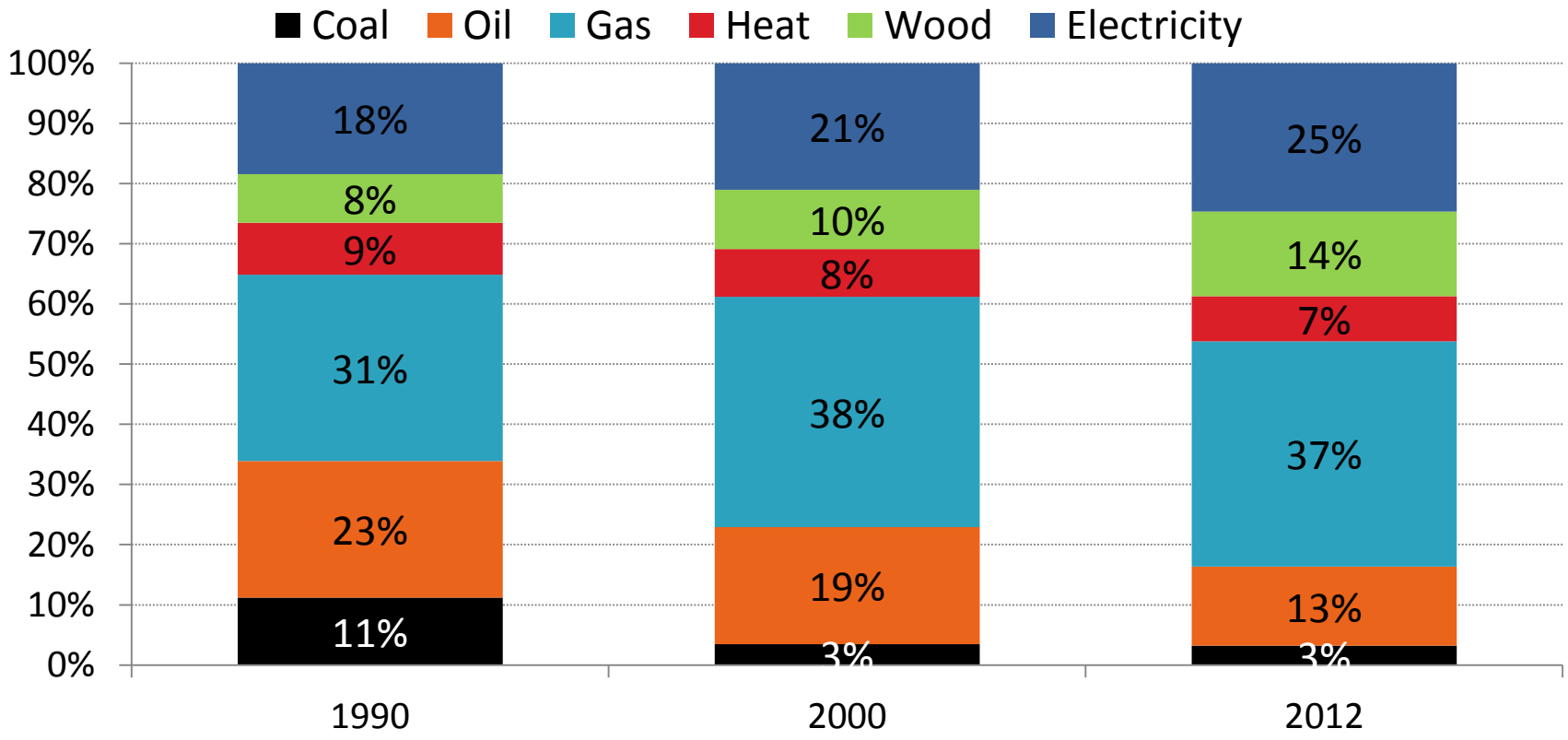
***** Average price of gas, electricity and heating oil weighted with energy market shares (at constant prices). Income capture by private household consumption

Odyssee

Enerdata

- Natural gas is the dominant source of energy for households in the EU.
- Electricity ranks second and its share is also increasing rapidly.
- Oil is slowly being phased out at EU average but remain significant in island countries.

Household energy consumption by energy source in the EU

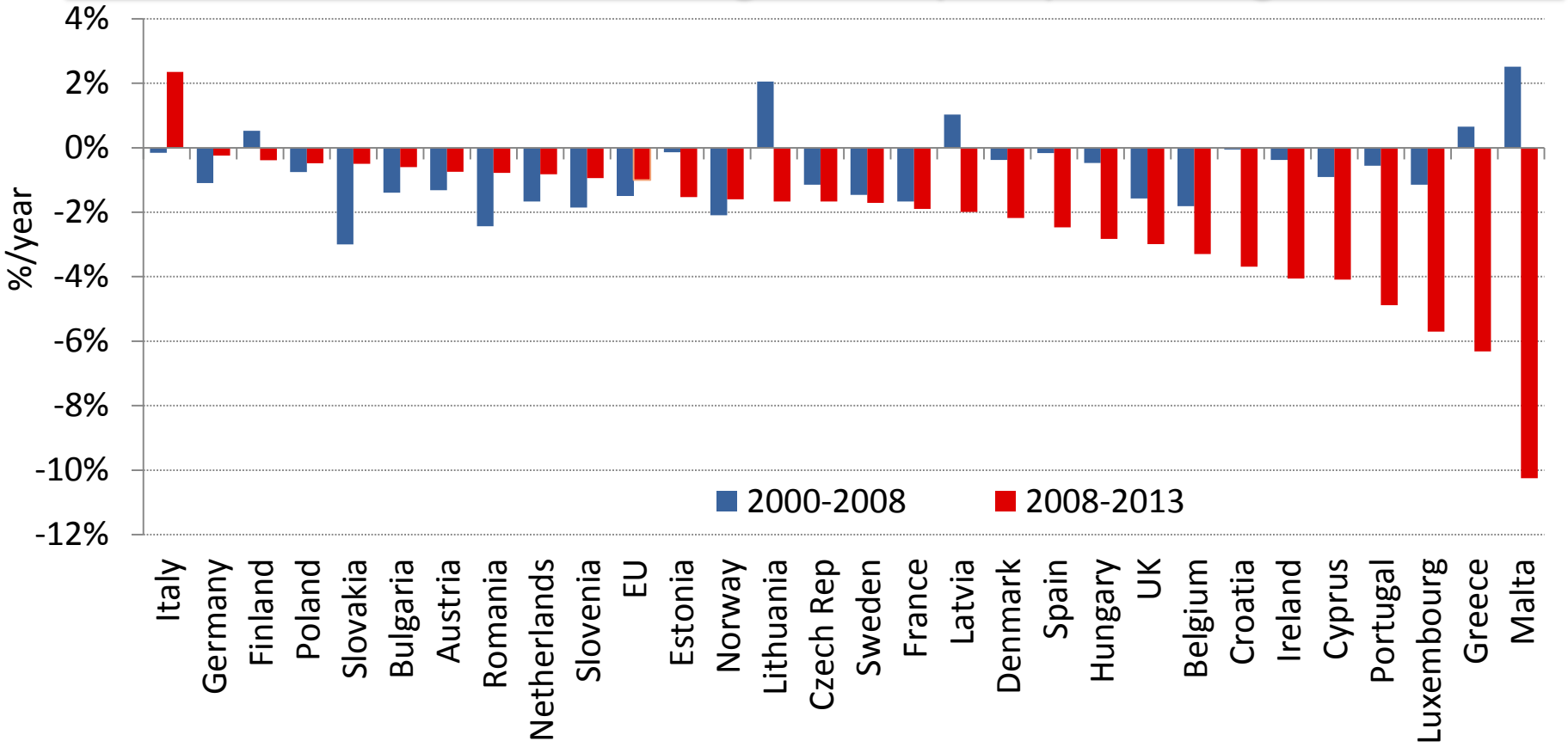


Odyssee

Enerdata

- Regular decrease of the average consumption per dwelling above 1.3 %/year at EU level since 2000;
- Strong reduction since 2008 in most countries.

Variation of the average consumption per dwelling*



Countries ranked according to the average growth 2008-2013

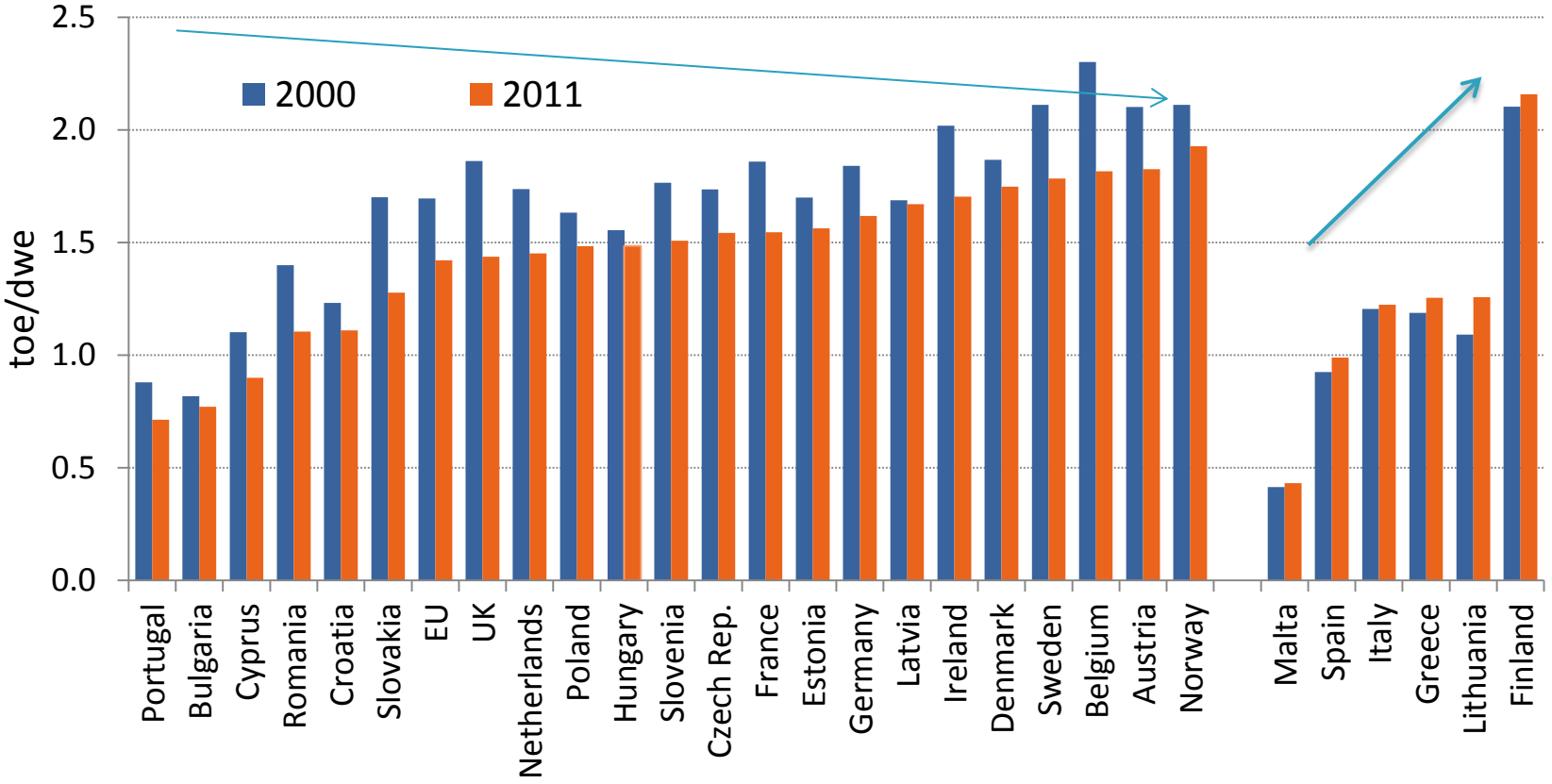
*At normal climate

Odyssee

Enerdata

Since 2000 reduction of the average energy consumption per dwelling in 20 countries;
Increase in southern Europe due to heating comfort;
Values in a range of 1 to 2 toe/dwelling (1.4 toe for the EU average)

Average consumption per dwelling (at normal climate)*



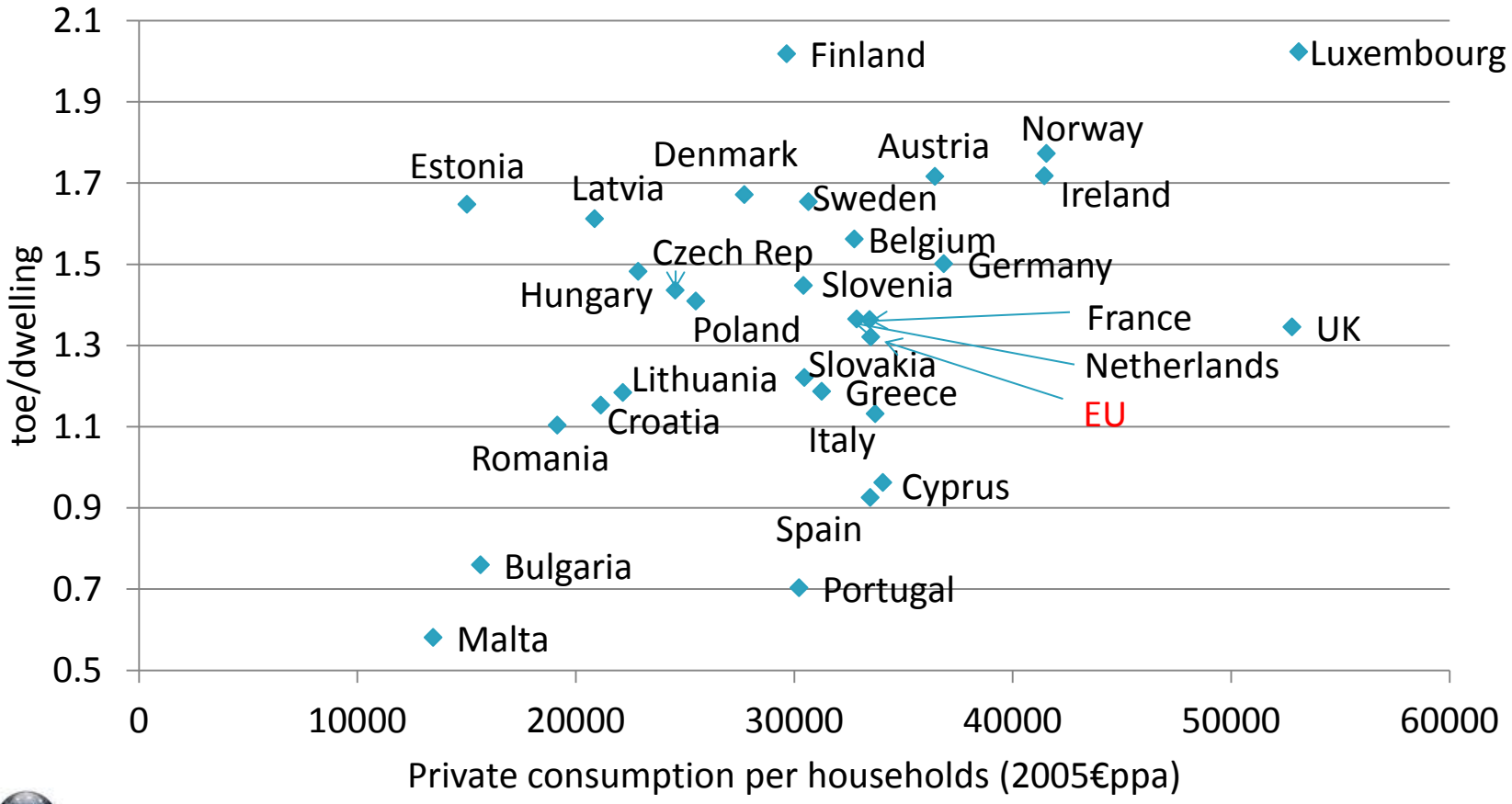
*2010 for Hungary, Malta and Estonia

Odyssee

Enerdata

Although the average household income determines energy consumption, either directly (e.g. affordable comfort level for space heating) or indirectly (e.g. size of dwelling and number of appliances), there is no robust relationship between private consumption per household and energy consumption per household

Influence of income on the consumption per dwelling (2011)

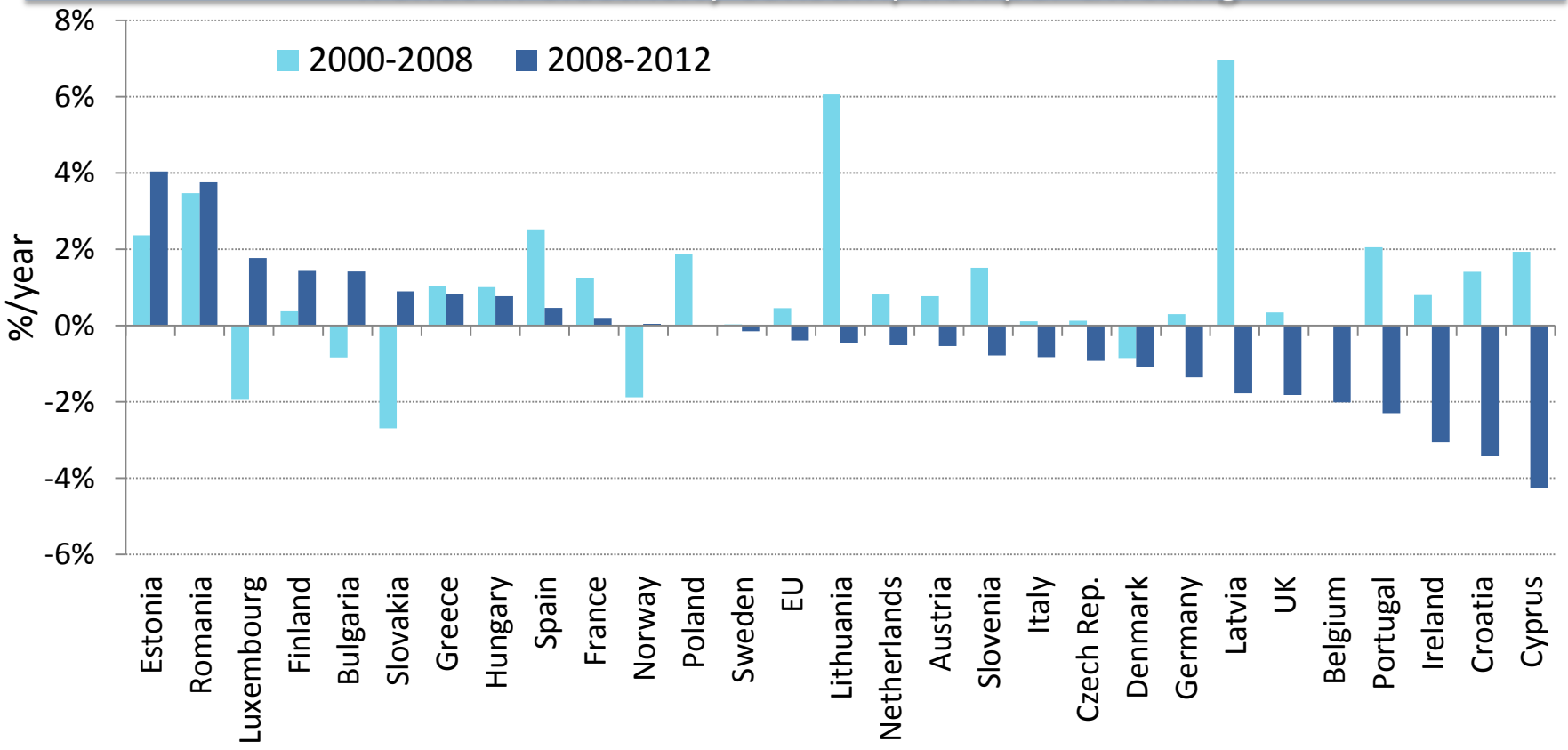


Odyssee

Enerdata

- Since 2008, decrease of the electricity consumption per household in 16 countries and at EU level (-0.4%/year);
- Strong reduction in Portugal, Cyprus, Croatia and Ireland (> 2%/year);
- In 10 countries, progression despite the recession with most progression for Southern countries (Spain, Greece, Bulgaria) due to air conditioning or Finland, Luxembourg, Romania.

