

International Recessions

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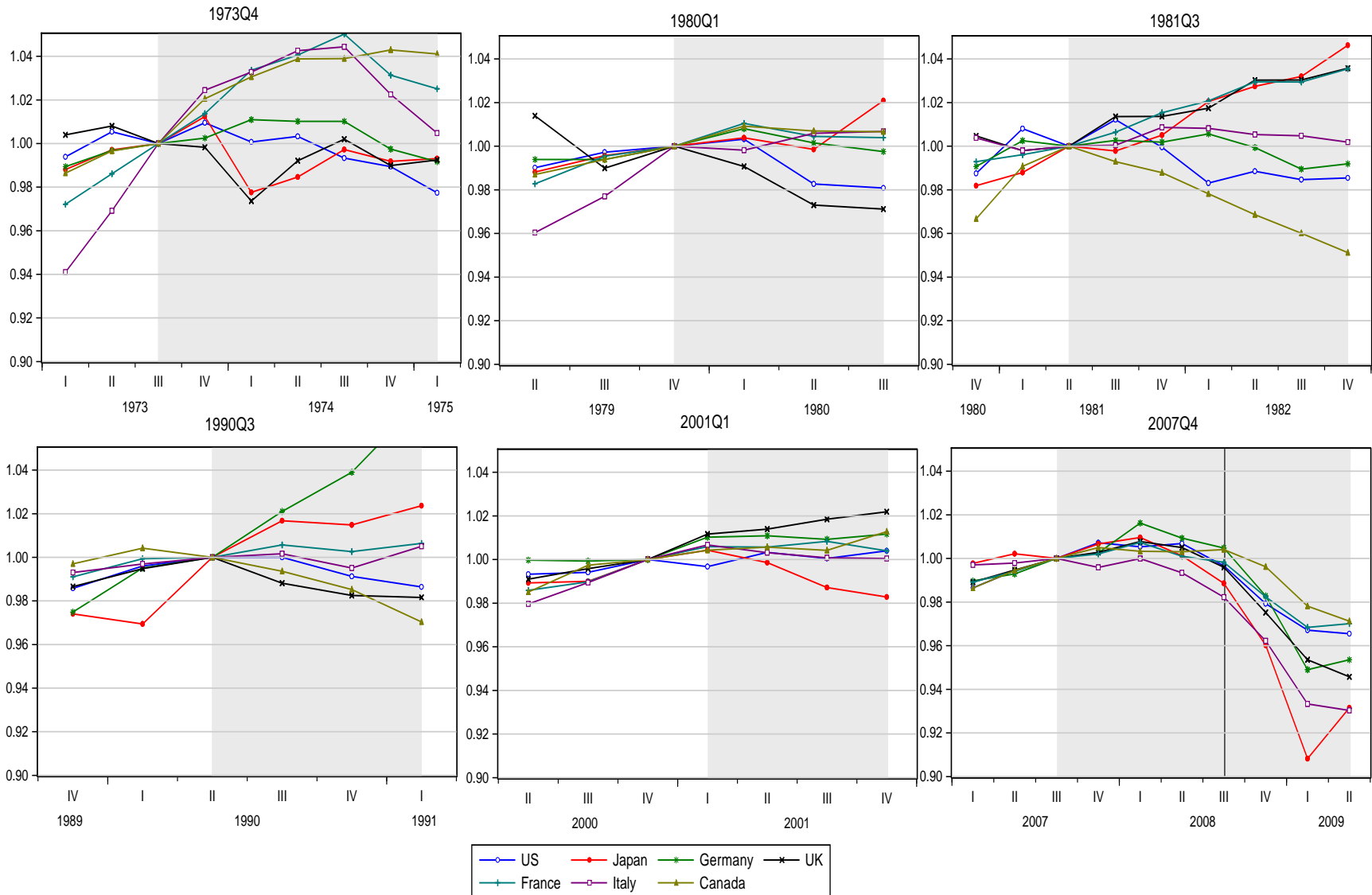
University of Southern California

