Financial Markets and Unemployment

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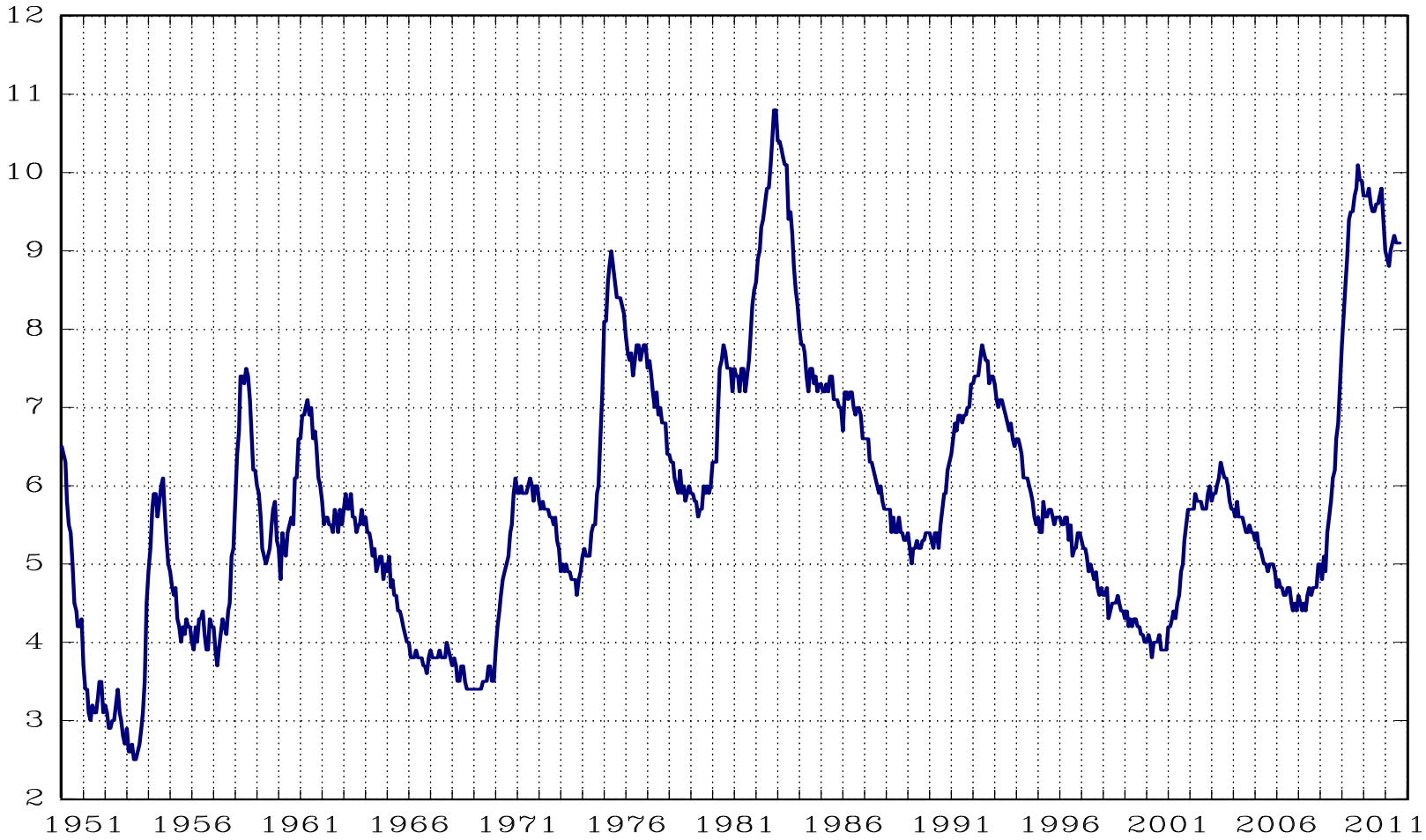
October 28, 2011

WHAT IS DIFFERENT?

