Evergreening

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Motivation

Evergreening:

- Idea that banks revive a loan close to default by granting further credit to the same firm
- Potentially contributes to keeping less-productive firms alive & depressing aggregate TFP
- "Zombie"-lending is typically associated with low-capitalized banks during depressions

Research Questions:

1. Is evergreening a general feature of financial intermediation?
2. Can we find empirical evidence even for the U.S. over the recent past?
3. What are the macroeconomic consequences of evergreening?

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This Paper

1. **Static Model**
   - Small deviation from benchmark model: “relationship banking”
   - Better terms to firms with $+$ legacy debt, $-$ productivity
   - Intuition: banks take into account legacy debt and steer firm default
2. **Empirics**
   - Exploit cross-sectional variation in bank exposure to distressed firms
   - $+$ lending & $-$ interest rates to distressed firms if bank owns a larger debt share
   - Effects at the firm level: $+$ borrowing, $+$ investment, consistent with theory
3. **Dynamic Model**
   - Embed static model mechanism into dynamic heterogeneous-firm model
   - Economy features relatively larger firms, more debt, lower spreads, lower TFP

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Literature

- **Empirical Evidence on Zombie Lending & Evergreening**
  - Japan: Peek & Rosengren (2005); Caballero, Hoshi & Kashyap (2008)
  - Eurozone: Schivardi, Sette & Tabellini (2020); Blattner, Farinha & Rebelo (2020); Acharya, Eisert, Eufinger & Hirsch (2019); Acharya, Crosignani, Eisert & Eufinger (2020); Bonfim, Cerqueiro, Degryse & Ongena (2022).
  - Cross-country: McGowan, Andrews & Millot (2018), Banerjee & Hofmann (2018)

  Here: Exploit risk assessments to document lending distortions among U.S. banks.

- **Models of Zombie Lending & Evergreening**
  - Static: Rajan (1994); Puri (1999); Bruche & Llobet (2014); Acharya, Lenzu, Wang (2021)
  - Dynamic: Hu & Varas (2021); Tracey (2021)

  Here: Evergreening to avoid firm default; dynamic model to study aggregate implications.

Static Model

Firm Problem

Firm Problem Solution

2 periods

- Firm has pre-existing liability b and productivity z
- Borrows new debt Qb' to invest k' today, produces tomorrow (+NPV)
- Defaults on b at the start iff $V(z, b; Q) < 0$; Q offered before default decision
- No default in the 2nd period, new lending risk-free

$$V(z, b; Q) = \max_{b', k'} Qb' - b - k' + \beta^f [z(k')^\alpha - b']$$

$$\text{s.t. } b' \leq \theta k'$$

- **Result**: there exists a $Q^{min}(z, b)$ such that firm defaults if $Q < Q^{min}$
- **Result**: investment k' satisfies: $MPK = \frac{1+\theta\beta^f}{\beta^f} - \frac{\theta}{\beta^f} Q$

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Economy I: Competitive Lenders

- Continuum of deep-pocketed, risk-neutral, competitive lenders with $\beta^k > \beta^f$
- Equilibrium contract of competitive lenders satisfies

$$Q = \begin{cases} \beta^k & \text{if } \beta^k \geq Q^{\min}(z, b) \\ 0 & \text{otherwise} \end{cases}$$

- Equilibrium allocation (b^c, k^c, V^c) satisfies

$$MPK = \frac{1 + \theta\beta^f}{\beta^f} - \frac{\theta}{\beta^f}\beta^k, \forall z, b$$

- MPK equalized across all non-defaulting firms $\Rightarrow$ no misallocation

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Economy II: Relationship Banking

Bank Problem Solution

- Two key differences:
  1. **Stackelberg timing**: lender moves first & internalizes effect of Q on (b', k', V)
  2. **Relationship lending**: lender owns pre-existing liability b, lost in default
- Bank problem:

$$W = \max_{Q \geq \beta^k} \mathbb{I}[V(z, b, Q) \geq 0] \times \left[b - Qb'(z, Q) + \beta^k b'(z, Q)\right]$$

