Financial Frictions and Job Flows

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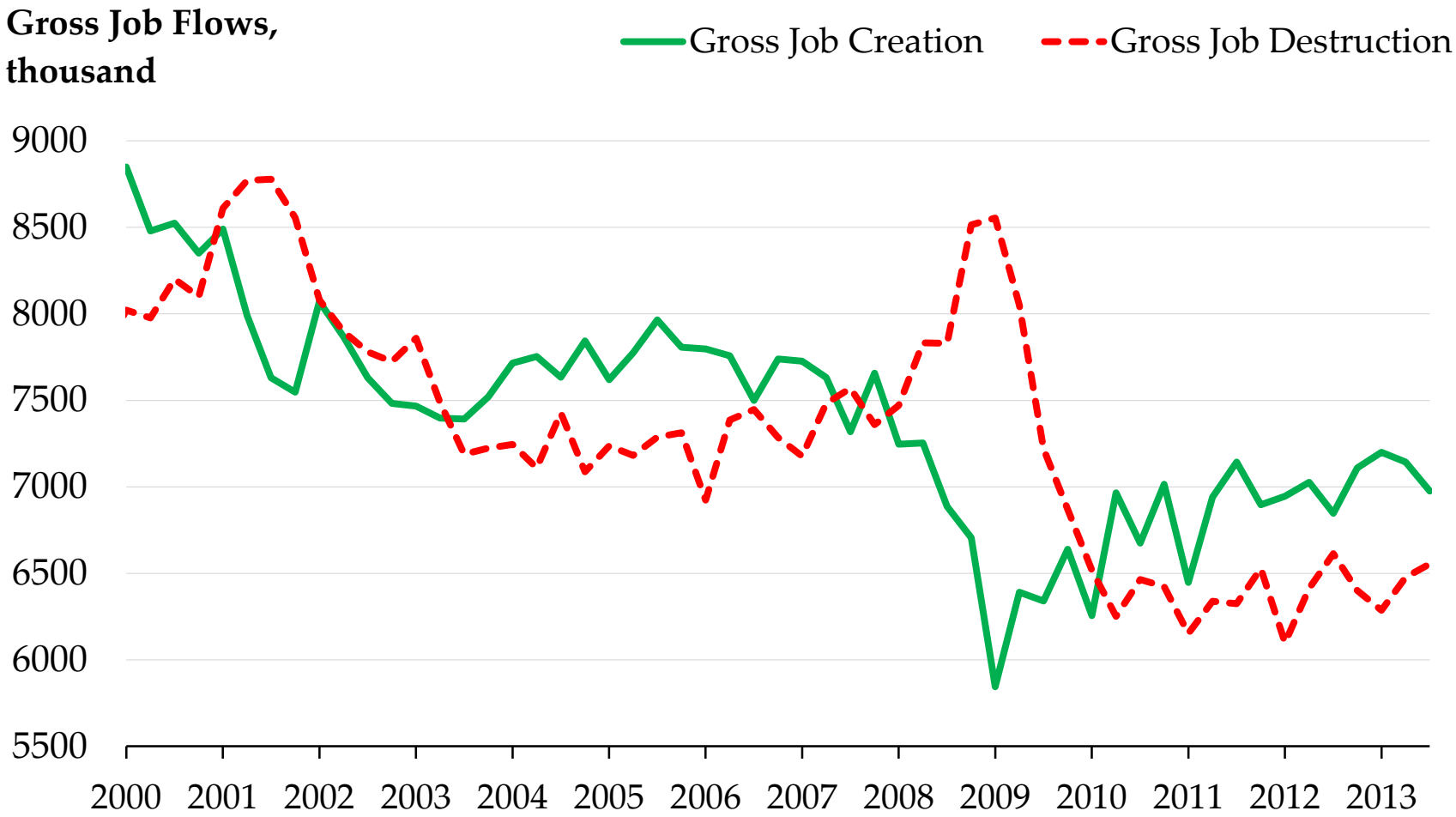
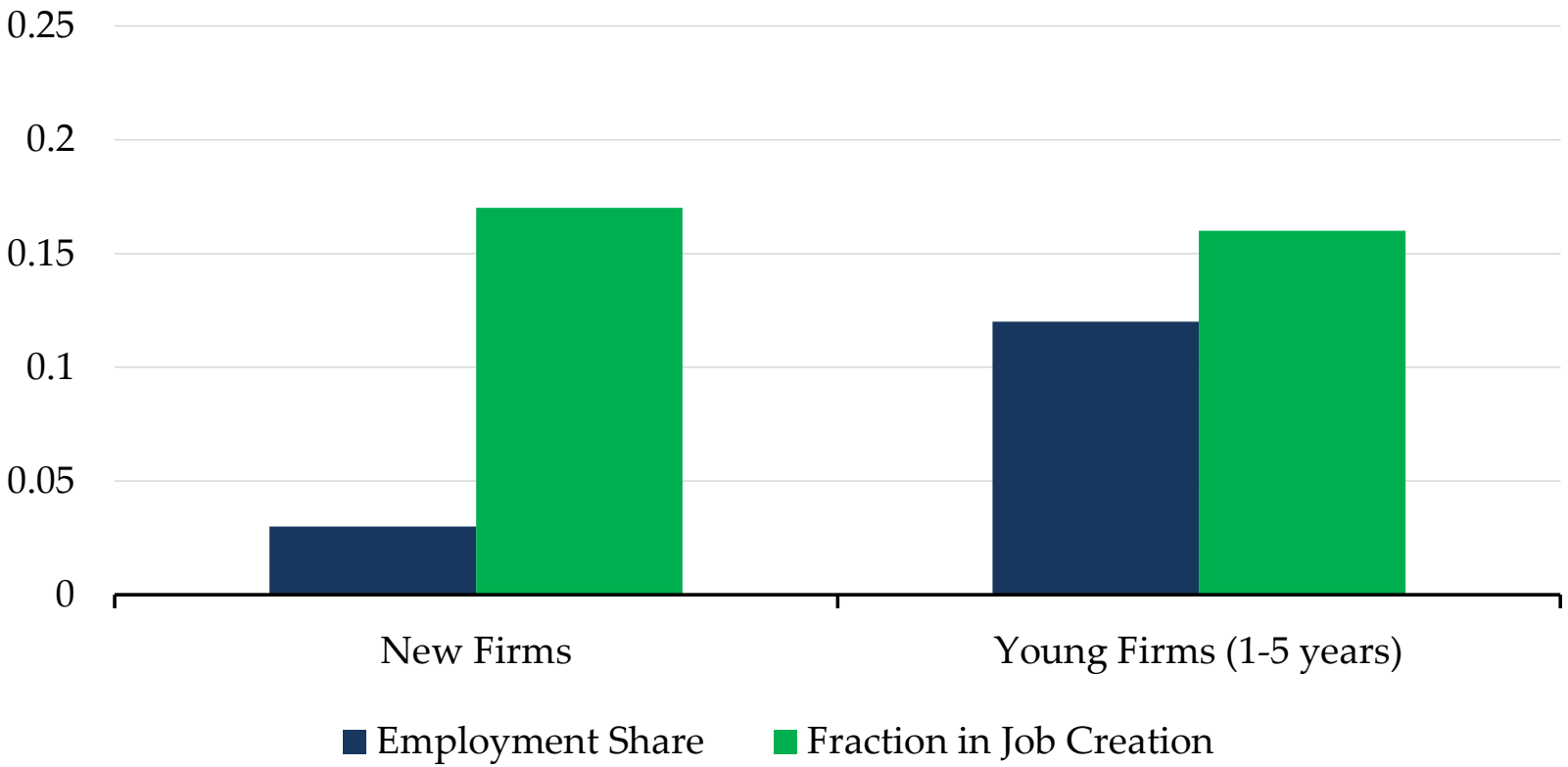
Job Flows in the Great Recession



