

INTANGIBLE CAPITAL:
IMPLICATIONS FOR INVESTMENT AND MARKET STRUCTURE

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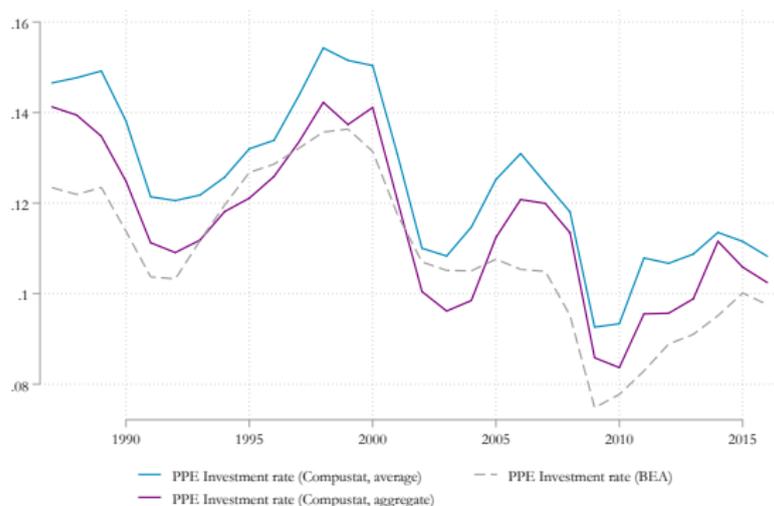
QUESTIONS

1. Why is capital investment low?
 - 5 percentage points below pre-2000s trend
 - Taking into account corporate valuations (Tobins Q), cash flow, cost of capital, etc.
2. Why have US industries become more concentrated?
 - Sales Herfindahl index has increased by at least 50% in 75% of US industries since mid-1990's
 - Superstar firms (Autor, Dorn, Katz, Patterson, Van Reenen (2017))
 - or Market power (Gutierrez and Philippon (2017))

FINDINGS

1. **Physical** investment is low because of the rising importance of **intangible** capital
 - R&D, creative originals, software, business processes
 - An omitted factor implies a wedge between measured investment and Tobin's Q
 - Treating intangibles as an omitted factor alone can account for 30 to 60% of the investment shortfall
2. Intangible capital has **economic properties** that may have enabled the rise in concentration
 - Intangibles may not be simply unmeasured physical capital
 - Non-rival: economies of scale
 - Excludability: market power
 - Intangible intensity is correlated with market share
 - Heterogeneous effects across industries, notably:
 - Consumer/Retail: scale effects (productivity)
 - Healthcare and High Tech: market power (markups)
3. New work: With both market power and intangibles \implies magnified wedge between investment and Tobin's Q

ISSUE 1: WEAK INVESTMENT

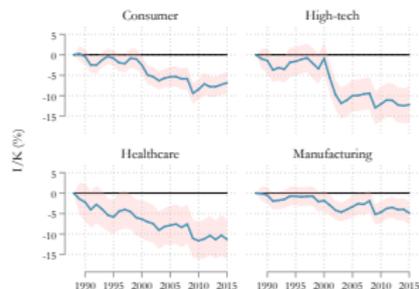


What explains this weakness?

