

# **Bank Liabilities Channel**

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## TWO QUESTIONS

1. How is the disruption in financial intermediation transmitted to the real sector of the economy?
2. What type of events can generate a big disruption in financial intermediation?

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# TWO ROLE OF BANKS

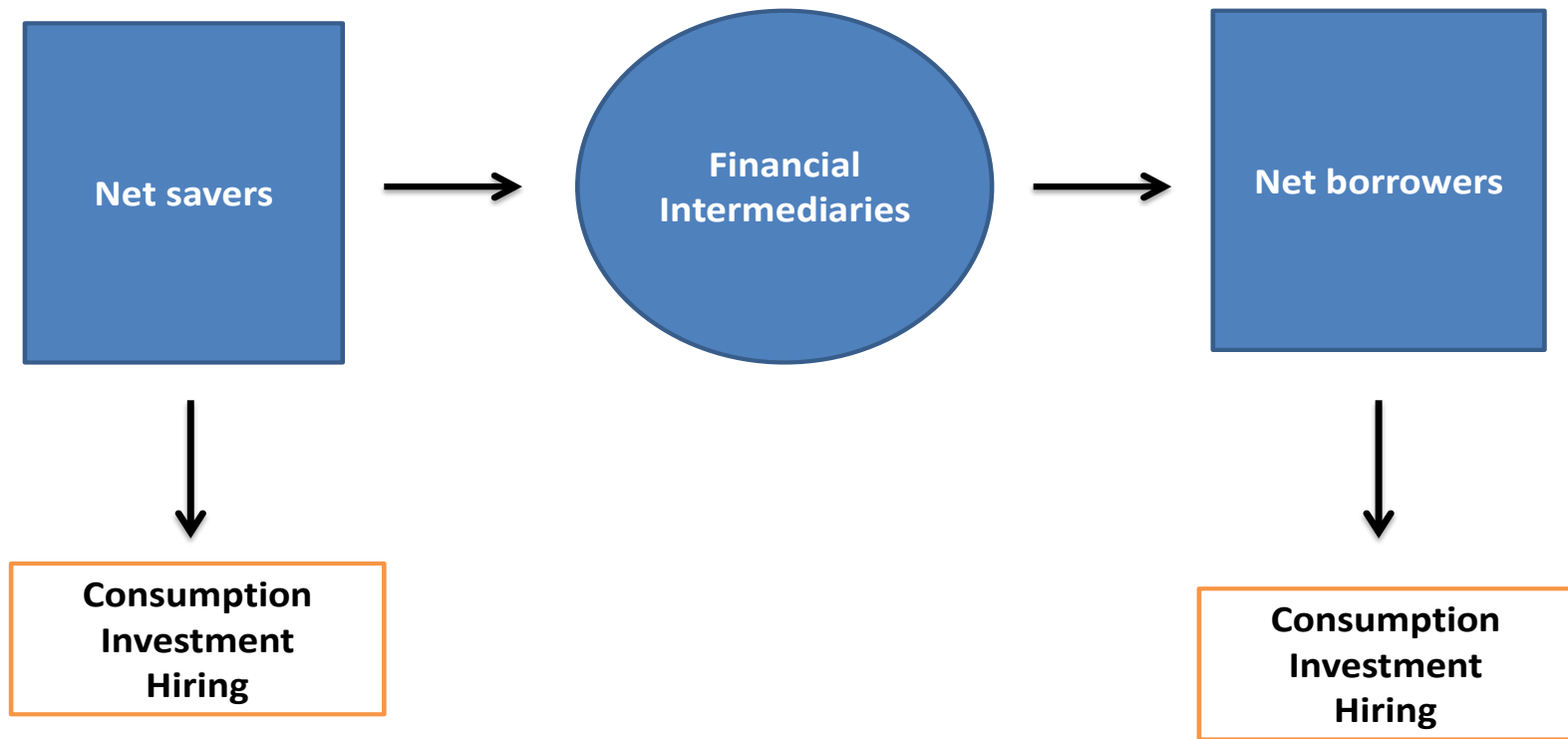
## 1. Providing credit

- When banks face financial difficulties, it becomes more difficult for nonfinancial borrowers to finance investment and hiring.  
*(Bank Lending Channel).*

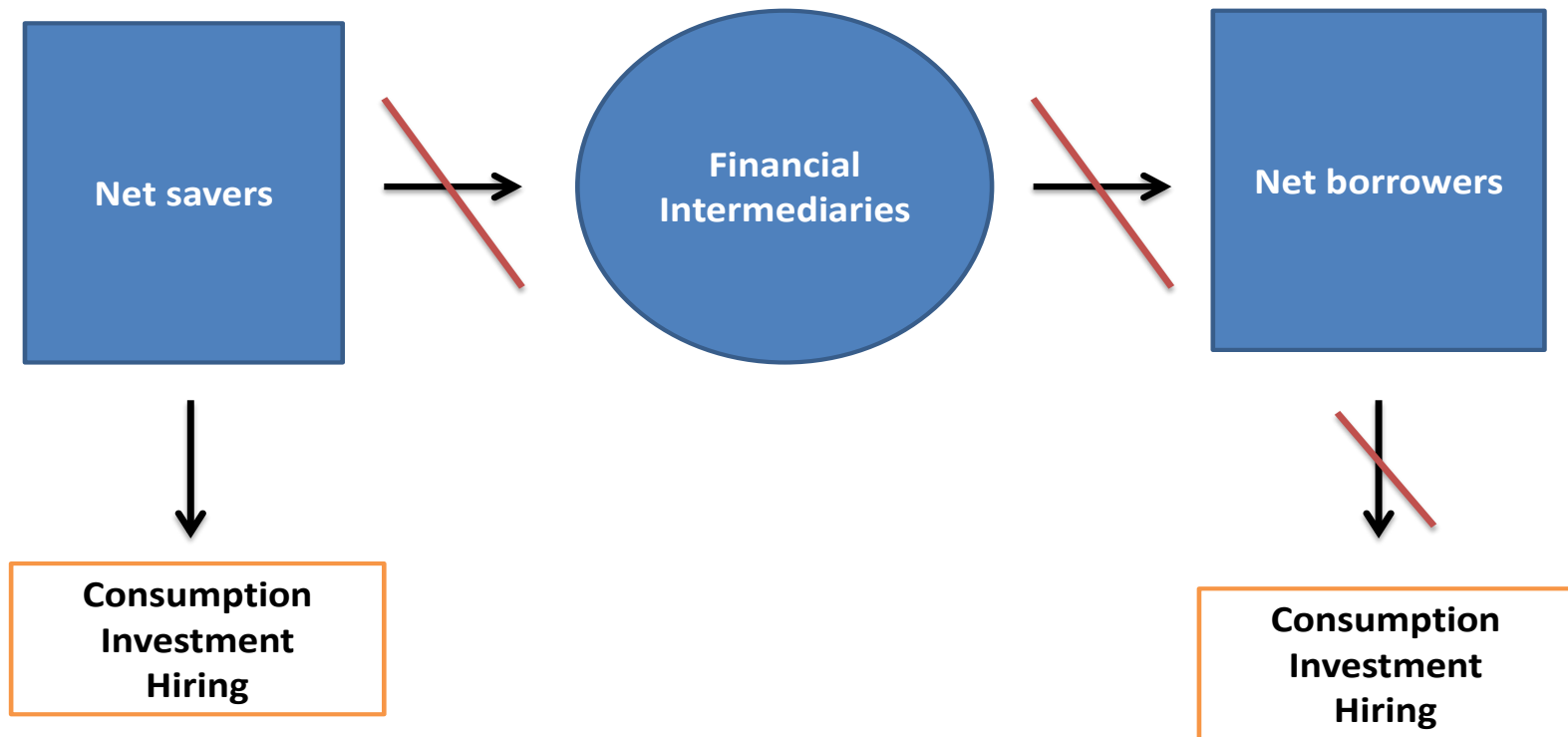
## 2. Issuing liabilities (*assets held by nonfinancial sector*)

- When banks face financial difficulties, the issuance of liabilities or the value of the outstanding liabilities fall. As a result, agents in the nonfinancial sector hold less financial assets for insurance purpose and are less willing to take risks, reducing investment and hiring.  
*(Bank Liabilities Channel).*

