

The Effects of Financial Heterogeneity on the Bank Balance Sheet Channel of Monetary Policy in a Monetary Union

Mai Hakamada

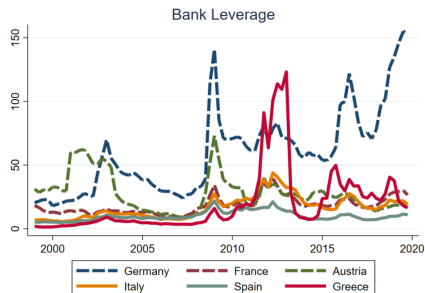
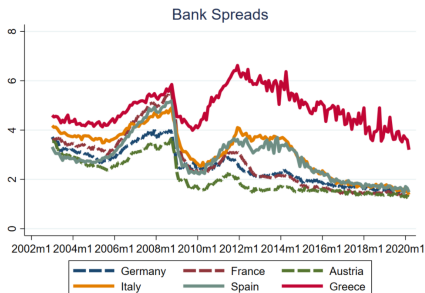
University of California, Santa Cruz

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Research Question

- ▶ We observe huge heterogeneities in banks' net interest income and leverage ratio in Eurozone countries
 - ▶ This is at odds with the assumption of homogeneous financial friction
- ▶ When regional heterogeneity of the financial friction is taken into account, what are the implications of the union-wide monetary policy?
 - ▶ Does different degree of the financial friction imply different effectiveness of monetary policy?
- ▶ Does using a model imply different degree of financial friction compared to the case only micro data is used without a model?
 - ▶ In models, we can track behaviors of all the agents and macroeconomic interactions

Figure: Bank Spreads (%) and Bank Leverage (Market Value)



Source: ECB Securities Issues Statistics (SEC), ECB, and Eurostat Quarterly Sector Accounts (QSA), and MFI Interest Rate Statistics (MIR Statistics)

Note: Bank Spreads (Net interest income) is calculated from average loan rates minus average deposit rates (%). Leverage is calculated from market value loans supplied by banks divided by market value bank equities.

- 1 New-Keynesian with financial acceleration: Gertler and Karadi (2011)
 - ▶ Monetary policy bank lending channel
- 2 Two country, monetary union, complete market model: Groll and Monacelli (forthcoming)
 - ▶ Single union with two regions, single monetary policy
- 3 Compare the estimates of the degrees of the financial friction
 - ▶ Panel Regression
 - ▶ We observe data on each EU country

- ▶ With an union model with bank-lending channel, we studied how different degree of the financial friction affects the responses to monetary policy
- ▶ The region with tighter friction has smaller responses to monetary policy
- ▶ With data on EU countries, we estimate the degree of the financial friction with panel regression
- ▶ Core countries have much looser financial constraint and the peripheral countries have very tight financial constraint
- ▶ Asset purchase policies, particularly region-specific asset purchases, can complement the bank balance sheet channel's unequal outcomes inside a region.

■ Empirical Literature

- Heterogenous effectiveness of credit channels in monetary union
[Jimenez, Ongena, Peydro, and Saurina (2012), Albertazzi, Nobili, and Signoretti (2016), Ciccarelli et al. (2013)]

■ Theoretical Literature

- Heterogeneity and monetary policy in monetary union
[Gilchrist, Schoenle, Sim, and Zakrajsek (2018)]

■ Model Framework

- Monetary union models
[Benigno (2004), Groll and Monacelli (2020)]
- Financial frictions in the banking sector
[Gertler and Karadi (2011), Galain and Ilbas (2017)]

Model Environment

- ▶ Two countries (regions: peripheral and core), single central bank
 - ▶ Two types of tradable goods: Home-produced goods and Foreign-produced goods
 - ▶ Households in the two regions can borrow/lend between them, complete market
- ▶ Agents: Household, Bank, Intermediate firm, Capital goods producer, Retail firm, Central Bank
 - ▶ **Households:** Deposit to bank, and supply labor to intermediate firm.
 - ▶ **Banks:** Supply loans to intermediate firms by raising deposits from household.
 - ▶ **Intermediate firms:** They finance themselves from bank loan and produce intermediate goods.
 - ▶ **Capital goods producers:** Produce capital under adjustment cost of investment.
 - ▶ **Retail firms:** Produce final goods while set prices under infrequent Calvo pricing opportunity.