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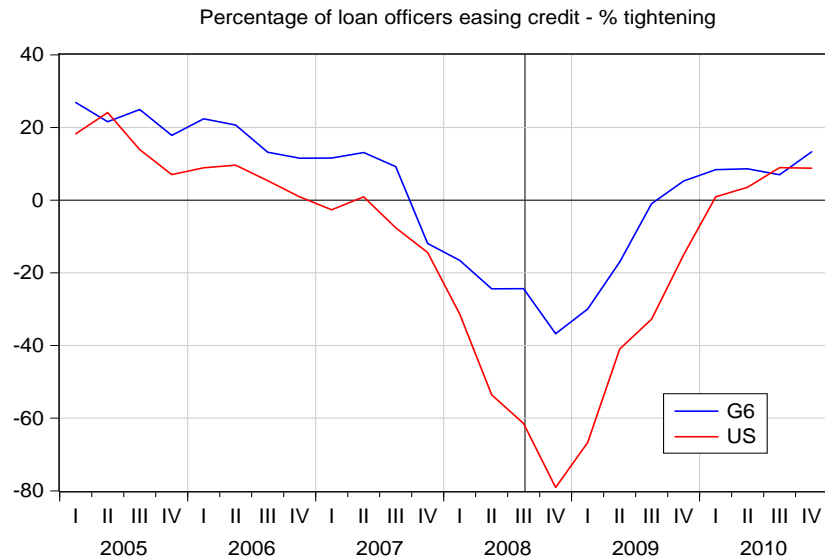
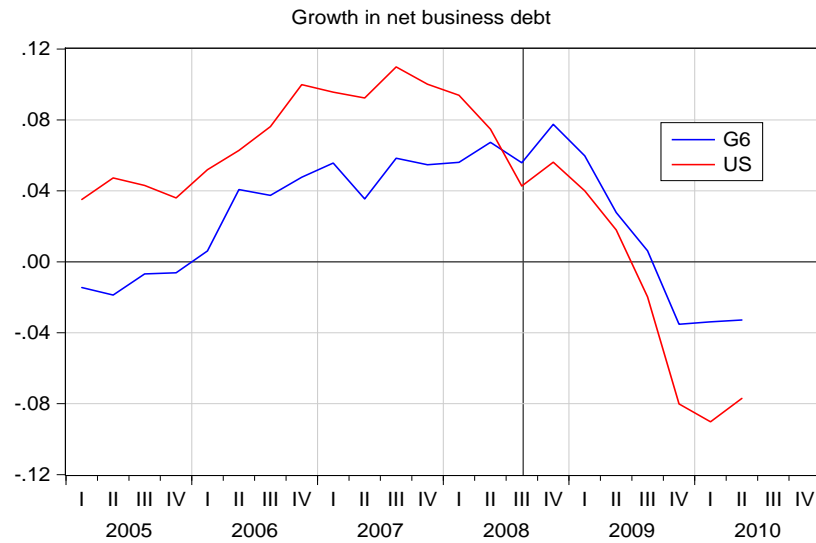
Feature of the 2007-2008 crisis

High degree of **real** and **financial** co-movement in industrialized countries.

GDP DURING RECESSIONS



FINANCIAL CO-MOVEMENT



WHAT EXPLAINS CO-MOVEMENT?

1. Shocks could be correlated (global shocks).
2. Country-specific shocks propagate to other countries (spillover).

WHAT DOES EXPLAIN CO-MOVEMENT?

1. Shocks could be correlated (global shocks).
2. Country-specific shocks propagate to other countries (spillover).
3. **Our proposal:** Propagation mechanism that makes shocks correlated.

WHAT DO WE DO?

We propose a two-country model where

- Credit expansions and contractions are generated by self-fulfilling expectations (**multiple equilibria**).
- Multiple equilibria arise because of **occasionally binding constraints**.

