# *Investment and Productivity: returns and rents to intangible capital*

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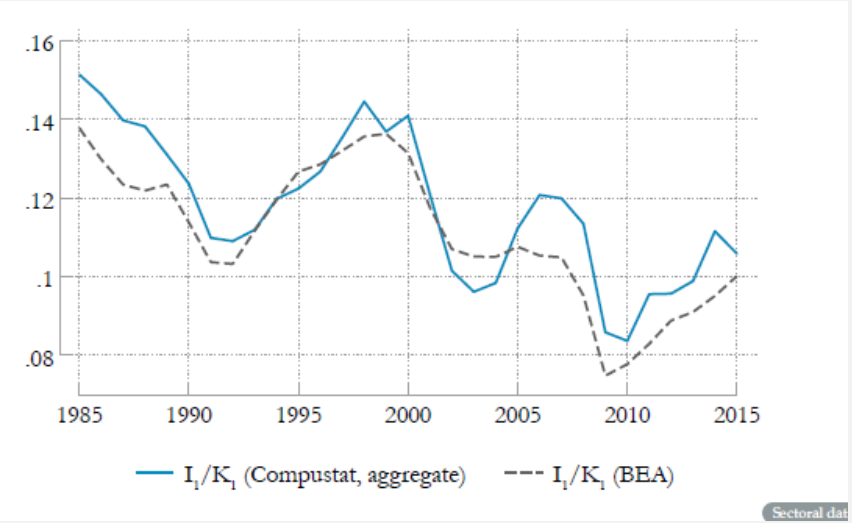
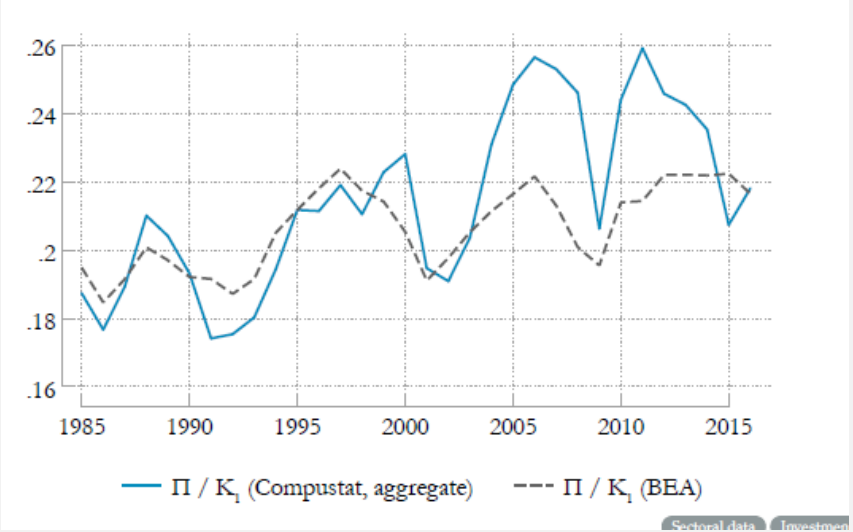
Northwestern | Kellogg

