Firm Cyclicality and Financial Frictions

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This paper

1. Empirics, SIZE $\times$ AGE:
   - Different patterns in levels, growth rates and cyclicality both real and financial variables
   - Effects of leverage on growth rate and cyclicality

2. Model with firm heterogeneity and financial frictions
   - Standard borrowing contraint is not able to match the data
   - Financial frictions + heterogeneous returs to scale
   - Effectivness of policies: wage vs credit subsidy

Literature

- Financial frictions as amplification mechanism: Bernanke and Gertler (1989); Gertler and Gilchrist (1994); Bernanke et al. (1999); Crouzet and Mehrotra (2020)
- Cyclicality by size: Gertler and Gilchrist (1994); Khan and Thomas (2013); Gavazza et al. (2018) vs Moscarini and Postel-Vinay (2012); Mian and Sufi (2014)
- Size vs age: Fort et al. (2013); Haltiwanger et al. (2013)
- Modelling framework: Khan and Thomas (2013), Bernanke and Gertler (1989); Kiyotaki and Moore (1997); Bernanke et al. (1999); Jermann and Quadrini (2012)
- Cyclicality of firm financing: Covas and Haan (2011), Jermann and Quadrini (2012); Crouzet (2017); Begenau and Salomao (2018); Nikolov et al. (2018)
- Two closest papers: Crouzet and Mehrotra (2020) and Dinlersoz et al. (2018)

Data

Sources and coverage

- Administrative micro-level datasets, 2001-2018
- Tax information from SKAT + survey by Statistics Denmark
- 90,000 firms per year, 1.25M firm-year observations
- Variables:
  - employment, sales, value added,...
  - debt, assets, equity
- All non-finance sectors
- All firm sizes
- All ages

▸ details ▸ details

Empirical results overview

Goal: recover AGE $\times$ SIZE interaction

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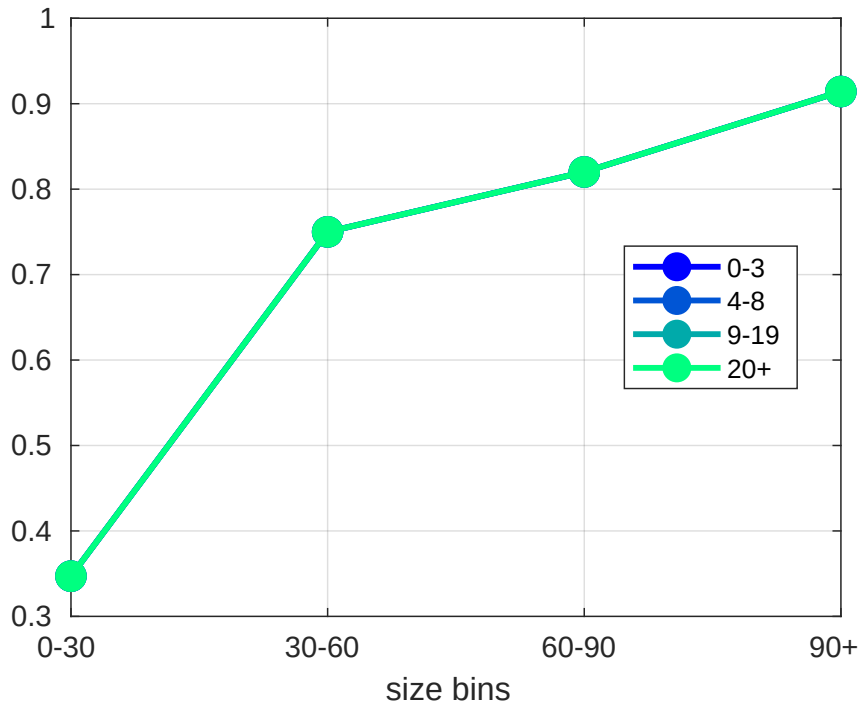
1. Cyclicality of sales, employment, debt and assets

Cyclicality of employment

Only size

$$g_{i,t}^{emp} = \sum_j \left(\alpha_j + \beta_j g_t^Y\right) \mathbb{1}_{i \in I_j} + \sum_l \left(\gamma_l + \delta_l g_t^Y\right) \mathbb{1}_{i \in S_l} + \varepsilon_{i,t}$$

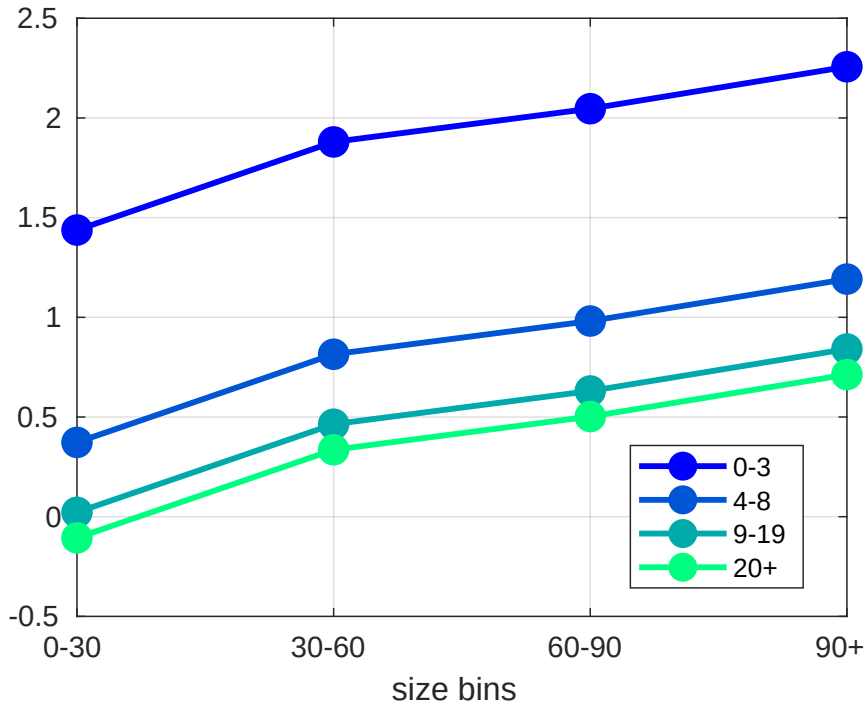


(similar framework to Crouzet and Mehrotra (2020))

Cyclicality of employment

Additive size and age

$$g_{i,t}^{emp} = \sum_j \left(\alpha_j + \beta_j g_t^Y\right) \mathbb{1}_{i \in I_j} + \sum_k \left(\alpha_k + \beta_k g_t^Y\right) \mathbb{1}_{i \in A_k} + \sum_l \left(\gamma_l + \delta_l g_t^Y\right) \mathbb{1}_{i \in S_l} + \varepsilon_{i,t}$$



(similar framework to Dinlersoz et al. (2018))

Cyclicality of employment

$$g_{i,t}^{emp} = \sum_j \sum_k \left(\alpha_{j,k} + \beta_{j,k} g_t^Y\right) \mathbb{1}_{i \in I_j} \mathbb{1}_{i \in A_k} + \sum_l \left(\gamma_l + \delta_l g_t^Y\right) \mathbb{1}_{i \in S_l} + \varepsilon_{i,t}$$

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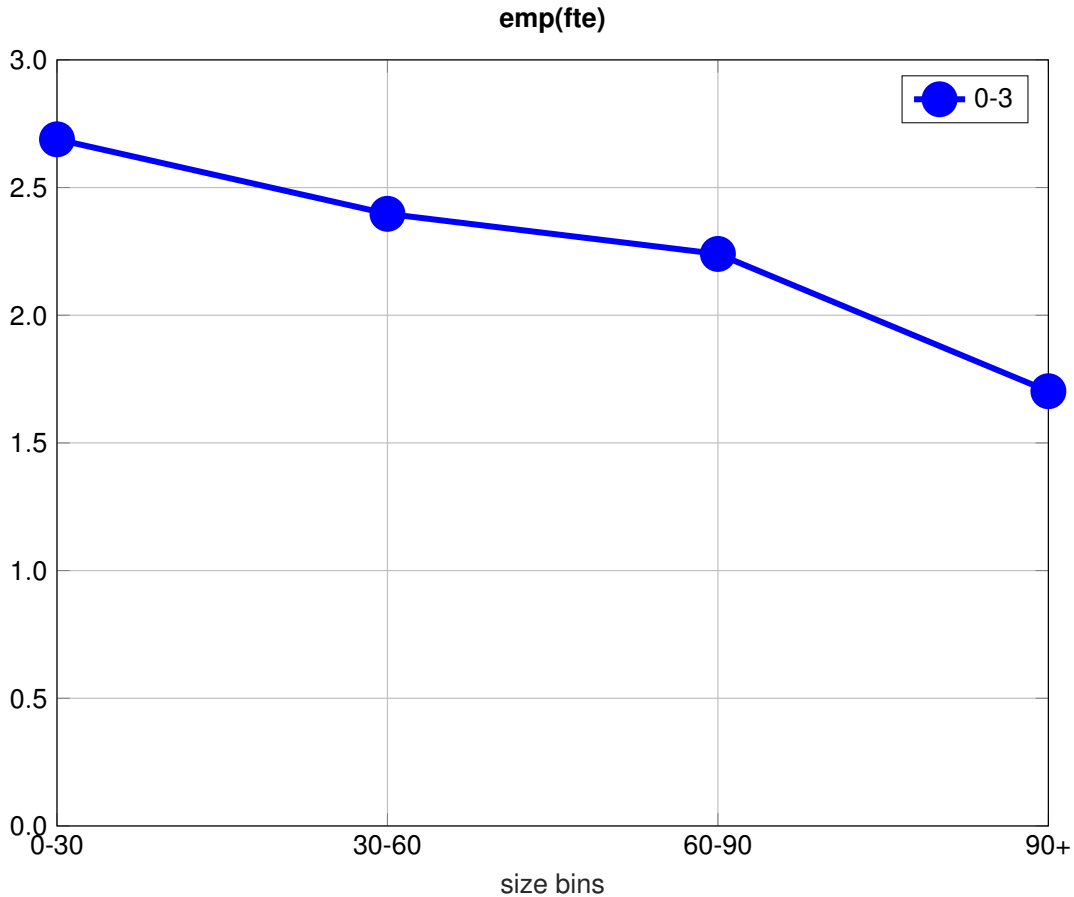
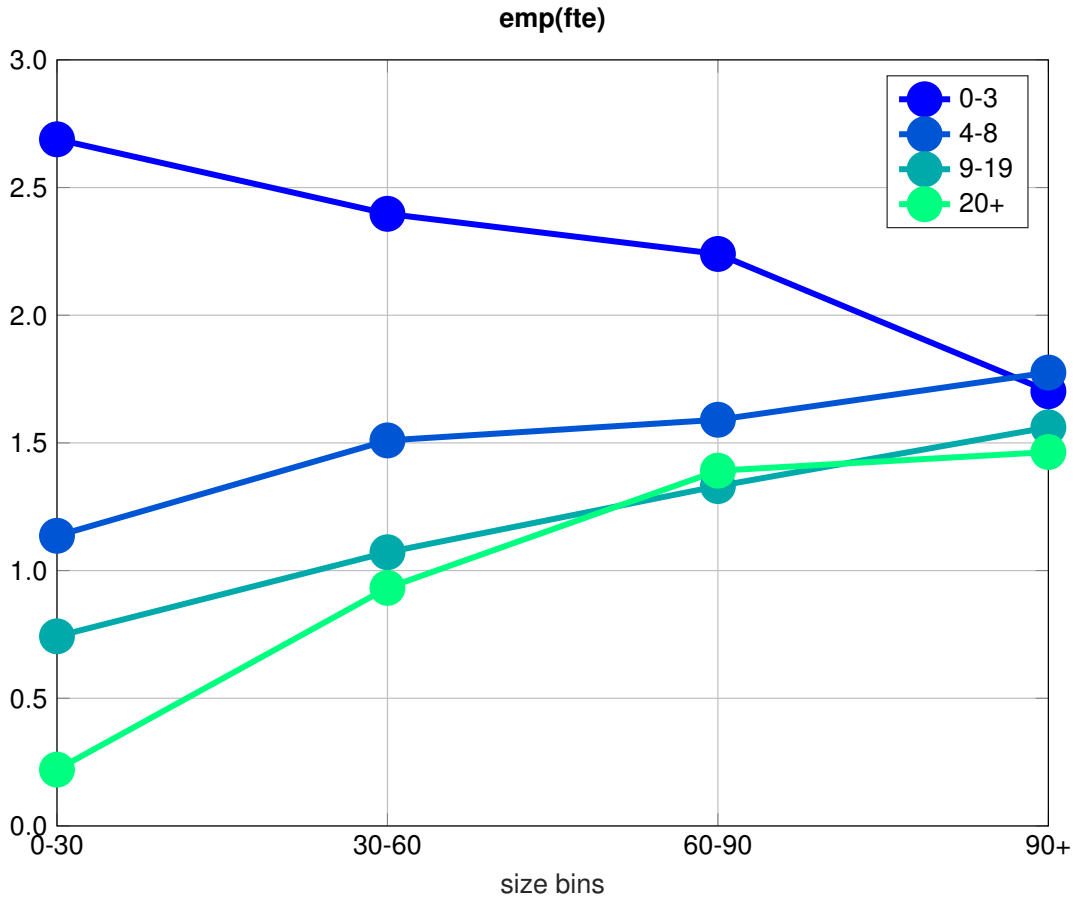


