Financial Markets and Unemployment

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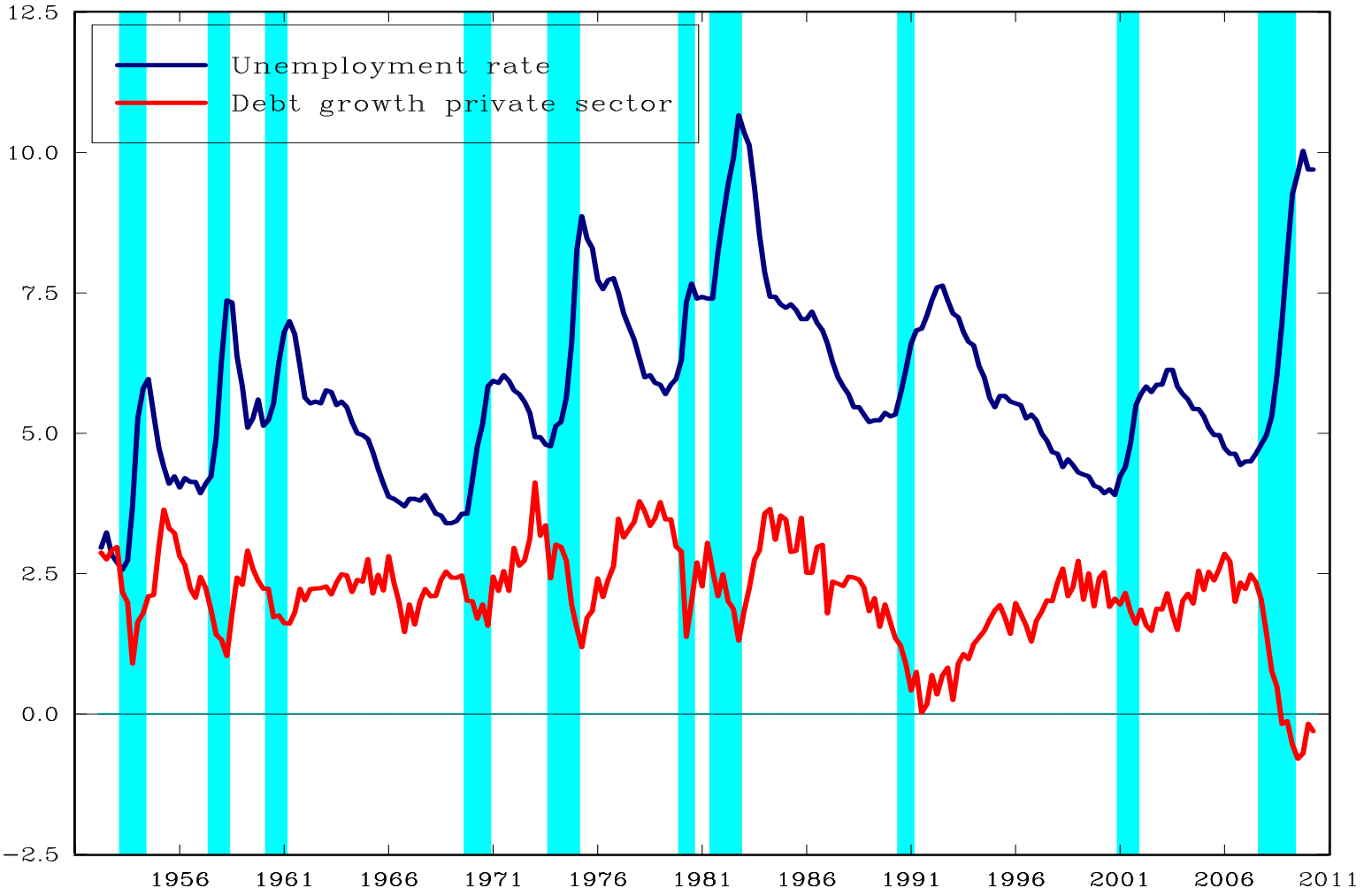
WHY FINANCIAL MARKETS?

Strong comovement unemployment and debt flows

Recessions more severe and long-lasting with banking crisis.



POSSIBLE LINKS?

- As a consequence of a credit contraction, employers lack the liquidity for investment and hiring:
  - *Credit Channel*.