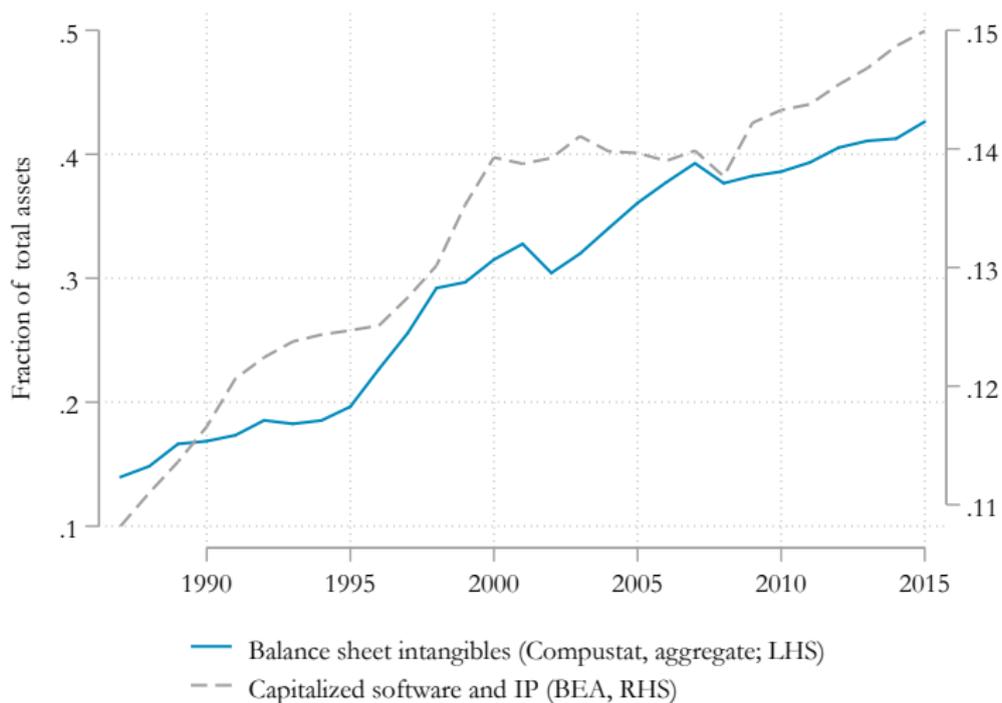
- ▶ Predates the financial crisis, though exacerbated by it.
- ▶ Could be weak fundamentals - control for Q, cash flow, etc.

INVESTMENT IS LOW RELATIVE TO FUNDAMENTALS

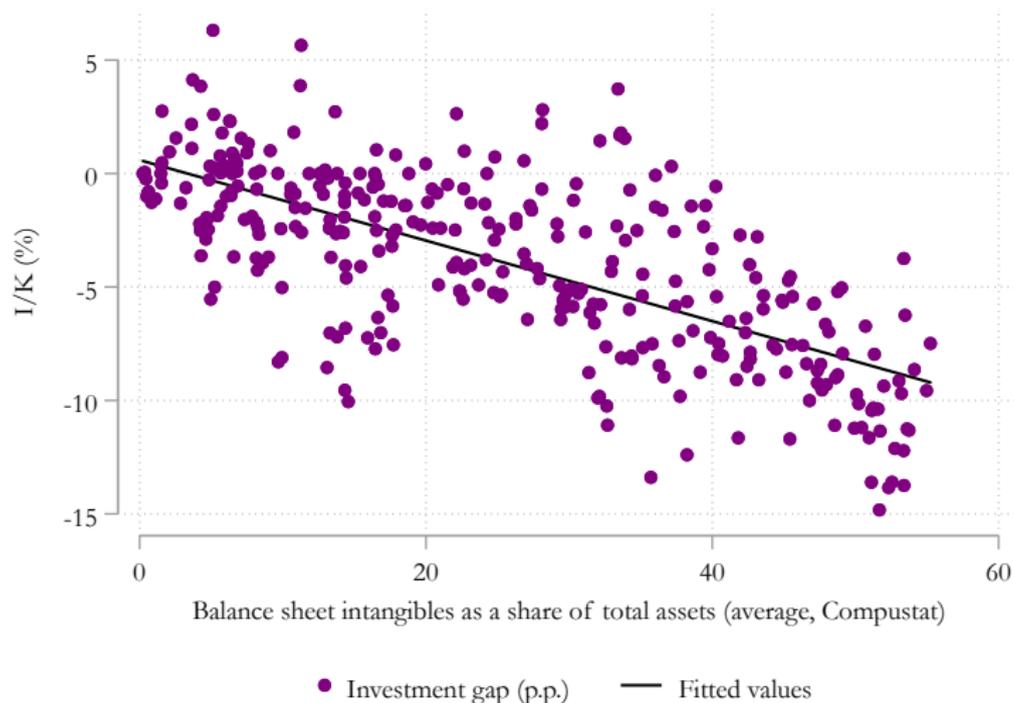
Controlling for Q and cash flow, time effects are negative starting in 2000.