- Entrants: higher over all, falls with size

▸ sales ▸ assets, debt

Cyclicality of employment



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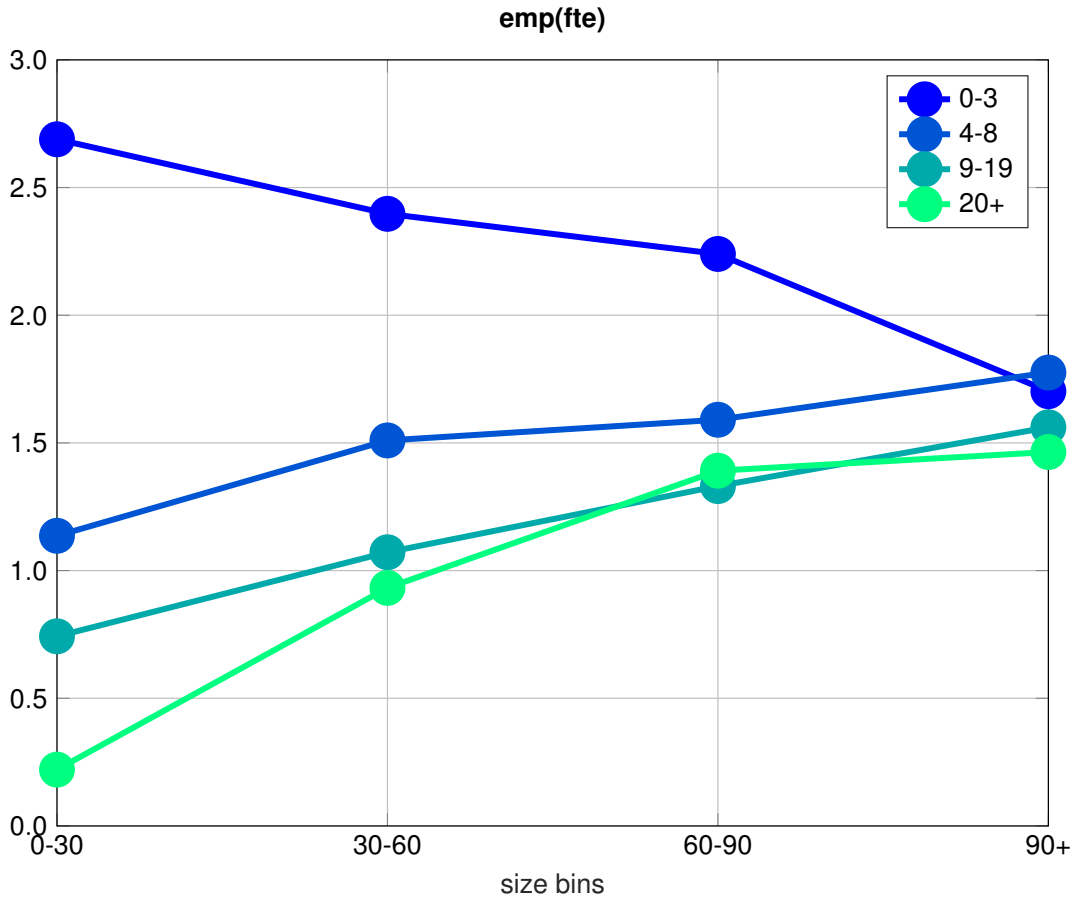
- Everybody else: increases with size

▸ sales ▸ assets, debt

Cyclicality of employment



- Entrants: higher over all, falls with size
- Everybody else: increases with size

$\Rightarrow$ large firms are much more alike than small firms

▸ sales ▸ assets, debt

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2. Document the size x age heterogeneity in the distribution of levels and growth rates of variables of interest
   - unlike capital in models, assets differ by age in each size category
   - *on average*, only very young firms grow (strongly decreasing in size), firms above 10 shrink (weakly increasing in size)

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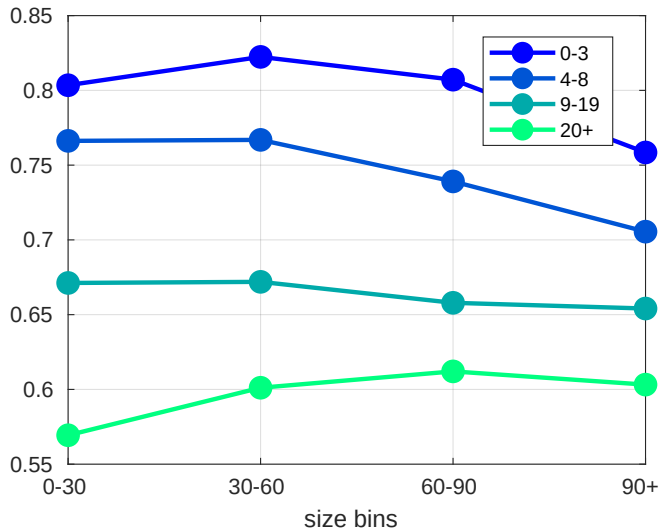
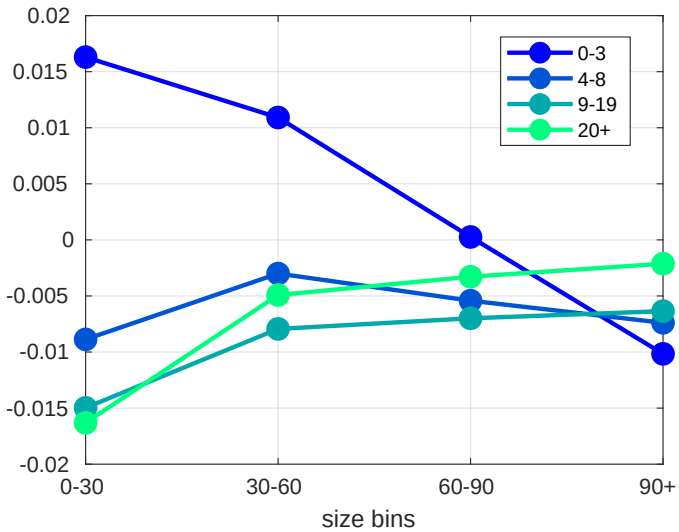
   - Over age, both debt and assets increase

▸ results

Level and growth rate of Leverage





- Debt/Asset ratio is generally falling with age,
- Both debt and assets growing $\Rightarrow$ assets are growing faster than debt
- However, for small AND young DA is increasing
  our interpretation: small AND young cannot borrow as much as they want

back

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     - for most firms, assets grow faster than debt $\Rightarrow$ D/A $\downarrow$
     - for young and small, debt grows faster $\Rightarrow$ D/A $\uparrow$

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3. Effects of leverage on cyclicality
   - not uniform across variables
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Our interpretation: different forces operate along size and age

- cyclical worsening of financing hits young firms particularly hard
- large firms more exposed to aggregate business cycle

Model introduction

Questions:

- What model features are needed match “age $\times$ size” distributions? (levels, growth rates, cyclicality)
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Heterogeous firm model with financial frictions

+ heterogeneity in returns to scale
+ starting net worth, superstar firms, entrant productivity penalty
- exogenous entry and exit
- (almost) no productivity shocks after entry

Model - firm problem

- Production function: $q_i = z_i f(k_I, l_i)^{\eta_i}$
- Aggregate output $Q = \left(\int_0^G q_i^\theta \, \mathrm{d}i \right)^{\frac{1}{\theta}}$

  $\Rightarrow$ i-th firm demand: $q_i = p_i^{-1/(1-\theta)} Q$
- Profit function:

$$\pi = \max \left\{ q^\theta Q^{1-\theta} - wl \right\}$$

- Leontief production function $f(k, l) = \min\left\{k, \frac{l}{\alpha}\right\}$ implies

$$l^*(k) = \alpha k$$
$$\pi(k, s, g) = z^\theta k^{\eta\theta} Q^{1-\theta} - \alpha w k.$$

- Firm borrow at rate r s.t. $b \leq \lambda p_K k$

Model - firm shocks

- Heterogeneous productivity: $z \equiv z(s,q) = z_s^S z_g^G$
  - z^S: firm "quality" $\rightarrow$ contributes to size dispersion
  - z^G: age component $\rightarrow$ penalty for entrants
- Timing of shocks:
  - at entry:
    - z_s^S and η (currently perfectly correlated)
  - every period:
    - age specific exogenous exit
    - transition to superstar state
      - new (much larger) z_i and η_i
      - allowed to issue equity, become unconstrained

Model experiments

1. Simple steady-state focused model does not match the data
   "Steady-state calibration"
   - setting:
     - no heterogeneity in rts
     - entrant productivity penalty
     - uniform initial net worth
   - finding: no combination of MIT shocks to colateral constraint, interest rate and tfp can replicate the cyclicality results from the data

