

# The Use of University Research in Firm Innovation

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# Research Questions

- Is the increase in university patenting associated with
  - a change in the pattern of exploitation of public science in industrial innovation?
  - a change in the pace of knowledge exploitation in industrial innovation?



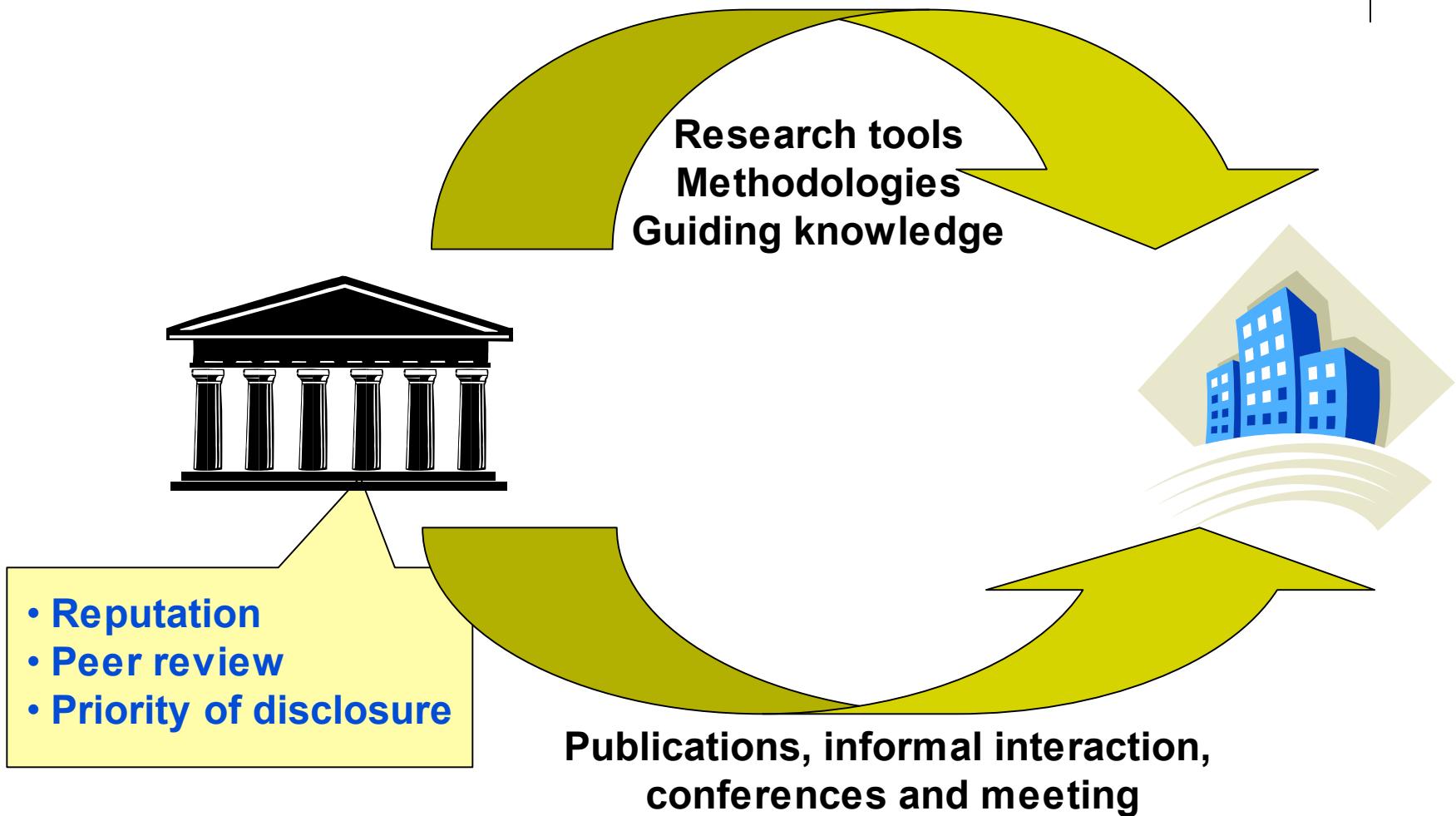
# University as Contributor

- Industry innovation relies on university research results as an input to innovation.
  - Universities typically contribute research knowledge, tools, and methodologies. (Cohen, Nelson, Walsh 2000)
  - Industry patents cite scientific publications as “prior art” and this reliance on science has grown over time. (Narin)
  - New innovations would be delayed without access to university-based research. (Mansfield 1991, 1998, Collins & Wyatt 1998)

