The Nature of Firm Financing and Growth

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Motivation

How does the nature of firm life cycle growth interact with the nature of firm financing?

- Problem: US firm financing data unavailable from the universe of firm dynamics data
- Solution: New UK Census data on the nature of financing & firm dynamics for all firms

Data (+ Theory) = Connect Fast-Growing Literatures

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3. **firm dynamics** lit: Sterk et al: temporary shocks $\Longrightarrow$ **permanent heterogeneity**
   - Estimate ex-ante predictability of firm potential like Guzman-Stern / Hurst-Pugsley

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- We can now study **young firm cash-flow debt finance with permanent heterogeneity**

This Paper

1. **Empirics**: getting cash-flow based financing earlier in life predicts future performance
2. **Tractable Theory:** selection on forward-looking value unique to future cash-flow lending
3. **Structural Model:** forward-looking debt matters with unpredictable cash-flows: IT/US

(1) Empirics

- New match data from birth for universe of UK corporations on the nature of
  - **firm dynamics** outcomes: employment + revenue, survival + age
  - **debt financing** based on collateralized assets vs cash flows (predominant for young firms)

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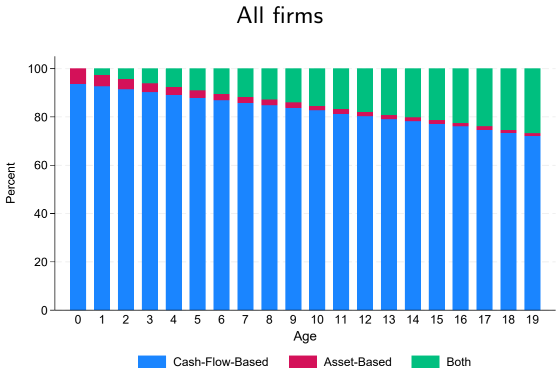
MAIN RESULT

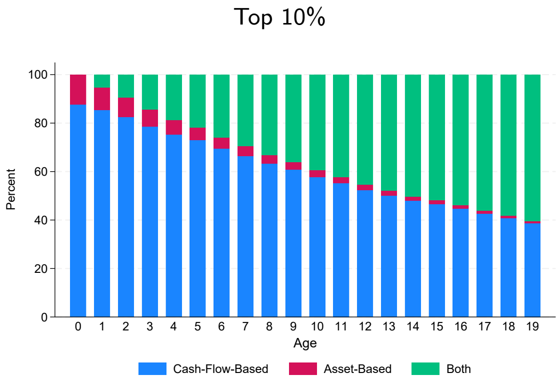
- **Age** when firms **first access** cash-flow based financing predicts long-run outcomes
  - Not for collateral/asset-based financing

Data

- Novel match of UK census 2002-24 for corporation universe and financial data from birth
    - Firm dynamics (similar to US LBD but also with revenue and including non-employer firms)
    - Annual balance sheets
    - National Loan register (similar to UCC filings but directly linked)
    - Full director and shareholder history (can track across firms)
- Measure entry & firm age in the same was as US LBD
    - 3.6 million entrants
    - 94% of firms have balance sheet data from birth
    - A quarter of firms have long-term debt from birth
        - birth is defined as in LBD; financing data availble after incorporation
- Measure the nature of long-term debt as:
    - Asset based : lending against corporate assets
    - Cash-flow based: lending NOT tied to corporate assets

Prevalence of Cash-Flow-Based Long-Term Debt

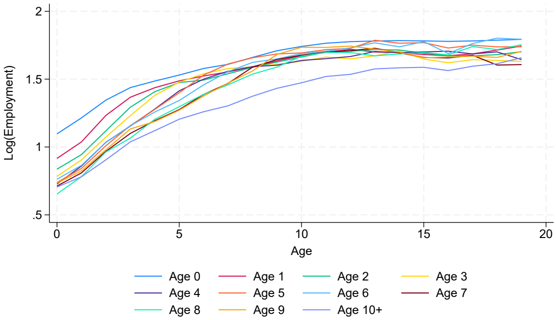




- We know debt is important source of financing for young firms: Robb & Robinson (2014)
- We know cash-flow based debt is big deal for mature firms: Lian & Ma (2021)
- <u>New fact:</u> **Long-term debt of young firms is overwhelmingly cash-flow based**

Timing of Initial Long-Term Debt and Future Firm Performance

Asset-Based = Eventually Equal ("Hopenhayn")



