

Public support for low-carbon demonstrations

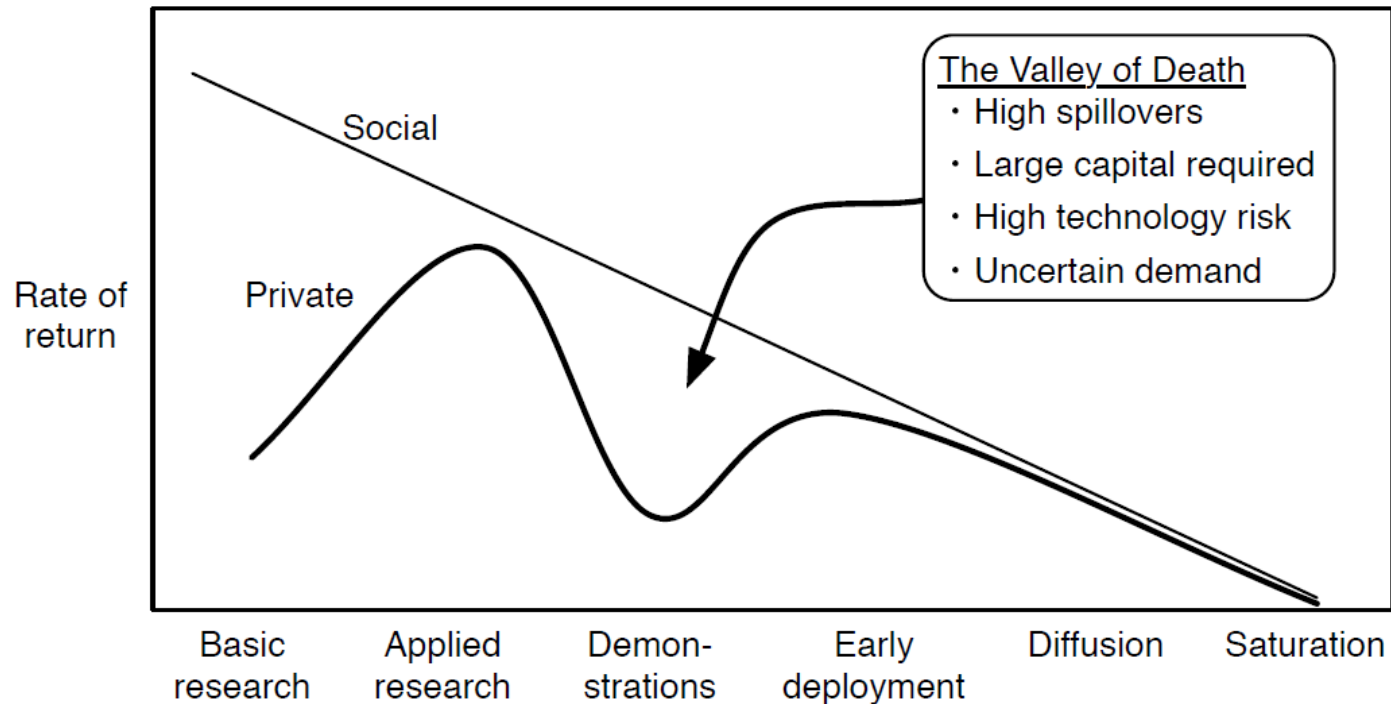
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In between Tech Push and Demand Pull: the “Valley of death”



Weak incentives between R&D and deployment phase

- High spillovers : Teece 1986; Hall, Mairesse et al 2009
- Large capital requirements:
- High technology risk
- Uncertain demand: Kalkuhl et al., 2016; Nemet et al., in review; Koch et al., 2015

In between Tech Push and Demand Pull: the “Technology Pork Barrel”

“political institutions introduce predictable systematic biases to R&D programs so that on balance, government projects will be susceptible to performance underruns and cost overruns.”

Cohen, L. R. and R. G. Noll (1991). *The Technology Pork Barrel*. Washington, Brookings.

Government failures when selecting financed projects:

- Information asymmetry
- Risk averse bureaucracy
- Lobbying groups
- Representative democracy

One interpretation: ***Governments should not pick winners***

...but what if scale, spillovers, and
market uncertainty force a choice?