- $Q \uparrow$ implies trade-off:
  - \+ Reduce firm's likelihood of default, increase chance of recovering b
  - \- Less surplus extracted from new contract $b'(\beta^k - Q)$
- Firm has outside option of competitive bond market, $Q \geq \beta^k$
- **Result**: there exists a $Q^{\max}(z, b)$ such that the bank liquidates the firm if $Q > Q^{\max}(z, b)$

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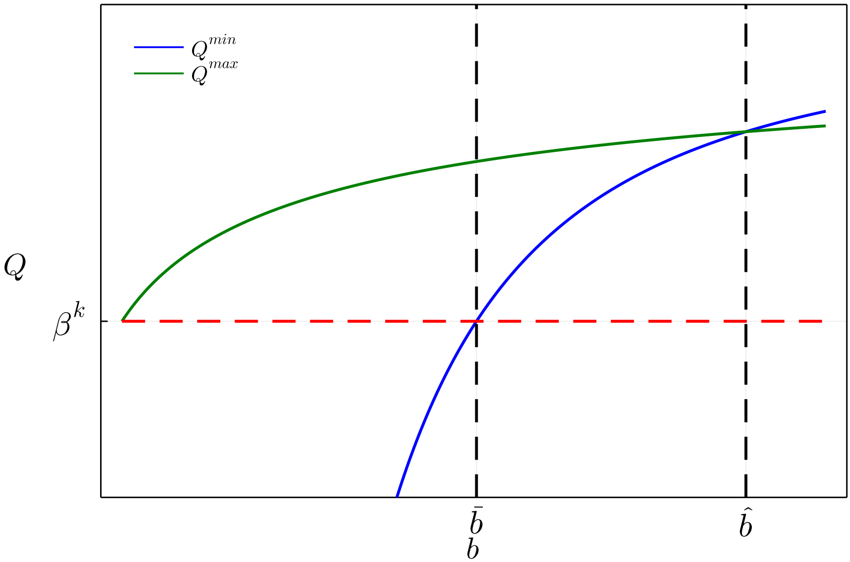

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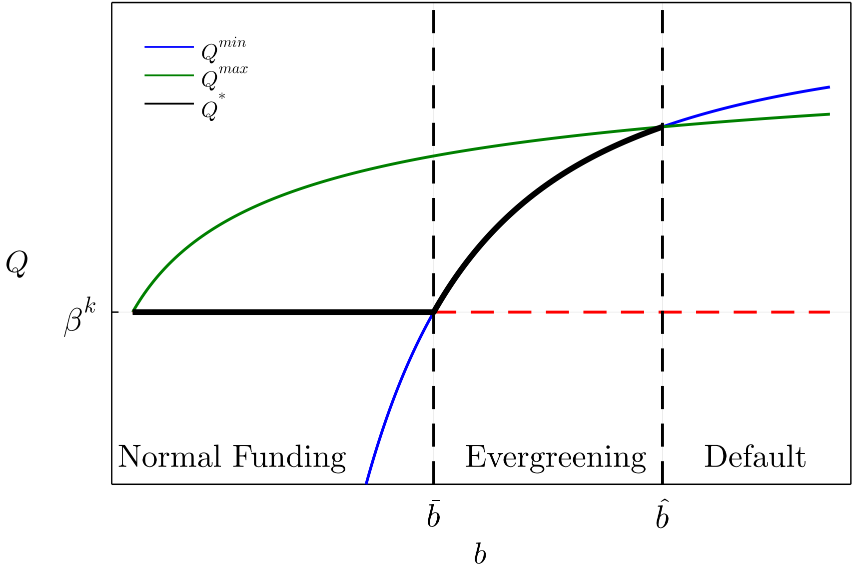

Analytical Results

- In ”evergreening region”:
  1. Q increasing in b
  2. Q decreasing in z
- “Worse” fundamentals (low z, high b) $\Rightarrow$ higher Q
- Same pattern for k', b'
- Firm liquidated if high enough b / low enough z

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Summary

- ***The static model illustrates:***
  - Incentives to save firms with worse fundamentals
  - Prevent inefficient liquidation & recover legacy debt

Empirical Evidence ?