Trends in electricity consumption per dwelling



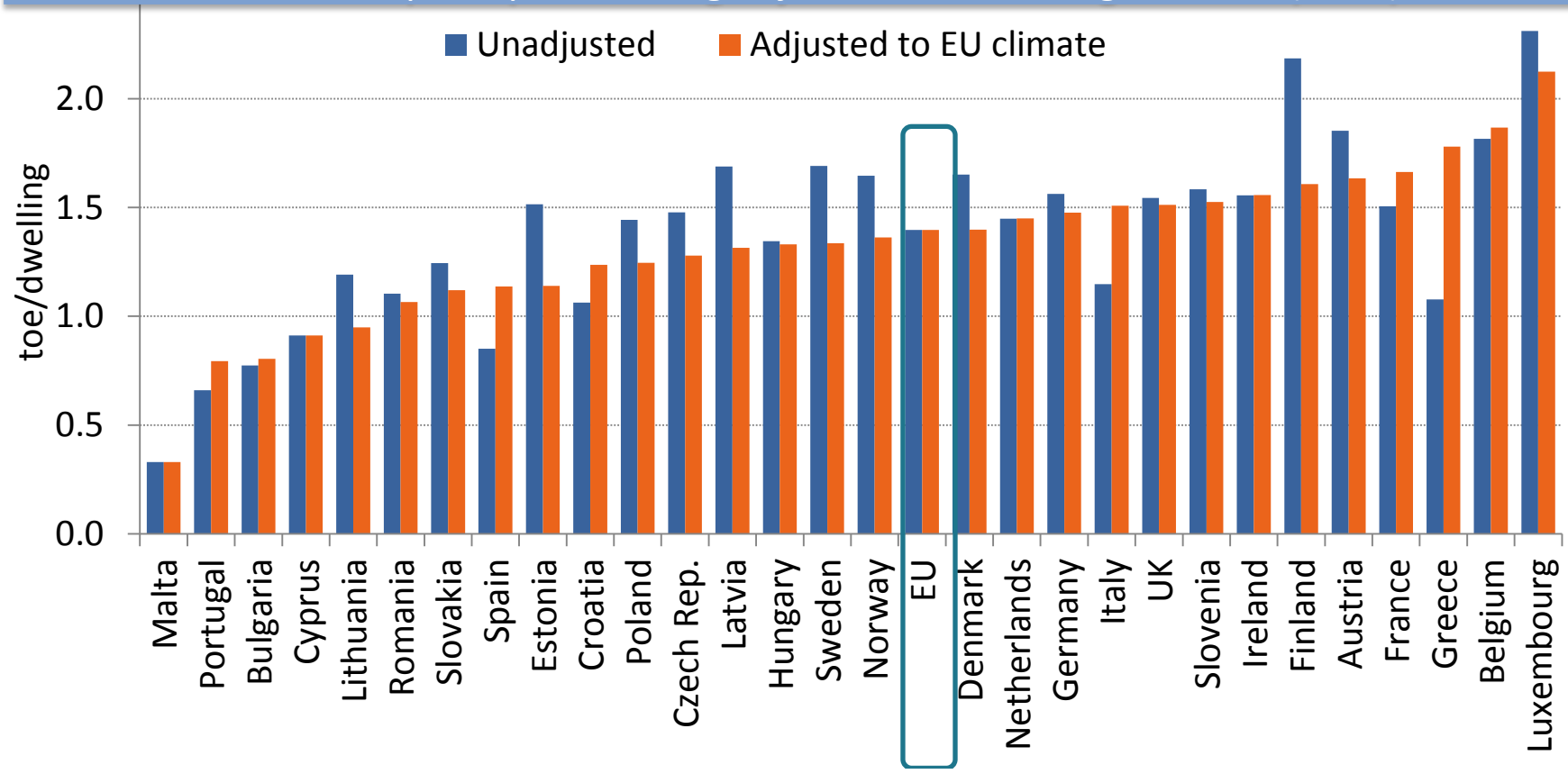
2010 for Estonia and Hungary

Odyssee

Enerdata

The comparison between countries is more relevant if the heating consumption is adjusted to the same climate (EU average);
After adjustment to the EU average climate, Spain, Greece or France for instance turns out to have the highest consumption.

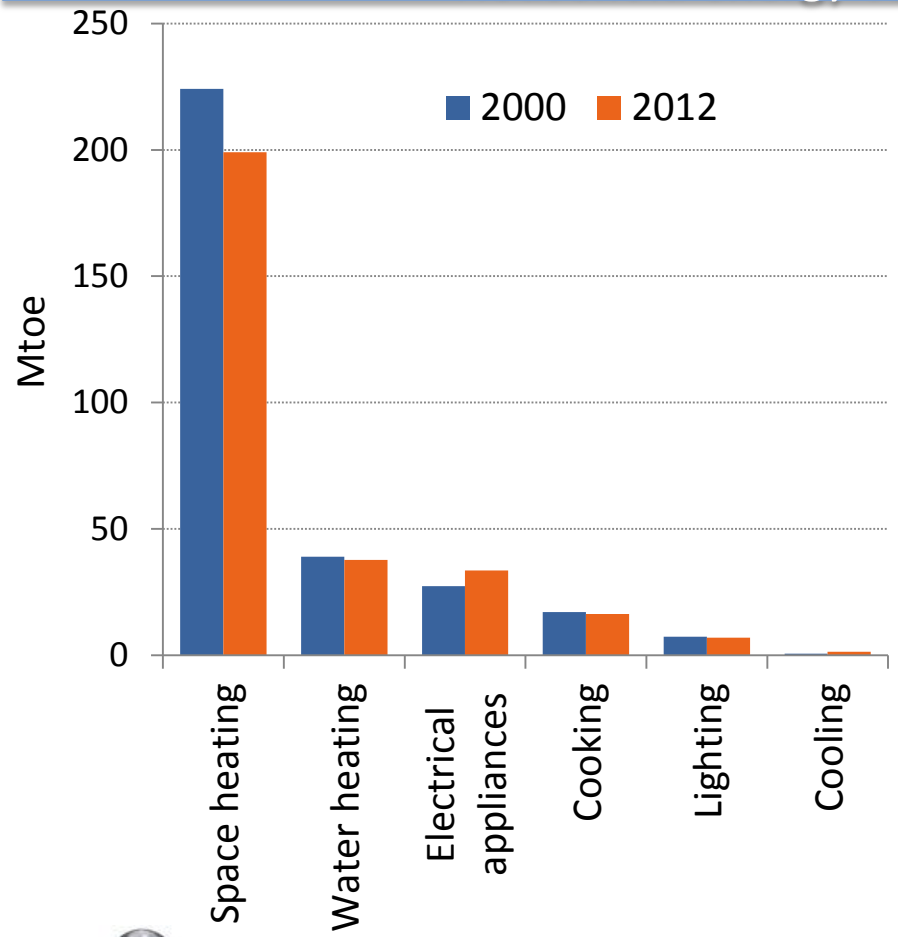
Unit consumption per dwelling adjusted to EU average climate (2012)

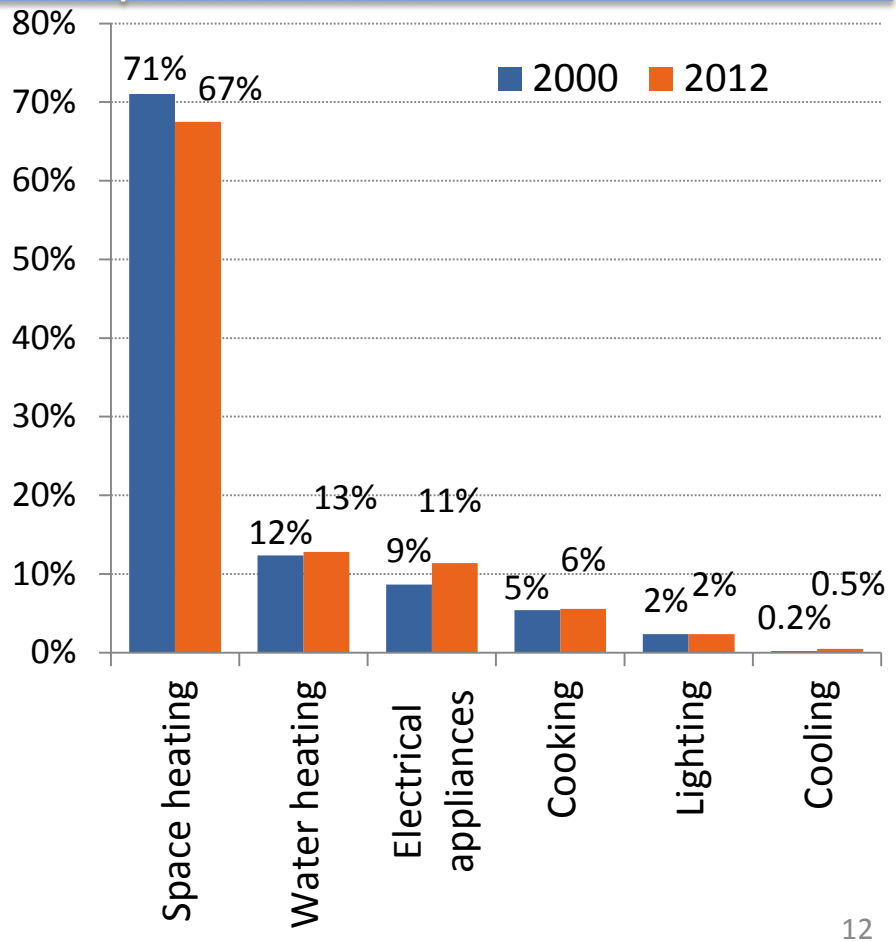


No adjustment for Cyprus and Malta.

- Declining space heating consumption (-25 Mtoe) and share (-4 points);
- Second end-use: water heating (13%);
- Increasing weight for electrical appliances from 9 to 11%;
- Lighting around 2% and negligible contribution of AC.

Household energy consumption in the EU





Odyssee

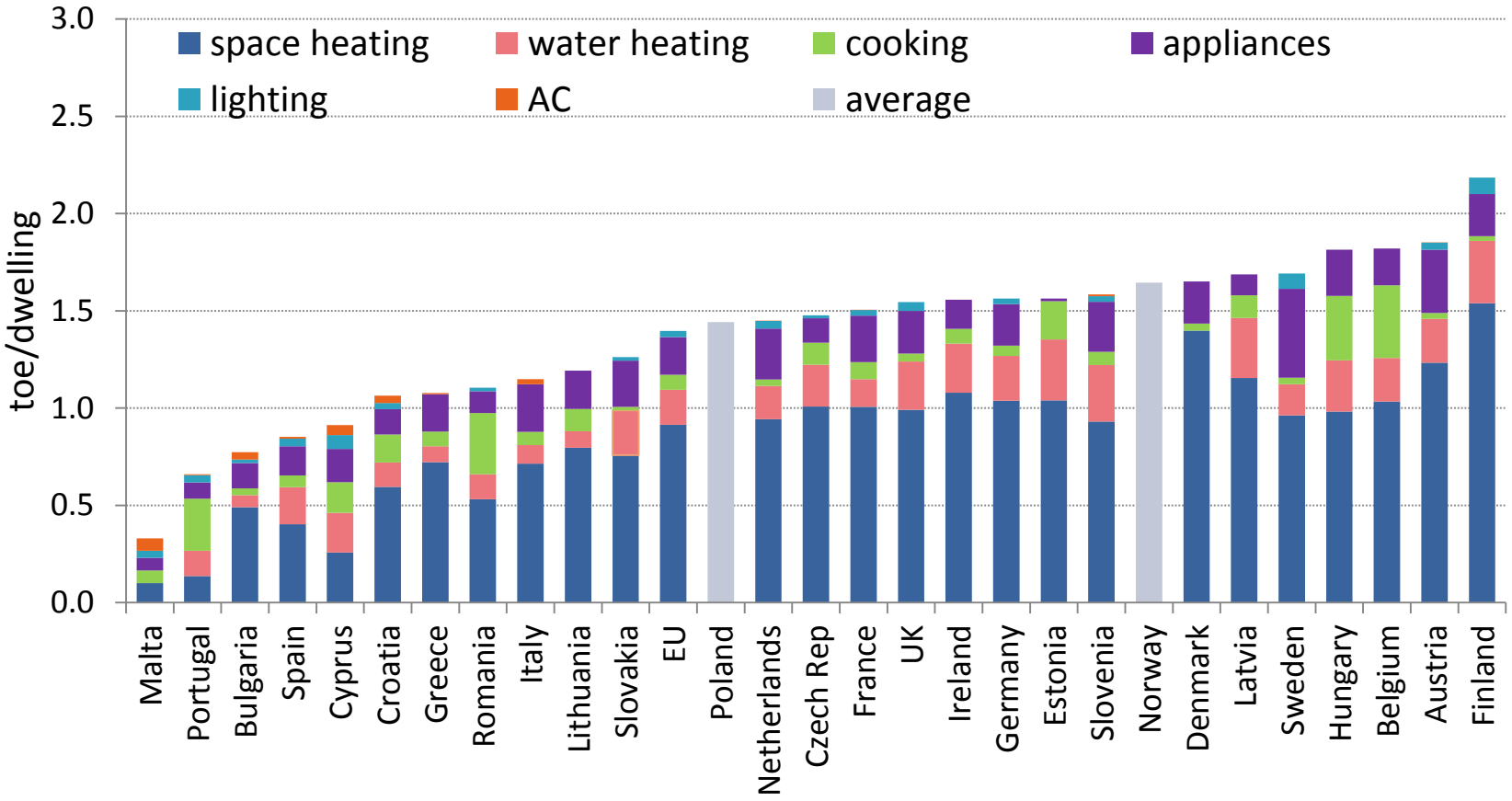
Enerdata

The breakdown of the household energy consumption by end-use differs substantially between member states

For space heating a correlation with cold winters can be expected

AC still represents a marginal share of dwelling consumption

Household energy consumption by end-use (2012)



Odyssee

Enerdata

Outline

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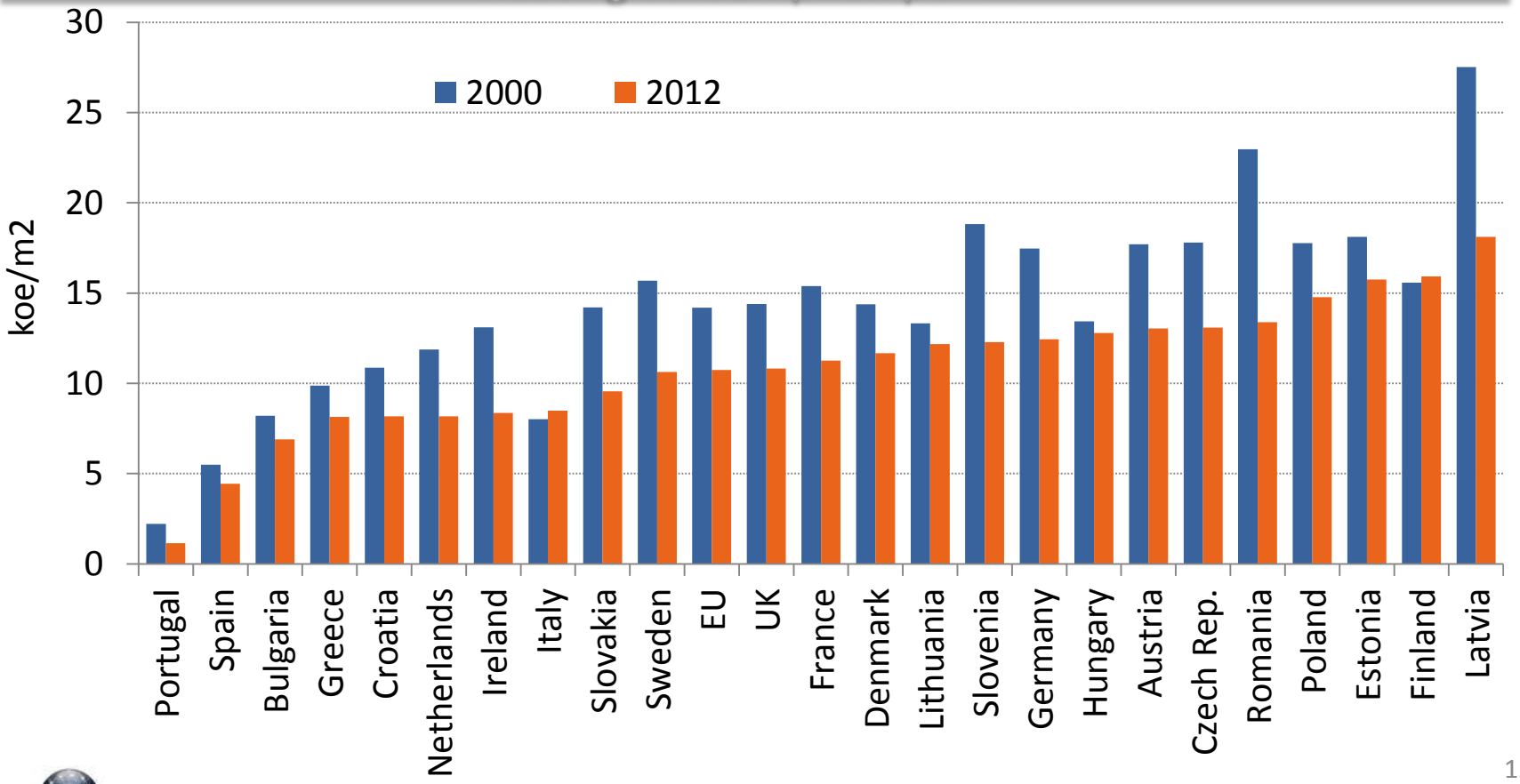
- Decrease of the heating consumption per m2 in all countries, except in Italy and Finland;
- Strong reduction in some 14 countries (~25-30%)
- In some new member countries such as Romania, Slovenia, Latvia and Slovakia the decrease is due to higher price and energy efficiency improvements;

Heating consumption per m²



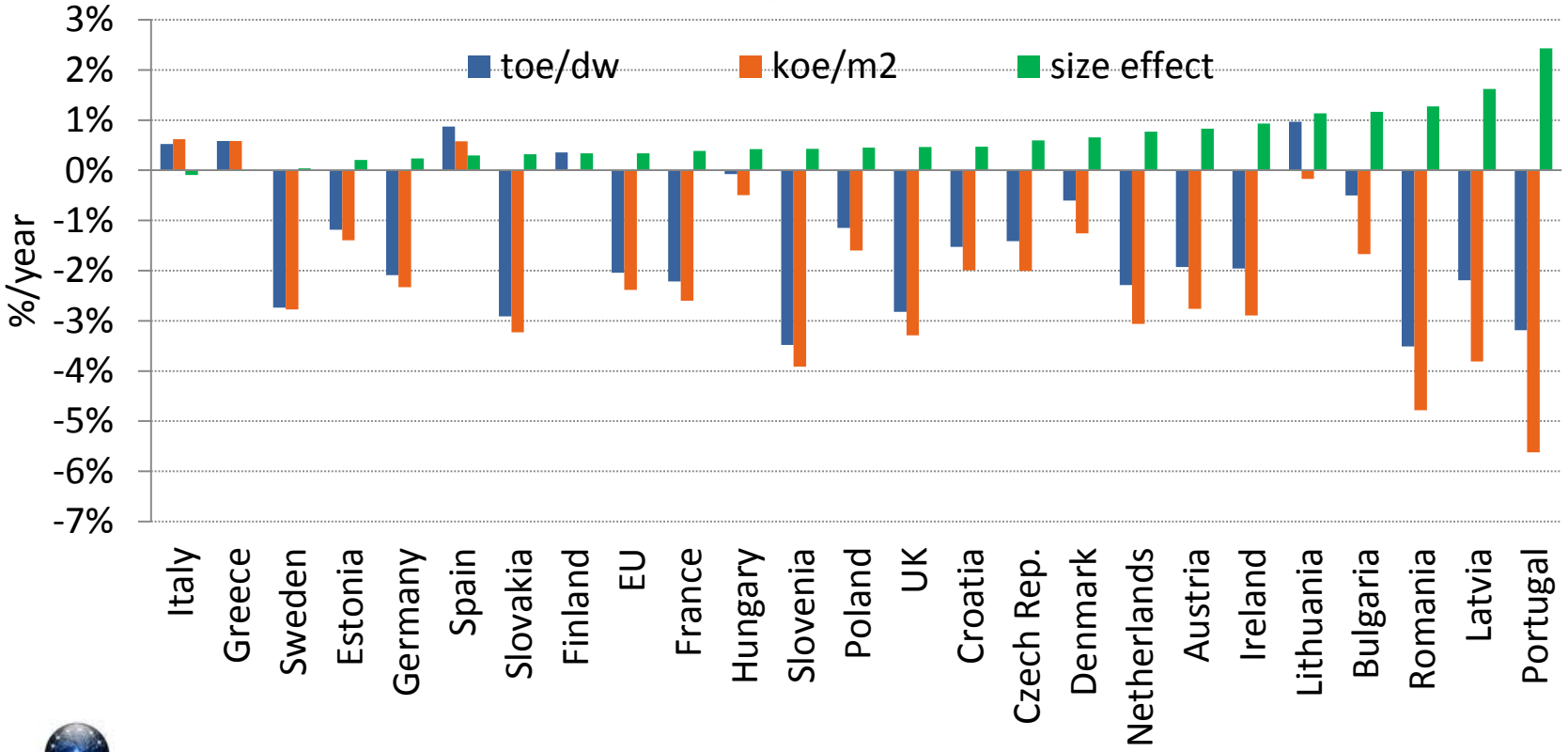
*2010 for Hungary, Estonia

Odyssee

Enerdata

The average dwelling size increased (by 4% since 2000 at EU level reaching 87 m2 per dw. on average), especially in Eastern European countries (about 10%). As a result, energy consumption per dwelling decreased slightly less (2%/year) than consumption per m2 (2.4%/year) in the EU. This means that almost 20% of the energy efficiency progress for thermal uses has been offset, all things being equal, by the larger size of dwellings.