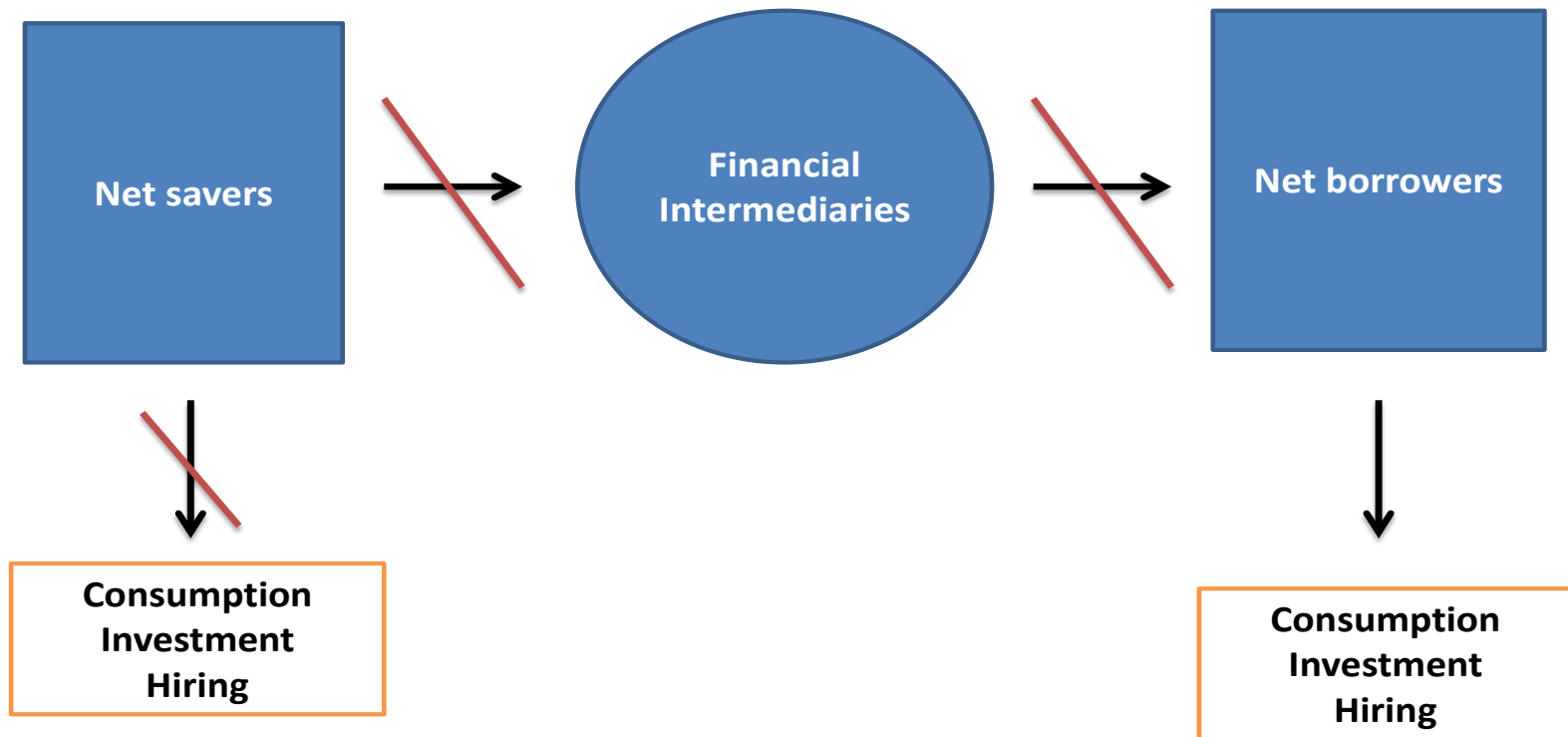
# LENDING CHANNEL



# LENDING CHANNEL



# LIABILITIES CHANNEL



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## IN THIS PRESENTATION

1. I illustrates how a crisis in the banking sector impacts on the macro-economy through the 'bank liabilities channel'.
2. Bank crises could be the result of pessimistic self-fulfilling expectations about the liquidity of the banking sector.
3. Greater demand for bank liabilities increases the vulnerability of the economy (higher probability and/or consequences of a crisis).
4. Application to an episode of growing demand for bank liabilities.

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# THREE SECTOR MODEL

1. Entrepreneurial sector
2. Workers sector
3. Financial intermediation sector



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# 1. Entrepreneurial sector

- Continuum of entrepreneurs with utility  $E_0 \sum_{t=0}^{\infty} \beta^t \ln(c_t^i)$
- Technology  $F(z_t^i, h_t^i) = z_t^i h_t^i$ 
  - $h_t^i$  = Input of labor
  - $z_t^i$  = Idiosyncratic shock observed **after** choosing  $h_t^i$ .
- They can buy bonds  $b_{t+1}^i$ . The budget constraint is

$$c_t^i + \frac{b_{t+1}^i}{R_t^b} = (z_t^i - w_t)h_t^i + b_t^i \equiv a_t^i$$

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## Optimal entrepreneur's policy

$$h_t^i = \phi(w_t) b_t^i$$

$$c_t^i = (1 - \beta) a_t^i$$

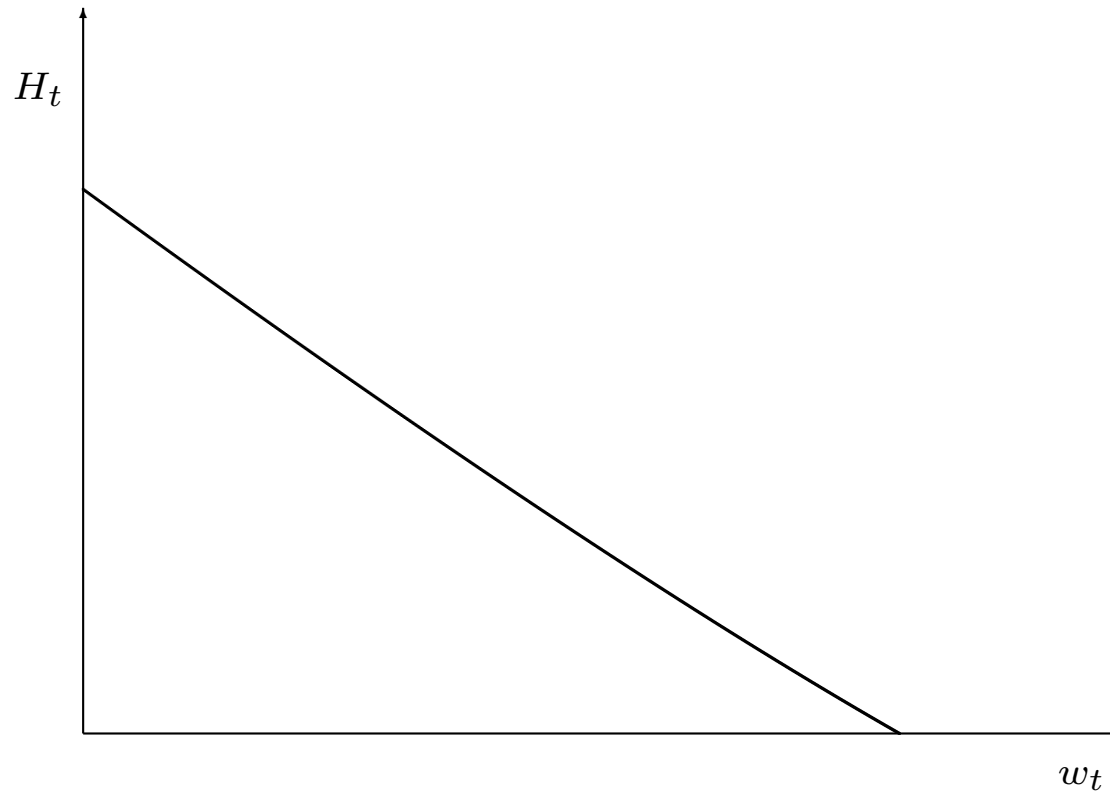
$$\frac{b_{t+1}^i}{R_t^b} = \beta a_t^i$$

Where  $\phi_t$  satisfies  $\mathbb{E}_z \left\{ \frac{z - w_t}{1 + (z - w_t) \phi_t} \right\} = 0$ .

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## Aggregate demand of labor

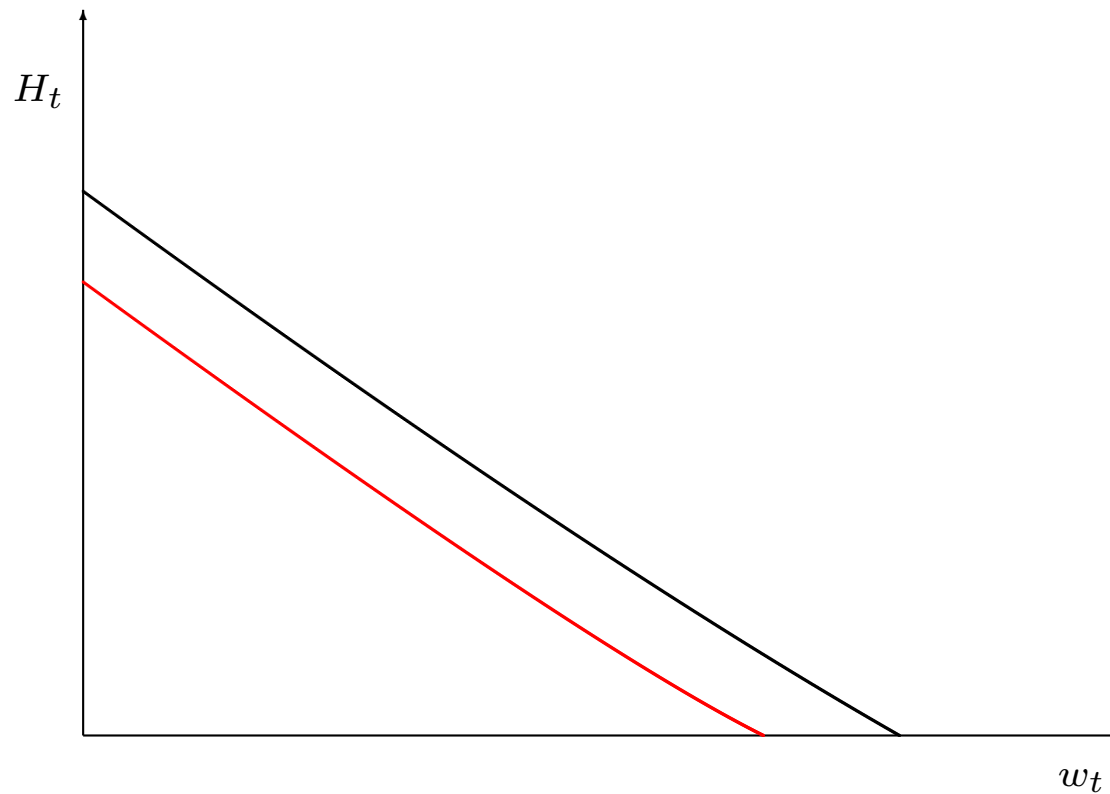
$$H_t = \phi(w_t) \underbrace{\int_i b_t^i}_{\text{Financial wealth}}$$



