

*“Economic impact of environmental and energy policies in Italy”*

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**Current and Future Challenges to Energy Security**  
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## Energy and environment are strictly linked

- CO2 emissions → Climate change
- main anthropogenic CO2 sources → activities requiring:
  - a direct fossil fuel combustion to produce energy (i.e. transport and power sectors)
  - the consumption of secondary forms of energy.

For these reasons:

**a) Energy policy design cannot ignore effects on CO2 emissions**

**b) Reduction of CO2 emissions must strongly rely on energy policies**

# Policy targets and instruments

## Targets

- To change production and consumption models
- To encourage the reduction of carbon intensity of energy sources;
- To abate energy intensity (industrial and transport activities, residential and commercial sectors)
- To reduce the demand for energy and transport services.

## Instruments

Marked-based instruments are usually regarded as cost-effective policy tools with high environmental effectiveness both in the short and in the long run

**Pigouvian tax** → sets price on CO<sub>2</sub> to internalize externalities

**Theoretical indication** → direct imposition on potential environmental damage (Pigou 1920):

- a) where the CO<sub>2</sub> is released in the atmosphere
- b) differentiated according to the marginal damage

**Administrative costs** (implementation and compliance costs) affect cost-effectiveness → uniform price upstream or downstream (Baumol and Oates 1971; Pearce 1991)

**Duty on fossil fuel sales** (upstream tax)

- low administrative costs
- large coverage
- proportional to the environmental damage
- effective both in the short and in the long run
- provides fiscal resources
- can be introduced as an independent instrument or can exist alongside other carbon pricing instrument (World Bank 2014)

# How does the carbon tax work?

**Price signal** to final consumers → increases the cost of “emission intensive” goods and services

- incentivizes producers to reduce CO2 intensity
- encourages households to consume less of them and more of other goods and services

## Risks

A carbon tax would have a negative effect on the economy through the following channels:

- **Reduction of purchasing power**
- **Worsening of price competitiveness**
- reduced labor supply
- distributive effects (households, industries, areas/parts of the country)

# How to address the economic impact issue

The evaluation of economic impact can be addressed in two ways:

1. Partial equilibrium analysis → direct effects on sectors associated with policy intervention
2. Macroeconomic (general equilibrium) analysis → does account for interactions and aggregation effects and considers both direct and indirect effects on the overall economic system and public finance.

*It can happen that policies that appear to improve efficiency in a partial equilibrium analysis, can indeed emerge as reducing efficiency when general equilibrium interactions are taken in account, arising economic and fiscal sustainability issues.*

# Theoretical and empirical main conclusions

**Theoretical and empirical literature** shows that it is not possible to draw generally-valid conclusions on economic consequences from a carbon tax, but that its final effects strongly depend on **country-specific factors** (economic, institutional and structural characteristics).

In this presentation, the most relevant factors are briefly discussed in order to identify indicators that can help to evaluate risks, potential costs and benefits.

## **Part I : theoretical indications**

**Part II: indicators → comparison among Italy, France and Germany**  
(Eurostat data)

# Macroeconomic approach

**Short and long term** and how the effects spread through the economy

**Direct or primary effects :**

**a) increased prices of fossil fuels** → real disposable income, real interest rates, profits.....,

**b) changes in relative prices** → mix of goods and services consumed and produced → relative demand for labor and capital and for imported and domestic goods

**Indirect or interaction effects** → second round effects on prices and competitiveness (indexation of economy, prices of domestically produced instrumental and investment goods), saving, investment decisions and labor supply

**Expectations**

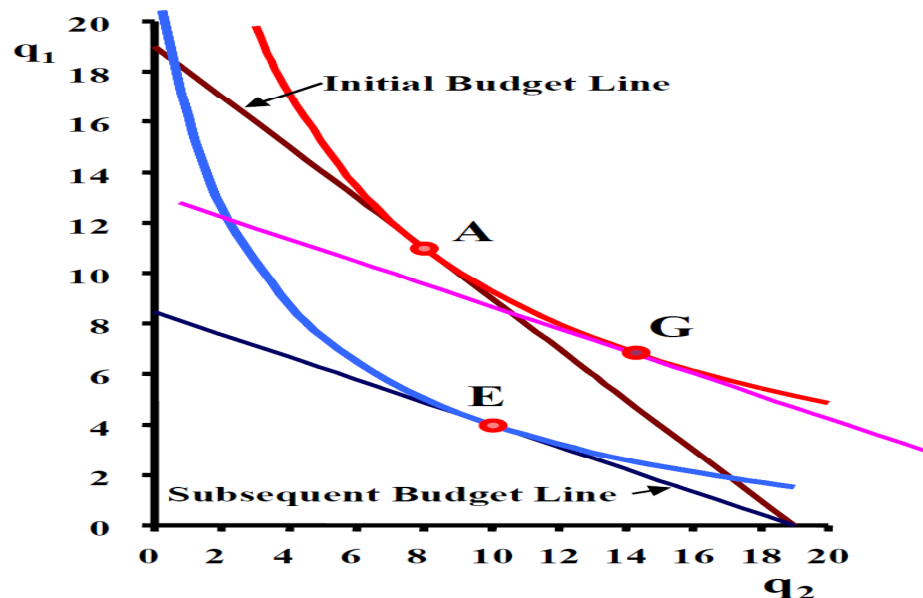


# Income and substitution impact on consumption

**Income effect** (price increase): lower real wages and profits → purchasing power, consumption,

**Substitution effects** (changes in relative prices): shifts in the mix of goods and services consumed (also between imported and domestic goods)

**Substitution and Income Effects**  
Increase in the price of good 1



Total effect → from A to E

Substitution effect → from A to G  
*With the new prices, what is the bundle that would make the consumer just as happy as before the price change?*

Income effect → from G to E  
*With the same relative prices than in G, which is the consumer optimal choice with the new bundle?*

# Impacts on firms and industry

Figure 1: Illustrative impact of a carbon tax on competitive firms facing world prices

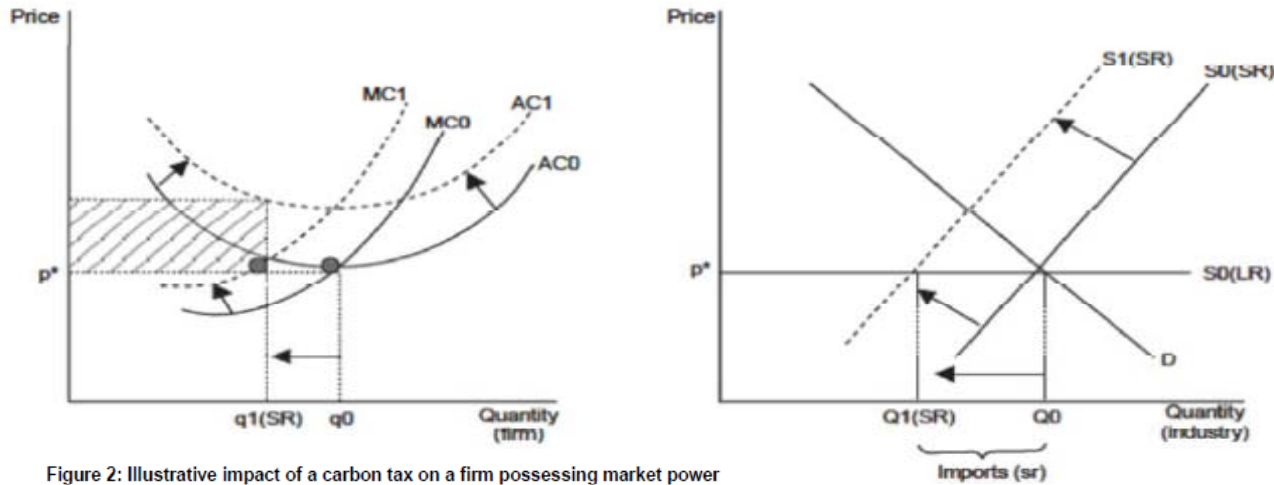
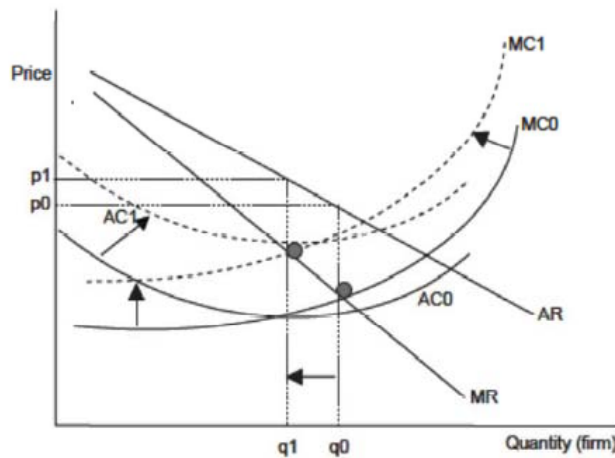


Figure 2: Illustrative impact of a carbon tax on a firm possessing market power



OCDE (2014 ) Competitiveness impacts of carbon pricing: a review of empirical findings

## Medium/long term effects

In a closed economy a carbon price signal provides incentives for efficiency improvements and innovations and for more responsible consumption.