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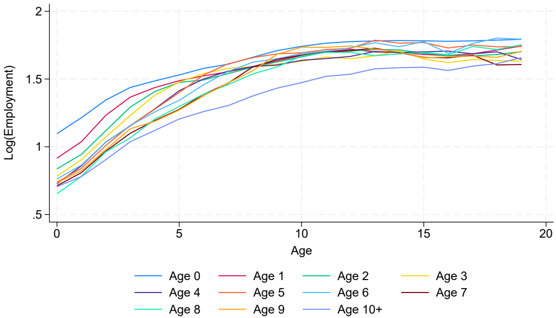
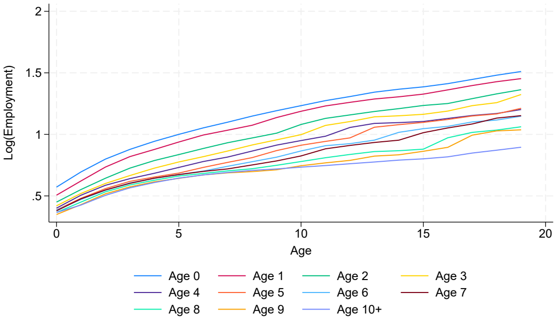


Cash-Flow Based = Stay Unequal ("Melitz")



- Age of initial Cash-Flow Based long-term debt predicts heterogeneous firm outcomes
  - Age of initial Asset-Based long-term debt does not (appearing "ex-ante homogenous")
- Regression prediction performance age 10/19 on age of each financing type confirms this

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  - asset-based lends against current z: similar to short-term cash-flows: $b' \leq \chi_\pi \pi(z)$
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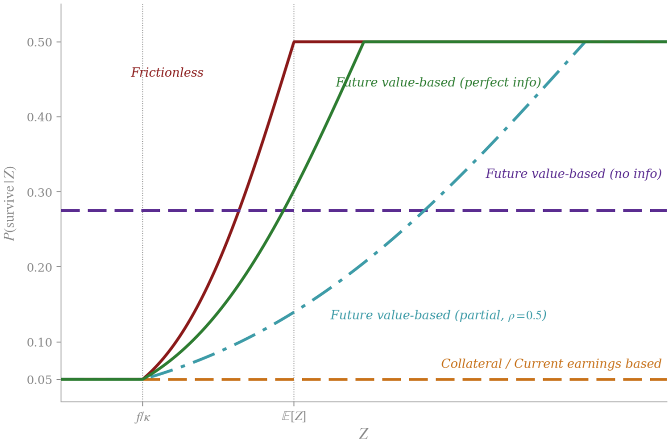
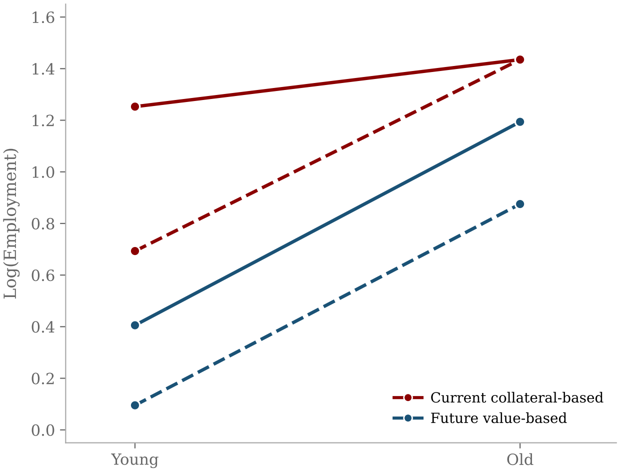
- **Selection on long-run potential** matters for cash-flow based financing & survival
  - asset-based $Pr(\text{Survival}) = Pr\left[z \geq \frac{f}{\kappa}\right]$ is independent of Z
  - cash-flow-based $Pr(\text{Survival}(Z))$ depends on Z

Cash-flow Finance $\Longrightarrow$ Selection into Survival based on long-run type Z



$$Pr(\text{Survive}(Z)) = Pr\left[\quad z \quad \geq \quad \frac{f}{\kappa} - \frac{1}{(1+r)}\frac{1-\rho}{1+1/\chi_v}\max\left\{Z - \frac{f}{\kappa}, 0\right\}\right]$$

Cash-Flow Based Financing Selection on Long-Run Types $\Longrightarrow$ Main Fact



- Myopic nature of asset-based financing masks ex-ante differences across firms
- Forward-looking nature of cash-flow based financing reveals ex-ante permanent types

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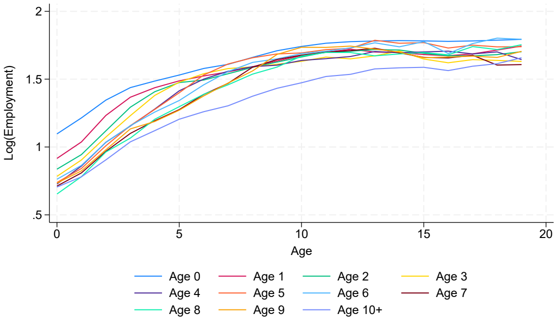

