

Discussion of

Fort, Goldschlag, Liang, Schott, and Zolas:
Growth Is Getting Harder to Find, Not Ideas
and

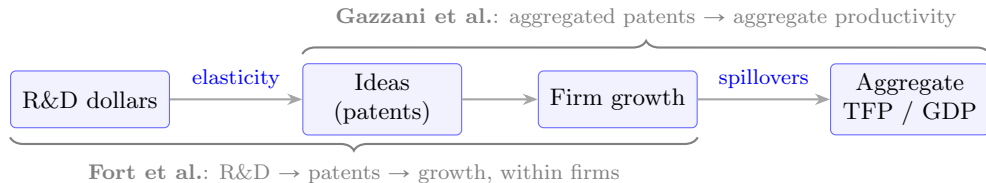
Gazzani, Martinez, Natoli, and Surico:
Where Do Technology Shocks Come From?
Public Funding and Private Ownership

Andrew J. Fieldhouse
Mays Business School
Texas A&M University

NBER Conference on the Rate of Return to R&D Investments

October 2, 2026

Same Chain, Different Segments: Firm-Level vs. Aggregate Evidence



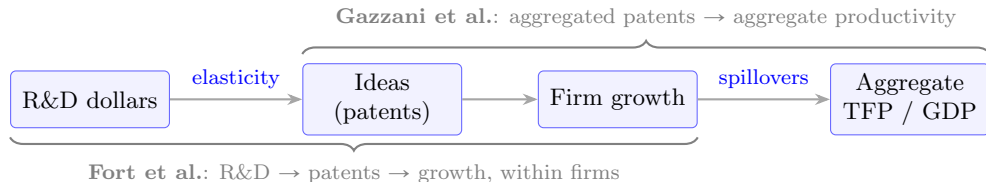
Fort et al.: universe of U.S. firms, 1977–2021

- R&D → patents: elasticities roughly double over sample, $0.26 \rightarrow 0.48$
- Patents → growth: link **stable or stronger**
- Firm sales growth slowdown loads on the **common component** (time fixed effects)
- LBD–USPTO crosswalk: **universe of firms, not just manufacturing or Compustat** — and a big public good!

Gazzani et al.: patent shocks by funding source and ownership, 1950:Q1–2015:Q4

- Funding source shapes **how technology shocks propagate**
- Public–private patents: **2% of filings, ~20%** of medium-run fluctuations
- Crowd-in of private R&D and investment
- Social returns to public R&D $\approx 2 \times$ **private** (1.91 vs. 0.88)

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What connects the two segments?

A Bridge Hiding in Plain Sight: Bloom et al. (2020)

The most-cited evidence that ideas are getting harder to find ends with another suspect:

“Or perhaps declines in basic research spending, potentially related to the US decline in publicly-funded research as a share of GDP, have negatively impacted overall research productivity. Clearly this would have important policy implications.”

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2. **Fort et al.** show where it would live: not in firms' own R&D chains, but in the common component across firms, industries, and sectors (time fixed effects)
3. **Gazzani et al.** show it matters in aggregate: publicly funded patents punch far above their weight, especially NIH/NSF-funded and science-intensive patents

Bridge 1 (Composition): Not All R&D Is Equally Productive

Bloom et al. count every researcher alike, but:

- **Across industries** (Fort et al.): patenting shifts to **information and professional services**; manufacturing's breakthrough patent share 73% → 12%

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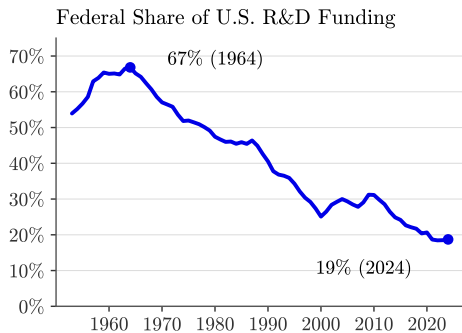
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- **Across funders:** federal share of R&D funding **67% (1964) → 19% (2024)**