Average consumption per m² vs consumption per dwelling for household for space heating (2000-2011)

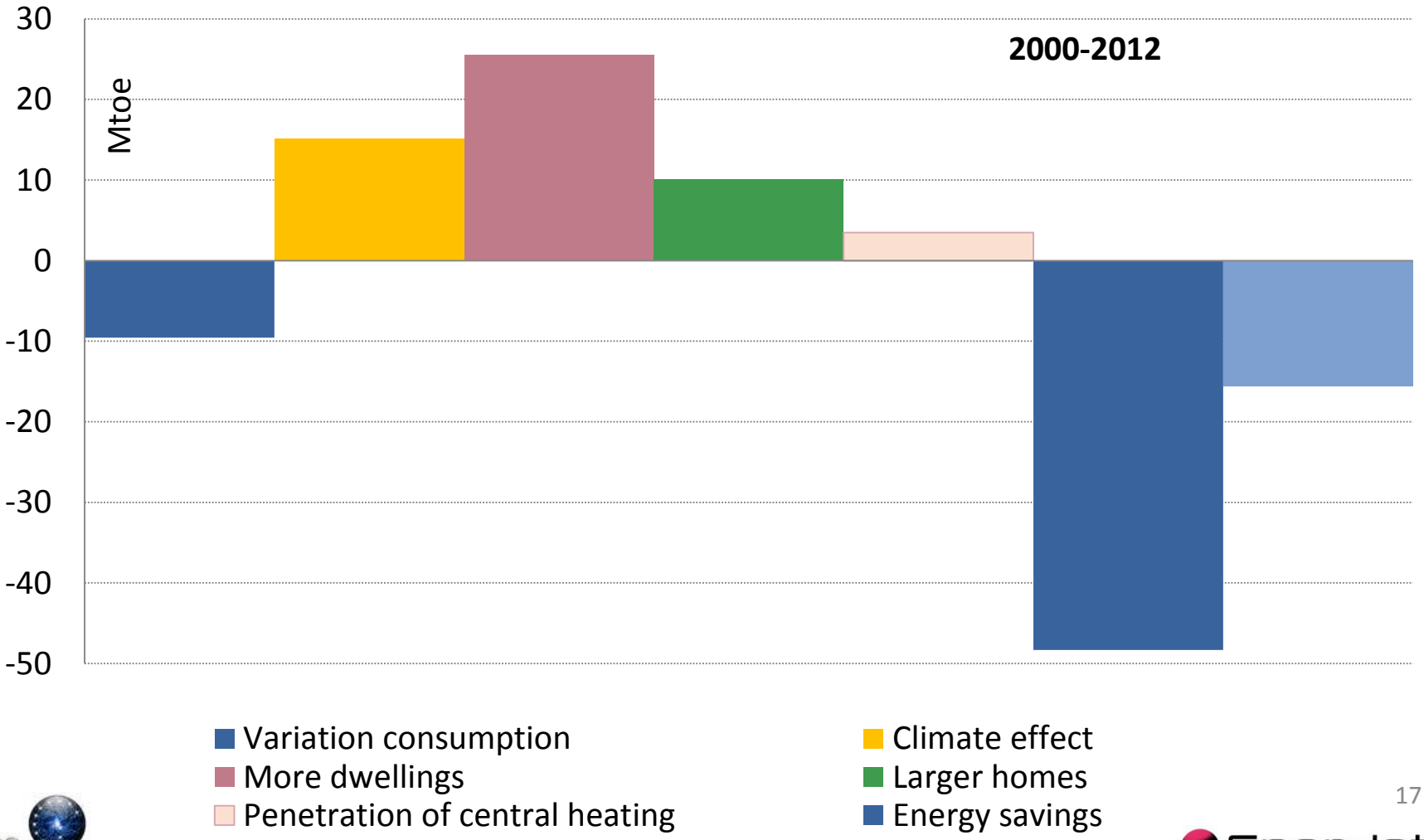


Odyssee

Enerdata

Larger dwellings and diffusion of central heating in the south of Europe have offset around 1/3 of energy efficiency gains at EU level. Heating behaviour contributed to decrease heating consumption per dwelling since 2000.

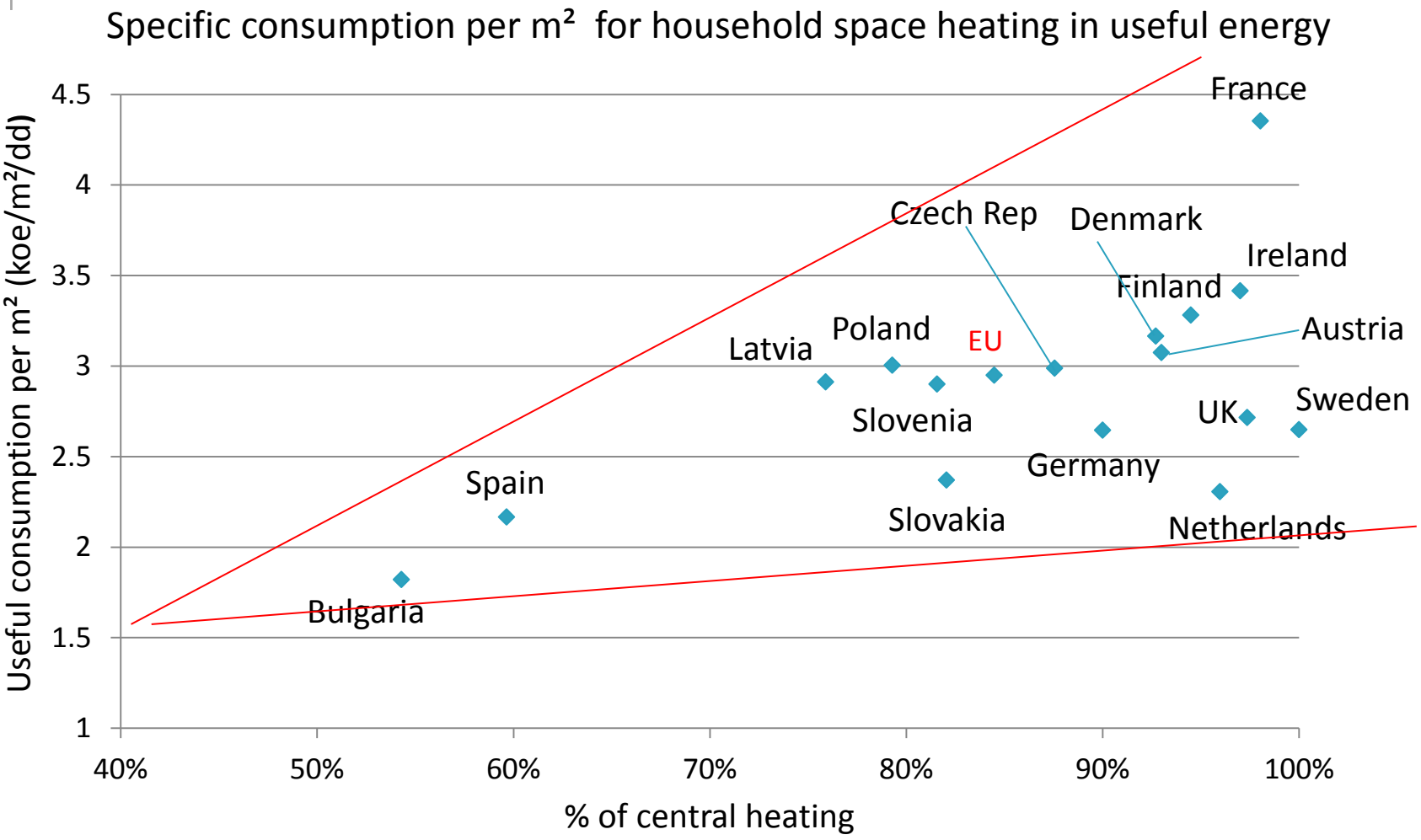
Drivers of the variation in heating consumption per dwelling



Odyssee

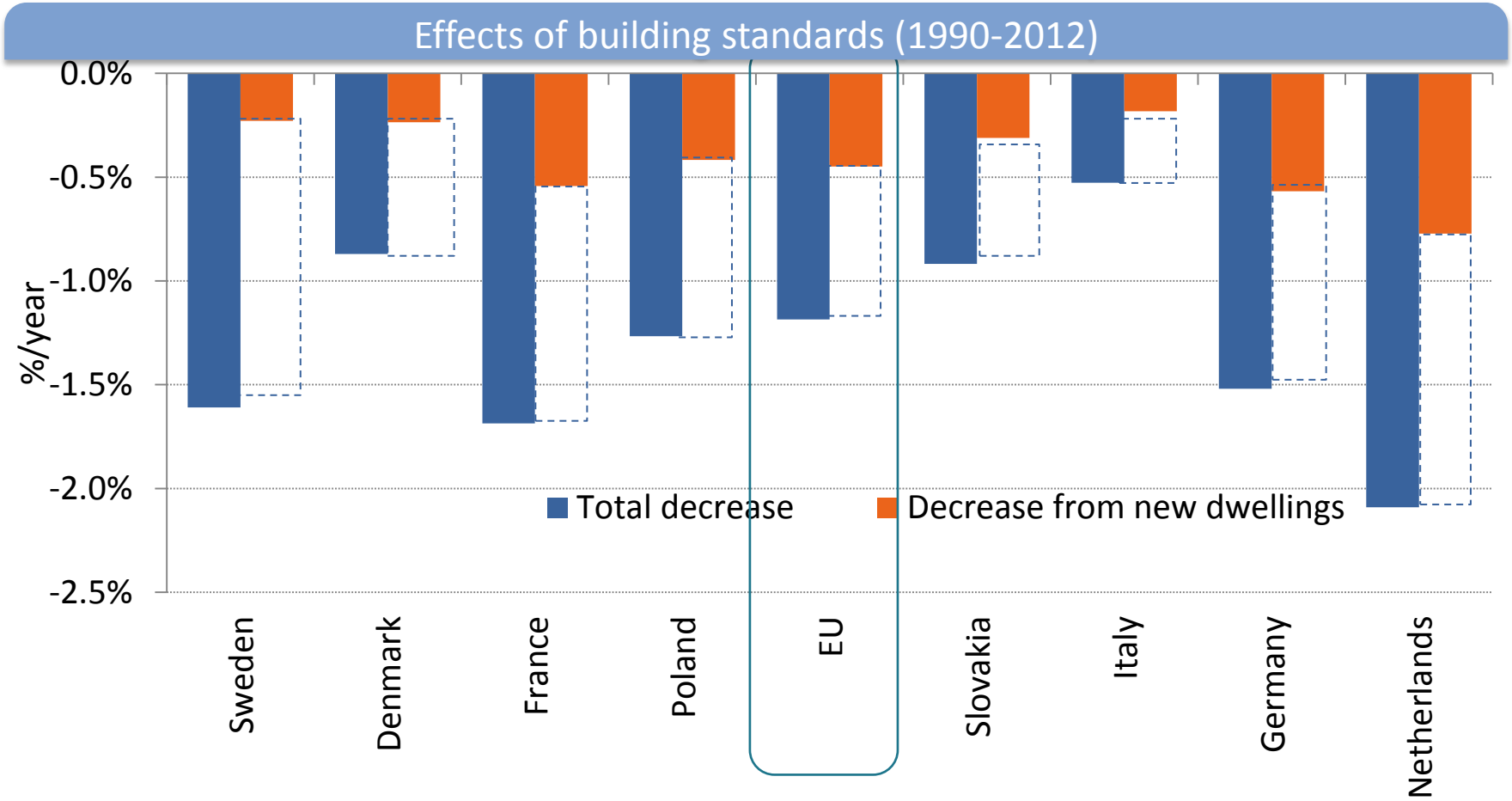
Enerdata

Indicators of benchmarking: case of space heating



Central heating, which includes district heating, block heating, individual boiler heating and electric heating, implies that all the rooms are well heated, as opposed to room heating, where generally a stove provides heat to the main room only.

- The introduction of new dwellings with better insulation since 1990 contributed to decrease the unit consumption per dwelling.
- The magnitude of the impact varies with the countries, depending on the number of standards upgrades, their severity and the volume of construction : 14% for Sweden, around 32% for France, 34% for Italy, 36-38% for the EU, Denmark, Netherlands and Poland.



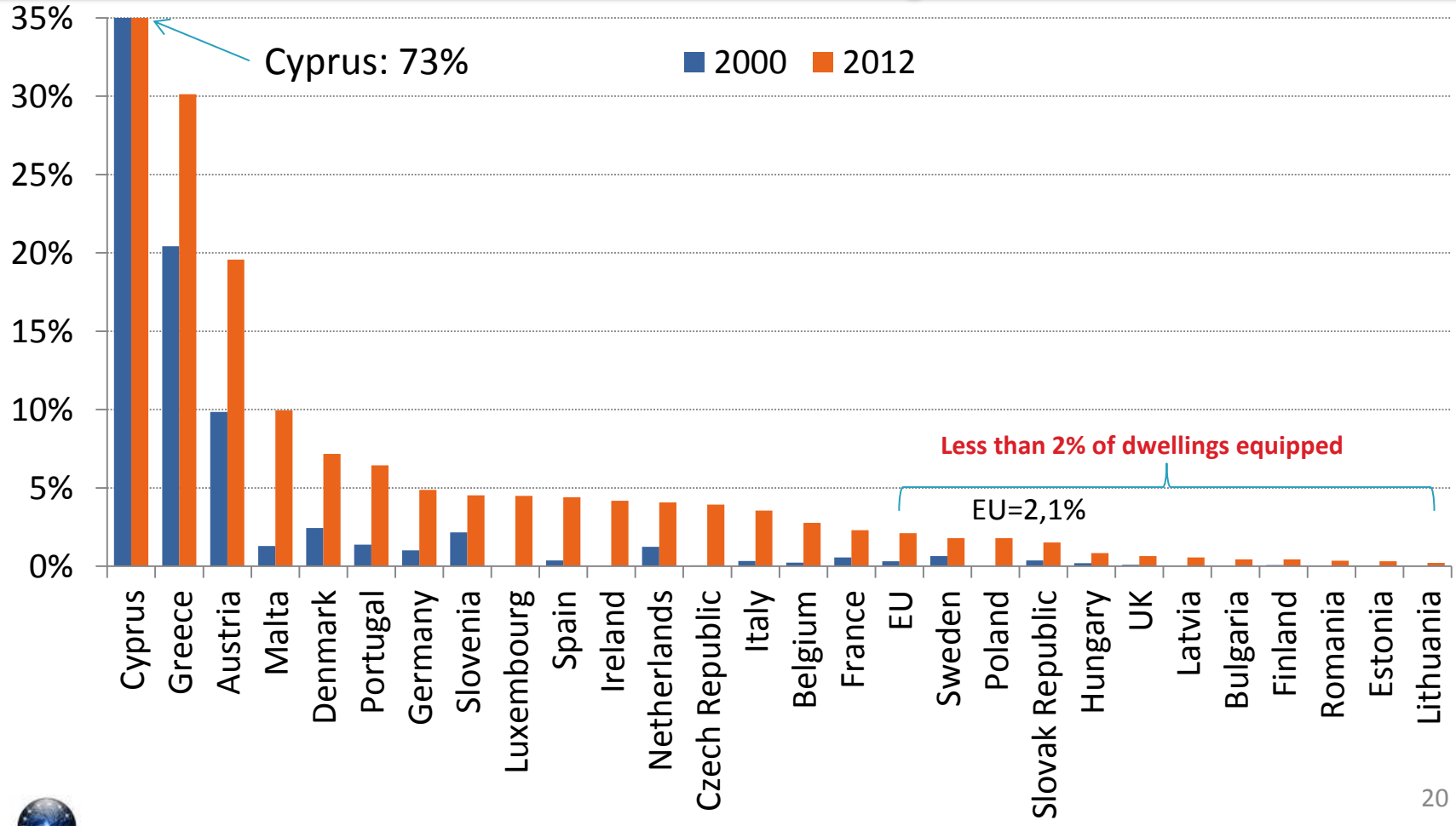
Odyssee

Enerdata

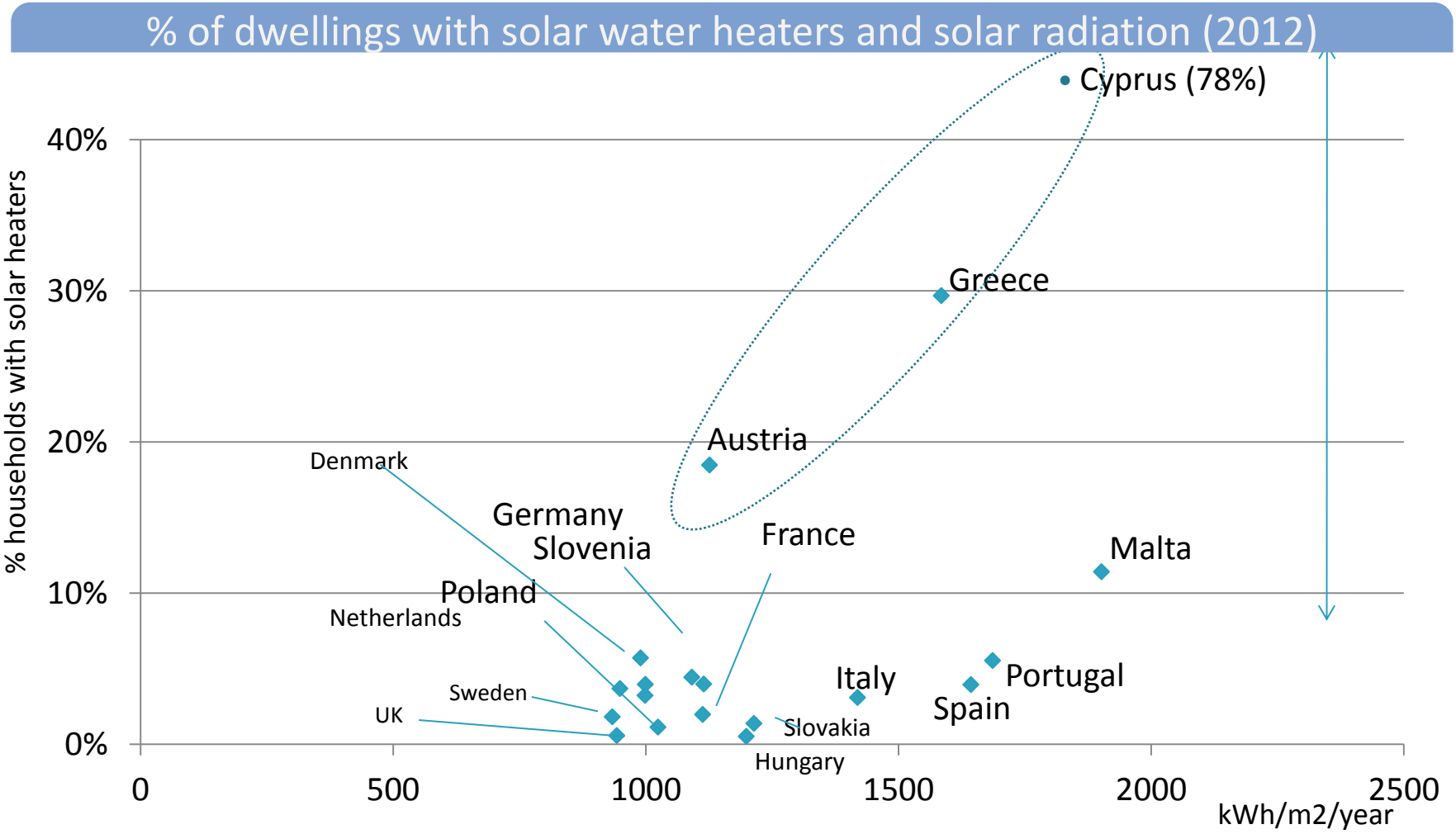
Austria is the benchmark for countries with medium solar radiation (about 20% in 2012) and Cyprus for countries with good solar radiation (about 73%), followed by Greece (30%);

Largest progression in Cyprus, Greece, Malta and Austria (about 1 point per year).

