

Bank Recapitalizations, Credit Supply and the Transmission of Monetary Policy

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ESCB Research Cluster on Monetary Economics
Second Annual Workshop

12 October 2018

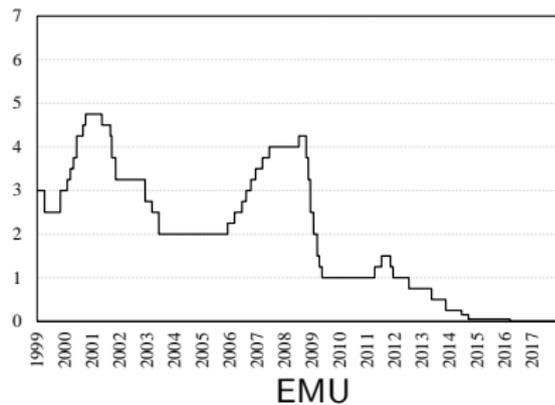
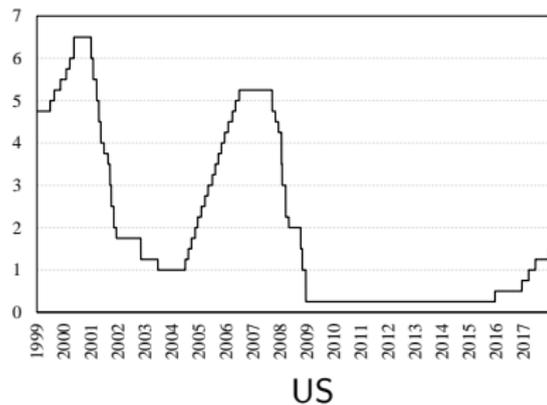
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Aim of the paper

- We examine how banking sector recapitalizations after a crisis affect credit supply and monetary transmission.
- To this end, we integrate a representative bank in a conventional New-Keynesian DSGE model (with sticky prices and investment).
- The key friction in the model is that the banking sector receives a transfer from the government if loan losses exceed equity buffers.
- The government can provide this transfer immediately after the crisis, or with a delay (this policy choice is exogenous).

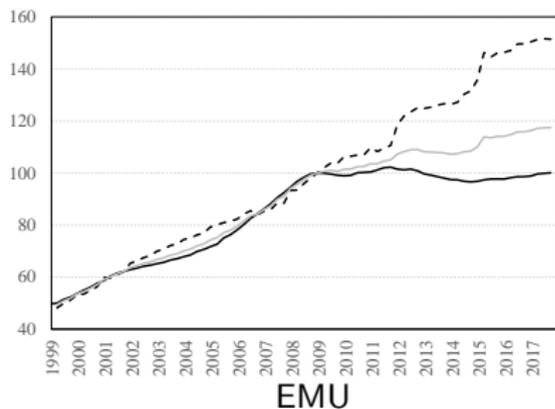
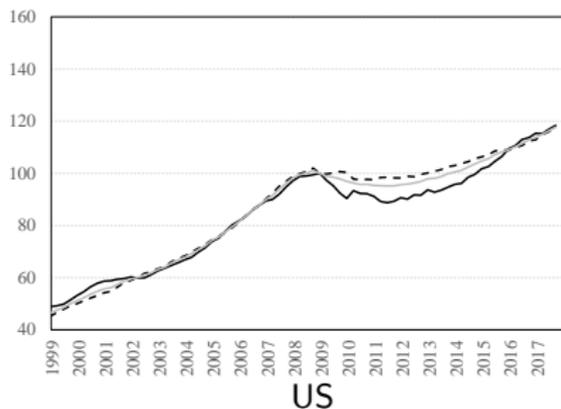
Motivation (1)

- 2008-09 financial crisis was followed by large monetary expansion:



Motivation (2)

