Rise of Superstar Firms and Fall of the Price Mechanism

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Rise of the Superstar Economy

- increasing corporate market power
- increasing corporate internal financing
Research Questions

- **Macro-finance implications of the new Superstar Economy**

1. what is its origin?
2. why do firms hold excessive cash?
3. how does the rise of Superstar Economy affect capital misallocation?
Main Story

- **Primitive shocks**: economic fundamental changes from both demand and supply sides
  - demand side: customers care more about product quality than quantity
  - supply side: digitization allows firms to increase operating scale

- **Consequences**: income and **risk** redistribution towards right-tail firms
  - earnings/markup as a **convex** function of product quality

- **Changes in corporate risk management policy**: rely more on internal financing
  - **external financing costs** + precautionary saving incentive

- **Aggregate impacts**: increasing capital allocation inefficiency
  - unequalized marginal cost of capital within internal financing region
  - Coase (1937): market is being replaced by firms for allocating resources
This Paper

- **Punchline:** increasing inefficiency of capital allocation in Superstar Economy

- **Underlying mechanism:** fundamental changes ⇒ earnings level and risk ⇒ risk management policy ⇒ capital allocation efficiency

- **Roadmap**
  1. Motivating Facts
  2. Theory
  3. Reduced-form Evidence
  4. Quantitative Results
Related Literature

- **Superstar firms**: Autor et al. (2020); De Ridder (2019); Korinek and Ng (2017);...
- **Misallocation**: Hsieh and Klenow (2009); Gopinath et al. (2017); Asker, Collard-Wexler and De Loecker (2014);...
- **Corporate liquidity management**: Bolton, Chen and Wang (2011); Wang, Wang and Yang (2012); Bates, Kahle and Stulz (2009);...
- **Declining number of public firms**: Decker et al. (2016); Doidge et al. (2018);...
- **Distributional macro**: Moll (2014); Kaplan, Moll and Violante (2018);...

- **Firm-market boundary**: Coase (1937); Williamson (1975);...
  - production side v.s. **financing side**
  - institutional quality v.s. **economic fundamental changes**
Three Facts

- Fact I: increasing dispersion of firm-level marginal revenue return to capital
Three Facts

• Fact II: negative correlation between firm-level TFP and net finance dependence
Three Facts

• Fact III: increasing gap between MPK and r

![Graph showing the increasing gap between MPK and r over time from 1980 to 2020.]
Facts and Interpretation

• **Three Facts**
  - increasing dispersion of firm-level marginal revenue return to capital
  - negative correlation between firm-level TFP and net finance dependence
  - increasing gap between MPK and r

• **Interpretation**: capital allocation efficiency has been declining in the U.S.

• **Conjecture**: related to this new Superstar Economy and its origin

• **Next**: a theoretical model to explain why
Model Setup – Agents

• An infinite-horizon continuous-time economy with [0, 1] entrepreneurs

• Stochastic differential utility with standard normalized aggregator $f(c, J)$

• (Two-layer) optimization problem
  1. optimal consumption $c$ and savings
  2. optimal savings portfolio: capital $\zeta$, cash $\omega$, debt $b$

• State of the economy: $\Lambda_t(\zeta, \omega, b)$
Model Setup – Earnings

• Each entrepreneur can sell a product with quality $\zeta$

  • demand: $p(\zeta) = \zeta^\phi$

  • $\phi$: taste for quality

• supply: $\Theta(y) = f_0 + \xi_0 y^{\frac{1}{\eta}}$

  • $\frac{1}{\eta}$: curvature of the supply curve, i.e., how costly for firms to expand operating scale

  • fixed cost assumption: De Ridder (2019)

• earnings (and also markup) as a function of underlying capital quality

$$\pi(\zeta) = (1 - \eta) \left( \frac{\eta}{\xi_0} \right)^{\frac{\eta}{1 - \eta}} \zeta^{\frac{\phi}{1 - \eta}} - f_0$$

(1)

• Stochastic capital quality process

$$d\zeta_t = \left( \bar{\mu} + \zeta_t - \delta \zeta_t \right) dt + \sigma \sqrt{\zeta_t} d\mathcal{F}_t$$

(2)
Model Setup – Risk Management

• **External financing**: credit risk-free debt
  
  • timeline adjustment and earnings-based borrowing constraint
  • **transaction costs** of using the external financial market
    
    \[ \mathbb{1}_{b \neq 0} (\chi_0 + \chi_1 |b|) \]

• **Internal financing**: completely risk-free cash
  
  • predetermined cash carry cost: \( \lambda \)
  • non-negativity condition: \( \omega_{i,t} \geq 0; \ \forall i,t \)
  
  • cash is **not** a publicly traded asset: no specific cash market clearance condition
  • classical cash inventory approach
Economic Fundamental Shocks ⇒ Risky Superstar Economy

- **Quality-based non-homogeneous earnings process**

\[
d\pi_t = \left[ \pi' (\zeta_t) \left( \bar{\mu} + \zeta_t - \delta \zeta_t \right) + \frac{\sigma^2 \zeta_t}{2} \pi'' (\zeta_t) \right] dt + \pi' (\zeta_t) \sigma \sqrt{\zeta_t} \ d\mathcal{Z}_t \tag{3}
\]