Diffusion of solar water heaters: % of dwellings of solar water heaters



Benchmarking of the penetration of solar water heaters should be related to the annual solar radiation: Austria is the benchmark for countries with medium solar radiation (from 3% in 1990 to 18% to 2011) and of course Cyprus for countries with good solar radiation



Outline

1. Overall energy consumption and drivers
2. Heating and water heating (solar)
3. **Overall electricity uses**
4. Electrical appliances and lighting
5. Large appliances
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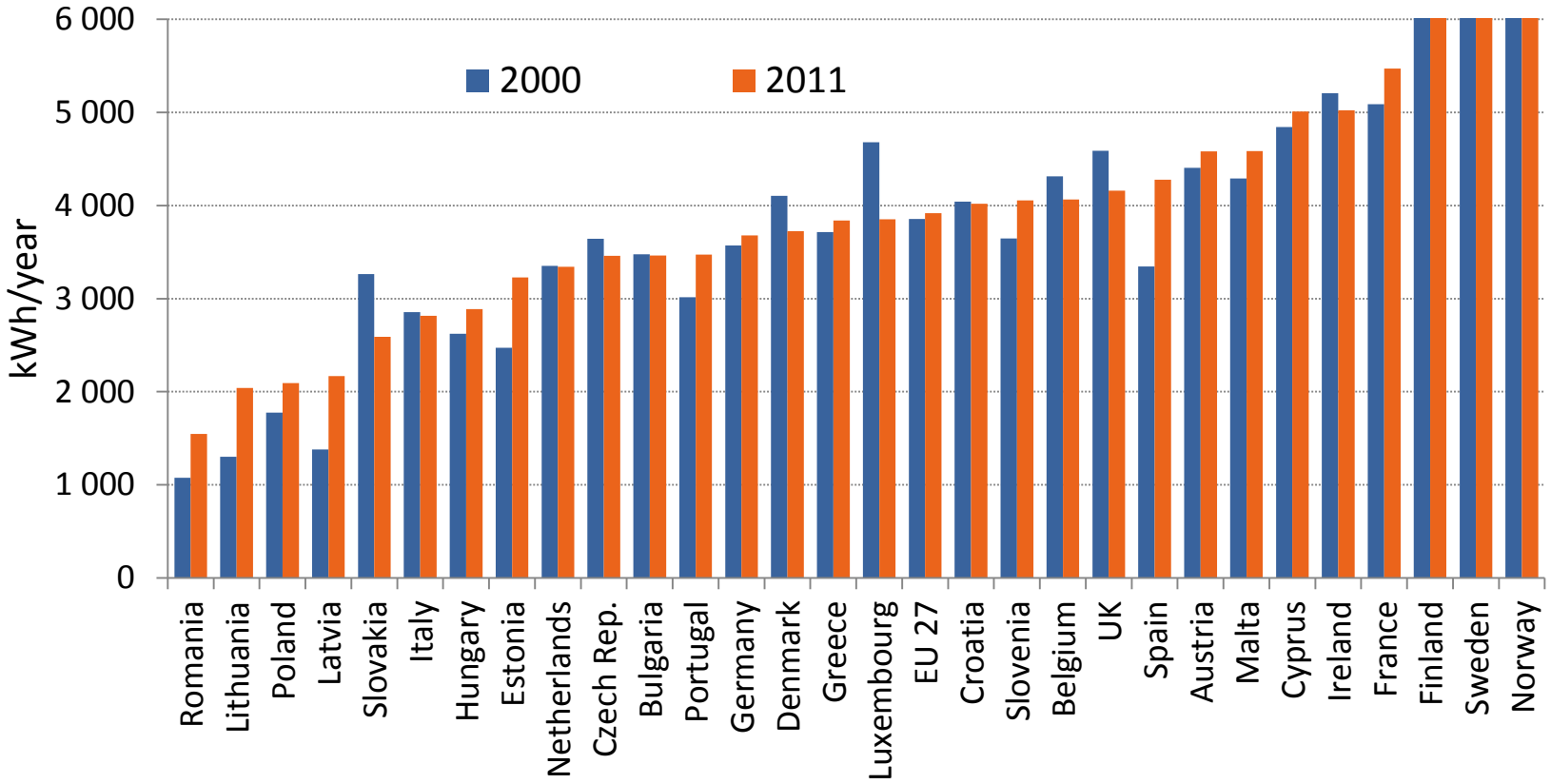
- Very unequal level of electricity consumption per household: from around 2000 kWh (Romania and Baltic countries) to around 5000 kWh in France , Cyprus and Ireland and very high levels in Finland, Sweden and Norway (around 8500, 9500 and 16 000 kWh respectively);
- Heterogeneity due to thermal uses, different level of appliance ownership and energy efficiency.

Electricity consumption per dwelling



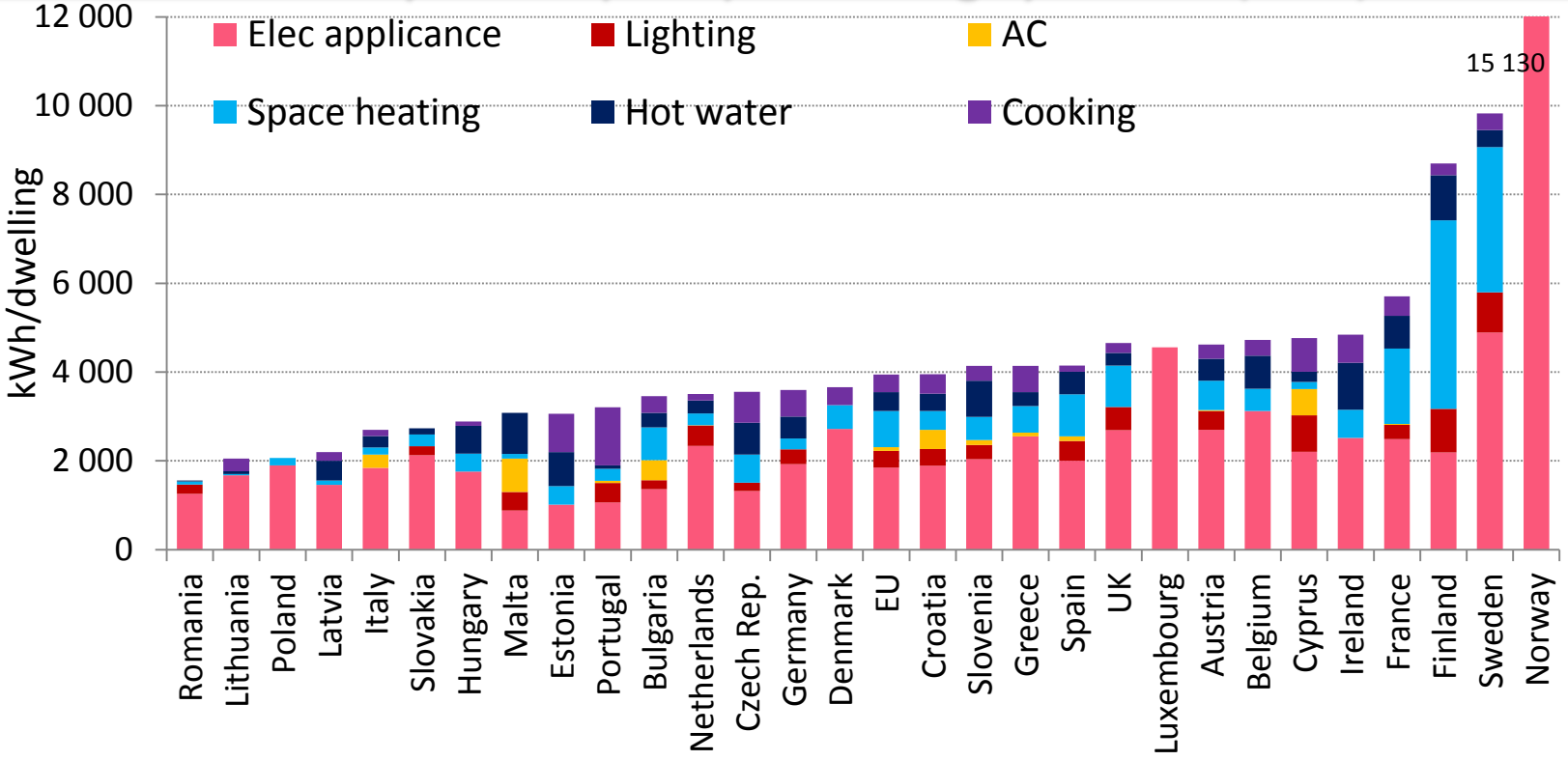
2010 for Estonia and Hungary

Odyssee

Enerdata

- Thermal uses of electricity important in Finland, Estonia and Czech Rep. (> 60%), in Portugal, France and Ireland (around 50%) and in Spain, Hungary, Slovenia and Sweden (around 40%).
- Consumption for electrical appliances, lighting and cooling in a range of 1500 kWh/yr for Romania and Baltic countries to 3800 kWh for Cyprus, Malta, Sweden and Finland (2300 kWh for the EU average) .

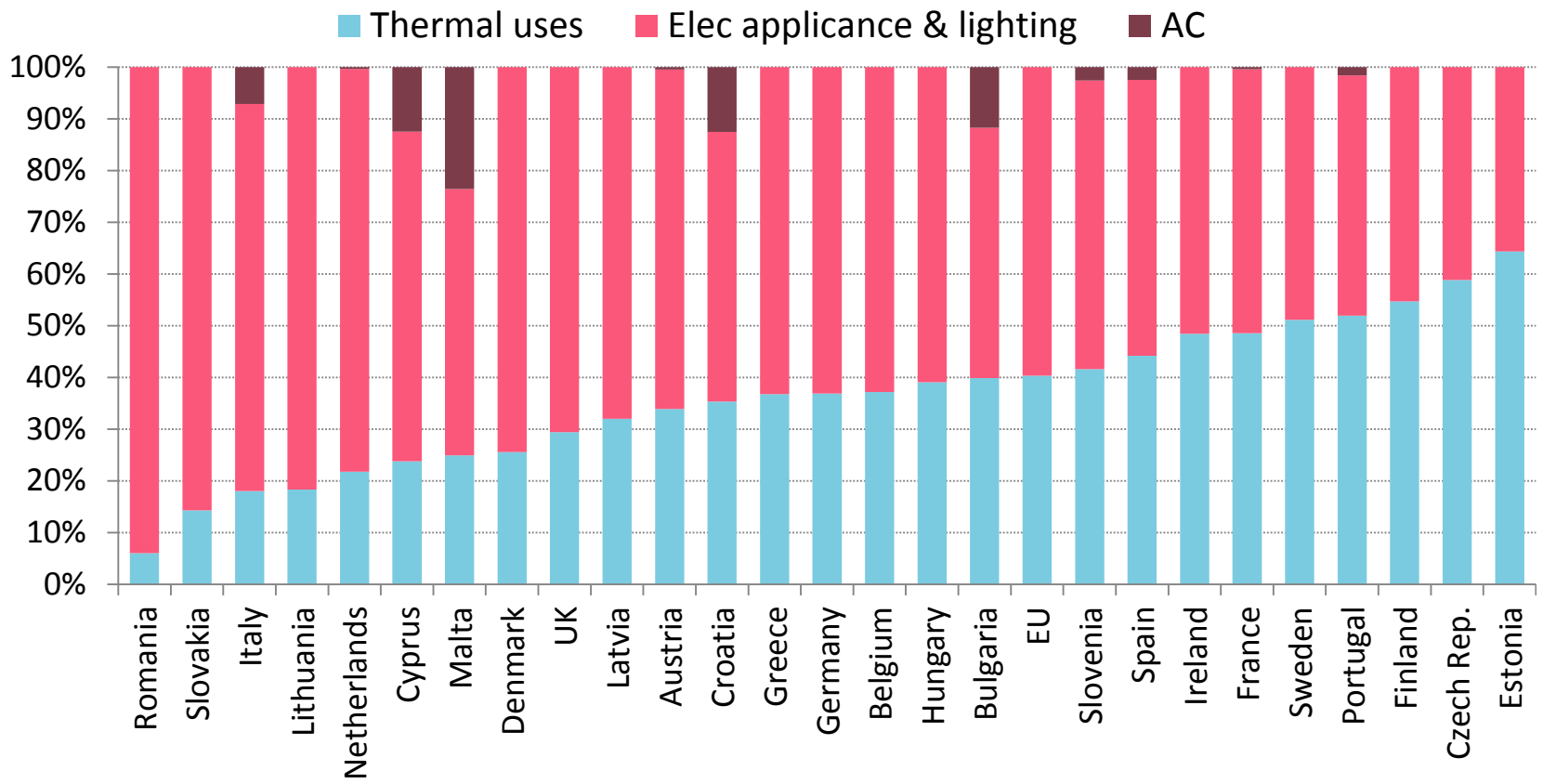
Electricity consumption per dwelling by end-use (2012)



2010 for Hungary and Estonia; breakdown not available for Luxembourg and Poland

- Thermal uses of electricity important above 50% in Portugal, Sweden, Finland, Czech Republic and Estonia.
- Still low share of AC (Air Conditioning) in southern countries (10-15%) of total electricity consumption (highest share for Malta)

Electricity consumption per dwelling: share of thermal uses (2011)

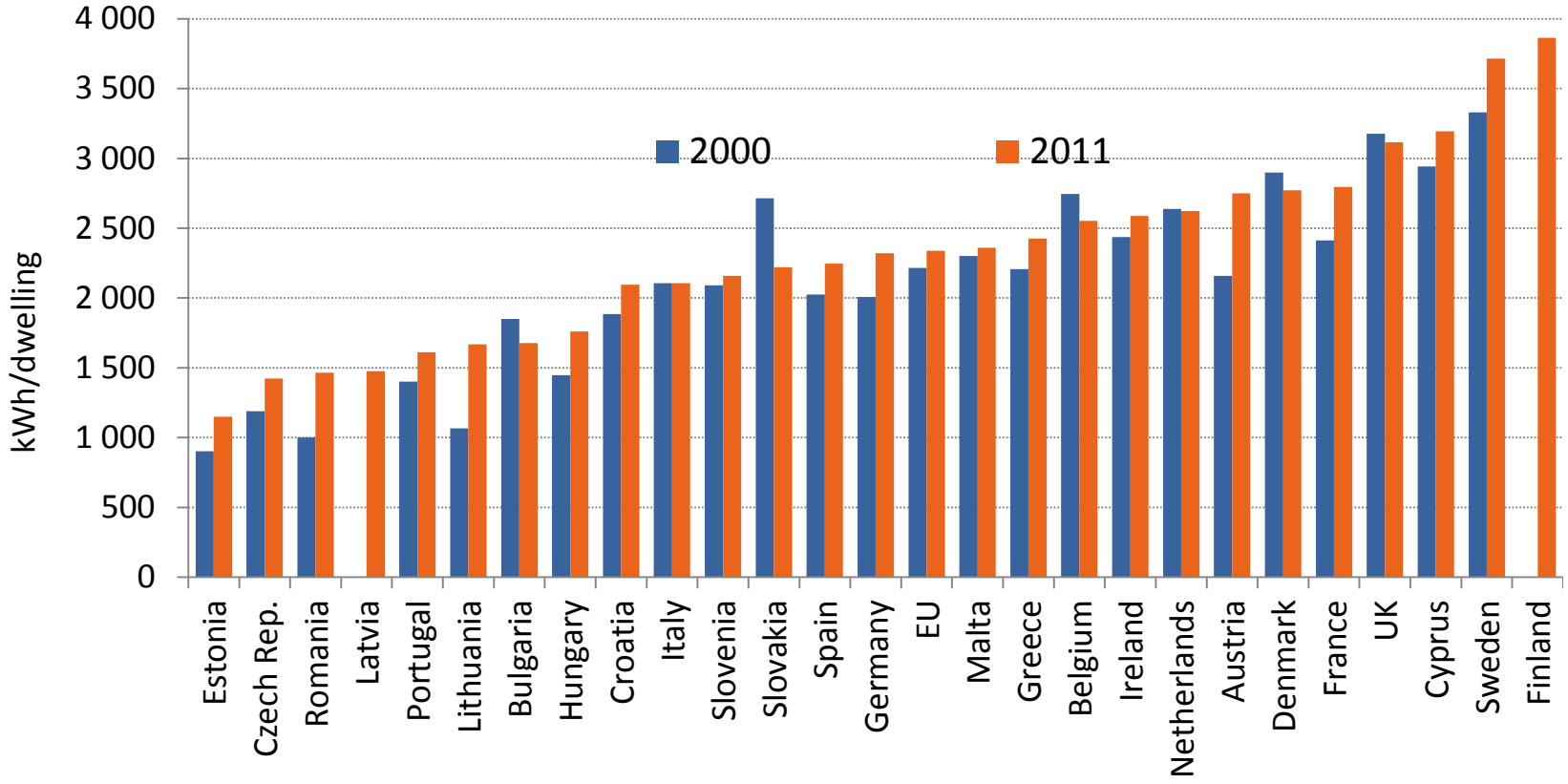


Odyssee

Enerdata

Among EU countries there are significant discrepancies in the electricity consumption for electrical appliances and lighting: in a range from 1000-1500 kWh (Estonia, Czech Republic, Romania, Latvia and Portugal) to around 3000 kWh in UK and Cyprus and almost 4000 kWh in Finland and Sweden.