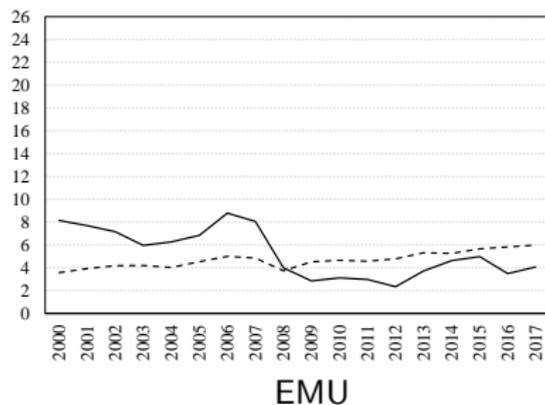
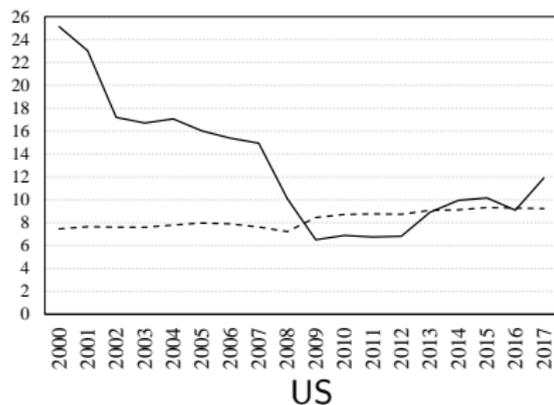
- Especially in EMU, recovery of bank credit was rather slow:



Bank credit (solid), non-bank credit (dashed) and total credit (gray)

Motivation (3)

- Especially in EMU, recovery of bank equity was rather slow as well:



Bank equity over assets in book values (dashed) and market values (solid)

Preview of the results

- Before a crisis, banks anticipate recapitalizations by charging lower lending rates (over-lending).
- This decline in lending rates is larger when recapitalizations are immediate instead of delayed.
- After a crisis, delaying a recapitalization leads to debt-overhang in the banking sector.
- This debt-overhang drives up high lending rates (under-lending) and weakens monetary policy transmission to inflation.

Related literature

- **Government safety nets and bank lending:** Merton (1977), Kareken and Wallace (1987), Dam and Koetter (2012), Farhi and Tirole (2012), Admati et al. (2013).
- **Debt-overhang in banking:** Myers (1977), Hanson, Kashyap and Stein (2011), Thakor (2014), Bahaj and Malherbe (2016), Occhino (2017), Admati et al. (2018).
- **Banking and macro-economic fluctuations:** Kiyotaki and Moore (1997), Bernanke, Gertler and Gilchrist (1999), Goodfriend and McCallum (2007), Gerali et al. (2010), Gertler and Karadi (2011), Clerc et al. (2015), Curdia and Woodford (2016).

Structure of the model

- “Standard” New-Keynesian DSGE model with household and firms
 - Monopolistic competition in intermediary goods sector
 - Price rigidity (Calvo pricing)
 - Taylor rule with persistence and response only to inflation
- Bank that intermediates between household and capital producer
 - Perfectly competitive representative bank
 - Household saves in bank equity and deposits
 - Capital producer borrows from bank to finance capital stock
 - Crucial friction is that bank may receive a government recapitalization

Bank when recapitalizations are absent (benchmark)

The bank maximizes its future stream of excess profits:

$$\max_{L_t, D_t, E_t} \mathbb{E}_t \sum_{\tau=0}^{\infty} \Lambda_{t+1+\tau} \left(\Pi_{t+1+\tau}^B \right),$$

where real profits at $t + 1$ are defined as:

$$\Pi_{t+1}^B \equiv \frac{R_t^L}{\pi_{t+1}} L_t - \frac{R_t^D}{\pi_{t+1}} D_t - \frac{R_t^E}{\pi_{t+1}} E_t + \Pi_{t+1}^K.$$

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Given the balance sheet identity and the equity requirement:

$$\begin{aligned} L_t &\equiv D_t + E_t, \\ E_t &= \kappa L_t, \end{aligned}$$

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Given the balance sheet identity and the equity requirement:

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the first-order condition for the bank lending rate is:

$$R_t^L = (1 - \kappa) R_t^D + \kappa R_t^E.$$

Bank when recapitalizations are immediate

The bank maximizes its future stream of excess profits:

$$\max_{L_t, D_t, E_t} \mathbb{E}_t \sum_{\tau=0}^{\infty} \Lambda_{t+1+\tau} \left(\Pi_{t+1+\tau}^B + S_{t+1+\tau} \right),$$

which include government recapitalizations that are received to compensate for any shortfalls:

$$S_{t+1} \equiv \max \left(0; \frac{R_t^D}{\pi_{t+1}} D_t - \frac{R_t^L}{\pi_{t+1}} L_t - \Pi_{t+1}^K \right),$$

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The first-order condition for the bank lending rate is:

$$R_t^L = \frac{(1 - \kappa) R_t^D + \kappa R_t^E}{1 + \Gamma(\bar{\omega}_t)},$$

where $\Gamma(\bar{\omega}_t) > 0$ is larger when expected future recapitalizations are larger (e.g., when S_{t+1} is higher due to a lower bank equity requirement κ).

Bank when recapitalizations are delayed

If the bank experienced a shortfall at time t , it receives a recapitalization at the end of $t + 1$ that equals:

$$\max \left(0, \frac{R_t^D}{\pi_{t+1}} S_t - \max \left(0; \Pi_{t+1}^K + \frac{R_t^L}{\pi_{t+1}} L_t - \frac{R_t^D}{\pi_{t+1}} D_t \right) \right),$$

which equals the shortfall at t minus any profits made during $t + 1$.

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which equals the shortfall at t minus any profits made during $t + 1$.

The first-order condition for the bank lending rate is:

$$R_t^L = \frac{(1 - \kappa) R_t^D + \kappa R_t^E}{1 + F(\tilde{\omega}_t) \Gamma(\tilde{\omega}_t) + \Gamma(\hat{\omega}_t)},$$

where $F(\tilde{\omega}_t) \in (0, 1)$ is the probability of experiencing a shortfall in the next period and receiving a recapitalization in the period thereafter.

$\Gamma(\hat{\omega}_t) \leq 0$ reflects how profits in $t + 1$ affect the recapitalization expected for $t + 1$ ($\Gamma(\hat{\omega}_t) = 0$ unless $S_t > 0$)

Four versions of the model

Banking sector without recapitalizations (efficient lending):

$$R_t^L = (1 - \kappa)R_t^D + \kappa R_t^E.$$

Before a shortfall with immediate recapitalizations (over-lending):

$$R_t^L = \frac{(1 - \kappa)R_t^D + \kappa R_t^E}{1 + \Gamma(\bar{\omega}_t)}.$$

Before a shortfall with delayed recapitalizations (less over-lending):

$$R_t^L = \frac{(1 - \kappa)R_t^D + \kappa R_t^E}{1 + F(\tilde{\omega}_t)\Gamma(\bar{\omega}_t)}.$$

In between a shortfall and a delayed recapitalization (under-lending):

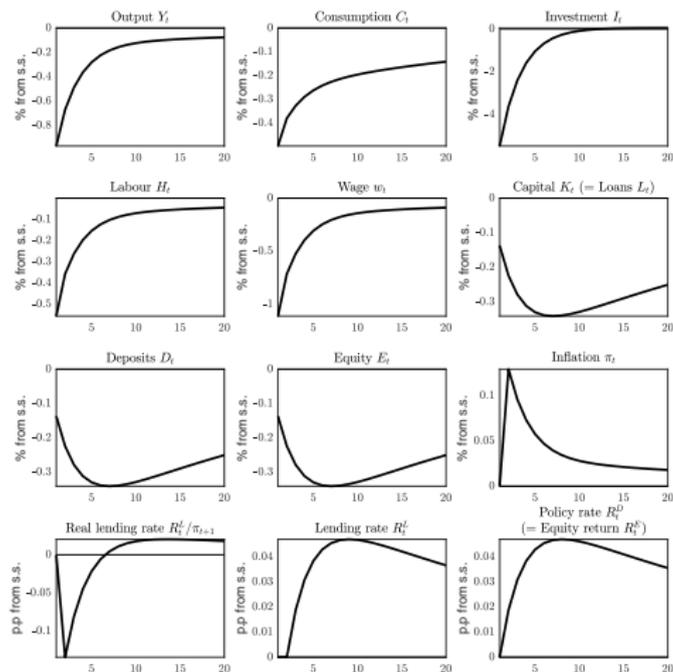
$$R_t^L = \frac{(1 - \kappa)R_t^D + \kappa R_t^E}{1 + F(\tilde{\omega}_t)\Gamma(\bar{\omega}_t) + \Gamma(\hat{\omega}_t)}.$$

