

Where Have All the “Creative Talents” Gone? Employment Dynamics of US Inventors

Based on BFI Working Paper 2023-32, “Where Have All the “Creative Talents” Gone? Employment Dynamics of US Inventors,” by Ufuk Akcigit, University of Chicago; and Nathan Goldschlag¹, US Census Bureau

Inventors are increasingly concentrated in large incumbent firms, less likely to work for young firms, and less likely to become entrepreneurs; also, an inventor hired by an incumbent earns 12.6% more than an inventor hired by a young firm, but their innovative output declines by 6-11%.

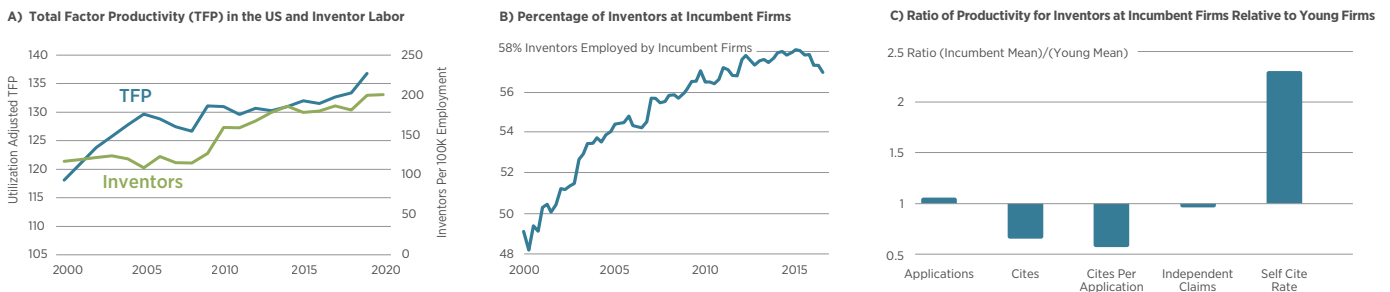
Technological progress is key to economic growth; likewise, economists have long focused on how many resources a society dedicates to research and development (R&D), whether in aggregate R&D spending or in the share of inventors in the workforce. However, this new research argues that focusing on the quantities of R&D investment misses an important point: It is not only the level of innovation inputs that matters for growth, but also the allocation of those investments.

The authors’ investigation has its grounding in a 1962 insight from the economist Kenneth Arrow, who intuited that monopolists have incentives to defend their market positions rather than produce radical technological breakthroughs. If true, this means that while the number of inventors and total R&D spending in an economy is

important, the efficacy of that spending is mediated by where those inventors are employed.

Figure 1 illustrates the authors’ provocative hypothesis. Panel A shows total factor productivity (TFP)² in the United States since 2000 (left axis) and a per capita measure of inventor labor (right axis). While there is a visible acceleration between 2000-2005, after 2005 there is a marked slow-down in TFP growth, even as the share of inventors grew by over 70%. In other words, innovation inputs are rising as technical progress slows. Equally striking is the shifting allocation of inventors across different-sized firms. Not only did the US economy allocate a bigger share of its employment into innovation, but its composition has also shifted toward the largest players in the economy.

Figure 1 • Inventor Employment Dynamics

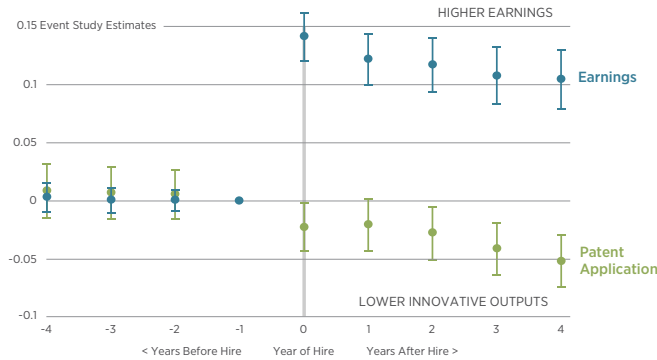


Note: Please see text of this Finding for description of this Figure, and see working paper for further details. Source: Fernald and Jones (2014), Inventor Employment History, BDS, author’s calculations.