MAIN FINDINGS

- Credit contractions generate sharp recessions while the macroeconomic impact of credit expansions is more gradual (**asymmetry**).
- Recessions are more severe after long periods of credit and macroeconomic expansions (**history dependence**).
- The model generates sizable movements in **asset prices**.

MODEL WITH SEGMENTED MARKETS

- Two types of agents (sectors):
 - **Investors**: They are the shareholders of firms and consume dividends.

$$\max E \sum_{t=0}^{\infty} \beta^t u(d_t)$$

- **Workers**: Supply labor and lend funds to firms with bonds.

$$\max E \sum_{t=0}^{\infty} \delta^t U(c_t, h_t)$$

- Different discount factors: $\beta < \delta$.

FIRMS

- ‘Concave’ production function $F(\bar{k}, h_t)$. **Fixed capital for the moment.**
- Budget constraint: $b_t + d_t = \frac{b_{t+1}}{R_t} + F(h_t) - w_t h_t$.
- Discount factor: $m_{t+1} = \frac{\beta u_c(d_{t+1})}{u_c(d_t)}$.
- Also borrow intra-temporally for working capital $l_t = F(h_t)$.
- Limited enforcement: $\xi_t \cdot \bar{k} \geq \frac{b_{t+1}}{R_t} + l_t$

RECURSIVE PROBLEM FOR THE FIRM

$$V(\mathbf{s}; b) = \max_{d, h, b'} \left\{ d + Em'V(\mathbf{s}'; b') \right\}$$

subject to:

$$b + d = \frac{b'}{R} + F(h) - wh$$

$$\xi \cdot \bar{k} \geq \frac{b'}{R} + F(h)$$

First order conditions

$$F_h(h) = w \cdot \left(\frac{1}{1 - \mu} \right)$$

$$REm' = 1 - \mu$$

μ

\Rightarrow

Multiplier for the enforcement constraint.

Positive if binding.

OPEN ECONOMY

- Two symmetric countries.
- Households borrow and lend internationally. They own domestic bonds, b_t , and foreign bonds, n_t .
- Investors are allowed to hold shares of domestic and foreign firms. They choose **full diversification**.

OPEN ECONOMY

- Because of investors' diversification, the **common** discount factor is:

$$m_{t+1} = \frac{\beta u_c(d_{t+1}^1 + d_{t+1}^2)}{u_c(d_t^1 + d_t^2)}$$

- Back to first order conditions of firms:

$$F_h(h^1) = w^1 \cdot \left(\frac{1}{1 - \mu^1} \right)$$

$$REm' = 1 - \mu^1$$

$$F_h(h^2) = w^2 \cdot \left(\frac{1}{1 - \mu^2} \right)$$

$$REm' = 1 - \mu^2$$

PROPERTY WITH EXOGENOUS ξ_t

Proposition. *An unexpected change in ξ_t (domestic credit shock) has the same impact on employment and output of domestic and foreign countries.*

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HOWEVER

Unless shocks are internationally correlated, the model does not generate co-movement in financial flows.

ENDOGENOUS ξ_t

- The enforcement constraint is occasionally binding,

$$\xi_t \cdot \bar{k} \geq \frac{b_{t+1}}{R_t} + F(h_t)$$

- Capital can be sold to households at price $\xi_t = \underline{\xi}$.
- Alternatively, capital can be sold to firms at price $\xi_t = \bar{\xi}$.
- However, acquiring firms need **liquidity**.

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- Alternatively, capital can be sold to firms at price $\xi_t = \bar{\xi}$.
- However, acquiring firms need **liquidity**.
- **Multiple equilibria:**
 - If the market expects $\xi_t = \bar{\xi}$, firms will not borrow up to the limit and the ex-post price of the liquidated capital is $\xi_t = \bar{\xi}$.
 - If the market expects $\xi_t = \underline{\xi}$, firms will borrow up to the limit and the ex-post price of the liquidated capital is $\xi_t = \underline{\xi}$.