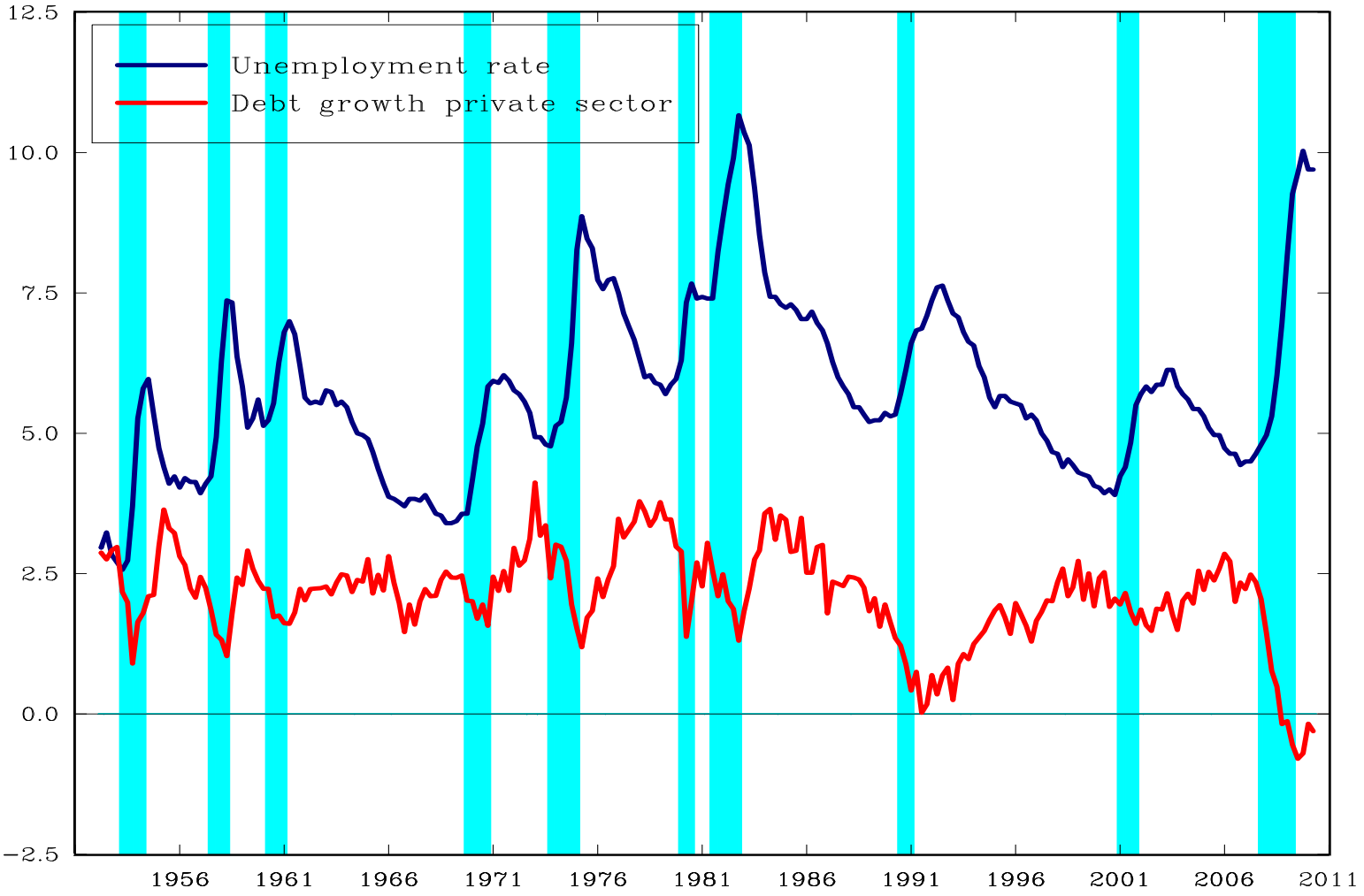
The unemployment hike has proven to be very persistent.



WHY FINANCIAL MARKETS?

Strong comovement unemployment and debt flows

Recessions more severe and long-lasting with banking crisis.

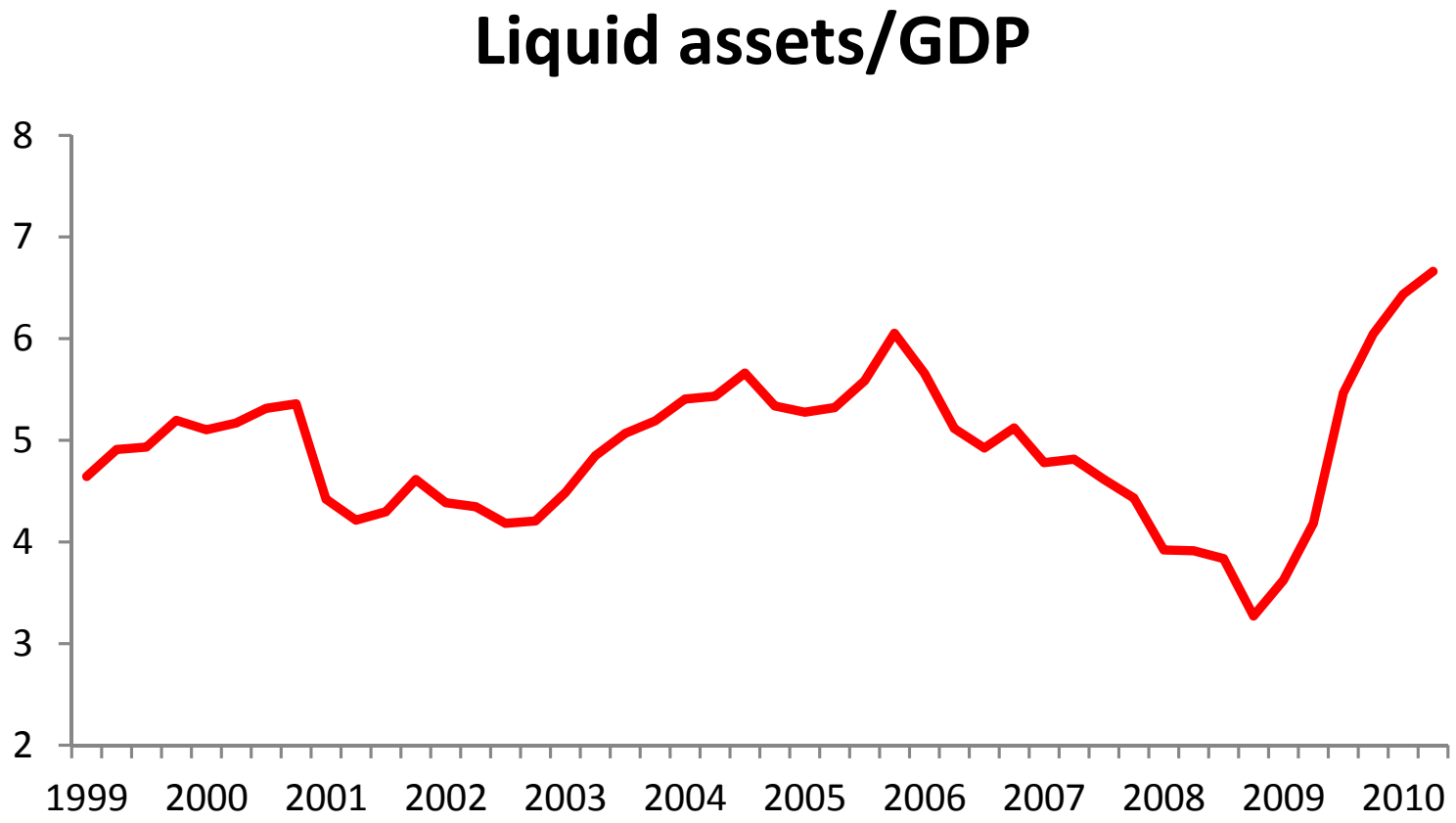


WHAT DOES THIS SUGGEST?