¹ Any opinions and conclusions expressed herein are those of the authors and do not represent the views of the U.S. Census Bureau. The Census Bureau has reviewed this data product for unauthorized disclosure of confidential information and has approved the disclosure avoidance practices applied to this release. DRB Approval Number(s): CBDRB-FY20-CES007-004, CBDRB-FY21-CES007-004, CBDRB-FY22-CES008-008, CBDRB-FY23-CES020-001, CBDRB-FY23-CES020-002. DMS Project Number 7083300.

² TFP attempts to measure the impact of technological improvement, including worker knowledge, on economic output.

Figure 2 • Difference in an Inventor's Outcome Between Inventors Hired by Incumbent or Young Firms



Note: This Figure shows event study estimates for years relative to the hire event of the difference in an inventor's outcome, patent applications and log earnings, between inventors hired by an incumbent firm and those hired by a young firm. Please see working paper for more details. Source: Inventor Employment History, Founding Team Database.

Panel B shows that the share of inventors employed by large, incumbent firms rose from 48 percent in 2000 to about 57 percent in 2016 (in a 2022 paper, the authors show a complementary fall in the share of inventors employed by young firms³). Finally, Panel C shows that inventors at incumbents produce lower quality innovations, with fewer citations, fewer citations per application, fewer independent claims, and more self-citations (a proxy for the incremental nature of an innovation).

These figures raise an important question that motivates this research: How are inventors allocated in the US economy, and does that allocation affect innovative capacity? To answer this question, the authors build a model that develops intuitions about the strategic incentives that incumbent firms face, and how they might use the innovation input market to limit competition. The model allows for an incumbent to hire an inventor who otherwise would create an innovation inside an entrant firm and displace the incumbent. Further, since the incumbent monopolist already has a successful product, it has less incentive to innovate.

So why would an established firm with successful products spend limited resources on hiring expensive inventors? The short answer: to stifle innovation. The authors' model implies that inventors hired by incumbent firms will, indeed, earn more by working

for an incumbent, but they will also produce fewer innovations. In other words, creative destruction, the process by which new innovations replace old ones, is diminished, slowing the growth of long-run output.

The authors then take their model to the data, examining the employment history of over 760,000 US inventors, finding the following:

- Inventors are increasingly concentrated in large incumbents, less likely to work for young firms, and less likely to become entrepreneurs.
- Inventors working for incumbent firms earn more and produce less impactful innovations than inventors at young firms.
- Finally, when an inventor is hired by an incumbent, compared to a young firm, their earnings increase by 12.6 percent and their innovative output declines by 6 to 11 percent; also, these patterns are robust to alternative explanations, and are not driven by promotion to managerial positions in large incumbents, for instance. (See Figure 2.)

Bottom Line: Innovation matters, and talent is key to invention; however, this research also reveals the importance of where innovation occurs. For policymakers, the lessons are salient. First, aggregate inputs (e.g., R&D spending or inventors per capita) may give a misleading picture of innovation capacity; second, factor reallocation toward large incumbents may lower growth capacity; and third, policies that encourage more incumbent innovation might occur at the expense of entrant innovations, which are higher quality on average.

This research also points to a number of interesting, policy-relevant questions. First, what role do non-compete agreements play in explaining when inventors work for incumbents or young firms? Policies that encourage or discourage spin-offs and inventor entrepreneurship may have significant impacts on innovation and growth. Second, what role do financial frictions play in the inventor's choice to work for incumbent firms? The availability (or lack thereof) of capital may weaken incentives for inventors to start a new firm. These and other questions will benefit from further research, and the authors' current and recent work—with its insights into the “black box” of inventor employment—offers a valuable starting point.

³ Akcigit, U., and N. Goldschlag (2022) “Measuring the Characteristics and Employment Dynamics of U.S. Inventors,” Discussion paper, Center for Economic Studies CES-WP-2022-43.

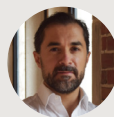
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NO. 2023-32 · MARCH 2023

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