- ***What's missing?***
  - Endogenous distribution of firm borrowing and capital
  - Firm entry & exit + aggregation across firms
  - Repeated dynamic decision & moral hazard

Dynamic macro-model needed !

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Empirical Strategy

Data

- **Data Set:**
  - Corporate loans of Y-14Q data, covers large BHCs, sample: 2014:Q4 - 2019:Q4
  - Loan-level panel with quarterly updates on universe of loan facilities $>$\$1M
  - Detailed information about features of credit arrangement
  - Banks' *risk assessments* about each individual loan or firm
- **Observed Risk Measures:**
  - One-year probability of default (PD), loss given default, ...
  - We use firms' PDs $\rightarrow$ sufficient statistic to measure firm distress (z, b)
  - PD is borrower-specific $\rightarrow$ comparable across banks

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Identifying Credit Supply Effects

- Do relationship lenders extend more credit to firms in distress ?
  - Need to account for potential links between bank-firm selection and firm demand
- Following Khwaja and Mian (2008), estimate regression for firm f and bank b:

$$\frac{L_{f,b,t+2} - L_{f,b,t}}{0.5 \cdot (L_{f,b,t+2} + L_{f,b,t})} = \alpha_{f,t} + \beta_1 \text{Debt-Share}_{f,b,t} + \beta_2 \text{Debt-Share}_{f,b,t} \times \text{Distress}_{f,t} + \gamma X_{b,t} + u_{f,b,t}$$

- Debt-share is $L_{f,b,t}/Debt_{f,t}$; Distress equals one if $\overline{PD}_{f,t} \geq \kappa_{90} = 3.89\%$
- Consider interest rate responses to address identification concerns
- Sample restricted to term loans only & pre-COVID period (”normal times”)

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Debt Share & Firm Distress

▸ Distress Cutoffs ▸ Interactions Terms ▸ Zombie Comparison

- Banks with a larger debt-share extend relatively more credit to firms in distress

	Δ Credit			Δ Interest Rate		
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Debt-Share	-10.59*	-5.75	-10.57	0.18***	0.12*	0.13**
	(6.02)	(5.65)	(6.40)	(0.05)	(0.06)	(0.06)
Debt-Share × Distress	31.58***	22.52**	36.08***	-0.90***	-0.68**	-0.71**
	(7.14)	(8.97)	(12.05)	(0.33)	(0.31)	(0.32)
Fixed Effects						
Firm × Time	✓		✓	✓		✓
Firm × Time × Pur.		✓			✓	
Bank × Time			✓			✓
Bank Controls	✓	✓		✓	✓	
R-squared	0.51	0.52	0.56	0.75	0.74	0.79
Observations	7,980	5,282	7,915	7,849	5,184	7,777
Number of Firms	847	602	844	837	588	834
Number of Banks	36	34	34	36	34	34

Bank controls: ROA, dep/assets, income gap, ln(assets), unused credit/assets, Tier 1 cap. buffer, liab./assets, loans/assets. Standard errors clustered by bank and firm. Distress: $\kappa = 3.89\%$. Sample: 2014:Q4-2019:Q4.

Debt Share & Firm Distress

▸ Distress Cutoffs ▸ Interactions Terms ▸ Zombie Comparison

- ... at lower interest rates (speaking against concerns about credit demand shifts)

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Effects at the Firm-Level

- Do these effects persist at the firm-level, affecting total debt and investment?
  - Aggregation: weight regressors by debt shares across banks for some firm f
- Estimate regression for firm f at annual frequency:

$$\frac{y_{f,t+4} - y_{f,t}}{0.5 \cdot (y_{f,t+4} + y_{f,t})} = \alpha_f + \tau_{m,k,t} + \beta_1 HHI_{f,t} + \beta_2 HHI_{f,t} \cdot Distress_{f,t} + \beta_3 Distress_{f,t} + \gamma X_{f,t} + u_{f,t}$$