In an **open economy**, increasing carbon prices increase production costs and may lead to relocation of economic activities to less-regulated countries and export back goods with an high content of CO<sub>2</sub> emissions to regulated regions

**Carbon leakage** → no global environmental benefit, adverse effects on the economy in the regulated country

# BASIC FACTORS AFFECTING ECONOMIC IMPACT

Main basic factors:

- open or closed economy (degree of openness and exposure to international competition)
- unilateral or global tax
- exchange rate regime
- monetary policy reaction
- fiscal policy reaction (use of tax revenues)
- market power of national producers («made in Italy»)

## SPECIFIC FACTORS – households (consumption)

- a) Share of households' direct consumption of fossil fuels (transport and residential use) → income and substitution effects, elasticities
- b) CO2 intensity of fossil fuel directly consumed by households (if carbon price is set according with carbon intensity) → income and substitution effects, elasticities
- c) Share of households' indirect consumption of fossil fuels (if the tax is passed to energy final price) → income and substitution effects, elasticities
  - i. energy consumption by households
  - ii. CO2 intensity of energy
- d) Share of imported fossil fuels on total fossil fuel consumption → demand of national and imported goods

## SPECIFIC FACTORS – firms (competitiveness)

- f) Carbon/ energy intensity of nationally produced goods and services → costs, competitiveness, profits
- h) Factor substitution elasticities → final prices → purchasing power, competitiveness
- i) Availability of cleaner technologies and cleaner energy sources → “
- j) Sectoral effects and relative weights of hit sectors → GDP, employment ..

## **ITALY → Small open economy belonging to a single currency area**

- Interest and exchange rates are not influenced by the carbon tax
  - Free movements of goods, services and capital
- 
- ➔ Expansive effects from real interest rates reduction, that can partially compensate negative effects on the economy
  - ➔ **Risks of competitiveness losses**

# INDICATORS

- I. CO2 emissions
  - a) who emits CO2 (household and economic activities)
  - b) CO2 intensity
  
- II. Energy balance (production, consumption, import and exports of energy products)
  - a) Energy intensity
  - b) Fossil fuel intensity
  - c) Households final consumption of energy products
  
- III. Final prices of energy for households and firms

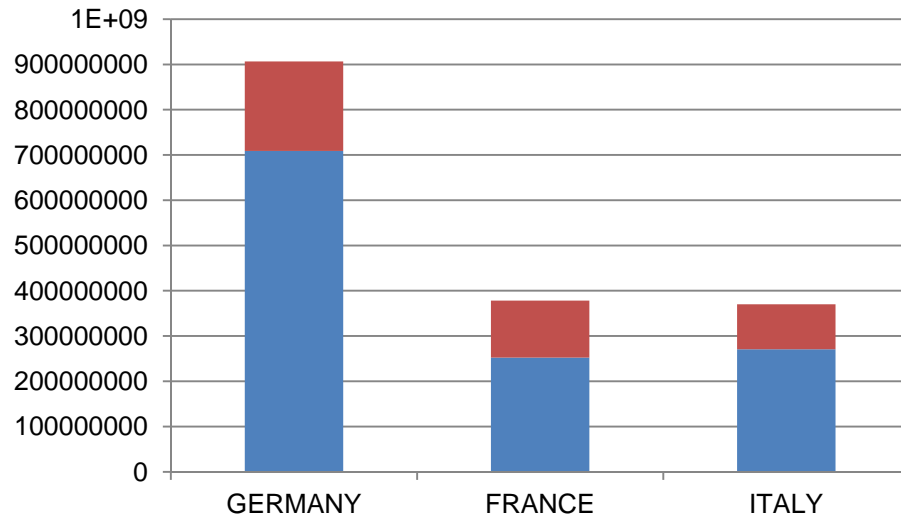




# CO2 EMISSIONS

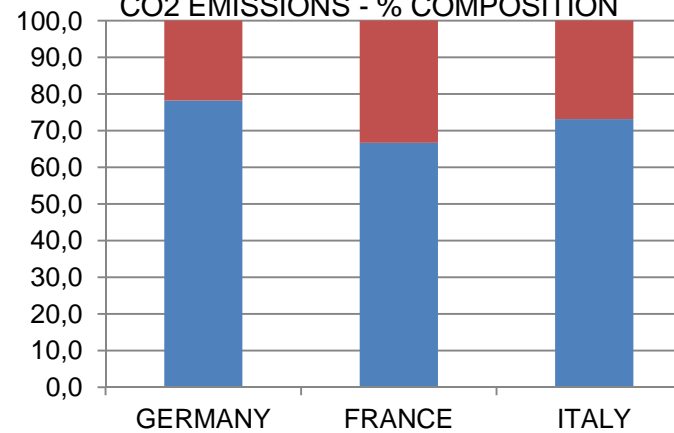
# CO2 emissions : households vs economic activities

CO2 EMISSIONS (tonne)



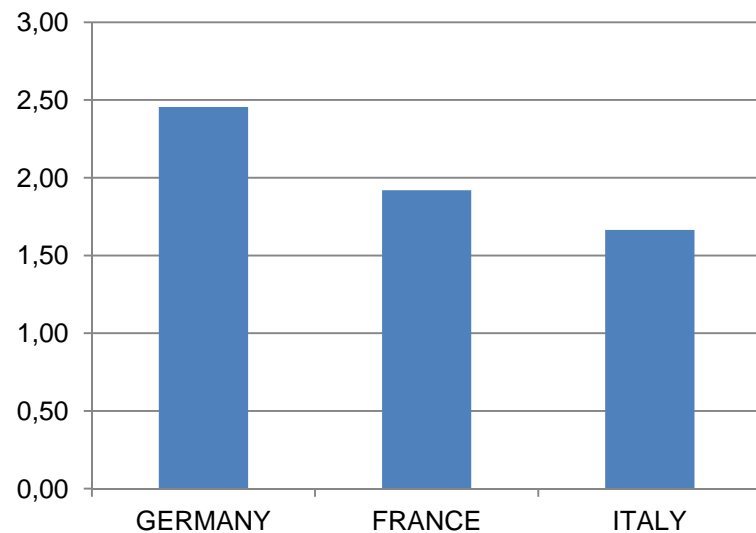
■ All economic activities ■ Households

CO2 EMISSIONS - % COMPOSITION



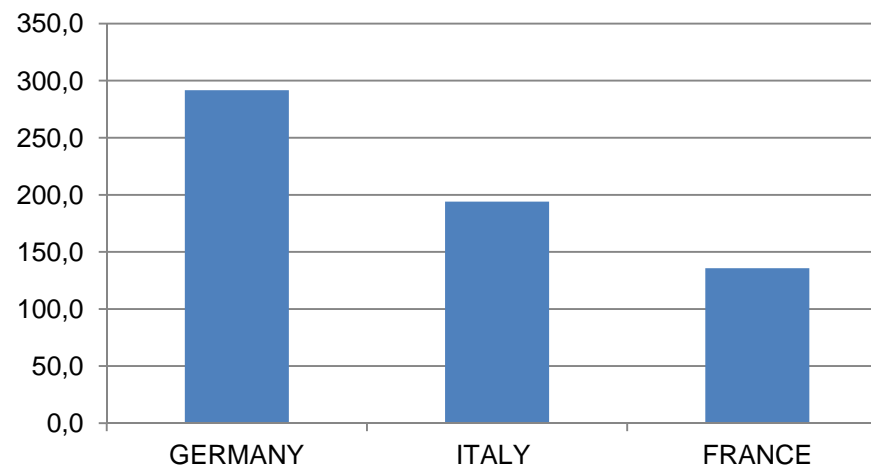
# Emissions per capita and in % of Value Added

## HOUSEHOLDS CO2 EMISSIONS (per capita) 2013



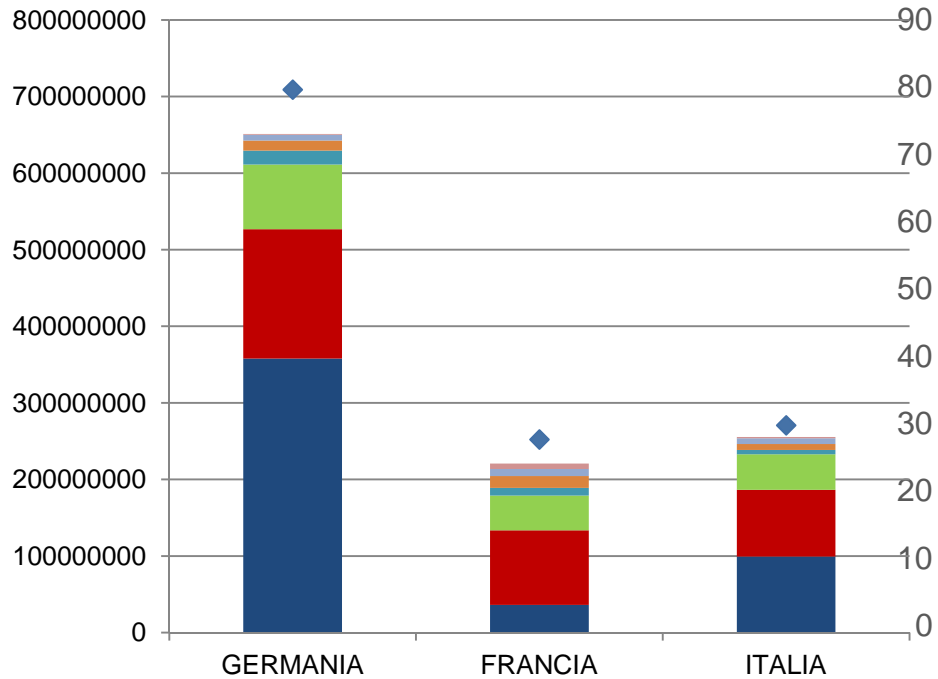
## CO2 EMISSIONS INTENSITY ECONOMIC ACTIVITIES (2013)