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## Aggregate demand of labor

$$H_t = \phi(w_t) \underbrace{\int_i b_t^i}_{\text{Financial wealth}}$$



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## 2. Workers sector

- Continuum of workers with utility  $\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left( c_t - \alpha \frac{h_t^{1+\nu}}{1+\nu} \right)$
- They hold a non-reproducible asset in fixed supply  $\bar{K}$ , traded at price  $p_t$ . Each unit produces  $\chi$  units of consumption goods.
- They can borrow subject to the collateral constraint

$$\frac{l_{t+1}}{R_t^l} \leq \eta \mathbb{E}_t p_{t+1} k_{t+1}$$

- Budget constraint

$$c_t + l_t + (k_{t+1} - k_t)p_t = \frac{l_{t+1}}{R_t^l} + w_t h_t + \chi k_t$$

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## First order conditions for workers

$$\alpha h_t^\nu = w_t$$

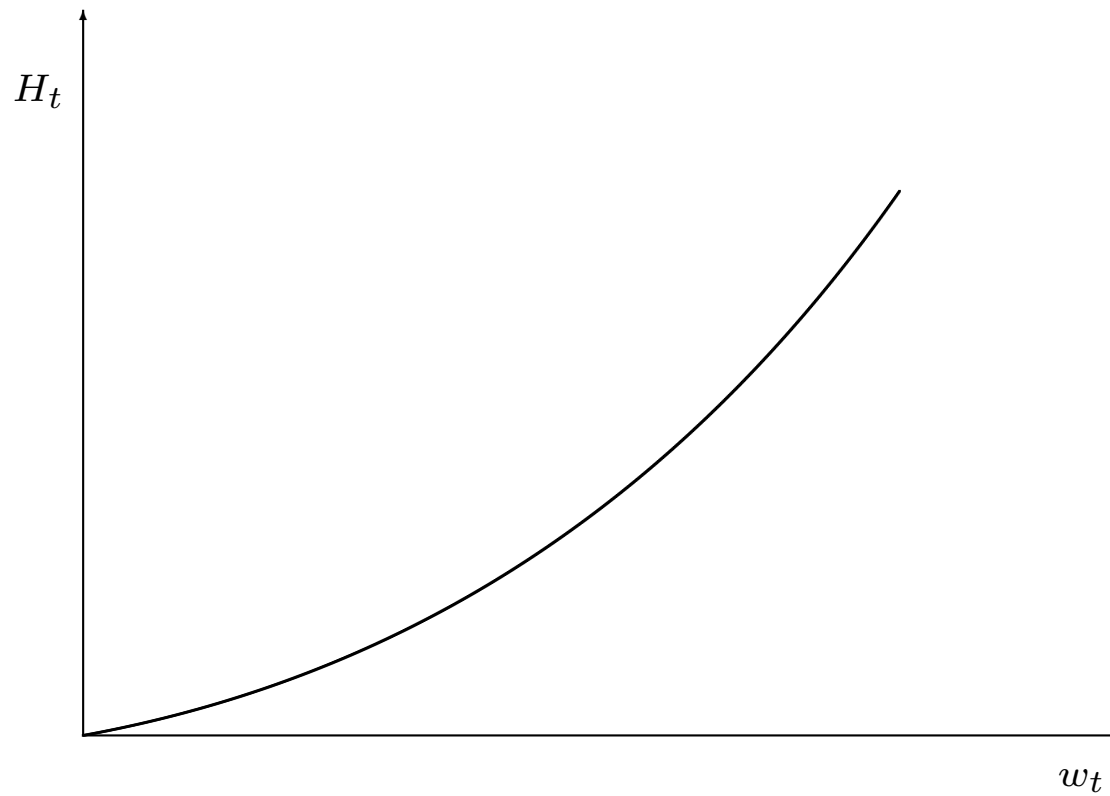
$$1 = \beta R_t^l (1 + \mu_t)$$

$$p_t = \beta \mathbb{E}_t \left[ \chi + (1 + \eta \mu_t) p_{t+1} \right]$$

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## Aggregate supply of labor

$$H_t = \left(\frac{w_t}{\alpha}\right)^{\frac{1}{\nu}}$$



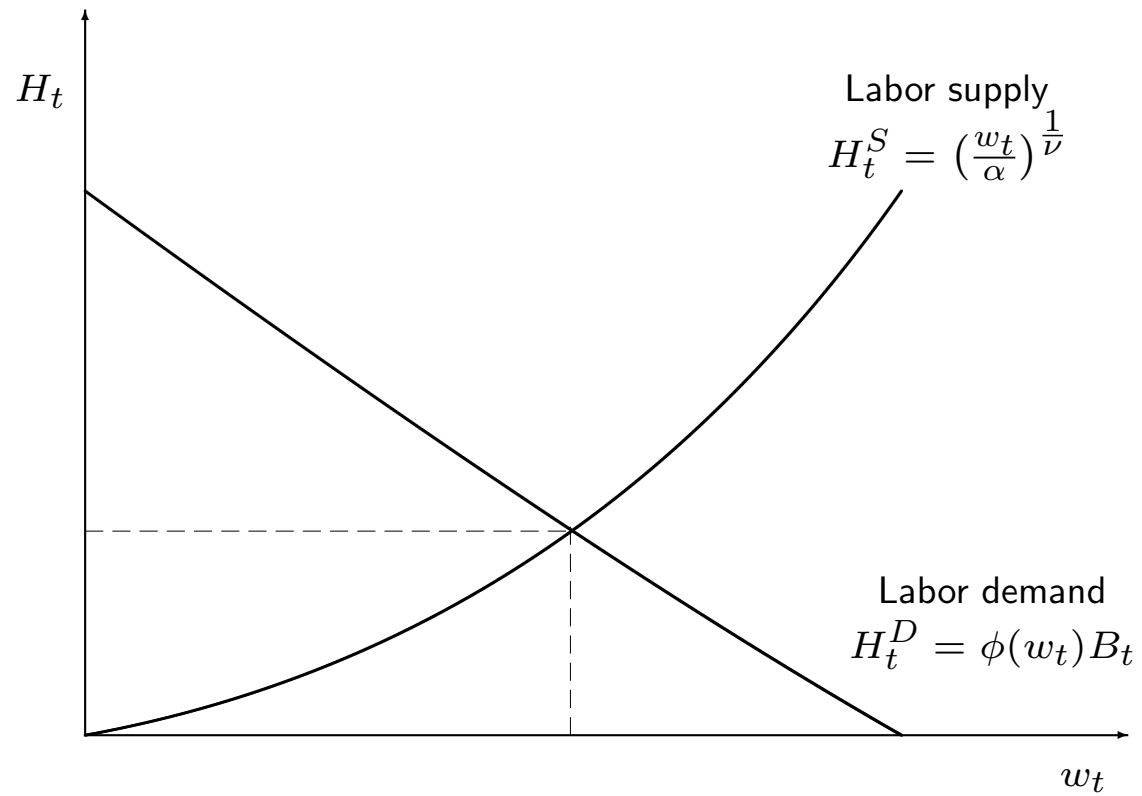
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**EQUILIBRIUM**  
**WITHOUT INTERMEDIATION**  
**(Borrowing and lending is direct)**