# Investment declining; Returns stable/rising

Property plant & equipment, firm level and national accounts



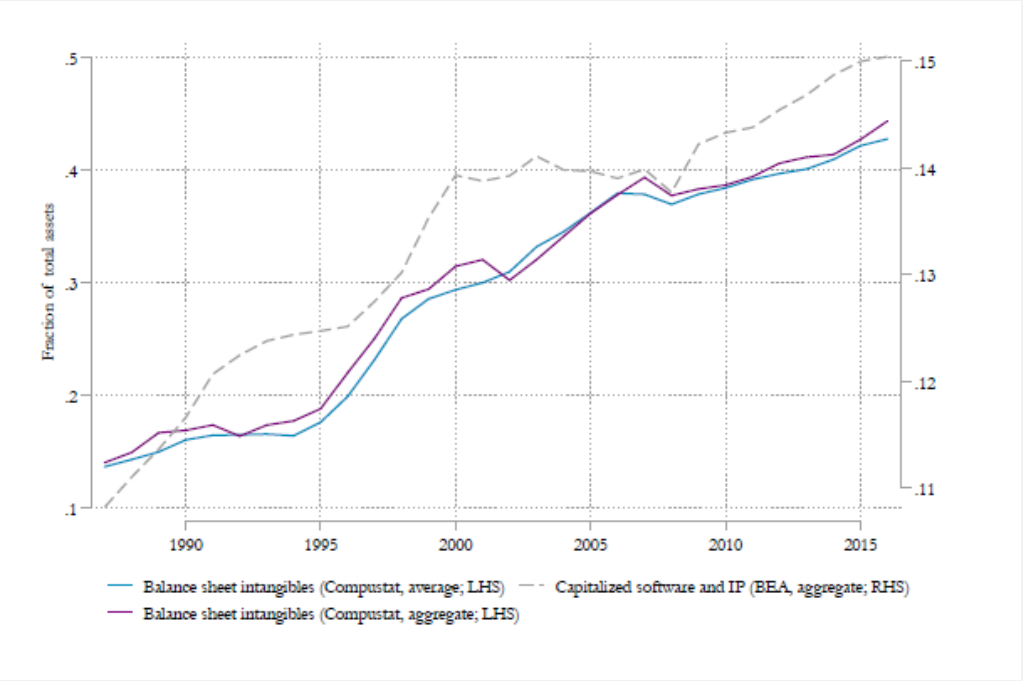

Gutierrez and Philippon (2017), Alexander and Eberly (2018)

# How can investment be low with high returns?

- Why is capital investment weak?
  - 3-4 pp below early 2000s average; 4-6 pp below cash flow and Tobin's Q prediction
  - Particularly in fast growing sectors: high tech and healthcare
- At the same time, concentration has risen
  - Sales herfindahls are at least 50% higher in 75 percent of US industries since the mid-1990s (Grullon, Larkin, and Michaely, 2017), Autor, Dorn, Katz, Patterson, and Van Reenen, 2018)
- Potential (proximate) causes
  - Rising market power (Gutierrez and Philippon, 2017)
  - Rising productivity gap between leaders and laggards (Autor et al, 2018)
- Underlying changes in technology and market structure
  - More intangible capital
  - The properties of intangibles facilitate changes in market structure
  - The pandemic revealed these properties at scale

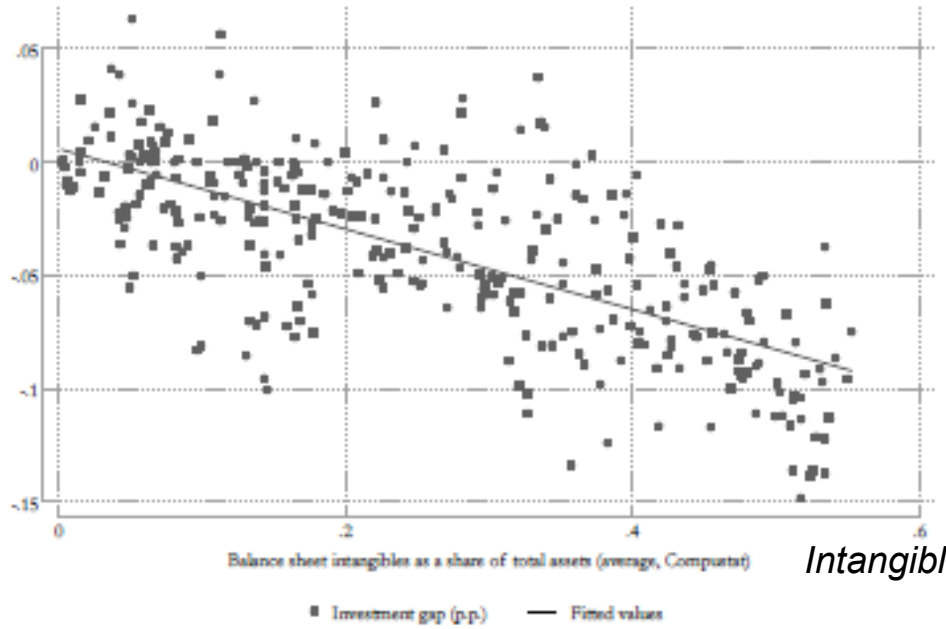
# Rising intangibles over time

- Whether measured in firm-level balance sheets, capitalized expenditures, or national accounts
- Narrow measures represented here.



Investment gaps – "missing" investment after controlling for cash flow, Q

Correlated with investment in intangibles rather than physical capital.




