The Economics of Technologies to Combat Global Warming
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Some Thoughts on the Dynamics
of R&D and Climate Policy

**Emanuele Massetti**
Catholic University of Milan, FEEM and CMCC

- Energy efficiency improvements will play a crucial role but we know very little about R&D spending to achieve higher energy efficiency. [J. Weyant: bias towards energy supply technologies]

- Learning curves: towards more comprehensive curves?

- Optimal total R&D investments under a climate policy: a broader view.

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Reductions of energy and carbon intensity in the next 30, 50 and 100 years, and past 30 years (changes w.r.t 2002).

Bosetti, Carraro, Massetti, Sgobbi and Tavoni (2008).

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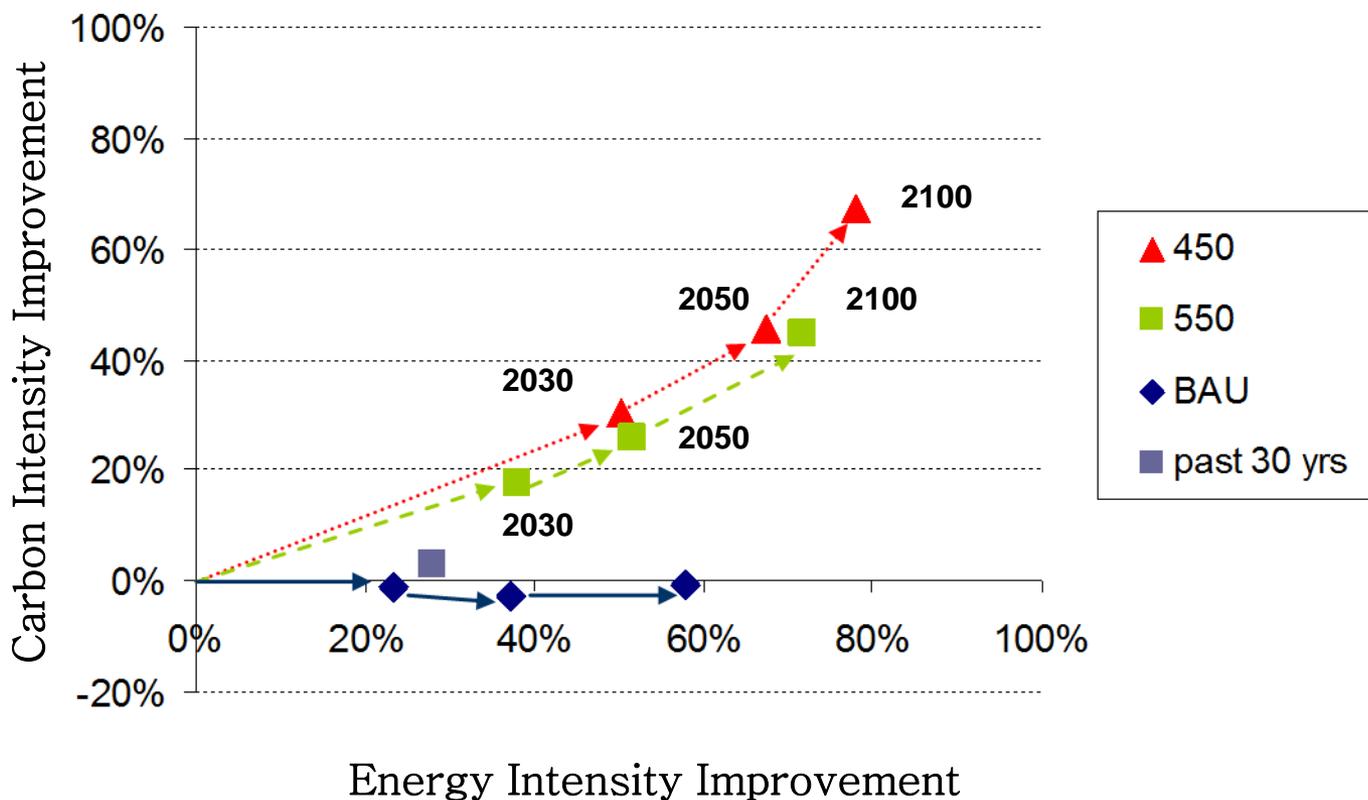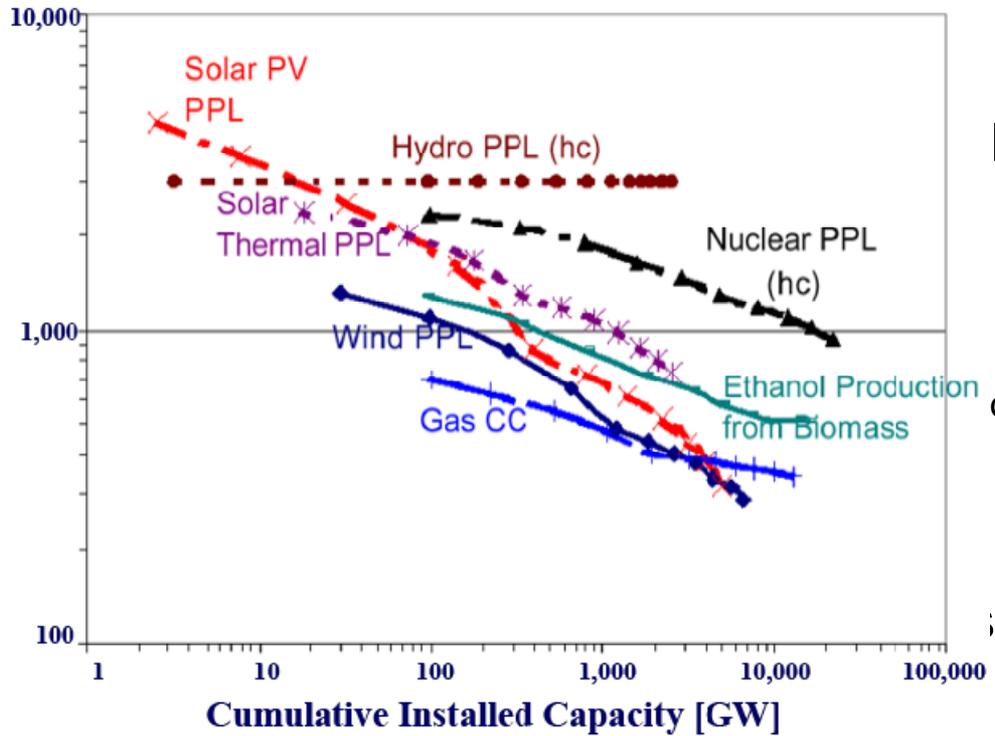
- In the next three decades, pursuing high energy efficiency gains will probably be a key mitigation strategy.