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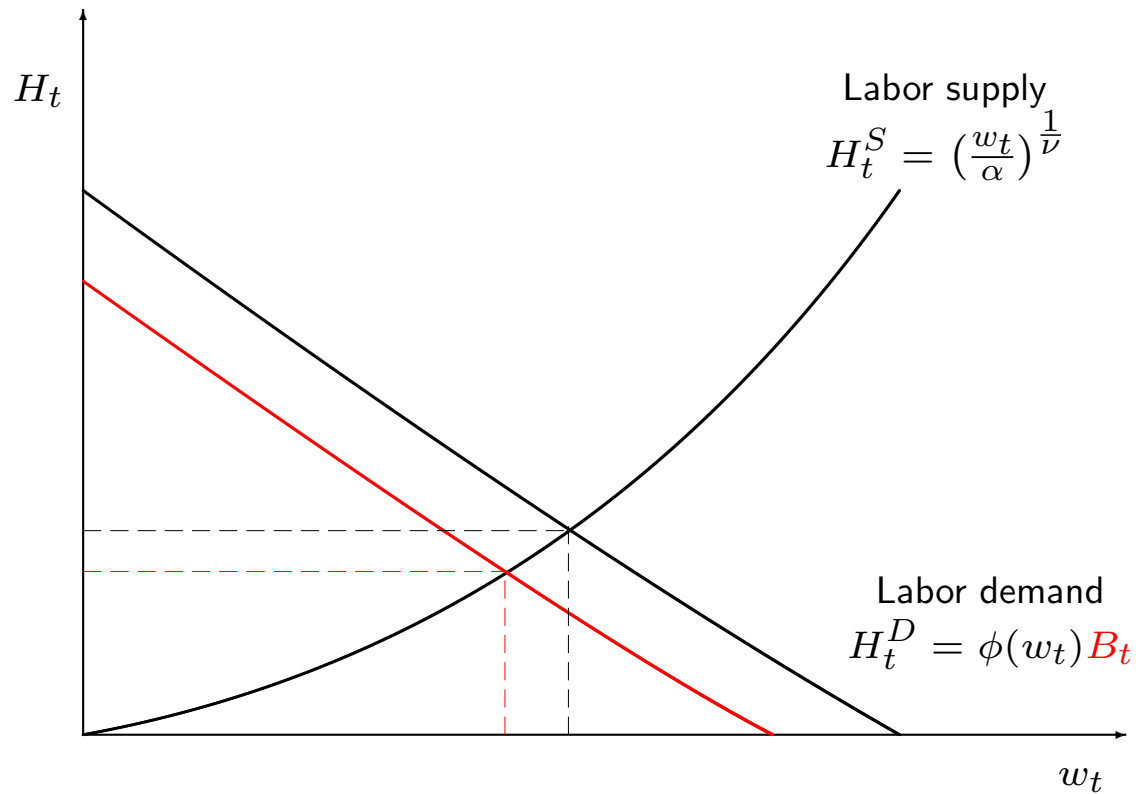
# LABOR MARKET EQUILIBRIUM



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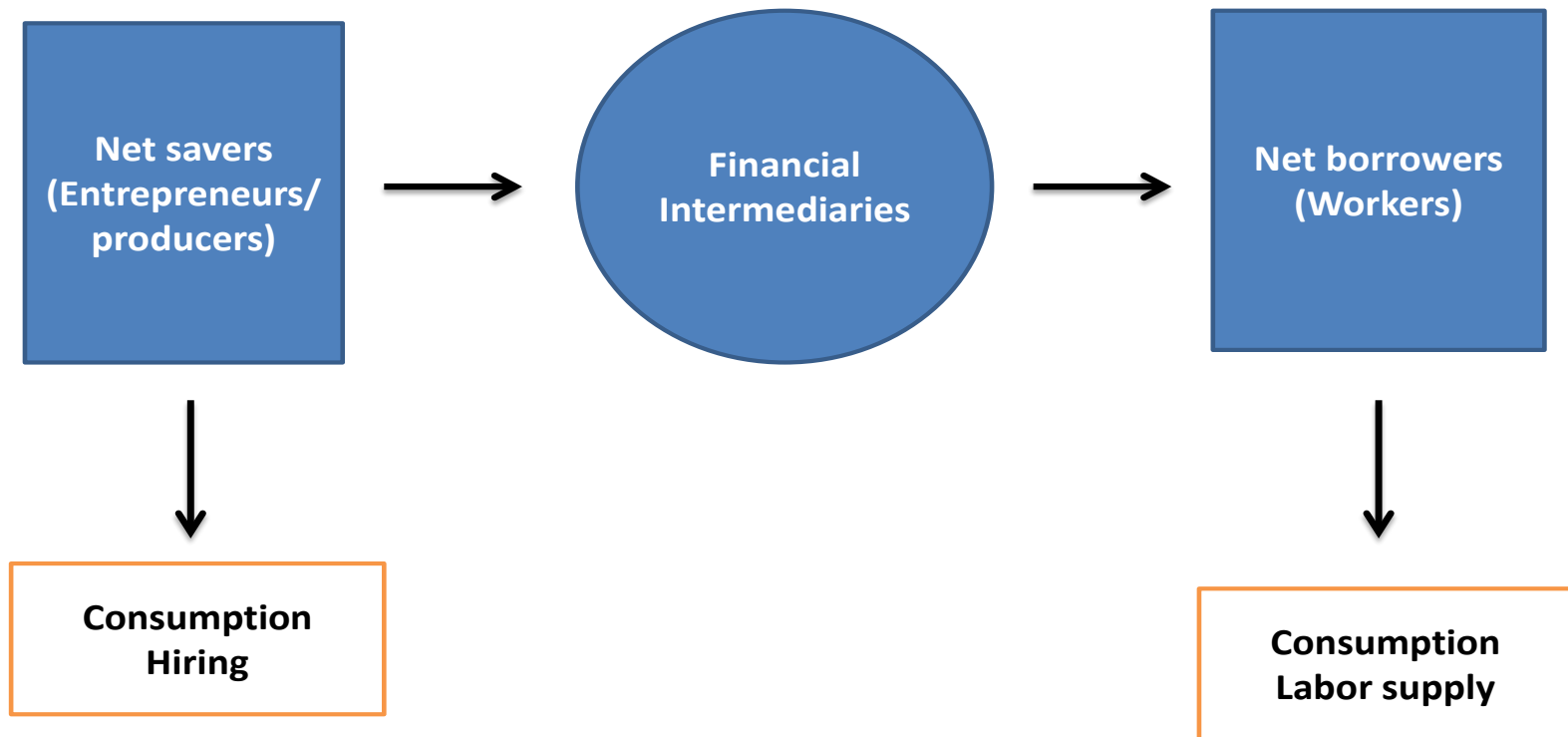
(Lower stock of bank liabilities)



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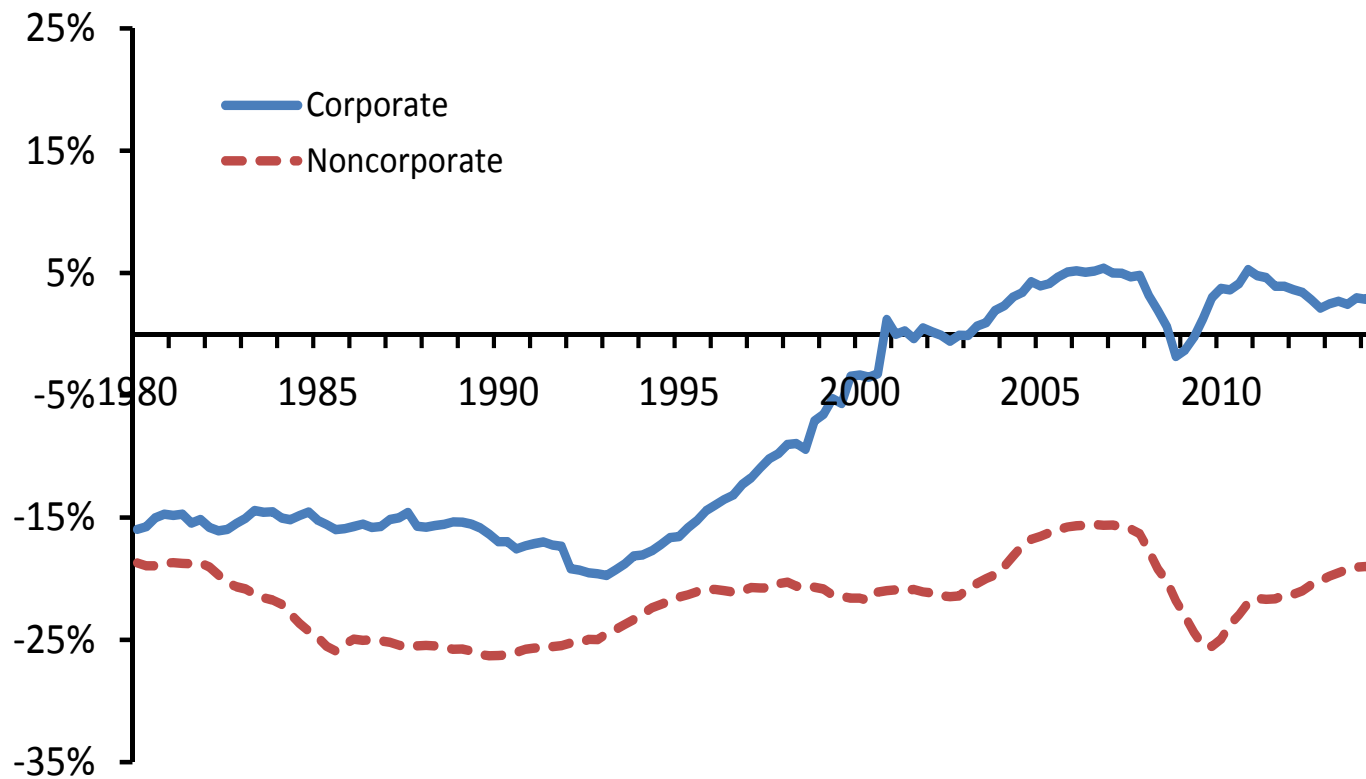
# **INTRODUCING THE INTERMEDIATION SECTOR**

# Schematic overview of the economy



# Net financial assets

*(In percent of nonfinancial assets)*



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### 3. Intermediation sector

- Banks start with liabilities  $b_t$  and loans  $l_t$ .
- The liquidation value of bank assets is  $\xi_t l_t$ , with  $\xi_t \in \{\underline{\xi}, 1\}$ .
- Banks renegotiate if liabilities exceed the liquidation value of assets,

$$\tilde{b}_t(b_t, l_t) = \begin{cases} b_t, & \text{if } b_t \leq \xi_t l_t \\ \xi_t l_t & \text{if } b_t > \xi_t l_t \end{cases}$$