Bridging the Valley of Death while avoiding the Technology Pork Barrel

Motivating question:

- How can public support for technology demonstration projects be structured to be most effective?

Approach:

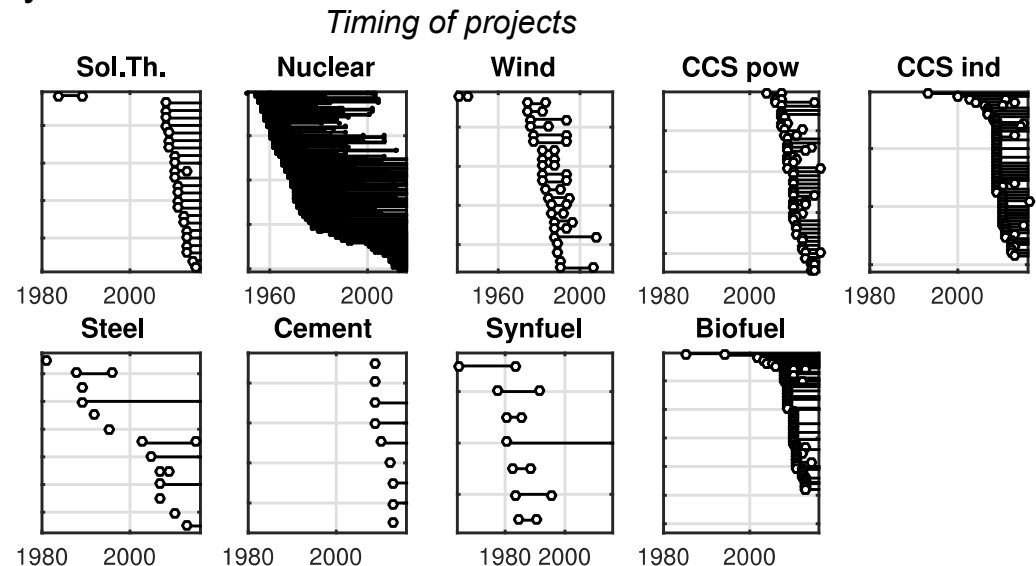
- Coding characteristics of 511 cases of large-scale demonstration projects
- Technology areas included:

- Solar thermal electricity
- Nuclear
- Wind power
- CCS power
- CCS industry
- Steel
- Cement
- Synthetic fuels
- Cellulosic biofuels