▸ calibration ▸ results

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2. Combination of heterogeneous rts + entry net worth matches the empirical moments well
   "Cyclical calibration"
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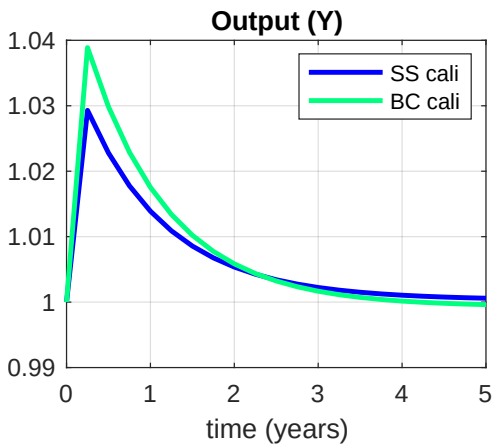
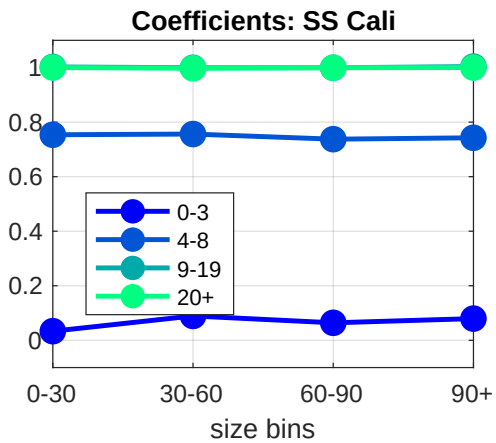
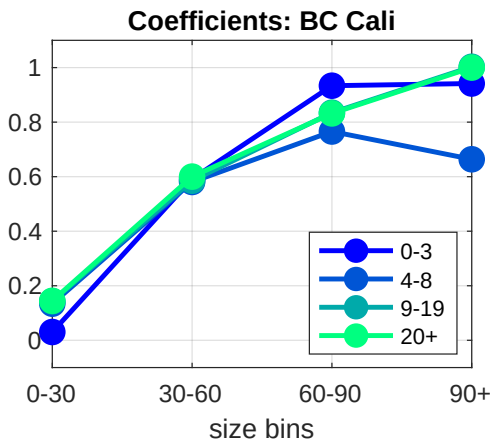
3. Policy experiments:
   - labour subsidy
   - debt relief

Policy experiments - Labor subsidy

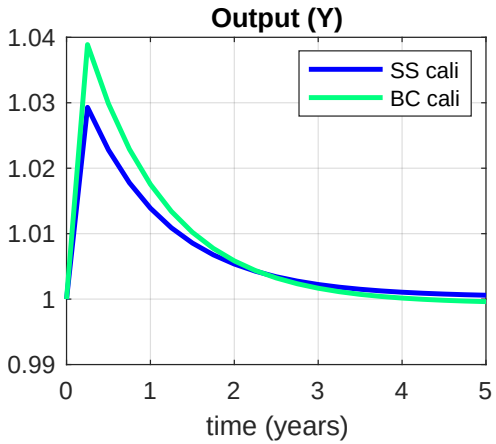


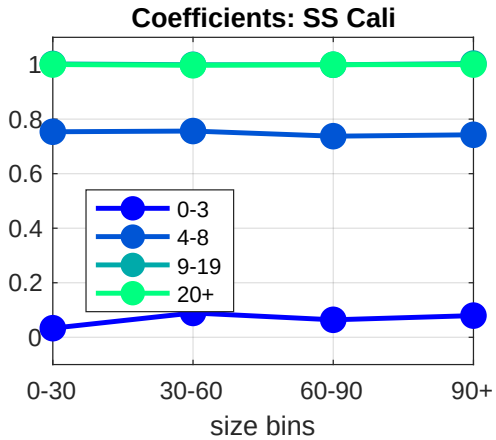


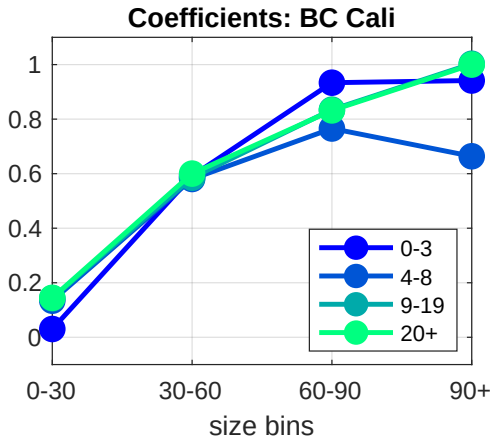


- SS calibration delivers slighly amplified aggregate response

Policy experiments - Labor subsidy







- SS calibration delivers slighly amplified aggregate response
- Who reacts?
  - SS calibration: old firms react more, regardless of size
  - cyclical calibration: large firms react more, regardless of age

  Why? Large entrants less constrained in cyclical calibration

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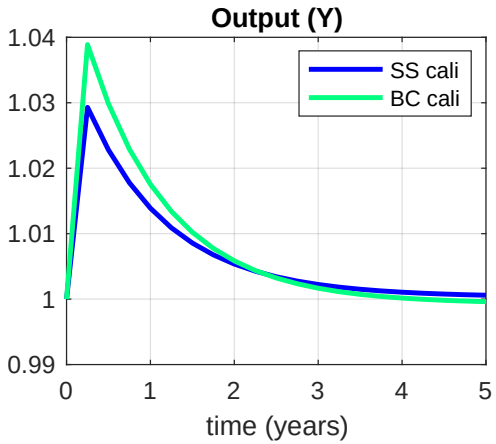

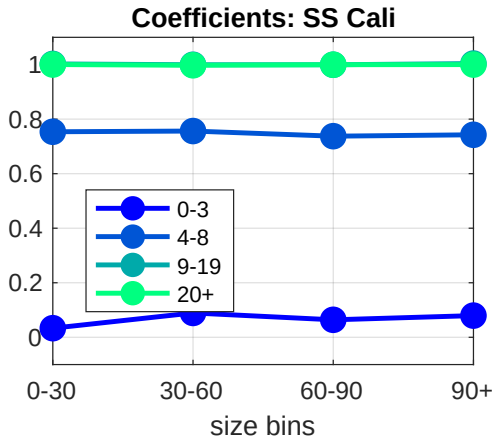

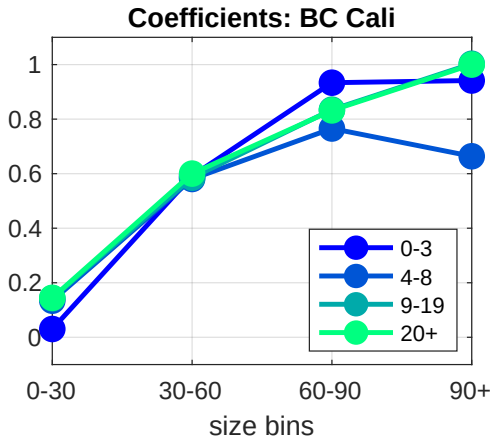

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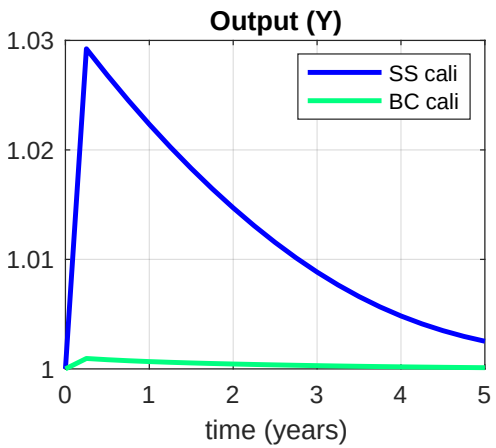
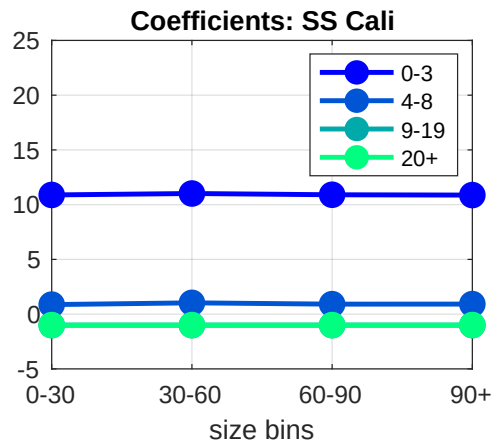
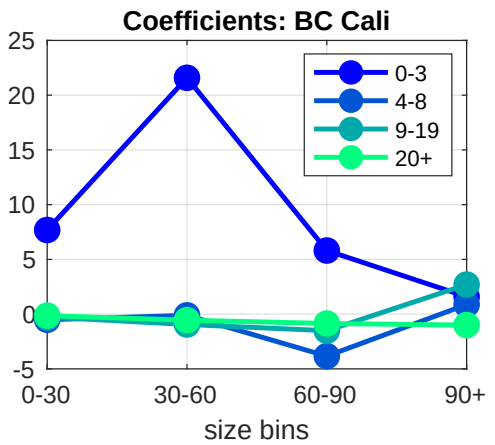
- Large firms responding more $\Rightarrow$ larger aggregate response

Policy experiments - Debt relief







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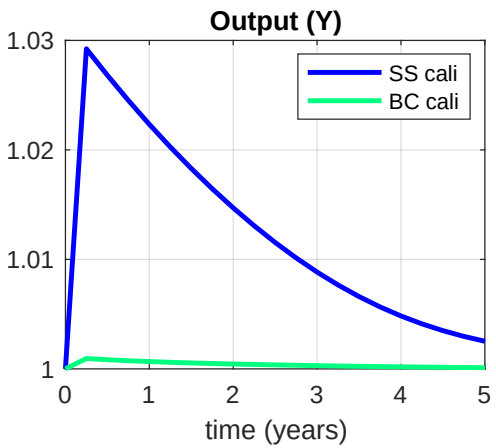
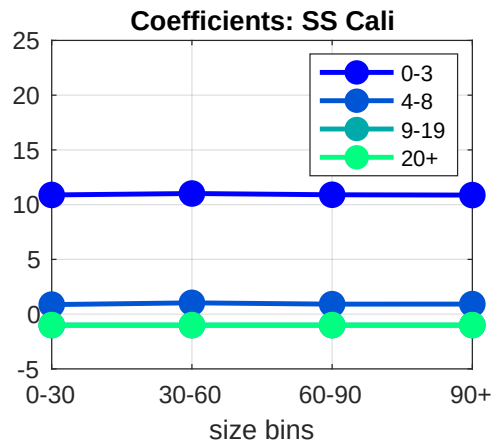
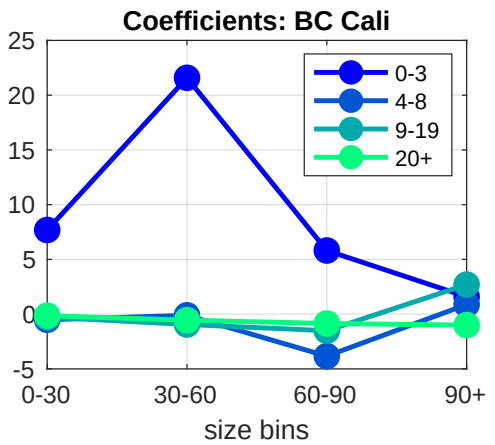






- SS calibration much more powerfull
- Why? Debt relief help only constrained firms young, large not constrained in cyclical calibration

Conclusion

1. Empirics: Size is not a perfect proxy for age and vice versa
   - Size gradient of cyclicality depends on age
   - in terms of cyclicality, large firms are more alike than small firms
2. Model
   - financial frictions make young firms highly responsive to shocks
   - but firms grow out of financial constraint relatively fast $\rightarrow$ second mechanism is needed to get the cyclicality by size right
     - **entrants**: positive corelation of starting net-worth with productivity generates negative cyclicality gradient wrt size
     - **older firms**: heterogeneous returns to scale generate positive cyclicality gradient with respect to size
3. Policy implications
   - who responds drives the aggregate reaction
     $\rightarrow$ capturing the behaviour of young-large firms particularly important

Literature

Andersen, S. G. and Rozsypal, F. (2021). What can old firms tell us about the effect of age on firm size. working paper.

Begenau, J. and Salomao, J. (2018). Firm Financing over the Business Cycle. *The Review of Financial Studies*, 32(4):1235–1274.

Bernanke, B. and Gertler, M. (1989). Agency Costs, Net Worth, and Business Fluctuations. *American Economic Review*, 79(1):14–31.