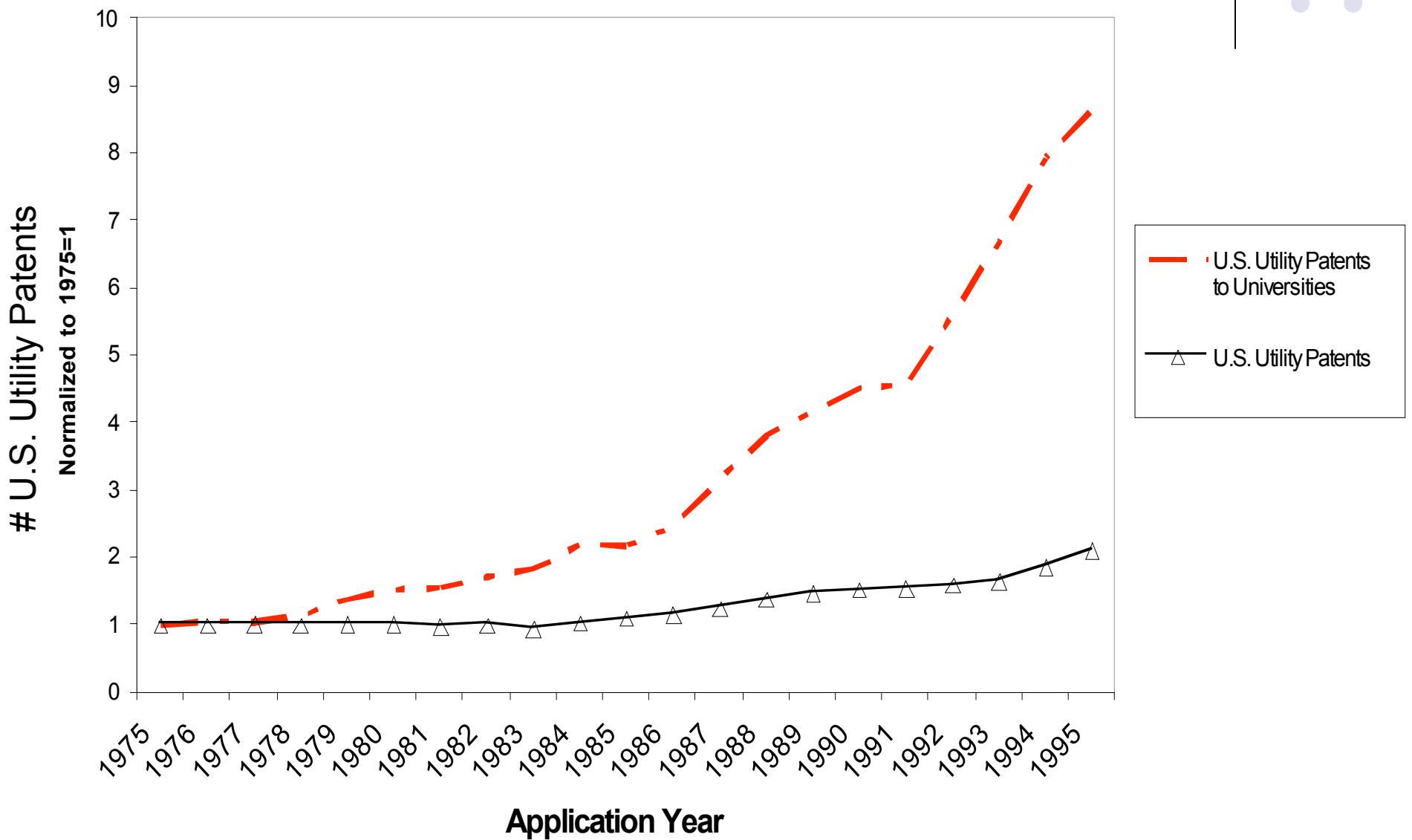


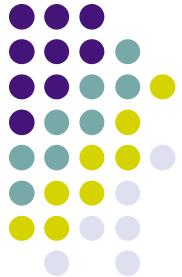


# “Traditional” Open Science

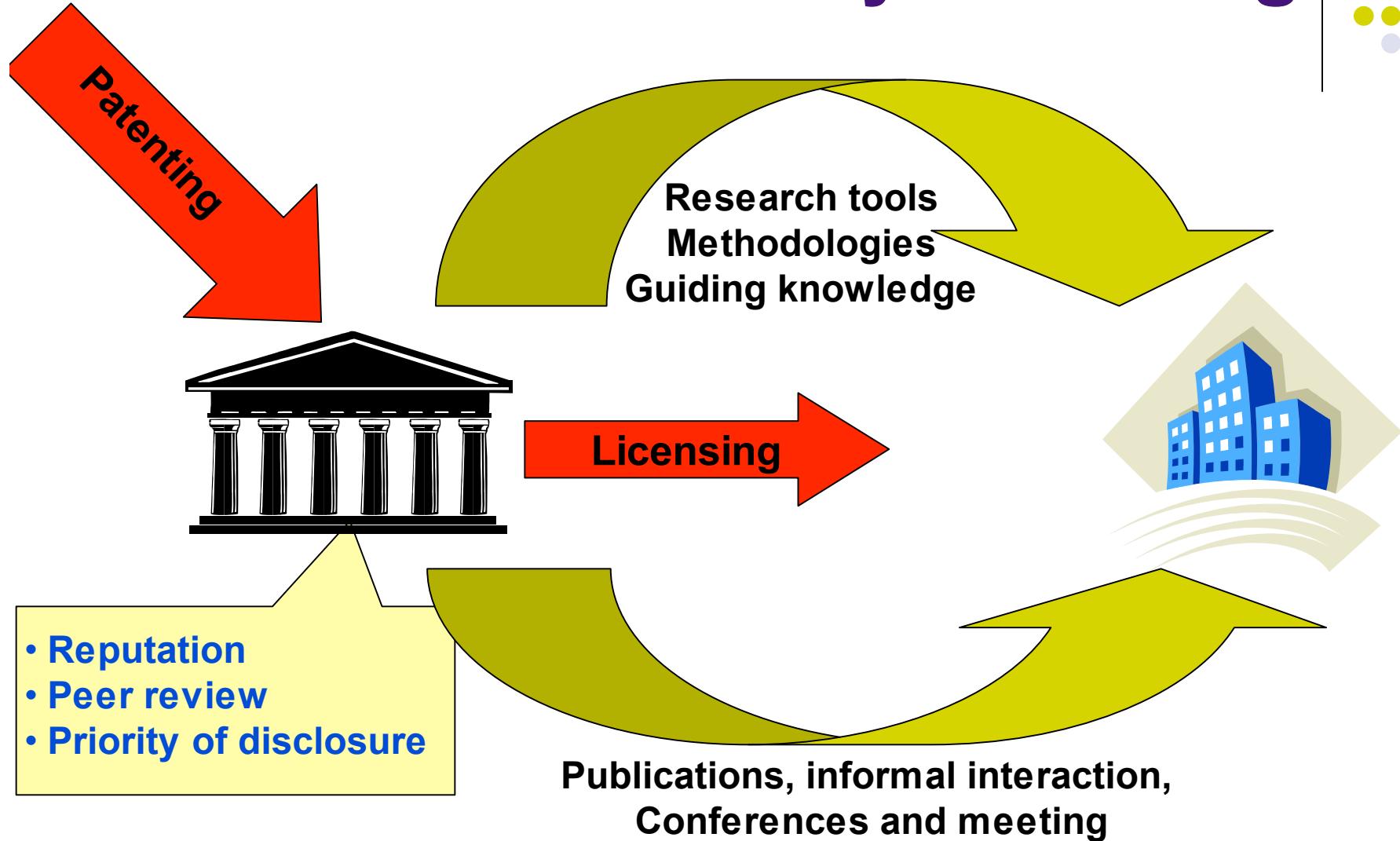


## The Increase in University Patents Has Outpaced Growth in Patenting





# Increase in University Patenting



# IP and knowledge transfer

- Technology management and Open Innovation literature typically view formal IP facilitating market for technology.
  - Clear property rights over which to negotiate
  - Less hazard of expropriation: protect value without secrecy
  - Protection of codified knowledge facilitates transfer of tacit knowledge



# Q1: pattern of industry exploitation

- IP → Lower transaction costs → wider use?
- Limited dissemination or availability?
  - Firms cut off from using patented research?
  - More secrecy?
  - Delayed publication?
- Is an increase in university patenting associated a change in pattern of use of university research in industry innovation?



# Q2: pace of industry exploitation

- IP facilitates transfer → industry able to exploit existing knowledge more quickly?
- Delays due to
  - negotiation
  - complexity of IP landscape
  - secrecy
  - limited or delayed dissemination
- Is an increase university patenting associated with a change in the pace of knowledge exploitation in industry inventions?



<i>Increase in IP yields:</i>	Implication	Test:
More disclosure, lower transaction costs, less risk of expropriation	Univ rsch disseminated more broadly to firms	Decrease in variance across firms
Greater secrecy, exclusive use	Limited access to & use of univ rsch	Increase in variance across firms
More efficient transfer	Timely access to inputs	Faster pace of knowledge exploitation