Electricity consumption per dwelling for electrical appliances & lighting



2010 for Hungary, Malta and Estonia

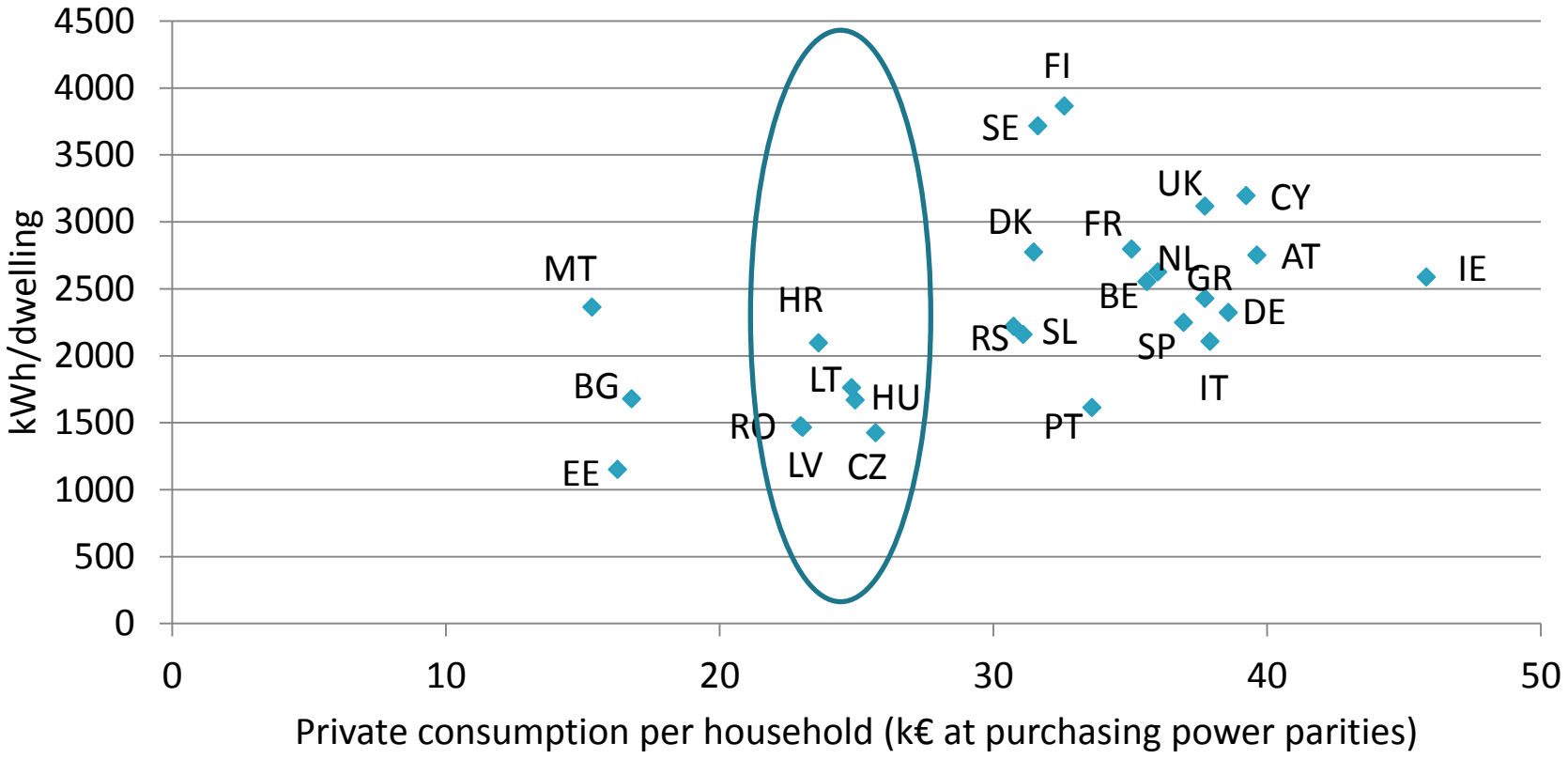
Odyssee

Enerdata

Electricity use for electrical appliances and lighting is only partially correlated with the average income.

For a given level of income, there exist huge disparities reflecting differences in lifestyles and equipment efficiency

Consumption for electrical appliances and lighting and private consumption (2011)

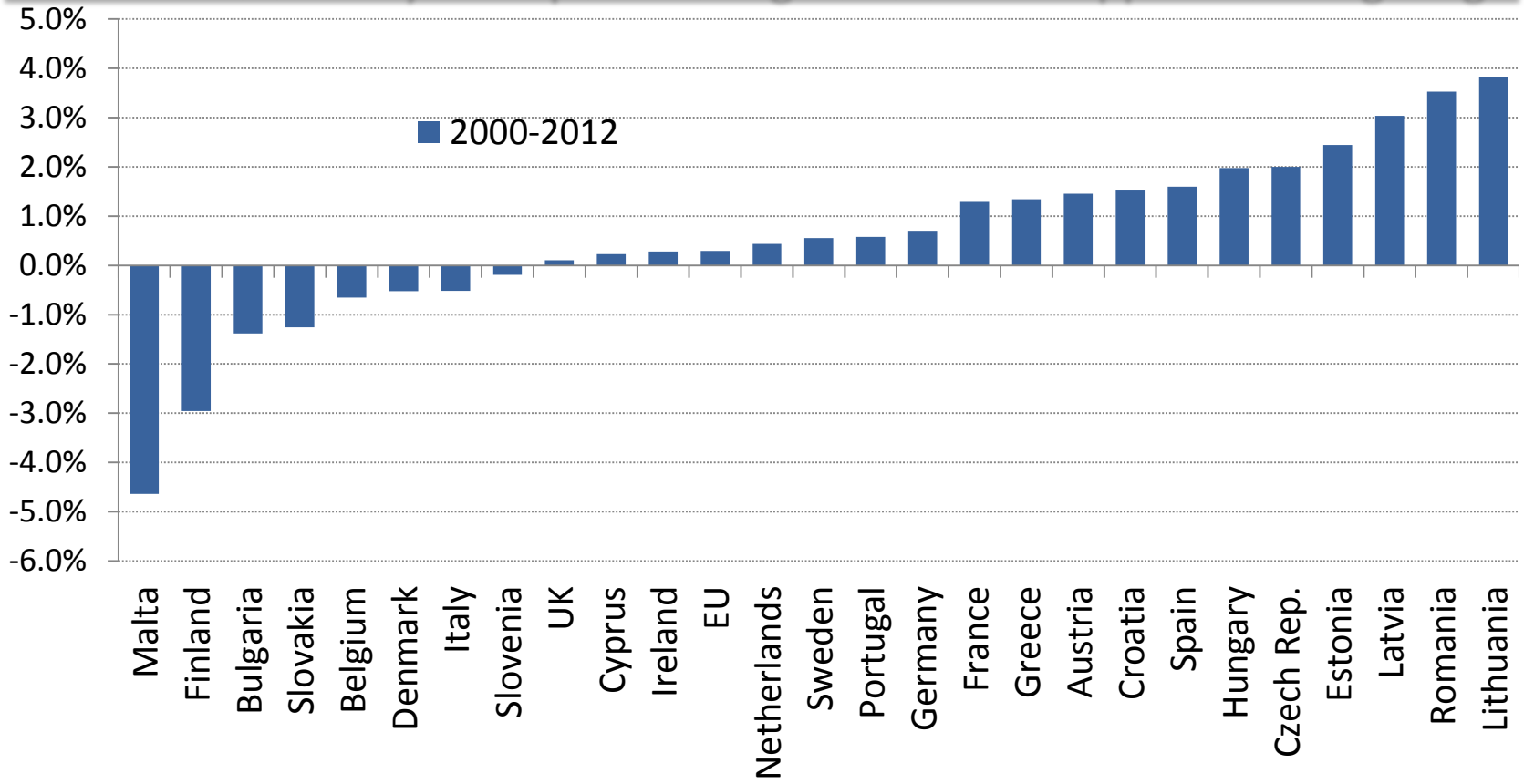


Odyssee

Enerdata

- At EU average, electricity consumption of electrical appliances and lighting increased by 0.3%/year since 2000 with a very unequal progression across countries;
- Increasing trend in almost all countries since 2000 (above 2%/year for 6 countries); on the opposite decreasing trends for 8 countries

Trends in electricity cons. per dwelling for electrical appliances & lighting



Odyssee

Enerdata

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2. Heating and water heating (solar)
3. Overall electricity consumption trends
4. **Electrical appliances**
5. Large appliances
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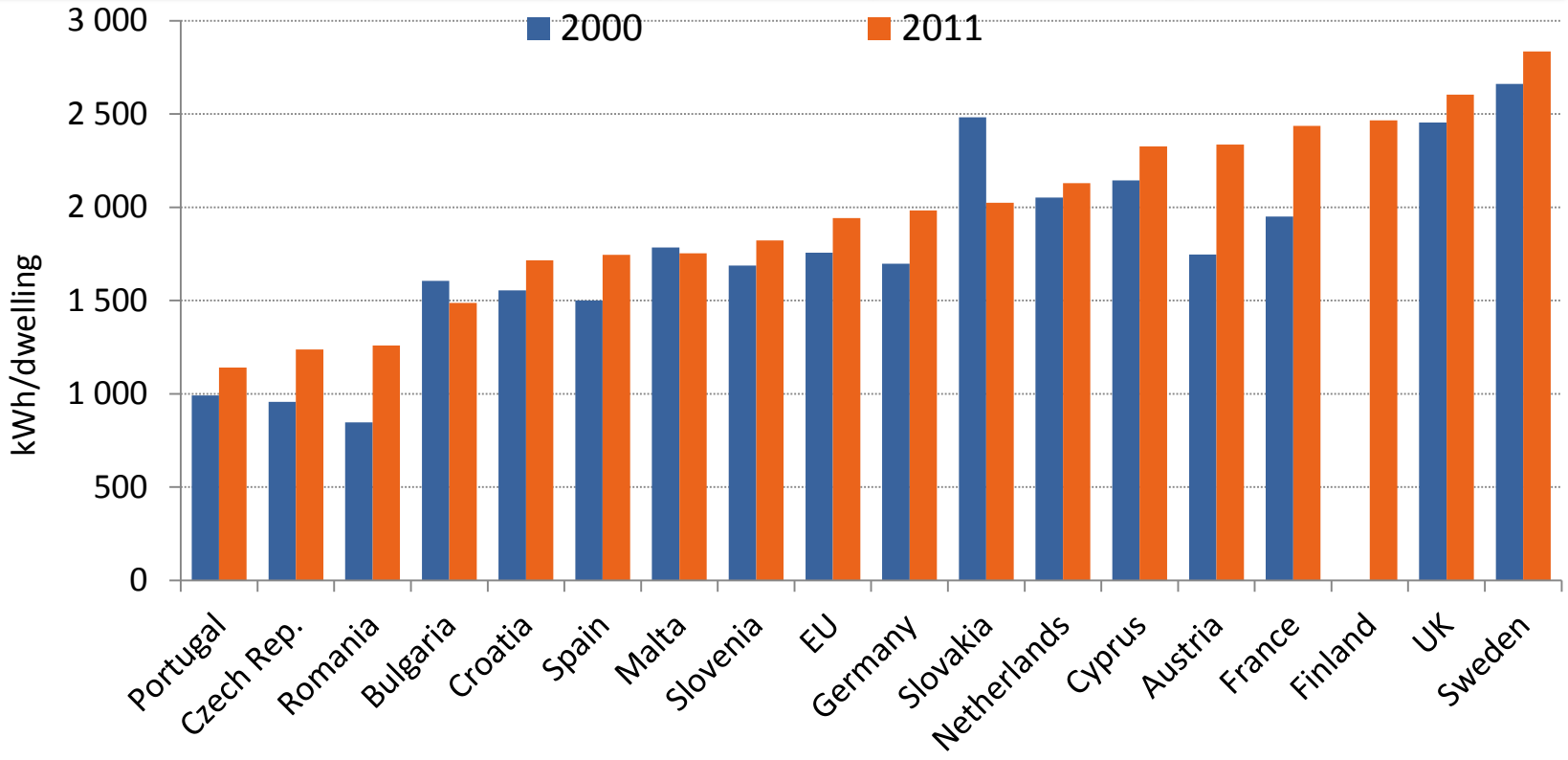
Among EU countries there are significant discrepancies in the electricity consumption for electrical appliances: in a range from 1200 kWh (Portugal, Czech Rep and Romania) to 2500 kWh (France, Finland and UK) and even 2800 kWh in Sweden.

Electricity consumption per dwelling for electrical appliances

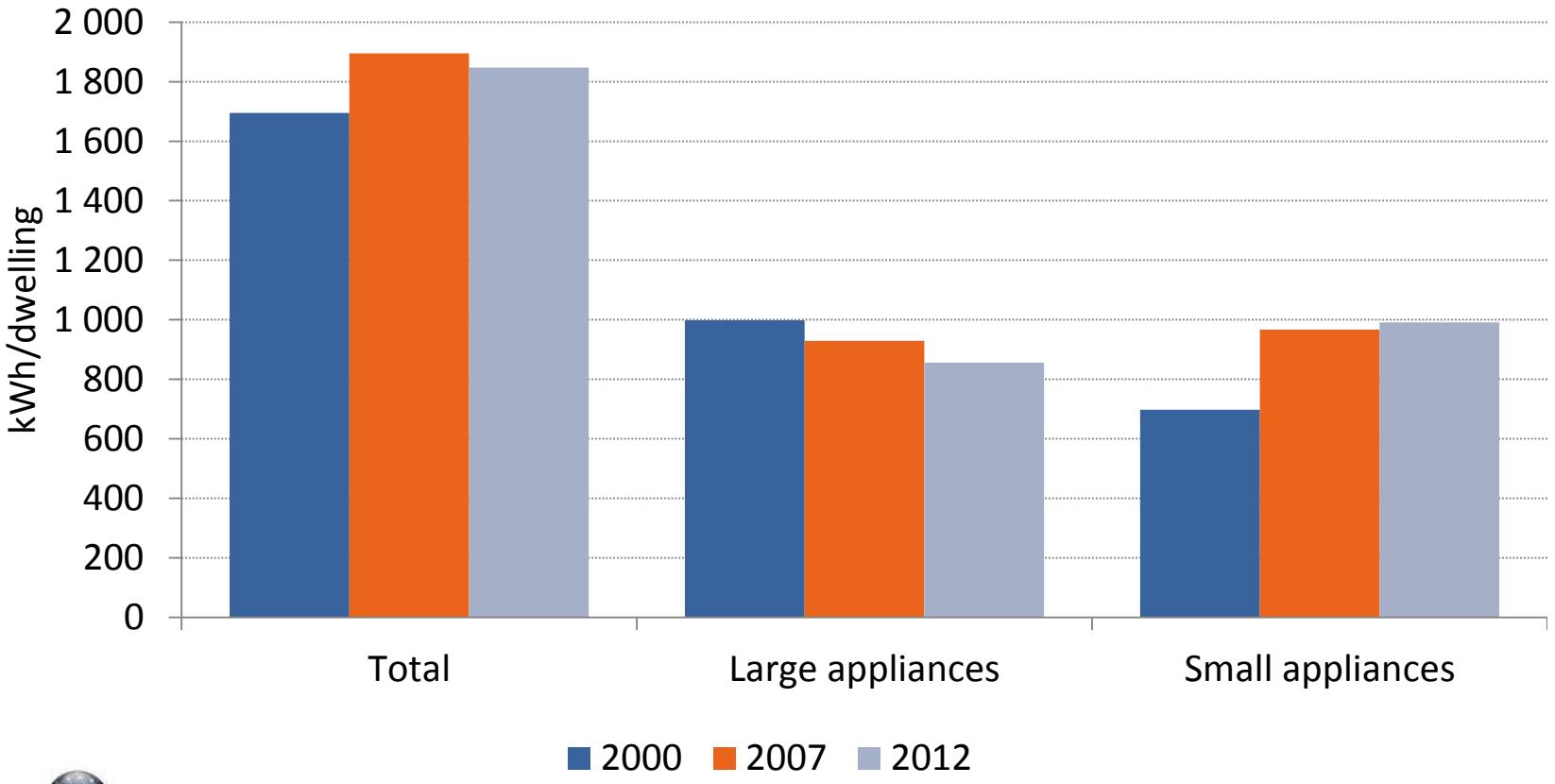


Odyssee

Enerdata

- In 2012 households consume around 40% more for small appliances than in 2000 (~ 990 kWh/year up from 700 kWh/year);
- Slight decrease of the annual consumption per dwelling for large appliances (- 142 kWh).

Consumption of electrical appliances per dwelling by type of appliance (EU)



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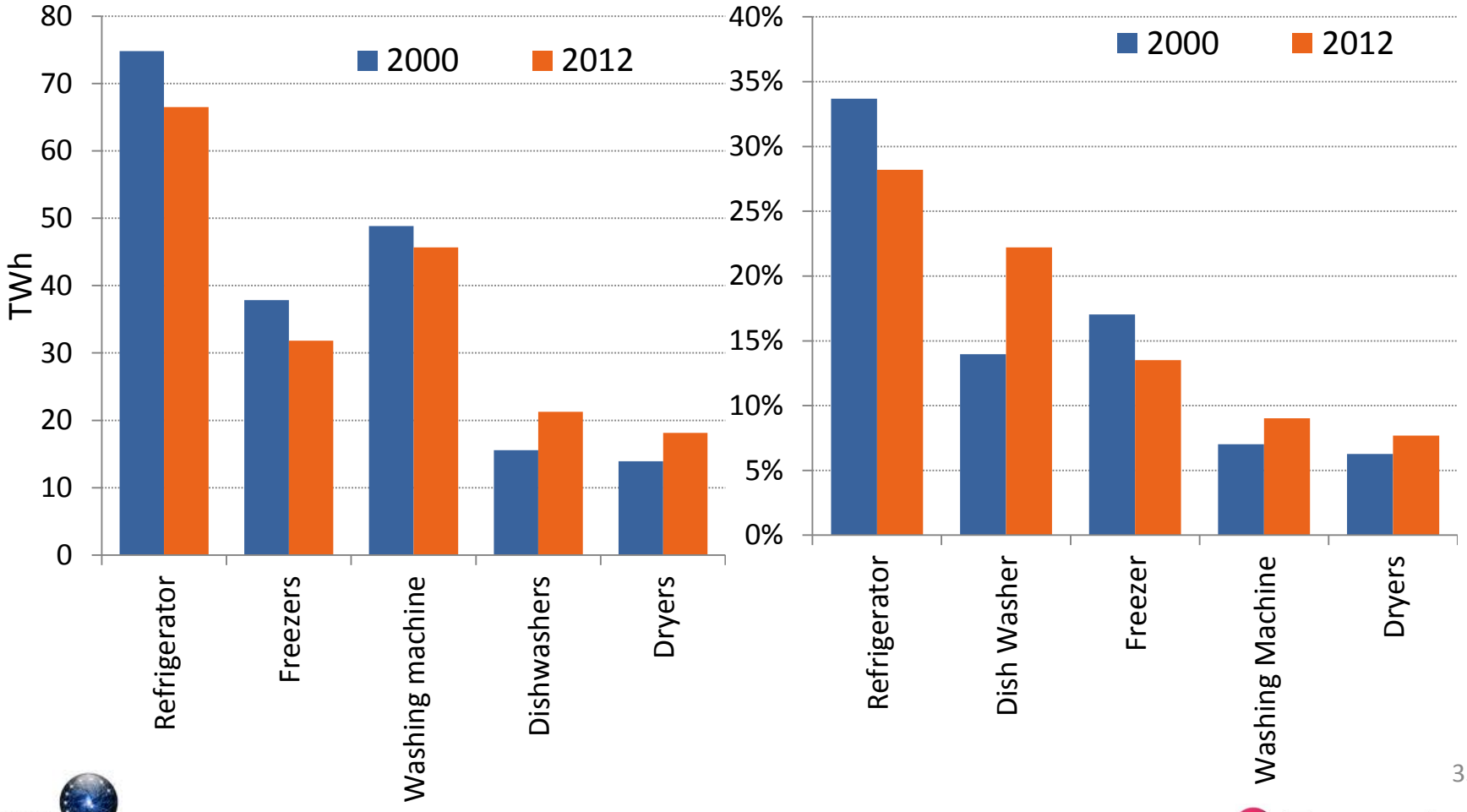
- Clothe dryers and dishwashers increased their consumption over the period 2000-2012 due to higher penetration rates;
- Refrigerators, freezers and washing machines' consumption decreased, mainly due to substantial electricity savings with the diffusion of efficient new equipment.