- Firm outcomes: y is either total debt or tangible assets (”investment”)
- $HHI_{f,t} = \sum_b (L_{f,b,t}/Debt_{f,t})^2$ is the Herfindahl-Hirschmann-Index for debt concentration
- $Distress_{f,t}$ measures firm distress and is defined as above: $\overline{PD}_{f,t} >= 3.89\%$
- Fixed effects: firm-FE α_f and industry-state-time-FE $\tau_{m,k,t}$

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Effects at the Firm-Level

- Debt & investment declines for distressed firms, but less so if their debt is concentrated

	Δ Total Debt		Investment	
	(i)	(ii)	(iii)	(iv)
HHI	28.29***	27.64***	10.17***	10.25***
	(8.59)	(8.57)	(3.82)	(3.85)
HHI × Distress	11.61**	16.38***	7.08**	6.63*
	(5.27)	(6.22)	(3.45)	(3.81)
Distress	-4.43***	-6.61***	-2.75***	-2.42***
	(1.34)	(1.70)	(0.70)	(0.83)
Fixed Effects				
Firm	✓	✓	✓	✓
Time × Industry × State	✓	✓	✓	✓
Firm Controls × Distress		✓		✓
Firm Controls	✓	✓	✓	✓
R-squared	0.56	0.56	0.58	0.58
Observations	62,785	62,785	74,260	74,260
Number of Firms	14,887	14,887	17,611	17,611
Number of Banks	37	37	37	37

Firm controls: cash, net income, tangible assets, liabilities, debt (all relative to assets), ln(assets), observed credit/debt. Standard errors clustered by main-bank and firm. Sample: 2014:Q4-2019:Q4.

Dynamic Model

Dynamic Model

▸ Timing & Firm Problem ▸ Equilibrium Definition

- Based on Hopenhayn (1992), Hennessy & Whited (2005), Gomes & Schmid (2010)
- Time discrete and infinite $t = 0, 1, \ldots, \infty$
- Endogenous entry and exit of firms
- Constant labor supply, wage determined by firms' free entry
- Elastic supply of capital, depreciates at rate δ
- Firm problem: static version + equity issuance cost & default shocks
- Firms heterogeneous in productivity which follows AR(1) in logs

Competitive and Relationship Lending

▸ Calibration ▸ Model Fit

- $\mathcal{P}(s;Q)$ is probability of repayment and $s = (z, b, k)$
- **Competitive Lending**: Free-entry for lenders $\Rightarrow$ zero-profit condition, implying

$$Q^{comp}(s)b' = \beta^k \mathbb{E}_{z'}[\mathcal{P}(s')b' + (1-\mathcal{P}(s'))\psi(s')]$$

- **Relationship Lending**: Lender can choose Q, subject to participation constraint

$$\max_Q W(s;Q) = \mathcal{P}(s;Q)\left[b - Qb'(s;Q) + \beta^k \mathbb{E}_{z'}[W(s')|z]\right] + (1-\mathcal{P}(s;Q))\psi(s)$$

$$\text{s.t.} \quad Q \geq Q^{new}(s)$$

where

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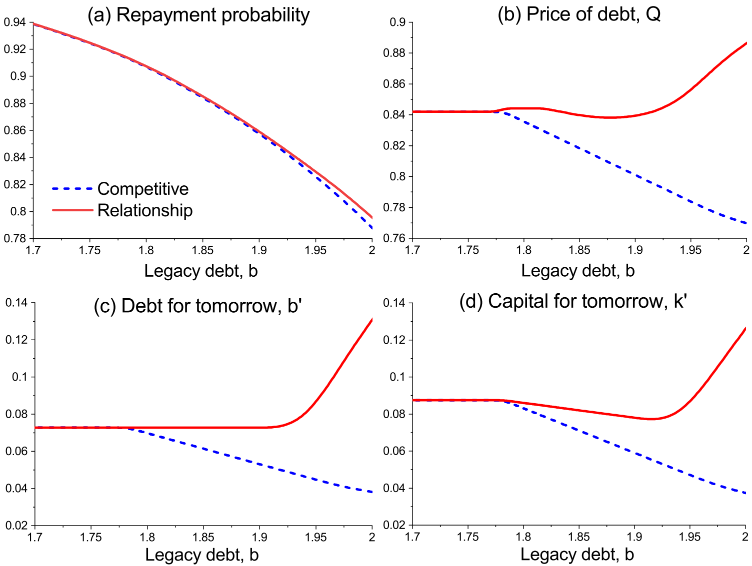
Dynamic Model: Policy Functions