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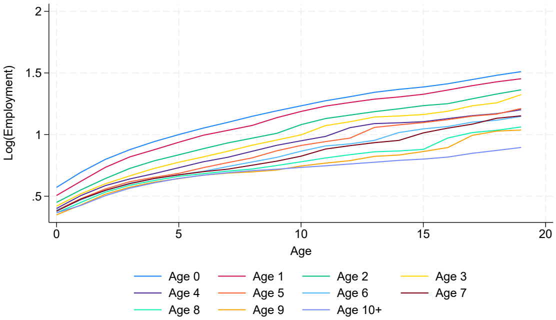
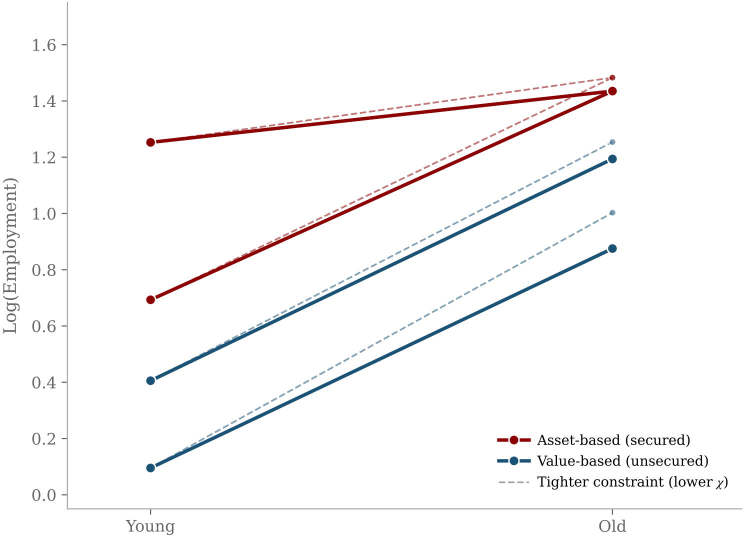


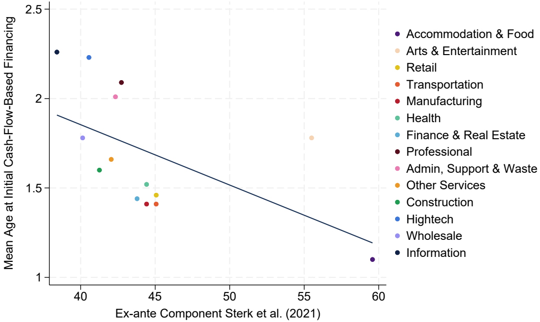
- Hopenhayn (1992) vs Melitz (2003) emerge from the same underlying process, but where different selection from nature of financing leads to different ex post distribution of firms
- In this important sense **the nature of firm financing and firm growth are intertwined**

Test: Tougher lending against future value $\implies \uparrow$ long-run selection

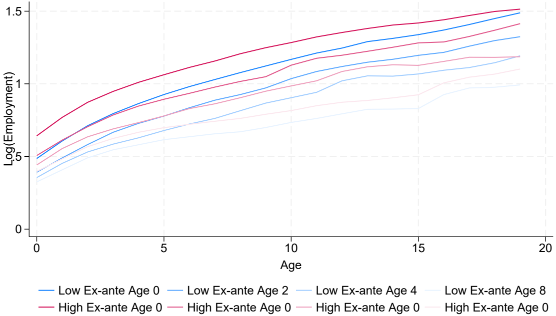


Data: Tougher to lend against future value $\Longrightarrow$ more long-run selection

Less predictable $\Longrightarrow$ Tougher selection



Tougher selection $\Longrightarrow$ Better long-run type financed



- Less predictable sectors (“predictability” = Ex-ante Component of Sterk et al (2021))
- $\rightarrow$ tougher to get financing early $\rightarrow$ older age of first cash-flow based financing
- $\rightarrow$ those financed are better selected on long-run types (end up growing larger)