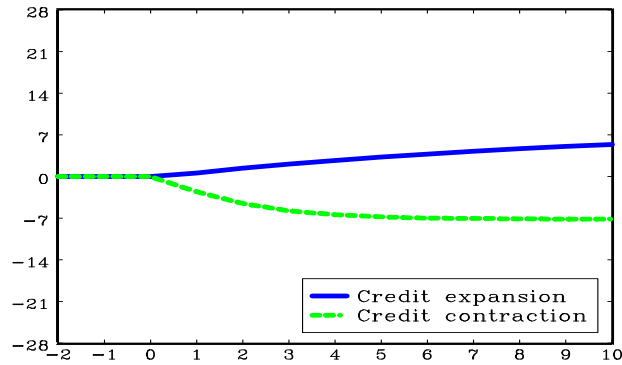
PROPERTY WITH ENDOGENOUS ξ_t

Proposition. *A credit contraction in the domestic country (decline in ξ_t) is always associated with a credit contraction in the foreign country (decline in ξ_t^*). Thus, both countries experience the same responses in macroeconomic and financial variables.*

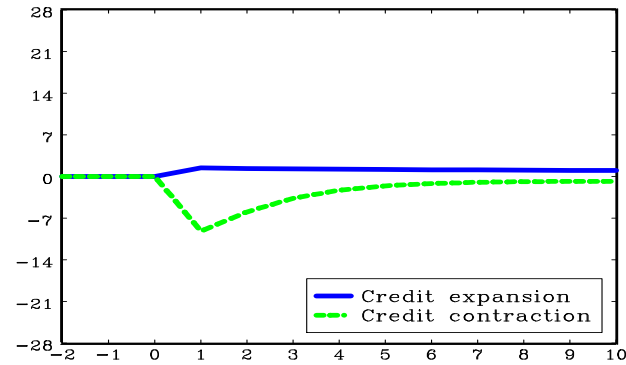
Result 1: Asymmetry

Credit contractions have larger macroeconomic and asset price effects than expansions