Calibration of the model

Parameter	Description	Value
β	Household discount factor	0.99
σ	Rate of inter-temporal substitution	1
φ	Inverse of the labor supply elasticity	2
χ	Weight of labor in the utility function	15
κ	Bank equity requirement	0.04
σ_ω	Standard deviation of the return on bank loans	0.02
α	Share of capital in the production function	0.3
ρ^Z	Autoregressive coefficient for productivity shocks	0.67
δ	Capital depreciation rate	0.025
θ	Final good substitution elasticity	6
ξ	Share of firms that cannot re-optimize their price	0.75
γ	Degree of price indexation	0
π^*	Steady state inflation rate	1
ϕ^R	Smoothing coefficient in the interest rate rule	0.9
ϕ^P	Response to inflation in the interest rate rule	1.5

Results (1)

Figure: A decrease in TFP when the banking sector is frictionless



Results (2)

- Monetary transmission in the standard New-Keynesian DSGE model:
 - ① An increase in the policy rate raises the cost of capital, causing firms to raise prices → inflation goes up
 - ② An increase in the policy rate reduces aggregate demand, causing firms to reduce labor demand and lower wages → inflation goes down
- Typically 2 dominates 1.

Results (2)

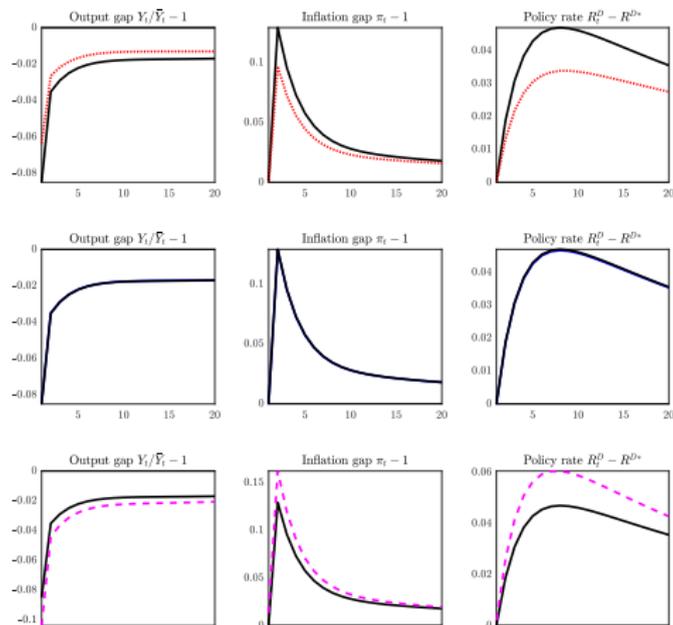
- Monetary transmission in the standard New-Keynesian DSGE model:
 - ① An increase in the policy rate raises the cost of capital, causing firms to raise prices \rightarrow inflation goes up
 - ② An increase in the policy rate reduces aggregate demand, causing firms to reduce labor demand and lower wages \rightarrow inflation goes down
- Typically 2 dominates 1. However, our model shows that:

$$\frac{\partial R_t^K}{\partial R_t^D} = \frac{\partial R_t^L}{\partial R_t^D} = \frac{1}{1 + F(\tilde{\omega}_{t+1})\Gamma(\bar{\omega}_t) + \Gamma(\hat{\omega}_t)},$$