- Energy efficiency is often achieved with applied research, at firm level: hybrid cars, Boeing 787…

- What do we know about firms' present and historic R&D spending to increase energy efficiency of their products? How can we improve our understanding of this crucial issue?

- For modeling R&D dynamics this is of great importance: we are probably underestimating R&D investments to increase energy efficiency.

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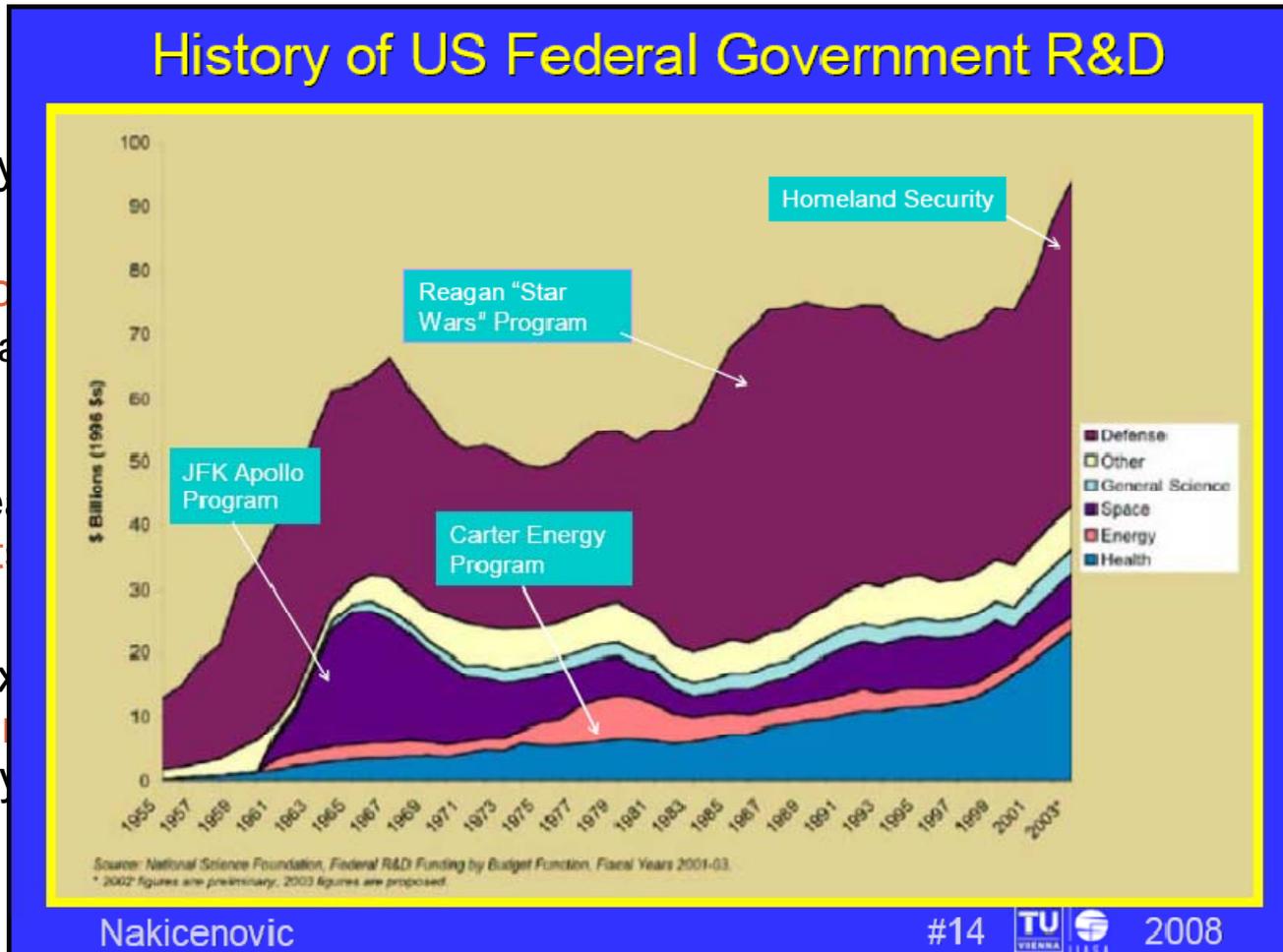 - bel[...] (to wind)
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- Two-factors (R&D and installed capacity) learning curves are problematic, but how do we determine the direction of causality without controlling for supply shocks in one-factor learning curves?

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History of US Federal Government R&D

Homeland Security

Reagan "Star Wars" Program

JFK Apollo Program

Carter Energy Program

Legend:
- Defense
- Other
- General Science
- Space
- Energy
- Health

Source: National Science Foundation, Federal R&D Funding by Budget Function, Fiscal Years 2001-03.
* 2002 figures are preliminary, 2003 figures are proposed.