INTANGIBLE CAPITAL HAS BECOME A LARGER PORTION OF FIRMS' CAPITAL OVER TIME.

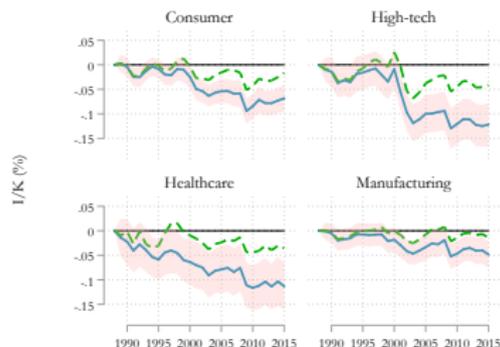
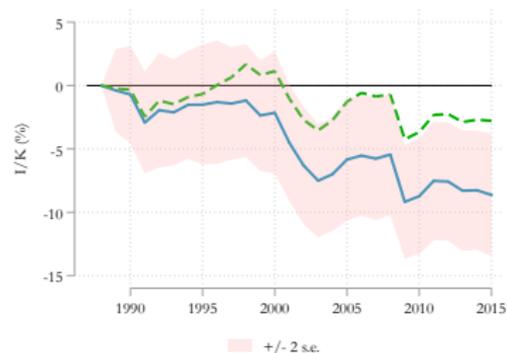


AT THE INDUSTRY LEVEL, THE INVESTMENT GAP IS HIGHLY CORRELATED WITH THE SHARE OF INTANGIBLE CAPITAL.



THE INVESTMENT GAP AFTER ACCOUNTING FOR INTANGIBLES

- The residual investment gap (green line) is substantially smaller than the raw investment gap (blue line) after controlling for industry-level intangible shares.
- The changing composition of the capital stock of US industries can account for about 60% of the total investment gap (top panel). The results are consistent across industries (bottom panel).
- Direct firm-level (unweighted) estimates of the investment-Q relationship, controlling for the intangible share, suggest a somewhat lower number, of about 30%.
- Also, the investment gap is largest among the most intangible-intensive firms, even within industries.