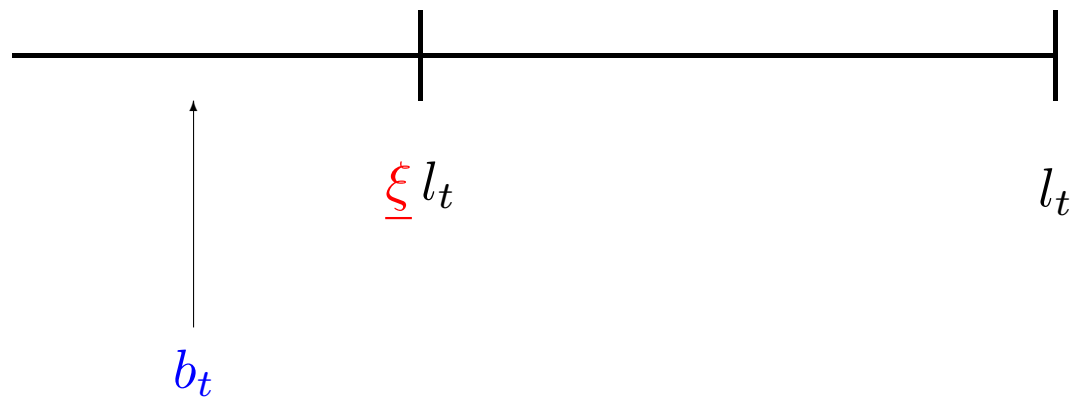
- Default implies a cost for the bank

$$\tilde{\varphi}_t(b_t, l_t) = \begin{cases} 0, & \text{if } b_t \leq \xi_t l_t \\ \varphi\left(\frac{b_t - \xi_t l_t}{l_t}\right) l_t & \text{if } b_t > \xi_t l_t \end{cases}$$

- There is an intermediation cost  $\tau$  to raise funds.

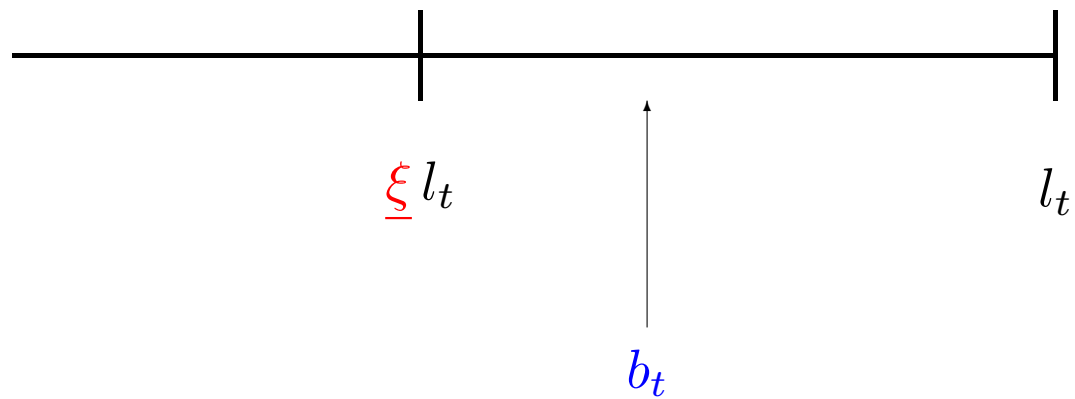
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## LOW LEVERAGE (No default)



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## HIGH LEVERAGE (Possibility of default)





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## Bank's problem

$$V_t(b_t, l_t) = \max_{d_t, b_{t+1}, l_{t+1}} \left\{ d_t + \beta E_t V_{t+1}(b_{t+1}, l_{t+1}) \right\}$$

subject to

$$\tilde{b}_t(b_t, l_t) + \tilde{\varphi}_t(b_t, l_t) + \frac{l_{t+1}}{R_t} + d_t = l_t + \frac{1 - \tau}{\bar{R}_t^b} E_t \tilde{b}_{t+1}(b_{t+1}, l_{t+1})$$

## First order conditions

$$\frac{1 - \tau}{R_t^b} \geq \beta \left[ 1 + \Phi \left( \frac{b_{t+1}}{l_{t+1}} \right) \right]$$

$$\frac{1}{R_t^l} \geq \beta \left[ 1 + \Psi \left( \frac{b_{t+1}}{l_{t+1}} \right) \right]$$

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## Endogenous $\xi$

**Assumption 1.** *In the event of renegotiation, bank's assets  $l$  can be sold to other banks or to other sectors (workers or entrepreneurs).*

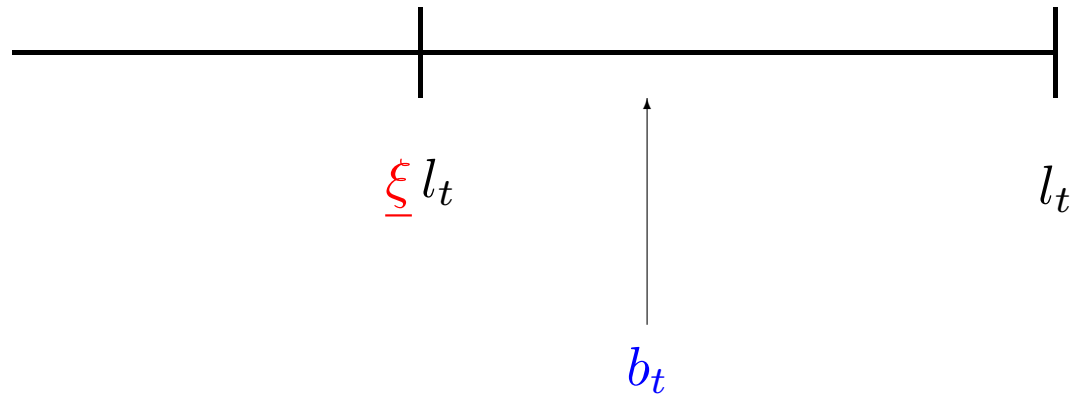
- *Other banks can recover the full value  $l_t$ ;*
- *Other sectors can recover only  $\xi l_t$ .*

**Assumption 2.** *Banks can purchase the assets of liquidated banks only if they are liquid. Banks are liquid if*

$$b_t < \xi l_t$$

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# MULTIPLE EQUILIBRIA



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## Possibility of multiple equilibria

Given beginning of period liabilities  $b_t$  and assets  $l_t$ ,

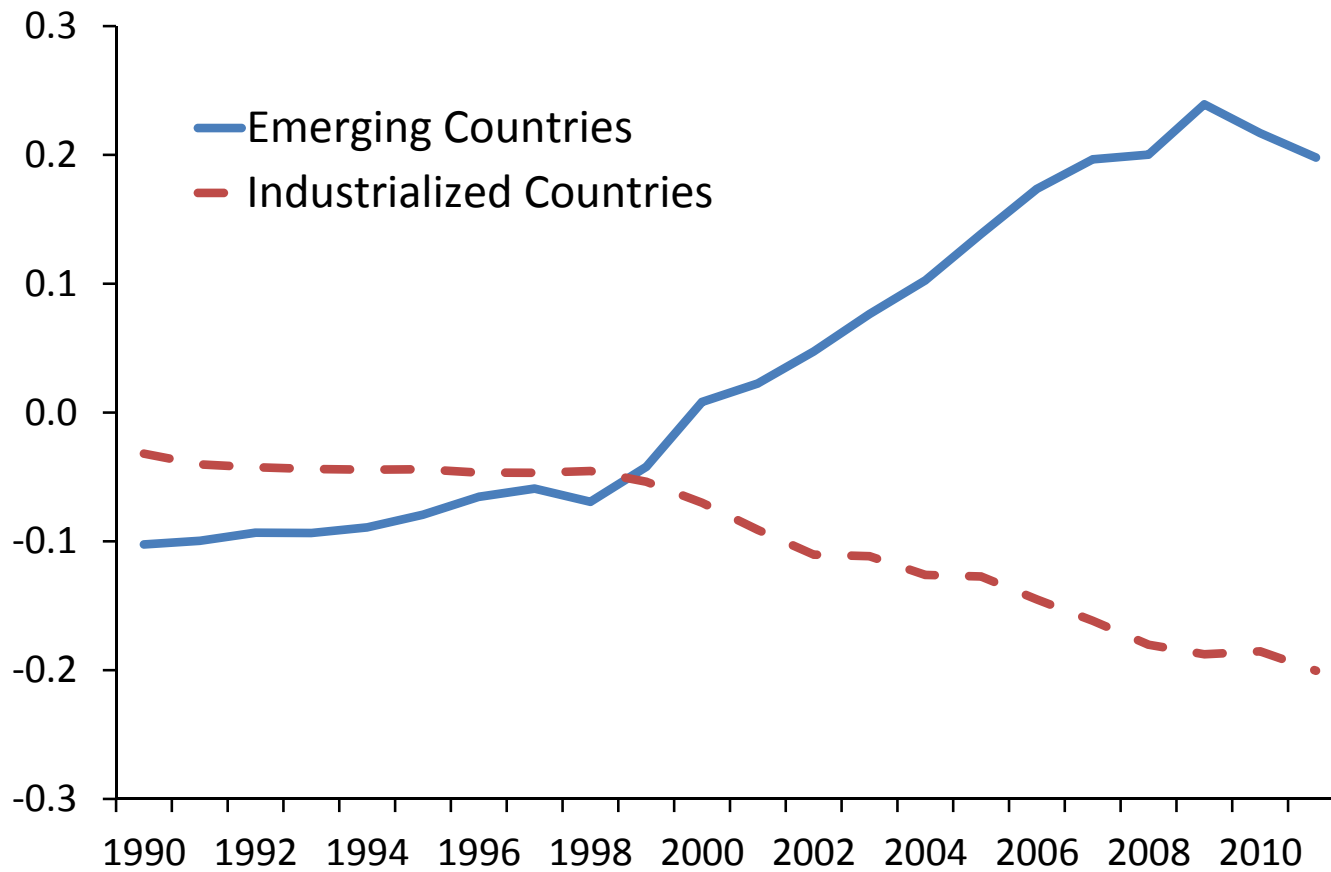
- If the market expects  $\xi_t = 1$ , banks remain liquid ( $b_t < l_t$ ) and the ex-post price of the liquidated assets is  $\xi_t = 1$ .
- If the market expects  $\xi_t = \underline{\xi}$ , banks could become illiquid ( $b_t > \underline{\xi}l_t$ ) and the ex-post price of the liquidated assets is  $\xi_t = \underline{\xi}$ .