- Recapitalization policies imply $F(\tilde{\omega}_{t+1})\Gamma(\bar{\omega}_t) > 0$, which weakens 1 and strengthens monetary transmission to inflation
- In between a shortfall and a delayed recapitalization $\Gamma(\hat{\omega}_t) < 0$, which strengthens 1 and weakens monetary transmission to inflation

Results (3)

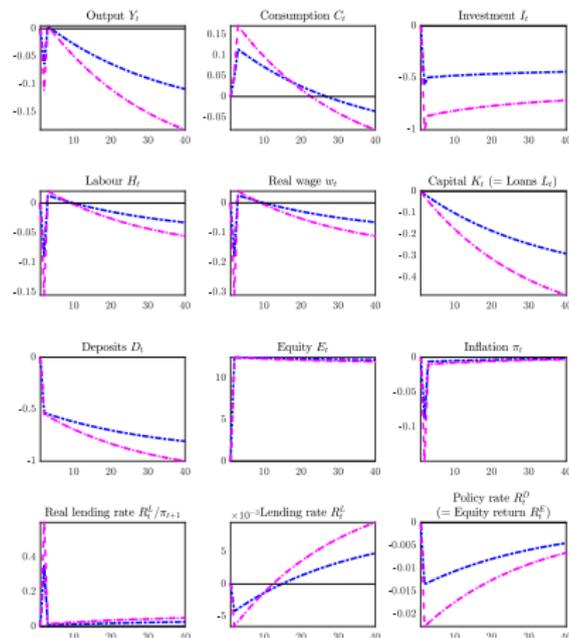
Figure: Monetary transmission after a decrease in TFP



Responses before a shortfall with immediate recapitalizations (top row), before a shortfall with delayed recapitalizations (middle row), and in between a shortfall and a delayed recapitalization (bottom row). The black line in each panel reflects the benchmark without recapitalizations.

Results (4)

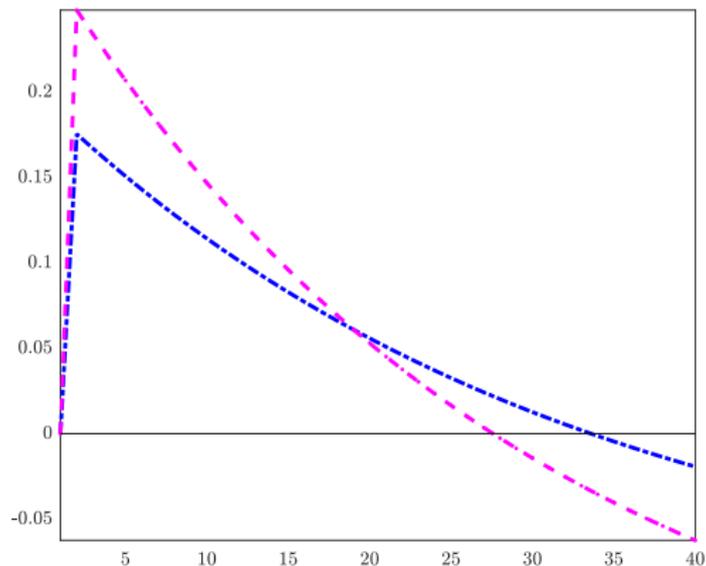
Figure: A permanent increase in the bank equity requirement by 0.5 p.p.



The blue line describes the situation before a shortfall when recapitalizations are delayed and the pink line describes the case in between a shortfall and a delayed recapitalization.

Results (5)

Figure: Utility after a permanent increase in the bank equity requirement



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Conclusion

- Banking sector recapitalizations affect both credit supply and the transmission of monetary policy
- Before a crisis, (especially immediate) recapitalizations cause banks to charge inefficiently low lending rates
- Between a crisis and a delayed recapitalization, banks:
 - suffer from debt-overhang
 - which causes them to raise their lending rates
 - and weakens monetary transmission to inflation (but not to output)
- Higher bank equity requirements reduce the need for recapitalizations, which reduces output but increases lifetime utility