Source: Business Employment Dynamics

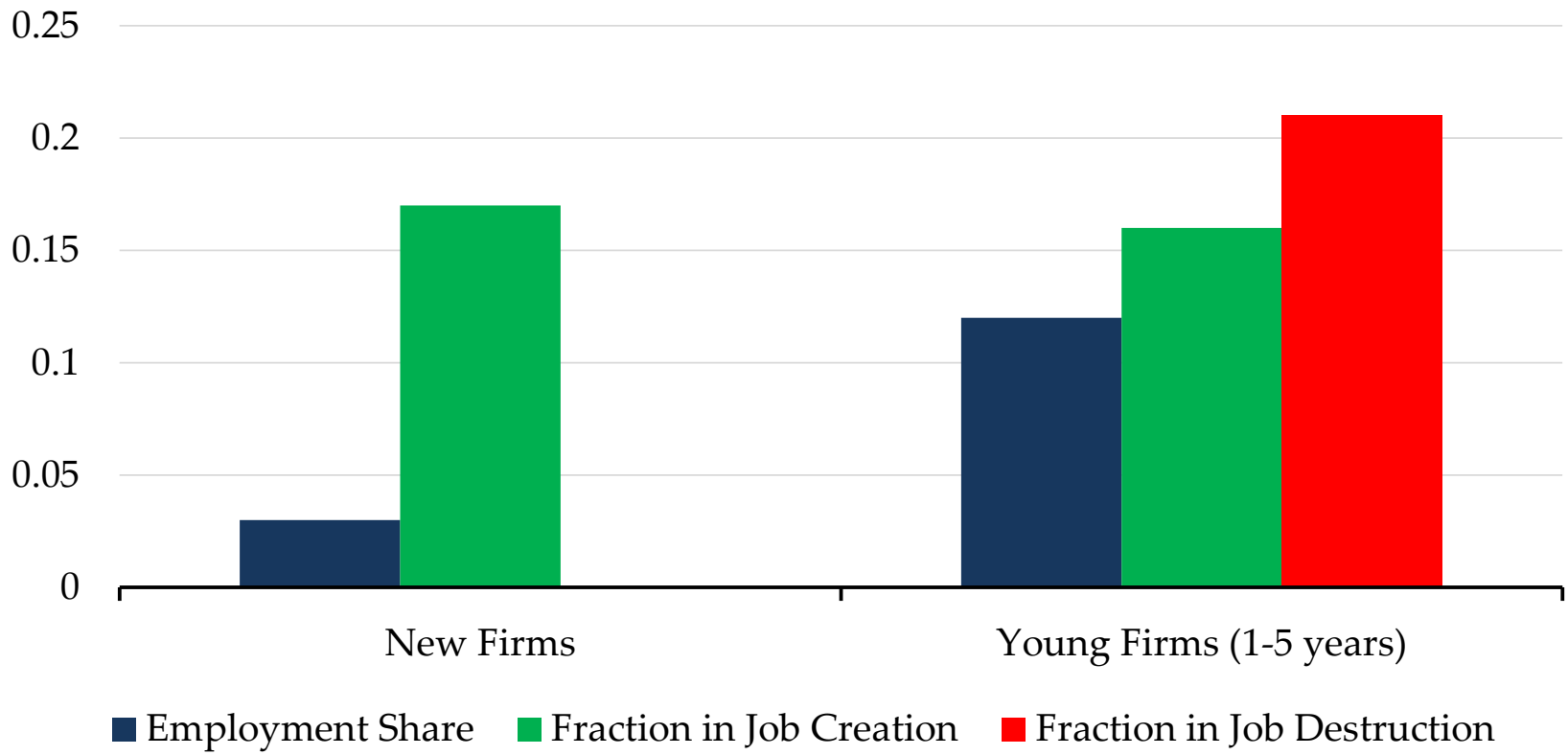
Ex-Construction

New and Young Firms



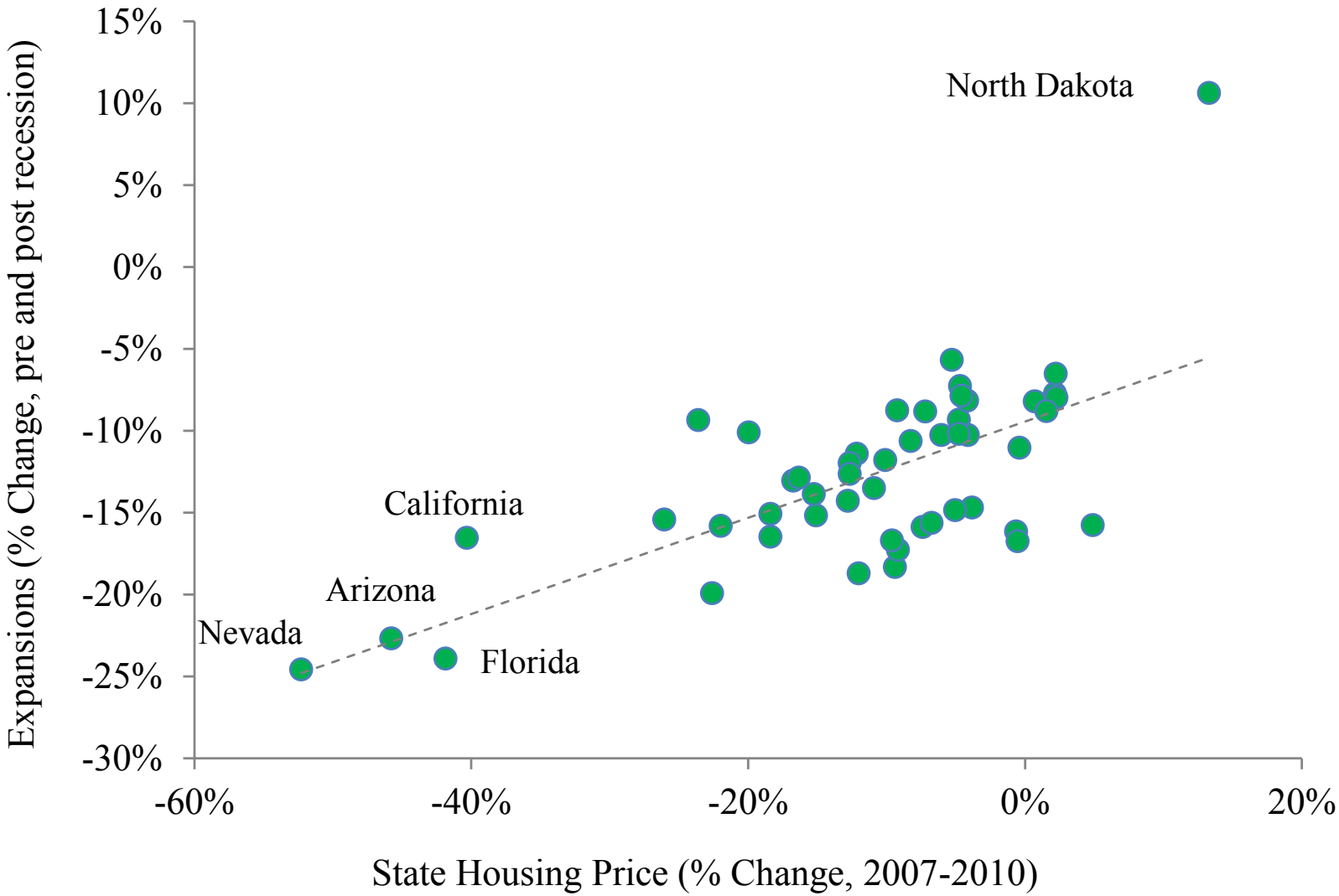
Source: Business Employment Dynamics, 2000-2006 averages

New and Young Firms



Source: Business Employment Dynamics, 2000-2006 averages

Link to the Financial Crisis?



Question and Approach

Questions

- How do financial shocks affect aggregate job flows?
- How do financial shocks affect job flows by firms age and size?

Approach

- Empirics
  - Use MSA-level variation for identification
  - Document differences across firm size and firm age
- Model
  - Build a firm dynamics model with financial constraints
  - Effect of financial shocks on job flows across firm size and age

Results: Empirics

Aggregate effects of housing price decline

- Persistent decrease in job creation
- Lagged decrease in job destruction

Category-specific effects

- Largest job flows effect for new and young firms
- Largest job flows effect for medium sized firms
- Significant effect on firm entry

Results: Model

Aggregate effects

- Job creation and destruction falls after negative financial shock
- Productivity and financial shocks operate via distinct margins

Category-specific effects

- Consistent with empirical patterns documented
- Largest effect on job creation for young and middle sized firms
- Raises job destruction for small firms, lowers for young/middle sized firms

Contribution to the Literature

Real effects of housing price shocks

- Mian, Sufi (2011), Gan (2007), Chodorow-Reich (2014)
- **This paper**: Job flows and multiple recessions

Job flows by firm size and firm age

- Davis, Haltiwanger (1999), Moscarini, Postel-Vinay (2009), Haltiwanger, Jarmin, Miranda (2010), (2012), Haltiwanger, Fort, Jarmin, Miranda (2012)
- **This paper**: Differential effect of financial shocks

Firm dynamics models

- Cooley, Quadrini (2001), Khan, Thomas (2013), Moll (2009)
- **This paper**: Analysis of labor market flows

Outline for Presentation

1. **Empirical Strategy and Data**
2. Empirical Results
3. Model
4. Calibration and Quantitative Results

Empirical Strategy

Causal effect of financial shocks on job creation and destruction?

$$y_{it} = \beta(L)\Delta hp_{it} + \epsilon_{it}$$
$$y_{it} \in \{\log(JobCreation_{it}),\ \log(JobDestruction_{it})\}$$

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Financial shocks measure?