- One interpretation is that in periods of credit contraction employers lack the liquidity for investment and hiring:
  - *Credit Channel*.

- Although the credit channel has played an important role in the midst of the crisis, some doubts it is the main driver of the sluggish recovery:
  - *Businesses appear to hold plenty of cash.*

Liquidity dropped during the crisis but rebounded quickly.



QUESTION

Should we conclude that de-leveraging is irrelevant for the post crisis dynamics of the labor market?

CONTRIBUTION

- We propose a theoretical framework where de-leveraging can have persistent effects on (un)employment.

- The mechanism we propose is different from the typical credit channel. It is NOT the limited ability or the higher cost to finance investment.

- The mechanism works through the wage determination process based on bargaining.

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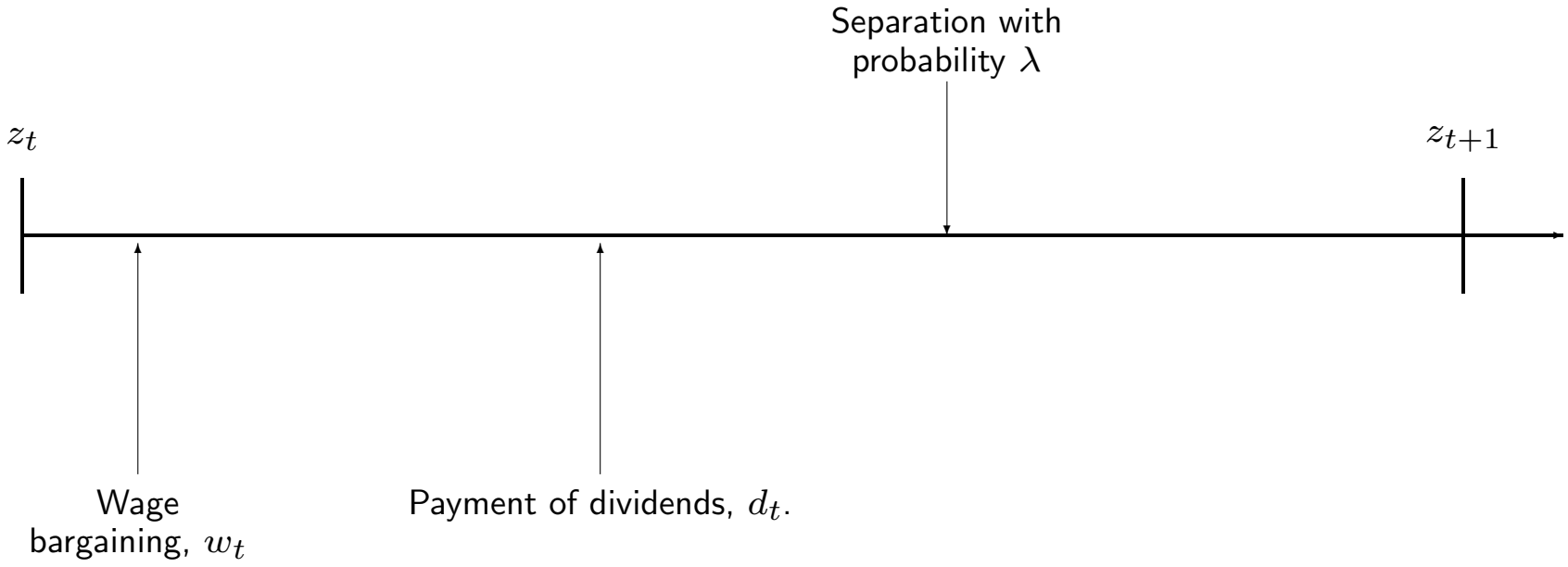
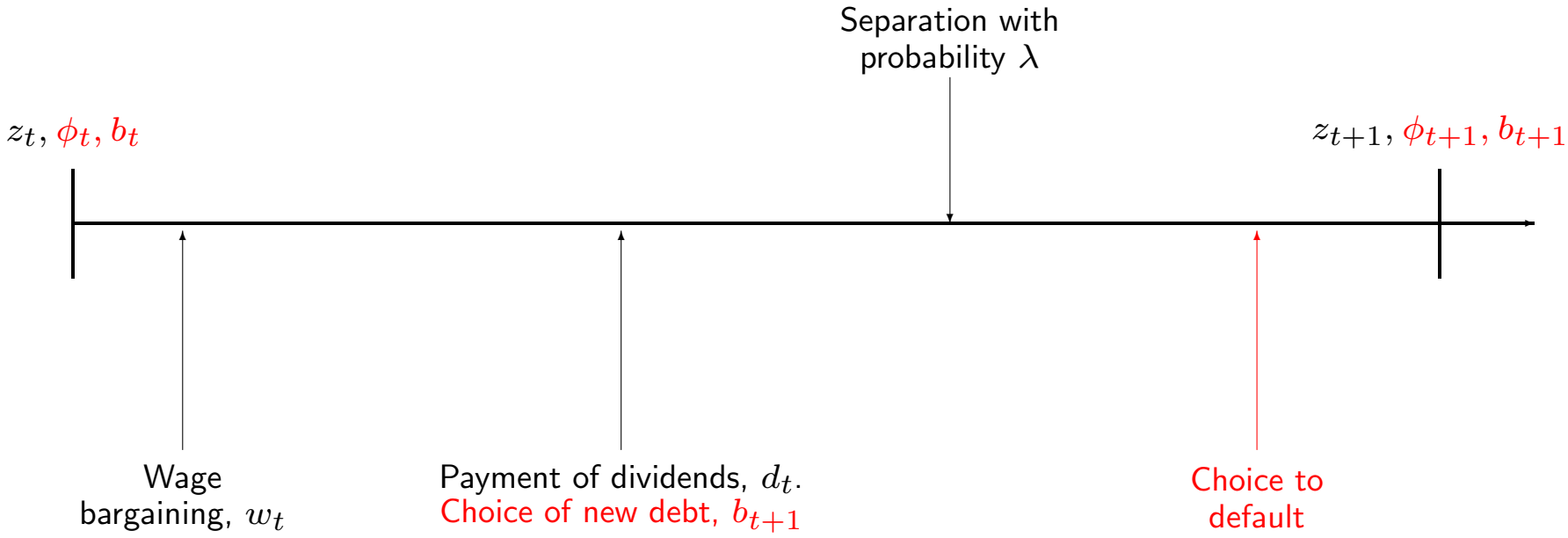
- Added features:
  1. Firms can issue debt b_t and pay dividends $d_t = z_t - w_t + \frac{b_{t+1}}{R} - b_t$.
  2. There are credit shocks (ϕ_t) that affect the borrowing limit.

