



KARLSRUHE, 8 NOVEMBER 2017

REFLEX-WORKSHOP

TECHNOLOGICAL LEARNING IN THE ENERGY SECTOR

Parallel Session „Methodology“

Parallel Session «Methodology»

Noah Kittner and Felix Lill present their «One vs. Two-factor Experience Curves» approach with cumulative product output and patents.

Issues:

- Theoretical framework missing (micro-economic production function? endogeneity issues)
- How many factors should be included
- Which type of patents to use
- Governmental R&D vs. private R&D
- Patent depreciation
- Lag effects (of patents)
- Correlation vs. causation
- Statistical issues: collinearity, few data points...



Parallel Session «Methodology» (2)

Thomas Martinsen presents

Issues:

- Outsourcing or make patent available to third parties to accelerate diffusion (vs. confining innovation in patents)
- Role of radical innovation (e.g. artificial intelligence)
- Define system boundaries
 - (e.g. include use phase of batteries)
 - Feedback loops, interaction btw. sub-systems
- Experience vs. increasing feedstock market price



Parallel Session «Methodology» (3)

Discussion issues:

- **Theoretical framework to define**
- **Define your learning system and its boundary**
- Either One factor or Many factor approach (two is just a random number)
- Multi-factor approaches to explain exogenous impact factors (e.g. from policy, market situation/business cycle, input material (also used by others), bubbles etc., especially if prices are used)
- Use part of the result of Mf or Of in models
- To conduct a review study to compare the different approaches
- Distinguish different phases in the learning process (first more innovation needed, than more deployment)
- Price vs. costs: how to deal with? Would multi-factor approaches help?

Parallel Session «Methodology» (4)

One factor or Many factor approach to include into models?

- Depends on the use case
- Could be complementary
- Mf to isolate scale effect from other drivers and use Of in models
- How long to extrapolate? Deal with upcoming uncertainties. And with the issue that input prices could dominate.

Balance btw. public spending R&D and deployment

- LR could probably not be influenced
- Force public spending too much
 - Could get inefficient (in case of rapid scaling up R&D spending)
 - Could increase prices (in case of massive deployment)
- Focus on radical innovation instead (next generation)
- Does R&D have a “consistent” impact?



Parallel Session «Methodology» (5)

Final round

- What to do with the learning curve (describe or explain)?
- R&D for the next generation (not for deployment)
- One vs. multi-factor depends on the (research) question and on the goal
- Public (risky, fancy) vs. private R&D (mature)
- Focus more on the “utility”: not kW, but kWh
- To advance on price forecasts
- Feedback loops are key
- Move from price to production costs
- Interesting workshop, learned a lot today

Secure your system boundaries





THE END

