What is the impact of rising concentration, rising intangibles, and other changes among firms in the age of the new economy?

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In recent decades, US businesses experienced

T1 Declining rates of investment
T2 Rising returns to capital
T3 Rising concentration

These trends have attracted attention

Productivity growth slowdown
Distribution of income across factors
Roadmap

1. What are the facts?

2. What are the explanations?

3. What’s missing from the explanations?
1. What are the facts?
Fact 1: Declining PPE investment rates
Fact 2a: Stable or rising returns to capital
Fact 2b: Rising valuations

\[ Q_{K,t} = \frac{V_t}{K_{t+1}} \] (NFCB)

\[ Q_{K,t} = \frac{V_t}{K_{t+1}} \] (Compustat)

[Add Q_{K,t} definition.]
Fact 3: Rising concentration

Compustat; NAICS-3D sectors weighted by sales.
Why do we puzzle over these facts?

\[
O_t = \max_{L_t} P_t \left( A_t K_t^\alpha L_t^{1-\alpha} \right) - W_t L_t = Z_t K_t
\]

\[
\frac{O_t}{K_t} \equiv \frac{\partial O_t}{\partial K_t} = r_t + \delta_K
\]

\[
V_t \equiv \text{NPV} \left[ O_t - \Phi \left( I_t/K_t \right) K_t \right] = Q_{K,t} K_t
\]

\[
\frac{V_t}{K_{t+1}} \equiv \frac{\partial V_t}{\partial K_{t+1}} = \Phi' \left( I_t/K_t \right)
\]

(Almost) two sides of the same coin
Five (relatively) open questions about the facts

1. When did the trends start?  
   [Karabarbounis, Neiman, 2019]

2. Are the trends the same across countries?  
   [Döttling, Gutierrez, Philippon, 2017]

3. Are the trends the same across sectors?  
   [Crouzet, Eberly, 2019]

4. Are PPE investment rates really that low?  
   [Gourio, 2019]

5. Within-firm changes vs. reallocation?  
   [Autor, Dorn, Katz, Patterson, Van Reenen, 2020]
2. What are the existing explanations?
Explanation 1: rising rents

\[ \frac{O_t}{K_t} = \mu \frac{\partial O_t}{\partial K_t}, \quad \mu > 1 \]

\[ \frac{O_t}{K_t} = \mu \frac{\partial O_t}{\partial K_t} = \mu (r_t + \delta_K) \]  

[Neo-classical growth model]
Explanation 1: rising rents

\[
\frac{O_t}{K_t} = \mu \frac{\partial O_t}{\partial K_t}, \quad \mu > 1
\]

\[
Q_{K,t}^{(+)} = q_{K,t} + \mathbb{E}_t \left[ \sum_{j \geq 1} M_{t,t+j} \left( \frac{O_{t+j}}{K_{t+j}} - \frac{\partial O_{t+j}}{\partial K_{t+j}} \right) \right]
\]

\[
= q_{K,t} + \left( \mu - 1 \right) \mathbb{E}_t \left[ \sum_{j \geq 1} M_{t,t+j} \frac{\partial O_{t+j}}{\partial K_{t+j}} \right]
\]

\[
> q_{K,t} = \Phi' \left( \frac{I_t}{K_t} \right)
\]
Explanation 1: rising rents

\[ \frac{O_t}{K_t} = \mu \frac{\partial O_t}{\partial K_t}, \quad \mu > 1 \]

Mechanisms for $\mu \uparrow$

- Oligopoly + rising entry costs  

- Oligopsony in labor markets  
  [Krueger, 2018; Benmelech, Bergman, Kim, 2020]
Does Explanation 1 work in the data?

Measured rents are rising

\[ \hat{\Pi}_t = O_t - (\overline{r_t + \delta_K})K_t = \frac{\mu - 1}{\mu}O_t \]

[Estimated rents]

Measured markups are rising

\[ \mu = 1 + \frac{\hat{\mu}_S - 1}{\alpha}, \quad \hat{\mu}_S = (1 - \alpha) \frac{P_t Y_t}{W_t L_t} \]

[Measurement problems]