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# APPLICATION

**Growth of emerging economies  
and external asset positions**

## Net Foreign Position in Debt and Reserves (Percent of GDP)



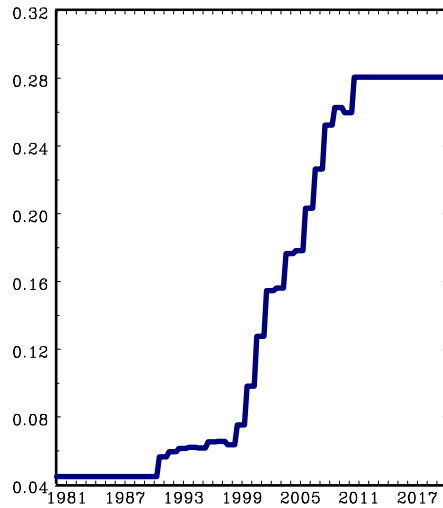
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# SIMULATION

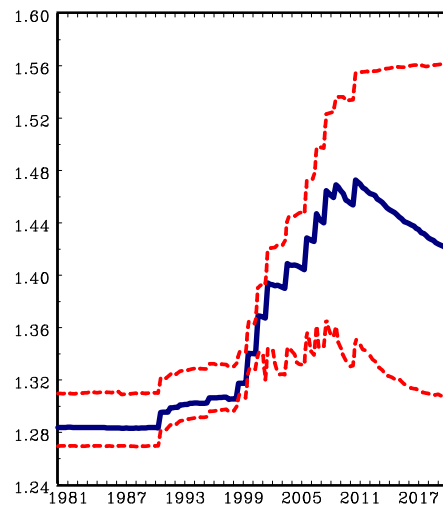
- The model is representative of industrialized countries.
- There is an external **exogenous** demand for bank liabilities from emerging economies.
- The external demand for bank liabilities from 1991 to 2011 replicates the net foreign position in debt and international reserves of industrialized countries.
- I conduct 1,000 repeated simulations of the model.

# REPEATED SIMULATIONS

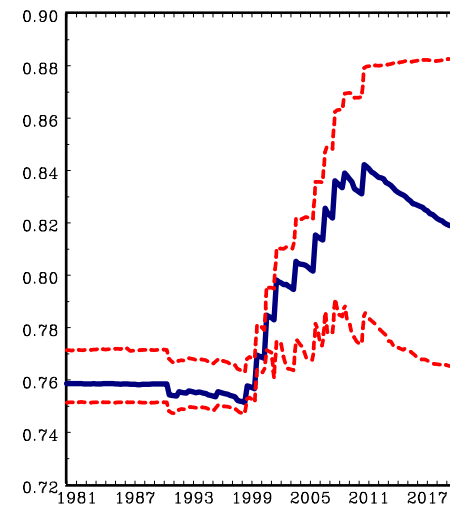
Foreign demand



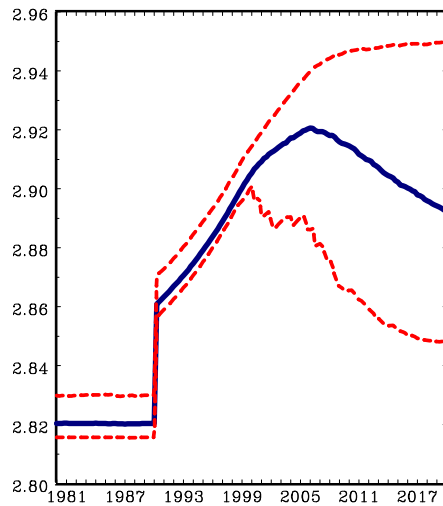
Bank liabilities



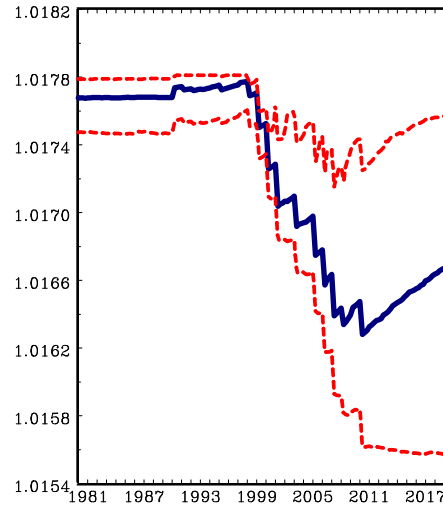
Bank leverage



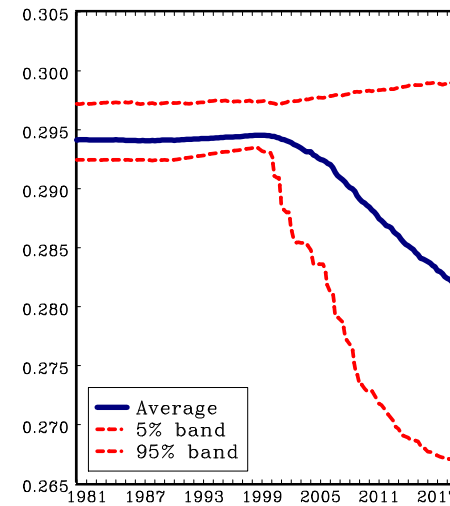
Asset price



Interest rate



Labor





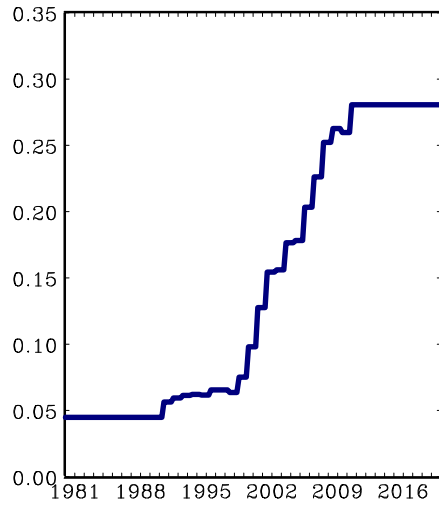
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## FOR A PARTICULAR REALIZATION OF SUNSPOTS

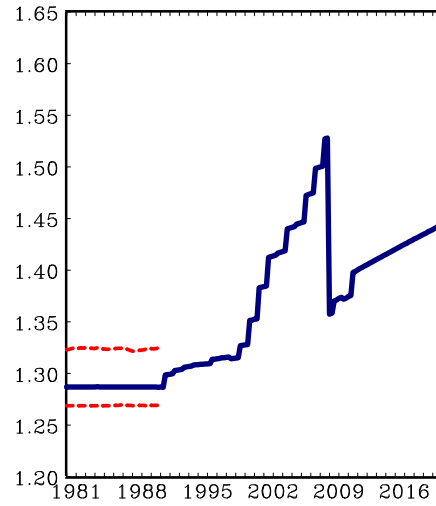
- From 1991 to second quarter of 2008 the realization of the sunspot shock is **HIGH**.
- In the third quarter of 2008 the realization of the sunspot shock is **LOW**.
- Afterwards, the realization of the sunspot shock is **HIGH**.