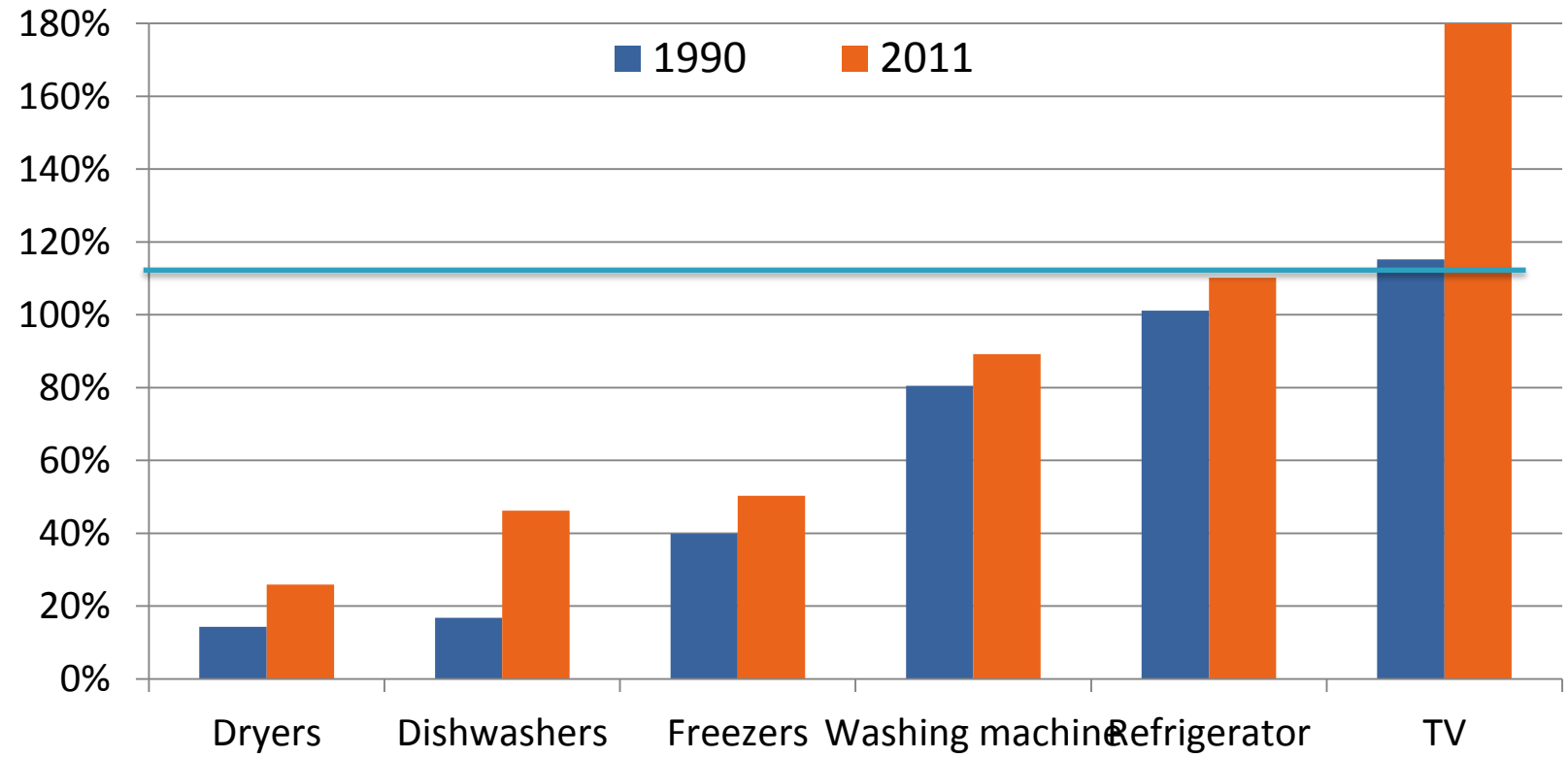
Consumption of large electrical appliances by type (EU 27)



Odyssee

Enerdata

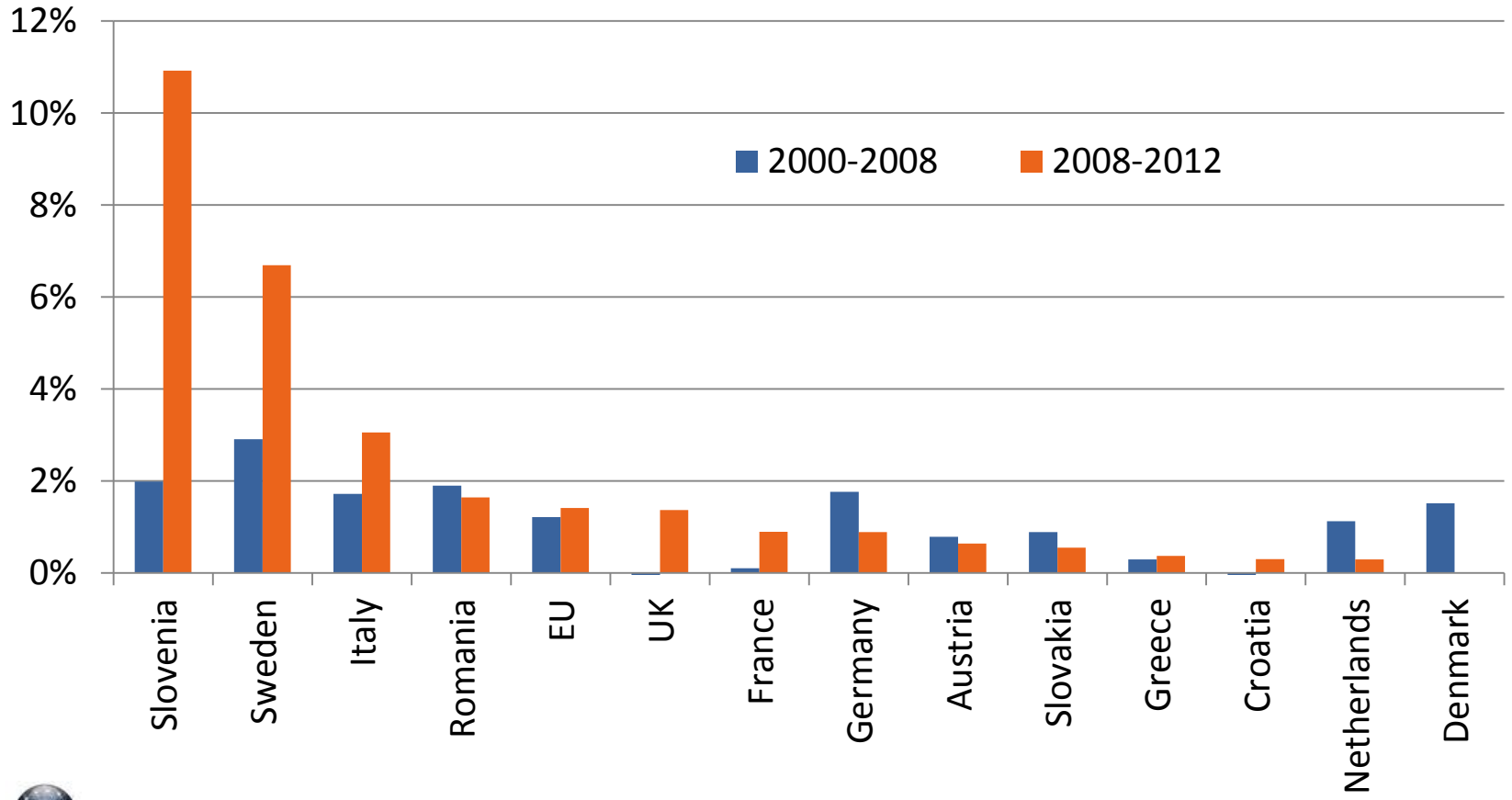
Average number of appliance per dwelling in the EU



- Large improvement for energy efficiency of large between 2008 and 2012 (1.4%/y at EU level).

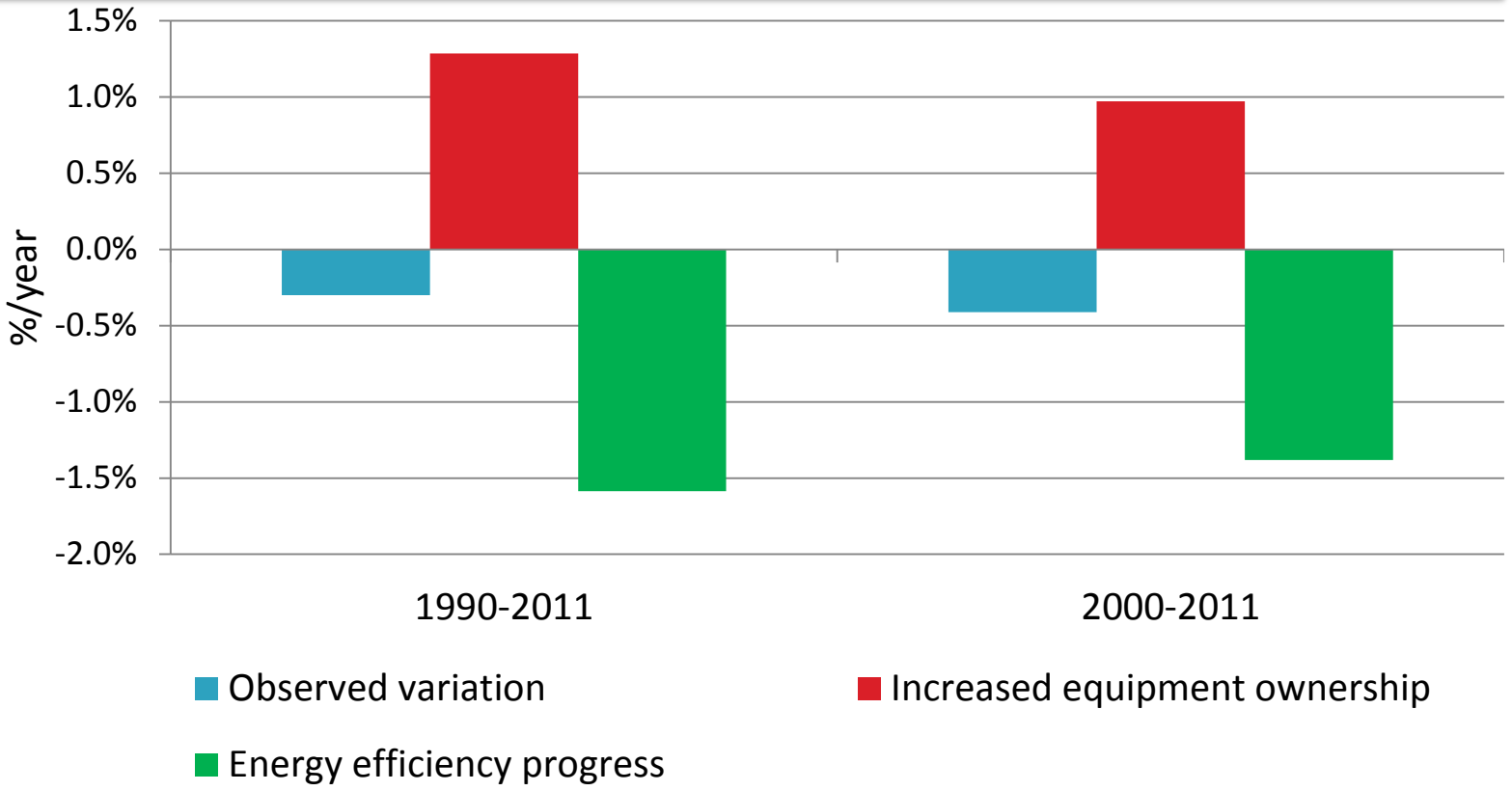
With some countries registering very strong progress (Slovenia , Sweden, Italy): ~3-11%/year;

Energy efficiency trends for large appliances (ODEX) (2000=100)



- Almost all energy efficiency gains over the last years have been offset by an increase in equipment ownership
- As a result, electricity consumption per household for large appliances is only slightly lower in 2011 than in 2000.

Variation of the consumption per dwelling for large appliances (EU)

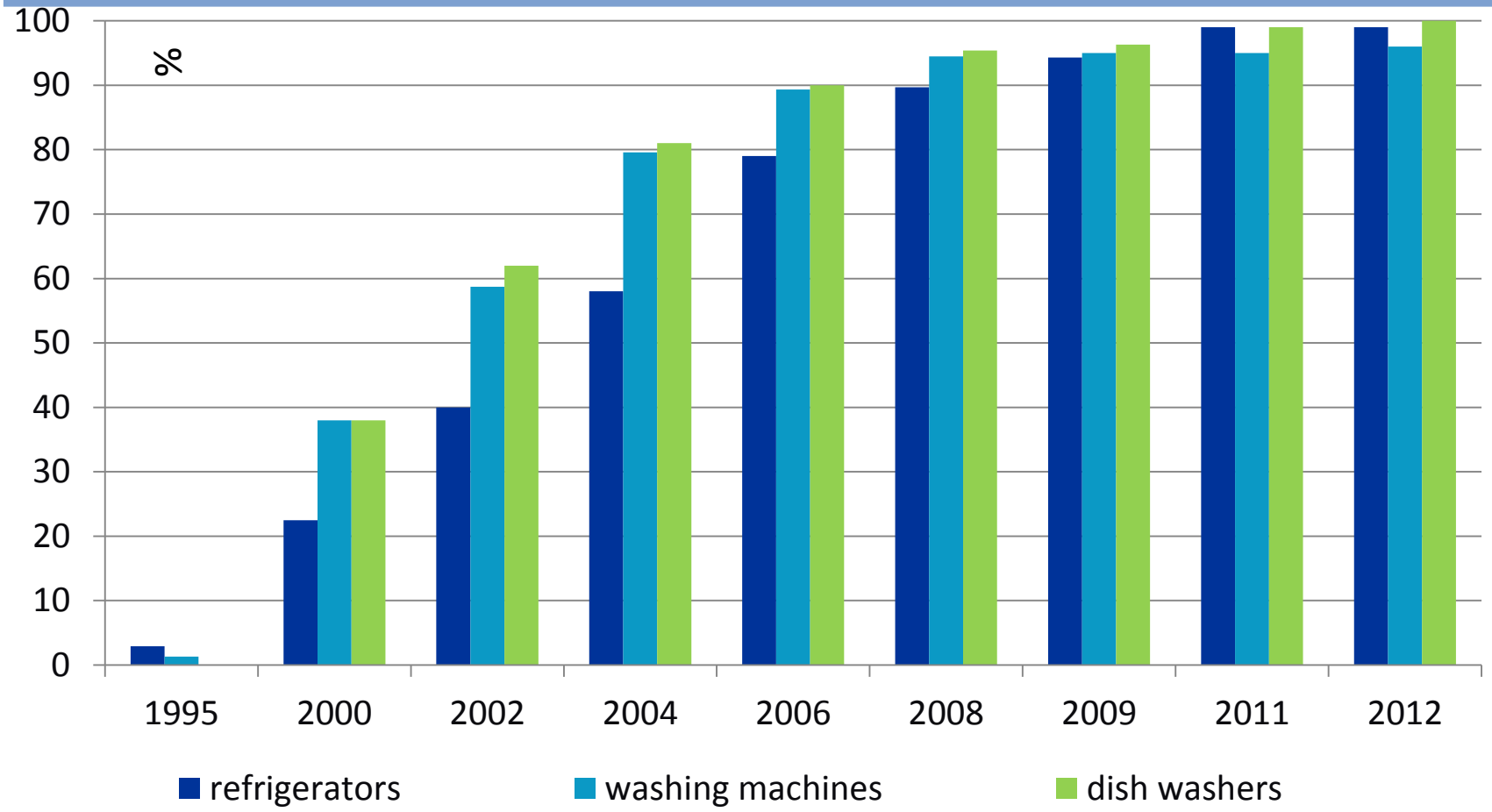


Odyssee

Enerdata

Almost 90% of refrigerators, washing machines and dishwashers with label equal or above A class; Nearly 1/3 of washing machine sold in 2012 are A++/A+++

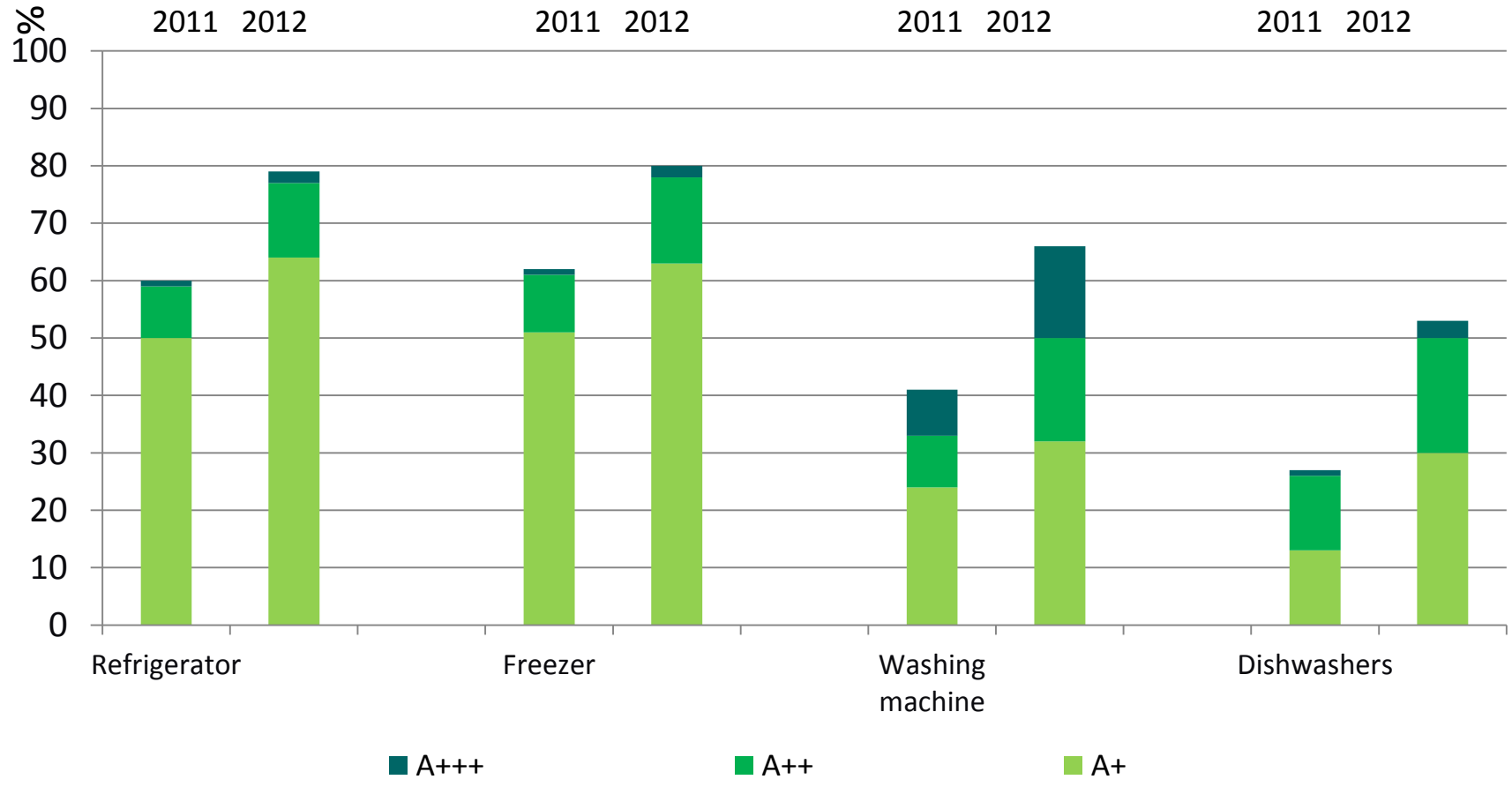
Market share of labels A, A+ and A++ for cold and washing appliances (EU)