Investment correlates with measured markups

[Gutiérrez, Philippon, 2017]
Explanation 2: rising intangibles

\[ O_t = O_t(K_t, B_t) \leftrightarrow \frac{O_t}{K_t} = \frac{\partial O_t}{\partial K_t} + \frac{B_t}{K_t} \frac{\partial O_t}{\partial B_t} \]

\[
\frac{O_t}{K_t} = r_t + \delta_K + \frac{B_t}{K_t} \frac{\partial O_t}{\partial K_t} \quad \text{[Neo-classical growth model]}
\]

\[
> r_t + \delta_K \quad \text{(-)}
\]

\[
Q_{K,t} = q_{K,t} + \frac{B_t}{K_t} q_{B,t} \quad \text{[Q-theory]}
\]

\[
> q_{K,t} = \Phi'(I_t/K_t) \quad \text{(-)}
\]
What are intangibles?

[Corrado, Hulten, Sichel, 2009, 2005]

Productive capital, but does not have a physical presence

- IT capital
- R&D capital
- Organization capital
An example from Amazon’s 2017 10-K

20% of operating expenses under "Marketing" and "Technology and content"

R&D payroll,

website maintenance costs

software development costs for AWS

"Collectively, these costs reflect the investments we make in order to offer a wide variety of products and services to our customers."
What are intangibles? [Corrado, Hulten, Sichel, 2009, 2005]

Productive capital, but does not have a physical presence

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- R&D capital
- Organization capital

Not exogenous — requires investment
The ratio $B_t/K_t$
What are intangibles?

Productive capital, but does not have a physical presence
    IT capital
    R&D capital
    Organization capital

Not exogenous — requires investment

Economic properties
    Excludable from use by other firms
    Non-rival in use within the firm
Does Explanation 2 work in the data?

Rising valuations and falling investment

\[ Q_{K,t} = q_{K,t} + \frac{B_t}{K_t} q_{B,t} \sim 1 + \frac{B_t}{K_t} < \hat{Q}_{K,t} \]

[Crouzet, Eberly, 2019]

[Firm-level evidence] [Flow returns to capital]

Concentration

Across industries, intangible intensity and HHI are correlated

Across firms, intangible intensity and market share are correlated

[Crouzet, Eberly, 2019]

[Firm-level evidence]
3. What’s missing from the explanations?
The intangibles/rents dichotomy is too simplistic. The two mechanisms are not mutually exclusive [Crouzet, Eberly, 2021].

Intangibles and rents interact to increase the investment/valuations gap

\[ Q_{K,t} - q_{K,t} = (\mu - 1)N_{K,t} + \frac{B_t}{K_t} q_{B,t} + \frac{B_t}{K_t} \times (\mu - 1)N_{B,t} \]

\[ N_{X,t} = \text{NPV}(\partial O_t / \partial X_t), \quad X \in \{K, B\} \]
The intangibles/rents dichotomy is too simplistic.

[Crouzet, Eberly, 2021]
The intangibles/rents dichotomy is too simplistic. The graph illustrates the Cobb-Douglas intangible share $\eta$ against Rents $\mu$ for different industries. The industries include Manufacturing, Healthcare, High-tech, Consumer Services, and Rents. The values range from 0.8 to 1.9 for $\eta$ and 0 to 1.9 for $\mu$. The data source is [Crouzet, Eberly, 2021].
The intangibles/rents dichotomy is too simplistic

Rents are endogenous — to past intangible investment

Customer capital

customer acquisition costs → durable customer base → pricing power [Gourio, Rudanko, 2014]

R&D capital

R&D investment → quality differentiation → pricing power [Klette, Kortum, 2004]

IT capital/Data

data acquisition costs → demand forecasting → (potentially) pricing power [Faboordi, Veldkamp, 2021]

Challenges for future work:

1. General framework capturing common features of these mechanisms
2. Mapping to data on investment and valuations
[B] Why is concentration rising?

Concentration is an equilibrium outcome, not a measure of market power

[Bain, 1951; Demsetz, 1973; Syverson, 2019]

At the core of several recent models

\[ \text{var}(z_i) > 0 \]

non-CES demand and/or imperfect competition

\[ \text{cov}(z_i, s_i) > 0 \]

\[ \text{cov}(z_i, \mu_i) > 0 \]

[Akcigit and Ates, 2019; Autor et al. 2020; Edmond, Midrigan, Xu, 2020; Peters, 2020; De Ridder, 2020]
Why is concentration rising?

Barriers to entry ↑?

But: concentrating sector innovate actively [Crouzet, Eberly, 2019]

Demand-side factors (market size/globalization)?

