

Optimal Renewable Energy Policies under Uncertainty: Commitment vs. Discretion

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Commitment vs. Discretion

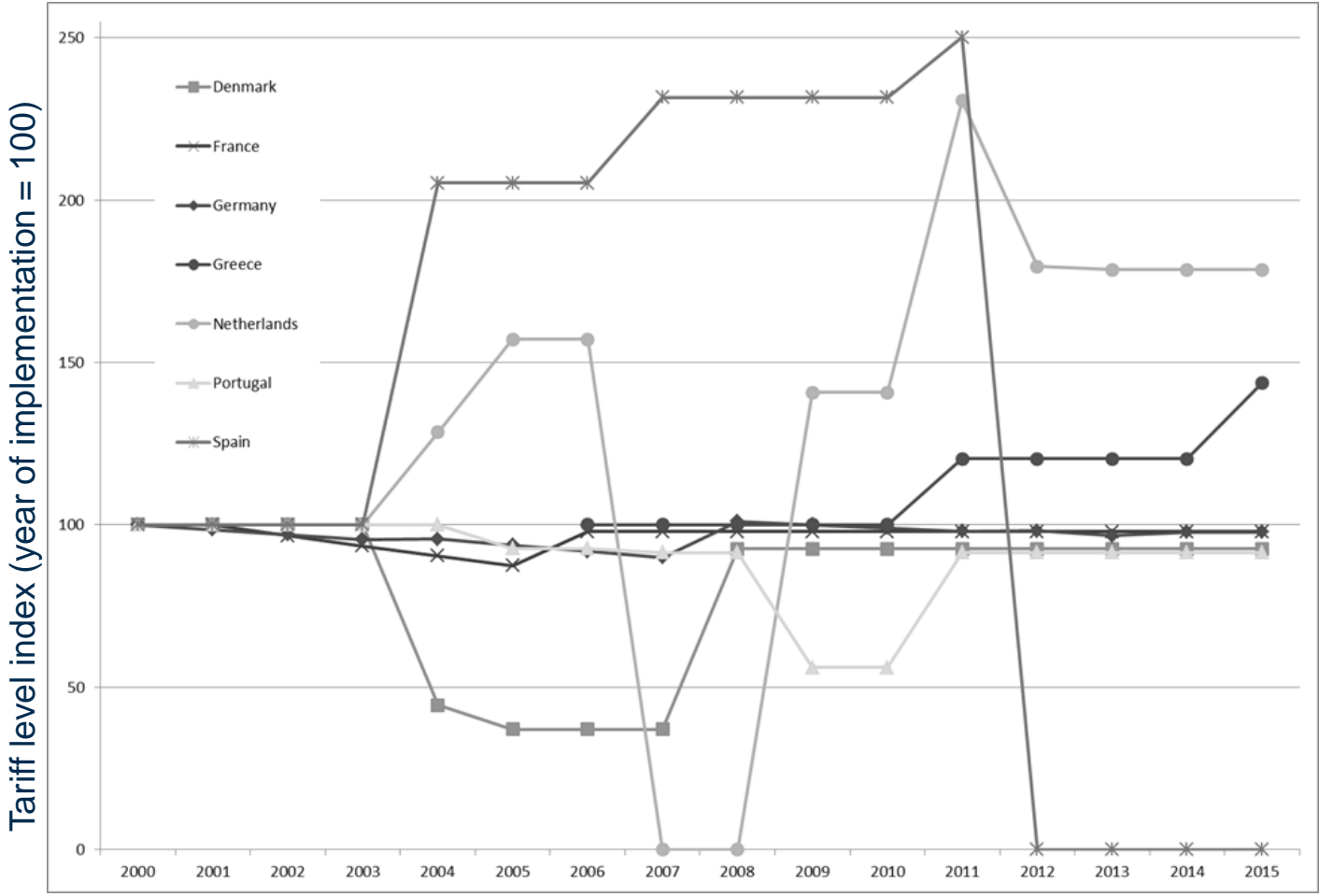
Florian Habermacher, Paul Lehmann

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RES policy commitment and discretion in Europe



