

The Productivity Slowdown: “The Phenomenon”

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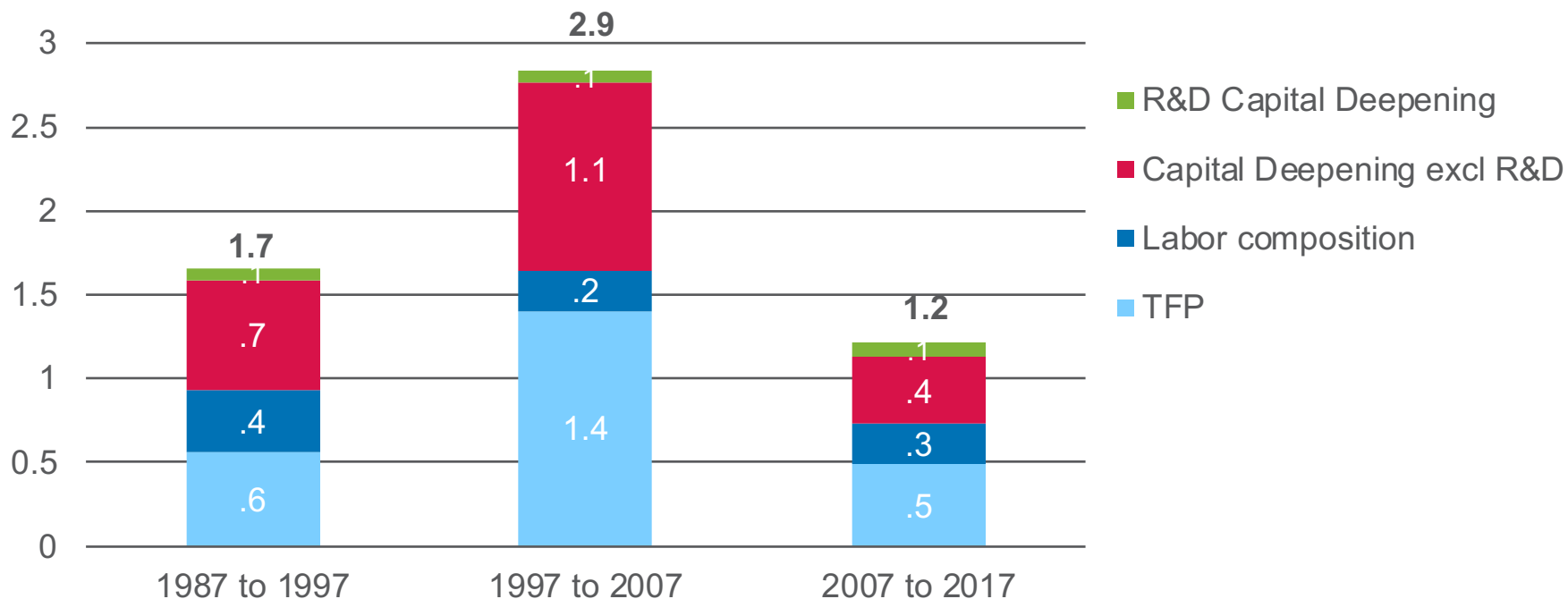
Why did productivity growth slow?

- IT revolution over
- Non-technological forces (secular stagnation, demographic and regulatory headwinds)
- Mismeasurement (within GDP, beyond GDP)
- Misunderstanding of history's lessons, aka “the innovation J-curve”

- Focus of my remarks:
 - Intangibles (beyond R&D), Digitization
- Summary:
 - Accounting for intangibles + better measurement of things digital clear *some* of the puzzles

Compared with bubble years, weak US labor productivity reflects slow growth in both capital deepening and TFP

