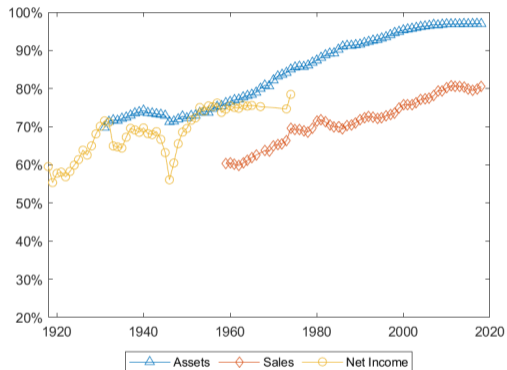


A Tale of Sunset Industries

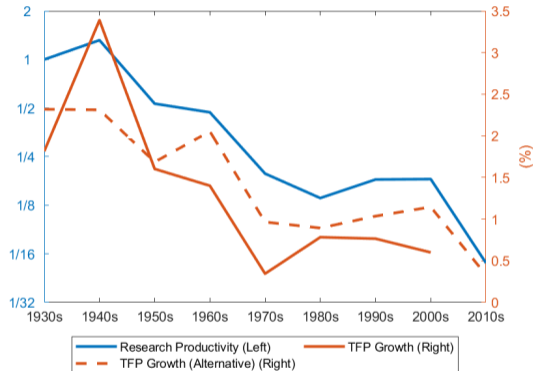
Jinglun Yao
London Business School

EEA-ESEM Congress
August 31, 2023

Introduction: Stylized Facts in the Long-run



(a) US Corporate Concentration of top 1% firms (Kwon et al. (2022))



(b) US Research Productivity (Bloom et al. (2020)) and TFP growth (Gordon (2016), Nordhaus (2021))

Introduction: Research Question

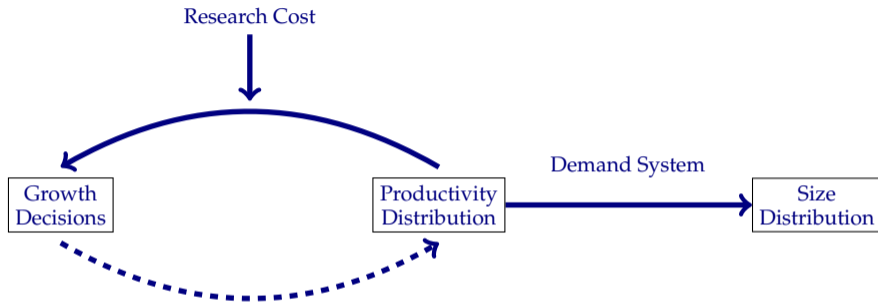
- ▶ What explains the **long-run** rise in corporate concentration, in the form of **flattening Pareto tail**?
- ▶ This paper: long-run decline in research productivity, via lower growth
- ▶ Contribution of this paper:
 - ▶ Pareto-tailed distributions endogenously generated by Schumpeterian growth and idiosyncratic productivity shocks
 - ▶ Link research productivity to the tail of distribution via growth
 - ▶ Implications on market power and business dynamics

Model Schema

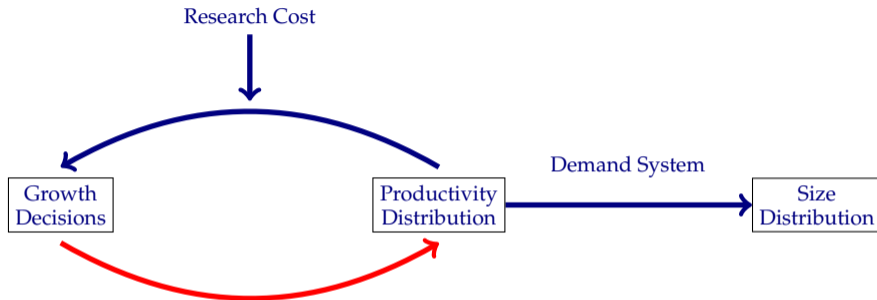
Model Schema



Model Schema



Model Schema



- ▶ Challenge: Joint determination of growth decisions and productivity distribution
- ▶ Methodology: Mean Field Game in a continuous-time setting à la Achdou, Han, Lasry, Lions and Moll (2022).

Model: Static Problem

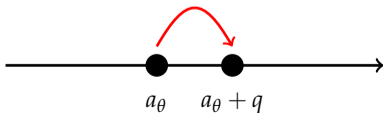
- ▶ One-sector economy with a continuum of firms. Each firm produces one good. Total measure of firms/goods M .
- ▶ Representative consumer with Kimball preference over differentiated goods. Demand elasticity decreases with quantity for each good.
- ▶ Monopolistic competition among firms.
- ▶ Profit function under optimal pricing: $\Pi(a_\theta; \phi^M)$, where
 - ▶ a_θ : log-productivity of firm θ
 - ▶ $\phi^M = M\phi$ where ϕ is PDF of log-productivity
- ▶ Per-period fixed cost pins down the lowest admissible productivity.