- Use housing prices as proxy for shocks to collateral SSBF

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Sufficient observations?

- Use MSA-level variation in job flows and housing prices

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Financial shocks measure?

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Sufficient observations?

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Endogeneity?

Regression Specification

OLS Specification

$$y_{it} = \beta(L)\,\Delta hp_{it} + \epsilon_{it}$$

Regression Specification

OLS Specification

$$y_{it} = \alpha_i + \delta_t + \beta(L)\,\Delta hp_{it} + \epsilon_{it}$$

Regression Specification

OLS Specification

$$y_{it} = \alpha_i + \delta_t + \gamma(L)\,\Delta cyc_{it} + \beta(L)\,\Delta hp_{it} + \epsilon_{it}$$

Regression Specification

OLS Specification

$$y_{it} = \alpha_i + \delta_t + \gamma(L)\,\Delta cyc_{it} + \beta(L)\,\Delta hp_{it} + \epsilon_{it}$$

IV Specification

$$y_{it} = \alpha_i + \delta_t + \beta(L)\,\Delta\widetilde{hp}_{it} + \epsilon_{it} \qquad \text{(2nd stage)}$$

$$\Delta hp_{it} = \alpha_i + \delta_t + \rho_i(L)\Delta hp_t + u_{it} \qquad \text{(1st stage)}$$

Data Sources

Job flows

- Business Dynamics Statistics, US Census Bureau
- Variables: job creation/destruction by firm size/age by MSA
- Annual, 1982-2011
- Panel of 30 years $\times$ 366 MSAs

House price indices

- Federal Housing Finance Agency all-transactions price indices
- Quarterly, 1979-2011

MSA personal income

- Bureau of Economic Analysis
- Annual, 1979-2011

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Job Creation

	OLS	IV
Δhp_t	0.36**	0.31**
Δhp_{t-1}	0.18**	0.05
Δhp_{t-2}	-0.01	0.18**
Sum of coefs	0.52**	0.54**

- Job creation falls on impact after negative shock
- The shock has a persistent effect on job creation

Job Destruction

	OLS	IV
Δhp_t	-0.32**	-0.22
Δhp_{t-1}	0.12**	-0.45**
Δhp_{t-2}	0.27**	0.62**
Sum of coefs	0.08	-0.05

- Job destruction increases on impact after negative shock
- The shock has a persistent **lagged** effect on job creation

Category-Specific Regressions

OLS regression for category-specific job flows

$$y_{iht} = \alpha_i + \delta_t + \kappa_h + \gamma_h(L)\,\Delta cyc_{it} + \beta_h(L)\,\Delta hp_{it} + \epsilon_{iht}$$

IV regression for category-specific job flows

$$y_{iht} = \alpha_i + \delta_t + \kappa_h + \beta_h(L)\,\Delta \widetilde{hp}_{it} + \epsilon_{iht} \qquad \text{(2nd stage)}$$

$$y_{iht} \in \{\log(JobCreation_{iht}),\ \log(JobDestruction_{iht})\}$$

Job Creation by Firm Age

Categories	OLS	IV
Births	1.05**	0.80**
Young Firms, 1-5 years	0.80**	0.87**
Mature Firms, 5+ years	-0.70**	-0.96**
H = Births - Mature	1.74**	1.76**

- Job creation by new and young firms decline after negative shock
- Job creation by mature firms increase after negative shock

Job Destruction by Firm Age

Categories	OLS	IV
Young Firms, 1-5 years	0.44**	0.44**
Mature Firms, 5+ years	-0.26**	-0.57**
H = Young - Mature	0.70**	1.02**

- Job destruction by young firms falls after negative shock
- Job destruction by mature firms increases after negative shock

Job Creation by Firm Size

Categories	OLS	IV (Bartik)
1-19 employees	0.34**	0.20**
20-99 employees	0.86**	0.84**
100+ employees	0.49**	0.70**
(20-99 emp) - (1-19 emp)	0.52**	0.64**

- Middle-sized firms are the most sensitive to financial shock

Job Destruction by Firm Size

Categories	OLS	IV
1-19 employees	-0.34**	-0.46**
20-99 employees	0.15**	0.001
100+ employees	0.83**	0.93**
(20-99 emp) - (1-19 emp)	0.48**	0.46**

- Job destruction by small firms increases after negative shock
- Job destruction by middle-sized and large firms falls after negative shock

Outline for Presentation

1. Empirical Strategy and Data
2. Empirical Results
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4. Calibration and Quantitative Results

Economic Environment

- Time: $t = 0, 1, 2, ...$
- Goods: consumption good (c)
- Assets: capital, riskless bonds
- Technology: $y_i = z\epsilon_i \left(k_i^{\alpha} n_i^{1-\alpha}\right)^{\phi}$
- Agents:
  - Households — Full Problem
  - Firms — Full Problem
  - Intermediaries — Full Problem

$k \leq \chi a$

Today

- No aggregate uncertainty: $z, \chi = const$
- Idiosyncratic productivities are constant: $\epsilon = const$
  - Two types of productivity: $Pr(\epsilon = \epsilon_H) = \pi$, $Pr(\epsilon = \epsilon_L) = 1 - \pi$
- Only exogenous firm entry and exit
  - $Pr(exit) = \sigma$, $Pr(entry) = \sigma$
- Recursive Equilibrium Definition
  - Stationary Equilibrium: $w, r_k, r, \Lambda = const$
  - Transition path with endogenous wages