Grams per euro of VA, chain linked volumes (2010)



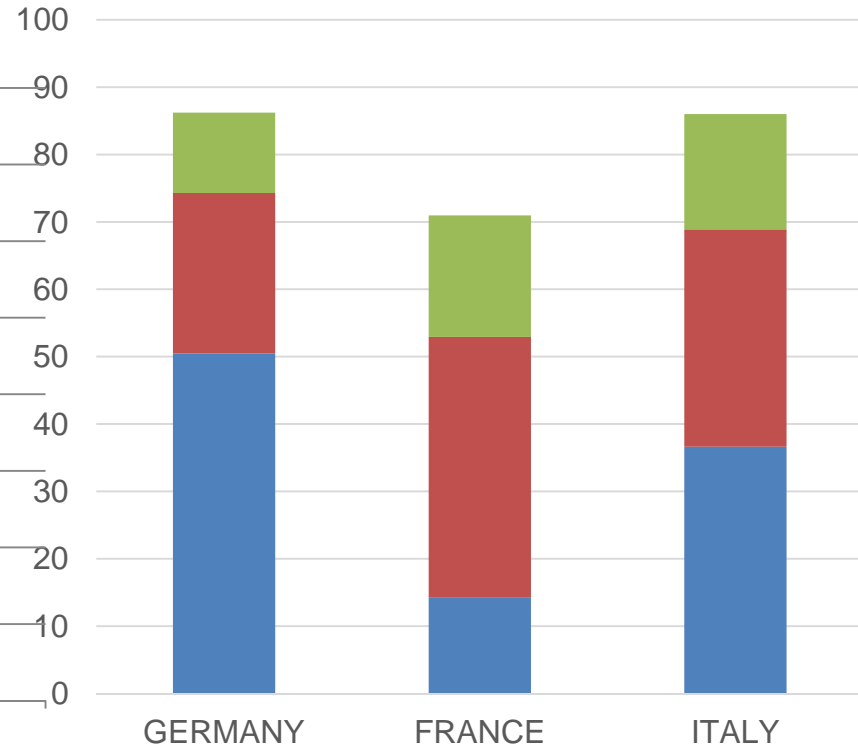
# CO2 EMISSIONS BY SECTOR

## CO2 EMISSIONS BY SECTOR- 2013 (tonne)



- Electricity, gas, steam and air conditioning supply
- Manufacturing
- Transportation and storage
- ◆ Total - all NACE activities

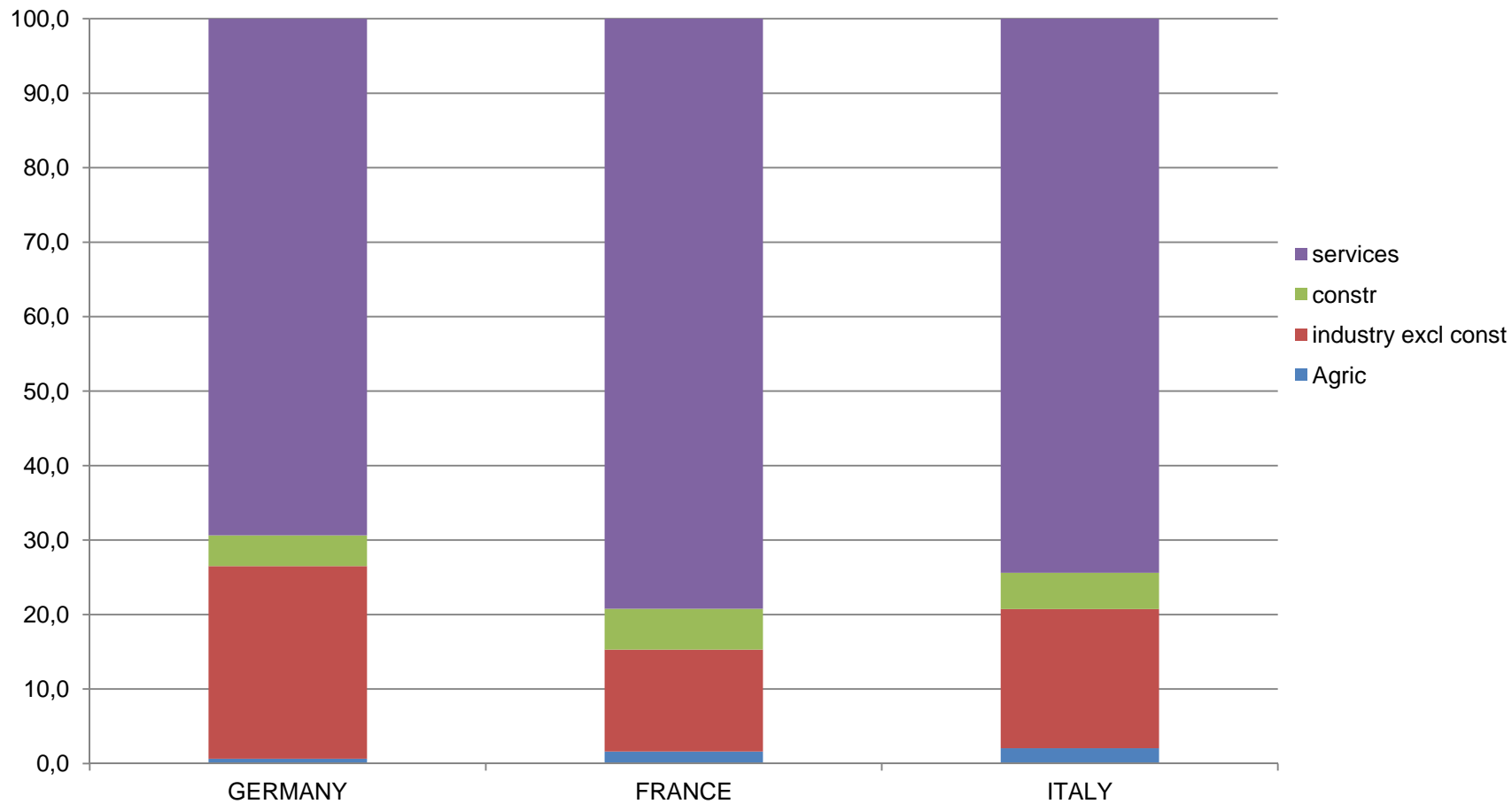
## CO2 EMISSIONS BY SECTOR (% comp)



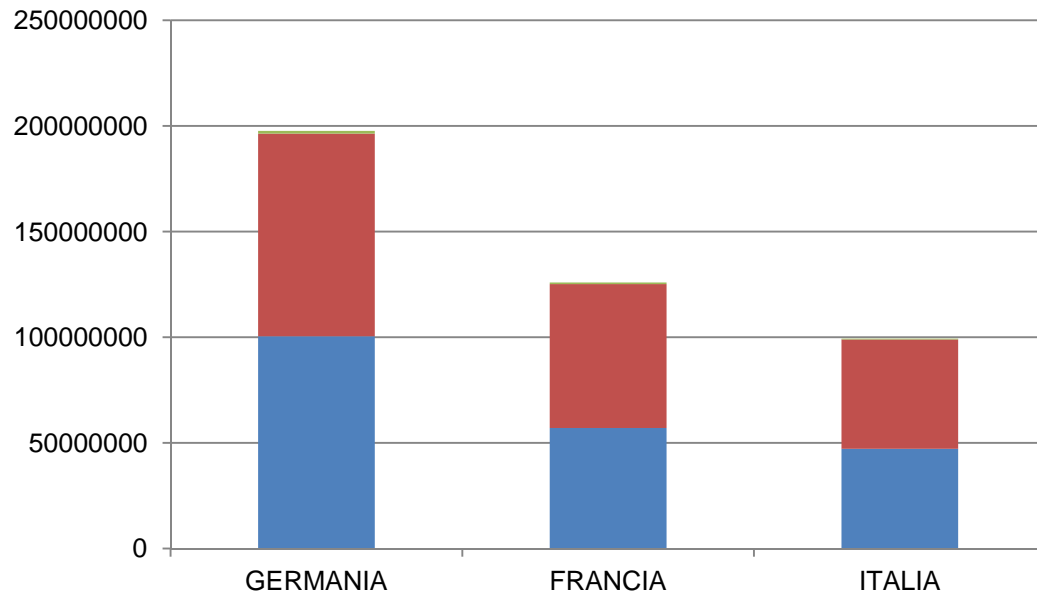
- Electricity, gas, steam and air conditioning supply
- Manufacturing
- Transportation and storage