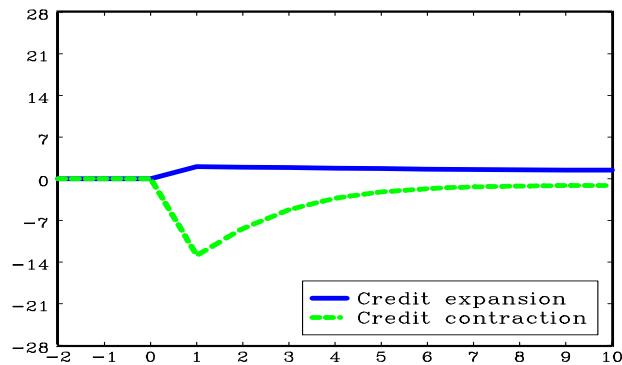
Debt



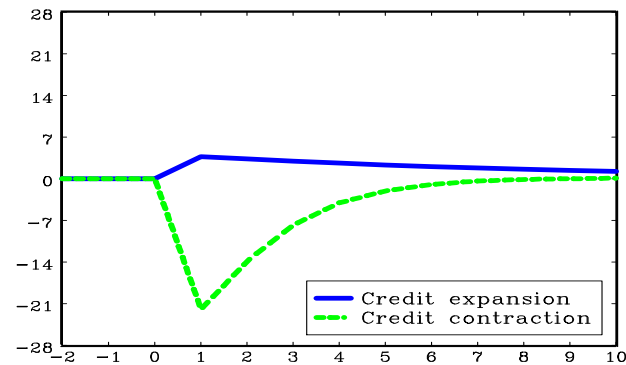
Output



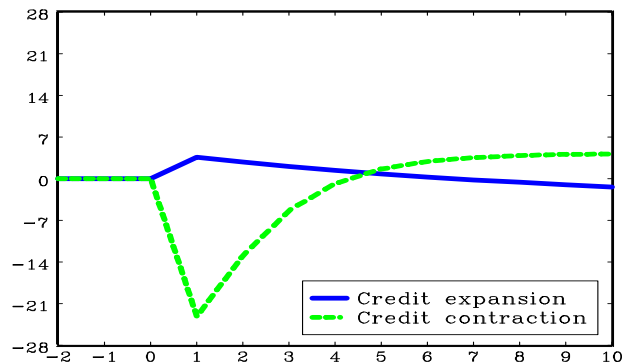
Labor



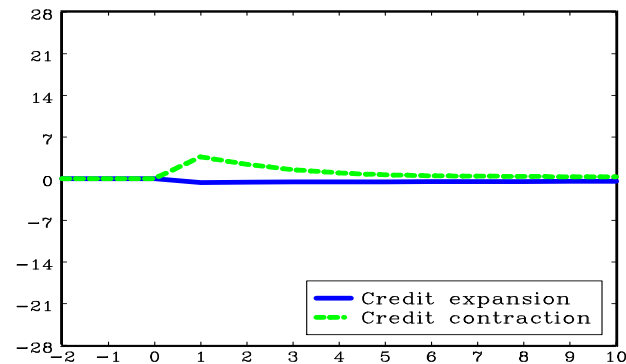
Investment



Stock market value



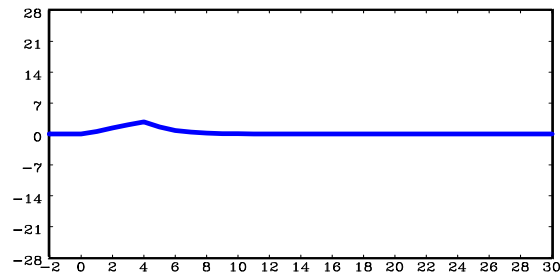
Labor productivity



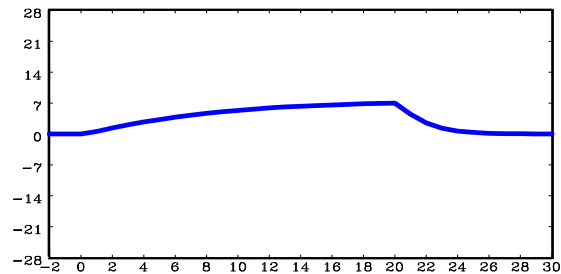
Result 2: Recessions led by credit booms

The severity of crises increases with the duration of the credit expansion

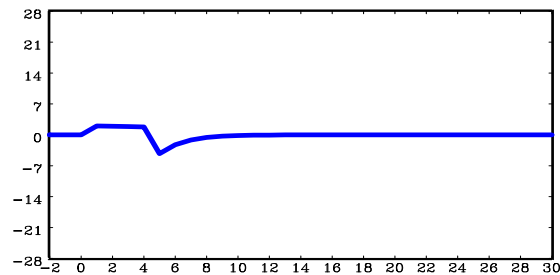
Debt (4 quarters expansion)



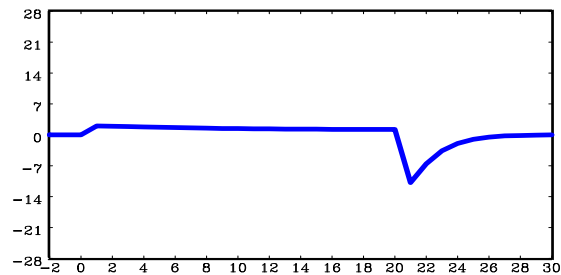
Debt (20 quarters expansion)



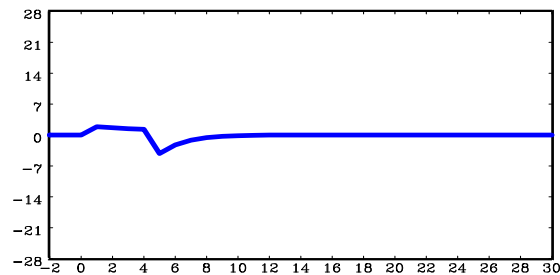
Labor (4 quarters expansion)