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

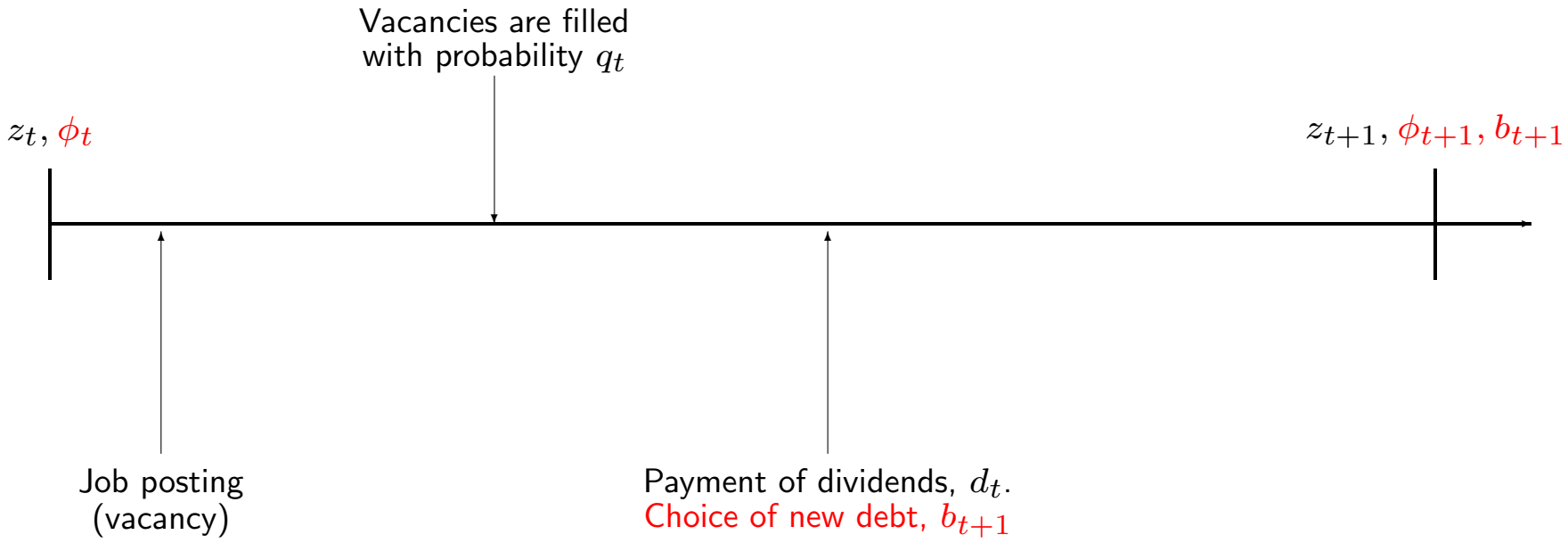
Bargaining problem:

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

Wage equation:

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

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

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

STRUCTURAL ESTIMATION

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

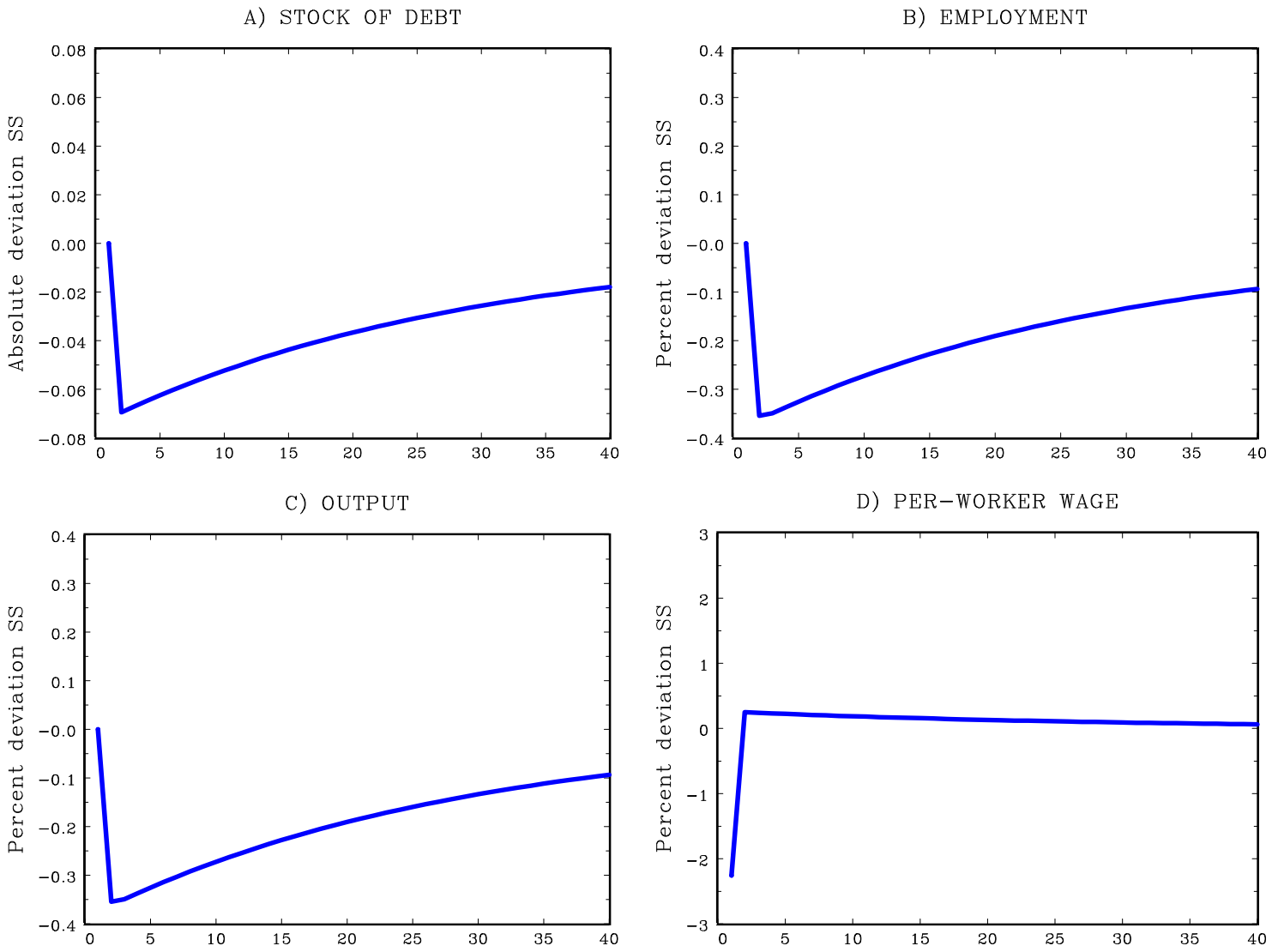
- Three empirical variables in first differences:
  1. Log-GDP, Y_t
  2. Log-employment, N_{t+1}
  3. New debt over GDP in business sector, $\frac{B_{t+1}-B_t}{Y_t}$

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

PARAMETERS

Estimated parameter	*Prior[mean,std]*	*Mode*	*Posterior thresholds*	
			Below 5%	*Below 95%*
Matching share parameter, α	Beta[0.5,0.1]	0.649	0.621	0.662
Bargaining power workers, η	Beta[0.5,0.1]	0.672	0.665	0.693
Utility flow unemployed, a	Beta[0.4,0.1]	0.468	0.442	0.472
Mean enforcement parameter, $\bar{\phi}$	IGamma[8,5]	3.637	3.589	3.634
Productivity shock persistence, ρ_z	Beta[0.5,0.20]	0.944	0.922	0.962
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	0.945	0.977
Credit shock volatility, σ_ϕ	IGamma[0.001,0.05]	0.143	0.130	0.157
Matching shock persistence, ρ_ξ	Beta[0.5,0.20]	0.983	0.977	0.986
Matching shock volatility, σ_ξ	IGamma[0.001,0.05]	0.056	0.053	0.065