- As a consequence of a credit contraction, employers face weaker bargaining conditions with workers.
  - *Bargaining channel.*

THEORETICAL INTUITION

- Suppose that there are only two periods. No discounting.
  - **Period 1**: The firm issues debt b and hires a worker.
  - **Period 2**: The firm produces z and splits the net surplus:

    Wage $= \frac{1}{2}(z-b)$, Dividend $= \frac{1}{2}(z-b)$

- The value of hiring a worker in period 1 (**Value of a Match**) is:

$$b + \frac{1}{2}(z-b)$$

MODEL

- Agents have utility $\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t c_t$.
  - They could be employed or unemployed.
  - They are the owners of firms. The interest rate is $r = 1/\beta - 1$.

- A firm is created when a vacancy is filled with an unemployed worker.
  - The cost of posting a vacancy is κ.
  - A vacancy is filled with probability $q_t = m(v_t, u_t)/v_t$.
  - An unemployed worker finds a job with probability $p_t = m(v_t, u_t)/u_t$.
  - The match is separated with probability λ.

- Wages are determined through bargaining (η=**Workers' Power**).

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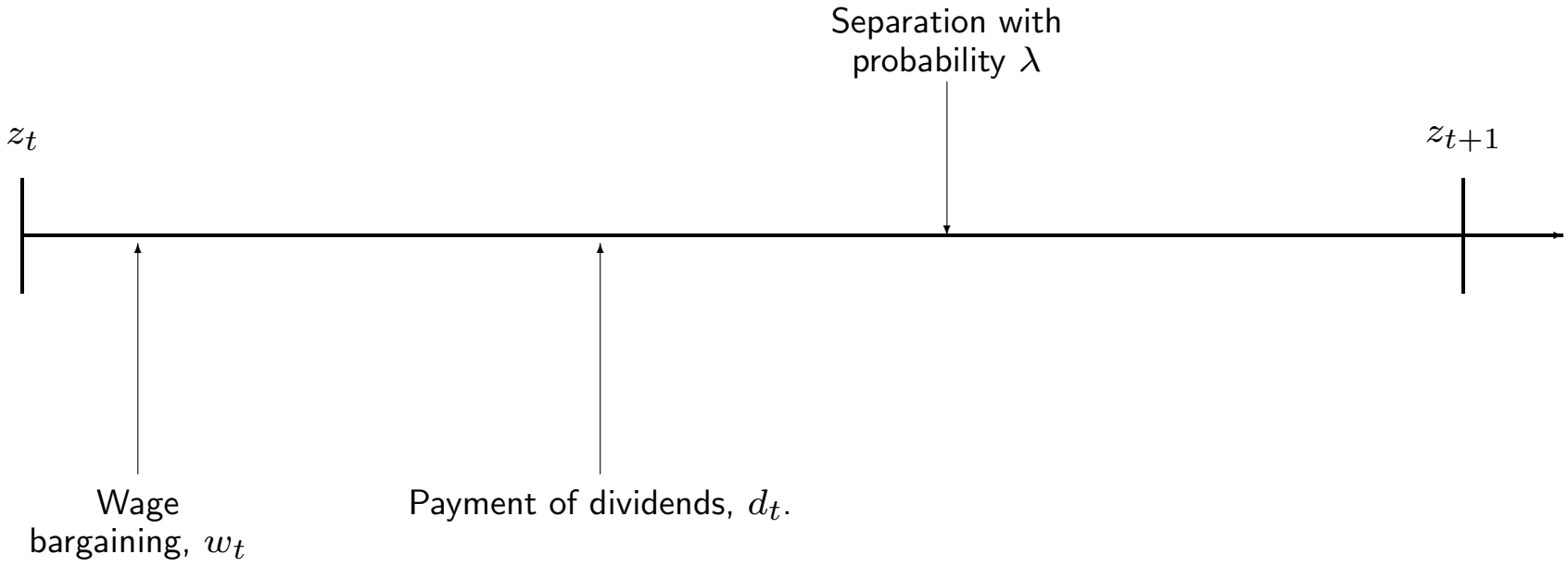
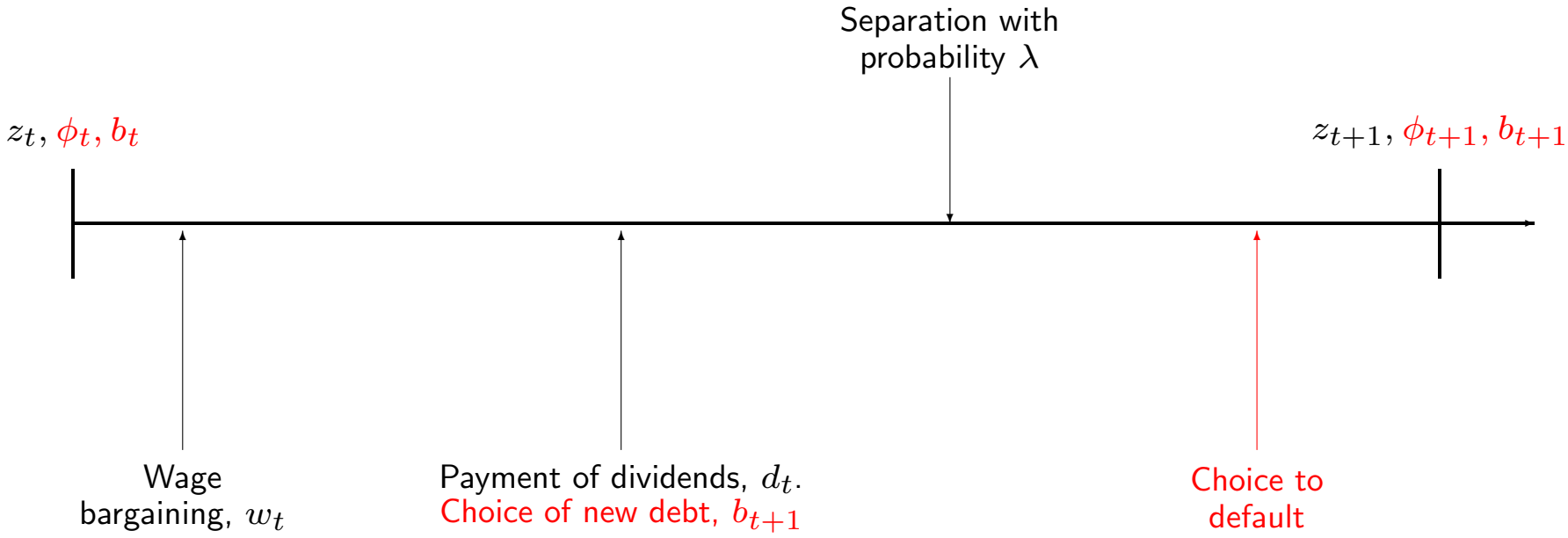
- Added features:
  1. Firms can issue debt b_t and pay dividends $d_t = z_t - w_t + \frac{b_{t+1}}{R} - b_t$.
  2. There are credit shocks (ϕ_t) that affect the borrowing limit.

