Economic Implications of Research Investments
Discussion of Arora et al.

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The Decline in Corporate Research: Should We Worry?
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Should we worry?

- Arora et al. examination very thorough, very nuanced

- Scientific knowledge
  - Supply and demand
  - Innovation ecosystem

- View of innovation from 30,000 feet
  - Has the decline in corporate research been a culprit in productivity paradox #2?

- Other Players/Griliches redux/Conclusion
What may be responsible for the decline in corporate research?

- Innovation opportunities (domestically or via globalization) may have become more plentiful, given the stock of scientific knowledge
  - *Could* be the case for existing firms with established brands
  - Evidence?
    - Investments in product development, digitization, and management improvements remain relatively strong (Corrado et al. 2016).
    - Valuations for firms who are in the top 100 in terms of IP ownership are up way more so far this year and last (CNBC IQ100).

- Demand for science-based innovation may have declined
  - Given importance of human health and the many aspects of medical technology, hard to imagine
  - *Possible* if there is a step-down in relative importance of national defense, but given cyber threats, hard to imagine
Innovation is thought to emanate from ecosystems with certain dynamics of their own . . .

- Corporate research has been an important part of that dynamic.
- Difficult to know how “unplugging” one part disturbs the workings of the system.
- Success of the system depends in part on a healthy business environment.
View from 30,000 feet

R&D investment rates by broad business sub-sector have rather different long-term trends

Business R&D, funder basis (1959 to 2016)
Percent of GDP

Note. ICT R&D is R&D in NAICS 334, 51pt, and 5415 (i.e., includes software development). "Related" in “Pharma and related” refers to medical instruments R&D and biotech R&D services. "Other" is R&D in all other industries.
Source. Elaboration of data issued by BEA. The sector split in 2016 is estimated.
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View from 30,000 feet

Productivity paradox #2: MFP slow since 2004, financial crisis hits in 2008, weak investment since then

Contributions to labor productivity growth, nonfarm business sector
Percentage points

- 1995 to 2005: 3.0
  - R&D Capital Deepening: 1.1
  - Capital Deepening excl R&D: 1.6
  - Labor composition: 0.3
  - MFP: 0.4

- 2005 to 2010: 2.0
  - R&D Capital Deepening: 1.1
  - Capital Deepening excl R&D: 0.4
  - Labor composition: 0.3
  - MFP: 0.2

- 2010 to 2015: 0.4

Source: Elaboration of estimates issued by the BLS.

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Yes, ICT is mis-measured, mainly due to uncaptured quality change

- That’s good for thinking about the future=> ICT could contribute, alone, up to 1.4 percentage points to labor productivity growth

- What about the rest of the economy?
  - Without going into details, I estimate that outside of the productivity gains that can be attributed to ICT production and use (including use of ICT services, e.g., cloud services), NonICT industries’ TFP likely is falling (between -.1 and -.2 percentage points per year)
  - The decline in corporate research may be a contributing factor

Does this mean there are no returns to R&D (much less spillovers, etc.)?

- No
View from 30,000 feet

Corporate shifting of R&D-generated income IS a culprit in productivity paradox #2

Figure 4 – Geographical reattribution of earnings of U.S. MNEs, 2012 (bil. USD)

Notes: The United Kingdom Islands (U.K.I.), Caribbean, are made up of the British Virgin Islands, Cayman Islands, Montserrat, and Turks and Caicos Islands.


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Can nonmarket (i.e., university, nonprofit, and government) R&D pick up the slack in corporate research?

- Arora et al results suggests university research plays a different role in the innovation ecosystem
- Earlier microdata-based research suggested government funding was growth-promoting
- Recent cross-country evidence suggests countries with relatively higher rates of nonmarket R&D investment tend to have higher productivity growth
  - Studies conducted by the OECD and published in 2004
  - Recent work by Corrado et al. suggests nonmarket R&D spend is related to (and a possible driver of):
    - The rate of intangible investment in the market sector (controls for tangible investment, relative prices, labor and product market regulations)
    - Market sector TFP growth
Nonmarket R&D intensity\textsuperscript{*} is correlated with market sector TFP growth across advanced economies.

Roughly the same x-country pattern as 1996-07 (but TFP growth is shifted down)

* (Non-market R&D spend)/(market sector value added), lagged

Graphs by period
Conclusions

- Things to worry about
  - The decline in corporate research probably has had an impact on the innovation ecosystem and innovation outcomes as measured by MFP growth
  - We don’t have an estimate of the contribution of the slowdown in corporate research to the recent slowdown in productivity growth
    - Griliches redux

- Things that are brighter
  - Trend in ICT R&D is strong, and the estimated contribution of ICT (production, use and diffusion) to growth in output per hour is very strong
  - R&D/IP income generation is stronger than you thought!
Thank you.

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