Stationary Equilibrium

Households

$$r = \frac{1}{\beta} - 1$$
$$w = v'(n)$$

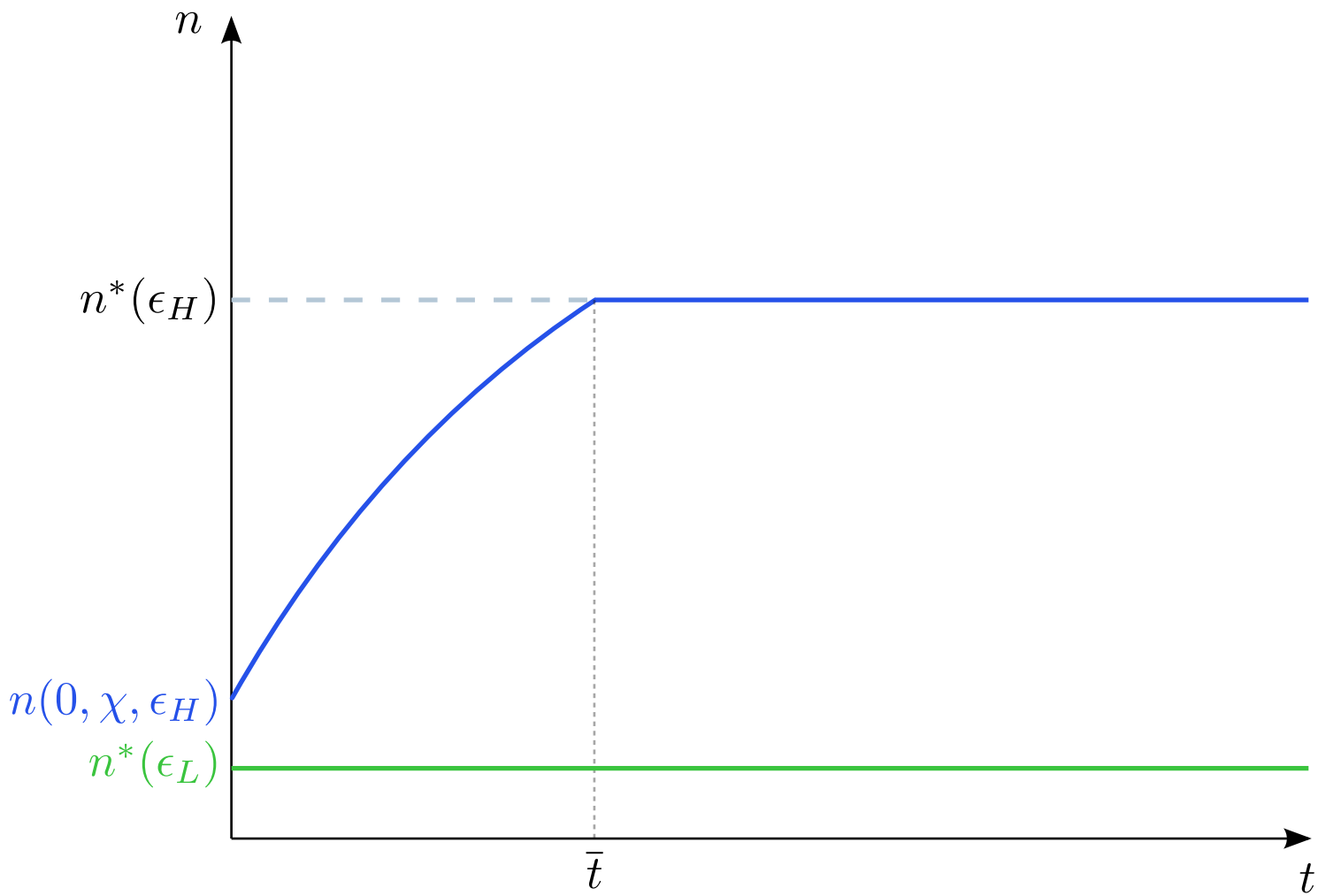
Intermediaries

$$r_k = r + \delta$$

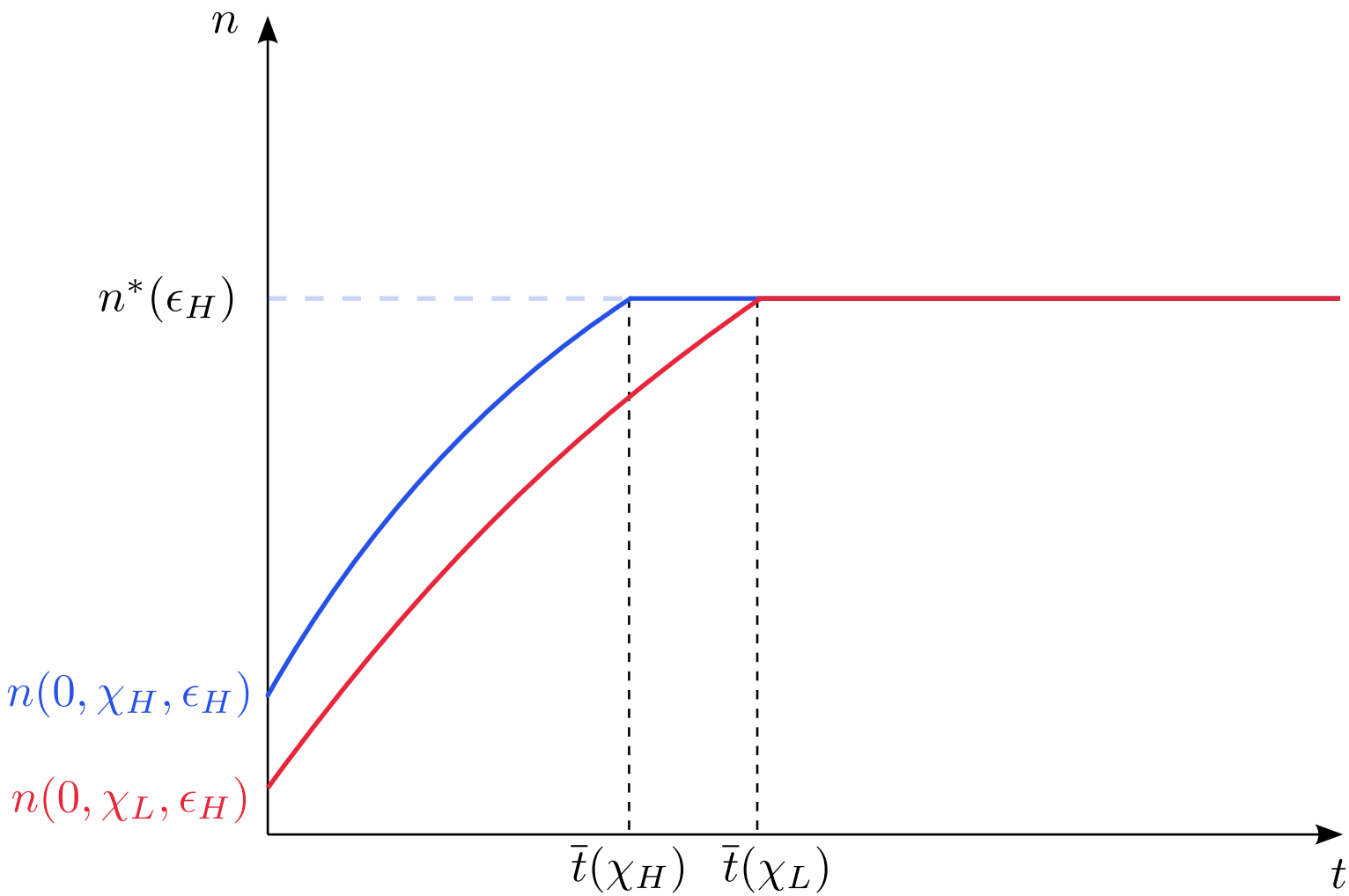
Firms

$$MPN = w$$
$$MPK = r_k + \frac{\eta}{\lambda}$$

Firm Dynamics



Firm Dynamics and Financial Shock



Total Job Creation and Destruction

Partial Equilibrium Effect

- $N^d(\chi_L, w) < N^d(\chi_H, w)$
- $JC(\chi_L, w) < JC(\chi_H, w)$
- $JD(\chi_L, w) < JD(\chi_H, w)$

General Equilibrium Effect

- $N\left[\chi_L, w(\chi_L)\right] < N\left[\chi_H, w(\chi_H)\right]$
- $JC\left[\chi_L, w(\chi_L)\right] < JC\left[\chi_H, w(\chi_H)\right]$
- $JD\left[\chi_L, w(\chi_L)\right] < JD\left[\chi_H, w(\chi_H)\right]$

Outline for Presentation