TIMING FOR INCUMBENTS
Standard model



TIMING FOR INCUMBENTS

Standard model with added features



BORROWING LIMIT

Firm's value:

$$J_t(b_t) = d_t + \beta(1-\lambda)\mathbb{E}_t J_{t+1}(b_{t+1})$$

Enforcement constraint:

$$\phi_t \mathbb{E}_t J_{t+1}(b_{t+1}) \geq b_{t+1}$$

WAGE BARGAINING

Bargaining problem:

$$\max_{w_t} \left\{ \hat{J}_t(b_t, w_t)^{1-\eta} \left[\hat{W}_t(b_t, w_t) - U_t \right]^{\eta} \right\}$$

Wage equation:

$$w_t = \eta \cdot (z_t - b_t) + \eta \cdot \left\{ \frac{[p_t + (1-\lambda)\phi_t]\kappa}{q_t(1+\phi_t)(1-\lambda)} \right\}$$

CHOICE OF DEBT

$$J_t = \max_{b_{t+1}} \left\{ z_t - w_t - b_t + \frac{b_{t+1}}{R} + \beta(1-\lambda)(1-\eta)\mathbb{E}_t S_{t+1}(b_{t+1}) \right\}$$

subject to

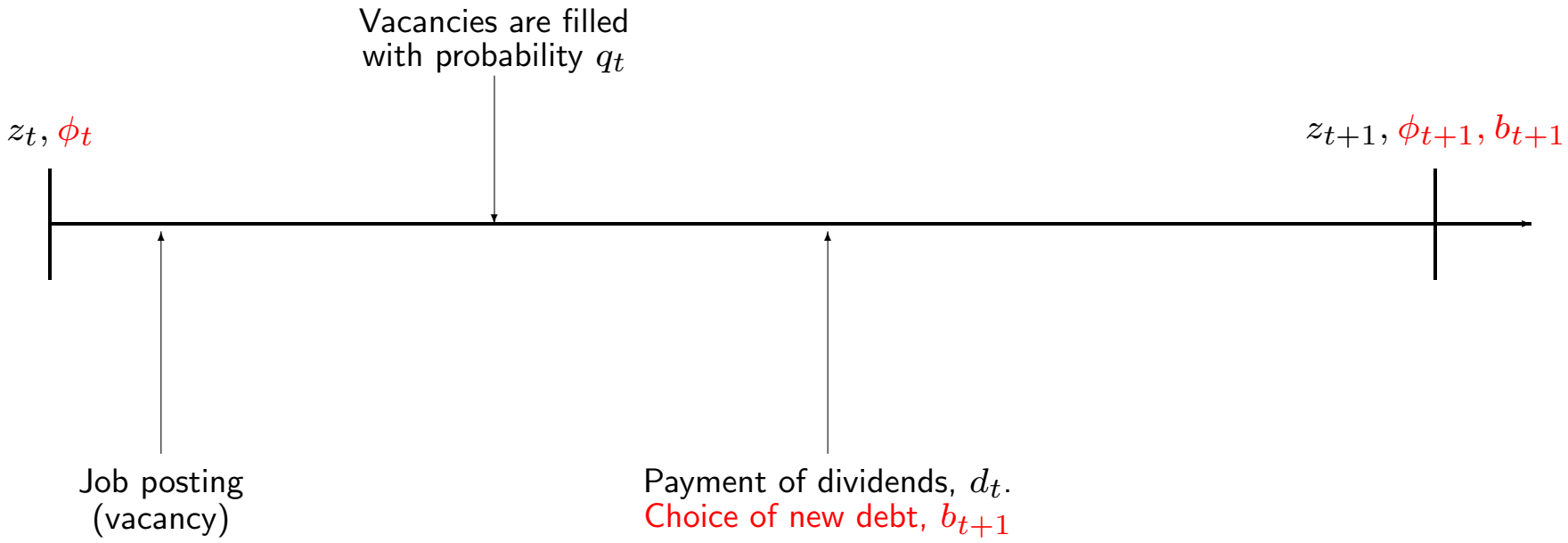
$$(1-\eta)\phi_t \mathbb{E}_t S_{t+1}(b_{t+1}) \geq b_{t+1}$$

First order condition

$$\mu_t = \underbrace{\left(\frac{1}{1+(1-\eta)\phi_t}\right)}_{\substack{\text{Total change} \\ \text{in debt}}} \times \underbrace{\left(\frac{1}{R} - \frac{1-\eta}{R}\right)}_{\substack{\text{Marginal gain} \\ \text{from borrowing}}}.$$

RESULT: Borrowing constraint binding if $\eta > 0$.

TIMING FOR NEW FIRMS AND JOB CREATION



FREE ENTRY AND JOB CREATION

$$q_t Q_t = \kappa$$

- q_t = Probability of finding a worker.
- Q_t = Value of a filled vacancy.
- κ = Cost of posting a vacancy.

