Energy use in industrial processes : A method to transpose detailed data from France to Germany

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Context

➢ **Energy efficiency : An important but difficult to measure objective for the European Energy Policy**

- *Need to **identify most relevant technologies** to reduce energy consumption*
- *Technical improvements of energy performance are carried out **at the scale of processes**, not for a whole industrial sector*

➢ **Strong differences among European industries**

- *Different industrial structures and mix of energy sources*
- *Even for a common industrial sector, processes can be different among countries*

Issues

➢ *Develop a **methodology to transpose detailed data on energy use at the process level** from one European country to another one*

➢ ***Provide effective guidance for best energy efficiency innovation and diffusion** inside the manufacturing sector*

Methodology

➢ **Review of existing databases**

- In France : Detailed **survey database** on energy consumption in industrial sites (CEREN)

➔131 sectors, 46 process uses, 14 energy carriers

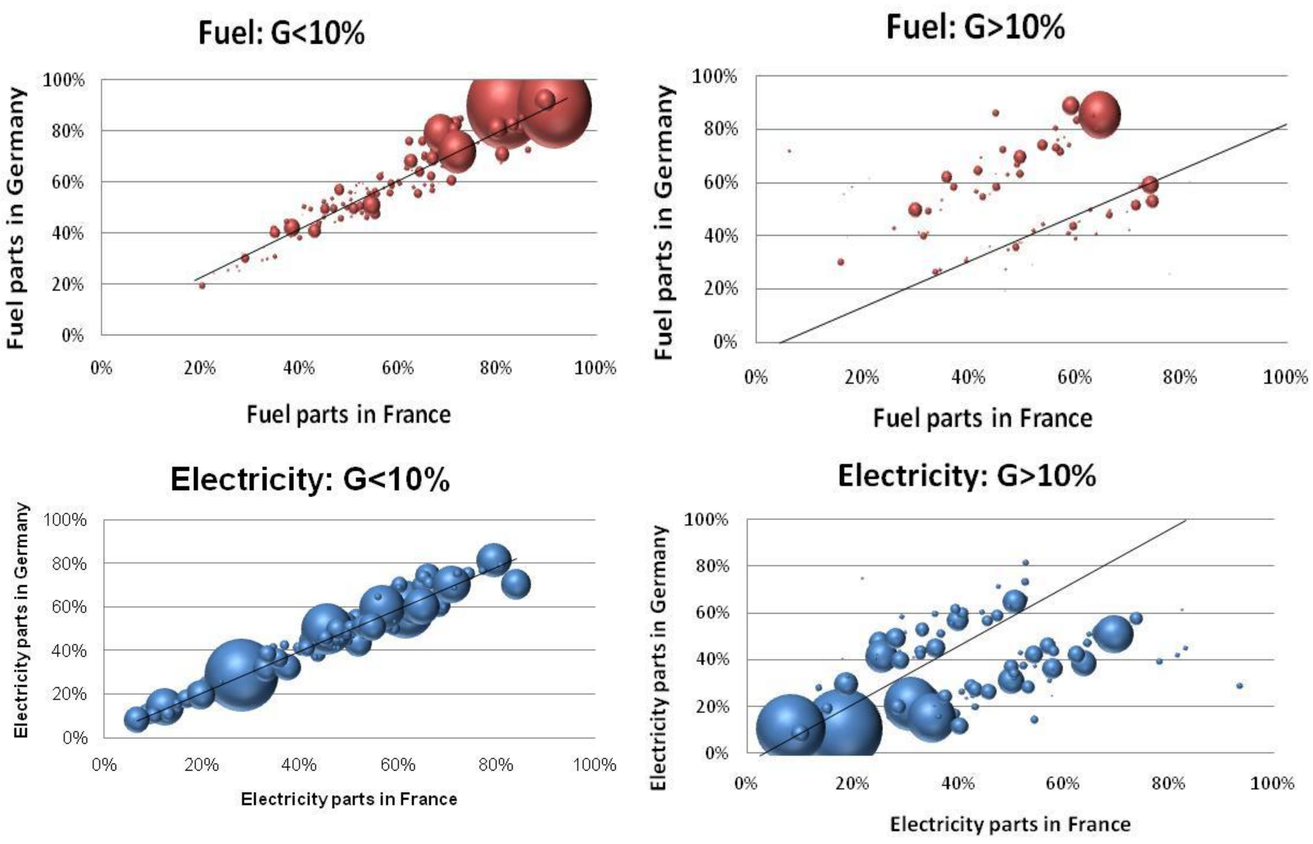
- In Germany : Public data estimated from a **technical bottom-up model** (ISIndustry, Fraunhofer ISI)

➔14 sectors, 13 process uses, 12 energy carriers

- In both countries : Energy consumption by industrial sector (without process uses) for more than 100 segments (CEREN, AGEB)

➢ **An indicator to identify industrial sectors (*G*) with similar energy uses by process**

- Use a detailed industrial sector classification (>100 sub-sectors)
- When the energy mix is different for a sector among countries, the assumption of equivalent energy intensity cannot be used.