Bernanke, B., Gertler, M., and Gilchrist, S. (1999). The financial accelerator in a quantitative business cycle framework. In Taylor, J. B. and Woodford, M., editors, *Handbook of Macroeconomics*, volume 1, Part C, chapter 21, pages 1341–1393. Elsevier, 1 edition.

Covas, F. and Haan, W. J. D. (2011). The Cyclical Behavior of Debt and Equity Finance. *American Economic Review*, 101(2):877–899.

Crouzet, N. (2017). Aggregate Implications of Corporate Debt Choices. *The Review of Economic Studies*, 85(3):1635–1682.

Crouzet, N. and Mehrotra, N. R. (2020). Small and large firms over the business cycle. *American Economic Review*, 110(11):3549–3601.

Dinlersoz, E., Kalemli-Ozcan, S., Hyatt, H., and Penciakova, V. (2018). Leverage over the Life Cycle and Implications for Firm Growth and Shock Responsiveness. NBER Working Papers 25226, National Bureau of Economic Research, Inc.

Fort, T. C., Haltiwanger, J., Jarmin, R. S., and Miranda, J. (2013). How Firms Respond to Business Cycles: The Role of Firm Age and Firm Size. *IMF Economic Review*, 61(3):520–559.

Gavazza, A., Mongey, S., and Violante, G. L. (2018). Aggregate recruiting intensity. *American Economic Review*, 108(8):2088–2127.

Gertler, M. and Gilchrist, S. (1994). Monetary Policy, Business Cycles, and the Behavior of Small Manufacturing Firms*. *The Quarterly Journal of Economics*, 109(2):309–340.

Haltiwanger, J., Jarmin, R. S., and Miranda, J. (2013). Who Creates Jobs? Small versus Large versus Young. *The Review of Economics and Statistics*, 95(2):347–361.

Jermann, U. and Quadrini, V. (2012). Macroeconomic effects of financial shocks. *American Economic Review*, 102(1):238–71.

Khan, A. and Thomas, J. (2013). Credit shocks and aggregate fluctuations in an economy with production heterogeneity. *Journal of Political Economy*, 121(6):1055–1107.

Kiyotaki, N. and Moore, J. (1997). Credit Cycles. *Journal of Political Economy*, 105(2):211–248.

Mian, A. and Sufi, A. (2014). What explains the 2007–2009 drop in employment? *Econometrica*, 82(6):2197–2223.

Moscarini, G. and Postel-Vinay, F. (2012). The contribution of large and small employers to job creation in times of high and low unemployment. *American Economic Review*, 102(6):2509–39.

Nikolov, B., Schmid, L., and Steri, R. (2018). The Sources of Financing Constraints. Swiss Finance Institute Research Paper Series 18-74, Swiss Finance Institute.

Data

Averages of Variables of Interest by Age and Size

	Age groups				Size groups			
	0-3	4-8	9-19	20+	0-30	30-60	60-90	90+
Employment	7.7	12.2	17.5	26.2	1.6	4.0	11.2	115.9
sales	17435	28038	45910	93294	4219	9333	25012	320649
Assets	18705	32859	56870	128151	10115	20451	24029	360309
Debt	10595	17615	30204	69040	5237	10809	12760	192787
Equity	4627	11155	21058	49123	4197	7620	9894	144007
DA (w)	0.85	0.79	0.69	0.62	0.75	0.75	0.73	0.68

Note: Sales, assets, debt and equity in thousands of DKK (1000 DKK = 134 EUR $\approx$ 150-200 USD). Debt/assets (DA). Continuing firms only.

back

Data

Number of observations by size and age

	Age							
	0	[1,5)	[5,10)	[10,15)	[15,20)	[20,25)	25+	all
emp<50	0.98	0.98	0.96	0.94	0.91	0.9	0.84	0.94
emp>=50	0.02	0.02	0.04	0.06	0.09	0.10	0.16	0.06
size(0-30)	0.46	0.41	0.35	0.30	0.26	0.26	0.23	0.33
size(30-60)	0.25	0.28	0.26	0.24	0.23	0.23	0.19	0.25
size(60-90)	0.23	0.26	0.31	0.33	0.35	0.33	0.32	0.30
size(90+)	0.06	0.06	0.09	0.13	0.16	0.18	0.26	0.12
all	17273	236500	168725	117111	78781	55854	115105	789349

Note: size defined on headcount employment to prevent to much switches due to hours fluctuations

back

Regression framework

Goal: recover AGE $\times$ SIZE interaction

Regression framework

Goal: recover AGE $\times$ SIZE interaction

- A: age groups (0-3, 4-7, 8-19, 20+)
- I: employment groups (percentile cutoffs: 30,60,90,95)

details

Regression framework

Goal: recover AGE $\times$ SIZE interaction
for levels, growth rates,

$$X_{i,t} = \sum_j \sum_k \alpha_{j,k} \; \mathbb{1}_{i \in I_j} \mathbb{1}_{i \in A_k} + \varepsilon_{i,t}$$

- A: age groups (0-3, 4-7, 8-19, 20+)
- I: employment groups (percentile cutoffs: 30,60,90,95)
- $X_{i,t}$: $i - th$ firm variable of interest

details

Regression framework

Goal: recover AGE $\times$ SIZE interaction
for levels, growth rates, cyclicality,

$$X_{i,t} = \sum_j \sum_k \alpha_{j,k} \; \mathbb{1}_{i \in I_j} \mathbb{1}_{i \in A_k} + \varepsilon_{i,t}$$

$$g^X_{i,t} = \sum_j \sum_k \left(\alpha_{j,k} + \beta_{j,k} g^Y_t \right) \mathbb{1}_{i \in I_j} \mathbb{1}_{i \in A_k} + \varepsilon_{i,t}$$

- A: age groups (0-3, 4-7, 8-19, 20+)
- I: employment groups (percentile cutoffs: 30,60,90,95)
- $X_{i,t}$: $i-th$ firm variable of interest
- $g^X_{i,t}$: (normalised) growth rate of $X_{i,t}$
- g^Y_t: GDP growth rate

details

Regression framework

Goal: recover AGE $\times$ SIZE interaction
for levels, growth rates, cyclicality, effect of leverage

$$X_{i,t} = \sum_j \sum_k \alpha_{j,k} \, \mathbb{1}_{i \in I_j} \mathbb{1}_{i \in A_k} + \varepsilon_{i,t}$$

$$g^X_{i,t} = \sum_j \sum_k \left(\alpha_{j,k} + \beta_{j,k} g^Y_t \right) \mathbb{1}_{i \in I_j} \mathbb{1}_{i \in A_k} + \varepsilon_{i,t}$$

$$g^X_{i,t} = \sum_j \sum_k \left(\alpha_{j,k} + \beta_{j,k} g^Y_t \right) \mathbb{1}_{i \in I_j} \mathbb{1}_{i \in A_k} + \varepsilon_{i,t}$$
$$+ \sum_m (\omega_m + \psi_m y_t) \mathbb{1}_{i \in DA_m}$$

- A: age groups (0-3, 4-7, 8-19, 20+)
- I: employment groups (percentile cutoffs: 30,60,90,95)
- $X_{i,t}$: $i-th$ firm variable of interest
- $g^X_{i,t}$: (normalised) growth rate of $X_{i,t}$
- g^Y_t: GDP growth rate
- DA_{it}: quintile of leverage distribution

details

Regression framework

Goal: recover AGE $\times$ SIZE interaction
for levels, growth rates, cyclicality, effect of leverage

$$X_{i,t} = \sum_j \sum_k \alpha_{j,k} \, \mathbb{1}_{i \in I_j} \mathbb{1}_{i \in A_k} + \sum_l \gamma_l \, \mathbb{1}_{i \in S_l} + \varepsilon_{i,t}$$

$$g^X_{i,t} = \sum_j \sum_k \left(\alpha_{j,k} + \beta_{j,k} g^Y_t \right) \mathbb{1}_{i \in I_j} \mathbb{1}_{i \in A_k} + \sum_l \left(\gamma_l + \delta_l g^Y_t \right) \mathbb{1}_{i \in S_l} + \varepsilon_{i,t}$$

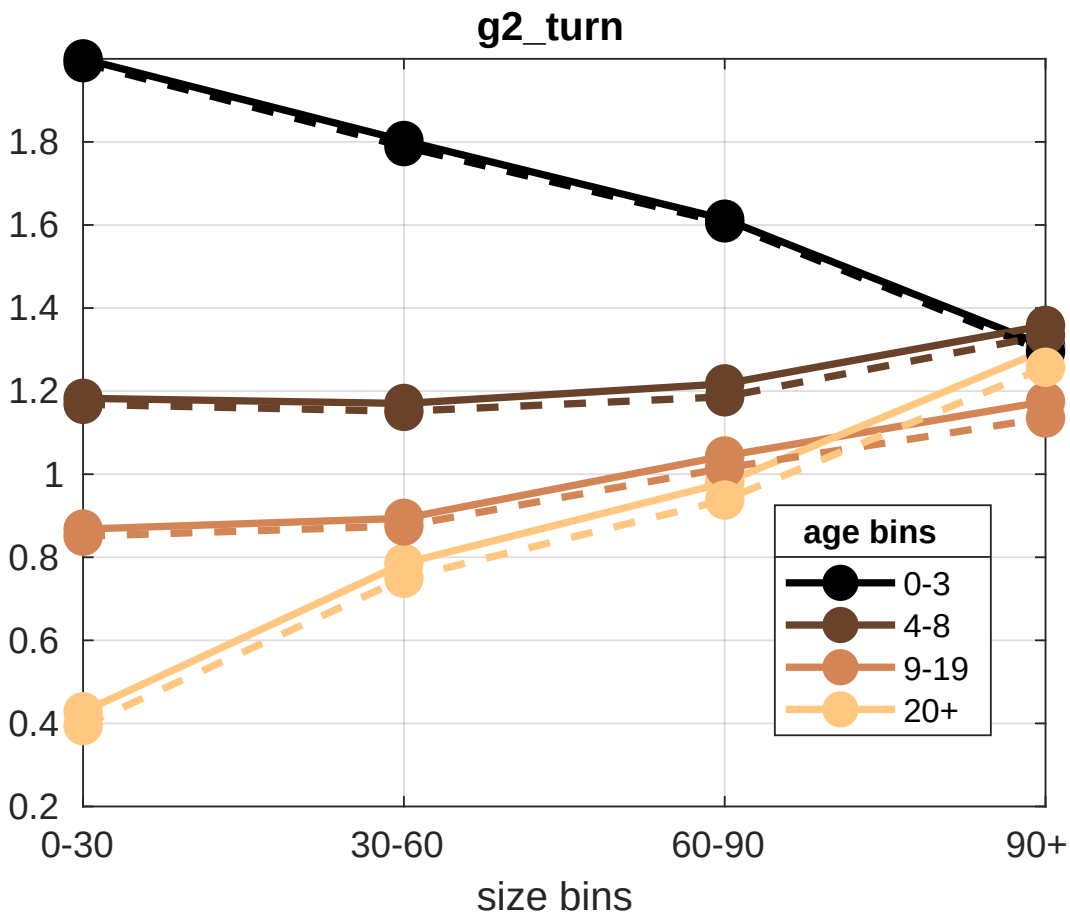
$$g^X_{i,t} = \sum_j \sum_k \left(\alpha_{j,k} + \beta_{j,k} g^Y_t \right) \mathbb{1}_{i \in I_j} \mathbb{1}_{i \in A_k} + \sum_l \left(\gamma_l + \delta_l g^Y_t \right) \mathbb{1}_{i \in S_l} + \varepsilon_{i,t} + \sum_m (\omega_m + \psi_m y_t) \mathbb{1}_{i \in DA_m}$$