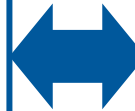
Evolution of feed-in tariffs for newly installed onshore wind power in selected European countries



Trade-off for climate and energy policy

Costs of discretion

- Time-inconsistent policy-making if policy-makers simultaneously aim at promoting RES deployment and limiting costs of RES deployment
- Result: suboptimal RES deployment by private investors



Costs of commitment

- Benefits and costs of RES deployment uncertain ex ante
- Commitment foregoes opportunity to incorporate new knowledge in RES policy design
- Result: Suboptimal RES support levels

Research question:

- How does this trade-off affect the optimal intertemporal design of policies to support RES deployment?

Approach: Dynamic partial equilibrium model

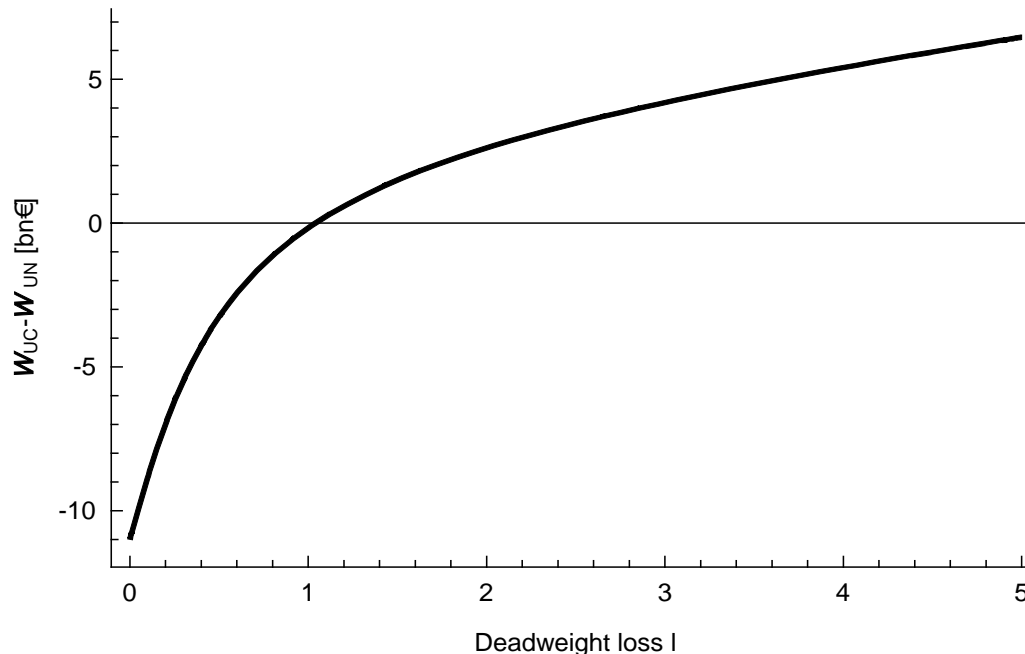
- A representative firm invests in RES deployment in period 1 and 2, investments are irreversible and last for two periods
- External benefits and technology costs of RES deployment may be uncertain with two possible states
- RES subsidy to internalize external benefit; produces deadweight loss due to distortionary taxes levied to fund the subsidy (= trigger for time-inconsistent policy-making in the case of discretion)
- Policy scenarios:

Commitment in period 1 to a fixed subsidy rate s_2 for period-2 investments

Discretion to set a subsidy rate s_{2i} in period 2 after learning about the firm's investment in period 1 and the actual state of the uncertain parameter in period 2

Results: Comparison of social welfare if external benefits of RES deployment are uncertain

