Security Losses, Interbank Markets, and Monetary Policy Transmission:

Evidence from the Eurozone

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Motivation

- Banks face inherent **liquidity risk** due to the maturity mismatch (Diamond and Rajan, 2001, 2005).
- The **value of collateral holdings** determines borrowing capacity in interbank markets
  $\Rightarrow$ Affects banks' ability to insure liquidity risk and extend illiquid loans to the private sector.
- Changes in **monetary policy** can alter collateral constraints and can potentially reduce credit supply.

Empirical evidence on the bank-based collateral channel of monetary policy remains limited.

This Paper

What is the effect of monetary policy on bank lending through the collateral channel?

- July 2022: ECB raised the policy interest rate in response to increasing inflation.
  - Large heterogeneity in *security losses* across banks and countries.
- Leverage micro-level data from the euro area:
  - Banks' securities holdings
  - Interbank lending
  - Firm-level credit registry
- We explore the effects of monetary tightening through security losses and disentangle the underlying mechanisms.

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- Interbank Market
  - Losses in pledgeable securities reduce access to the interbank market.
  - Effect is stronger for banks with high collateral utilization.
  - No differential effect based on capitalization.
  - No effect for banks unsecured borrowing $\Rightarrow$ collateral constraint, not creditworthiness.
  - Both AFS and HTM securities matter $\Rightarrow$ not driven by regulatory capital concerns.

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  - Both AFS and HTM securities matter $\Rightarrow$ not driven by regulatory capital concerns.
- Liquidity Redistribution Within Banking Groups
  - Domestic subsidiaries receive more intra-group loans after losses.
  - Foreign subsidiaries do not receive group support and face tighter constraints.
  - Within-group lending segmented along national lines.

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- Lending to Firms
  - Differences in access to the interbank market affect corporate lending.
  - Affected banks charge higher interest rates and shorten maturities on new loans.
  - Domestic subsidiaries are partially shielded; foreign ones behave like stand-alone banks.

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$\Longrightarrow$ Incomplete Banking Union: Internal capital markets do not overcome national segmentation. Local liquidity pools and deposit insurance firewalls continue to fragment monetary policy transmission within the euro area.

Related Literature

- **Transmission mechanism of monetary policy**
  - Jimenez et al. (2012), Rodnyansky and Darmouni (2017), Acharya et al. (2018), Gomez et al. (2021), Greenwald et al. (2024) ...
  - $\Longrightarrow$ Existing literature has highlighted the role of bank net wealth and regulatory capital. We show that lower pledgeable collateral restricts interbank access and lending.

- **Collateral Channel of Monetary Policy**
  - Theoretical foundations: Bernanke and Gertler (1989); Kiyotaki and Moore (1997)...
  - Firm-level evidence: Chaney et al. (2012), Cvijanovic (2014), Adelino et al. (2015), Bahaj et al. (2020, 2022)...
  - $\Longrightarrow$ First empirical evidence on a **bank-based** collateral channel affecting both funding and lending

- **International transmission of bank liquidity shocks**
  - Peek and Rosengren (2000), Schnabl (2012), Campello (2002), Cetorelli and Goldberg (2012a and b) Gilje, Loutskina, and Strahan (2016), Morais et al. (2019)...
  - $\Longrightarrow$ We rely on granular data on interbank and within group loans to document the mechanism; First evidence that foreign subsidiaries benefit less from within group risk sharing

Data

Securities Holdings Statistics (SHS-G)

- Debt security holdings at the ISIN-bank-quarter level
- Marked-to-market available for sales securities (AFS) vs. historical cost accounting held-to-maturity (HTM) securities

AnaCredit (AC), the European System of Central Banks' credit register

1. **Interbank market**
    - Interbank loans including repo and interbanks deposits
    - Covers also loans between subsidiaries of a banking group
2. **Lending to firms**
    - Harmonized loan-level data on all Eurozone commercial loans outstanding (above EUR 25,000)

Bank balance sheet data (IBSI)

- Information on banks granular asset and liability items at the subsidiary level

Security Losses

Computes the effect of the monetary policy tightening on the value of securities:

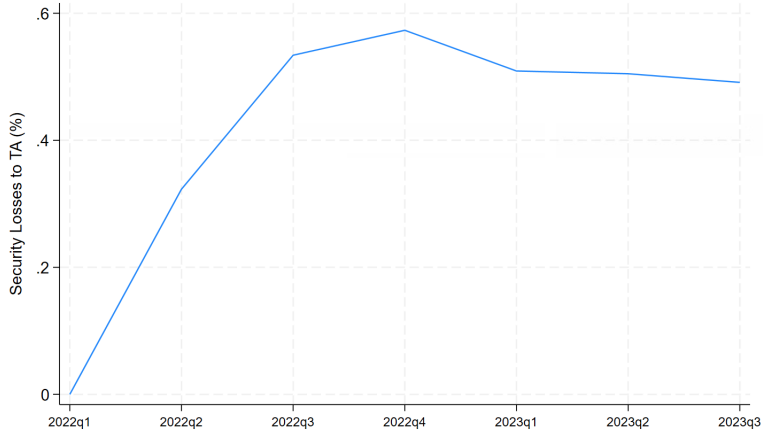
$$\text{Security Losses}_{b,t} = \frac{\sum_s \left(\frac{P^s_t - P^s_{2022Q1}}{P^s_{2022Q1}} \times \text{Value Held}^s_{b,2022Q1} \right)}{\text{Total Assets}_{b,2022Q1}}$$

- s = security (ISIN), b = bank, t = quarter
- Captures the change in value of a bank's ex-ante securities portfolio based on fluctuations in individual security prices.
- Treating a bank's ex-ante security holdings as fixed

Construct security losses for:

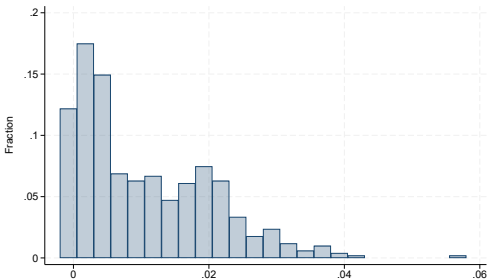
1. All securities
2. HTM vs. AFS respectively

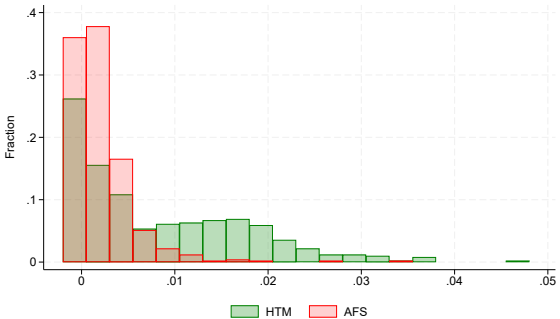
Security Losses Over Time



- Most of the losses were realized in Q2 and Q3 of 2022, following the first interest rate hike.
- Securities in our sample are primarily sovereign bonds → political and country risk effects are absorbed by country × time FE.

Distribution of Securities Losses





- On average, banks suffer securities losses of 1% of their total assets (or 12% of their total equity).
- AFS losses are four times smaller than HTM + smaller dispersion of AFS losses.

Security Losses and the Interbank Market

Impact of Security Losses on Interbank Borrowing

$$\text{Loan amount}_{b,c,l,h,t} = \alpha + \beta \text{ Security Losses}_{b,t-1} + \delta_{b,l} + \mu_{c,t} + \theta_{h,t} + \epsilon_{b,c,l,h,t}$$

	Loan Amount			
	(1)	(2)	(3)	(4)
All Security Losses$_{b,t-1}$	-3.691***			
	(1.403)			
Collateral Security Losses$_{b,t-1}$		-9.006***		-6.226*
		(3.211)		(3.325)
Non-Collateral Security Losses$_{b,t-1}$			-1.236	
			(1.014)	
Collateral Security Losses$_{b,t-1}$ × Collateral Util. Rate$_{b,2022q1}$				-4.939***
				(1.251)
Bank Lender – Bank Borrower FE	Yes	Yes	Yes	Yes
Country Lender – Time FE	Yes	Yes	Yes	Yes
Country Borrower – Time FE	Yes	Yes	Yes	Yes
N	120,799	120,005	120,005	99,344
R^2	0.899	0.898	0.898	0.896

- Following the MP tightening, banks with more security losses receive less credit in the interbank market.
- 1 s.d. ↑ in banks' losses is associated with a 3.76% decline in credit received in the interbank market.

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Collateral channel

- A decrease in the value of pledgeable securities reduces banks' interbank borrowing capacity.
- We do not observe an analogous effect for nonpledgeable securities.

Impact of Security Losses on Interbank Borrowing

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Collateral channel

- Banks that rely heavily on securities as collateral experience a larger drop in interbank borrowing.