Source GFK, EEDAL

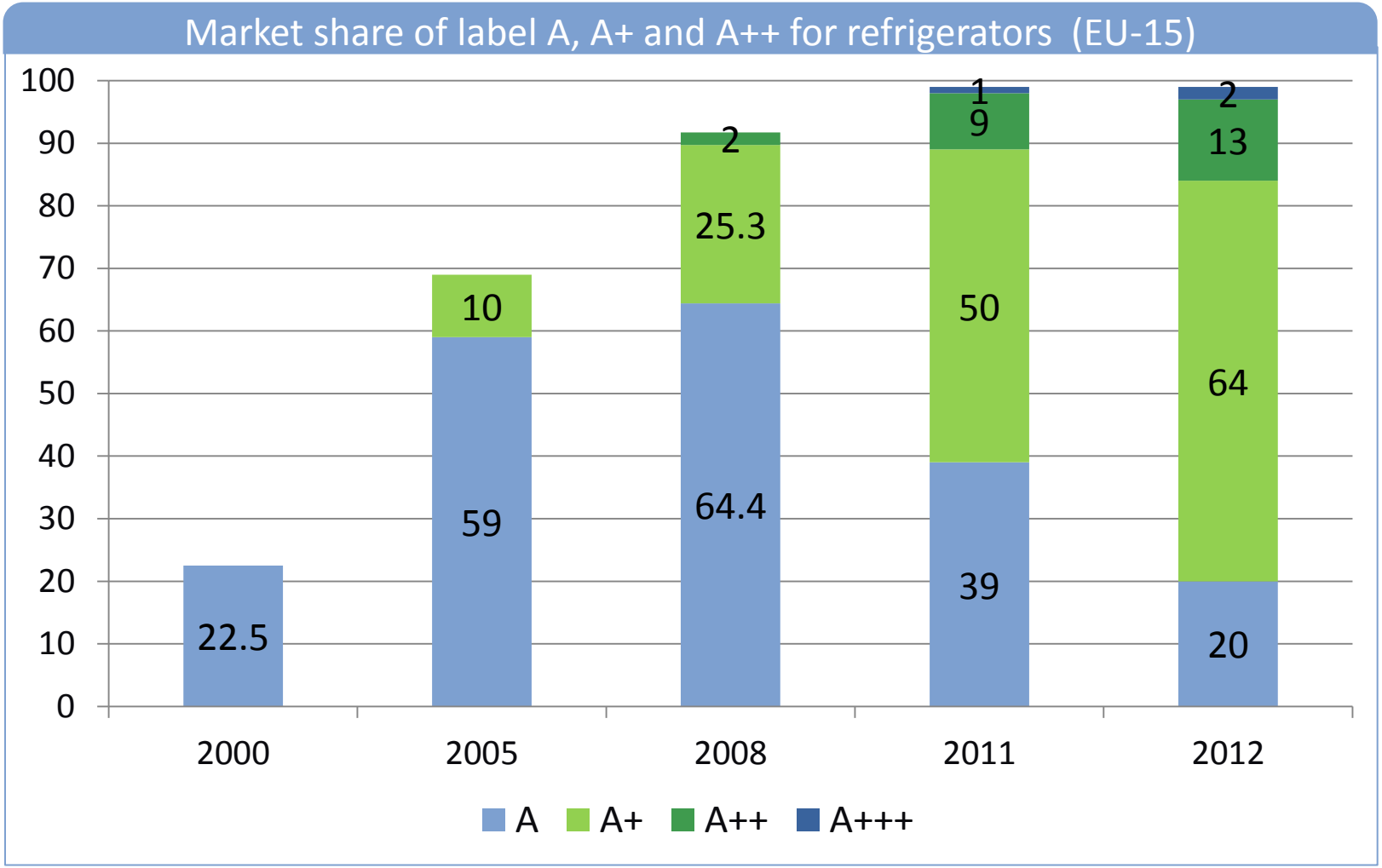
Almost 80% of refrigerators and freezers sold in 2012with label equal or above A+ class, 2/3 for washing machines and 50% for dishwashers

Market share of efficient-new appliances (labels A+ and above)



Source GFK, EEDAL

- About 15% of new refrigerators with labels A++ or A+++ in the EU in 2012 up from less than 2% in 2008: almost 2/3 with labels A+ (10% in 2005); Around 40% in The Netherlands and 45% in Germany



Source GFK, EEDAL

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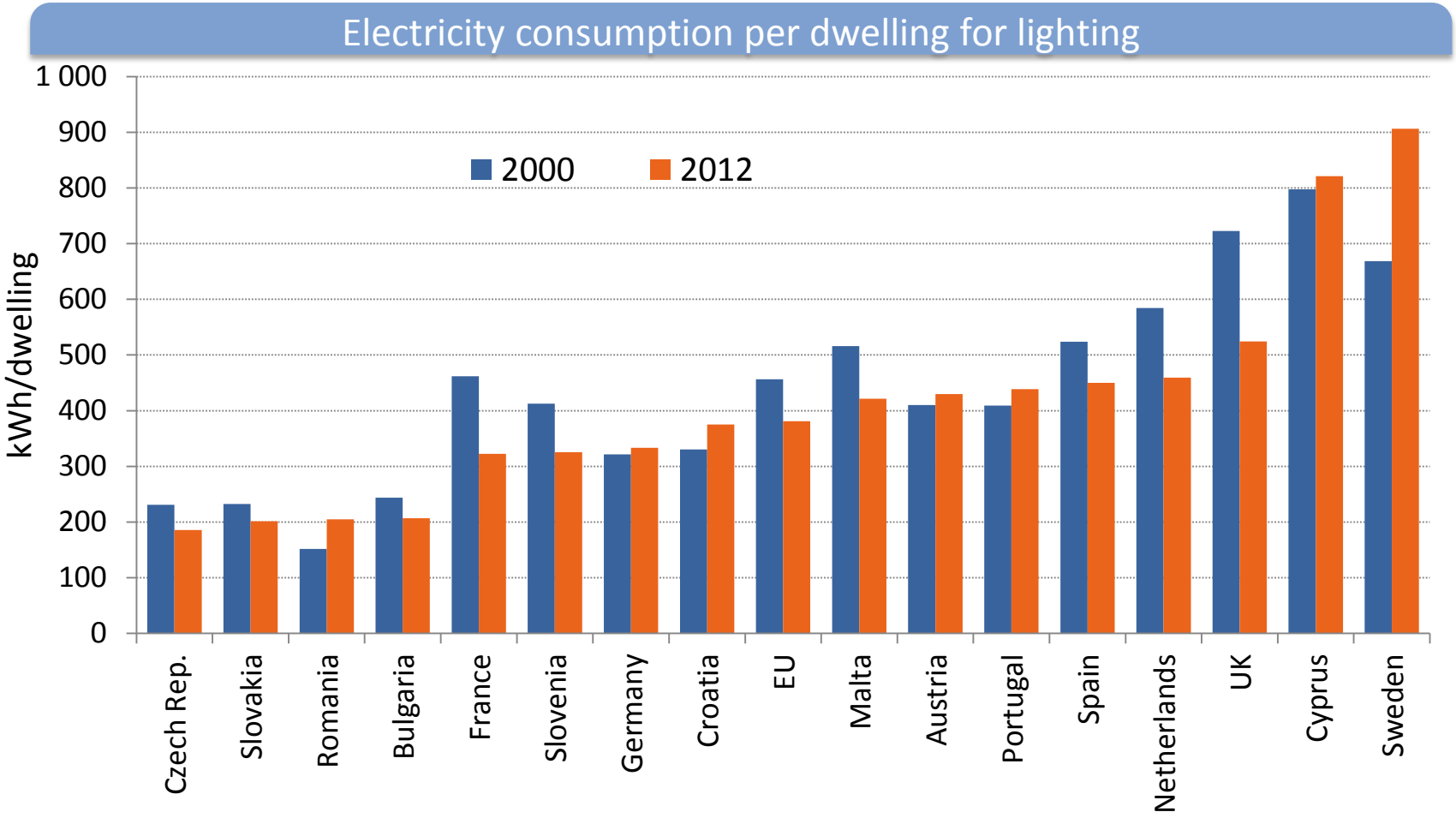
- In half of the sample of countries the specific consumption for lighting is decreasing thanks to the diffusion of CFL (by 35% in Sweden since 2000, about 30% in France and UK, about 20% in Netherlands and Czech Rep., 17% at EU level)
- Large discrepancies between countries: from 200 kWh/year for Czech Rep or Slovakia up to 900 kWh/year for Sweden .

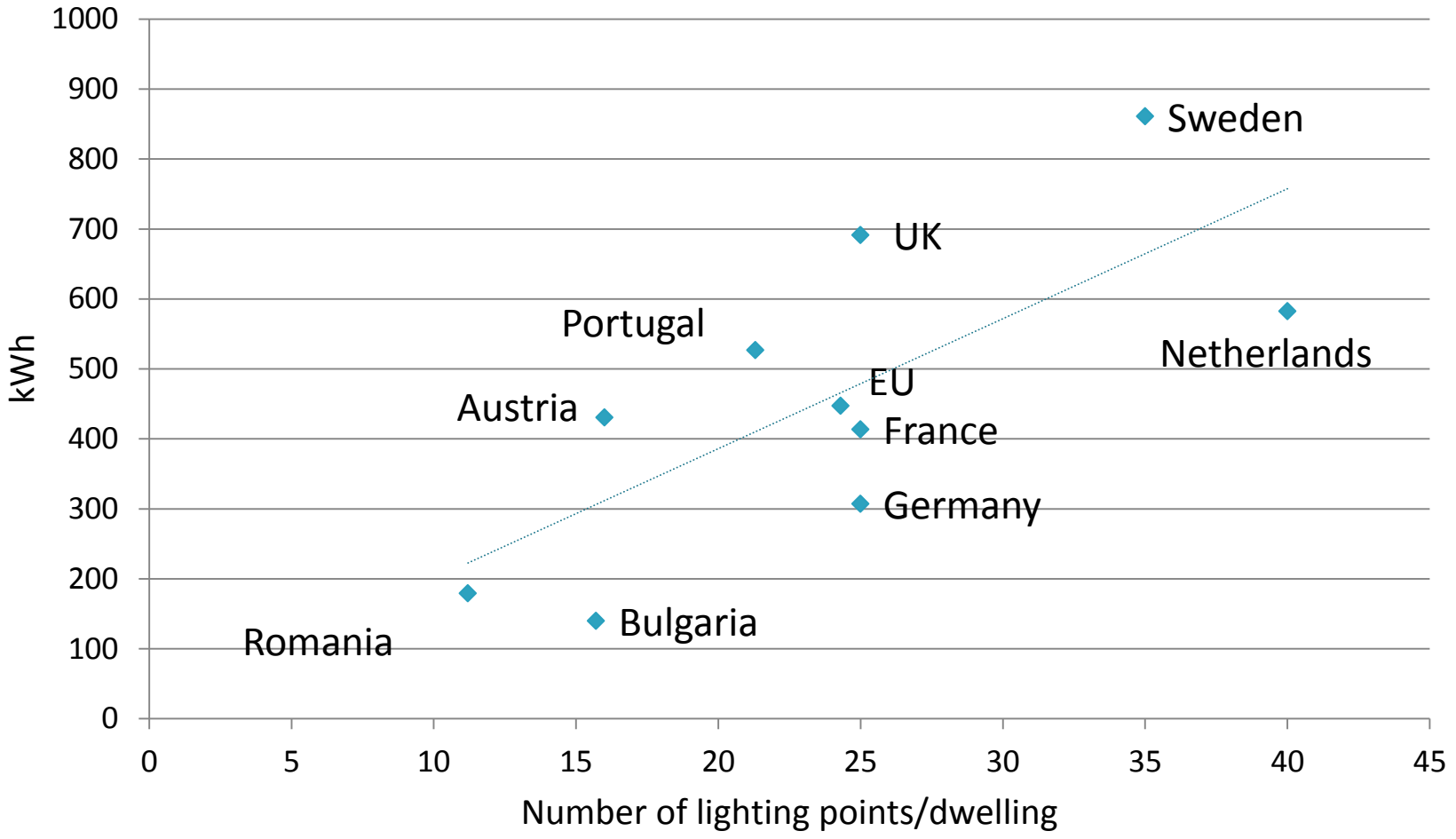


Odyssee

Enerdata

The level of consumption depends on the efficiency of lamps, i.e. the penetration of CFL, but also on the number of lighting points ... and this number is increasing

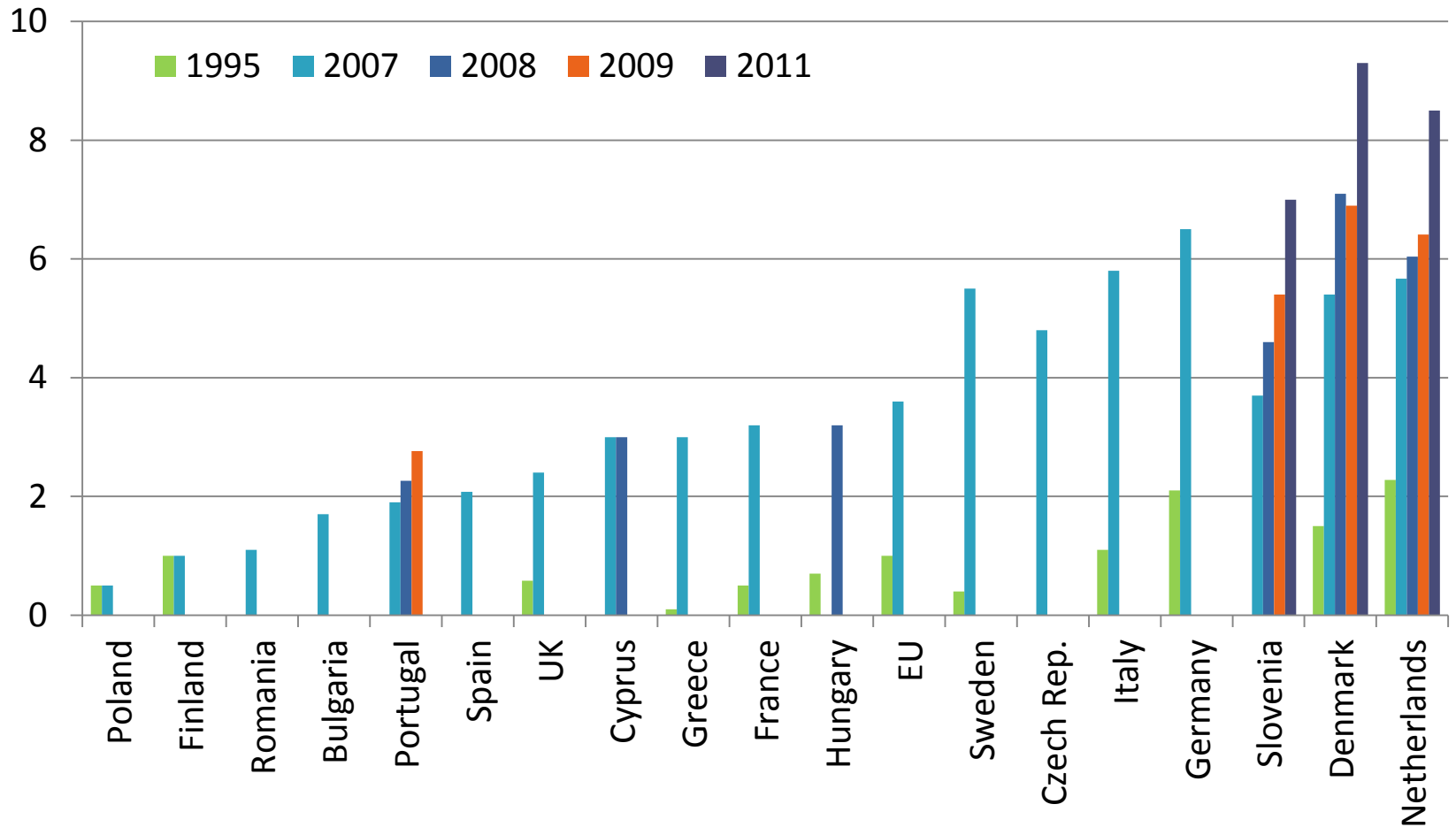
Electricity consumption per dwelling for lighting



Number of lighting points: compiled by Enerdata from various sources, of which Remodece, JRC-Ispra

About 8 CFL per household in the countries with the largest diffusion of CFL

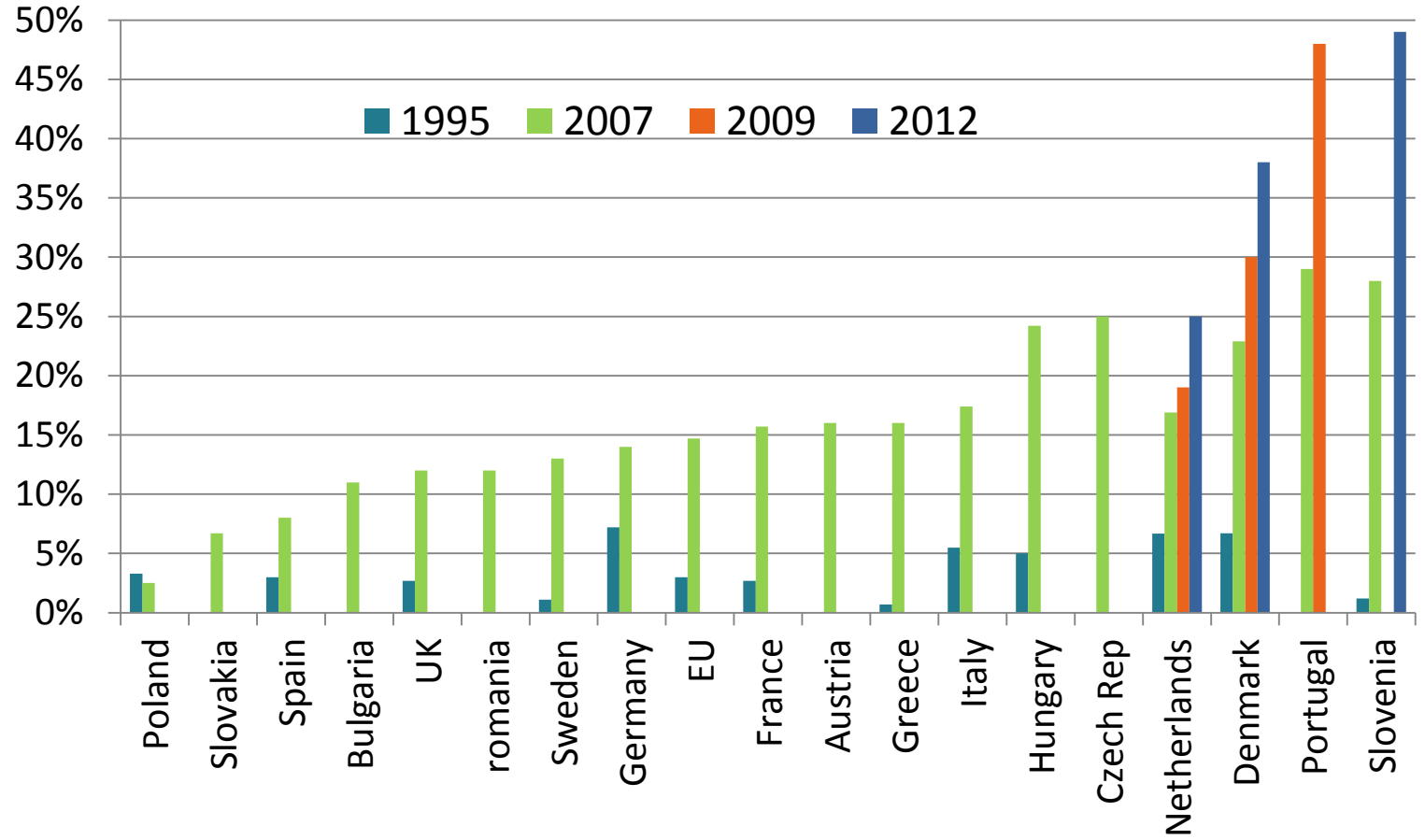
Diffusion of CFL lamps : number of lamps per household



Compiled by Enerdata from various sources, of which Odyssee, Remodece, JRC-Ispra

High penetration of CFL lamps in Slovenia, Portugal and Denmark: the % of CFL in total number of lamps depend on the number of CFL per household and the total number of lighting points (above 30 in Sweden and Denmark, below 20 in new member countries)