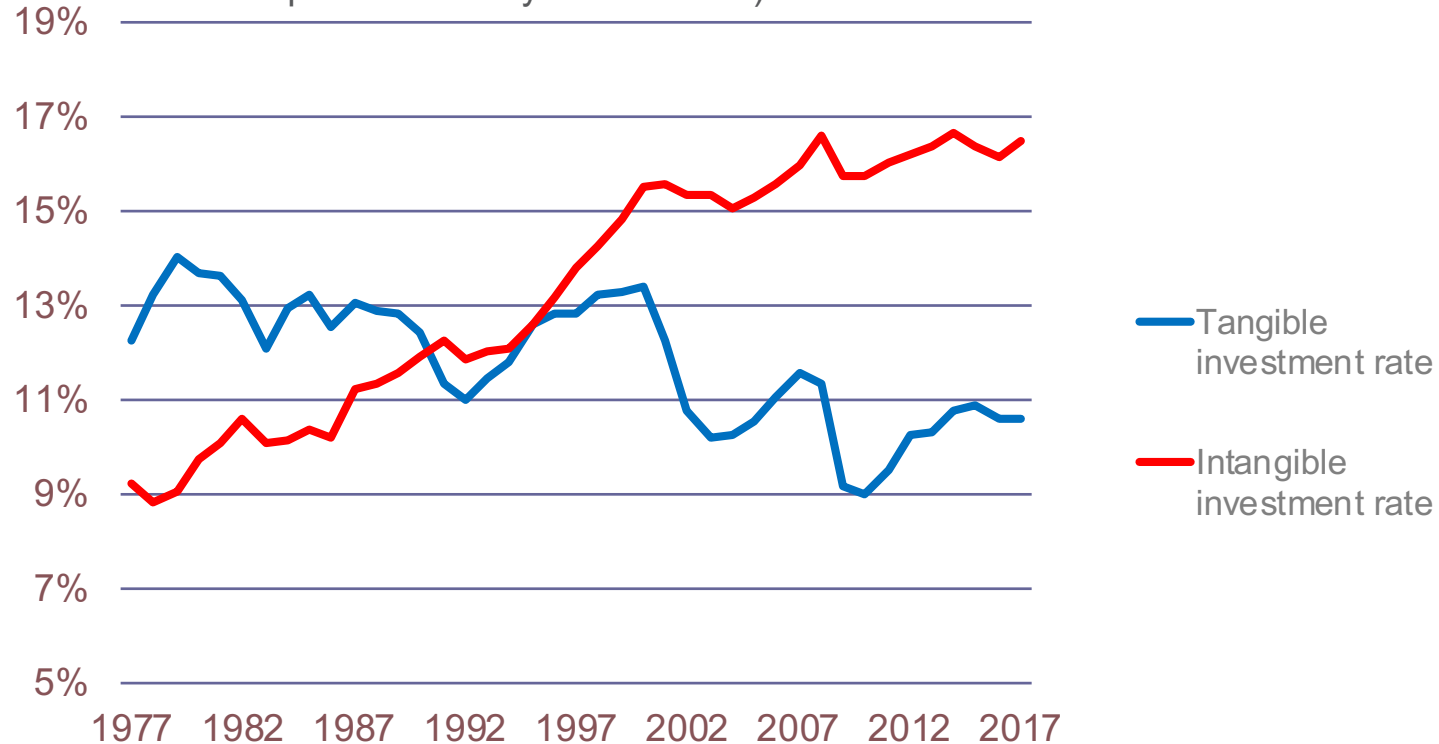
Contributions to labor productivity growth, nonfarm business sector
Percentage points



Source. Elaboration of estimates issued by the BLS.

Total intangible investment provides a more comprehensive picture of inputs to innovation

Investment rates, Private industries, 1977 to 2017
(investment relative to private industry value added)