Impact of Security Losses on Interbank Borrowing: Channels

	Loan Amount			
	Repo	Non-Repo	All Instruments	
	(1)	(2)	(3)	(4)
Collateral Security Losses$_{b,t-1}$	-25.22***	2.480	-9.953***	
	(5.602)	(4.592)	(3.632)	
Collateral Security Losses$_{b,t-1}$ × Total Capital Ratio$_{b,2022q1}$			2.088	
			(3.458)	
AFS Security Losses$_{b,t-1}$				-13.24**
				(5.441)
HTM Security Losses$_{b,t-1}$				-6.930**
				(3.325)
Bank Lender – Bank Borrower FE	Yes	Yes	Yes	Yes
Country Lender – Time FE	Yes	Yes	Yes	Yes
Country Borrower – Time FE	Yes	Yes	Yes	Yes
N	13,258	85,280	120,005	120,005
R^2	0.809	0.888	0.898	0.898

Collateral channel

- Security losses have an effect only on the amount that a bank is able to borrow through the repo market.
- Security losses appear to have no effect on banks' access to the unsecured market.

Impact of Security Losses on Interbank Borrowing: Channels

	Loan Amount			
	Repo	Non-Repo	All Instruments	
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Alternative channel: Net worth

- The impact of security losses is not stronger for banks with lower ex-ante capital ratios.

Impact of Security Losses on Interbank Borrowing: Channels

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	Repo	Non-Repo	All Instruments	
	(1)	(2)	(3)	(4)
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Alternative channel: Net worth

- Marked-to-market AFS securities affect bank capital requirements
- Finding: Losses on both AFS and HTM securities reduce banks' access to interbank credit.

Intragroup Lending Offsets Collateral Losses of Borrowing Banks

	Loan Amount	
	Borrowing Banks' Losses	
	Between Groups	Within Group
	(1)	(2)
Collateral Security Losses$_{b,t-1}$	-16.73***	13.61***
	(3.778)	(3.971)
Bank Lender – Bank Borrower FE	Yes	Yes
Country Lender – Time FE	Yes	Yes
Country Borrower – Time FE	Yes	Yes
N	99,134	20,855
R^2	0.881	0.907

1. The decrease in interbank borrowing is entirely driven by lending from banks outside the banking group
2. Intra-group lending has a counteracting effect
   - 1 s.d. ↑ in losses is associated with a 13.6% increase in intra-group credit.

Effects of Lending Banks' Losses

	Loan Amount				
	Borrowing Banks' Losses		Lending Banks' Losses		
	Between Groups	Within Group	All	Between Groups	Within Group
	(1)	(2)	(3)	(4)	(5)
Collateral Security Losses$_{b,t-1}$	-16.73***	13.61***			
	(3.778)	(3.971)			
Collateral Security Losses$_{l,t-1}$			-8.896**	-10.26**	0.273
			(3.467)	(4.840)	(4.280)
Bank Lender – Bank Borrower FE	Yes	Yes	Yes	Yes	Yes
Country Lender – Time FE	Yes	Yes	Yes	Yes	Yes
Country Borrower – Time FE	Yes	Yes	Yes	Yes	Yes
N	99,134	20,855	51,879	35,330	16,518
R^2	0.881	0.907	0.882	0.841	0.916

1. The decrease in interbank borrowing is entirely driven by lending from banks outside the banking group
2. Intra-group lending has a counteracting effect
3. Security losses affect not only banks' ability to borrow but also their lending behavior.

Banking Group Liquidity Support: Domestic vs. Foreign Subsidiaries

Lending by:	Loan Amount		
	All	Foreign subs.	Domestic subs.
	(1)	(2)	(3)
Collateral Security Losses$_{b,t-1}$ × Foreign$_b$	3.573	71.22*	-4.625
	(12.72)	(39.40)	(13.57)
Collateral Security Losses$_{b,t-1}$ × Domestic$_b$	9.948***	8.796	5.346*
	(3.834)	(7.820)	(2.956)
Bank Lender – Bank Borrower FE	Yes	Yes	Yes
Country Lender – Time FE	Yes	Yes	Yes
Country Borrower – Time FE	Yes	Yes	Yes
N	16,132	1,420	15,214
R^2	0.910	0.867	0.922

- **Only domestic subsidiaries** receive more intra-group loans in response to security losses.

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R^2	0.910	0.867	0.922

- **Internal capital markets exhibit border effects.**
- Foreign subsidiaries lend across borders, while domestic subsidiaries lend within the headquarters' country.
- Segmentation reflects local liquidity pools and firewalls due to the absence of common deposit insurance.