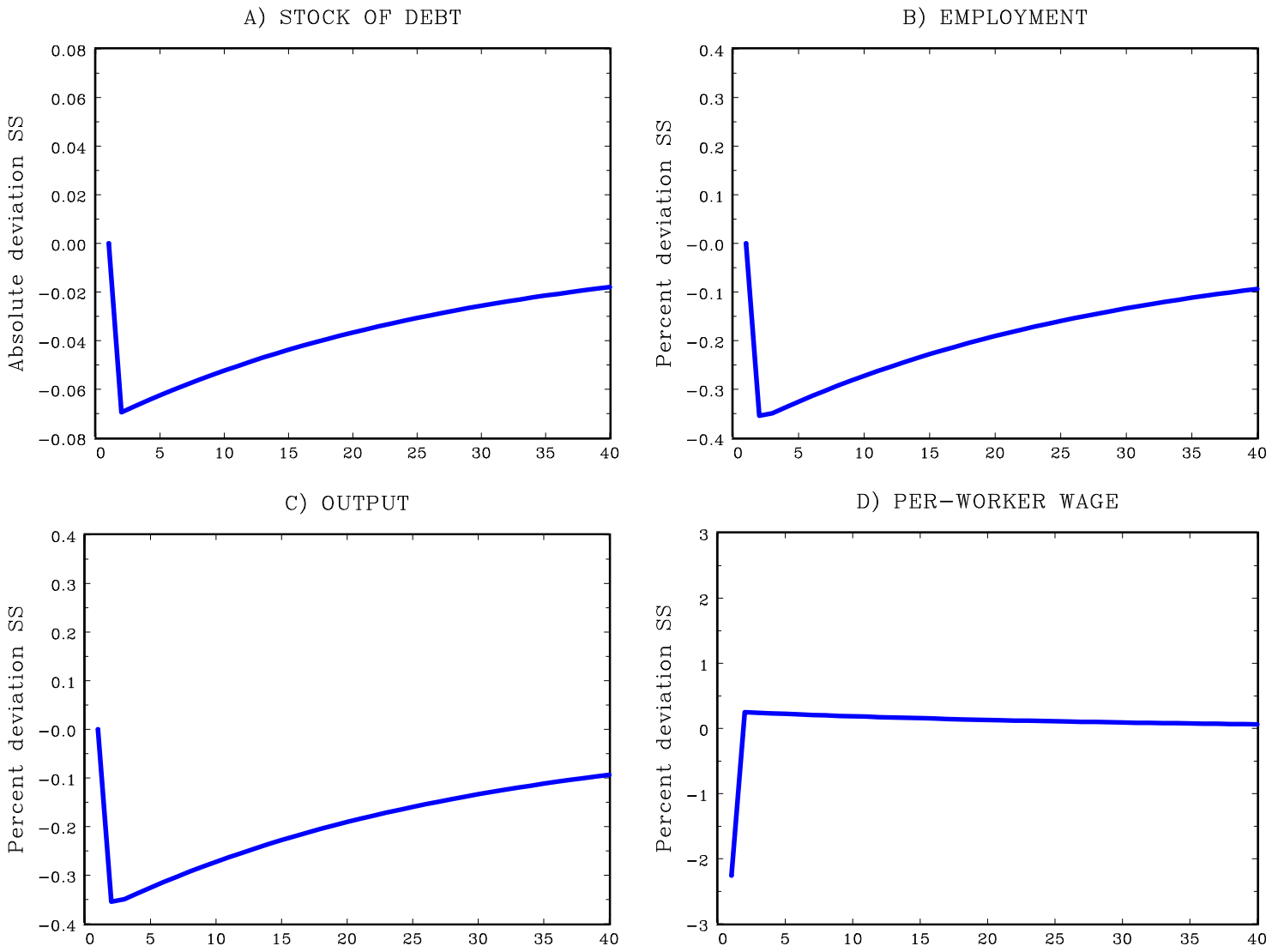
SENSITIVITY OF Q_t TO CREDIT SHOCK

$$\frac{\partial Q_t}{\partial \phi_t} = \eta \cdot \left[\frac{\beta \mathbb{E}_t J_{t+1}(b_{t+1})}{1 + \phi_t(1-\eta)} \right]$$

NUMERICAL IMPULSE RESPONSES

Description	*Value*
Discount factor for entrepreneurs, β	0.990
Matching parameter, $\bar{\xi}$	0.773
Matching parameter, α	0.649
Relative bargaining power, η	0.672
Probability of separation, λ	0.049
Cost of posting vacancy, κ	0.711
Utility flow unemployed, a	0.468
Enforcement parameter, $\bar{\phi}$	3.637

Response credit shock



EXTENSION: Monopolistic competition

- Each firm is a monopolistic producer of differentiated goods, y_i.
- Aggregate production: $Y = \left(\int_0^N y_i^{\varepsilon} \mathrm{d}i \right)^{\frac{1}{\varepsilon}}$
- Demand function: $P_i = Y^{1-\varepsilon} y_i^{\varepsilon - 1}$
- Production: $y_i = z l_i$; Cost: $\frac{A l_i^{1+\varphi}}{1+\varphi}$.