# GROSS VALUE ADDED BY SECTOR

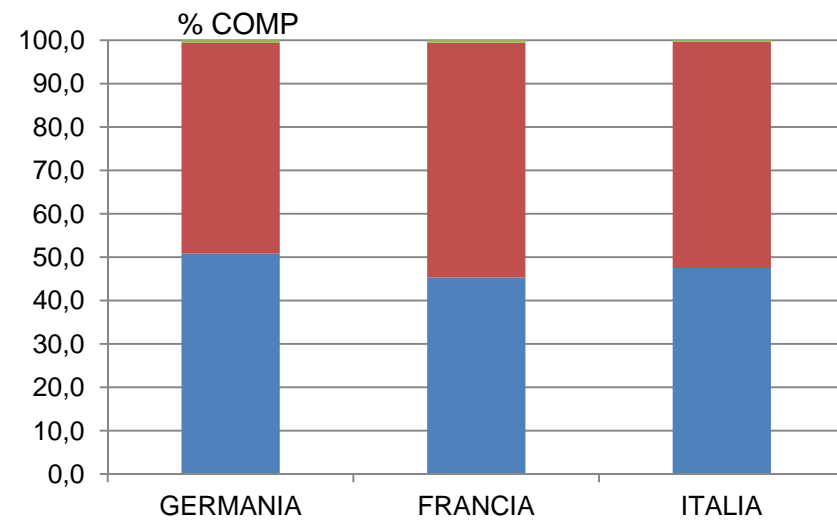
GROSS VALUE ADDED (VOLUME) % COMP



# HOUSEHOLDS CO2 EMISSIONS BY ACTIVITY



- Other activities by households
- Transport activities by households
- Heating/cooling activities by households

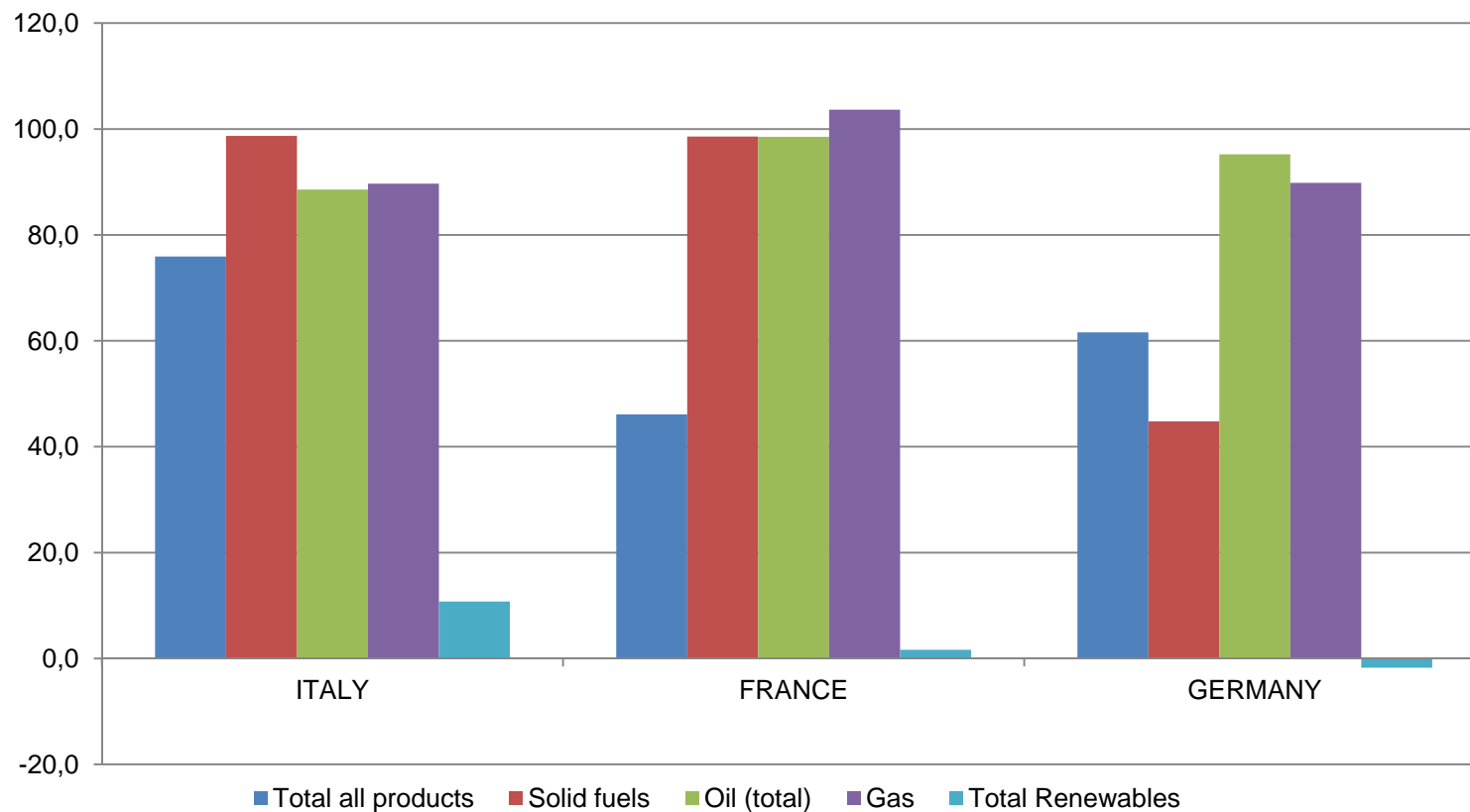




# Energy balance

# ENERGY DEPENDENCE BY PRODUCT

ENERGY DEPENDENCE BY ENERGY PRODUCT  
2014



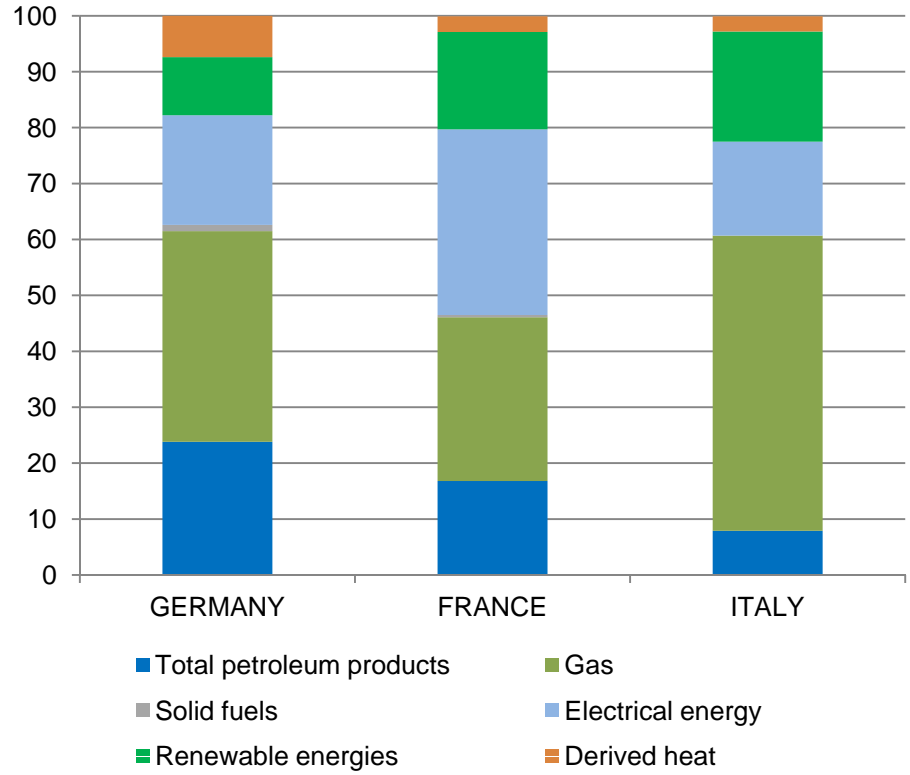


# CO2 EMISSION COEFFICIENTS

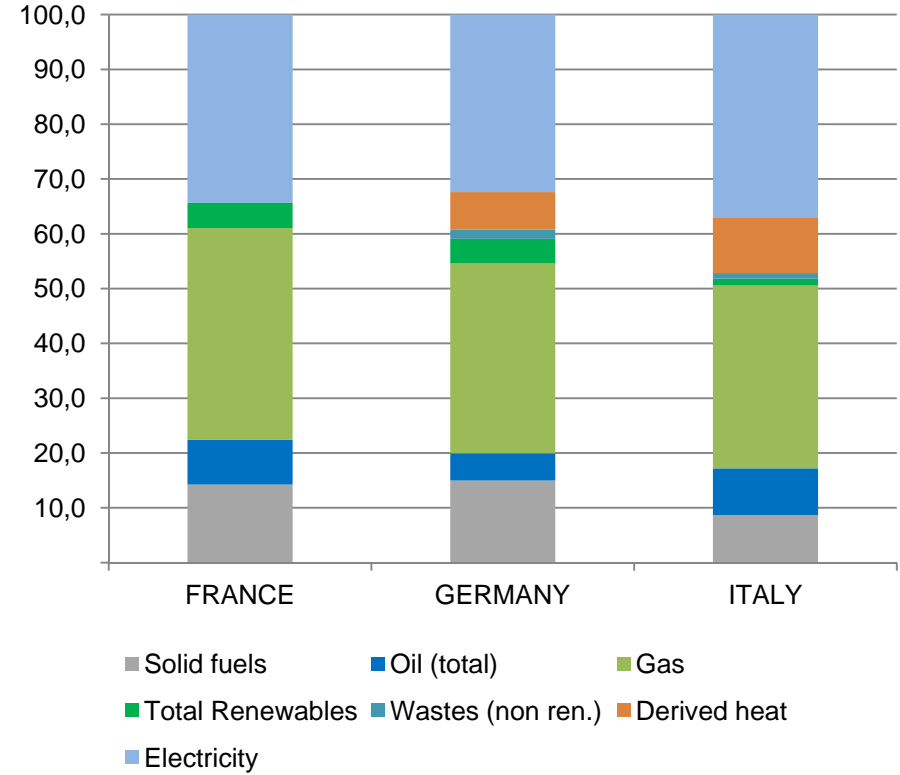
	<b>Solid fuels</b>	<b>Oil (total)</b>	<b>Gas</b>
<b>CO2 EMISSION COEFF.</b> (kg CO2 per MMBtu) (EEA)	<b>96</b>	<b>71</b>	<b>54</b>