- A: age groups (0-3, 4-7, 8-19, 20+)
- I: employment groups (percentile cutoffs: 30,60,90,95)
- $X_{i,t}$: $i-th$ firm variable of interest
- $g^X_{i,t}$: (normalised) growth rate of $X_{i,t}$
- g^Y_t: GDP growth rate
- DA_{it}: quintile of leverage distribution
- S: 36 sectors

details

Average growth rate of sales

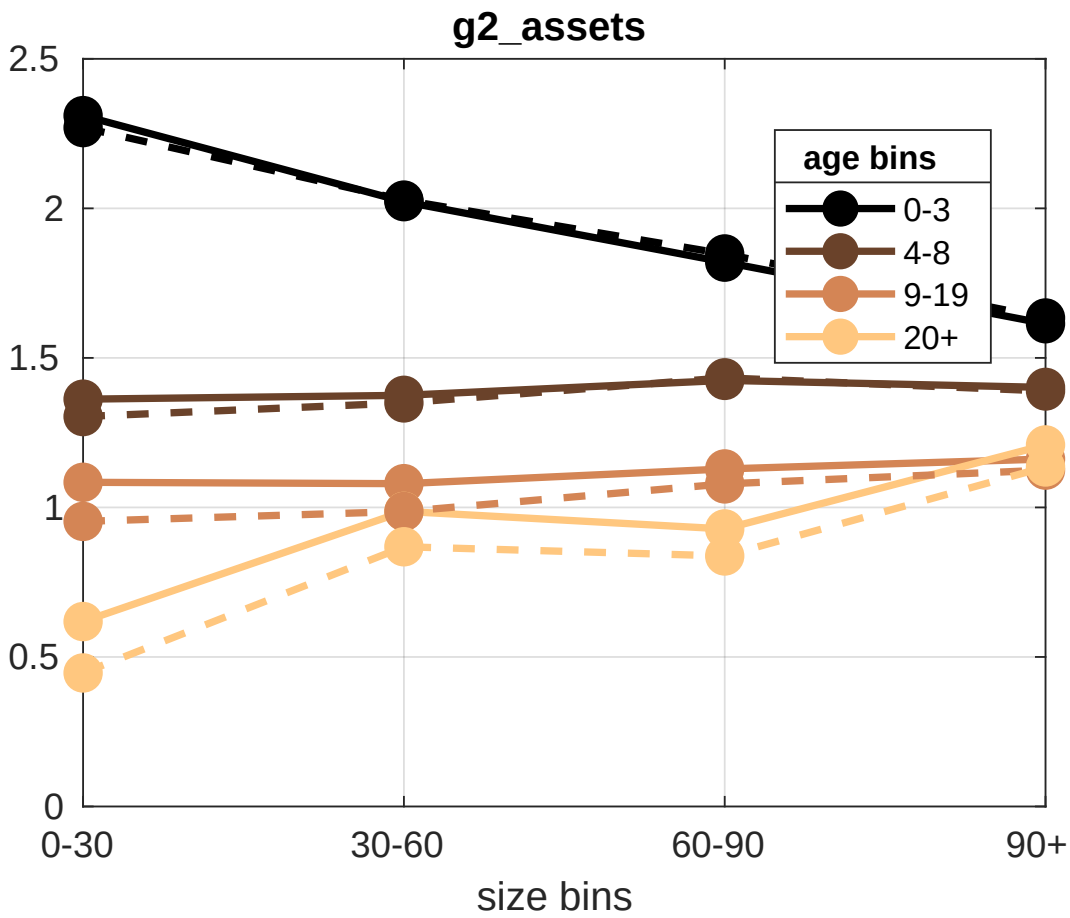
Basic moments



back

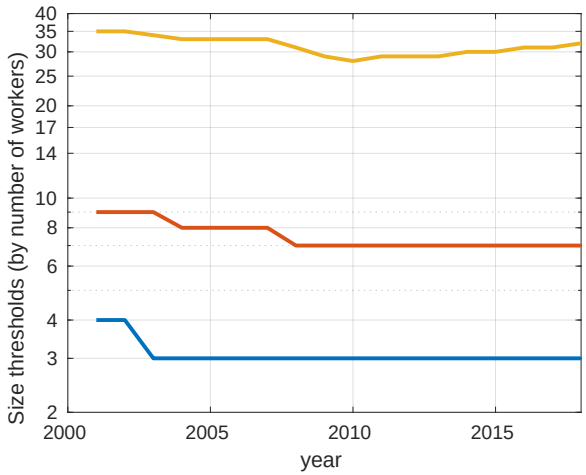
Average growth rate of assets

Basic moments

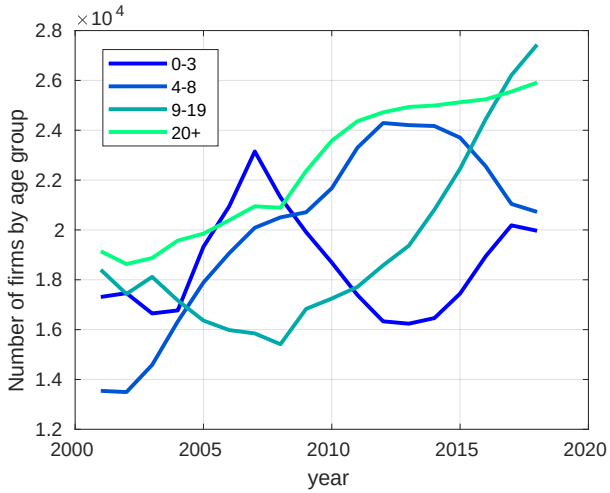


back

Size Thresholds and Number of Firms in Different Age Bins



(a) Size thresholds (log scale on y-axis)

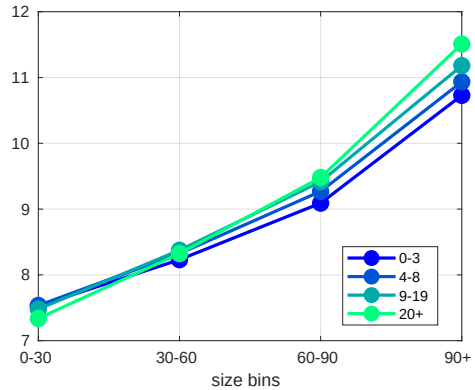


(b) Number of firms in each age group over time

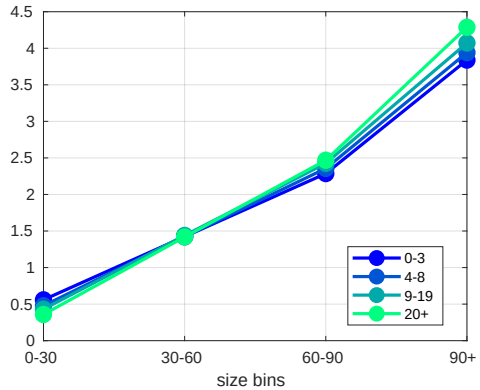
back

Basic moments

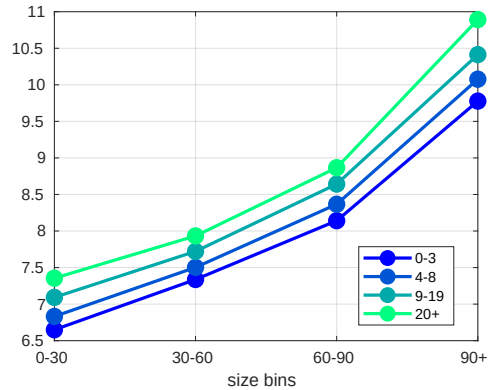
Figure: Average levels and growth rates by size and age



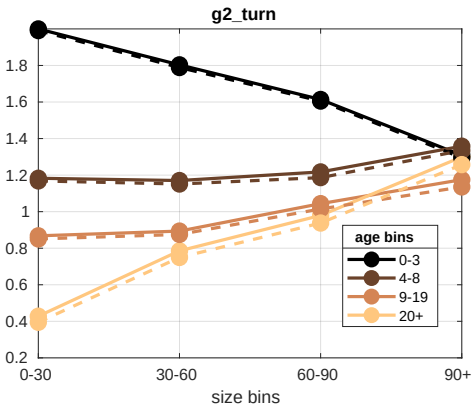
(a) (log) Sales



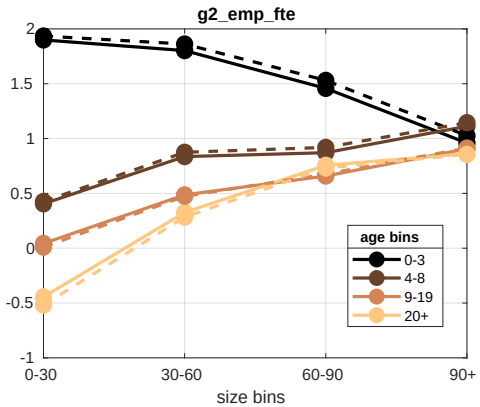
(b) (log) Employment



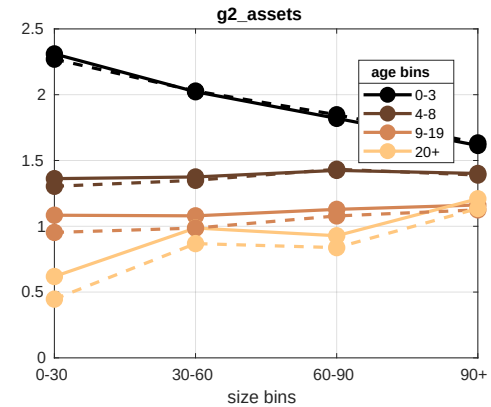
(c) (log) Assets



(d) Growth rate of sales



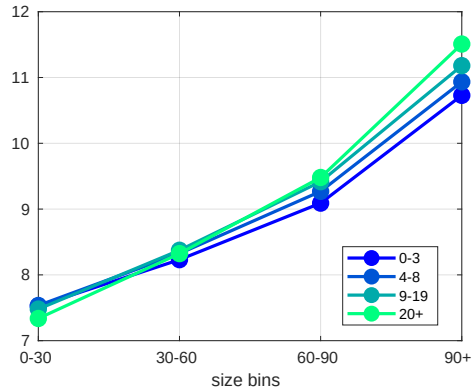
(e) Growth rate of employment



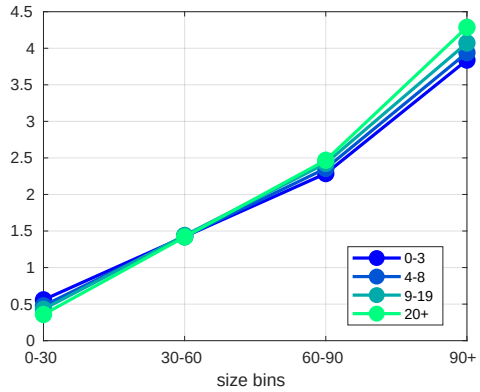
(f) Growth rate of assets

Basic moments

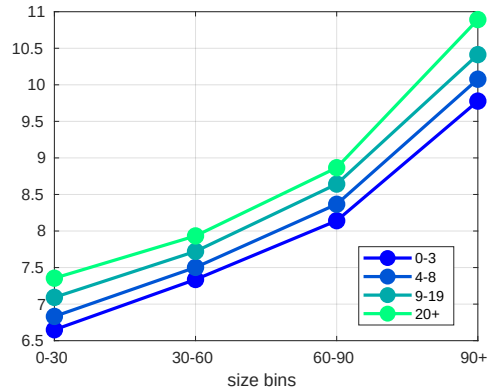
Figure: Average levels and growth rates by size and age