1. Empirical Strategy and Data
2. Empirical Results
3. Model
4. **Calibration and Quantitative Results**

Calibration Strategy

- Choose levels of permanent productivity to target size categories in Business Dynamics Statistics (BDS)
- Choose distribution of permanent productivity to match size distribution of mature firms employment in BDS, 2000-2006

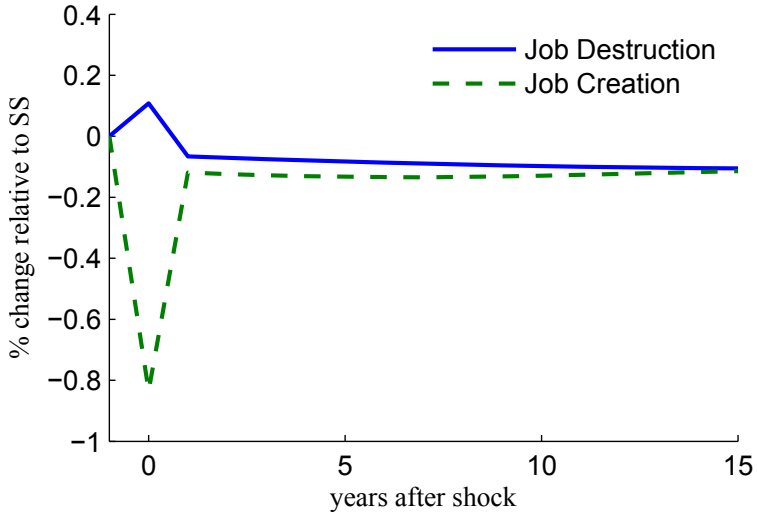
Model vs. Data

- Choose firm exit rates to match empirical distribution of firms using BDS averages, 2000-2006
- Jointly choose collateral constraint and initial assets to target distribution of employment by firm age and firm size

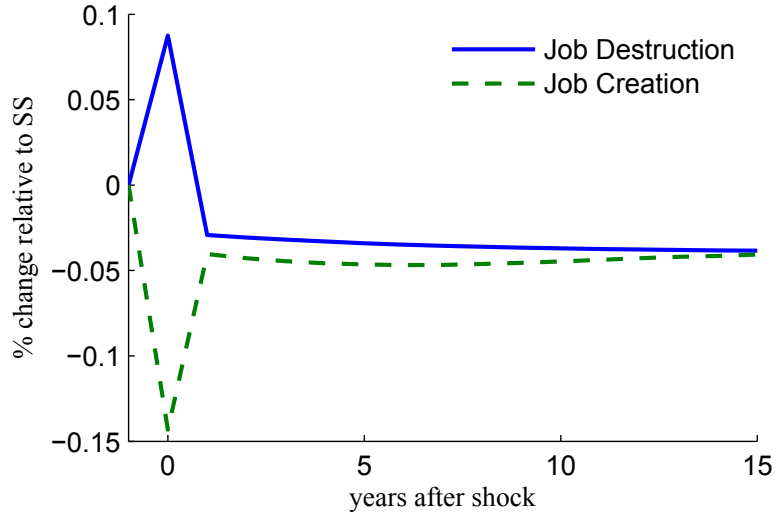
Parameters

Transition Paths

(a) Financial Shock (Frisch=∞)