Delays, negotiation, secrecy	Delayed or limited access to inputs	Slower pace of knowledge exploitation

# Empirical Test (Q1)

- Count firm's patent citations to public science in industry patents over time (1975-1995).
- Test for relationship between:
  - *An increase in university patenting* in a technology area and
  - *a change in the variance of citations to public science* across firms in that technology area
- Fixed effects model at the technology class –year level



# Preliminary Findings (Q1)

- Pattern of use:
  - As university patenting increases, the disparity in # citations across firms increases.
  - As # citations to public science increases, the disparity in use across firms increases.
- More analysis needed to unpack the relationships.



# Empirical Test (Q2)

- Examine the time lag between the cited prior art and new firm inventions.
- Test for relationship between:
  - *An increase in university patenting* in a technology area and
  - *a change in the mean backward citation lag* for firms in that technology area
- Longer time lag = slower pace of knowledge exploitation
- Fixed effects model at the firm-technology class level



# Preliminary Findings (Q2)

- Pace of knowledge exploitation:
  - Increased university patenting is associated with an increase in the lag time between existing and new innovations.



# Preliminary Implications

- Rising wave does not float all boats equally: Firm capabilities contribute to use of public science.
- Introduction of formal IP to “open science” environment may have unintended consequences, i.e. slowing knowledge transfer.
- For open innovation, firms need to invest in absorptive capacity to enhance exploitation of university science.
- More research needed!