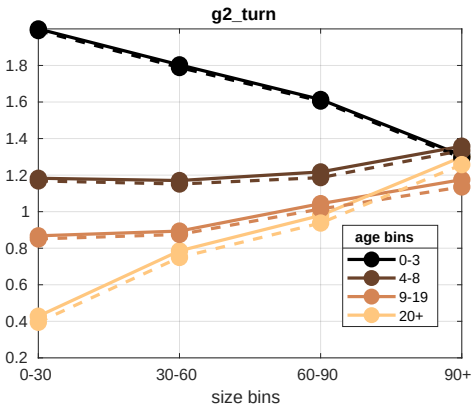
(a) (log) Sales



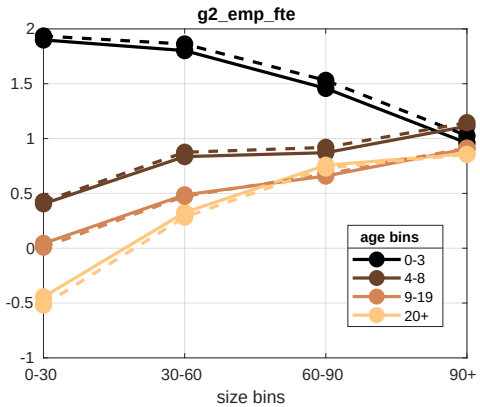
(b) (log) Employment



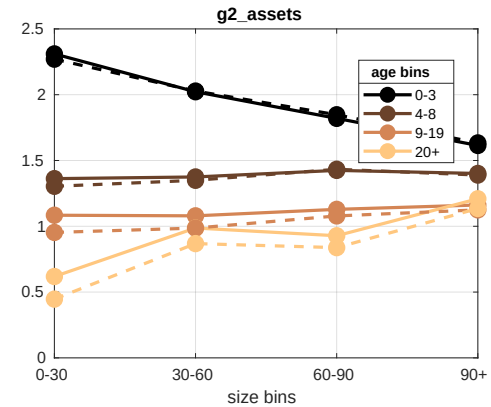
(c) (log) Assets



(d) Growth rate of sales



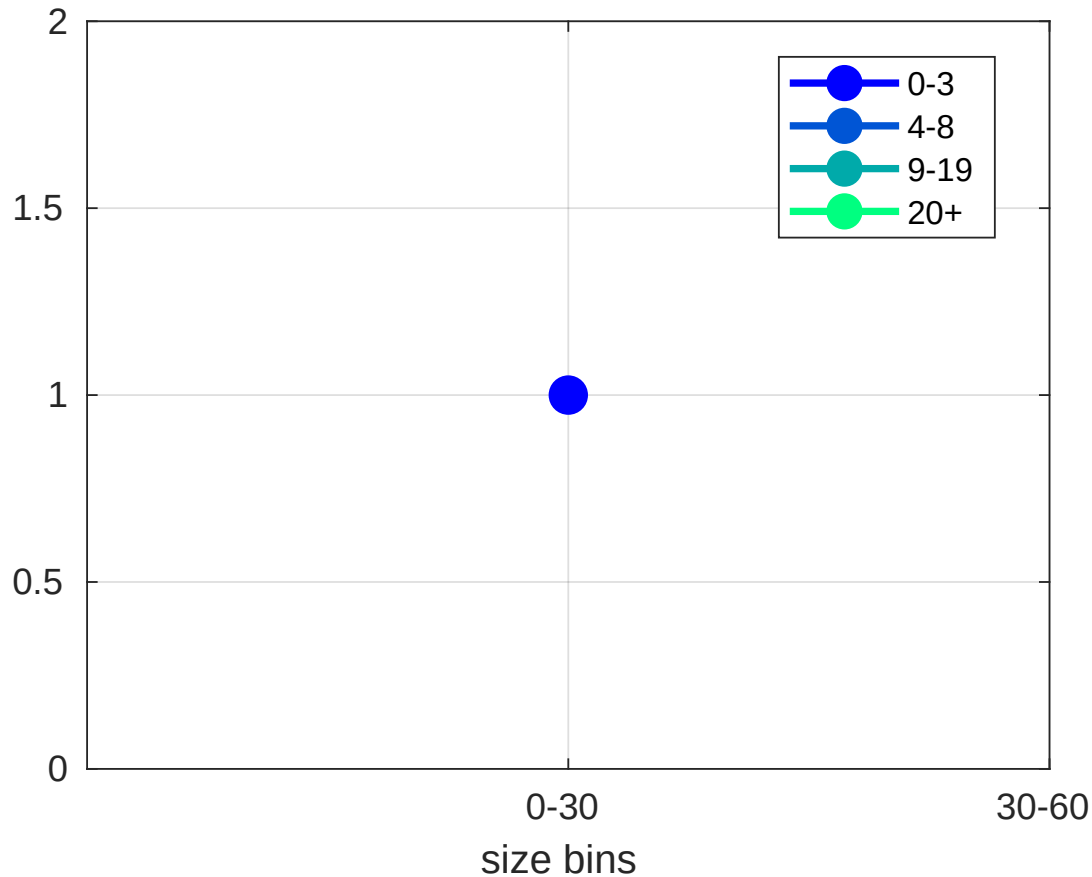
(e) Growth rate of employment



(f) Growth rate of assets

Predicted cyclicality

Sales

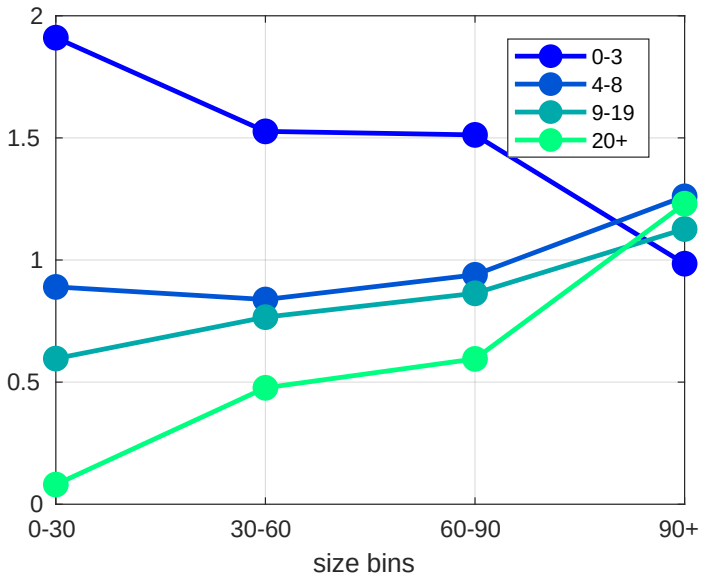


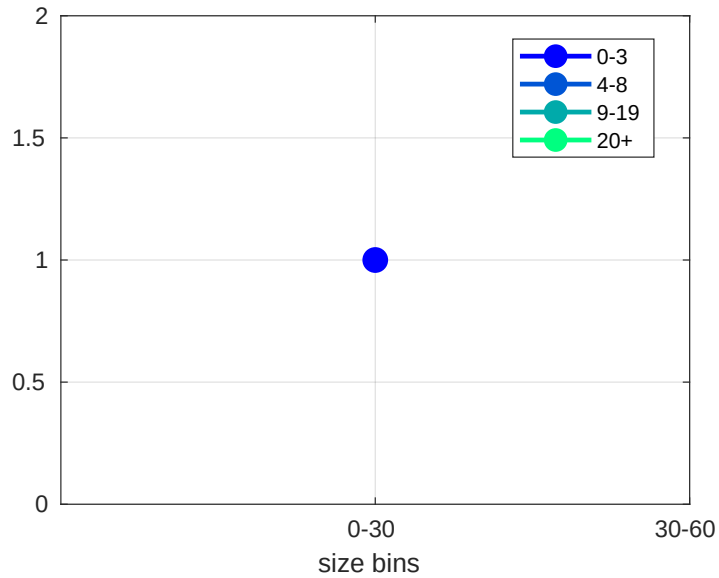
Same pattern:

- Entrants: higher cyclicality over all, cyclicality falls with size
- Everybody else: cyclicality increases with size

Predicted cyclicality

Assets, Debt





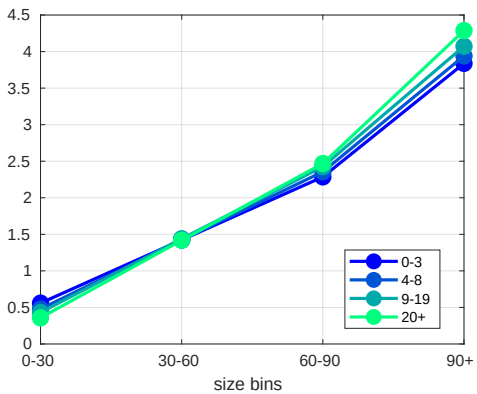
Same pattern:

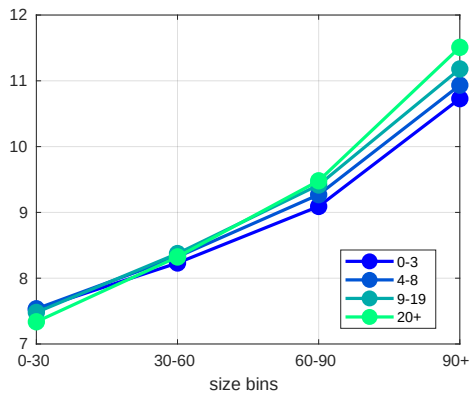
- entrants more cyclical
- entrants' cyclicality decreasing in size
- for everybody else cyclicality is (weakly) increasing with size