Diffusion of CFL lamps : % of CFL in total number of lamps



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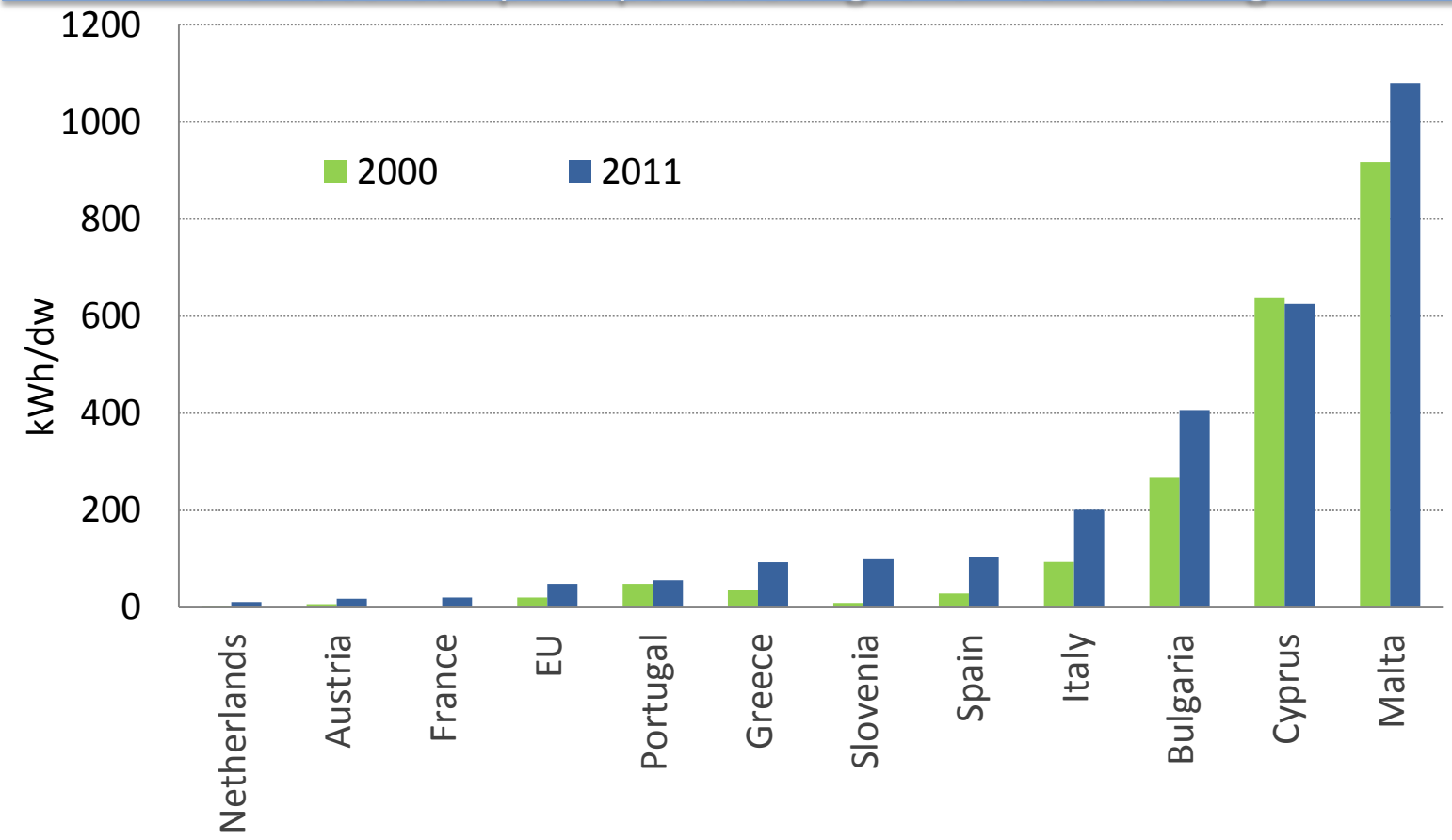
Outline

1. Overall energy consumption and drivers
2. Heating and water heating (solar)
3. Overall electricity consumption trends
4. Electrical appliances and lighting
5. Large appliances
6. Lighting
7. **Air conditioning**
8. Energy efficiency trends

Even if AC represents only 10% of total electricity consumption in the largest AC consumers (Cyprus, Malta and Bulgaria), the average consumption per dwelling for this end-use is increasing as the AC stock is increasing

Unit consumption per dwelling for air conditioning

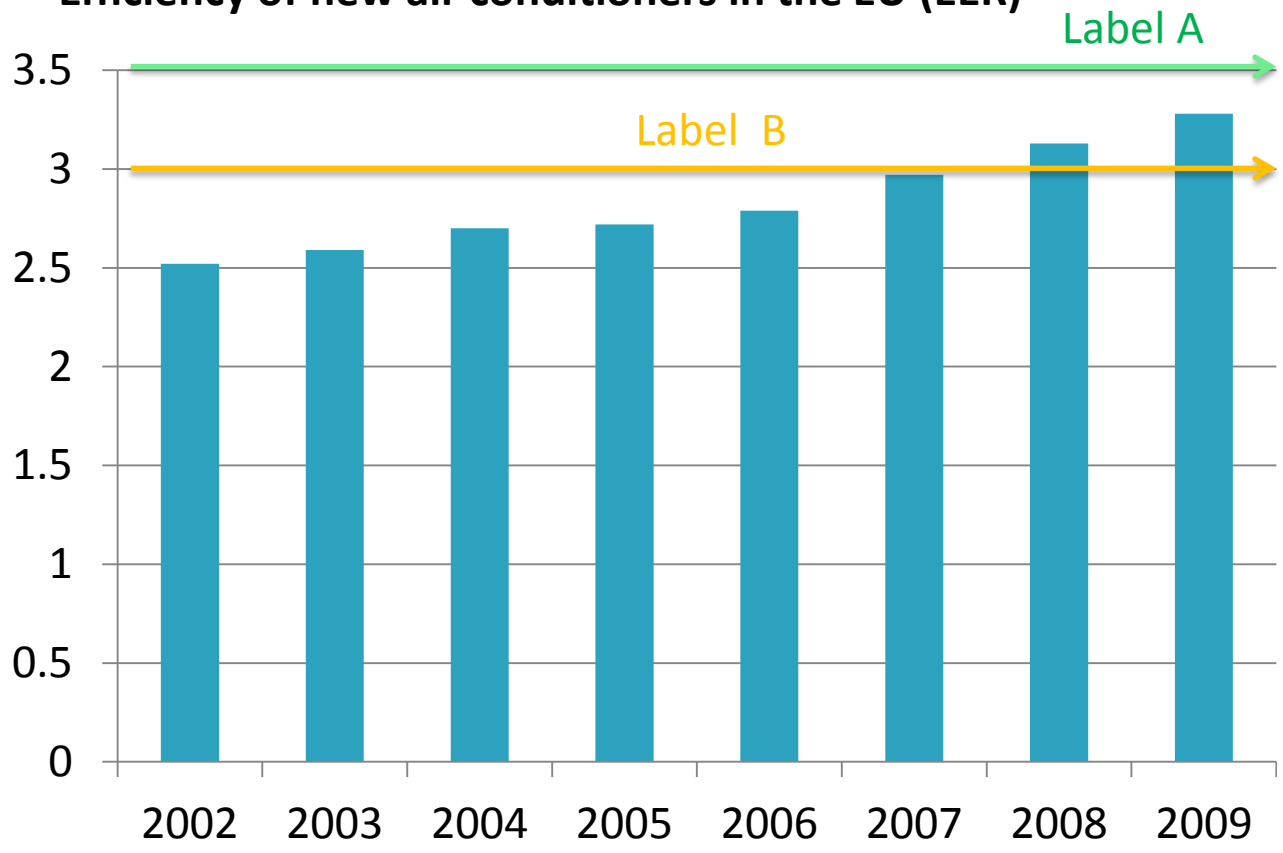


Odyssee

Enerdata

New air conditioners are 30% more efficient in 2009 than in 2002 in the EU

Efficiency of new air conditioners in the EU (EER)



- Labelling since 2002
- % of units with variable speed drive increased from 4 % to 50%
- Almost 90 % of reverse cycles models (up from about 50% in 2002)
- Over half of sales in Italy (33%) and Spain (21%) (Greece 13% and France 7%)

EER: kW per kW

Source: IEA, Mapping and Benchmarking, 2010; data from GFK; sales weighted; include split and multi-split (split about 95% of the market) ; products < 14kW

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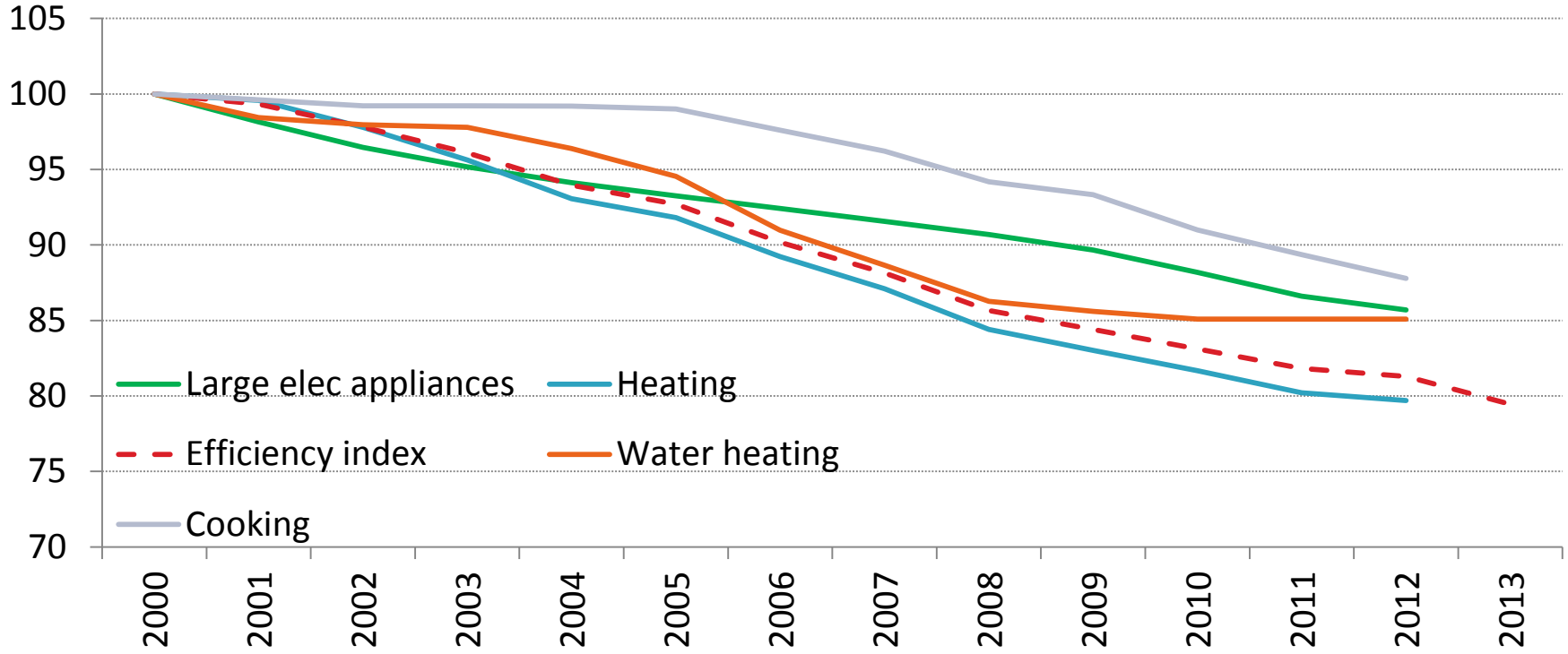
- Energy efficiency improved by 21% over the period 2000-2013, ie by 1.8%/year;
- The efficiency improvement for heating reaches 20% since 2000 ,15% for water heating, and 14% for large electrical appliances.

Energy efficiency progress for households in the EU: ODEX



ODEX is an index weighting the energy efficiency progress gains of 8 end-uses/appliances : heating (toe/m2) water heating, cooking (toe/dwelling), refrigerators, freezers, washing machine, dishwashers and TV (kWh/year)

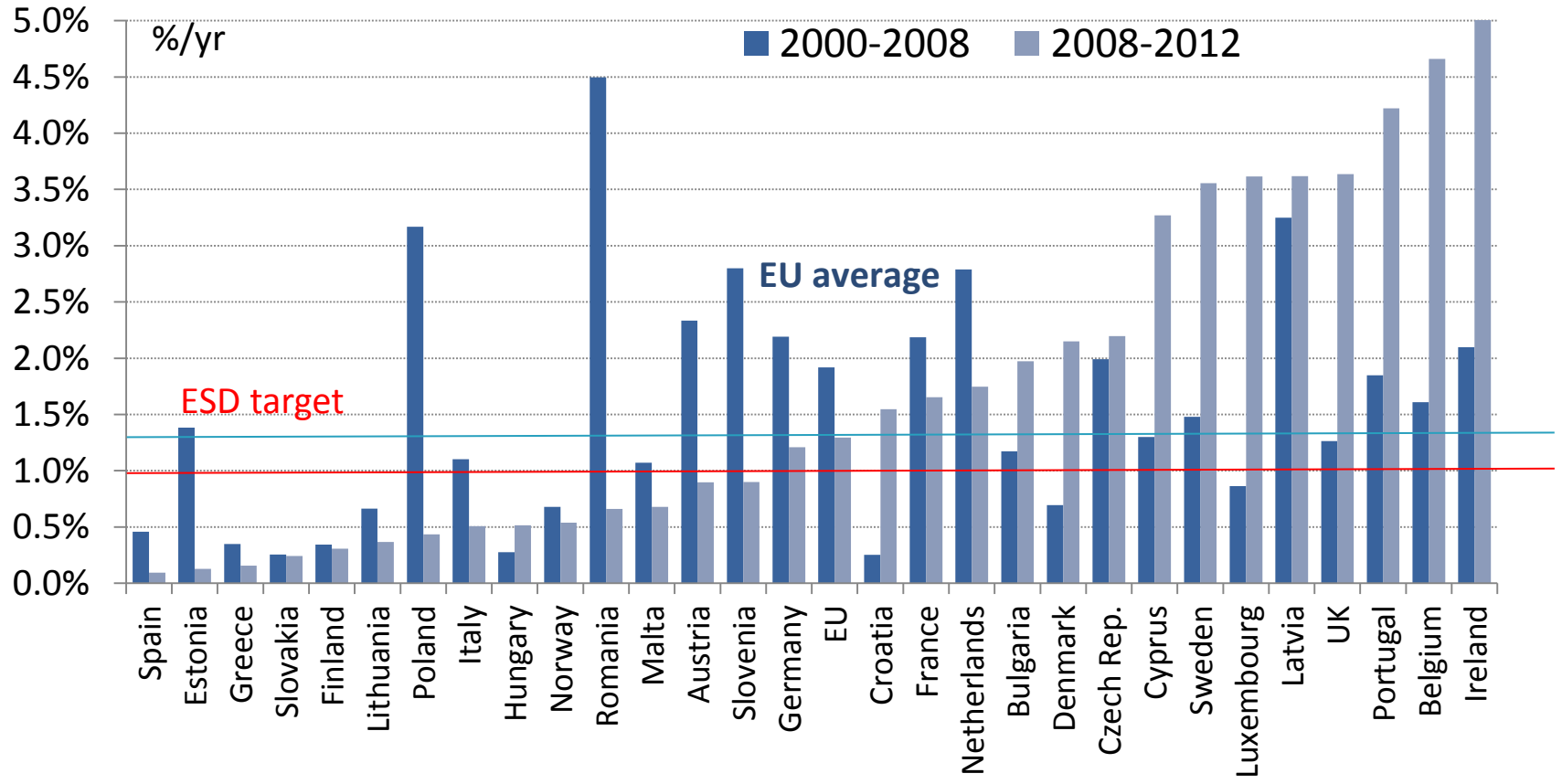
2013 estimates based on short term indicators for whole residential

Odyssee

Enerdata

- Slown down in energy efficiency in most countries between 2008 and 2012 (1.3%/year on average in EU).
- On the opposite, large improvements twice higher than the EU average in Cyprus, Sweden, Luxembourg, Latvia, UK, Portugal, Belgium and Ireland .

Energy efficiency improvements by country in the households sector



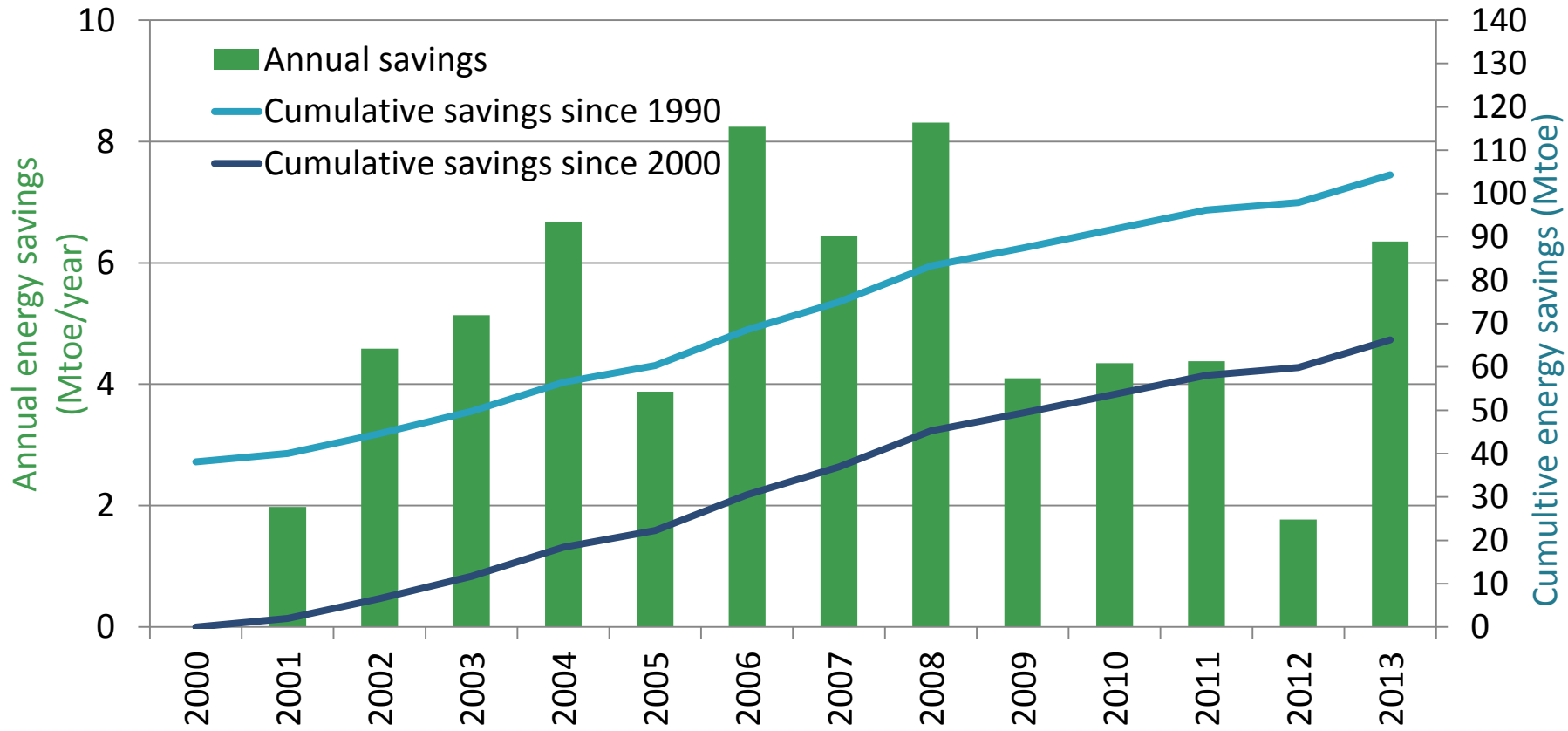
Period of analysis: 2000-2010 for Estonia, Hungary

Odyssee

Enerdata

- Energy savings for households reached around 70 Mtoe since 2000 : without energy efficiency improvement, the energy consumption would have been 70 Mtoe higher in 2013, ie the equivalent of the total consumption for water heating, electrical appliances and lighting;
Since 1990, the savings reach around 110 Mtoe.

Energy savings for households (EU)



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