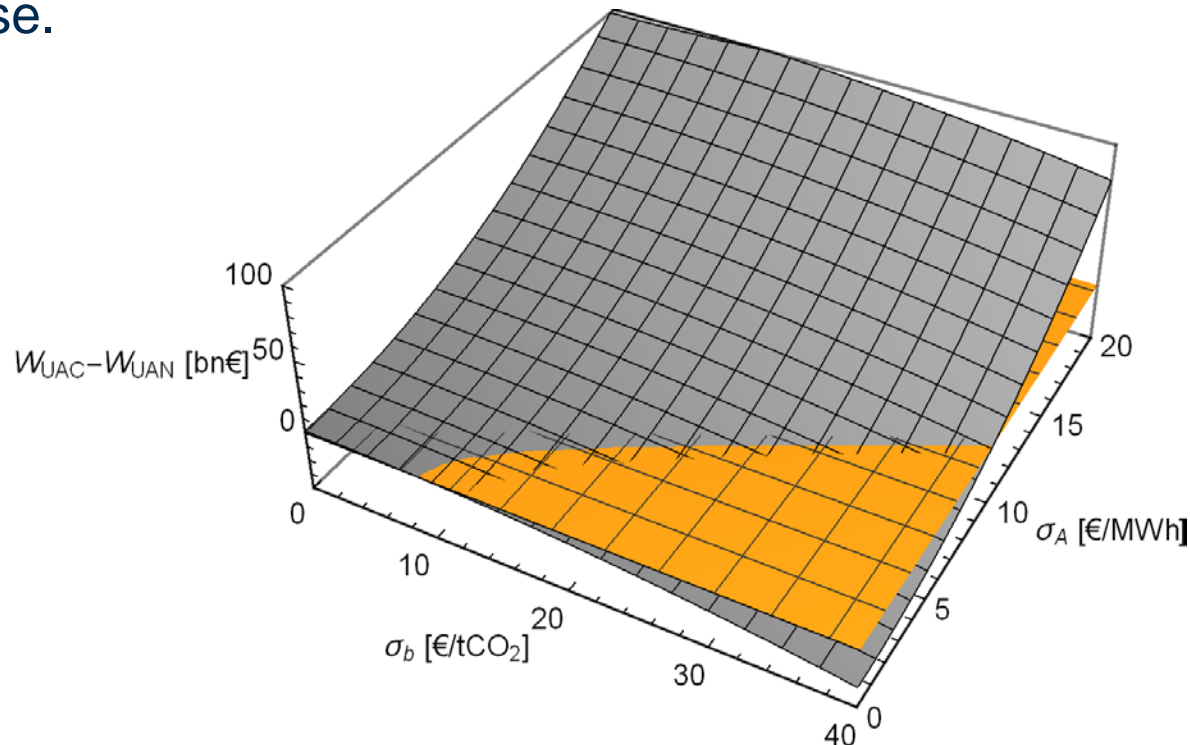
- Choice between commitment and discretion is **analytically ambiguous**
- Naïve numerical application to European power sector shows **discretion robustly outperforms commitment** for reasonable parameter values



Welfare difference between commitment W_{UC} and discretion W_{UN} : Sensitivity to deadweight loss l

Results: Comparison of social welfare if external benefits of RES deployment are uncertain

- Commitment becomes (more) favorable if (1) uncertainty resolves only slowly, (2) policy-makers set subsidies arbitrarily, and/or (2) investors are risk-averse.



Welfare difference between commitment W_{UC} and discretion W_{UN} : Sensitivity to standard deviation of the benefit σ_b and of the political arbitrariness σ_A (yellow plain shows the zero level)

Results: Comparison of social welfare if RES technology costs are uncertain

- **If subsidy is to internalize external benefits:** commitment $>$ discretion (because optimal Pigouvian subsidy rate independent of costs)
- **If subsidy is to attain politically set RES target:** discretion $>$ commitment (because target impedes discretion if policy-makers commit to it credibly)

Conclusions

- High degree of RES policy commitment is economically sensible (despite uncertain benefits and costs of RES deployment)
- But: Simultaneous commitment to RES targets and RES subsidies is not necessarily sensible
- Small welfare differential between commitment and discretion suggests choosing an adequate ambition for RES policy today is more important than the way policy makers commit to it across time.

Thank you for your attention!

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Contact:

paul.lehmann@ufz.de

www.ufz.de/energyeconomics