▸ Calibration ▸ Model Fit ▸ Equilibrium Definition



Impact of Introducing Relationship Lending

▸ Full Table

	Δ %
Firm level (Averages)	
Market Leverage	0.60
Interest rate	-1.24
Size	2.34
Productivity	-0.04
Exit rate	-0.70
Aggregates	
Debt	3.13
Capital	3.13
Measured TFP	-0.31

Relationship economy features: (i) less exit, (ii) more debt, (iii) lower interest rates, (iv) lower TFP

TFP Decomposition

$$Y = \underbrace{\left(\frac{1}{S}\right)^{1-\alpha-\eta}}_{\text{avg. firm size}} \times \overbrace{\mathbb{E}[z^{\frac{1}{1-\alpha-\nu}}]^{1-\alpha-\eta}}^{\text{selection}} \times \underbrace{\frac{Y}{Y*}}_{\text{static misallocation}} \times \overbrace{K^{\alpha} N^{1-\alpha}}^{\text{factor qtys.}}$$

Ratio	% Δ
Output	2.12%
Factors	2.43%
Capital	0.99%
Labor	1.45%
MTFP	-0.31
Size	-0.27
Selection	-0.01
Static Misallocation	-0.03

MTFP losses arise primarily from increased firm size.

How are subsidized firms different ?

▸ Full Table ▸ Subsidized vs. Zombie Firms

	Non-subsidized	Subsidized	Δ %
Capital	0.75	1.72	128.5
Productivity	1.02	0.94	-8.0
Output	0.41	0.60	46.1
Market leverage	0.53	0.80	50.6
Probability of survival	0.96	0.89	-7.6
Interest rate	7.75	10.02	29.2

- Subsidized firms are (i) larger, (ii) more indebted, (iii) less productive
- But: they pay higher interest rates, on average!

Conclusion

- **Small modifications to standard model generate incentives to evergreen**
  - Offer better terms to firms with $+$ pre-existing borrowings and $-$ productivity
  - Induces firms to borrow and invest more, may generate misallocation
- **Document evergreening behavior by large U.S. banks**
  - Compare credit conditions across banks that own different shares of firm debt
  - Banks with larger shares offer rel. more credit at lower rates to distressed firms
- **Embed mechanism into dynamic model of industry equilibrium**
  - Equilibrium: less productivity, larger firms, more debt, lower rates
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Appendix

Static Model: Solution to the Firm Problem ▸ Back

- Optimal borrowing b':

$$b' = \begin{cases} 0 & \text{if } Q < \beta^f \\ [0, \theta k'] & \text{if } Q = \beta^f \\ \theta k' & \text{if } Q > \beta^f \end{cases}$$

- Optimal investment k:

$$\alpha z (k')^{\alpha - 1} = \frac{1 - \theta(Q - \beta^f)}{\beta^f} (= MPK)$$

- Given interest rate Q, solution to the firm's problem characterized by set of functions

$$b'(z, Q), k'(z, Q), V(z, Q, b)$$

  - b', k', V increasing in z, Q
  - V decreasing in b

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Bank Problem: Solution ▸ Back

- Let $Q^{\max}(z, b)$ denote maximum Q for which bank lends; $W(z, b; Q^{\max}) = 0$
- Bank's optimal policy is then given by

$$Q = \begin{cases} \beta^k & \text{if } Q^{\min}(z,b) < \beta^k < Q^{\max}(z,b) \\ Q^{\min}(z,b) & \text{if } \beta^k < Q^{\min}(z,b) < Q^{\max}(z,b) \\ 0 & \text{otherwise} \end{cases}$$