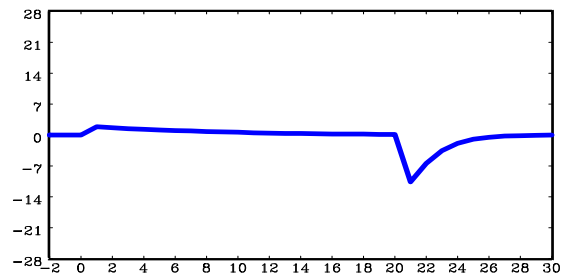
Labor (20 quarters expansion)



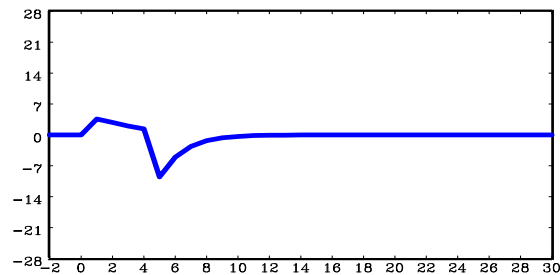
Investment (4 quarters expansion)



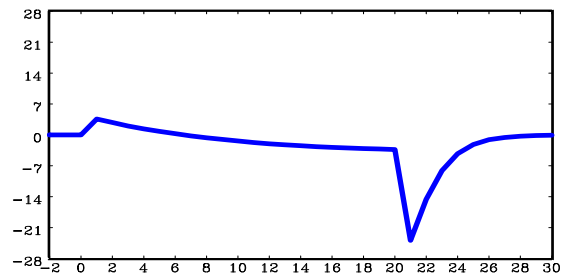
Investment (20 quarters expansion)



Stock market (4 quarters expansion)



Stock market (20 quarters expansion)



