Prosumage of solar electricity: Tariff design, prices, and capacity investment

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**Motivation**

**PRO-SUM-AGE***

- **PROduction**
- **ConSUMption**
- **StorAGE** (batteries)

*Schill et al. (2017)\(^*\)

Source: own illustration
Motivation

Research question

• How does the tariff design affect household incentives for investments in PV and battery capacity?

Tariff design options studied

• Feed-in tariff:
  • Different levels
  • Time-invariant vs. real-time pricing
  • Feed-in restriction

• Retail tariff:
  • Energy- vs. capacity-oriented pricing
  • Time-invariant vs. real-time pricing
  • Self-consumption tax

Source: own illustration
Intuition: prosumage incentives

Source: own illustration adapted from Ossenbrink (2017).
Methods

Electricity system modeling

• Formulation of DIETER* as mixed complementarity problem
• Prosumage segment 1 mio. households
• DIETER calibrated to German network development plan 2030

* Zerrahn & Schill (2017)
Results: optimal household PV and battery storage capacities

- PV capacity sensitive to feed-in tariff design
- Battery capacity rather robust
Results: optimal household PV and battery storage capacities

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  - However, no storage deployed at strong capacity-oriented retail design
Results: optimal household PV and battery storage capacities

- PV capacity sensitive to feed-in tariff design
- Battery capacity rather robust
  - However, no storage deployed at strong capacity-oriented retail design
Results: central trade-off

Annual system cost contribution in EUR

Capacity-oriented retail tariff
- high
- low

Feed-in tariff
- high
- low

PV capacity in kW

Retail_30 FIT_8

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• Under continuation of current tariff design:
  • Expansion of prosumage segment expected
  • This may lead to load defection issues

• Mitigation possible by more capacity-oriented retail pricing…
  • ... but not with lower FIT

• See paper for other tariff design options
Thank you for your attention.
Sources