*Intangibles/assets*

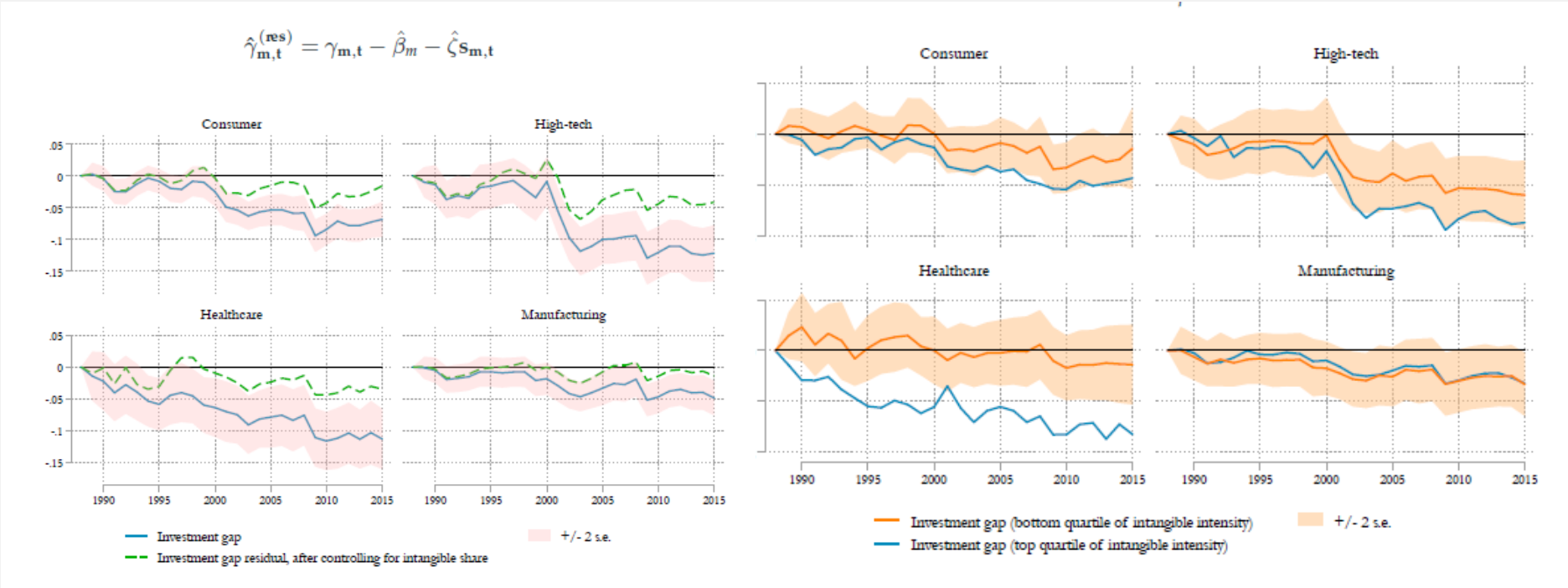
**Figure 5:** Scatterplot of the industry-level investment gap, $\gamma_t$ against the average intangible share. The investment gaps are estimated at the level of the 52 KLEMS industries, then averaged up to the 12 sector level, using the value added share of the industry in 2001 as weights. The intangible share is defined at the firm level as the ratio $\frac{\texttt{intan}}{\texttt{intan+ppegt}}$. The average intangible share is computed for each KLEMS industry and year separately; it is then averaged to the 12 sector and year level, using the same weights as for the measures of the investment gap.

Crouzet and Eberly, 2019, *Jackson Hole Economic Policy Symposium*

# Intangibles as assets

- Some types of intangibles are familiar
  - Education => human capital
  - Coding => software
  - Research and development => patents
- Others are not well-measured
  - Skills, Experience, Managerial Practice, Brands
  - These roughly double the intangibles share of capital
- All have unique qualities compared to K
  - Non-rival in use: can be utilized repeatedly (over time and simultaneously)
  - Excludable: legal protections, patents and trademarks

# Intangibles account for a much of the investment gap, especially among market leaders in key industries




Crouzet and Eberly, 2019, *Jackson Hole Economic Policy Symposium*

# Intangible assets are especially evident in leading firms, in Tech and Healthcare

- The investment gap is largest for market leaders
  - esp in Tech and Healthcare
- Intangibles account for most of the gap for these leaders, in the key industries
- Higher intangibles share associated with higher market share

| | Dependent variable : market share | | |
|---|---|---|---|
| | (A) | (B) | (C) |
| Compustat intangible share | 0.1308*** | 0.0096*** | 0.0073*** |
| | (17.69) | (5.40) | (4.91) |
| Observations | 98520 | 97245 | 97245 |
| Industry × year f.e. | Yes | No | No |
| Firm f.e. | No | Yes | Yes |
| Year f.e. | No | No | Yes |

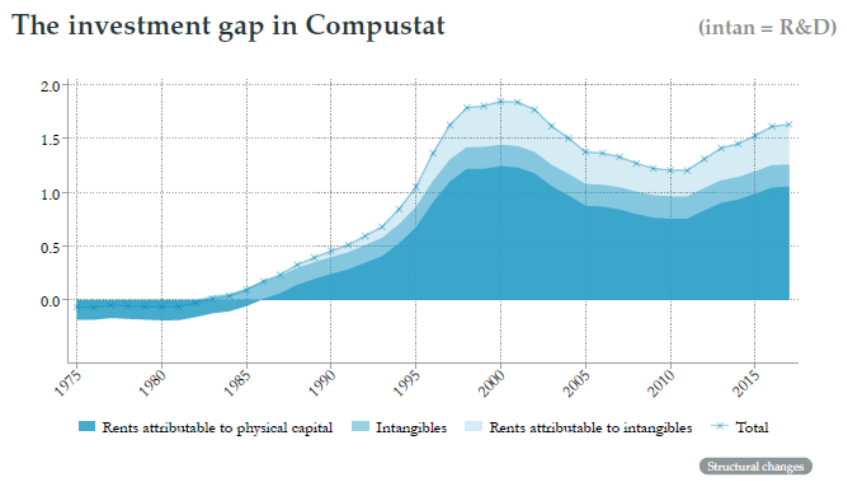
Crouzet and Eberly, 2019, *Jackson Hole Economic Policy Symposium*