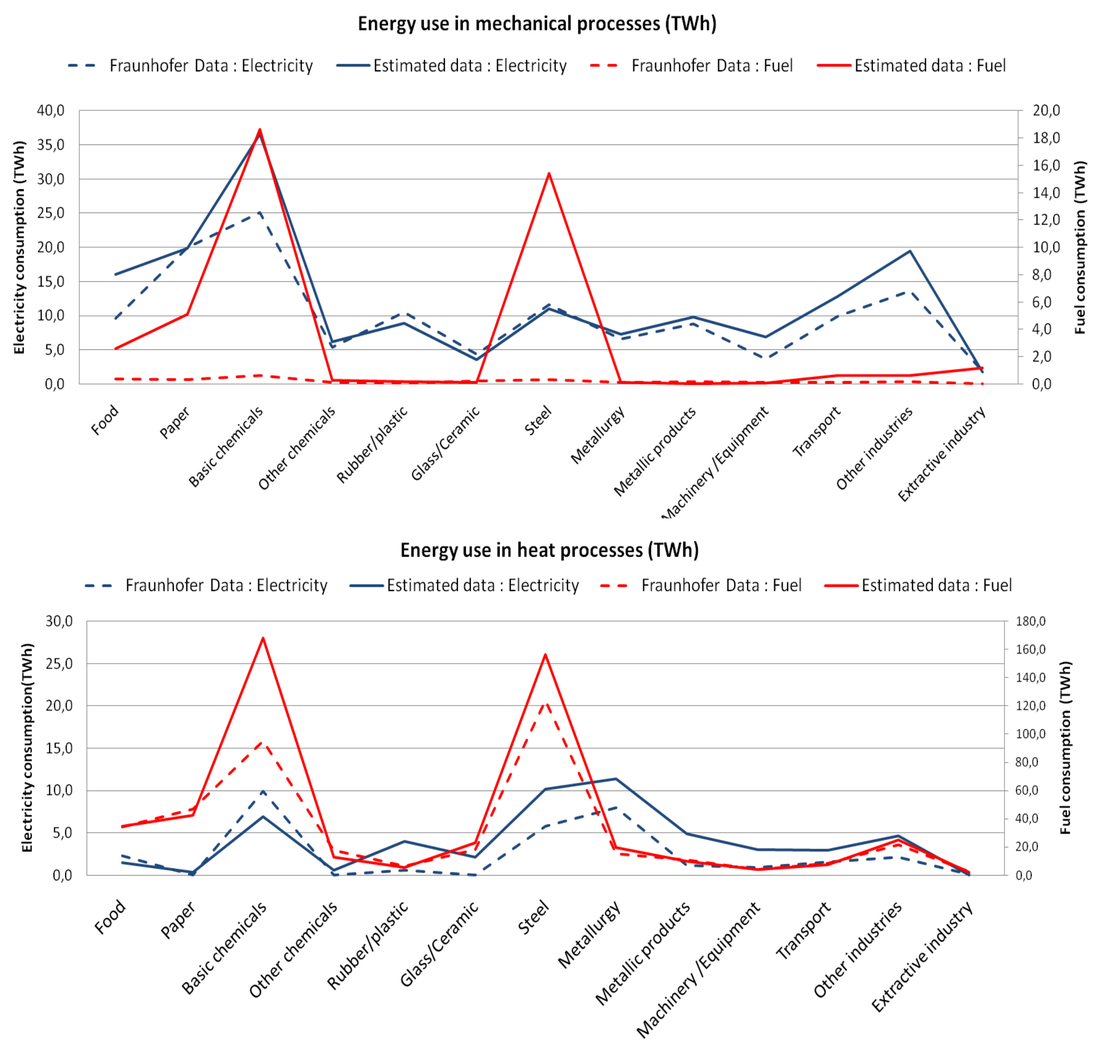
Part of fuel or electricity in total energy consumption in the German/French industries according the energy mix indicator (*G*). *Size of circle represents energy consumption of one industrial sector.*

- Definition of **energy mix indicator (G)** for each sectors :
  - *PG : Part of electricity (or fuel) consumption in Germany*
  - *PF : Part of electricity (or fuel) consumption in France*

$$G = \frac{PF - PG}{PF + PG}$$

➢ ***Comparison of energy use by process between Germany and France***

- For most sectors, **production processes are standardized**; energy consumption should be roughly equivalent in both countries.
- To **identify** sectors needing **additional expertise, or a survey.**
- **Simple transposition method** combining data on energy use by sector and by process for both countries. A test on aggregated sectors.



Comparison of energy consumption data in mechanical and heat processes by sector and by energy in Germany between Fraunhofer ISI data and the transposition estimation.

Results

- Transposition is more robust for the **main consuming process of a specific energy carrier** : *Electricity for mechanical processes, Fuel for heat processes*
- When **indicator *G*** is lower than **10%**, the estimation error is below 30% in these situations.
- For **half of industrial sectors**, the simple transposition method is robust for the main energy-consuming processes of a specific energy carrier.
- When data are available, it is possible **to correct for different processes or products** among countries (e.g. Iron and steel industry).
- **For other processes and industrial sectors, a European cooperation to develop databases on energy uses by process is necessary.**

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