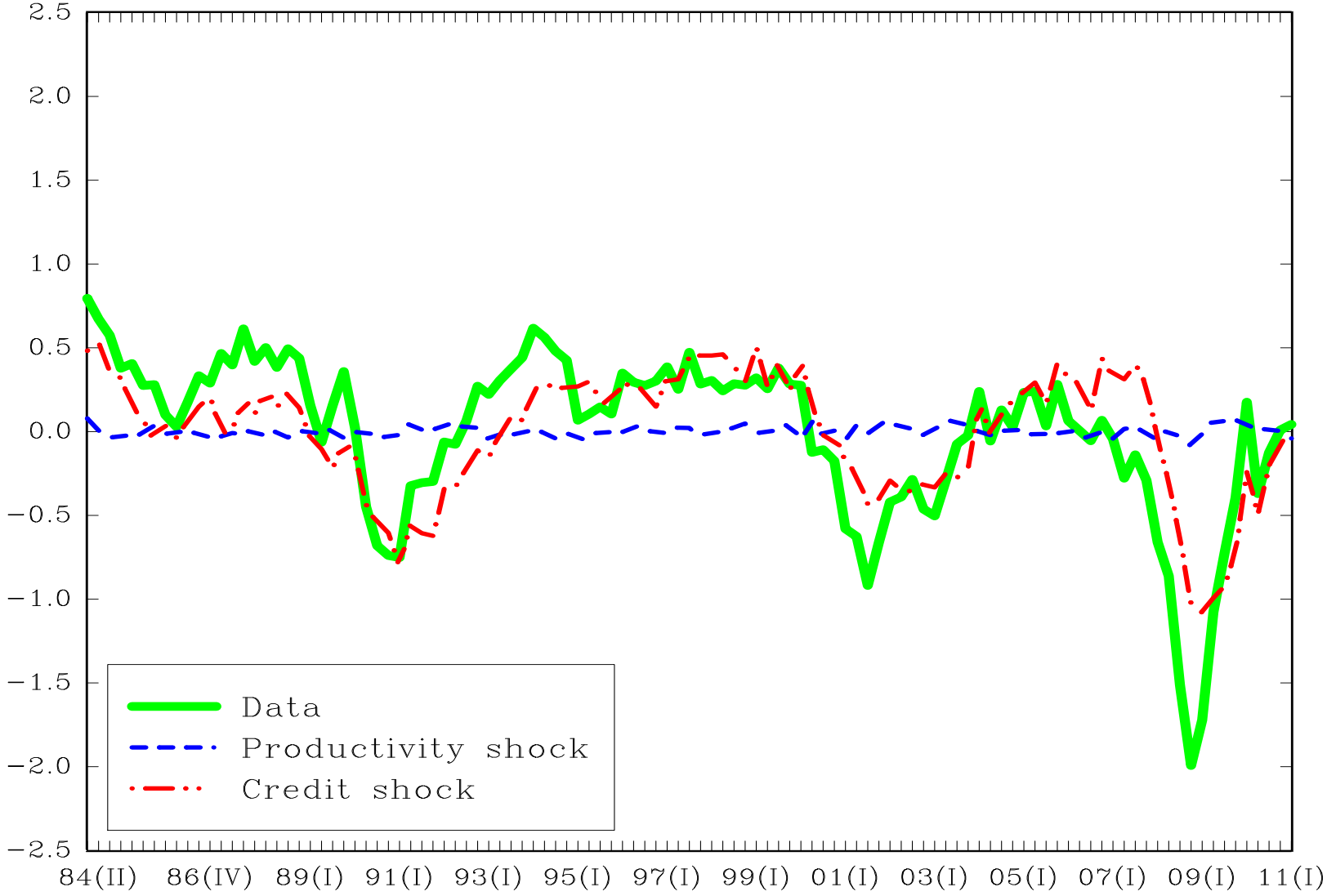
Response credit shock



VARIANCE DECOMPOSITION

	TFP shock z	*Credit shock* ϕ	*Matching shock* ξ
Output	45.9	27.9	26.2
Employment	0.4	51.4	48.2
New debt/output	0.2	65.7	34.1
Wages	0.1	40.5	59.4

Quarter-by-quarter decomposition



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 have sufficient cash.

Empirical analysis: VAR

- Linearized model:

$$\begin{pmatrix} z_t \\ \phi_t \\ b_t \\ e_t \end{pmatrix} = \begin{bmatrix} \rho_z & 0 & 0 & 0 \\ 0 & \rho_\phi & 0 & 0 \\ a_{bz} & a_{b\phi} & a_{bb} & a_{be} \\ a_{ez} & a_{e\phi} & a_{eb} & a_{ee} \end{bmatrix} \begin{pmatrix} z_{t-1} \\ \phi_{t-1} \\ b_{t-1} \\ e_{t-1} \end{pmatrix} + \begin{pmatrix} \epsilon_{z,t} \\ \epsilon_{\phi,t} \\ 0 \\ \epsilon_{\xi,t} \end{pmatrix}$$

- We can use the third equation to eliminate ϕ_t and ϕ_{t-1},

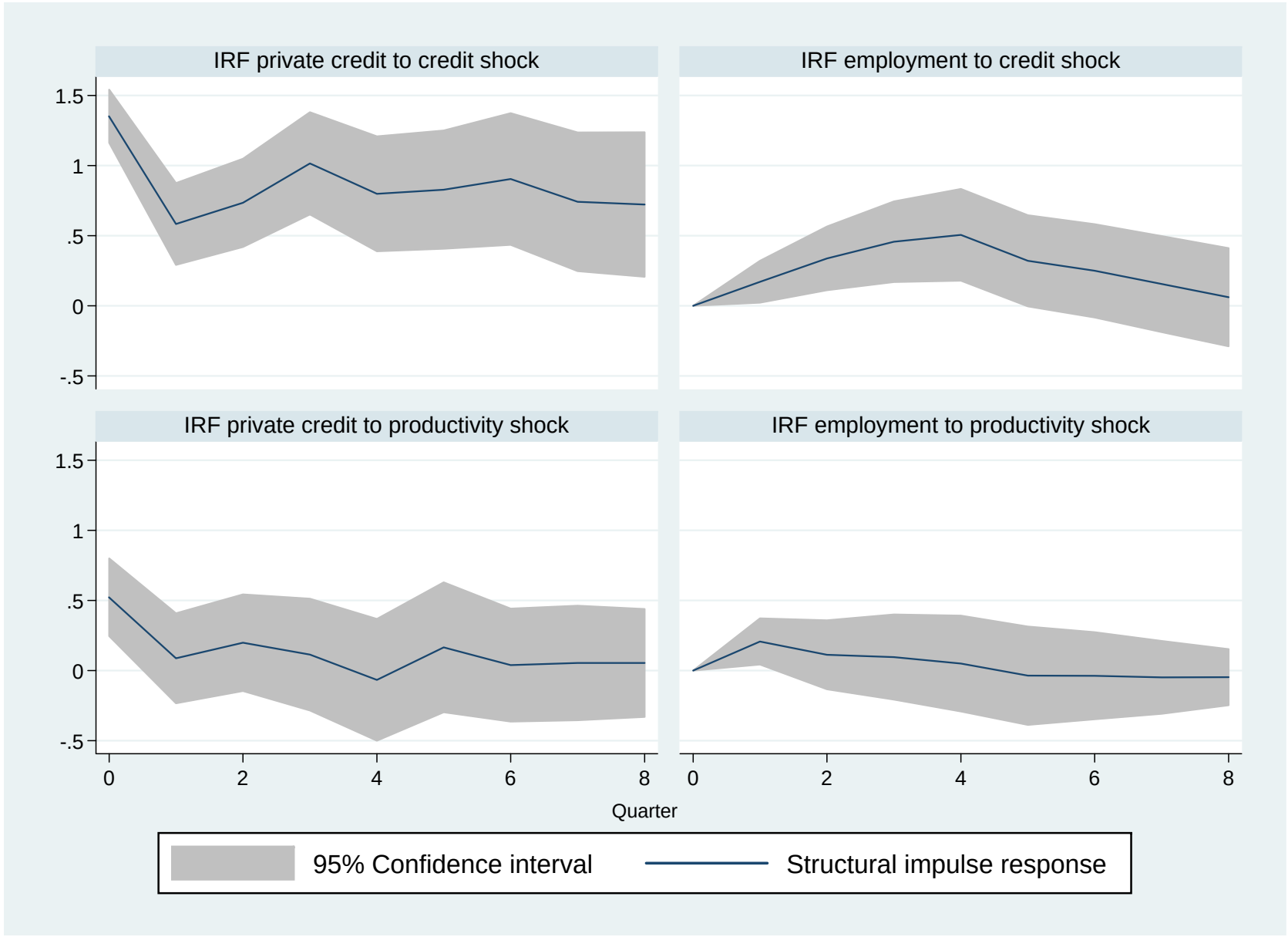
$$\begin{aligned} b_t &= a_{bz} z_{t-1} + a_{b\phi} \phi_{t-1} + a_{bb} b_{t-1} + a_{be} e_{t-1} \\ b_{t+1} &= a_{bz} z_t + a_{b\phi} \phi_t + a_{bb} b_t + a_{be} e_t \end{aligned}$$