# FINAL CONSUMPTION OF ENERGY PRODUCTS (% comp.)

HOUSEHOLDS

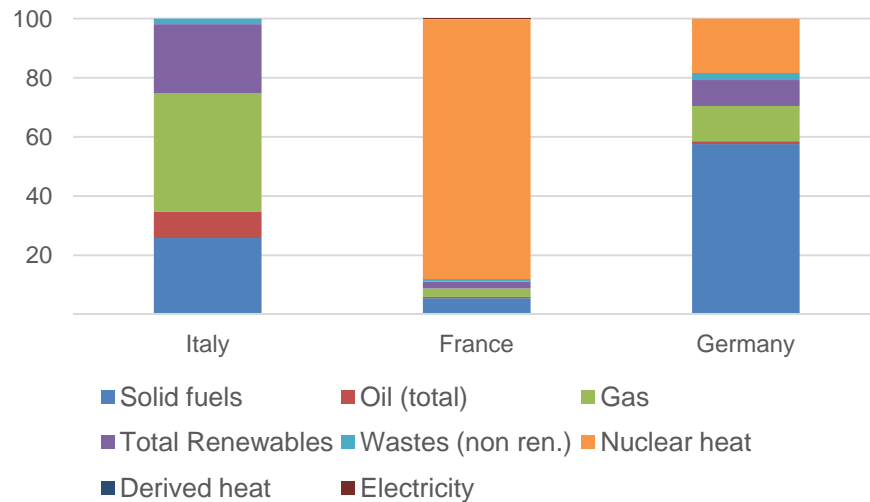


INDUSTRY

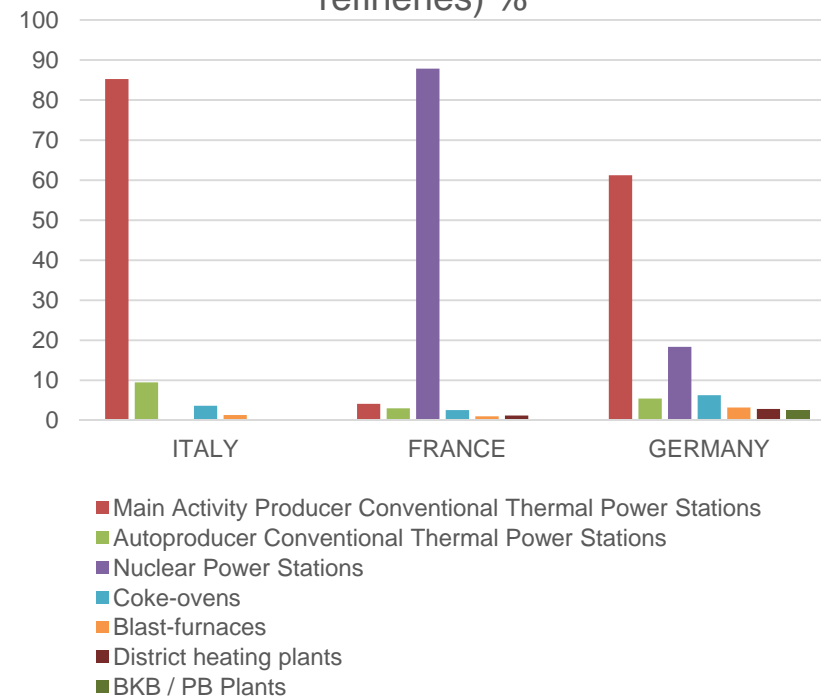


# Energy products as transformation input

Transformation input by product % comp.  
(excl.refineries)