But: tradable and non-tradable sectors both concentrating [Autor et al., 2020]

\( \text{var}(z_i) \uparrow \) [Andrews, Criscuolo, Gal, 2016]

Challenges for future work:

1. What explains \( \text{var}(z_i) \uparrow \)? Does intangible investment play a role? [De Ridder, 2020]
2. Is there really a one-size-fits all (sectors) story?
Firm boundaries

To what extent is rising concentration due to changing firm boundaries?

- M&A activity among incumbents
- Start-up acquisitions

Intangibles and rents can both shape firm boundaries

- Intangibles create economies of scope across incumbents
- Dominant incumbents allow potential entrants to "scale" [Kamepalli, Rajan, Zingales, 2021]

Challenges for future work:

- Pretty wide open!
Conclusion
Take-aways

In recent decades, US businesses experienced

T1 Declining rates of investment
T2 Rising returns to capital
T3 Rising concentration

T1/T2 can be accounted for by jointly rising rents and rising intangibles

general, quantifiable model of intan \(\rightarrow\) rents

Causes and implications of T3 are more elusive

drivers of productivity gaps; sectoral heterogeneity; role of firm boundaries
More
Intangible vs. physical investment flows

\[ I_{B,t}/O_t \text{ (BEA)} \]
\[ I_{K,t}/O_t \text{ (BEA)} \]
\[ I_{B,t}/O_t \text{ (Compustat)} \]
\[ I_{K,t}/O_t \text{ (Compustat)} \]
Measured markups are rising

Are magnitudes plausible?

De Loecker, Eeckhout, Unger, 2020: $\mu_S \sim 1.60$

Rents are $\sim 35\%$ of sales, $\sim 70\%$ of value added

Can we hope to use income statements to recover variable costs?

$\mu_S \sim \frac{\text{sales}}{\text{cogs} + 0.7 \times (\text{sg\&a} - \text{r\&d})}$

Walmart: *all* wages are in sg\&a; $\mu_{S,Walmart} = 1.12$ in 2015

Costco: *only some* wages in sg\&a; $\mu_{S,Costco} = 1.06$ in 2015

$\mu_{S,Walmart} > \mu_{S,Costco}$? Or $0.7 \times (\text{sg\&a} - \text{r\&d})$ too low for Walmart?
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Intangibles and returns to capital

Are measured returns to capital rising?

\[ O_{t}^{\text{unadj}}/(P_{t}Y_{t}) = (O_{t} - P_{B,t}B_{t})/(P_{t}Y_{t}) \text{ is trendless} \]

But is \( P_{B,t}B_{t} \) really capital income? Or is it paid to key firm talent?
The investment gap after controlling for intangibles

Solid: \( \left( \frac{I}{K} \right)_{j,t} = \alpha_j + \gamma_t + \beta Q_{K,j,t} + \epsilon_{j,t} \)

Dashed: \( \left( \frac{I}{K} \right)_{j,t} = \alpha_j + \gamma_t + \beta Q_{K,j,t} + \zeta \left( \frac{B}{K} \right)_{j,t} + \epsilon_{j,t} \)

[Crouzet, Eberly, 2019]
# Intangible intensity and market share

<table>
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<th></th>
<th>Market share</th>
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<tbody>
<tr>
<td></td>
<td>(A)</td>
<td>(B)</td>
<td>(C)</td>
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<tr>
<td>Compustat intangible share</td>
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<td>0.0096***</td>
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<tr>
<td></td>
<td>(17.69)</td>
<td>(5.40)</td>
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</tr>
<tr>
<td>Year f.e.</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
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Measured rents are rising

\[\hat{\Pi}_t/(P_tY_t) = \frac{\mu - 1}{\mu} O_t/(P_tY_t), \quad \text{NFCB sector}.\]
Related facts

Declining labor share

\[ LS_t = \frac{W_t L_t}{P_t Y_t} = 1 - \frac{O_t}{K_t} \frac{K_t}{P_t Y_t} \]

Karabarbounis, Neiman, 2014

Declining “business dynamism”

- Falling entry rates
- Rising productivity gap between leaders and laggards
- Falling rates of job reallocation

Gourio, Messer, Siemer, 2016
Andrews, Criscuolo, Gal, 2016
Decker, Haltiwanger, Jarmin, Miranda, 2016