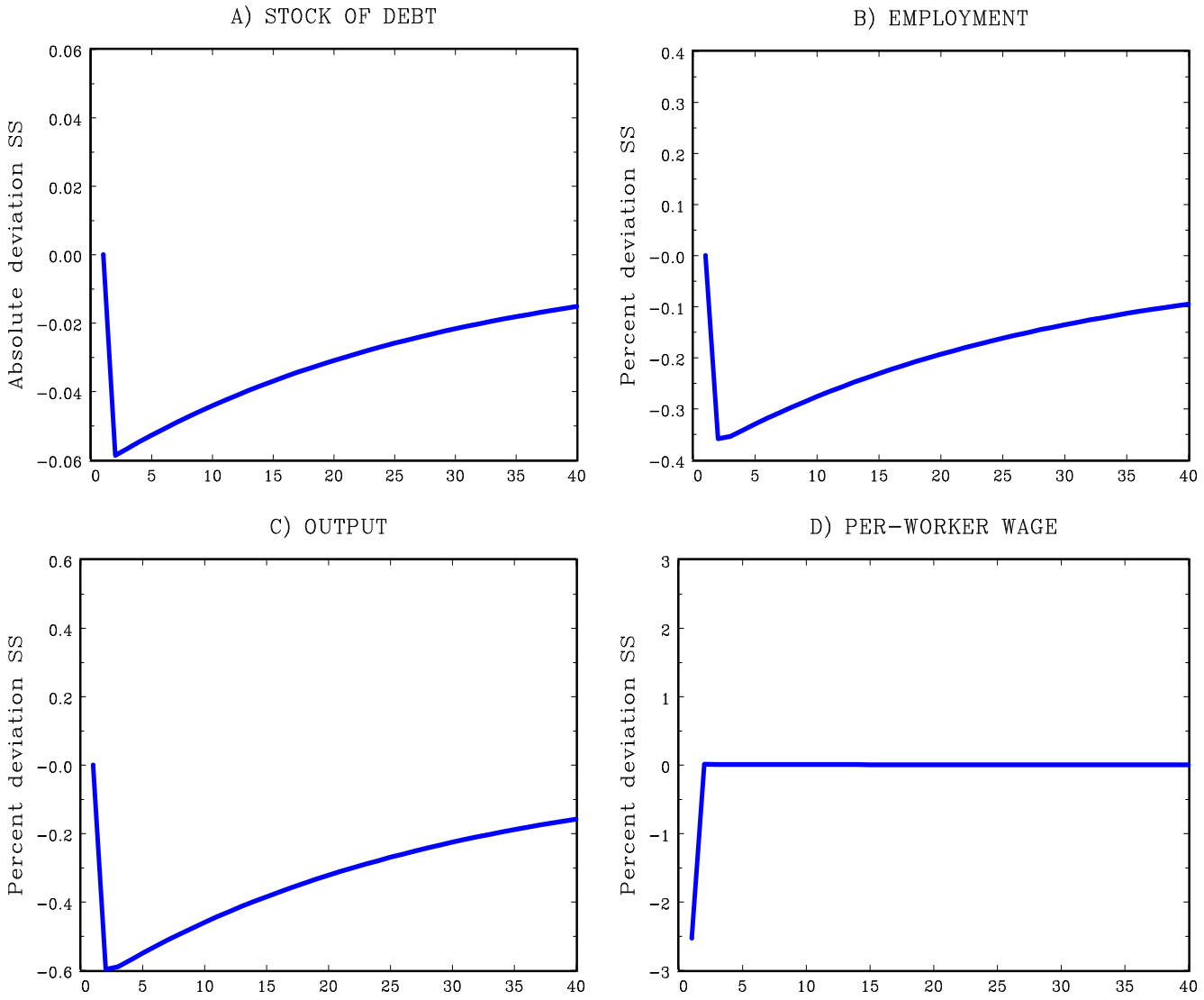
IN REDUCED FORM: Replace z_t with $\tilde{z}_t N_t^{\nu}$.

PARAMETERS

- Price mark-up, $\frac{1}{\varepsilon} - 1 = 0.33$.

- Elasticity of intensive margin $\frac{1}{\varphi} = 1$.

Response credit shock



STRUCTURAL ESTIMATION

- Three AR(1) shocks:
  1. Productivity, z_t
  2. Credit, ϕ_t
  3. Matching, ξ_t

- Three empirical variables in first differences:
  1. Log-GDP, Y_t
  2. Log-employment, N_{t+1}
  3. New debt over GDP in business sector, $\frac{B_{t+1}-B_t}{Y_t}$

- Three parameters are pre-determined: β, λ, κ.