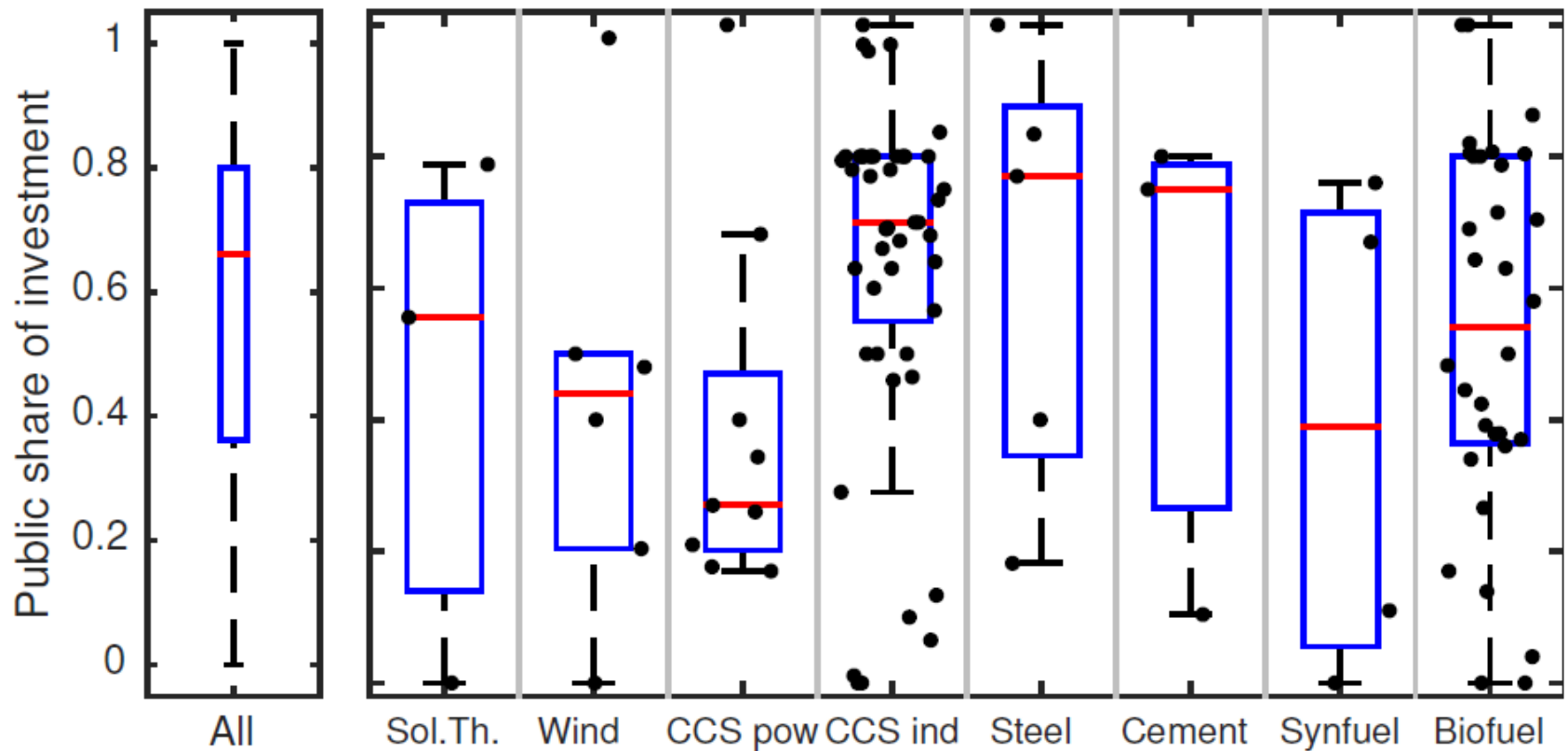
Electricity

Industry

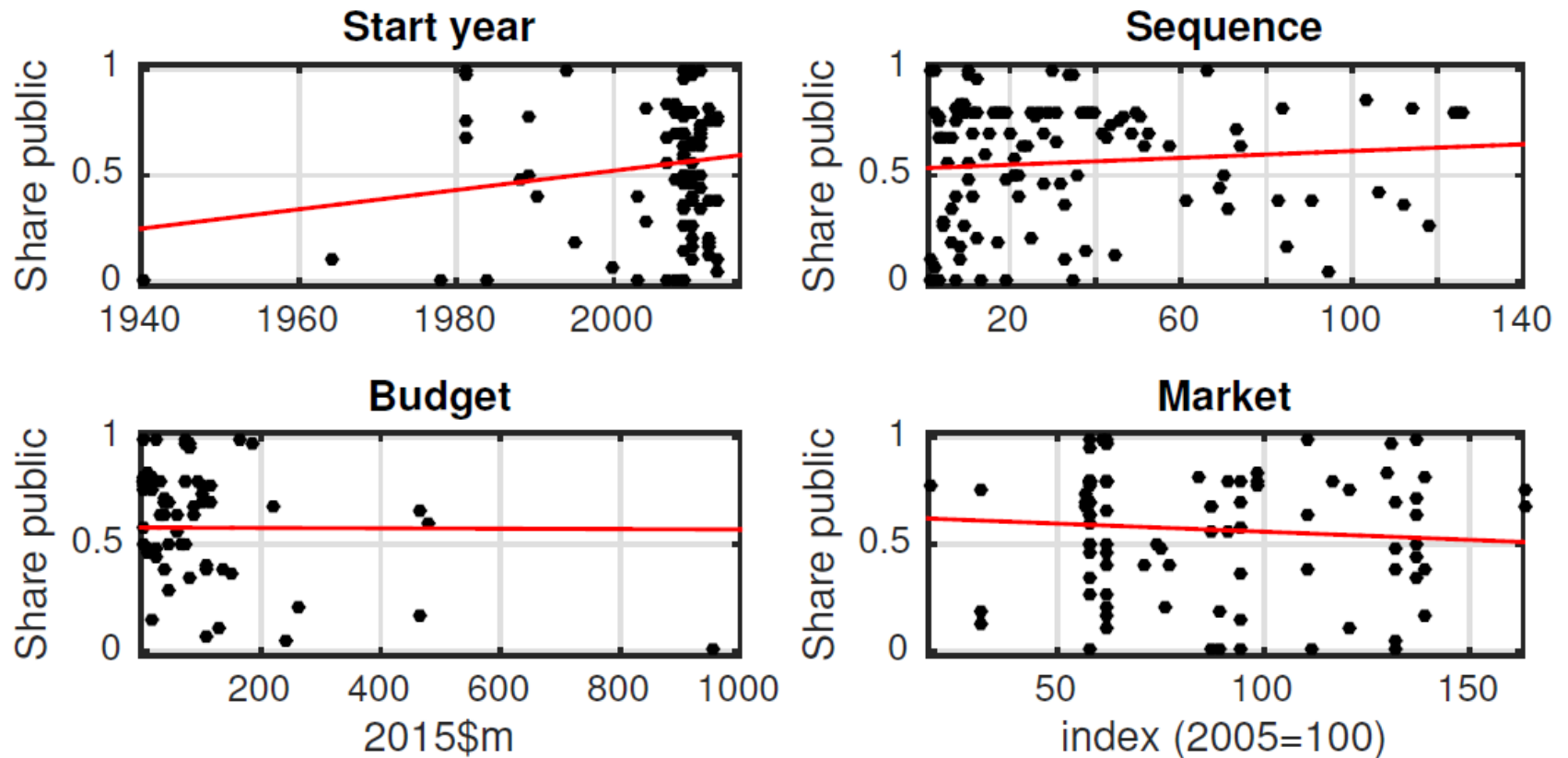
Fuels



Public sector financial contribution