Bank Optimization and Risk Sharing

- ▶ Bank faces incentive constraint $V_t \geq \theta Q_t s_t$ which induces spreads

$$E_t \tilde{\Lambda}_{t,t+1} [(R_{k,t+1} - R_{t+1})] = \theta \frac{\lambda_t}{1 + \lambda_t} \quad (1)$$

- ▶ Consumption of home-produced and foreign-produced goods

$$C_t \equiv \left[(1 - \gamma)^{\frac{1}{\eta}} C_{H,t}^{\frac{\eta-1}{\eta}} + \gamma^{\frac{1}{\eta}} C_{F,t}^{\frac{\eta-1}{\eta}} \right]^{\frac{\eta}{\eta-1}} \quad (2)$$

$$\gamma \equiv (1 - n)\alpha \quad (3)$$

where n is the relative size of Home, $1 - \alpha$ is home bias

- ▶ Risk sharing condition

$$(1 - \gamma - \gamma^*)T_t = \sigma(c_t - c_t^*) \quad (4)$$

$$T_t \equiv \frac{P_{F,t}}{P_{H,t}} \quad (5)$$

- ▶ When $\alpha = 0$ (no home bias) and $n = 1/2$ (same size), $c_t = c_t^*$

Estimation: Panel Regression

- ▶ Based on the structural equation,

$$\frac{L_t^i}{N_t^i} = \frac{E_t R_{t+1}^i}{\theta - E_t [R_{t+1}^{K,i} - R_{t+1}^i]}. \quad (6)$$

- ▶ Estimate the following equation.

$$L_t^i = \alpha^i + \beta_1^i R_{t+1}^i + \beta_2^i N_t^i + \beta_3^i Spread_{t+1}^i + D_t + \epsilon_t^i. \quad (7)$$

where D_t is control variables.

- ▶ The structural relationship between β_2^i and θ^i is

$$\hat{\beta}_3^i = \frac{\beta Spread}{\theta - \beta Spread}, \quad (8)$$

Estimation Results

VARIABLES	(1) Aggregate	(2) Core	(3) Peripheral
Deposit Rate	0.0139 (0.212)	0.648* (0.342)	1.140 (0.831)
Bank Equity ¹	0.396*** (0.113)	0.363** (0.142)	0.521** (0.234)
Spreads ²	5.612*** (1.156)	8.753*** (1.588)	12.64** (5.279)
Lending Demand ³	0.00573 (0.00488)	-0.00691 (0.00826)	0.00766 (0.00626)
Constant	9.251*** (1.446)	7.270*** (2.724)	5.426** (2.716)
Time FE	Yes	Yes	Yes
Observations	116	59	57
Number of country_id	8	4	4

- The implied values of the degree of financial degree are

$$\hat{\theta}_{Peripheral} = 0.512, \hat{\theta}_{Core} = 0.260.$$

¹Logged value.

²Average loan rate minus average deposit rate.

³ECB Bank Lending Survey, net percentage of lending demand for small and medium size enterprises.

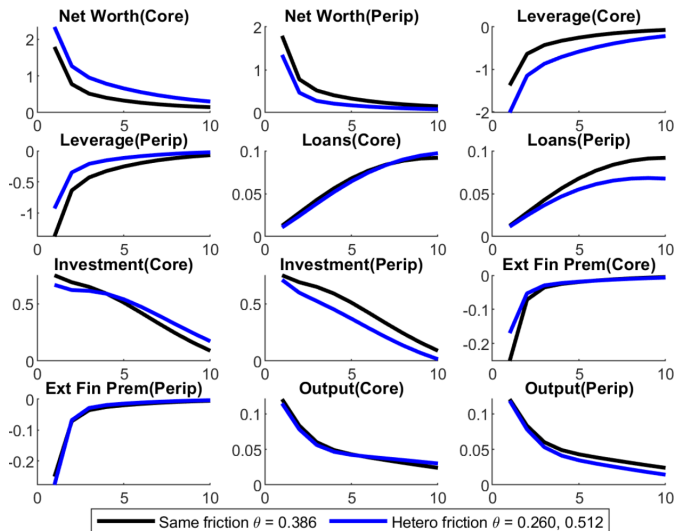
Table: Calibration

	Parameters	Home	Foreign
Financial Intermediaries			
X	Proportional transfer to the entering bankers	0.002	
σ	Continuation rate of the bankers	0.972	
θ	Fraction of asset that can be diverted	0.260	0.512
efp_{ss}	Steady-state external finance premium	0.0025	
Open economy			
n	Relative size of Home region	1/2	
$1 - \alpha$	The degree of Home bias	0.6	0.6

This implies the steady-state level of leverage is 5.7773 in Home and 1.1208 in Foreign.