- Properties: (i) $Q^{\max} > \beta^k$ iff $b > 0$; (ii) $\frac{\partial Q^{\max}}{\partial b} > 0$; (iii) $\frac{\partial Q^{\max}}{\partial z} < 0$

Robustness: Distress Cutoffs

Back

		Δ Credit			Δ Interest Rate	
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Debt-Share	-10.15*	-10.47*	-10.03	0.19***	0.17***	0.18***
	(5.95)	(6.02)	(5.95)	(0.06)	(0.05)	(0.05)
Debt-Share × Distress	27.62**	31.51***	26.87**	-1.29*	-0.81**	-1.05*
	(11.93)	(7.62)	(13.08)	(0.66)	(0.31)	(0.55)
Distress Cutoffs						
$\overline{p} \geq \kappa_{95}$	✓			✓		
$\kappa_{99} > \overline{p} \geq \kappa_{90}$		✓			✓	
$\kappa_{99} > \overline{p} \geq \kappa_{95}$			✓			✓
Firm × Time FE	✓	✓	✓	✓	✓	✓
Bank Controls	✓	✓	✓	✓	✓	✓
R-squared	0.51	0.51	0.51	0.75	0.75	0.75
Observations	7,756	7,980	7,756	7,628	7,849	7,628
Number of Firms	837	847	837	828	837	828
Number of Banks	36	36	36	36	36	36

Bank controls: ROA, dep/assets, income gap, ln(assets), unused credit/assets, Tier 1 cap. buffer, liab./assets, loans/assets. Distress cutoffs: $\kappa_{90} = 3.89\%$, $\kappa_{95} = 7.75\%$, $\kappa_{99} = 35.42\%$. Standard errors clustered by bank and firm. Sample: 2014:Q4-2019:Q4.

Robustness: Interaction Terms

▸ Back

	Δ Credit			Δ Interest Rate		
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
Debt-Share	-10.84*	-6.58	-5.45	0.17***	0.21**	0.22*
	(6.01)	(6.10)	(14.08)	(0.05)	(0.09)	(0.12)
Debt-Share × Distress	26.69***	26.50***	34.02***	-0.65*	-0.87***	-0.66**
	(9.24)	(7.08)	(8.50)	(0.34)	(0.29)	(0.29)
Interaction Terms						
Bank Controls × Distress	✓			✓		
Debt-Share × Bank Controls		✓			✓	
Debt-Share × Firm Controls			✓			✓
Firm Controls			✓			✓
Bank Controls	✓	✓	✓	✓	✓	✓
Firm × Time FE	✓	✓	✓	✓	✓	✓
R-squared	0.51	0.51	0.51	0.75	0.75	0.77
Observations	7,980	7,980	7,400	7,849	7,849	7,279
Number of Firms	847	847	797	837	837	787
Number of Banks	36	36	36	36	36	36

Bank controls: ROA, dep/assets, income gap, ln(assets), unused credit/assets, Tier 1 cap. buffer, liab./assets, loans/assets. Firm controls: cash/assets, ROA, tangible assets/assets, ln(assets), liab./assets. Standard errors clustered by bank and firm. Sample: 2014:Q4-2019:Q4.

Zombie Measures & Firm Distress

Back

Zombie Measure	Obs.	Corr. Distress	Indicator	PD Distribution P10	P50	P75	P90	P95	P99
FMP	79,119	0.20	1	.23	1.85	8.07	22.94	61.35	100
			0	.16	.67	1.53	3.7	6.65	23.54
SST	200,156	0.22	1	.31	1.62	3.98	10.22	19.88	100
			0	.17	.73	1.6	3.5	5.9	20
CHK	189,388	-0.04	1	.15	.66	1.56	3.73	6.57	25.16
			0	.18	.97	2.08	5.07	10.01	35.42
Model	245,341	0.14	1	.43	2.8	7.16	19.73	30	100
			0	.17	.76	1.77	3.73	6.92	22.7
PD Baseline				.17	.82	1.91	3.89	7.75	35.24

FMP=Favara, Minoiu, Perez-Orive (2022), SST=Schivardi, Sette, Tabellini (2022), CHK=Caballero, Hoshi, Kashyap (2008), Model=leverage$>$p90, ROA$<$p10.