# REPEATED SIMULATIONS

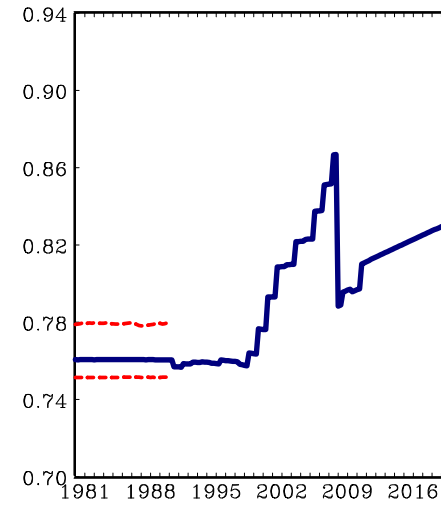
Foreign demand



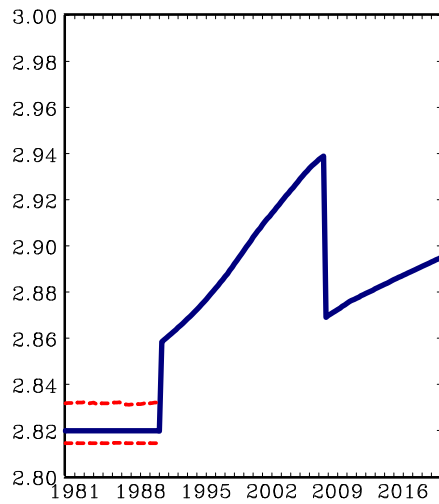
Bank liabilities



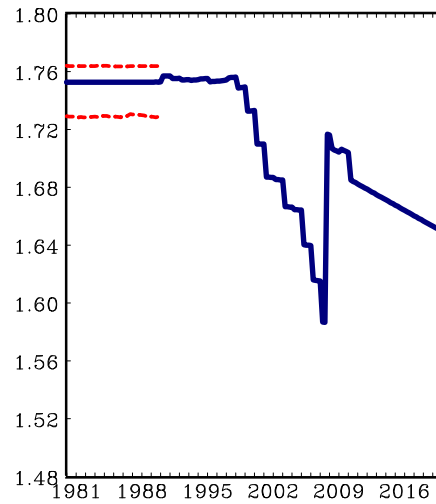
Bank leverage



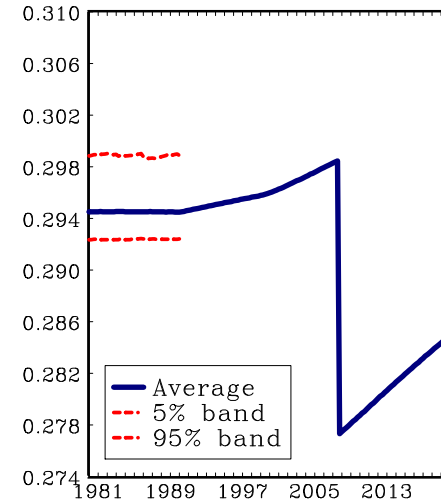
Asset price



Lending rate



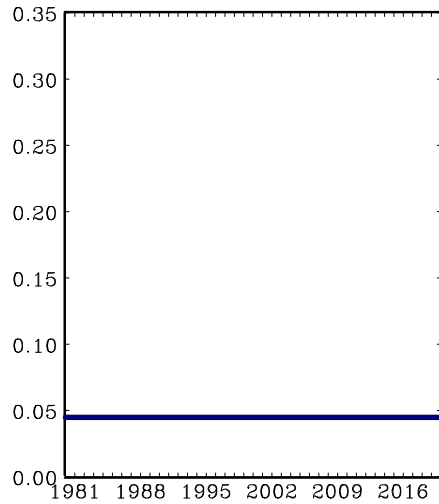
Labor



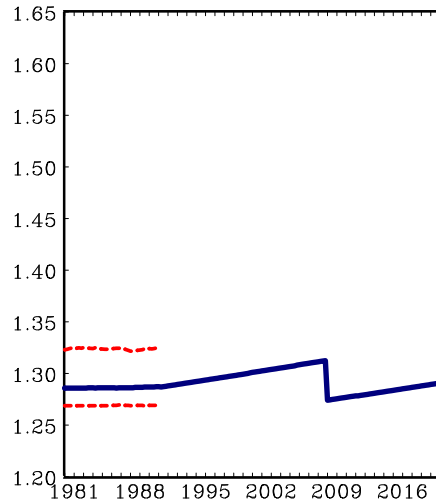
— Average  
- - - 5% band  
- - - 95% band