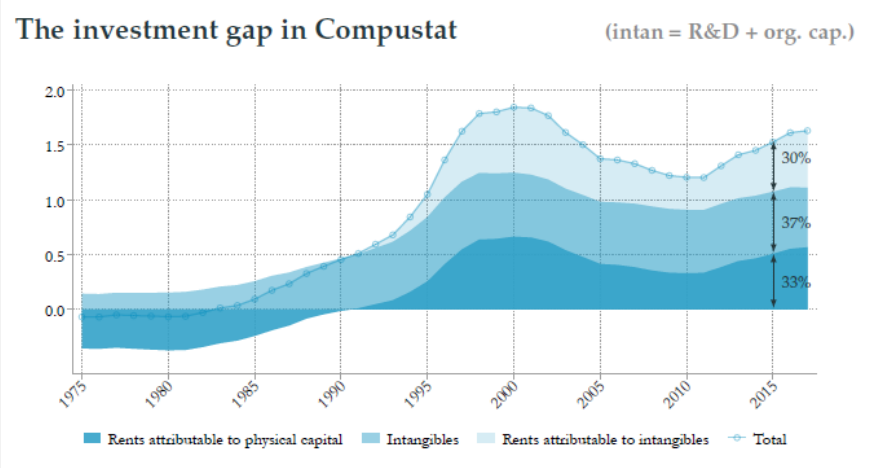
# How are intangibles and concentration/market power potentially connected?

Intangibles may accelerate changes in market structure

1. Non-rivalry
   - Scale economies -> high measured labor productivity
   - e.g., networks and platforms
2. Excludability
   - Differentiation and barriers to entry => markups, margins
   - e.g., patents, trademarks, brands