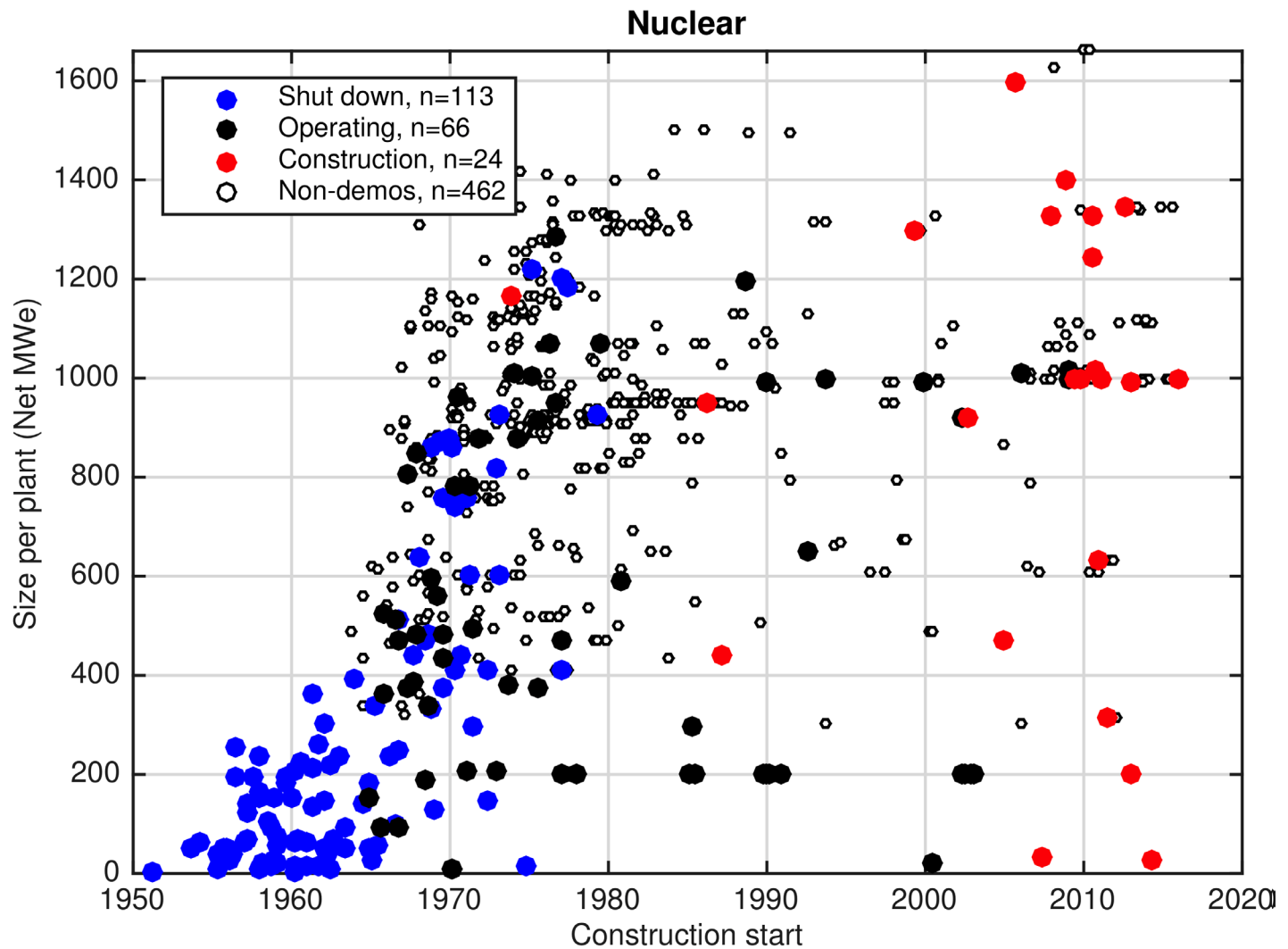


Private sector share decreases over time and over projects

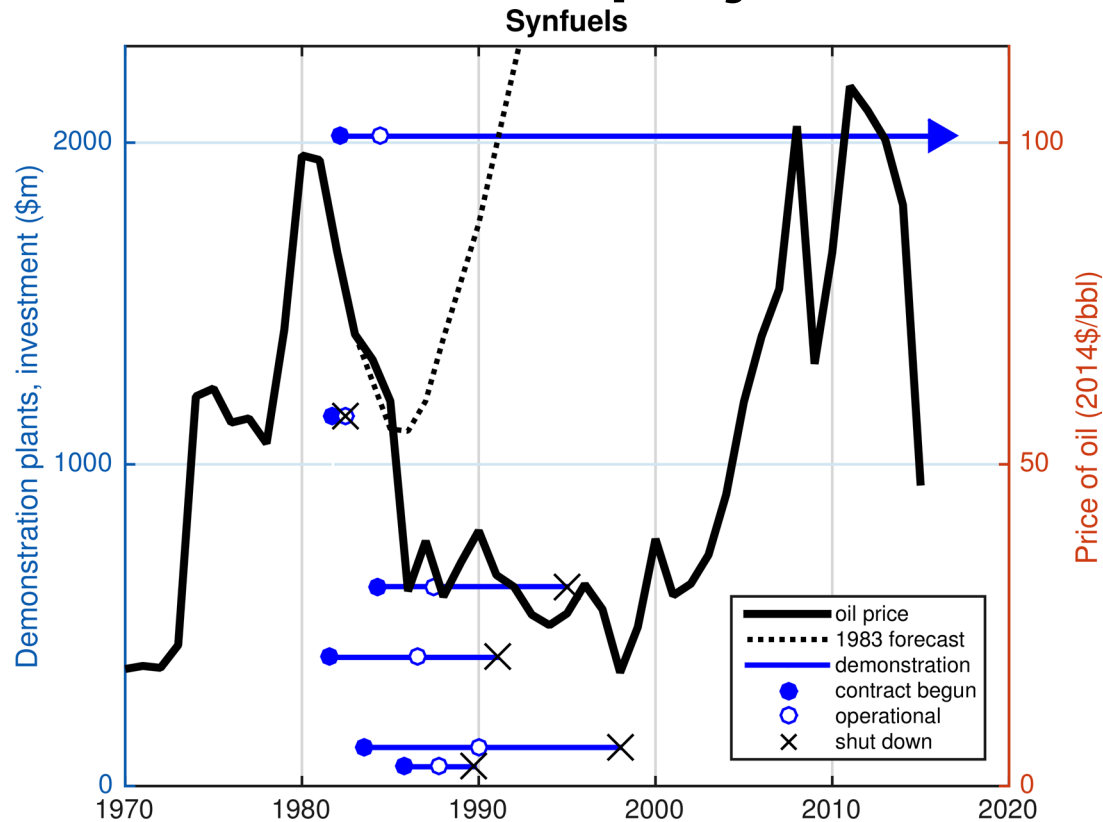


Relationships are not significantly different from zero