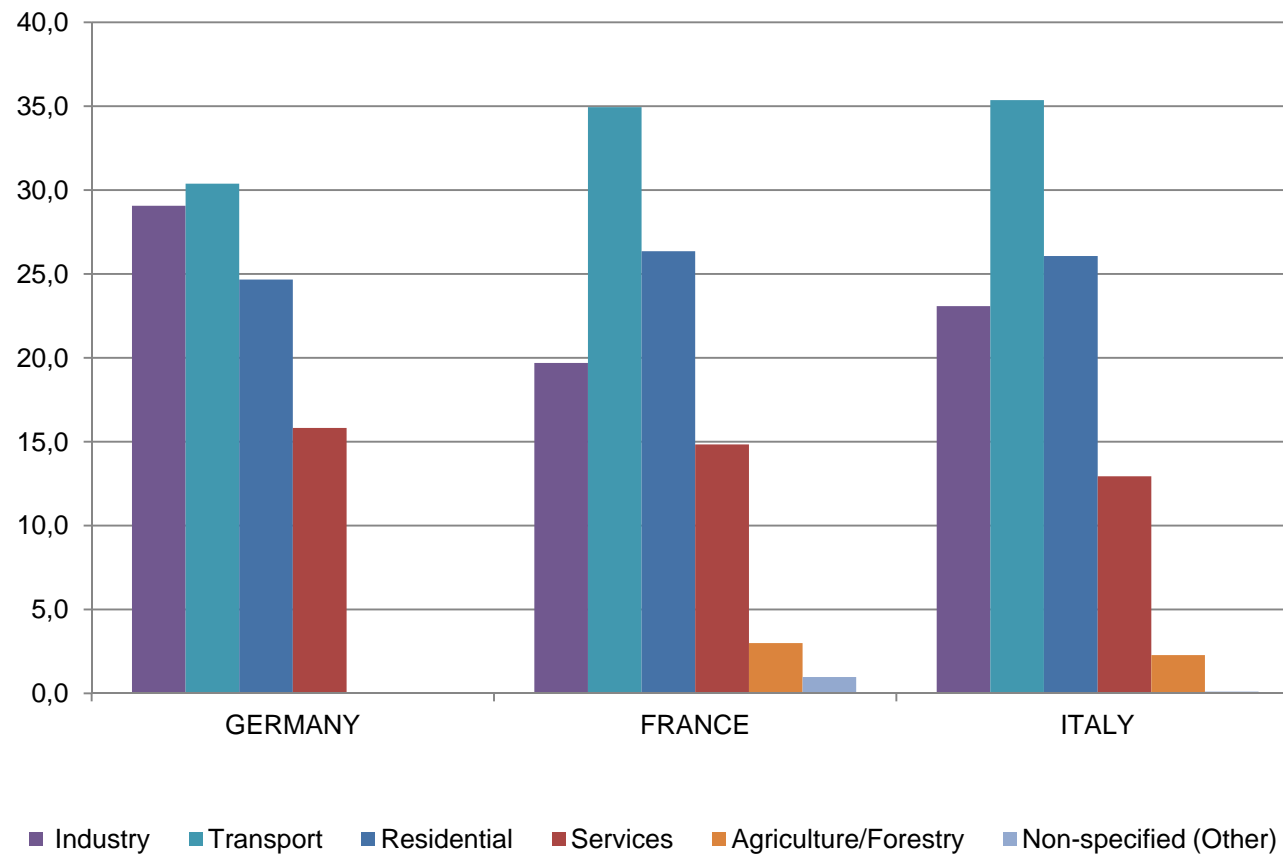


Transformation input by activities (excl. refineries) %



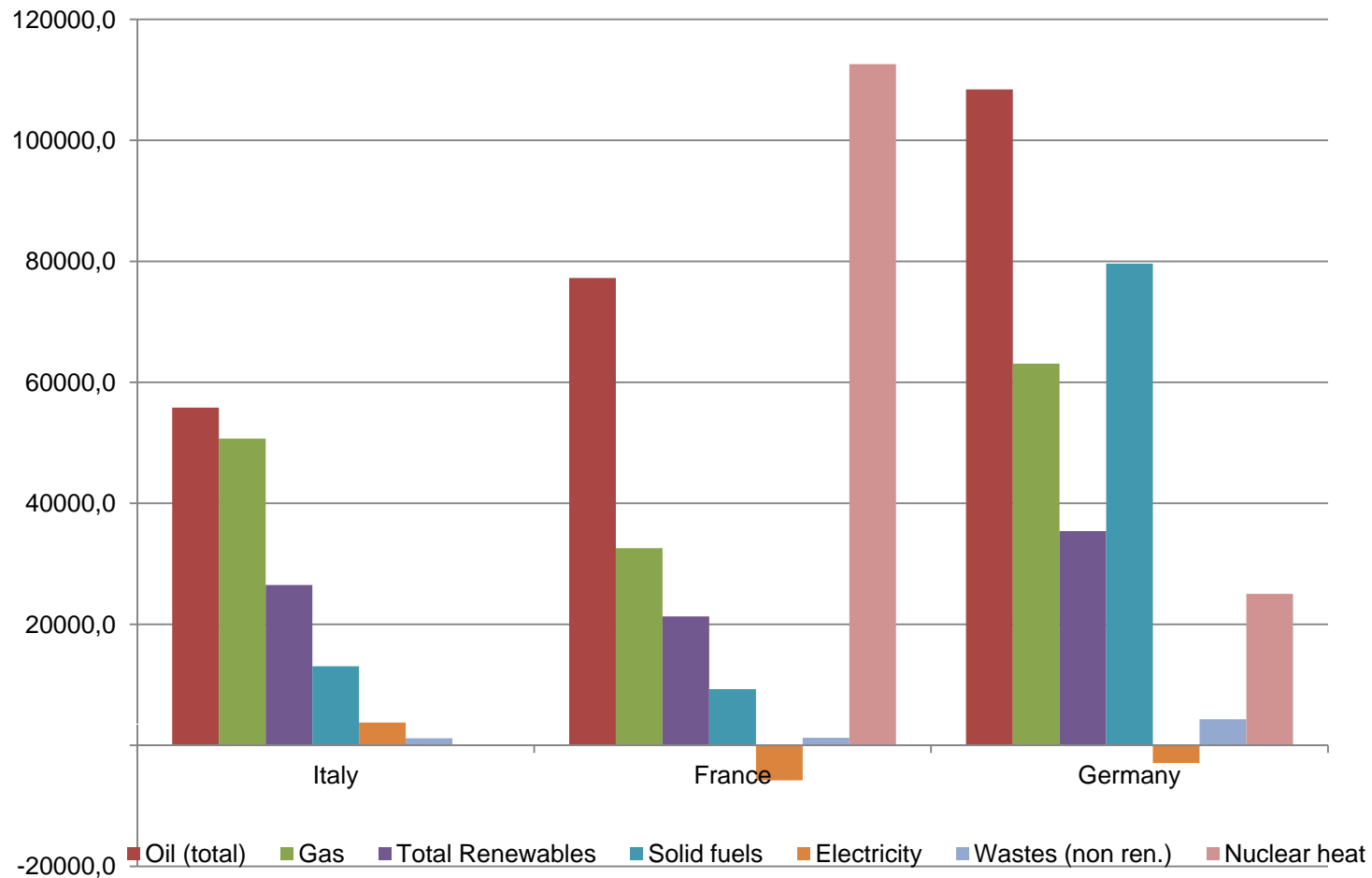
# FINAL ENERGY CONSUMPTION

FINAL ENERGY CONSUMPTION BY SECTOR 2014  
% comp.