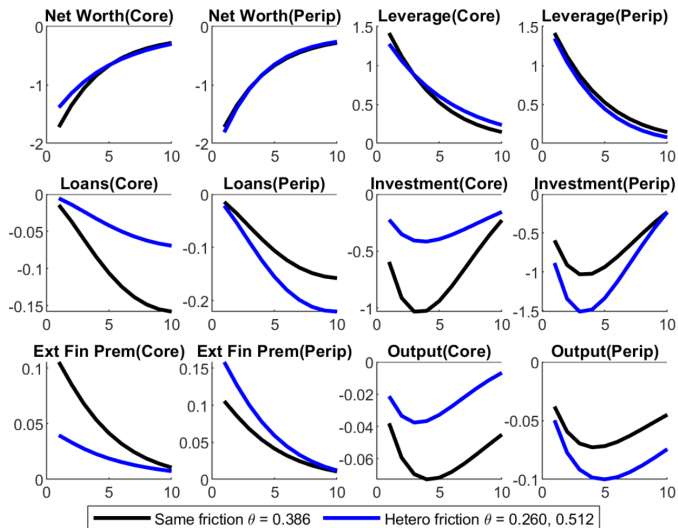
Simulation for interest rate shock

Interest Rate Shock



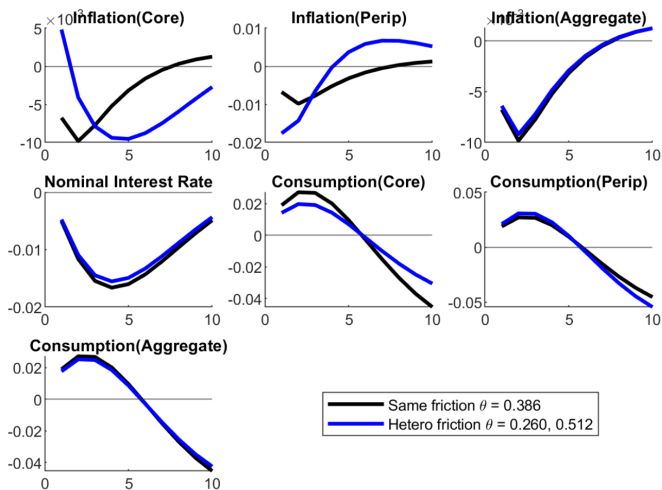
Simulation for net worth shock

Net Worth Shock (Aggregate)



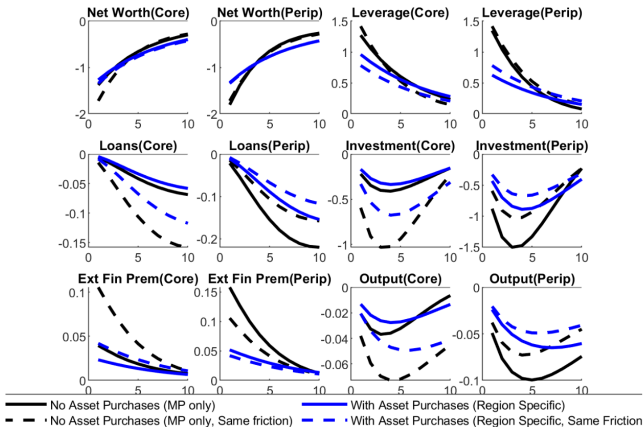
Simulation for net worth shock

Net Worth Shock (Aggregate)



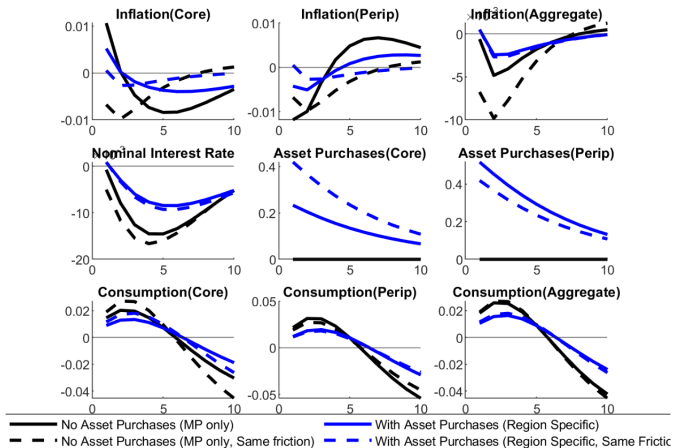
Simulation for region specific asset purchasing policies

Net Worth Shock (Aggregate)



Simulation for region specific asset purchasing policies

Net Worth Shock (Aggregate)



Conclusion

- ▶ With an union model with bank-lending channel, we studied how different degree of the financial friction affects the responses to monetary policy
- ▶ The region with tighter friction has smaller responses to monetary policy
- ▶ With data on EU countries, we estimate the degree of the financial friction with panel regression
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Appendix

Table: Data sources and time periods in estimations

Bank / Financial Variables			
Variables	Level	Sources	Quarters
Bank Net Worth (MTM)	Country	ECB Securities Issues Statistics	1989Q3-2020Q1
Bank Loan	Country	ECB and Eurostat Quarterly Sector Accounts	1999Q1-2019Q4
Spreads (NIM)	Country	ECB MFI Interest Rate Statistics	2003Q1-2020Q1
Deposit Rate	Country	ECB MFI Interest Rate Statistics	2003Q1-2020Q1
Lending Demand	Country	ECB Bank Lending Survey	2000Q1-2020Q1
Other Economic Variables			
Variables	Level	Sources	Quarters
Output	Country	OECD	1989Q3-2020Q1
Consumption	Country	OECD	1989Q3-2020Q1
Inflation (CPI)	Country	OECD	1989Q3-2020Q1
Hours Worked	Country	ECB Statistical Data Warehouse	2000Q2-2015Q2
Wage	Country	OECD	1989Q3-2020Q1
Investment (GFCF)	Country	OECD	1989Q3-2019Q1
Monetary Policy Rate	Country	Deutsche Bundesbank	1999Q1-2020Q1