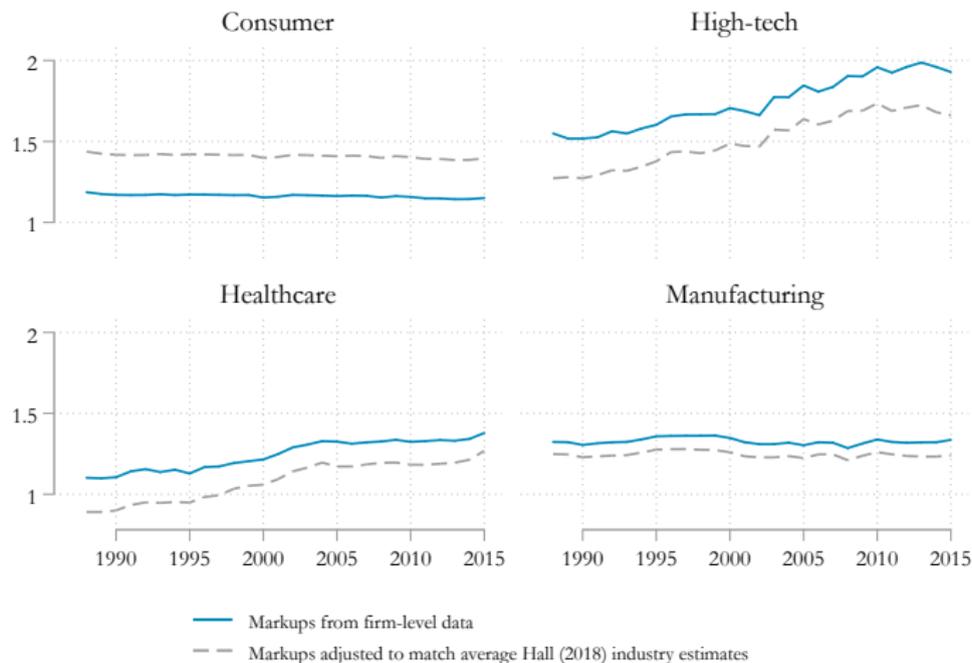


ISSUE 2: MARKET CONCENTRATION

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

- A firm's market share in its industry is higher when its intangible share is higher.
- This relationship holds between firms of the same industry, within firms over time, and controlling for year effects.

ISSUE 2: MARKET CONCENTRATION \Rightarrow RISING MARKUPS



- Estimated markups rising in High-tech and Healthcare.
- Recall that rising markup industries also have the largest investment gaps - even after controlling for omitted intangible capital.

ALLOWING FOR BOTH INTANGIBLES AND MARKET POWER: $Q +$

Average **physical** Q is strictly larger than marginal **physical** q :

$$Q_1 = q_1 + \underbrace{\frac{K_2}{K_1} q_2}_{\text{Intangibles}} + \underbrace{\frac{\mu - 1}{\alpha + \mu - 1} \frac{1 + g_{PK}}{r^* - g_T} A \left(\eta + (1 - \eta) \left(\frac{K_2}{K_1} \right)^\rho \right)^{\frac{1}{\rho}}}_{\text{Market power}}$$

Investment in **physical** capital is given by:

$$\begin{aligned} i_1 &= \frac{1}{\gamma} (q_1 - 1) \\ &= \frac{1}{\gamma} (Q_1 - 1) - \frac{1}{\gamma} \frac{K_2}{K_1} q_2 - \frac{1}{\gamma} \frac{\mu - 1}{\alpha + \mu - 1} \frac{1 + g_{PK}}{r^* - g_T} A \left(1 - \eta + \eta \left(\frac{K_2}{K_1} \right)^\rho \right)^{\frac{1}{\rho}} \end{aligned}$$

Investment in (physical) capital is "low relative to average (physical) Q ", because of **both** intangible capital (K_2) and rents, and largest when they interact.

More intangibles \implies higher monopoly wedge.

THE INTERACTION BETWEEN INTANGIBLES AND MONOPOLY POWER

- The over-statement of the incentive to invest (measured by average Q) is largest with **both** market power and intangible capital.
 - The interaction enlarges the investment gap
- Our earlier data analysis showed that markups and intangible capital are correlated
 - Firms with more intangible capital charge higher markups, both across time and cross-firms
 - This relationship is strongest in Healthcare and High Tech industries
 - ... which is where the investment gap is also largest.
- Future work to explore this effect
 - How large is the effect of intangibles on markups (and then to investment) quantitatively?
 - Is it a coincidence? Modeling the connection between intangibles and markups (varieties and value)
 - Better measures of intangibles (connect firm behavior to direct measures)

CONNECTING DIRECT MEASURES OF INTANGIBLES TO MARKET POWER

Patents and trademarks are direct measures of intangibles generated by firms. Preliminary analysis:

- Trademarks are correlated with markups, profits, and market share.
- Patents may be more closely related to efficiency gains.

	$100 \times \log \left(\frac{\text{sale}}{\text{cogs}} \right)$	$100 \times \log (\text{Lerner index})$	$100 \times \text{Market share}$
$\log (1 + \# \text{ trademarks})$	0.984 ^{***} (6.57)	0.536 ^{***} (6.84)	0.257 ^{***} (6.86)
$\log (1 + \# \text{ patents})$	2.085 ^{***} (21.04)	-0.090 [*] (-1.66)	-0.226 ^{***} (9.11)
Observations	30,012	30,012	30,012
Industry \times year f.e.	Yes	Yes	Yes
Control for firm characteristics	Yes	Yes	Yes
Clustering of s.e.	Ind.-year	Ind.-year	Ind.-year