# Modeling investment with intangibles *and* market power



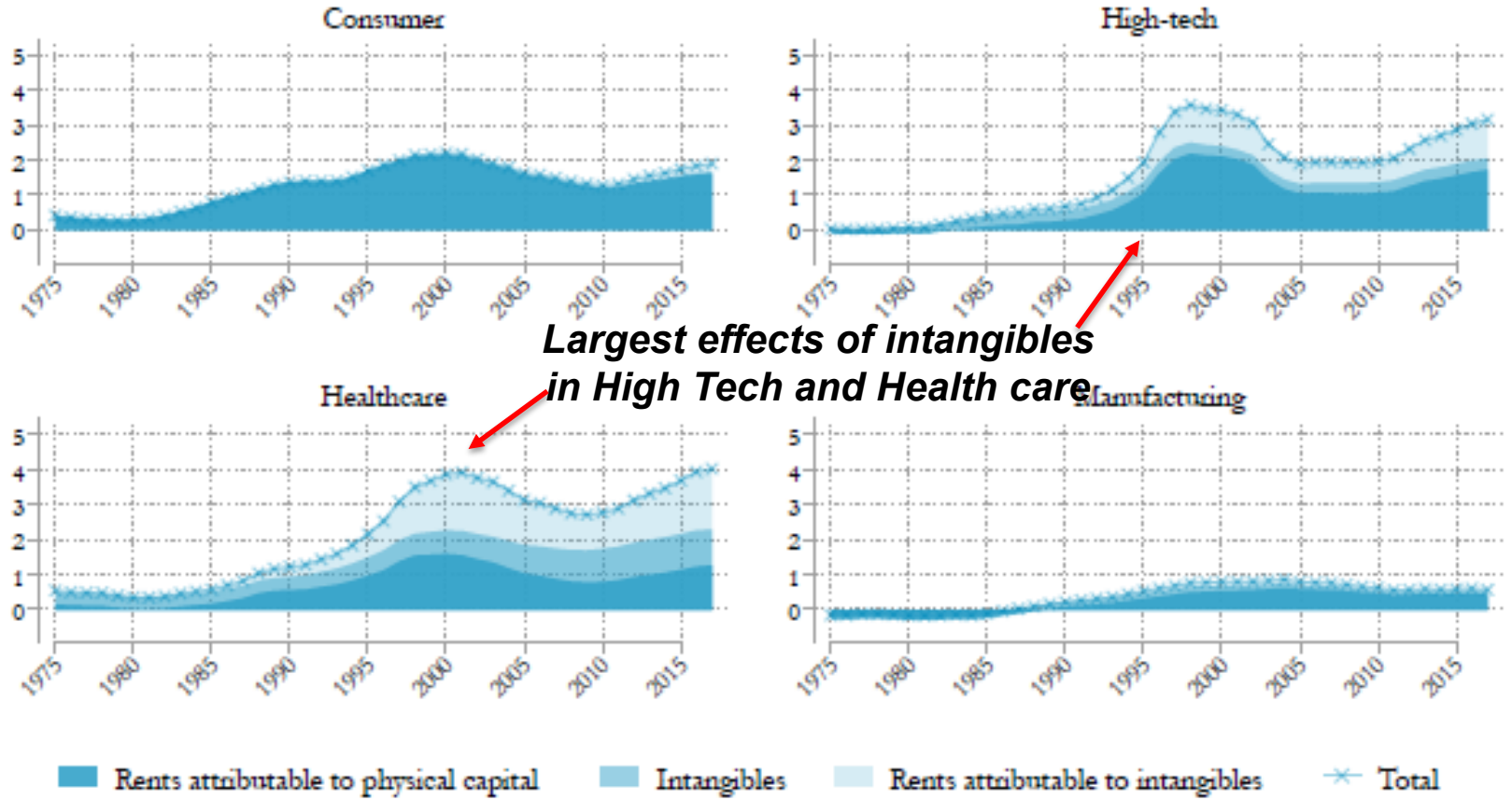

With a narrow measure, intangibles account for 1/3 of the investment gap. With a broad measure, intangibles account for about 2/3. *An important element is the rents attributable to intangibles themselves*.

Regression estimates and structural modeling give similar results. Crouzet and Eberly (2019, 2020)

Crouzet and Eberly, 2021, *Journal of Finance, forthcoming*

# The investment gap across sectors

(intan = R&D)




Crouzet and Eberly, 2021, *Journal of Finance, forthcoming*

# Beyond unmeasured capital?

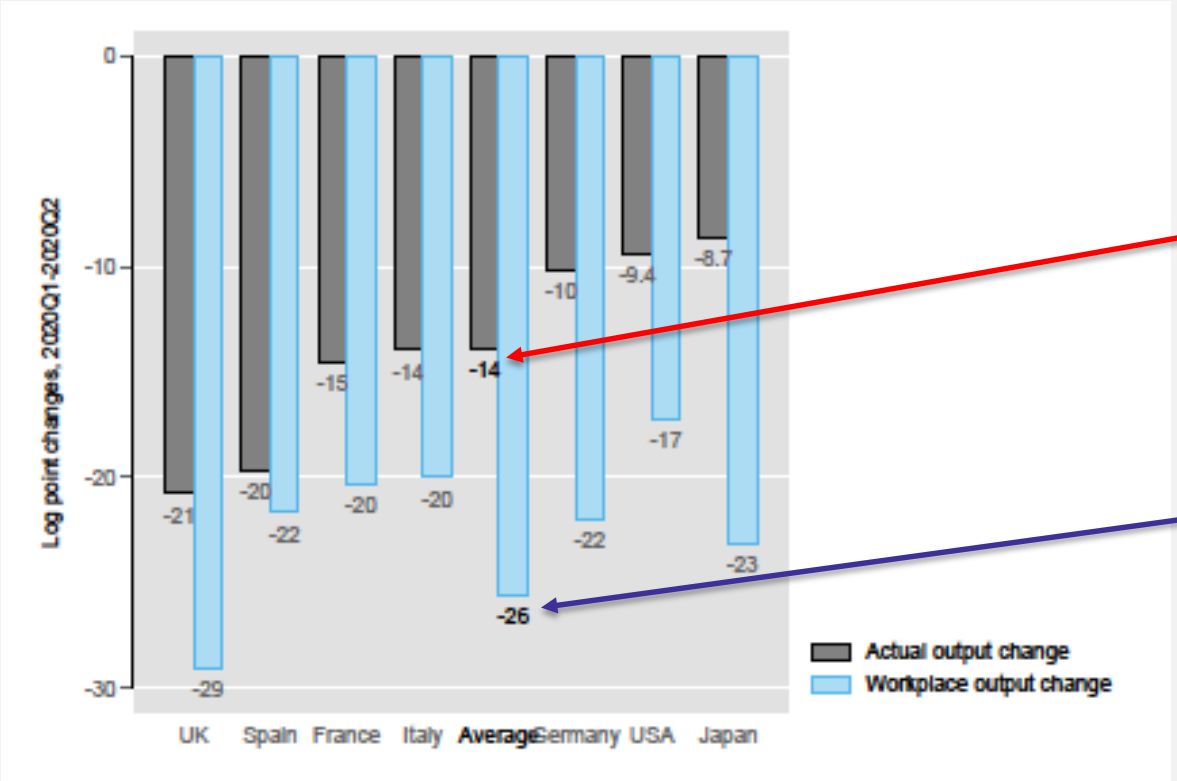
- Much work has focused on the effects of unmeasured intangibles
  - Only some software, artistic originals, and R&D are in national accounts
  - And even these are not consistently measured in firm-level data.
  - Nonetheless, this capital produces output (and hence valuation).
- This capital is not generic K that happens not to be measured.
  - Intangibles are correlated with higher markups, market share, and industry concentration, especially in high tech and healthcare sectors.
  - Leading firms tend to have higher intangible shares.
- Possible explanations:
  - Technology (software): platforms, non-rival (or anti-rival) capital
  - Innovation (patents): large fixed costs, market power, compensation for risk
  - Consumer (brands): customer market power, data accumulation