- drift component
- volatility component

- shifts in supply and demand curves: $\uparrow \phi$ and $\uparrow \eta$ ⇒ $\pi$ convex in $\zeta$ ⇒ $\pi'$ increasing in $\zeta$

- $\pi'$: rise of superstars

- $\pi'$: superstars are inherently riskier
Risky Superstar Economy with Income and Risk Redistribution

- **Generality**: convexity + Ito’s lemma
Dynamic Risk Management ⇒ Firm-Market Boundary

- **Optimal cash holdings policy:** $\left[ \Omega^\zeta, \overline{\Omega}^\zeta \right]$
  - upper boundary $\overline{\Omega}^\zeta$: cash carry cost
  - lower boundary $\Omega^\zeta$: external financing cost
  - depend on capital quality $\zeta$

- **Unintended outcome:** three sub-economies
  1. external lending region: $\omega = \overline{\Omega}^\zeta$ and $b < 0$
  2. external borrowing region: $\omega = \Omega^\zeta$ and $b > 0$
  3. internal financing region: $\Omega^\zeta < \omega < \overline{\Omega}^\zeta$ and $b = 0$
• self-financing (through safe assets) increases misallocation
• firm-market boundary is exactly the Neumann boundary conditions of certain PDEs
• these PDEs come from optimal decisions made by individual entrepreneurs
A Tale of Two Allocation Systems

• Firm-market boundary: a set of downward and upward control boundaries \( \{\Omega^i, \Omega^i \}_{i \in [0,1]} \).

1. area governed by the price mechanism

\[
\Psi_t = \iiint (1 - \mathbb{1}_{\Omega^i < \omega < \Omega^i}) \Lambda_t(\zeta, \omega, b) \, d\zeta \, d\omega \, db
\]

2. area governed by entrepreneurs

\[
\Psi^E_t = 1 - \Psi_t
\]

• Why do we need this?

• invisible hand is invisible by nature, so is its boundary
• formally establish Coase (1937)’s idea in GE with a well-defined firm-market boundary
Reduced-Form Evidence I: Risky Superstars

• discussion on Herskovic et al. (2016)
  • different definitions
  • size premium & profitability premium
  • “realized” outcomes
Reduced-Form Evidence II: Markup and Misallocation

- **left-tail firms**: borrowing constraint story
- **right-tail firms**: risk management story
Reduced-Form Evidence III: Markup and Cash holdings

- a positive and significant association
Parameterization

• Two subsamples (Farhi and Gourio, 2018):
  • traditional economy (1980-1999)
  • superstar economy (2000-2015)

• Standard calibration + estimation (SMM-MCMC)

• Changes in parameters
  • an increase in taste for quality $\phi$: 0.43 $\rightarrow$ 0.56
  • an increase in fixed production costs $f_0$: 0.11 $\rightarrow$ 0.32
  • an increase in operating scale $\eta$: 0.48 $\rightarrow$ 0.64
  • a reduction in marginal cost $\zeta_0$: 0.94 $\rightarrow$ 0.26
Quantitative Results

<table>
<thead>
<tr>
<th>Macro-Finance Indicators</th>
<th>Trends</th>
</tr>
</thead>
<tbody>
<tr>
<td>degree of “misallocation”</td>
<td>+0.22</td>
</tr>
<tr>
<td>correlation between TFP and net finance</td>
<td>-0.164</td>
</tr>
<tr>
<td>MPK - r</td>
<td>+5.00%</td>
</tr>
<tr>
<td>area disciplined by the price mechanism</td>
<td>-10.88%</td>
</tr>
</tbody>
</table>

- $\Psi$: wealth-weighted share of firms using external financial market
- Market system effectiveness: 11% decline
- Bils, Klenow and Ruane (2021): 15% decline in capital allocation efficiency
  - specific government policies
  - capital/labor market frictions
## Decomposition

<table>
<thead>
<tr>
<th></th>
<th>Data</th>
<th>Fix $\phi$</th>
<th>Fix $\eta$</th>
<th>Fix $f_0$</th>
<th>Fix $\xi_0$</th>
<th>Fix $\eta$, $f_0$, &amp; $\xi_0$</th>
<th>Fix $\phi$, $\eta$, $f_0$, &amp; $\xi_0$</th>
<th>Fix $\beta$</th>
</tr>
</thead>
<tbody>
<tr>
<td>degree of “misallocation” (%) of the full model</td>
<td>+0.22</td>
<td>+0.18</td>
<td>+0.25</td>
<td>+0.26</td>
<td>+0.14</td>
<td>+0.10</td>
<td>+0.08</td>
<td>+0.28</td>
</tr>
<tr>
<td>correlation between TFP and net finance (%) of the full model</td>
<td>-0.164</td>
<td>-0.071</td>
<td>-0.116</td>
<td>-0.113</td>
<td>-0.087</td>
<td>-0.040</td>
<td>+0.023</td>
<td>-0.129</td>
</tr>
<tr>
<td>MPK - $r$ (%) of the full model</td>
<td>+5.00%</td>
<td>+3.33%</td>
<td>+3.91%</td>
<td>+3.85%</td>
<td>+2.80%</td>
<td>+1.60%</td>
<td>+1.04%</td>
<td>+4.72%</td>
</tr>
<tr>
<td>area disciplined by the price mechanism (%) of the full model</td>
<td>N/A</td>
<td>-7.28%</td>
<td>-9.34%</td>
<td>-9.26%</td>
<td>-5.50%</td>
<td>-3.25%</td>
<td>-3.17%</td>
<td>-10.68%</td>
</tr>
</tbody>
</table>