Model: Innovation and Learning of Incumbents I

Innovation: Choose Poisson success rate $\lambda_{i,\theta}$ with cost $C_{i,\theta}$. If innovation is realized:

Model: Innovation and Learning of Incumbents I

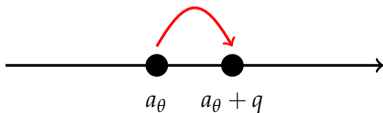
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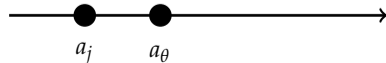
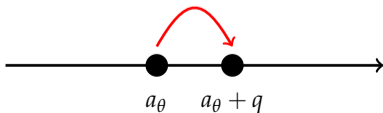
Learning/diffusion/adoption: Choose Poisson success rate $\lambda_{l,\theta}$ with cost $C_{l,\theta}$. If learning is realized:



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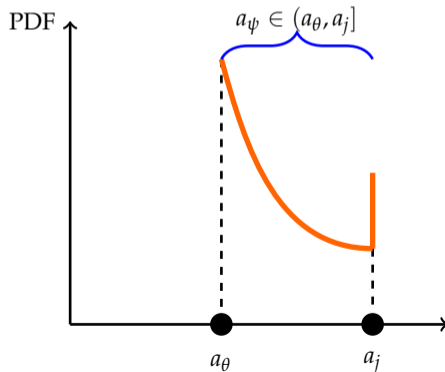
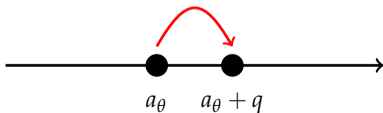
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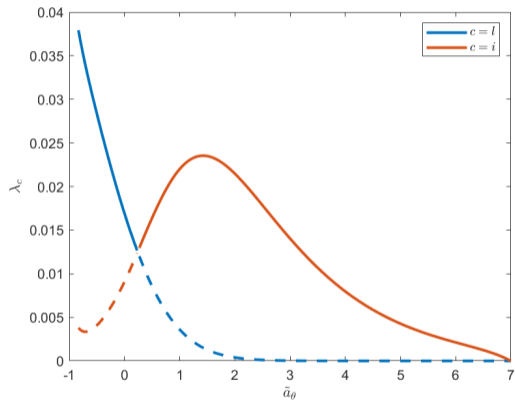
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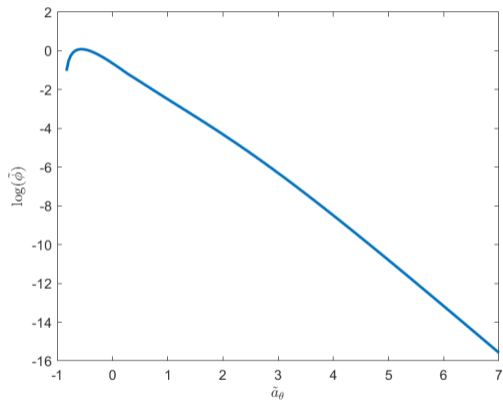
Model: Innovation and Learning of Incumbents II

- ▶ α in cost functions of innovation and learning: industry-average innovation and learning difficulty
- ▶ Keep α constant and solve balanced growth path, i.e. travelling wave equilibrium.
- ▶ Larger α for more recent history: **harder innovation and learning over time, uniformly for all firms.**
- ▶ Apart from endogenous growth, idiosyncratic productivity shocks, i.e. random growth.
- ▶ Mean field system:
 - ▶ HJB equation: firm-wise optimal choice between innovation and learning, and intensity of it.
 - ▶ KF equation: determines equilibrium productivity distribution ϕ based on firms' growth decisions.
- ▶ Imperfect learning is the key for the unique Pareto tail of equilibrium distribution.