Three variables VAR

$$
\begin{pmatrix} z_t \\ b_{t+1} \\ e_t \end{pmatrix} = \begin{bmatrix} \rho_z & 0 & 0 \\ \psi_{bz} & \psi_{bb} & \psi_{be} \\ \psi_{ez} & \psi_{eb} & \psi_{ee} \end{bmatrix} \begin{pmatrix} z_{t-1} \\ b_t \\ e_{t-1} \end{pmatrix}
$$

$$
+ \begin{bmatrix} 0 & 0 & 0 \\ 0 & \gamma_{bb} & 0 \\ 0 & \gamma_{eb} & 0 \end{bmatrix} \begin{pmatrix} z_{t-2} \\ b_{t-1} \\ e_{t-2} \end{pmatrix}
$$

$$
+ \begin{bmatrix} \pi_{zz} & 0 & 0 \\ \pi_{bz} & \pi_{bb} & \pi_{be} \\ 0 & 0 & \pi_{ee} \end{bmatrix} \begin{pmatrix} \epsilon_{z,t} \\ \epsilon_{\phi,t} \\ \epsilon_{\xi,t} \end{pmatrix}
$$


IRF private credit to credit shock
IRF employment to credit shock
IRF private credit to productivity shock
IRF employment to productivity shock
1.5
1
.5
0
-.5
0
2
4
6
8
Quarter
95% Confidence interval
Structural impulse response

SEPARATING WAGE BARGAINING FROM CREDIT CHANNEL - Four variables VAR

z_t=growth rate of TFP;

b_{t+1}=growth rate of private credit;

e_t=growth rate of employment.

r_t=interest rate spread (Baa-Aaa).