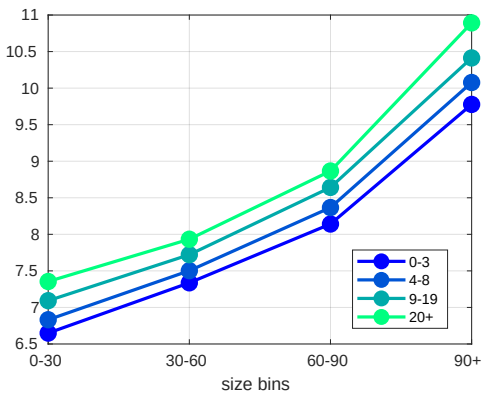
back

Basic moments

Levels of employment, sales and assets

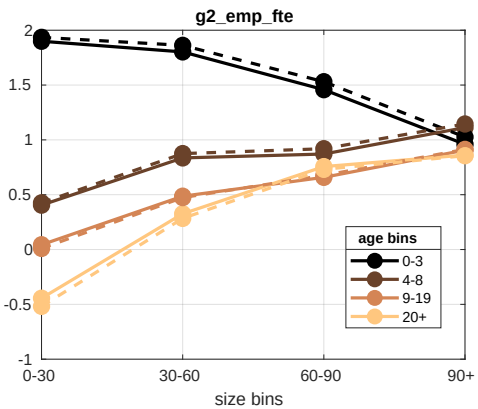


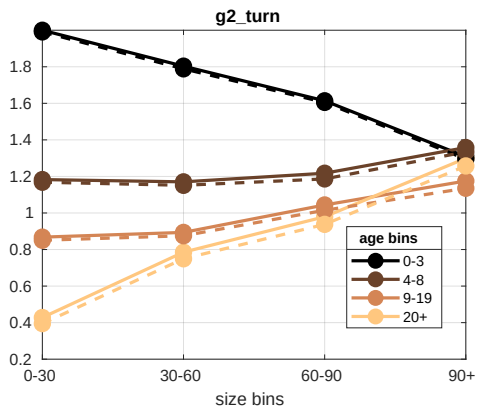


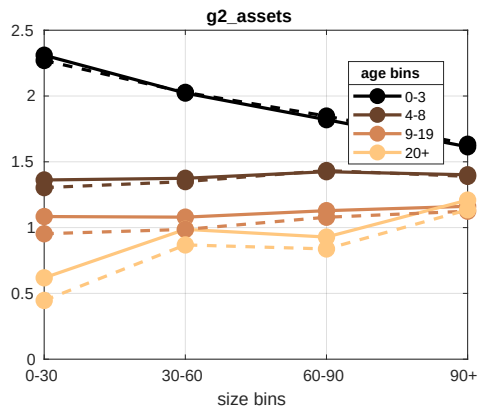


Basic moments

Growth rates of employment, sales and assets







back

Effects of Leverage

- Growth rate

	(1) Sales	(2) Sales	(3) Employment	(4) Employment	(5) Assets	(6) Assets
Constant	0.012*	0.007	-0.009	-0.043***	0.026***	0.014*
	(1.99)	(1.16)	(-1.44)	(-6.69)	(4.40)	(2.31)
y	1.528***	1.717***	1.301***	1.473***	1.289***	1.224***
	(5.25)	(5.70)	(4.30)	(4.80)	(4.54)	(4.18)
0-20	-0.045***	-0.034***	-0.022***	-0.017***	0.010***	0.017***
	(-29.33)	(-22.21)	(-16.30)	(-12.45)	(6.43)	(10.90)
20-40	-0.018***	-0.015***	-0.007***	-0.005***	0.013***	0.015***
	(-12.00)	(-9.99)	(-5.55)	(-4.05)	(8.25)	(9.67)
60-80	0.005***	0.001	-0.004**	-0.009***	-0.019***	-0.022***
	(3.45)	(0.96)	(-3.15)	(-6.56)	(-11.94)	(-13.73)
80+	0.005**	-0.004*	-0.042***	-0.059***	-0.023***	-0.031***
	(2.84)	(-2.26)	(-26.81)	(-37.76)	(-11.75)	(-15.97)
0-20 × y	-0.102	0.018	-0.395***	-0.180**	-0.503***	-0.407***
	(-1.43)	(0.25)	(-6.37)	(-2.88)	(-7.46)	(-5.91)
20-40 × y	-0.145*	-0.109	-0.145*	-0.080	-0.182**	-0.148*
	(-2.13)	(-1.59)	(-2.47)	(-1.38)	(-2.71)	(-2.22)
60-80 × y	-0.021	-0.028	0.193**	0.172**	0.111	0.090
	(-0.30)	(-0.39)	(3.11)	(2.80)	(1.56)	(1.27)
80+ × y	0.061	0.023	0.335***	0.309***	0.437***	0.354***
	(0.77)	(0.28)	(4.62)	(4.24)	(5.01)	(4.02)
Observations	595547	595547	674084	674084	594646	594646
adj-r2	0.017	0.035	0.015	0.053	0.010	0.021
Sectors	yes	yes	yes	yes	yes	yes
Clustering level	firm	firm	firm	firm	firm	firm
Size and Age controls	no	yes	no	yes	no	yes

t statistics in parentheses

*$p < 0.05$, *$p < 0.01$, *$p < 0.001$

Effects of Leverage

- Growth rate
  - Emp: ∩

	(1) Sales	(2) Sales	(3) Employment	(4) Employment	(5) Assets	(6) Assets
Constant	0.012*	0.007	-0.009	-0.043***	0.026***	0.014*
	(1.99)	(1.16)	(-1.44)	(-6.69)	(4.40)	(2.31)
y	1.528***	1.717***	1.301***	1.473***	1.289***	1.224***
	(5.25)	(5.70)	(4.30)	(4.80)	(4.54)	(4.18)
0-20	-0.045***	-0.034***	-0.022***	-0.017***	0.010***	0.017***
	(-29.33)	(-22.21)	(-16.30)	(-12.45)	(6.43)	(10.90)
20-40	-0.018***	-0.015***	-0.007***	-0.005***	0.013***	0.015***
	(-12.00)	(-9.99)	(-5.55)	(-4.05)	(8.25)	(9.67)
60-80	0.005***	0.001	-0.004**	-0.009***	-0.019***	-0.022***
	(3.45)	(0.96)	(-3.15)	(-6.56)	(-11.94)	(-13.73)
80+	0.005**	-0.004*	-0.042***	-0.059***	-0.023***	-0.031***
	(2.84)	(-2.26)	(-26.81)	(-37.76)	(-11.75)	(-15.97)
0-20 × y	-0.102	0.018	-0.395***	-0.180**	-0.503***	-0.407***
	(-1.43)	(0.25)	(-6.37)	(-2.88)	(-7.46)	(-5.91)
20-40 × y	-0.145*	-0.109	-0.145*	-0.080	-0.182**	-0.148*
	(-2.13)	(-1.59)	(-2.47)	(-1.38)	(-2.71)	(-2.22)
60-80 × y	-0.021	-0.028	0.193**	0.172**	0.111	0.090
	(-0.30)	(-0.39)	(3.11)	(2.80)	(1.56)	(1.27)
80+ × y	0.061	0.023	0.335***	0.309***	0.437***	0.354***
	(0.77)	(0.28)	(4.62)	(4.24)	(5.01)	(4.02)
Observations	595547	595547	674084	674084	594646	594646
adj-r2	0.017	0.035	0.015	0.053	0.010	0.021
Sectors	yes	yes	yes	yes	yes	yes
Clustering level	firm	firm	firm	firm	firm	firm
Size and Age controls	no	yes	no	yes	no	yes

t statistics in parentheses
*$p < 0.05$, *$p < 0.01$, *$p < 0.001$

Effects of Leverage

- Growth rate
  - Emp: $\cap$
  - Sales: $+$

	(1) Sales	(2) Sales	(3) Employment	(4) Employment	(5) Assets	(6) Assets
Constant	0.012*	0.007	-0.009	-0.043***	0.026***	0.014*
	(1.99)	(1.16)	(-1.44)	(-6.69)	(4.40)	(2.31)
y	1.528***	1.717***	1.301***	1.473***	1.289***	1.224***
	(5.25)	(5.70)	(4.30)	(4.80)	(4.54)	(4.18)
0-20	-0.045***	-0.034***	-0.022***	-0.017***	0.010***	0.017***
	(-29.33)	(-22.21)	(-16.30)	(-12.45)	(6.43)	(10.90)
20-40	-0.018***	-0.015***	-0.007***	-0.005***	0.013***	0.015***
	(-12.00)	(-9.99)	(-5.55)	(-4.05)	(8.25)	(9.67)
60-80	0.005***	0.001	-0.004**	-0.009***	-0.019***	-0.022***
	(3.45)	(0.96)	(-3.15)	(-6.56)	(-11.94)	(-13.73)
80+	0.005**	-0.004*	-0.042***	-0.059***	-0.023***	-0.031***
	(2.84)	(-2.26)	(-26.81)	(-37.76)	(-11.75)	(-15.97)
0-20 $\times$ y	-0.102	0.018	-0.395***	-0.180**	-0.503***	-0.407***
	(-1.43)	(0.25)	(-6.37)	(-2.88)	(-7.46)	(-5.91)
20-40 $\times$ y	-0.145*	-0.109	-0.145*	-0.080	-0.182**	-0.148*
	(-2.13)	(-1.59)	(-2.47)	(-1.38)	(-2.71)	(-2.22)
60-80 $\times$ y	-0.021	-0.028	0.193**	0.172**	0.111	0.090
	(-0.30)	(-0.39)	(3.11)	(2.80)	(1.56)	(1.27)
80+ $\times$ y	0.061	0.023	0.335***	0.309***	0.437***	0.354***
	(0.77)	(0.28)	(4.62)	(4.24)	(5.01)	(4.02)
Observations	595547	595547	674084	674084	594646	594646
adj-r2	0.017	0.035	0.015	0.053	0.010	0.021
Sectors	yes	yes	yes	yes	yes	yes
Clustering level	firm	firm	firm	firm	firm	firm
Size and Age controls	no	yes	no	yes	no	yes

t statistics in parentheses

*$p < 0.05$, *$p < 0.01$, *$p < 0.001$

Effects of Leverage

- Growth rate
  - Emp: $\cap$
  - Sales: $+$
  - Assets: $-$

	(1) Sales	(2) Sales	(3) Employment	(4) Employment	(5) Assets	(6) Assets
Constant	0.012*	0.007	-0.009	-0.043***	0.026***	0.014*
	(1.99)	(1.16)	(-1.44)	(-6.69)	(4.40)	(2.31)
y	1.528***	1.717***	1.301***	1.473***	1.289***	1.224***
	(5.25)	(5.70)	(4.30)	(4.80)	(4.54)	(4.18)
0-20	-0.045***	-0.034***	-0.022***	-0.017***	0.010***	0.017***
	(-29.33)	(-22.21)	(-16.30)	(-12.45)	(6.43)	(10.90)
20-40	-0.018***	-0.015***	-0.007***	-0.005***	0.013***	0.015***
	(-12.00)	(-9.99)	(-5.55)	(-4.05)	(8.25)	(9.67)
60-80	0.005***	0.001	-0.004**	-0.009***	-0.019***	-0.022***
	(3.45)	(0.96)	(-3.15)	(-6.56)	(-11.94)	(-13.73)
80+	0.005**	-0.004*	-0.042***	-0.059***	-0.023***	-0.031***
	(2.84)	(-2.26)	(-26.81)	(-37.76)	(-11.75)	(-15.97)
0-20 $\times$ y	-0.102	0.018	-0.395***	-0.180**	-0.503***	-0.407***
	(-1.43)	(0.25)	(-6.37)	(-2.88)	(-7.46)	(-5.91)
20-40 $\times$ y	-0.145*	-0.109	-0.145*	-0.080	-0.182**	-0.148*
	(-2.13)	(-1.59)	(-2.47)	(-1.38)	(-2.71)	(-2.22)
60-80 $\times$ y	-0.021	-0.028	0.193**	0.172**	0.111	0.090
	(-0.30)	(-0.39)	(3.11)	(2.80)	(1.56)	(1.27)
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$\Rightarrow$ Leverage and Size x Age not (perfect) proxies

back

Steady-state calibration details

- targets:
- s-type to target size distribution
- age-dependent exogenous exit rate to target age distribution (Andersen and Rozsypal, 2021)
- size x age distribution:
  - initial net worth of entrants (n_0) to target size of entrants
  - superstar productivity z^* : average employment of firms 20+

back

Cyclical calibration details

- targets: relative cyclicality by size and age, size of the recession, growth rate of young-small firms
- calibration instruments: two shocks + two features = 9 new parameters
- productivity penalty of entrants $y_1^G < 1$ to match average size of 0-aged firms
- only financial shocks:
  1. colateral ϕ_0 relative cyclicality of small entrants
  2. discount rate r_0 chosen such that recession delivers GDP fall of 5% on impact
- distribution of η - cyclicality of older firms
  1. $\eta_1 - \eta_3$: relative cyclicality of respective group
  2. η_4: average $\eta = 1$
- distribution of initial net worth
  1. $n_2 - n_4$: decling cyclicality of entrants
  2. n_1: average employment growth of smallest entrants

back

Model equations

- final good manufacturer:
  - production function $Q = \left(\int_0^G q_i^\theta \, \mathrm{d}i \right)^{\frac{1}{\theta}}$
  - profits $\pi = \left(\int_0^G q_i^\theta \, \mathrm{d}i \right)^{\frac{1}{\theta}} - \int_0^G p_i q_i \, \mathrm{d}i$
  - FOC $q_i = p_i^{-\epsilon} Q$
  - zero profits $Q = \int_0^G p_i q_i \, \mathrm{d}i$
- aggregation accounting
  - final goods resource constraint: $Q = C + I + M$
  - aggregate output $Y = C + I + G$
  - intermediate goods $M = \int_0^G m_i di$.
- intermediate good production
  - production function: $q_i = z_i f(k_i, l_i, m_i)^{\eta_i}$
  - revenue: $p_i q_i = z^\theta f(k_i, l_i, m_i)^{\eta\theta} Q^{1-\theta}$
  - value added: $y = p_i q_i - m_i$
  - profit: $\pi(k, z) = \max_{l,m \geq 0} z^\theta f(k, l, m)^{\eta_z \theta} Q^{1-\theta} - wl - m$
  - capital evolution $\dot{k} = i - \delta k$