# Intangibles during the pandemic

- Pandemic immediacies highlighted intangibles
  - Information, communications technology, remote work
- Facilitated production
  - Resilience and higher output, especially for high-value services
  - Increased use of platforms, such as online retailing
  - Reallocated investment (even more tech, less K)
  - Raised productivity (measured composition effects, unmeasured efficiencies)

# Resilience during the COVID-19 pandemic

The Q2 decline in Output during COVID, in large Developed economies

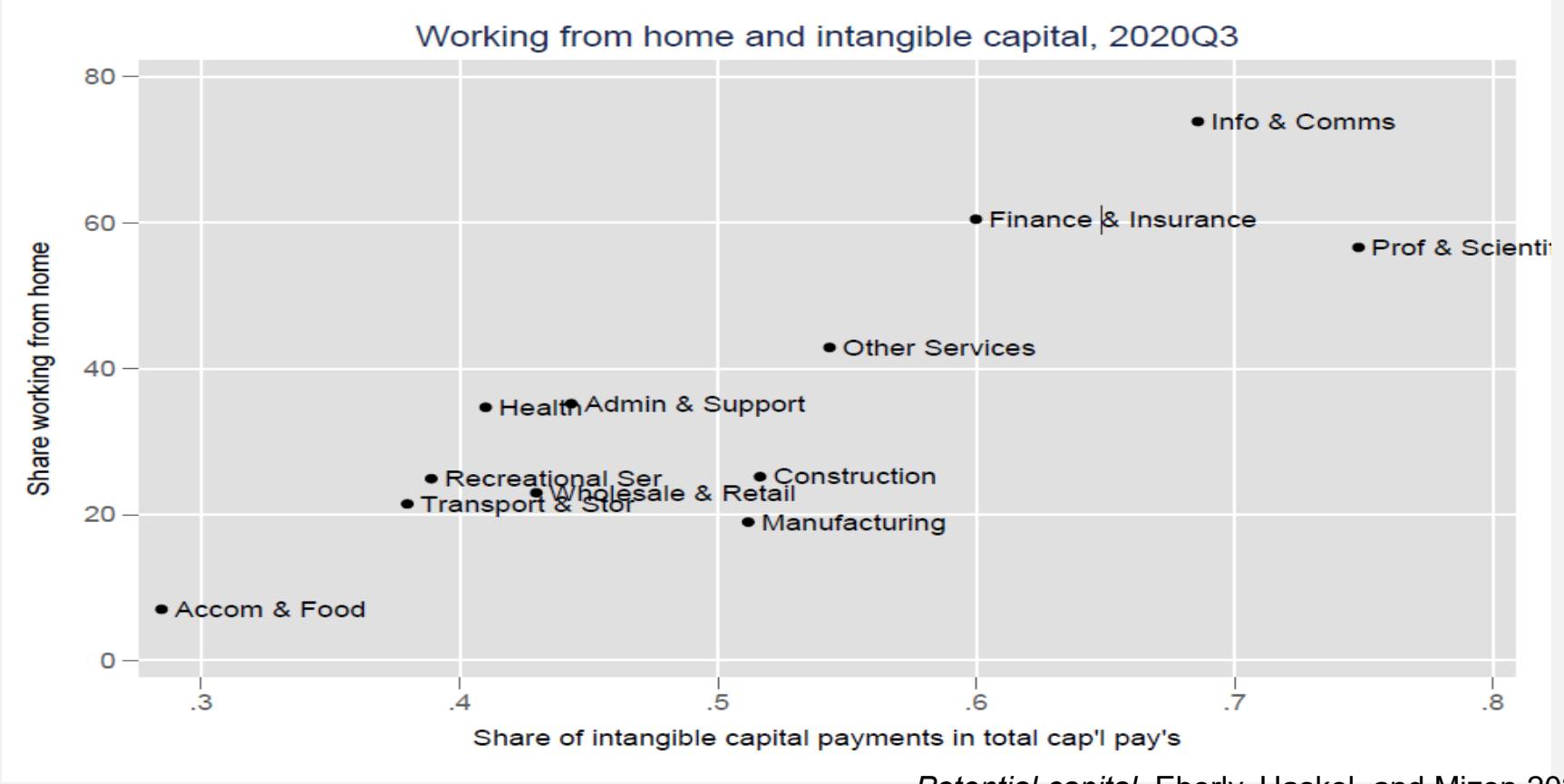



Quarterly actual log changes in GDP (average) = -14%

Workplace output (average) = output without work-from-home = -26% 2/3 x -30% + 1/3 x -20% (hours at work fell 30%, K at work fell 20%)

Eberly, Haskel, and Mizen 2021

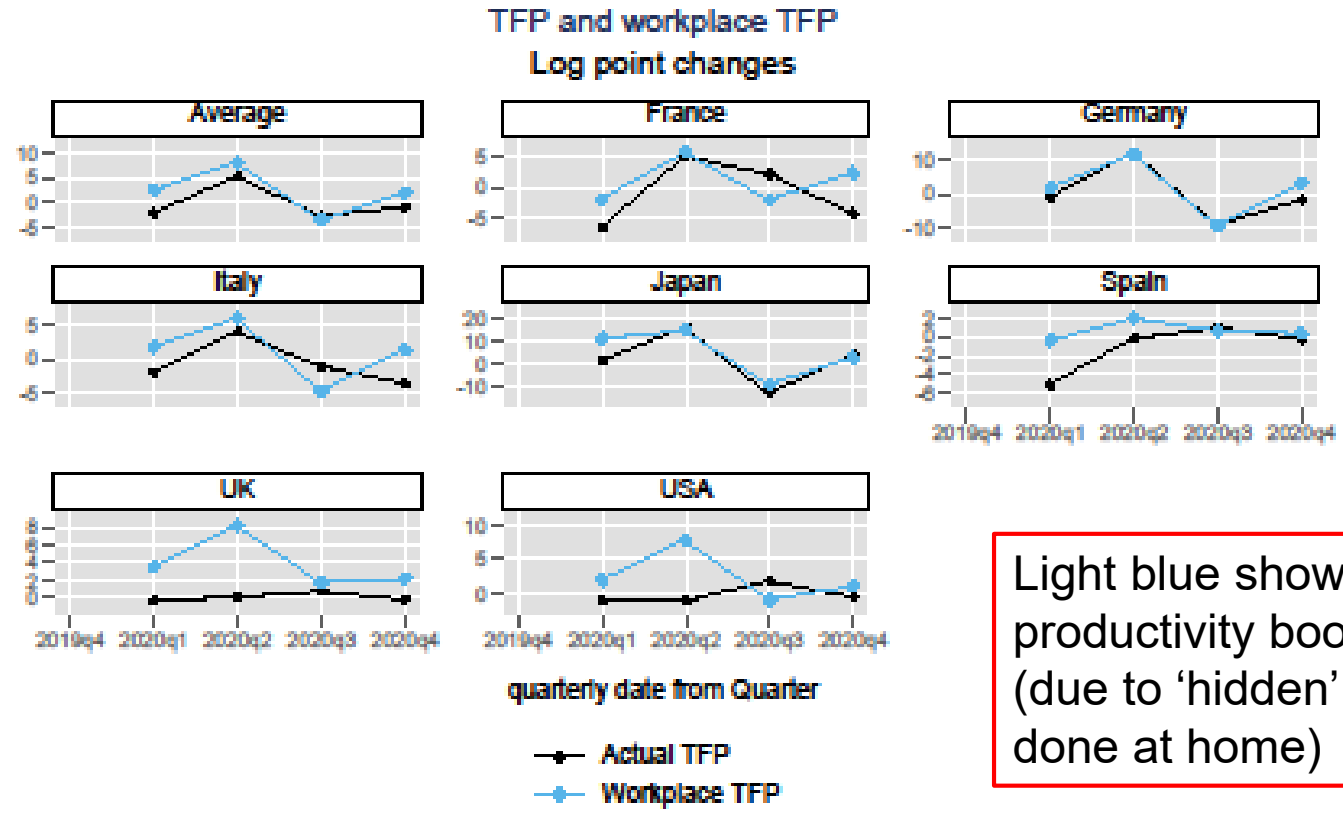
# Intangibles in the Pandemic: Greater working from home is positively associated with firms' initial intangible capital (ICT, Software, etc.)




*Potential capital*, Eberly, Haskel, and Mizen 2020.