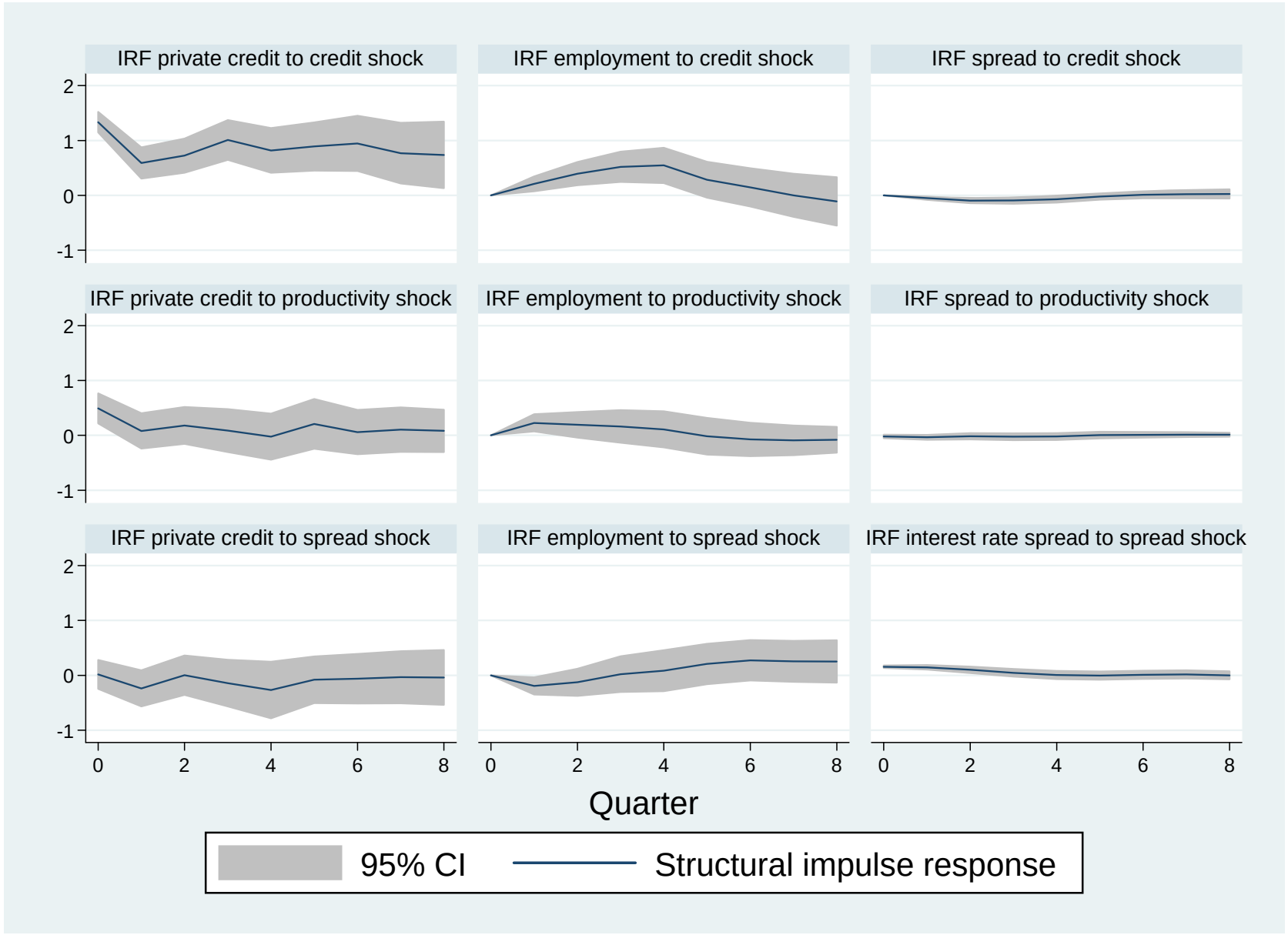
IDENTIFICATION WITH CREDIT SPREADS

$$(I - \mathbf{A}_1 L - ... - \mathbf{A}_n L^n) \begin{pmatrix} z_t \\ b_{t+1} \\ e_t \\ r_t \end{pmatrix} = \begin{pmatrix} p_{zz} & 0 & 0 & 0 \\ p_{bz} & p_{bb} & p_{be} & p_{br} \\ 0 & 0 & p_{ee} & 0 \\ p_{rz} & 0 & p_{re} & p_{rr} \end{pmatrix} \begin{pmatrix} \epsilon_{z,t} \\ \epsilon_{\phi,t} \\ \epsilon_{\xi,t} \\ \epsilon_{r,t} \end{pmatrix}$$

1. Since TFP is exogenous, credit and other shocks cannot affect TFP.

2. Since employment reacts with one period lag, innovations to productivity, credit and interest rate spreads cannot affect employment at impact.

3. A credit shock that is propagated through the 'bargaining channel' does not impact on the interest rate spread.


IRF private credit to credit shock
IRF employment to credit shock
IRF spread to credit shock
IRF private credit to productivity shock
IRF employment to productivity shock
IRF spread to productivity shock
IRF private credit to spread shock
IRF employment to spread shock
IRF interest rate spread to spread shock
2
1
0
-1
0
2
4
6
8
Quarter
95% CI
Structural impulse response

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.

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STRUCTURAL ESTIMATION WITH WAGES

- Three AR(1) shocks:
  1. Productivity, z_t
  2. Credit, ϕ_t
  3. Matching, ξ_t
  4. Measurement errors on wages, e_t

- Four empirical variables in first differences:
  1. Log-GDP, Y_t
  2. Log-employment, N_{t+1}
  3. New debt over GDP in business sector, $\frac{B_{t+1}-B_t}{Y_t}$
  4. Hourly wages, w_t/l_t

PARAMETERS

Estimated parameter	*Prior[mean,std]*	*Mode*	*Posterior thresholds*	
			Below 5%	*Below 95%*
Matching share parameter, α	Beta[0.5,0.1]	0.762	0.749	0.793
Bargaining power workers, η	Beta[0.5,0.1]	0.272	0.252	0.268
Utility flow unemployed, a	Beta[0.4,0.1]	0.768	0.765	0.794
Mean enforcement parameter, $\bar{\phi}$	IGamma[8,5]	8.009	7.987	8.002
Negotiation frequency, ψ	Beta[0.25,0.05]	0.188	0.174	0.195
Std measurement error wages, σ_w	IGamma[0.001,0.05]	0.009	0.008	0.010
Mark-up parameter, ε	Beta[0.8,0.05]	0.958	0.952	0.973
Elasticity of effort, φ	Beta[1,0.1]	0.907	0.906	0.934
Productivity shock persistence, ρ_z	Beta[0.5,0.20]	0.923	0.919	0.934
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]	0.967	0.959	0.975
Credit shock volatility, σ_ϕ	IGamma[0.001,0.05]	0.136	0.135	0.152
Matching shock persistence, ρ_ξ	Beta[0.5,0.20]	0.982	0.976	0.986
Matching shock volatility, σ_ξ	IGamma[0.001,0.05]	0.032	0.029	0.037

VARIANCE DECOMPOSITION

	TFP shock z	*Credit shock* ϕ	*Matching shock* ξ	*Measure error wages*
Output	50.8	22.0	27.2	0.0
Employment	6.3	42.0	51.7	0.0
New debt/output	3.2	73.8	23.0	0.0
Hourly wage	0.1	1.6	1.5	96.8

Quarter-by-quarter decomposition