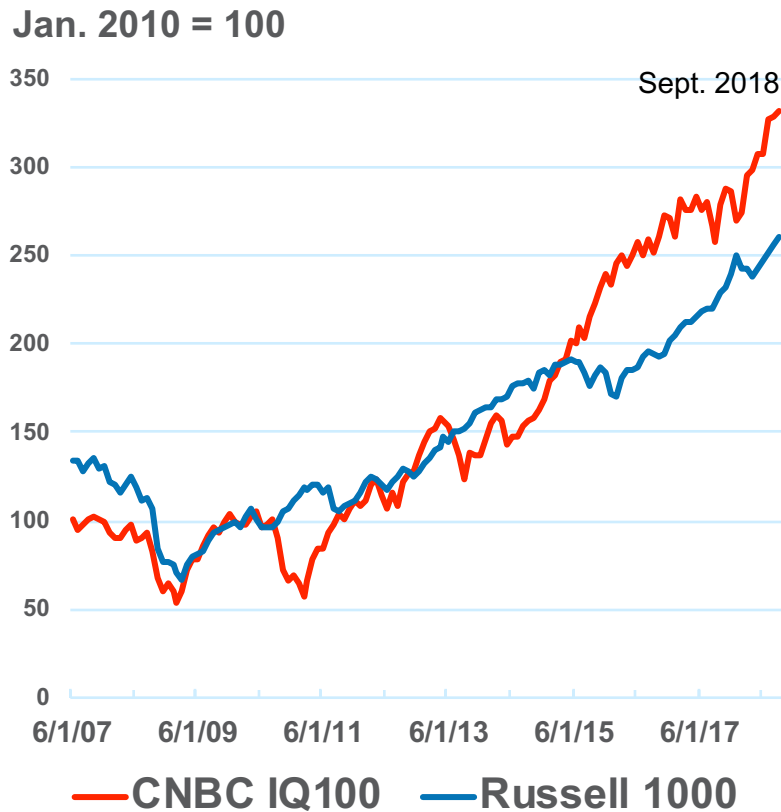
Note: Non-national accounts Intangibles estimates are preliminary and do not include own-account expenditures on brand and customer development as reported in Corrado and Hao (2013).. Data available at www.intaninvest.net

Does an “intangibles approach” help understand the productivity slowdown?

- If intangible capital has spillovers, then a slowdown in intangible investment suggests a slowdown in TFP
- Research* suggests productivity spillovers accrue to nonR&D intangibles, i.e., beyond the well-documented effects of R&D
- The slowdown in nonR&D intangibles could account for as much as $\frac{1}{4}$ of the slowdown in TFP growth

* Corrado, Carol, Jonathan Haskel, and Cecilia Jona-Lasinio, “Knowledge Spillovers, ICT, and Productivity Growth” *Oxford Bulletin of Economics and Statistics* 79:4 (August 2017), 592-618.

Financial performance of intangibles-intensive large cap firms outstrips its benchmark, especially in recent years



Notes:

- CNBC IQ100 is an index comprised of 100 firms (chosen from the Russell 1000) with greatest forward-looking profitability based on their intangible capital
- Not tech-heavy
- Developed from M-Cam's very detailed, global IP database

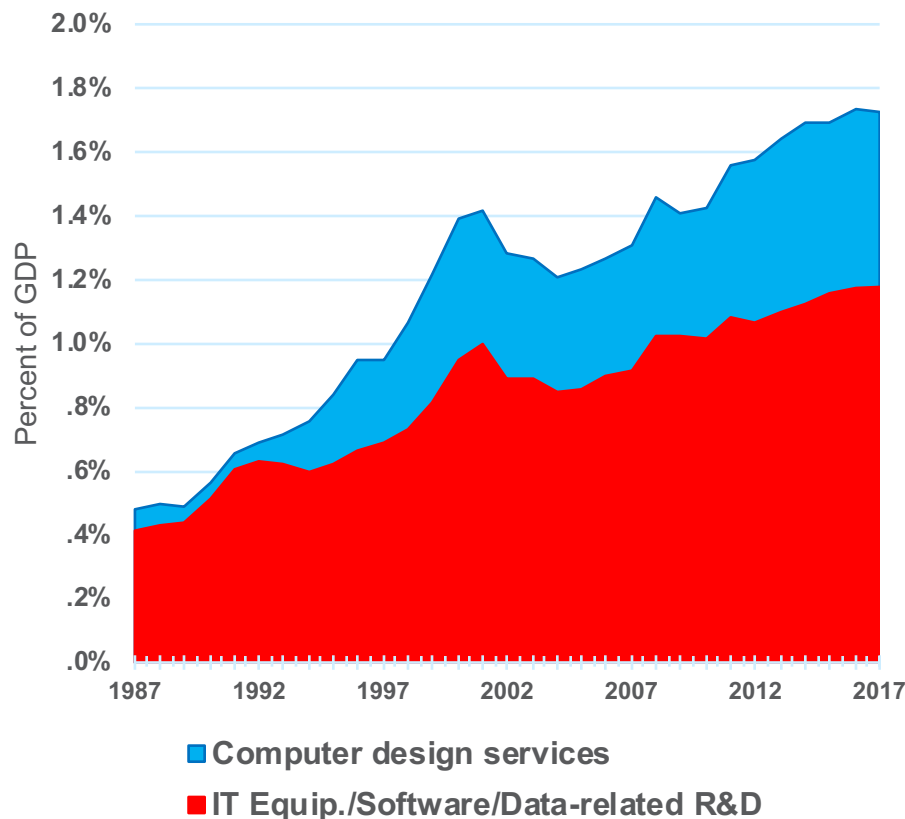
Does an “intangibles approach” help understand the productivity slowdown? -- continued