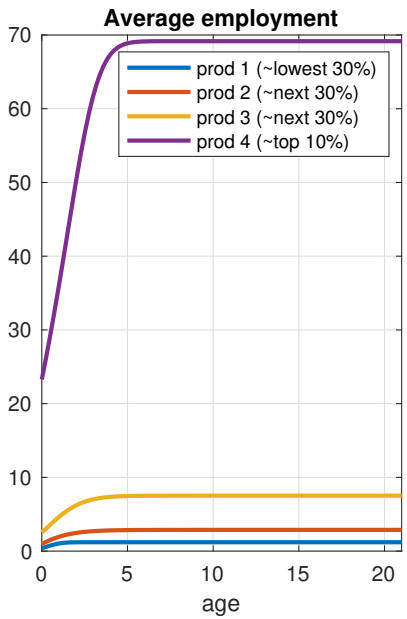
Model

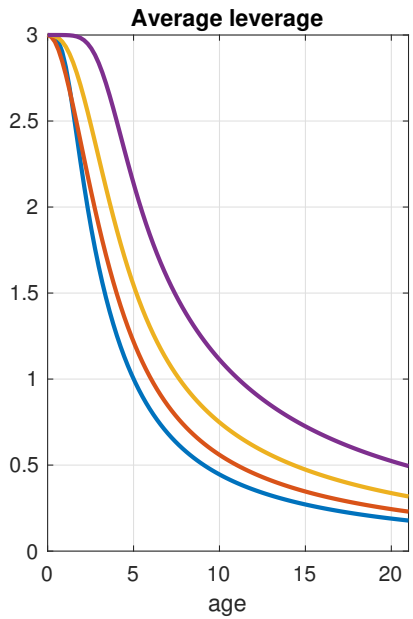
Calibration

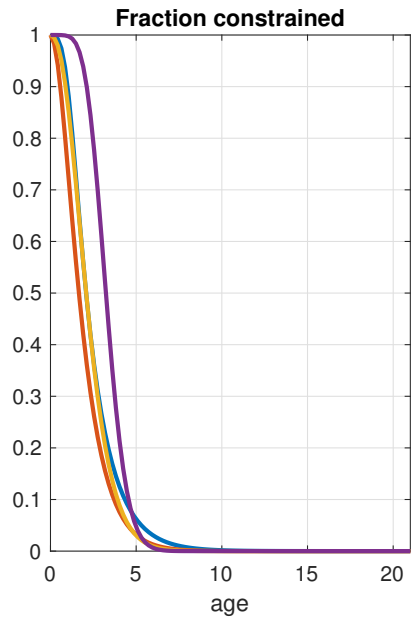
	Interpretation	Value	Source
r	Discount rate	0.0202	2% yearly real interest rate
z	Productivity distribution	-	See text
η_z	Returns to scale distribution	-	See text
ζ_z	Exit rates	-	See text
θ	Substitution across varieties	0.9	10% markup in frictionless model
α	Labor-capital ratio in prod fun	7.208	Aggregate L
β	Intermediate-capital ratio in prod fun	0.3703	Aggregate M
μ_0	Firm entry rate	0.0834	Normal total mass of firms to one
$\bar{\phi}$	S.s. collateral limit	3	Maximum leverage
δ	Depreciation rate	0.1054	10% annual rate
$\bar{n}$	Net worth where start paying dividends	38.78	Normalisation
α_s	Rate transition to superstar firm	5e-5	0.5% of firms are superstar
z_s	Superstar productivity	1.2803	Employment share of firms age 20+
χ	Labor disutility shifter	0.0128	Labor share of income
η	Labor supply elasticity	0.5	Real wage flexibility

Model results

Firm evolution by age



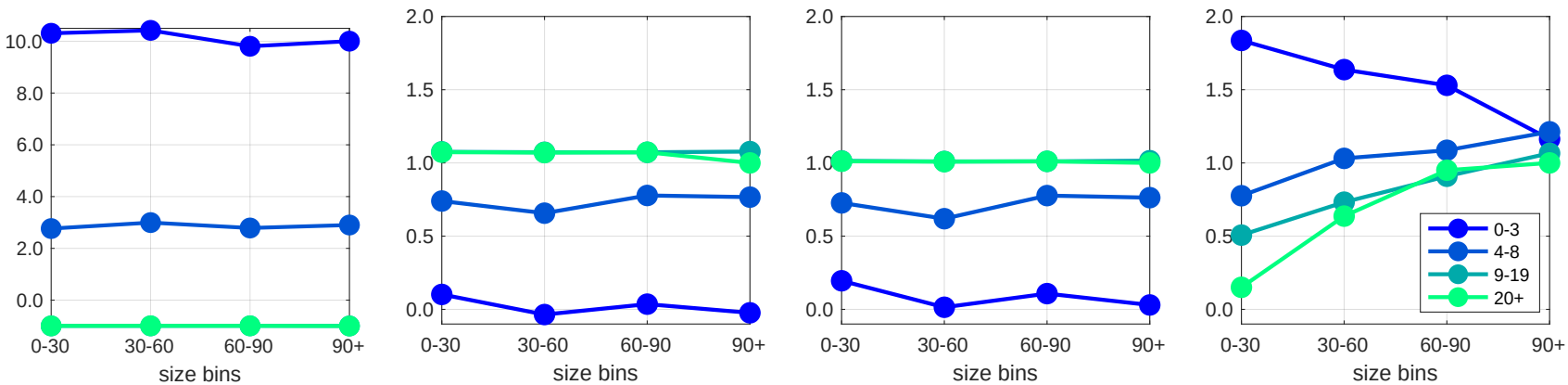




Model results

Basic model

Figure: Cyclicality of employment



(a) Collateral ($\bar{\phi}$) (b) Discounts (r) (c) TFP (z) (d) Data

(normalised relative to oldest-largest (age 20+ size 90+) bin)

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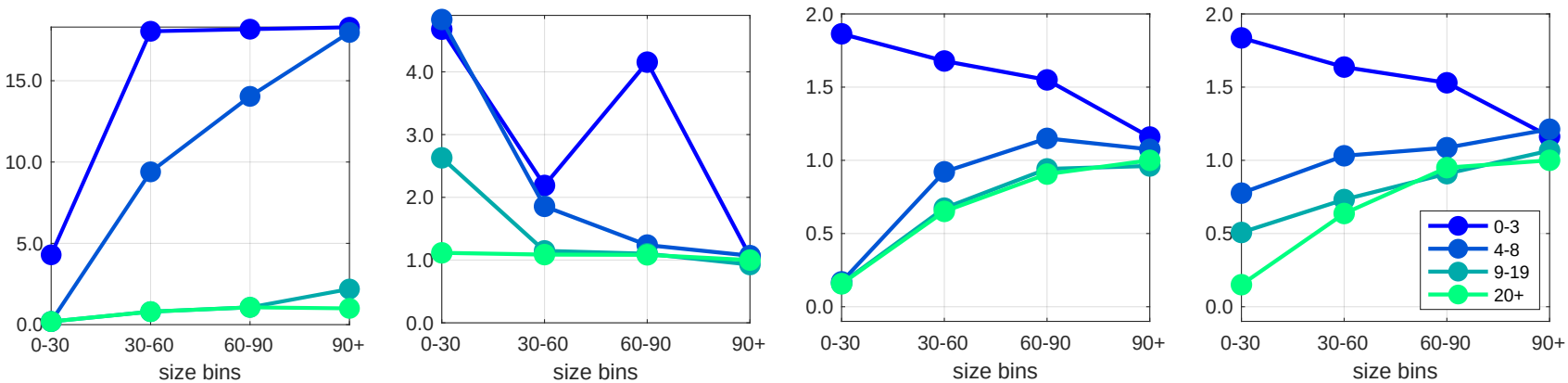
Model results

Full model

Figure: Cyclicality of employment



(a) Het. η_s (b) Het. n_s^e (c) Full model (d) Data

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Steady-state calibration details

- targets:
- s-type to target size distribution
- age-dependent exogenous exit rate to target age distribution (Andersen and Rozsypal, 2021)
- size x age distribution:
  - initial net worth of entrants (n_0) to target size of entrants
  - superstar productivity z^* : average employment of firms 20+

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Cyclical calibration details

- targets: relative cyclicality by size and age, size of the recession, growth rate of young-small firms
- calibration instruments: two shocks + two features = 9 new parameters
- productivity penalty of entrants $y_1^G < 1$ to match average size of 0-aged firms
- only financial shocks:
  1. colateral ϕ_0 relative cyclicality of small entrants
  2. discount rate r_0 chosen such that recession delivers GDP fall of 5% on impact
- distribution of η - cyclicality of older firms
  1. $\eta_1 - \eta_3$: relative cyclicality of respective group
  2. η_4: average $\eta = 1$
- distribution of initial net worth
  1. $n_2 - n_4$: decling cyclicality of entrants
  2. n_1: average employment growth of smallest entrants

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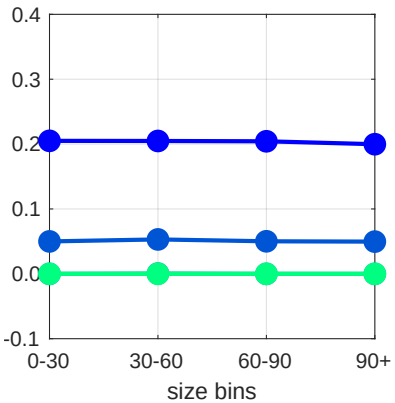
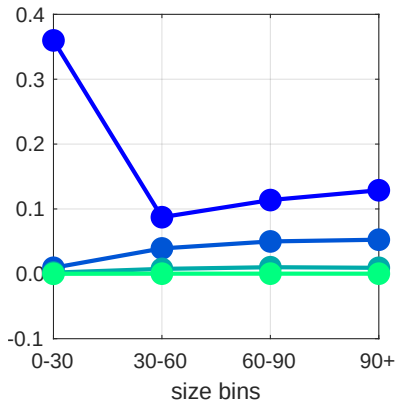
Model results

Growth rates

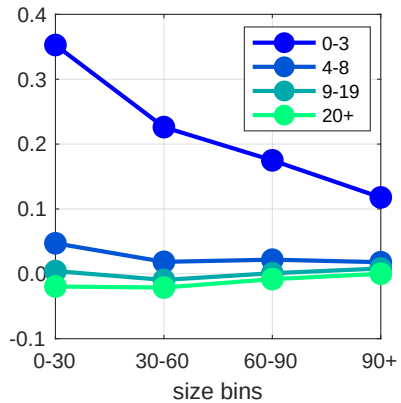
Figure: Average growth rate of employment



(a) Basic model



(b) Full model



(c) Data

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