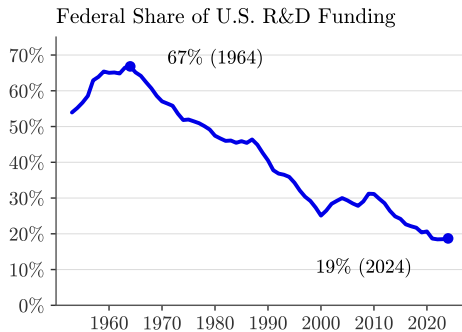


Source: NCSSES National Patterns of R&D Resources, Table 6.

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If public dollars return $\sim 2\times$ private dollars, the funding shift alone lowers measured research productivity $\sim 30\%$ (**composition effect, not harder-to-find ideas**)

Bridge 2 (Micro $\leftrightarrow$ Macro): What's in the Fixed Effects?

Fort et al.: semidecade fixed effects absorb everything common across firms

- Rising within-firm elasticities **don't rule out** ideas getting harder to find in aggregate — that could also sit in the fixed effects
- The estimated common component of firm growth **declines after the early 1990s**

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Candidates: the common component **can't tell these apart**

- **Firm-to-firm** spillovers (Fort et al.'s candidate; Akcigit and Ates 2023) vs. **public-to-private** spillovers (Bloom et al.'s conjecture; Bergeaud et al. 2025)
- Also: market structure (mega-firms' breakthrough share), general-purpose technology cycles

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Micro estimates can discipline macro return calculations: in Gazzani et al., patent effects become dollar returns using a constant patent elasticity of 0.4

- Within-firm range 0.26–0.48 (Fort et al.) $\rightarrow$ public return **1.24–2.29**, private **0.57–1.06**
- The **$\sim 2\times$ ratio** finding assumes equal elasticities across funding sources — **an open question**

Bridge 3 (Design): Who Can Estimate Time-Varying Returns?

The question every paper in this literature gets: [have the returns to R&D fallen?](#)

	Total effect, incl. spillovers	Within-firm effect
Sample average	Aggregate time series (Gazzani et al.)	Griliches-style firm regressions
Time-varying		Period-by-period firm panels (Fort et al.)

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Why aggregate time series frameworks struggle here:

- Only identifying variation is [time](#): ~75 years, a handful of big R&D and TFP regime shifts
- Long lags between R&D activity and productivity (often 5–10+ years) leave few independent episodes per subsample → [only large breaks would be detectable](#)

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Paths forward?

- Cross-sectional exposure to aggregate R&D shocks across regions, industries, or countries (e.g., Bergeaud et al. 2025; De Souza et al. 2026)
- Back of the envelope: scale sample-average macro returns by time-varying micro elasticities, e.g., Gazzani et al. $\times$ Fort et al. (but heavy on assumptions, e.g., [stable spillovers](#))

A Research Agenda: Measuring and Communicating Social Returns

Measuring: do micro elasticities plus measured spillovers add up to macro returns?

- Fiscal multipliers as template: local and aggregate estimates measured different objects; theory eventually bridged the two (Nakamura and Steinsson 2014; Chodorow-Reich 2019)
- Macro: growing evidence of large TFP effects from public R&D. Micro: rich evidence on patents, papers, and citations. Thinner evidence: spillovers from non-firm R&D to firms
- Trace the spillovers: ~80% of federally funded R&D is performed outside firms (universities, national labs, agencies). How does it reach firm productivity, including beyond Compustat? First steps: Dyèvre 2024; Bergeaud et al. 2025; Gazzani et al. 2026

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Communicating: map native estimates into units that are common (across papers), policy-relevant (for CBO), and intuitive (for the public)

- Rates of return and \$ per \$ of R&D: public appropriations and private investment
- A related suggestion for each paper:
 - Fort et al.: estimate R&D $\rightarrow$ productivity in one step, where data allow
 - Gazzani et al.: estimate returns per dollar of appropriations, *by federal agency*