# GROSS INLAND CONSUMPTION

GROSS INLAND CONSUMPTION OF ENERGY PRODUCTS 2014  
Ktoes

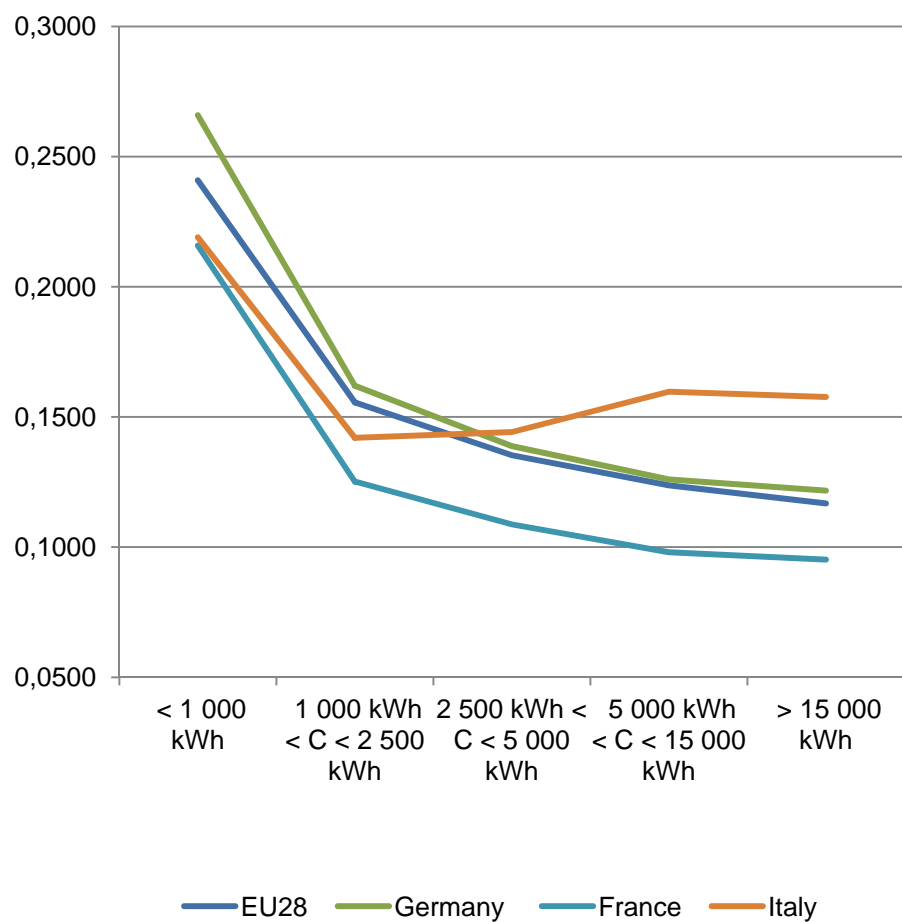




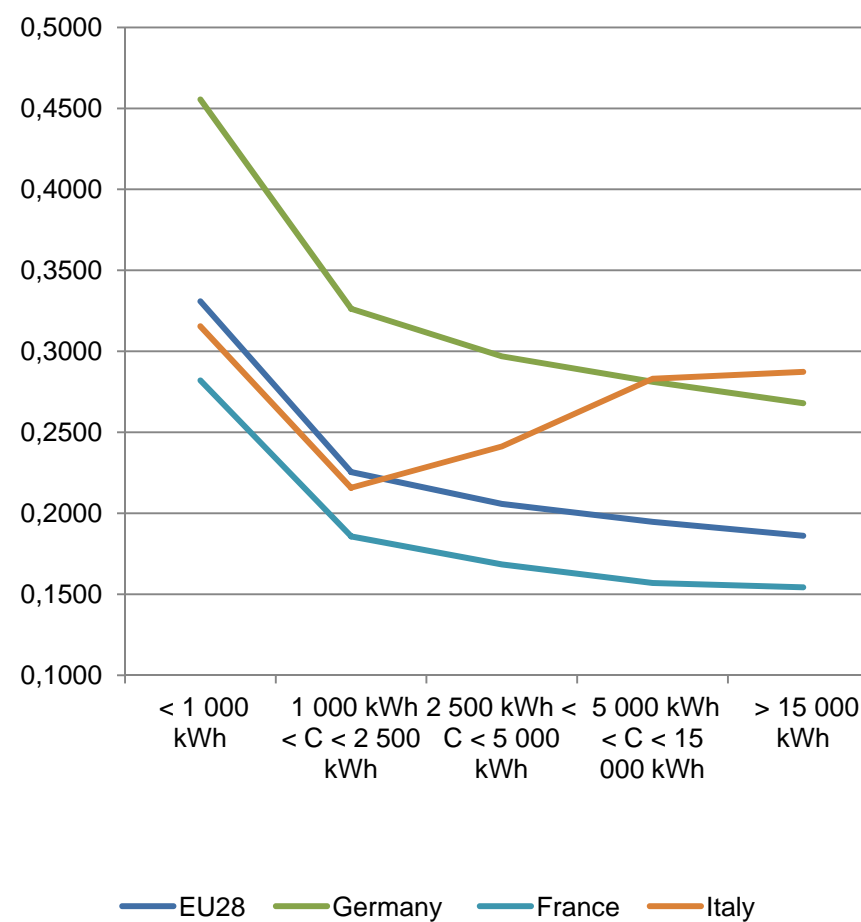
# ENERGY PRICES

# Electricity prices for domestic consumption (2016 S1)

Excluding taxes and levies

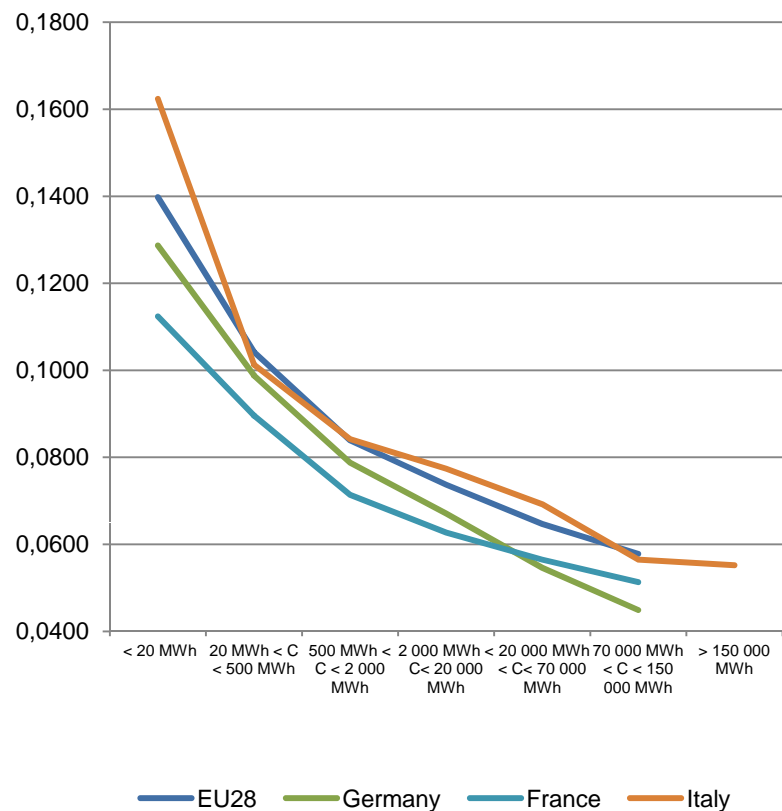


All taxes and levies included

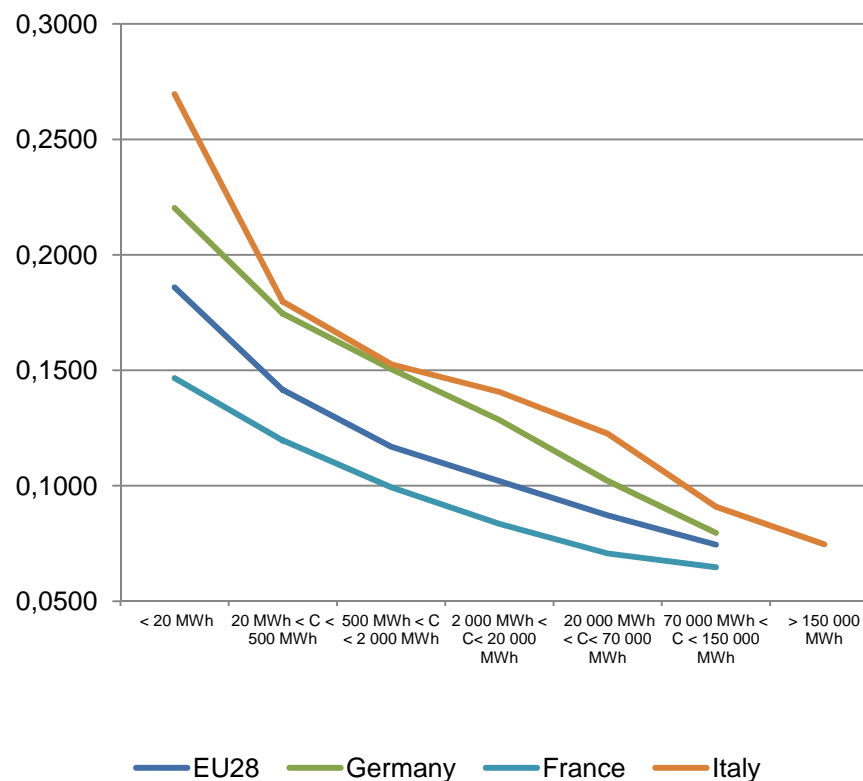


# Electricity prices for industrial consumers (2016 S1)

Excluding all taxes and levies



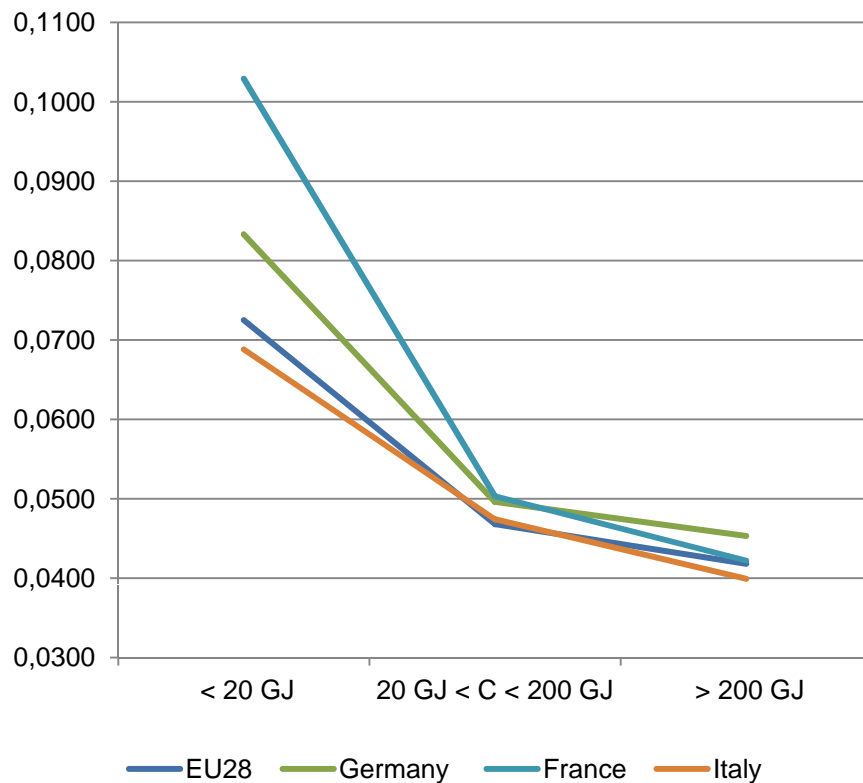
Excluding VAT and other recoverable taxes and levies