Up-scaling takes time and is not trivial

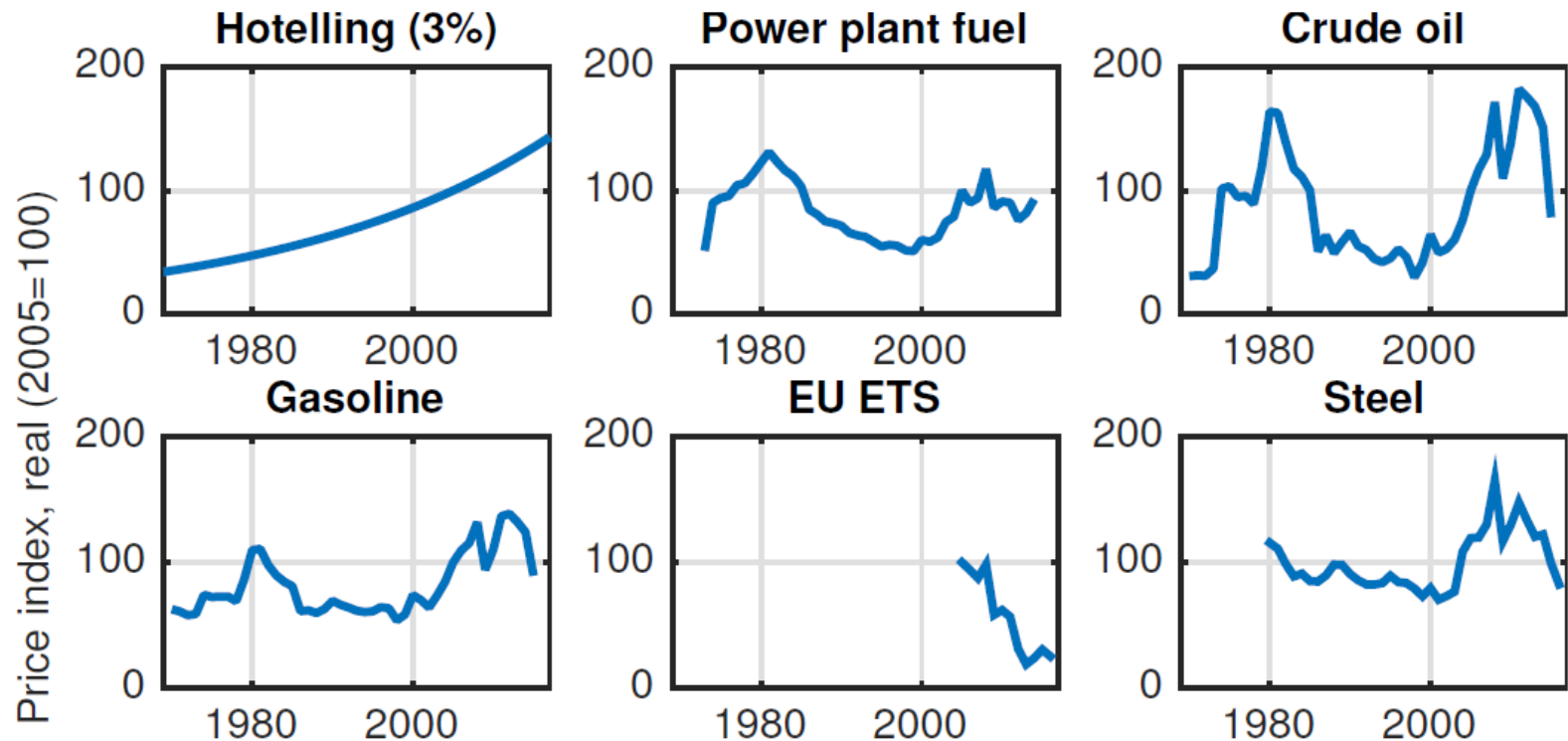


Market conditions can result in cancellation of projects