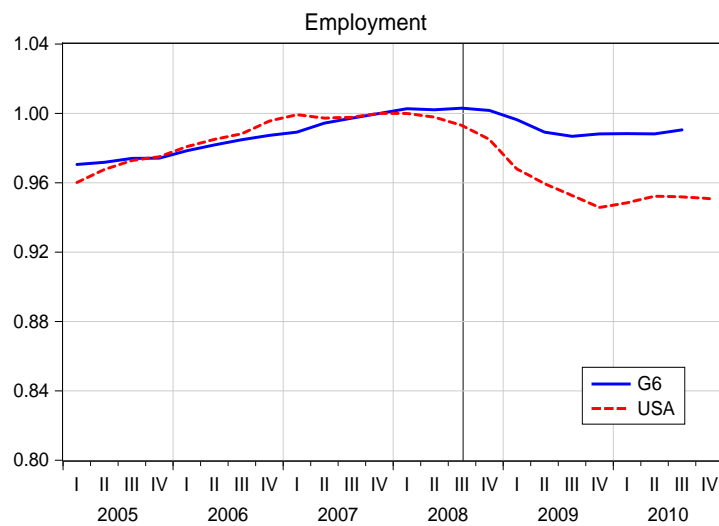
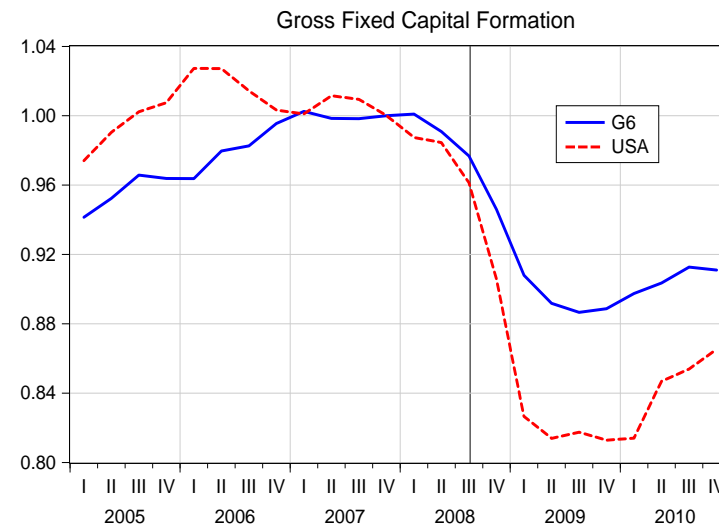
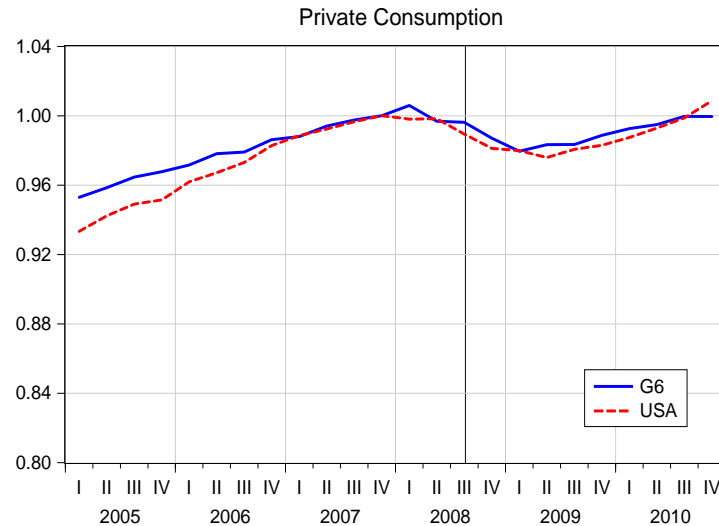
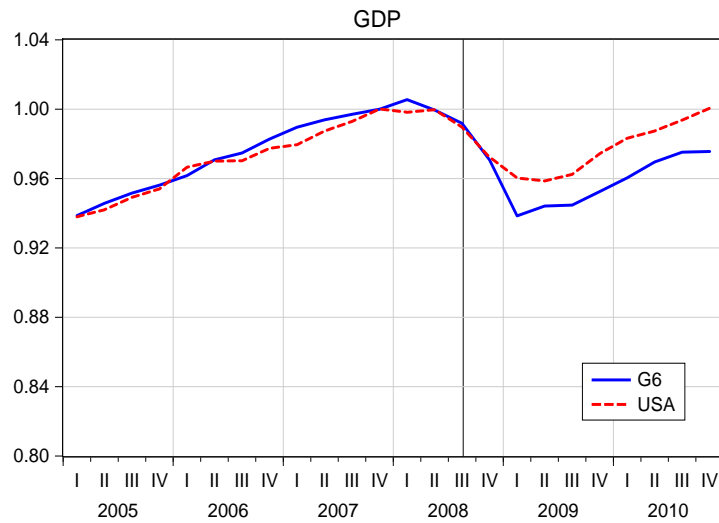
Result 3: Employment and asset price volatility

Credit shocks generate large fluctuations in employment and asset prices

Business cycle statistics

	Credit shocks only	Productivity shocks only	Both shocks
<i>Standard deviations</i>			
Output	0.88	0.76	1.16
Consumption	0.68	0.44	0.77
Labor	1.26	0.26	1.26
Investment	2.27	0.77	2.36
Tobin's q	1.14	0.38	1.18
Stock market value	2.46	0.54	2.45
Interest rate	0.48	0.25	0.48
Return on equity	5.82	0.37	5.82
<i>Expected returns (% annualized)</i>			
Interest rate	1.40	1.56	1.40
Return on equity	6.96	5.62	6.96
Equity risk premium	1.56	0.06	1.56
Nonbinding constraints, %	96.44	99.99	96.04