# REPEATED SIMULATIONS

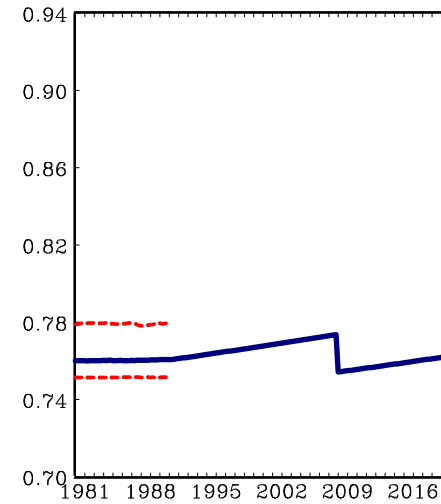
Foreign demand



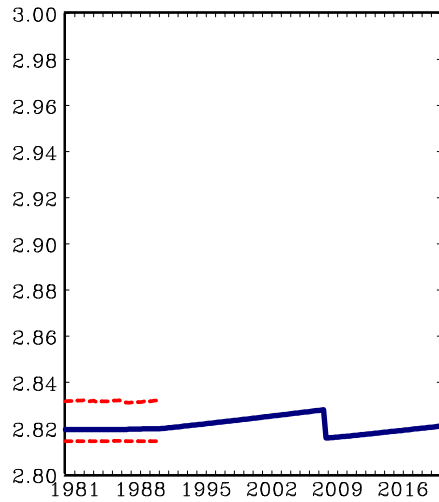
Bank liabilities



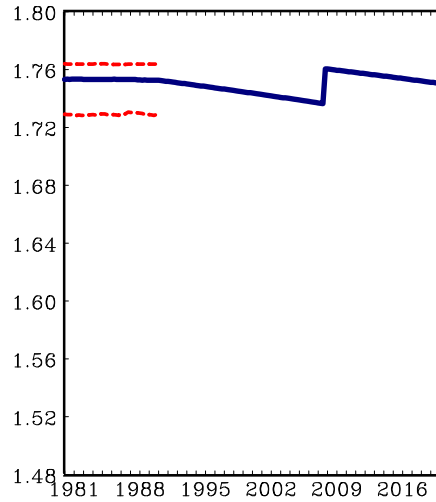
Bank leverage



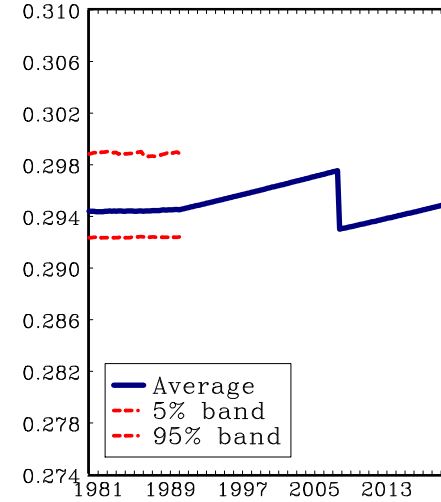
Asset price



Lending rate



Labor

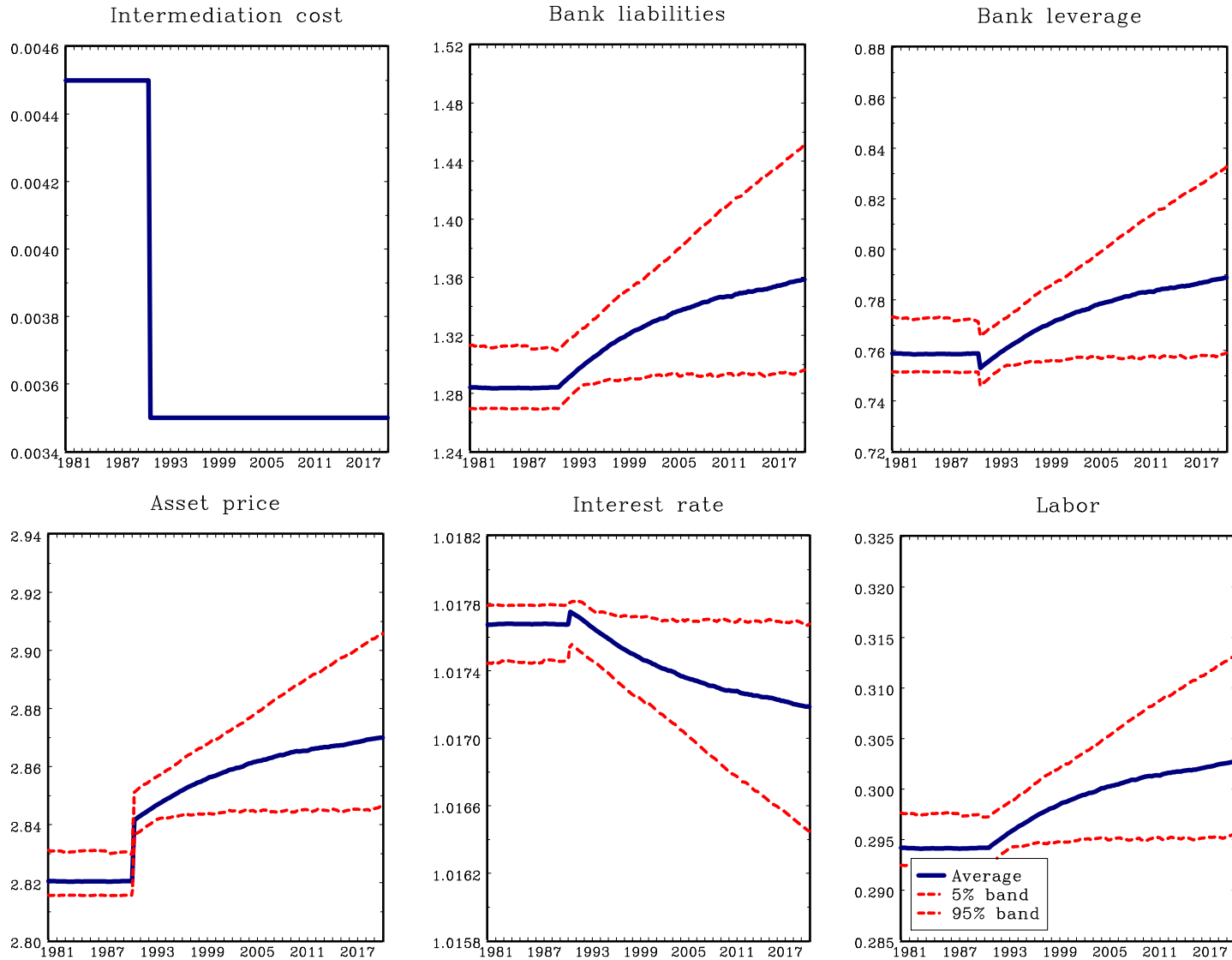


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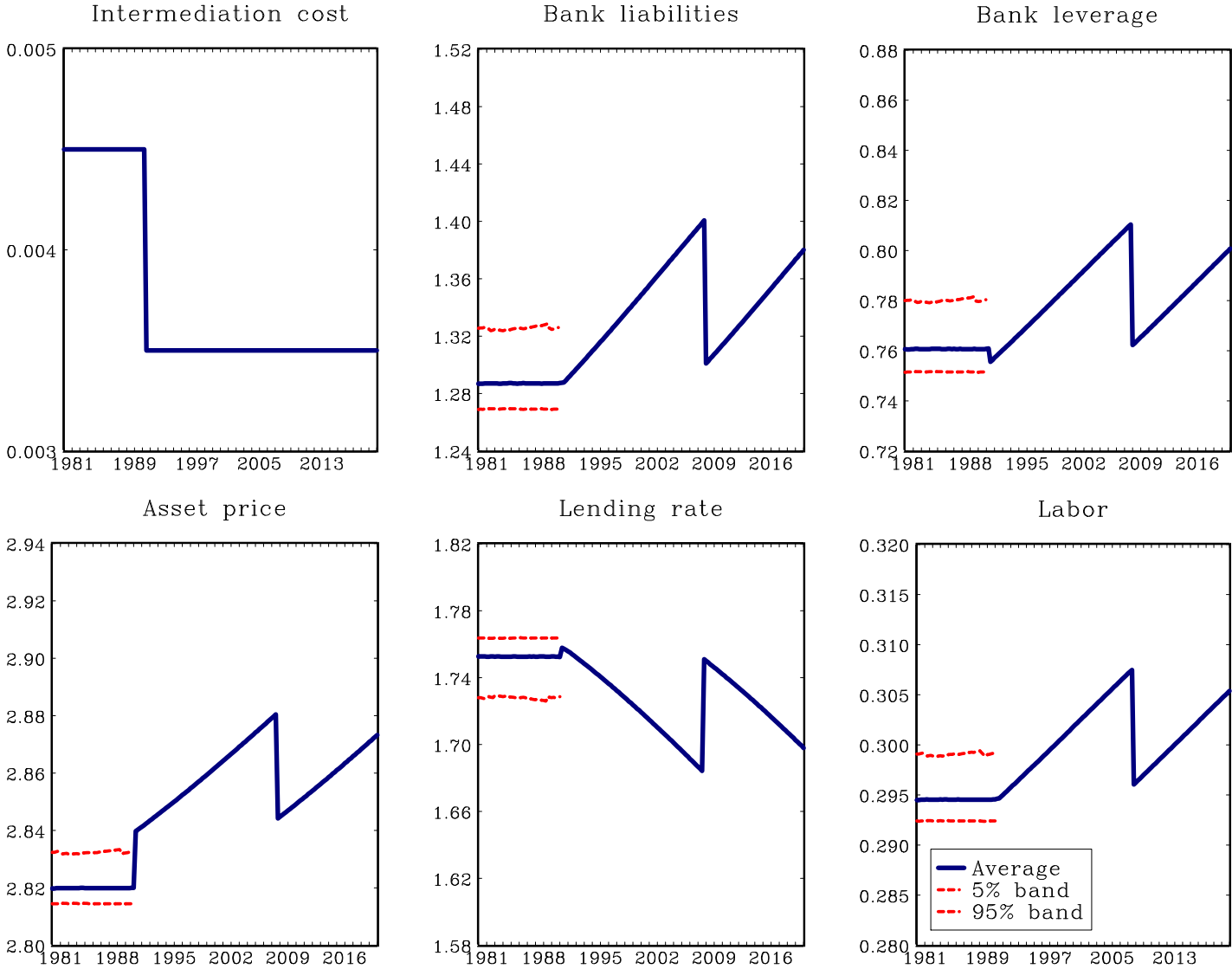
# APPLICATION

**Financial innovations**  
**(Reduction in the funding cost  $\tau$ )**

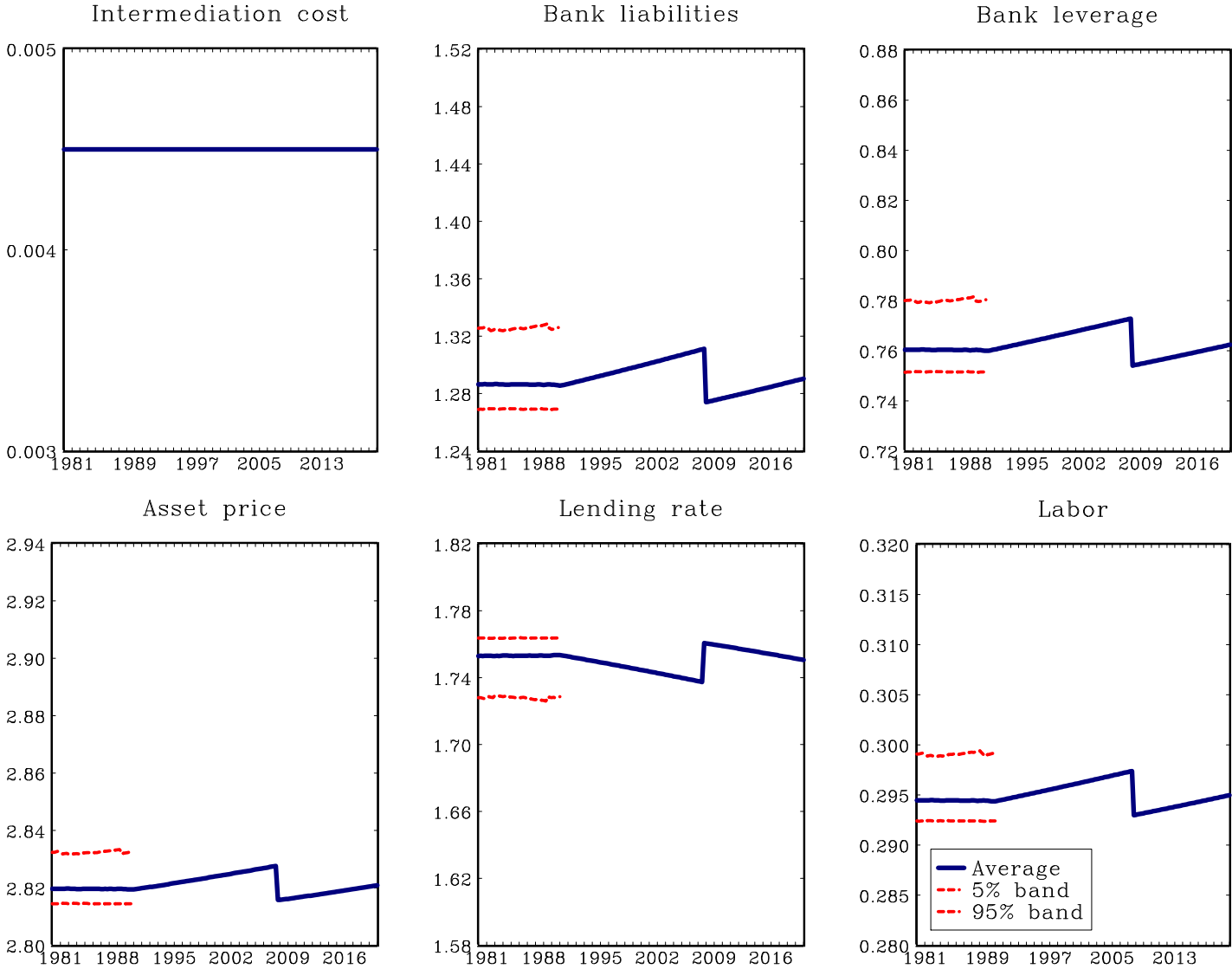
# REPEATED SIMULATION



# REPEATED SIMULATION (deterministic after 1991)



# REPEATED SIMULATION (deterministic after 1991)



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# CONCLUSION

- Good times induce banks to increase leverage.
- But more leverage exposes the banking sector to crisis because of possible liquidity shortage when market expectations become pessimistic.
- Bank crises could be damaging for the real sector of the economy not necessarily because of lending cuts but because of the contraction in supply or value of liabilities created by banks (**Bank Liabilities Channel**).
- The increasing demand for financial assets (for example from emerging economies) may increase the likelihood and/or consequences of a crisis.