- **demand side story**: 35%
- **supply side story**: 50%
- **borrowing constraint story**: 10%

Quantitative Analysis
• **Fundamental changes lead to rising superstars but falling price mechanism.**

• **Policy implication**: increasing inefficiency
  
  • not on the production side: more productive producers serve more customers
  
  • on the financing side: increasing internal financing $\Rightarrow$ inefficient use of resources
Appendix
1. **Superstar Firms** literature

   - Autor et al. (2020), De Ridder (2019): earnings/markup *level* redistribution channel
   - this paper: earnings/markup *risk* redistribution channel $\Rightarrow$ corporate risk management policy $\Rightarrow$ allocation efficiency

2. **Finance & Misallocation** literature

   - Buera, Kaboski and Shin (2011), Midrigan and Xu (2014), Moll (2014) ...
     - firms are *exogenously* assumed to be borrowers and face borrowing constraints
     - self-financing can *reduce* misallocation due to (wealth-based) borrowing constraint
   - this paper
     - firms *endogenously* choose between internal financing and external financing
     - self-financing can *increase* misallocation due to the unequalized cash value
## Calibration

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>$\rho$</td>
<td>rate of time preference</td>
<td>0.046</td>
<td></td>
<td>Wang, Wang and Yang (2012)</td>
</tr>
<tr>
<td>$\gamma$</td>
<td>risk aversion</td>
<td>4.0</td>
<td></td>
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</tr>
<tr>
<td>$\theta$</td>
<td>EIS reciprocal</td>
<td>2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\lambda$</td>
<td>cash carry cost</td>
<td>1%</td>
<td></td>
<td>Bolton, Chen and Wang (2011)</td>
</tr>
<tr>
<td>$\delta$</td>
<td>capital depreciation rate</td>
<td>0.053</td>
<td>0.056</td>
<td>BEA-FAT</td>
</tr>
<tr>
<td>$\eta$</td>
<td>operating scale</td>
<td>0.48</td>
<td>0.64</td>
<td></td>
</tr>
<tr>
<td>$f_0$</td>
<td>fixed production cost</td>
<td>0.11</td>
<td>0.32</td>
<td>Compustat</td>
</tr>
<tr>
<td>$\bar{\mu}$</td>
<td>capital quality: long-run mean</td>
<td>1.48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\sigma$</td>
<td>capital quality: volatility</td>
<td>0.76</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **capital quality**: (normalized) mean and s.d. of sales in *Compustat*
- **production technology**: De Ridder (2019)
## Estimation: SMM-MCMC approach

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Traditional Economy</th>
<th>Superstar Economy</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\phi$</td>
<td>taste for quality</td>
<td>0.43</td>
<td>0.56</td>
<td>+ 0.13</td>
</tr>
<tr>
<td>$\zeta_0$</td>
<td>variable production cost</td>
<td>0.94</td>
<td>0.26</td>
<td>-0.68</td>
</tr>
<tr>
<td>$\kappa_0$</td>
<td>investment adjustment cost</td>
<td>1.20</td>
<td>1.30</td>
<td>+0.10</td>
</tr>
<tr>
<td>$\chi_0$</td>
<td>fixed external financing cost</td>
<td>0.37</td>
<td>0.55</td>
<td>+0.18</td>
</tr>
<tr>
<td>$\chi_1$</td>
<td>variable external financing cost</td>
<td>0.053</td>
<td>0.088</td>
<td>+0.035</td>
</tr>
<tr>
<td>$\beta$</td>
<td>tightness of borrowing constraint</td>
<td>0.22</td>
<td>0.29</td>
<td>+0.07</td>
</tr>
</tbody>
</table>
Coase (1937) Revisited

“The price mechanism might be superseded if the relationship which replaced it was desired for its own sake.”


**Intuition:** Market v.s. Firms

- market system eliminates misallocation through the price mechanism
- but using market system incurs transaction costs

**This paper:**

- trend of this competition in the new Superstar Economy
- key conclusion: increasing inefficiency of capital allocation in Superstar Economy

**Underlying mechanism:**

- transaction costs: external financing costs
- main driver: increasing earnings **risk** arising from some economic fundamental shocks
References I


References II


Korinek, Anton, and Ding Xuan Ng. 2017. “The Macroeconomics of Superstars.”