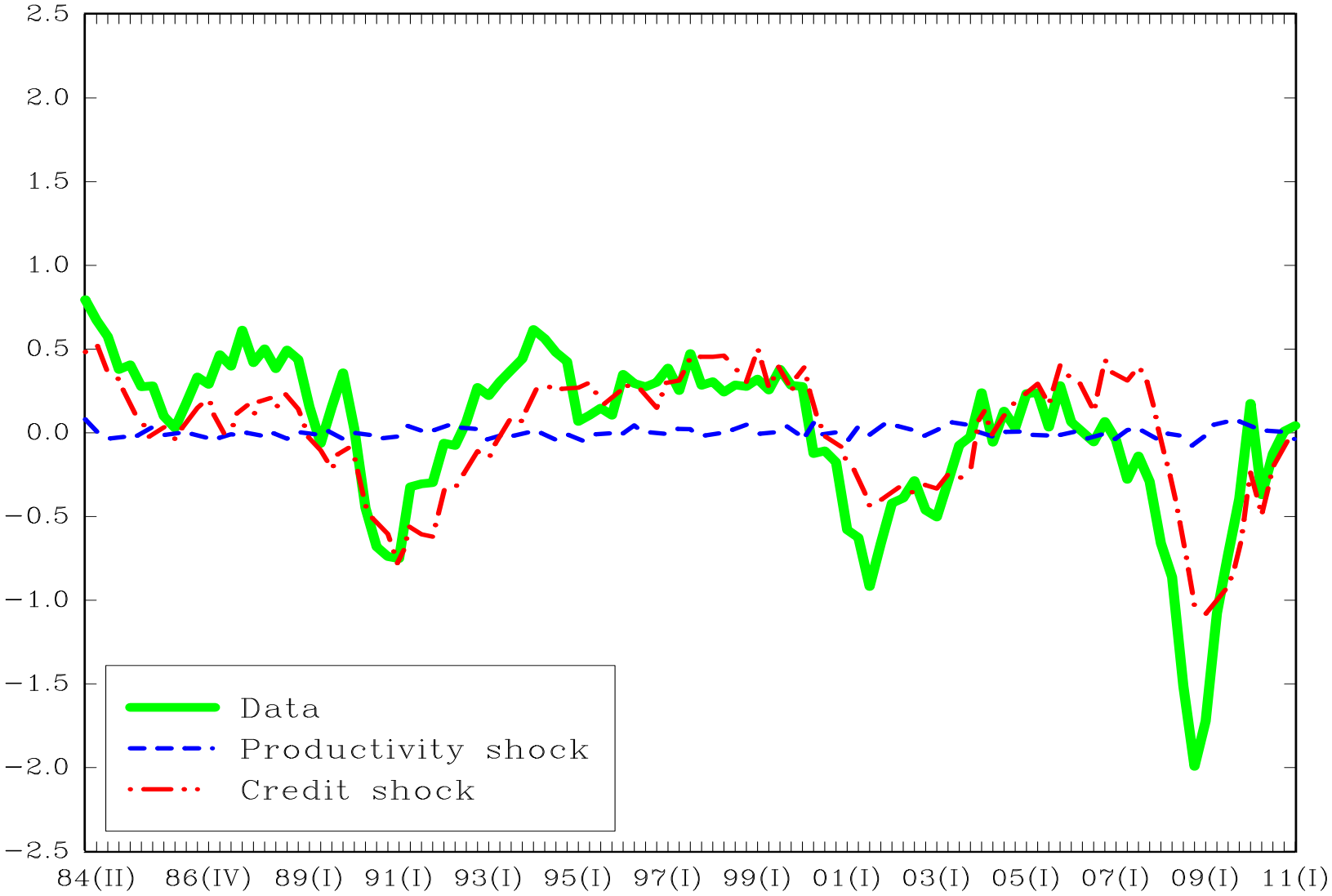
PARAMETERS

Estimated parameter	*Prior[mean,std]*	*Mode*	*Posterior thresholds*	
			Below 5%	*Below 95%*
Productivity shock persistence, ρ_z	Beta[0.5,0.20]	0.944	0.937	0.968
Productivity shock volatility, σ_z	IGamma[0.001,0.05]	0.005	0.004	0.006
Credit shock persistence, ρ_ϕ	Beta[0.5,0.20]	0.965	0.954	0.970
Credit shock volatility, σ_ϕ	IGamma[0.001,0.05]	0.143	0.135	0.155
Matching shock persistence, ρ_ξ	Beta[0.5,0.20]	0.983	0.977	0.987
Matching shock volatility, σ_ξ	IGamma[0.001,0.05]	0.056	0.052	0.062
Matching share parameter, α	Beta[0.5,0.1]	0.650	0.638	0.656
Bargaining power workers, η	Beta[0.5,0.1]	0.674	0.676	0.696
Utility flow unemployed, a	Beta[0.4,0.1]	0.470	0.433	0.463
Mean enforcement parameter, $\bar{\phi}$	IGamma[8,5]	3.621	3.607	3.654
Mark-up parameter, ε	Beta[0.8,0.05]	0.937	0.932	0.954
Elasticity of effort, φ	Beta[1,0.2]	1.033	1.002	1.035