- If investments in artificial intelligence are not fully represented in existing intangibles measures, then productivity is mismeasured
- Pattern of impact is called the “AI innovation J-curve” in a recent paper **
- Investments in AI should be counted as increases in intangible capital

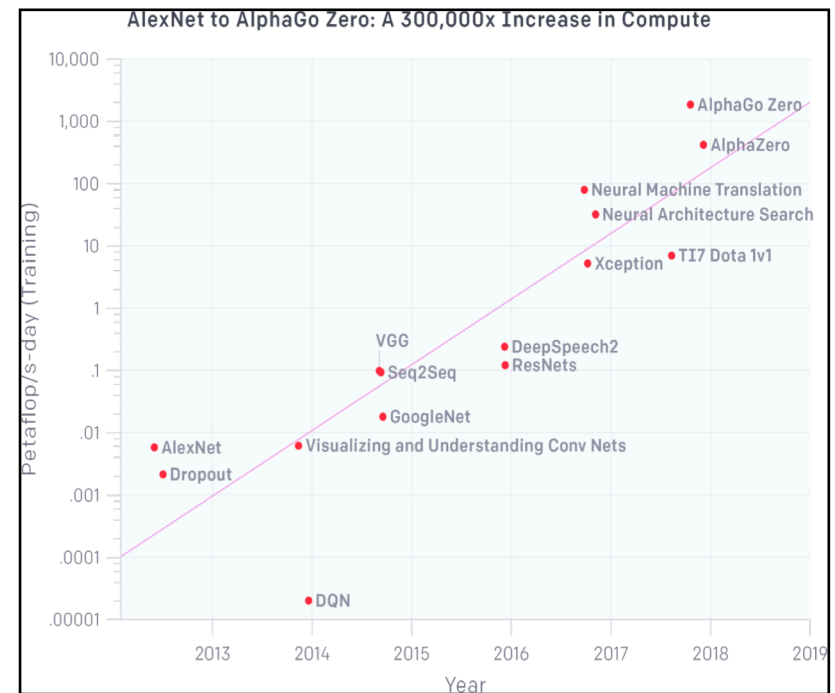
*** Brynjolfsson, Rock, and Syverson, “Artificial Intelligence and the Modern Productivity Paradox: A Clash of Expectations and Statistics,” NBER Working paper (October 2018).*

Available indicators suggest a surge of investments in AI

ICT R&D and computer design services continue a strong upward trend



Computing power used in AI training runs



Source: Blog by Dario Amodei and Danny Hernandez, "AI and Compute", May 16, 2018, at <https://blog.openai.com/ai-and-compute/>

Summary

- Part of the slowdown in productivity may be due to fewer spillovers from nonR&D intangibles, i.e., a slowdown in diffusion of commercial knowledge
- All things digital suggest optimism for future productivity growth
 - ✓ R&D in ICT/AI/computing is very robust
 - ✓ Payoffs to measured and unmeasured investments in data analytics by businesses not evident in productivity (yet)
- Digital mismeasurement (not discussed) can also explain part of the slowdown
 - ✓ Productivity of telecommunication services (internet, mobile, video) is understated, and the understatement is larger after 2007*

**See "Accounting for Innovation Consumer Digital Services: Implications for GDP and Consumer Welfare" by David Byrne and Carol Corrado, November 2017 (preliminary)*

Thankyou.

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