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Energy to Non-Energy R&D Investment Ratio

Total Investment in R&D
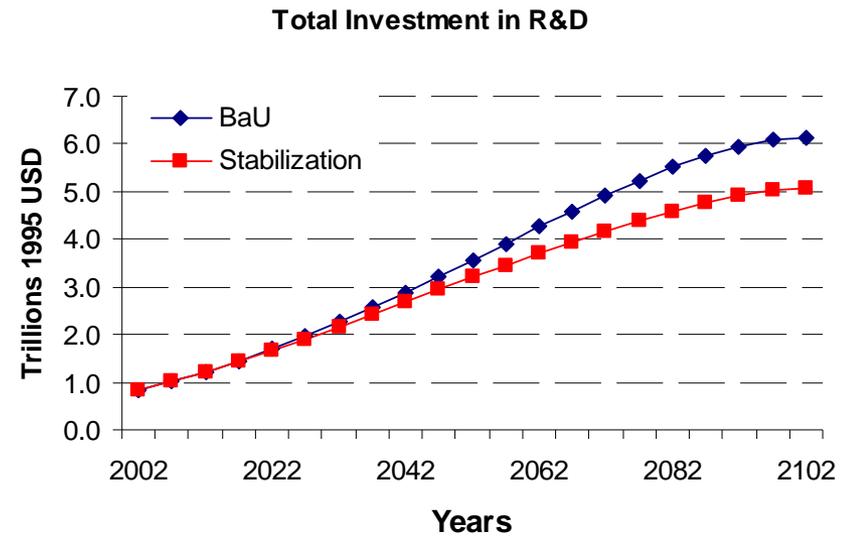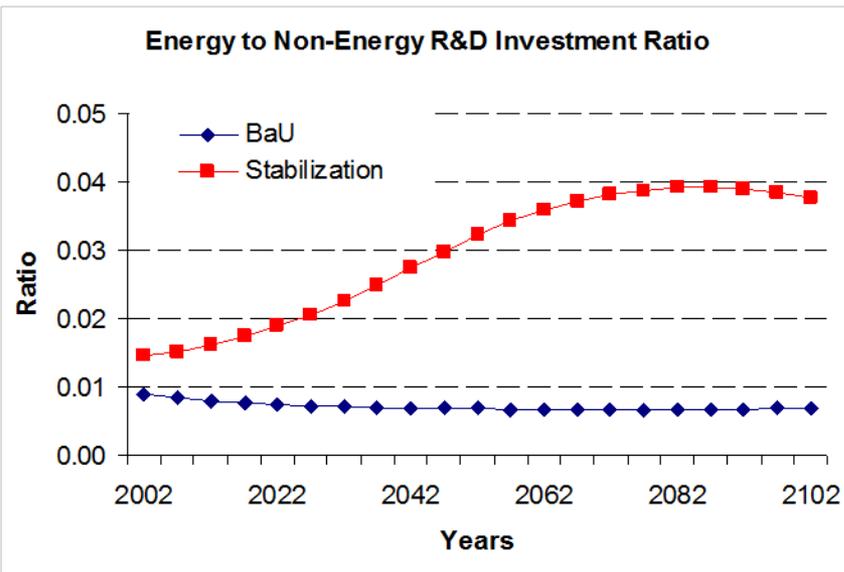
- In the Business as Usual (BaU) the ratio between Energy and Non-Energy R&D is declining.

- Stabilization scenario: CO_2 concentrations in the atmosphere at 450ppm in 2100. Policy tool: cap&trade with global carbon market.

- The Energy to Non-Energy R&D investment ratio sharply increases due to a strong increment of Energy R&D and to a decrease of Non-Energy R&D.

- The contraction of Non-Energy R&D investment is stronger than the increase of Energy R&D investment and total R&D expenditures decline.

Why such a strong contraction of Non-Energy R&D investments?

1. Energy-biased (pollution-biased) technical change.

2. Scale effect due to lower output in the stabilization scenario.

3. Simulation exercises and analytical results show that increased spending in Energy R&D does not have pure crowding-out effects on Non-Energy R&D investments.

A low-carbon world will likely be a world with a higher or a lower rate of technical innovation?

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Thank you for your attention!

emanuele.massetti@feem.it

www.feem-web.it/witch

www.economicsclimatechange.com

Fondazione
Eni
Enrico Mattei

corso Magenta 63
20123 Milano - Italy

tel   +39 | 02 | 5203.6934
fax   +39 | 02 | 5203.6946
web   http://www.feem.it