(b) Financial Shock (Frisch=5)



(c) Productivity Shock (Frisch=∞)

(d) Productivity Shock (Frisch=5)

Age and Size Effects

		Permanent Financial Shock	Financial Shock	Permanent Productivity Shock
		Model	*Data*	*Model*
Job Creation				
Age	Births	-0.09	-	-0.01
	1-5 years	-0.37	-	-0.02
	5+ years	0.09	+	-0.04
Size	1-19 emps	0.07	+	-0.02
	20-99 emps	-0.22	-	-0.03
	100+ emps	-0.15	-	-0.03
Job Destruction				
Age	1-5 years	-0.04	-	0.02
	5+ years	0.03	+	0.09
Size	1-19 emps	0.08	+	0.06
	20-99 emps	-0.06	-	0.06
	100+ emps	0.01	-	0.08

Next Steps

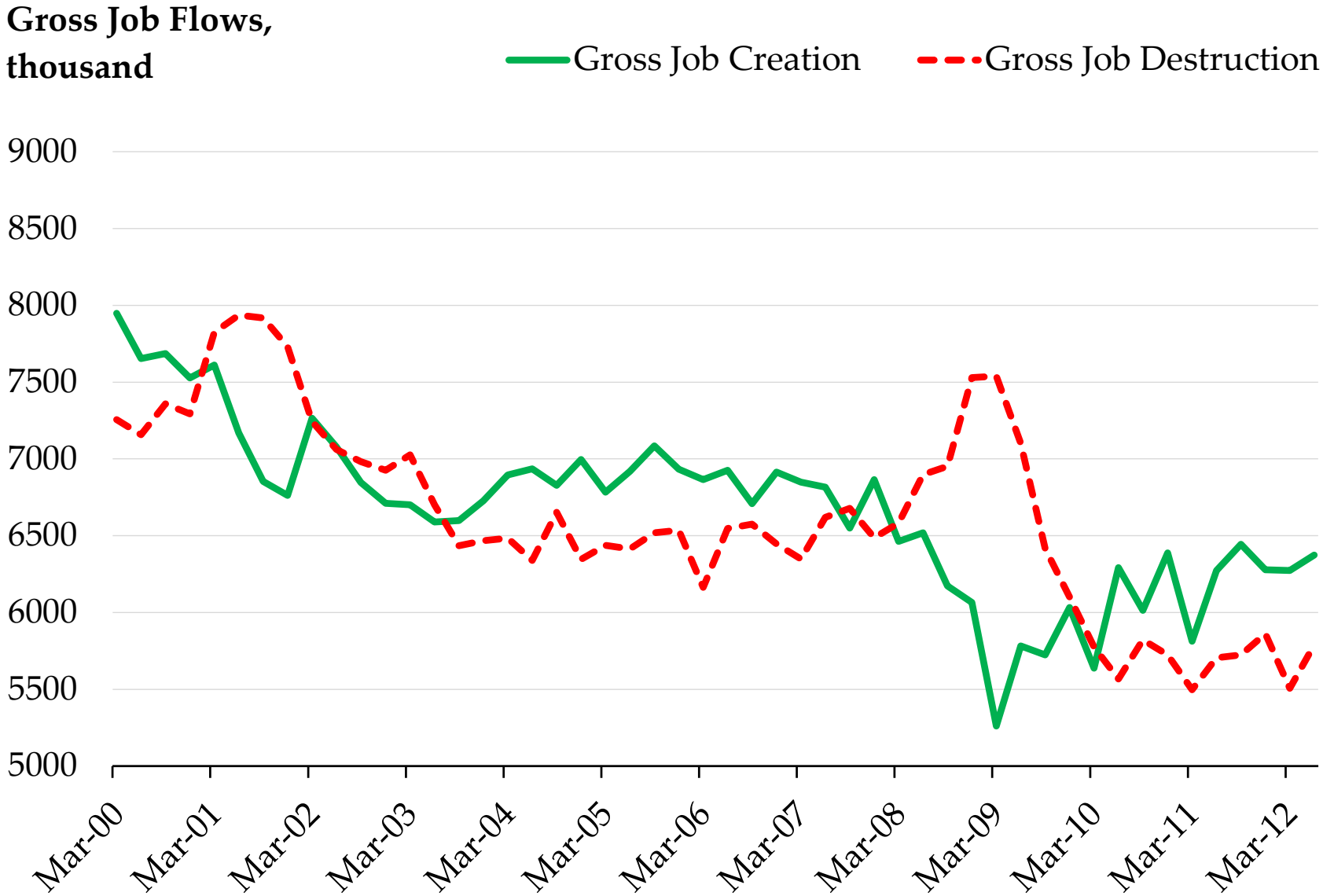
- Idiosyncratic shocks to match job flows level and distribution
- Active firm entry and exit margin
- Implications for net employment growth
- Implications for labor productivity and TFP

Conclusion

- Evidence that housing crises diminish job flows
- Evidence of strongest effects for new and medium-sized firms
- Present firm dynamics model with financial frictions
- Model qualitatively matches job flows behavior across firm age and size