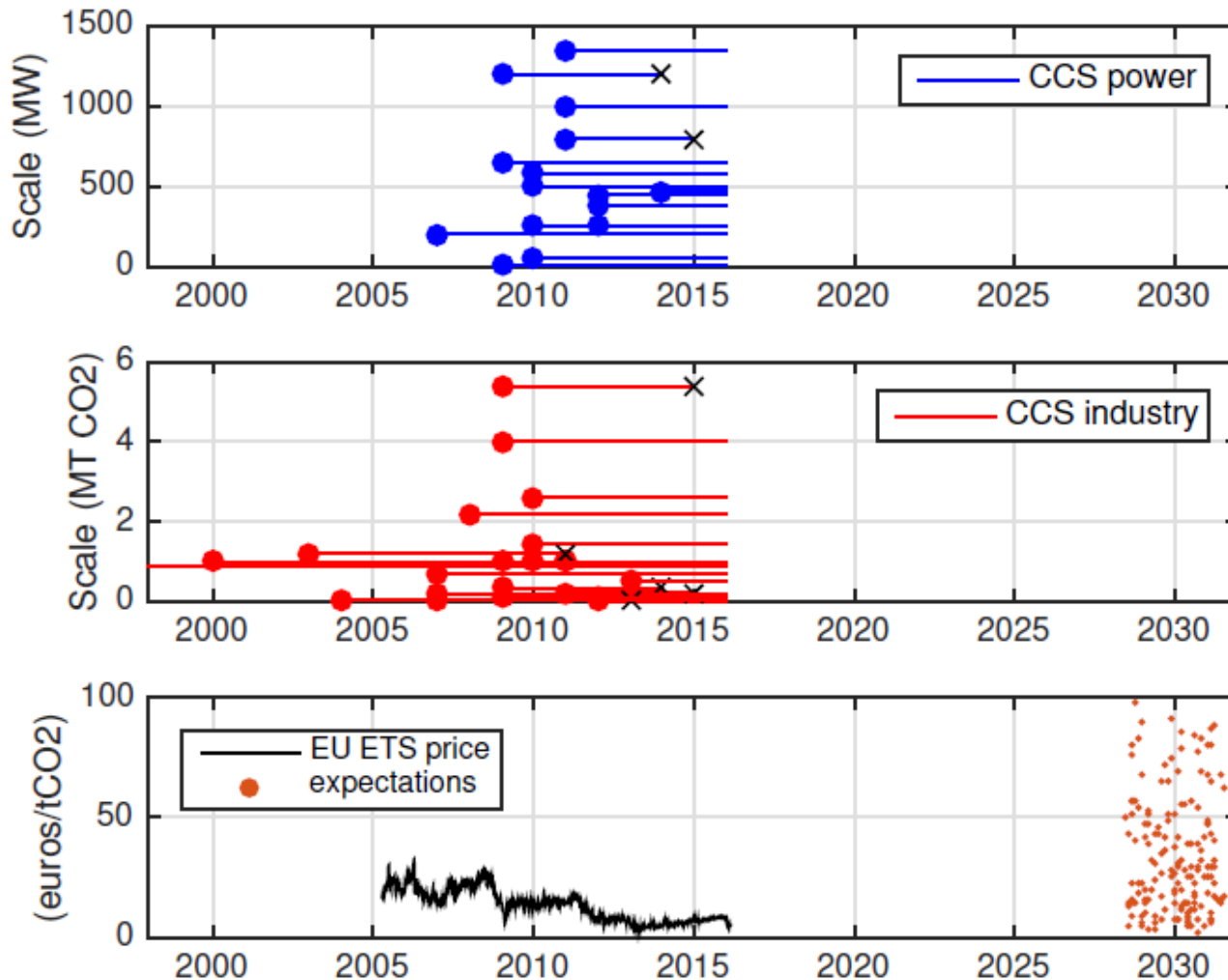
Anadon, L. D. and G. F. Nemet (2014). *The U.S. Synthetic Fuels Corporation: Policy Consistency, Flexibility, and the Long-Term Consequences of Perceived Failures*. *Energy Technology Innovation: Learning from Historical Successes and Failures*. A. Grubler and C. Wilson. Cambridge, Cambridge University Press: 257--273.