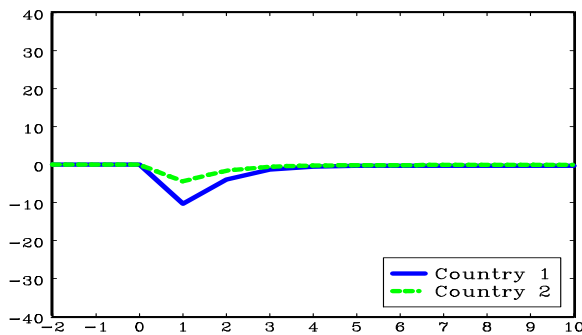
HETEROGENEOUS DYNAMICS OF LABOR



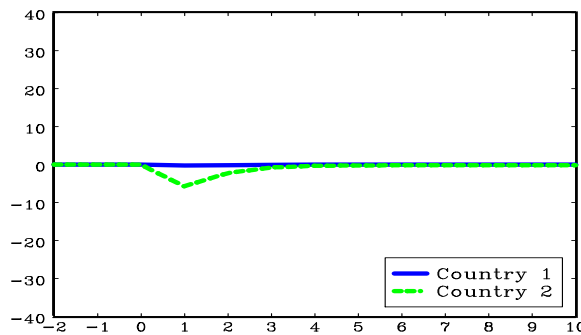
Result 4: Heterogeneous responses of labor

Heterogeneous response of employment but similar responses of financial variables and other real variables

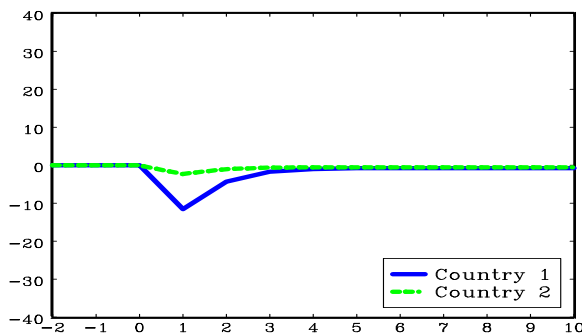
Hours worked



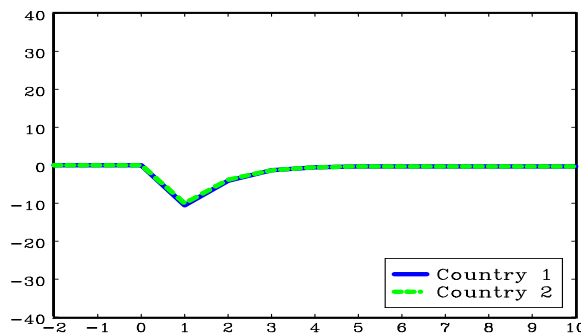
Labor productivity



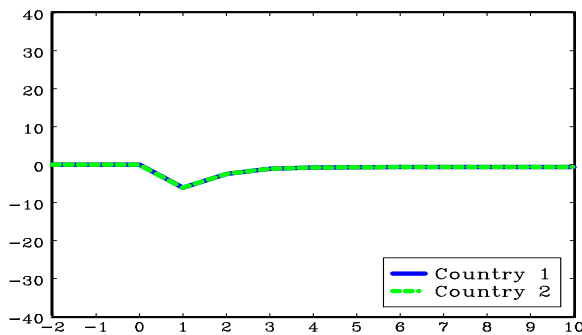
Labor wedge



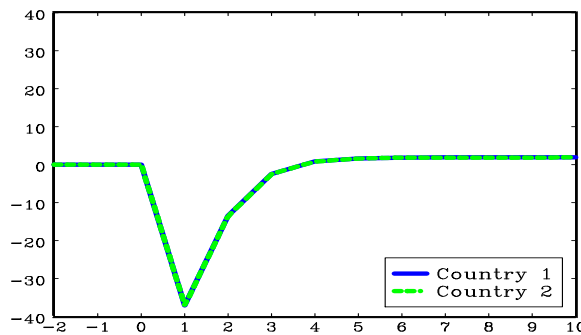
Output



Consumption



Investment



CONCLUSION

- At a broad level a model with **endogenous** credit shocks and **financial integration** helps understanding the recent macroeconomic development:
 1. Non-productivity driven recessions,
 2. High international correlation in real and financial variables.

- The next step is to ask whether policies can do something about them?