Dynamic Model: Timing

Back

Within each period t:

1. Firm productivity z realized
2. Firm draws preference shocks $\varepsilon^P, \varepsilon^D \sim$ extreme value, chooses to default or not
3. Non-defaulting firms invest, produce, repay debt, and borrow
4. Entrants pay cost of entry

- **Competitive Lenders**: contract Q determined at step 3
- **Bank Lenders**: contract Q determined at step 1

Dynamic Model: Firm Problem ▸ Back

- Value given Q and realization for the extreme-value shocks

$$V_0(z, b, k, \varepsilon^P, \varepsilon^D; Q) = \max \left\{ V^P(z, b, k; Q) + \varepsilon^P, 0 + \varepsilon^D \right\}$$

- $\varepsilon^P - \varepsilon^D \equiv \varepsilon$ distributed logistic with scale parameter κ, thus

$$\text{Prob of Repayment} : \mathcal{P}(z, b, k; Q) = \frac{\exp\left[V^P(z, b, k; Q)/\kappa\right]}{1 + \exp\left[V^P(z, b, k; Q)/\kappa\right]}$$

$$\text{Expected Value} : \mathcal{V}(z, b, k; Q) = \mathbb{E}_{\varepsilon^P, \varepsilon^D} V_0(z, b, k, \varepsilon^P, \varepsilon^D; Q) = \kappa \log \left\{ 1 + \exp\left[V^P(z, b, k; Q)/\kappa\right] \right\}$$

- Firm value of repayment:

$$V^P(z, b, k; Q) = \max_{b', k', n} div - \mathbb{I}[div < 0][e_{con} + e_{slo} \times div^2] + \beta^f \mathbb{E}_{z'}[\mathcal{V}(z', b', k')|z]$$

$$\text{s.t. } div = z(k^\alpha n^{1-\alpha})^\eta - wn - k' + (1 - \delta)k + Qb' - b - \phi k$$

$$b' \leq \theta k'$$

Dynamic Model: Solution to the Firm Problem ▸ Back

- FOC for capital:

$$\mathbb{E}_{z'}\left\{\mathcal{P}(z',b',k')\left(\beta^f\frac{1+\mu(div')}{1+\mu(div)}\right)[\pi_k(z',k')-\theta]\right\}=1-\theta Q.$$

- $\pi_k(z',k')$ is the MPK next period
- Relationship between offered Q and the MPK when borrowing constraint binds
- $\uparrow Q$ associated with MPK $\downarrow$
- Constraint binds when

$$Q[1+\mu(div)]-\beta^f\mathbb{E}_{z'}\{\mathcal{P}(z',b',k')[1+\mu(div')]\}>0$$

Dynamic Model: Entrants & Industry Equilibrium

Back

- Large pool of entrants may pay cost κ to enter and start producing next period.
- We assume that each entrant is endowed with κ units of physical capital
- The value that they obtain is given by

$$V^E(w) = \int_{\underline{z}}^{\tilde{z}} \frac{V(z, 0, \kappa; w)}{\tilde{z} - \underline{z}} \mathrm{d}z.$$

Stationary Industry Equilibrium

Back

Given an arbitrary interest rate function Q, a SIE consists of

1. Policy functions $(k, b')(z, b, k)$ and value functions $V(z, b, k)$
2. Equilibrium wage w
3. Mass of entrants m
4. Stationary distribution $\lambda(z, b, k)$

such that:

1. Policies and values solve the firm's problem given (Q, w)
2. Wage is such that the free-entry condition is satisfied
3. Mass of entrants is such that the market for labor clears
4. λ satisfies its law of motion

$$\lambda(z', b', k') = \sum_{z,b,k} \Pr(z'|z)\mathbb{I}[b^p(z, b, k) = b']\mathbb{I}[k^p(z, b, k) = k']\mathcal{P}[V(b, z, k)]\lambda(z, b, k)$$
$$+\mathrm{m} \times \Pi^e_z(z')\mathbb{I}[b' = 0]\mathbb{I}[k' = 0]$$

Calibration

Back

Parameter	Description	Value	Source/Reason
ω	Cost of entry	1.118	Normalize $w = 1$
ρ_z	TFP persistence	0.767	Gourio & Miao (2010)
σ_u	TFP volatility	0.211	Gourio & Miao (2010)
e_{slope}	Equity issuance cost	0.2	Hennessy & Whited (2007)
δ	Depreciation rate	0.10	Standard
α	Production, capital share	0.32	Standard
η	Production, labor share	0.48	Standard
β^k	Lender discount rate	0.97	Standard, real rate of 3%
ψ_1	Recovery value	0.35	Kermani & Ma (2020)
β^f	Borrower discount factor	0.884	Internally calibrated
$\mathbf{c}$	Fixed cost	0.055	Internally calibrated
κ	Logistic distr., scale	0.225	Internally calibrated
$\tilde{z}$	TFP distr. for entrants	1.301	Internally calibrated
$\underline{k}$	Initial capital	0.805	Internally calibrated
θ	Constraint parameter	1.040	Internally calibrated
e_{con}	Cost of issuing equity	0.010	Internally calibrated

Model Fit

Back

Moment	Source	Data	Model
Market leverage (median)	Y-14/Compustat	0.63/0.57	0.59
Debt over fixed assets (median)	Y-14/Compustat	1.09/1.20	1.04
Investment rate (aggregate)	Y-14/Compustat	0.104/0.14	0.14
Interest rate spread (median)	Y-14	3.29%	4.22%
Exit rate	Hopenhayn (2018)	9.0%	8.46%
Size at entry (relative to mean)	Lee & Mukoyama (2015)	0.60	0.58
Size at exit (relative to mean)	Lee & Mukoyama (2015)	0.49	0.37
TFP at entry (relative to mean)	Lee & Mukoyama (2015)	0.75	0.79
TFP at exit (relative to mean)	Lee & Mukoyama (2015)	0.64	0.72

Impact of introducing relationship lending ▸ TFP Decomposition ▸ back

	Δ % with const. entry	Δ % with const. labor
Firm level (Averages)		
Market Leverage	0.60	0.54
Interest rate	-1.24	-1.13
Size	2.34	1.99
Productivity	-0.04	-0.02
Exit rate	-0.70	-0.17
Aggregates		
Debt	3.13	1.04
Capital	3.13	1.04
Labor	2.14	0.00
Output	2.14	0.10
Wage	0.00	0.10
Measured TFP	-0.31	-0.23
Number of firms	0.77	-0.94

Relationship economy features: (i) less exit, (ii) more debt, (iii) lower interest rates, (iv) lower TFP

How are subsidized firms different ? ▸ Back

Subsidized vs. Non-subsidized Firms in the RLE (medians)

	Non-subsidized	Subsidized	Δ %
Capital	0.75	1.72	128.5
Productivity	1.02	0.94	-8.0
Output	0.41	0.60	46.1
Payouts/assets	0.05	-0.01	-114.4
Market leverage	0.53	0.80	50.6
Interest rate	7.75	10.02	29.2
Probability of survival	0.96	0.89	-7.6
Interest-coverage ratio	1.67	0.45	-73.1
Age	7.87	10.17	29.2

- Larger, more indebted, less productive
- Actually Pay higher interest rates, on average! ▸ Subsidized vs. Zombie Firms

Subsidized Firms vs. Zombie Firms

Back

Zombie firm definition from Favara, Minoiu, and Perez-Orive (2022):

- (i) Leverage above median, (ii) ICR below 1, (iii) negative net income

Model: 5.8% vs. 5.7% in the data.