Hotelling Path subject to much variation



Other literature: Krautkraemer (1998); Zaklan et al (2011)

EU ETS price as market condition for CCS projects facing large uncertainty



Conclusion

Summary results from 511 demos:

- Public share varies, even within technologies
- Up-scaling is central
 - Need many demos, increasing in size
 - Sequential to enable iterative learning
- Need payoffs that are robust to market conditions
 - Risky to depend on hotelling price increases
 - Niche markets, hedging across markets,

Follow up study

“The results indicate that larger plant sizes increase the risk of CCUS projects being terminated or put on hold;

increasing capacity by 1 Mt CO₂/y increases the risk of failure by nearly 50%.”

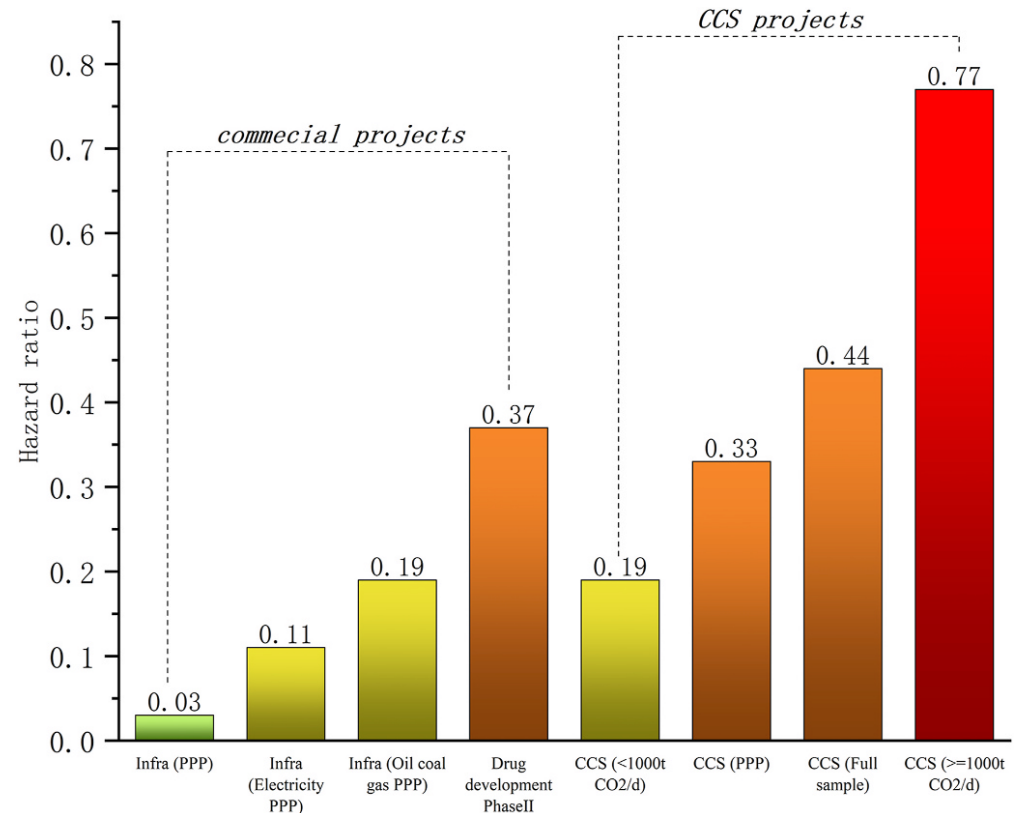


Fig. 6. Risk comparison of infrastructure projects (PPP), electricity infrastructure projects (PPP), oil coal & gas infrastructure projects, drug development projects (phase II) in the United States, and CCUS projects.

Implications for policy decisions on support for demonstrations:

Policy makers should consider:

- 1) prioritizing learning,
- 2) iterative upscaling,
- 3) private sector engagement,
- 4) broad knowledge dissemination, and
- 5) making demand pull robust.

Implementation issues:

- 1) Rent seeking
- 2) Selection, picking winners
- 3) Information access
- 4) Crowding out
- 5) Risk aversion

APPENDIX

Types of demos

- Large scale
- System integration within projects
- Upscaling unit size
- Development of supporting infrastructure

Motivation for projects