# Capital and labor contributions to home and workplace output

# TFP total and implied by workplace inputs



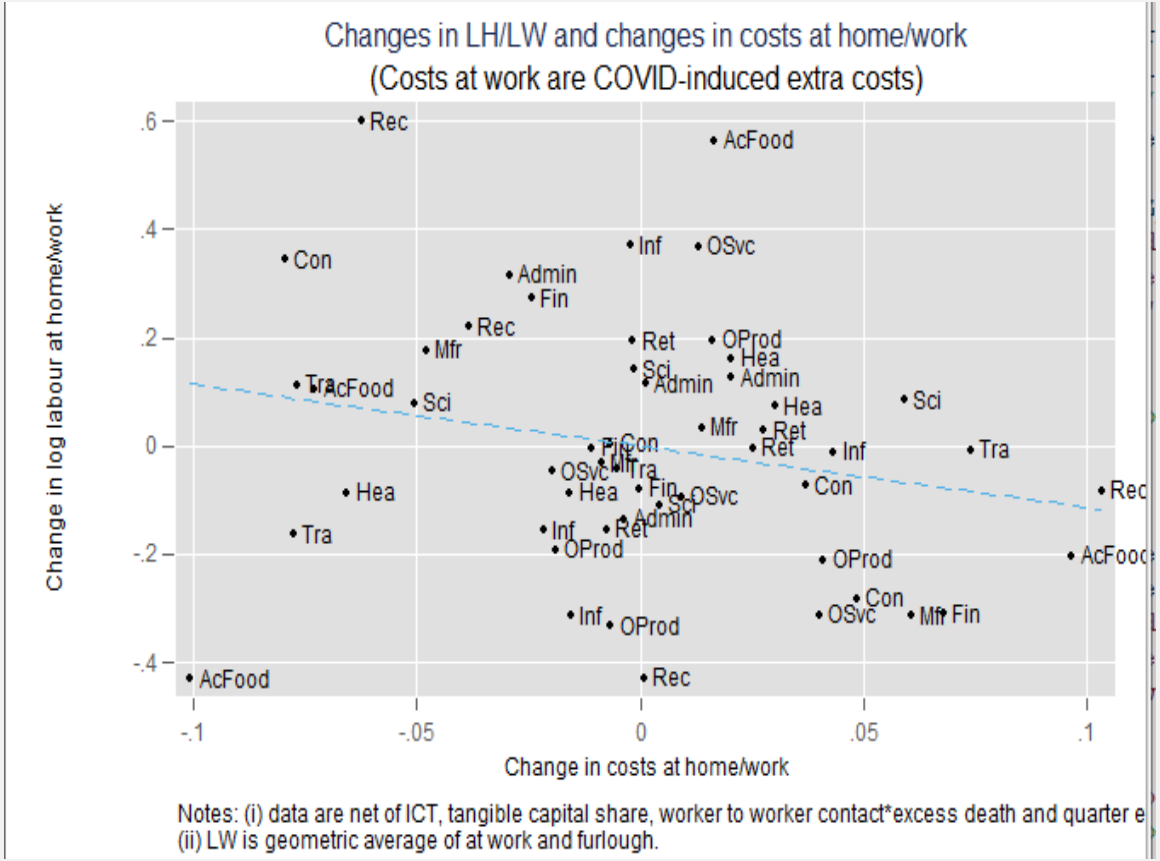

Light blue shows productivity boom (due to 'hidden' work done at home)

# The elasticity of substitution between H and W?

The future of remote work depends on the elasticity of substitution between Home and Work.

- Past productivity improvements did not increase remote work
- Our estimate σ ≈ 2

+ Remote work is positively correlated with pre-pandemic ICT and intangible capital



# Summary: what drives Labor remote vs premises?

- Price and ICT effects, especially early in the pandemic
- Price effects suggest there is room to reverse remote work as the relative cost of home and premises locations revert.
- However, the role of initial ICT suggests that the capacity for remote work was there all along – obstacle may have been collective action.
  - Large shock solved the collection action problem and forced learning.
  - Surveys show preference for 2-3 days/week of WFH.

## References


- De Loecker Eeckhout (2017 WP, QJE 2020 with Unger)
- Barkai (2019)
- Karabarbounis and Nieman (2019)
- Gutierrez and Philippon (2018)
- Alexander and Eberly (2018)
- Corrado, Hulten, Sichel (2005, 2009)
- Peters and Taylor (2017)
- Belo, Lin, Vitorino (2014)
- Belo, Gala, Salomao, Vitorino (2018)
- Farhi and Gourio (2018)
- Eisfelt and Papanikolaou (2013)
- McGrattan and Prescott (2010)
- Haskel and Westlake (2018)
- Crouzet and Eberly (2019, 2021)
- Eberly, Haskel, and Mizen (2020)