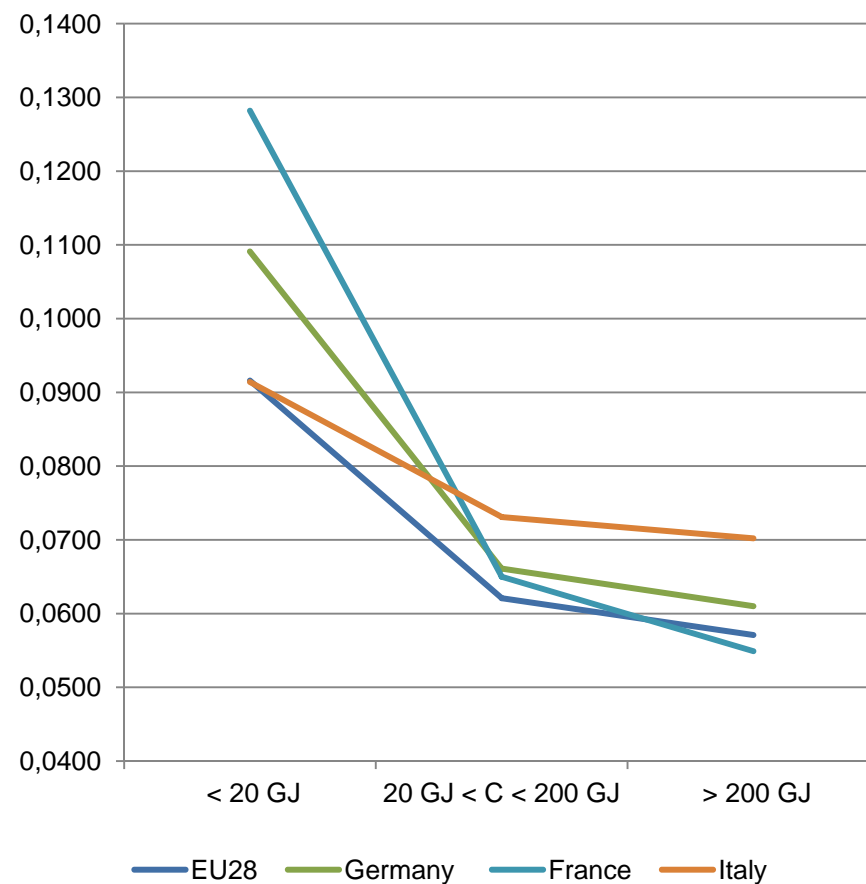


# Gas prices for domestic consumption (2016 S1)

## ALL TAXES EXCLUDED

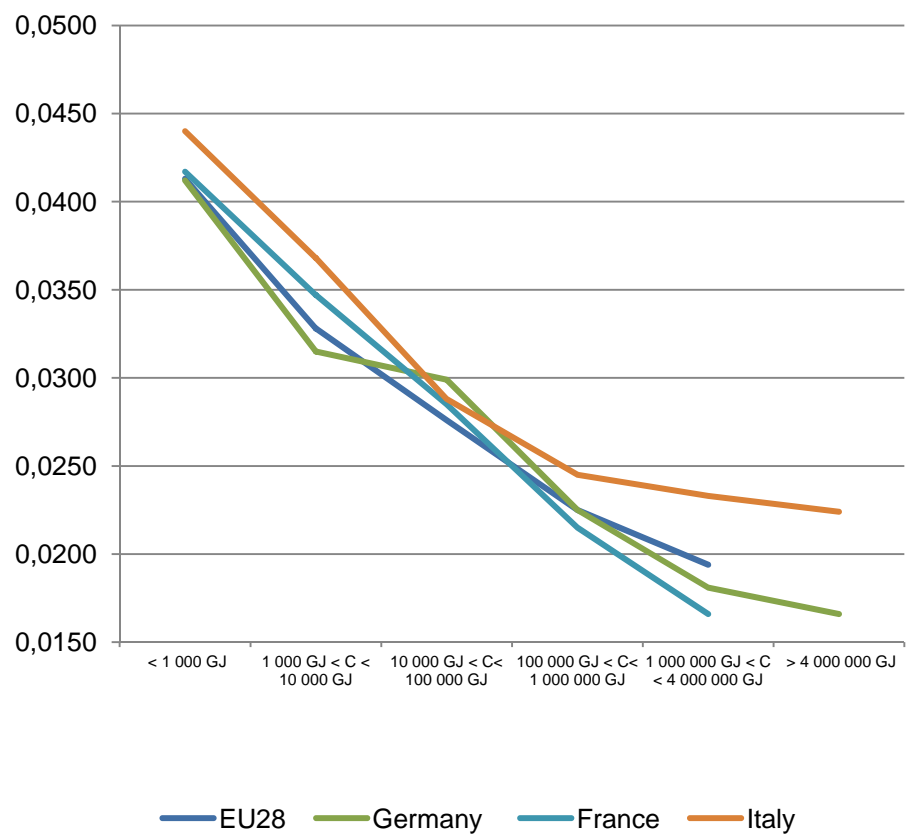


## ALL TAXES INCLUDED

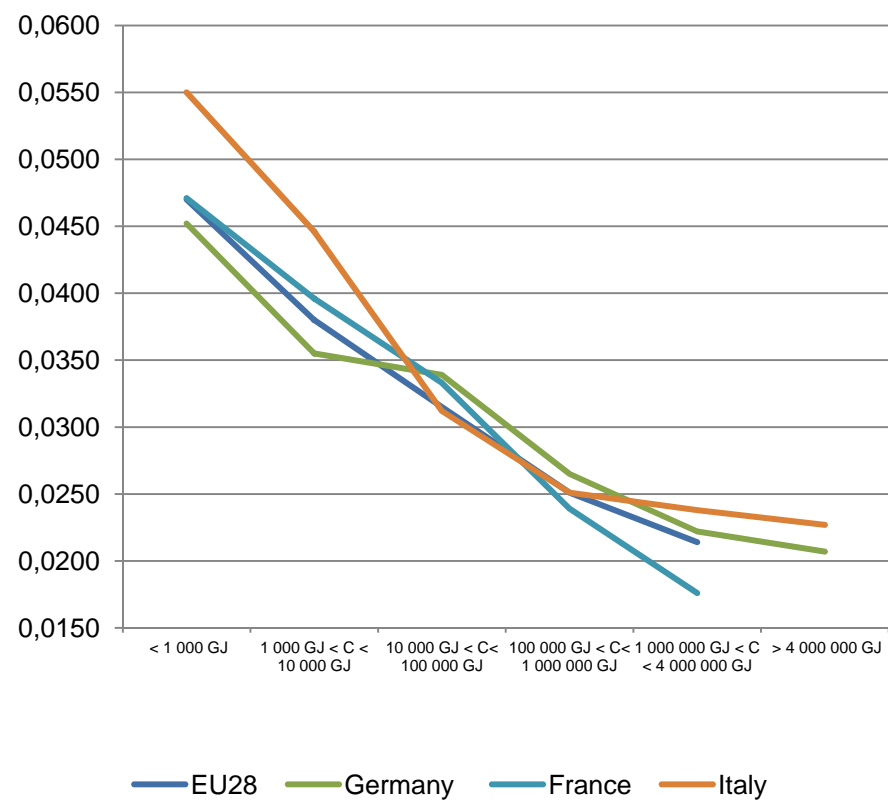


# Gas prices for industrial consumers (2016 S1)

## ALL TAXES EXCLUDED

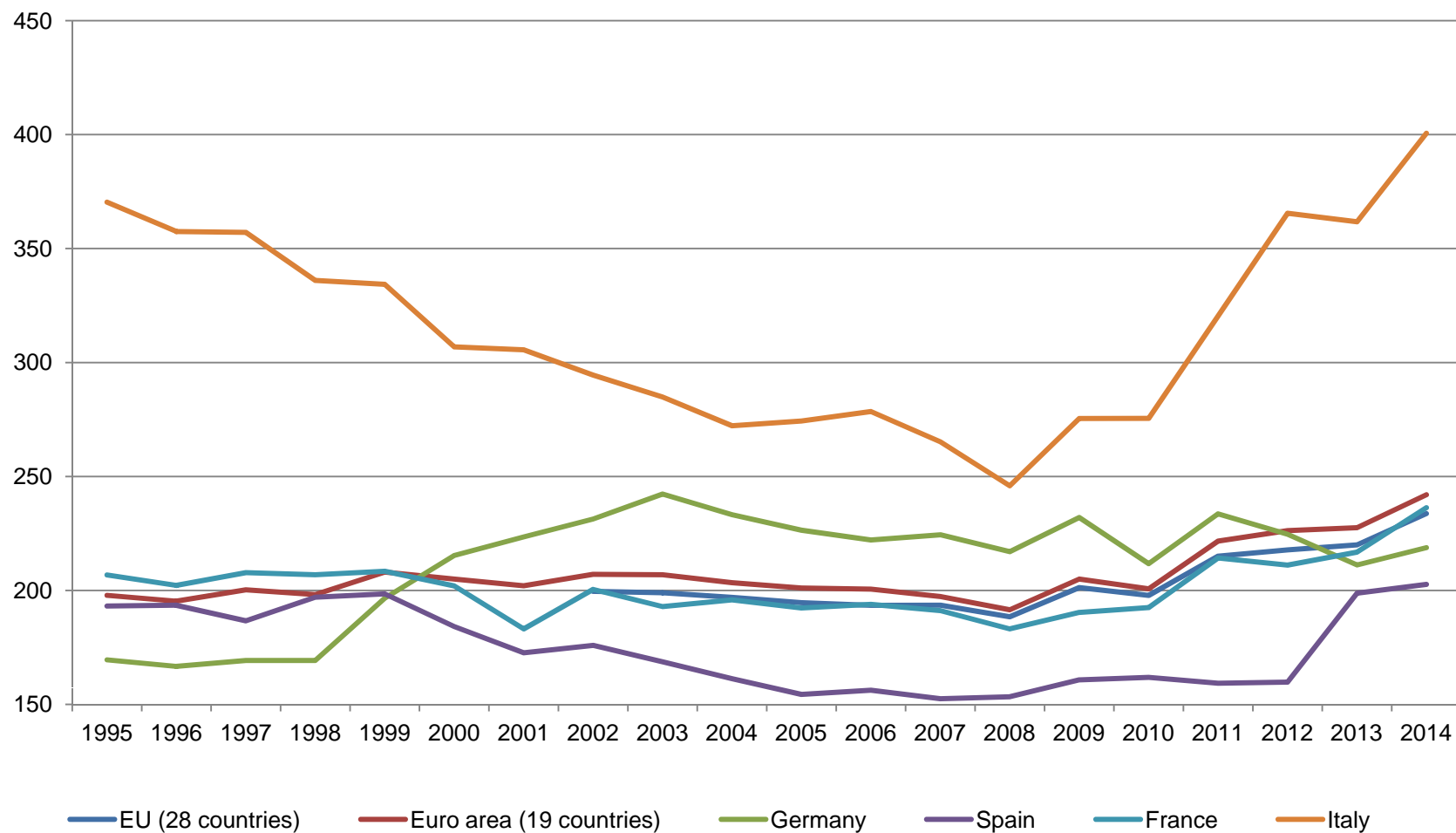


## VAT AND OTHER RECOVERABLE TAXES AND LEVIES EXCLUDED



# Implicit tax rate on energy

(EUR per TOE)



# Conclusions

## Comparing Italy with France and Germany:

- Potentially stronger terms of trade gains
- Lower impacts on firms and households in the short term but the adjustment could be slower and more costly because of:
  - lower elasticities
  - fewer alternatives
  - smaller room for further improvements?
- European carbon tax would probably hit Germany and Italy more than France.

An unilateral carbon tax (duty on fossil fuels purchases) could have negative effects on economy mainly through competitiveness losses

Competitiveness losses would reduce exports and increase imports both in the short and in the long term  
→ carbon leakage towards not regulated country could be a real risk

## A viable alternative could be a downstream or consumption-based carbon tax modelled on VAT :

- It protects competitiveness of domestic producers
- It falls entirely on domestic final consumers and does not affect prices of instrumental goods
- It reduces incentives for tax evasion
- It can provide incentives for partner countries to adopt their own carbon prices
- Simulations with ISTAT macroeconomic model MeMo-It show why it should be more effective and less costly with respect to a duty on fuel purchases.

(cfr. “A good F.A.C.T. for climate change mitigation” in Environmental Taxation - Green Fiscal Reform for a Sustainable Future Vol XVII Edward Elgar Publ. -2016 and “Modello Iva per la carbon tax” [lavoce.info](http://lavoce.info) 15.03.2016.)