Additional Slides

Job Flows without Construction



Back

Evidence of Credit Constraints for Small Businesses

- Of firms that had mortgages, 40% used personal real estate as collateral
- Of firms that had credit lines, 62% required collateral, of which 11% was personal real estate

		Firms whose employment . . .			
Percentage of Small Businesses with . . .	All	Expanded	Contracted	Did not Change	New Firms
Use of Personal Credit Card	44%	43%	39%	45%	46%
Use of Business Credit Card	54%	65%	64%	49%	41%
Using Credit Line	**45%**	**65%**	**56%**	**38%**	**28%**
Using Mortgage	**16%**	**22%**	**17%**	**15%**	**13%**
Using Equipment Loan	15%	23%	23%	12%	7%
Request Credit	26%	39%	27%	22%	22%
Median Equity in Residence	$200,000	$250,000	$200,000	$180,000	$140,000

Back

Households

$$V^H(a,x) = \max_{c,n,a'} \left\{ u\left[c - v(n)\right] + \beta \int V^H(a',x') d\Phi(x'|x) \right\}$$

$$\text{s.t.} \quad c + a' = wn + (1+r)a + \Pi$$

- $x = \{z, \chi, \mu\}$ - aggregate state
- μ - distribution of firms over state space

Back

Firms

$$V^F(\epsilon, a, x) = \max_{k,n,a'} \int \left\{ \sigma \Lambda' a' + (1-\sigma) V^F(\epsilon', a', x') \right\} d\Phi(x'|x) dG(\epsilon'|\epsilon)$$

$$\text{s.t.} \quad a' = z\epsilon \left(k^\alpha n^{1-\alpha}\right)^\phi - r_k k - wn + (1+r)a$$

$$k \leq \chi a$$

- $x = \{z, \chi, \mu\}$ - aggregate state
- Λ - stochastic discount factor

Endogenous Entry and Exit
Back

Intermediaries

- Sell one-period riskless bonds for r
- Rent out capital for r_k
- Zero-profit condition:

$$r_k = r + \delta$$

Back

Recursive Equilibrium Definition

A collection of functions $V^H(a,x), V^F(\epsilon,a,x), c(a,x), a'_H(a,x)$, $n(\epsilon,a,x), k(\epsilon,a,x), a'_F(\epsilon,a,x)$, $w(x), r(x), r_k(x)$, $\Gamma(x)$, $\Lambda(x)$ such that

1. households, firms, intermediaries optimize;
2. capital, labor, goods markets clear;
3. Γ: for all Borel $\mathcal{E} \times \mathcal{A} \in \mathbf{R}^+ \times \mathbf{R}^+$

$$\mu'(\mathcal{E} \times \mathcal{A}) = (1-\sigma) \int_{\epsilon' \in \mathcal{E}} \int_{(\epsilon,a) \in \mathcal{B}(x,\mathcal{A})} d\mu(\epsilon,a) dG(\epsilon'|\epsilon) + \sigma \mathbb{1}\left(a_0 \in \mathcal{A}\right) G_0(\mathcal{E})$$

where $\mathcal{B}(x,\mathcal{A}) = \{(\epsilon,a) : \pi(x,\epsilon,a) + (1+r(x))a \in \mathcal{A}\}$.

given μ_0.

Endogenous Entry and Exit

Back

Endogenous Entry and Exit

Incumbent

$$V^F(\epsilon, a, x) = \max\Big\{0, -c_F + \max_{k,n,a'} \int \Big[\sigma\Lambda' a' + (1-\sigma)V^F(\epsilon', a', x')\Big] d\Phi(x'|x) dG(\epsilon'|\epsilon)\Big\}$$

$$\text{s.t.} \quad a' = z\epsilon\left(k^\alpha n^{1-\alpha}\right)^\phi - r_k k - wn + (1+r)a$$
$$k \leq \chi a$$

Would-be Firm

$$V^E(\epsilon, a_0, x) = \int V^F(\epsilon', a_0, x') d\Phi(x'|x) dG(\epsilon'|\epsilon)$$

Entry Decision

$$V^E(\epsilon, a_0, x) \geq c_E$$

Back

Endogenous Entry and Exit

A collection of functions $V^H(a,x), V^F(\epsilon,a,x), c(a,x), a'_H(a,x)$, $n(\epsilon,a,x), k(\epsilon,a,x), a'_F(\epsilon,a,x)$, $w(x), r(x), r_k(x)$, $\Gamma(x)$, $\Lambda(x)$ such that

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where

$$\begin{aligned}\mathcal{B}_E(x,\mathcal{A}) &= \{(\epsilon,a_0) : V^E(\epsilon,a_0,x) \geq c_E\}, \\ \mathcal{B}(x,\mathcal{A}) &= \{(\epsilon,a) : V^F(\epsilon,a,x) > 0, \pi(x,\epsilon,a) + (1+r(x))a \in \mathcal{A}\}\end{aligned}$$

given μ_0.

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Calibration

Aggregate Parameters		Value
Discount rate	β	0.96
Depreciation rate	δ	0.1
Capital share	α	0.3
Decreasing returns	ϕ	0.95
Frisch elasticity	ν	$(0, \infty)$
Initial assets	a_0	8
Collateral constraint	χ	20

Back

Employment Across Firm Age/Size (%)

	1-19 emps	20-99 emps	100+	**Total**
Data				
Births	1.5	0.8	0.6	**2.8**
1-5 years	5.7	3.4	3.0	**12.1**
5+ years	12.1	13.6	59.3	**85.0**
Total	**19.3**	**17.8**	**62.9**	
Model				
Births	2.9	0.2	0.0	**3.0**
1-5 years	6.1	6.1	1.6	**13.7**
5+ years	11.1	15.6	56.6	**83.2**
Total	**20.0**	**21.8**	**58.2**	

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