VARIANCE DECOMPOSITION

	TFP shock z	*Credit shock* ϕ	*Matching shock* ξ
Output	46.2	29.2	24.6
Employment	0.4	54.1	45.5
New debt/output	0.1	66.7	33.1
Hourly wage	12.0	57.0	31.0

Quarter-by-quarter decomposition



TESTING THE BARGAINING CHANNEL
Quadrini & Sun (2012)

- We start from an industry dynamics model.

- Model is an extension of the previous model:
  - Multi-workers firms.
  - Firm-level idiosyncratic shocks to productivity and credit.
  - Collectively bargaining of wages.
  - The bargaining power of workers η differ across firms.
  - Partial equilibrium analysis.

Optimality condition for hiring

$$\beta\left[(1-\eta)\mathbb{E}_t\bar{s}_{t+1}+\frac{\eta g^B_{t+1}b_t}{g^N_{t+1}}\right]=\Upsilon'\left(g^N_{t+1}-1+\lambda\right)$$

LINEARIZED OPTIMALITY CONDITION

$$g^N_{t+1} = \alpha_c + \alpha_s \cdot \mathbb{E}_t \bar{s}_{t+1} + \alpha_b \cdot b_t + \alpha_g(\eta) \cdot g^B_{t+1}$$

where

$$\alpha_s = \frac{(1-\eta)\gamma(g^N - 1 + \lambda)g^N}{[\eta\gamma(g^N - 1 + \lambda)/g^N + \eta(1-\gamma) + (1-\eta)(1-\gamma)(1+\xi)/\xi]bg^B},$$

$$\alpha_b = \frac{\eta\gamma(g^N - 1 + \lambda)}{[\eta\gamma(g^N - 1 + \lambda)/g^N + \eta(1-\gamma) + (1-\eta)(1-\gamma)(1+\xi)/\xi]b},$$

$$\alpha_g(\eta) = \frac{\eta\gamma(g^N - 1 + \lambda)}{[\eta\gamma(g^N - 1 + \lambda)/g^N + \eta(1-\gamma) + (1-\eta)(1-\gamma)(1+\xi)/\xi]g^B}$$

TESTING HYPOTHESIS

The sensitivity of employment to credit increases with the bargaining power of workers.

EMPIRICAL EQUATION

$$
\begin{aligned}
\Delta employ_{it} \quad = \quad & \beta_1 \cdot union_{cic,t} \cdot \Delta debt_{it} + \\
& \beta_2 \cdot union_{cic,t} + \\
& \beta_3 \cdot \Delta debt_{it} + \\
& \beta_4 \cdot leverage_{it-1} + \\
& \beta_5 \cdot \log(employ_{it-1}) + \\
& \beta_6 \cdot Q_{it} + \\
& \beta_7 \cdot cashflow_{it} + \nu_i + \tau_t + \varepsilon_{it}
\end{aligned}
$$

		Unionization Rate	
		High	Low
$union_{cic,t} \cdot \Delta debt_{it}$	**0.252*****		
	(0.087)		
$union_{cic,t}$	**-0.009**		
	(0.111)		
$\Delta debt_{it}$	**0.051*****	**0.092*****	**0.051*****
	(0.010)	(0.011)	(0.009)
$leverage_{it-1}$	**-0.038**	**0.003**	**-0.088****
	(0.025)	(0.031)	(0.038)
$\log(employ_{t-1})$	**-0.314*****	**-0.352*****	**-0.292*****
	(0.022)	(0.047)	(0.028)
Q_{it}	**0.018*****	**0.034*****	**0.011**
	(0.007)	(0.013)	(0.009)
$cashflow_{it}$	**0.118*****	**0.138*****	**0.117*****
	(0.025)	(0.048)	(0.029)
Firm Fixed Effects	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes
Adjusted R^2	0.40	0.41	0.39
Observations	9,148	4,441	4,707

CONCLUSION

- We have proposed a mechanism through which leverage affects the hiring decision of employers.
- The mechanism is not based on the typical credit channel but on the wage determination process.
- This may explain why in a tight credit market firms do not invest and hire even if they are not short of cash.
- The mechanism finds empirical support at the micro level.