We do a lot more in the paper

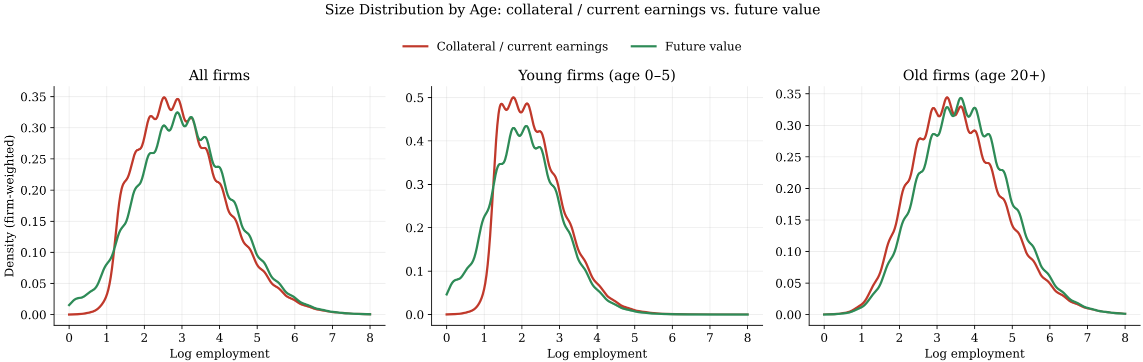
When harder to evaluate companies when the future potential is very unpredictable $\implies$ less firms get financed, but the few that get financed are **better selected in the long-run**

1. Data:
   - **Serial entrepreneurs** that stay in or switch their sector $\rightarrow$ conditional on cash-flow-based finance at same age, switchers (more difficult to predict) start smaller but outperform
   - **Intangible** vs tangible... not pledgeability of assets, but lower predictability of cash-flows
2. Theory:
   - **Endogenize probability of debt access** via lender screening: $\Pr(s \geq \tilde{v}) = 1 - \Phi\left(x - \frac{1}{\sigma_v} v_v(Z)\right)$ where lenders lend if noisy proxy for firm value
   - Selection from having to clear lending hurdle: $s \sim v_v(Z) + \sigma_v N(0,1) > \tilde{v}$

(3) Structural Model

- Calibrate and simulate full life cycle model with ex-ante heterogeneity & financial frictions
- US willingness to lend against unpredictable future value rather than current state gets:
  - more superstar firms than Europe in IT – least predictable sector ($z <<<< Z$)
  - more inequality: (top) high-Z older firms + (bottom) forgiving against low-z younger firms
- Point light to **predictability of future cash flows** rather than **pledgeability of collateral**
  - Nature of firm financing fundamental for the distribution of firms that survives and grow
  - Availability of forward-looking financing is fundamental for superstars to survive when young

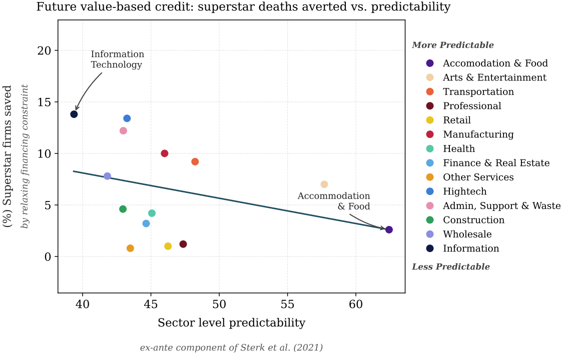
Lending on current vs. future cash: different firm dynamics implications



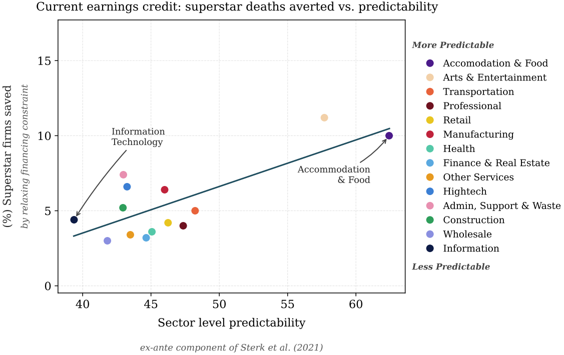
- Financing based on (a) future value rather than (b) current earnings increases dispersion
- (a) let's **large future superstars** that **under-perform when young** survive: ↑ TFP, Entry
- (b) conservative financing makes firms appear more equal even if structurally they are not

Model: Biggest difference is in the least predictable sectros like IT

Future value based financing favors IT superstars



Current earnings based financing favors Food & Ac



- Value-based financing favors less predictable businesses (IT), opposite for current earnings
- Idea can be extended to US VCs more willing to take bets on unpredictable low-z high-Z

Conclusion: The Nature of Firm Financing & Growth

New data to study **young firm cash-flow debt finance with permanent heterogeneity**

- Cash-flow-based long-term debt is quantitatively important
  - **Especially** for start-ups: long-term debt of young firms is overwhelmingly cash-flow-based
- Cash-flow-based long-term debt is forward-looking in nature
  - **Age of 1st cash-flow-based debt predicts long-run outcomes**, but not for asset-based
- Cash-flow-based long-term debt ties together nature of firm growth and financing
  - Standard lending against current states implicitly shut down **selection based on firm value**
- Nature of financing firms can access fundamentally liked to aggregate firm dynamics
  - Especially important for young firms where a lot of **heterogeneity backloaded in the future**