Peeling the Onion: Analyzing Aggregate, National and Sectoral Energy Intensity in the European Union
An Application of the WIOD Database

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Outline

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2 Research Approach

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5 Conclusion
Motivation and Research Question

Introductory Graphs for the EU27-Aggregate

Figure: Gross Output, Energy Use and Energy Intensity in the EU27

What do these figures tell us?

- Shift in the composition of the aggregated European economy?
- Technology?
- Regulation, prices, country specific characteristics?
Motivation and Research Question

Introductory Graphs for the EU27-Aggregate

(a) Gross Output
(b) Energy Use
(c) Energy Intensity

Figure: Gross Output, Energy Use and Energy Intensity in the EU27

What do these figures tell us?

▶ Shift in the composition of the aggregated European economy?
▶ Technology?
▶ Regulation, prices, country specific characteristics?
▶ Research Question: What are the drivers of this cleanup?
Our Approach

1. *Index Decomposition Analysis*
   - For the EU27 Aggregate
   - For all 27 European countries

2. *Construction of variables to control for:*
   - Technological Change
   - Energy Prices
   - Structural Change & Trade
   - Environmental Regulation
   - Country Characteristics

3. *Econometric analysis of index values and controls:*
   - Cross-Section and Panel Regressions to sort out causalities
   - Various types of estimation procedures
EU27-Aggregate

Figure: Log Mean Divisia Index Decomposition of Energy Intensity

- How does the picture(s) look like when individual countries are introduced?
Part I: Index Decomposition Results

Two Exemplary Countries

Figure: IDA Results for the Czech Republic and Germany

- Structure became more energy-intensive in Germany
- Technology almost unaltered in Czech Republic
- We have performed IDA for all 27 European Countries
Factors we control for

- Panel of 27 European Countries, 1995 - 2009 ⇒ 405 observations
- 3 dependent variables: Index values for total, structural and technology effect

1 Technology Factors: Total Factor Productivity (TFP), Income, Capital Vintaging, Energy Prices
   - WIOD, Barro and Lee (2010), Penn World Tables 7.0, Mincerian Returns on Education, Eurostat

2 Structural Factors: Trade Openness, Capital-to-Labor ratios
   - WIOD, CIA World Fact Book, Penn Word Tables

3 Political Factors: Regulation
   - Constructed Policy Index of > 3000 energy policies in the 27 countries (together with FEEM)

4 Country Characteristics: Latitude, Size, EU15, Heating Degree Days, Population Growth
   - CIA World Fact Book, Penn World Tables, Eurostat
## Results (Schematic)

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Some tentative conclusions

- Extensive study of European energy intensity
- Usage of WIOD and combination with established data sets
- Very large heterogeneity in Europe
- Decline due to improving technology
- Positive effects from European integration

Thank you for your attention!