Example Solution

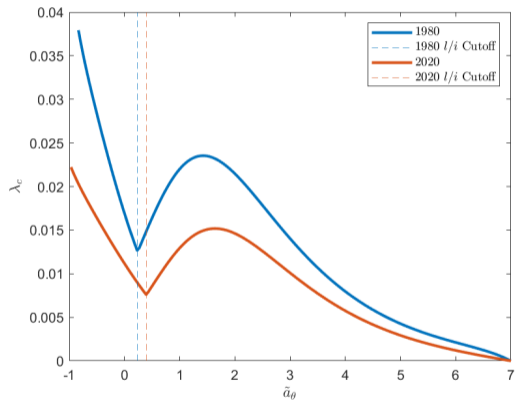


(a) Learning/Innovation intensity of incumbents

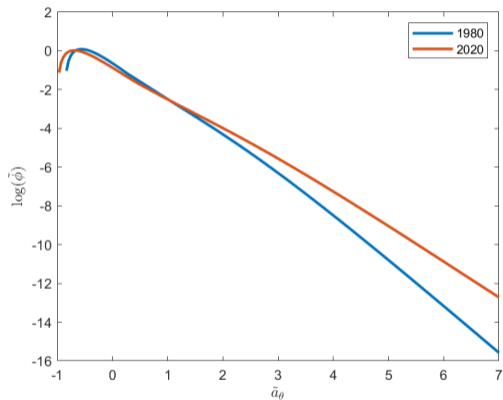


(b) Log-productivity distribution in log scale

Comparative Statics When Ideas Get Harder to Find ($\alpha \uparrow$)



(a) Learning/Innovation intensity of incumbents



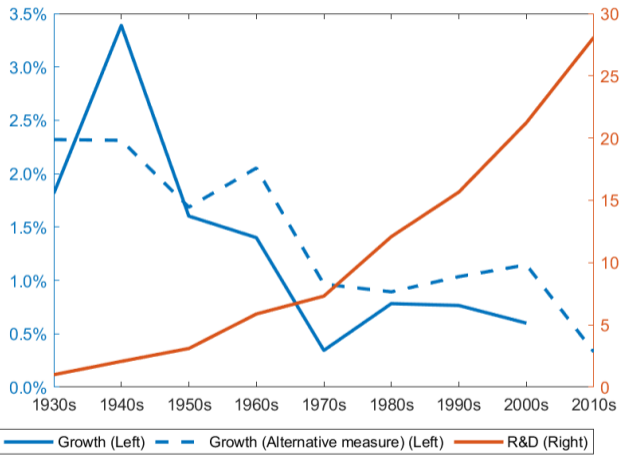
(b) Log-productivity distribution in log scale

Mechanism and Additional Results

- ▶ Different advantages:
 - ▶ Dynamic growth advantage of laggards
 - ▶ Static advantage of leaders
- ▶ **Uniform** harder research decreases the growth of all firms, but especially that of laggards due to their dynamic advantage
- ▶ **Relative** growth of leaders $\uparrow \Rightarrow$ Pareto tail fattens
- ▶ Important takeaways:
 - ▶ Dominating force: Growth determines market structure, not the other way around
 \Rightarrow Anti-trust policies *not* recommended for promoting growth
 - ▶ The paper proves analytically a one-to-one correspondence between lower aggregate growth and fatter Pareto tail.
- ▶ Calibrated model explains a majority of the changes in productivity growth, corporate concentration, markup, labor share, R&D cost, entry and exit rates, and job creation and destruction rates of US since 1980s.

Appendix

US TFP growth and R&D cost

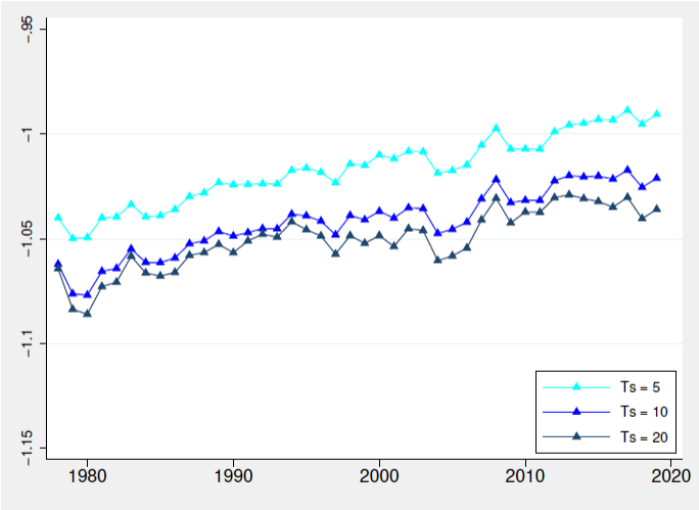


Sources:

- ▶ TFP Growth: Gordon (2016)
- ▶ Alternative measure of TFP growth: Nordhaus (2021)
- ▶ R&D cost: Bloom et al. (2020)

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Pareto Tail Index of Firm Employment Distribution



Source: Chen (2022) [Back](#)

- Bloom, N., Jones, C. I., Van Reenen, J., and Webb, M. (2020). Are ideas getting harder to find? *American Economic Review*, 110(4):1104–44.
- Chen, Z. (2022). Economic growth and the rise of large firms.
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- Nordhaus, W. D. (2021). Are we approaching an economic singularity? information technology and the future of economic growth. *American Economic Journal: Macroeconomics*, 13(1):299–332.