Corporate Lending

Security Losses and Bank Lending to Firms

$$\text{Loan Amount}_{b,g,f,t} = \alpha + \beta \text{ Security Losses}_{b,t-1} + \gamma X_{b,t} + \delta_{f,t} + \mu_{g,t} + \theta_{b,f} + \epsilon_{b,g,f,t}$$

	Loan Amount		
	(1)	(2)	(3)
Collateral Security Losses$_{b,t-1}$	-2.910***	-2.542***	-5.476***
	(0.572)	(0.541)	(0.576)
Bank Controls	No	Yes	Yes
Bank – Firm FE	Yes	Yes	Yes
Firm – Time FE	Yes	Yes	Yes
Banking Group – Time FE	No	No	Yes
N	16,290,844	16,290,840	16,290,839
R^2	0.972	0.972	0.972

- Banks that experience larger security losses lend less to a given firm relative to other banks.
- 1 s.d. increase in banks' losses is associated with a 5.48% decline in lending to firms.

Security Losses and Bank Lending to Firms

$$\text{Loan Amount}_{b,g,f,t} = \alpha + \beta \text{ Security Losses}_{b,t-1} + \gamma X_{b,t} + \delta_{f,t} + \mu_{g,t} + \theta_{b,f} + \epsilon_{b,g,f,t}$$

	Loan Amount					
	(1)	(2)	(3)	(4)	(5)	(6)
Collateral Security Losses$_{b,t-1}$	-2.910***	-2.542***	-5.476***			
	(0.572)	(0.541)	(0.576)			
Collateral HTM Security Losses$_{b,t-1}$				-7.120***		-6.489***
				(0.838)		(0.872)
Collateral AFS Security Losses$_{b,t-1}$					-5.727***	-3.868***
					(1.069)	(1.048)
Bank Controls	No	Yes	Yes	Yes	Yes	Yes
Bank – Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm – Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Banking Group – Time FE	No	No	Yes	Yes	Yes	Yes
N	16,290,844	16,290,840	16,290,839	16,290,839	16,290,839	16,290,839
R^2	0.972	0.972	0.972	0.972	0.972	0.972

- Lending declines regardless of whether losses are marked-to-market or at historical cost.

Security Losses, Bank Lending to Firms and Collateral Channel

	Loan Amount	
	(1)	(2)
Collateral Security Losses$_{b,t-1}$	-5.204***	-4.725***
	(0.945)	(0.873)
Collateral Security Losses$_{b,t-1}$ × Collateral Utilization Rate$_{b,2022q1}$	-2.588***	
	(0.354)	
Collateral Security Losses$_{b,t-1}$ × Excess Liquidity$_{b,2022q1}$		16.989**
		(7.499)
Bank Controls	Yes	Yes
Bank – Firm FE	Yes	Yes
Firm – Time FE	Yes	Yes
Banking Group – Time FE	Yes	Yes
N	12,536,511	12,610,601
R^2	0.968	0.967

- The effect of security losses is larger for banks with high collateral utilization rates.
- Collateral scarcity leads to a sharper contraction in bank lending following a monetary tightening.
- The negative effect of security losses on credit supply is stronger for less liquid banks.

Security Losses, Banking Group Structure and Lending

	Loan Amount		
	All Banks	Domestic Banks	Banking Groups
	(1)	(2)	(3)
Collateral Security Losses$_{b,t-1}$ × Stand-Alone Bank$_b$	-6.761***	-7.368***	
	(2.052)	(2.064)	
Collateral Security Losses$_{b,t-1}$ × Subsidiary$_b$	-1.951***	-1.985***	
	(0.8181)	(0.855)	
Collateral Security Losses$_{b,t-1}$ × Foreign Subsidiary$_b$			-4.125***
			(1.093)
Collateral Security Losses$_{b,t-1}$ × Domestic Subsidiary$_b$			-1.446***
			(0.556)
Bank Controls	No	No	No
Bank – Firm FE	Yes	Yes	Yes
Firm – Time FE	Yes	Yes	Yes
Banking Group – Time FE	No	No	Yes
N	16,290,844	13,748,918	10,611,217
R^2	0.972	0.972	0.974

- One euro of security losses translates into a larger contraction in lending for stand-alone banks rather than for subsidiaries of banking groups

Security Losses, Banking Group Structure and Lending: Within Banking Groups

	Loan Amount		
	All Banks	Domestic Banks	Banking Groups
	(1)	(2)	(3)
Collateral Security Losses$_{b,t-1}$ × Stand-Alone Bank$_b$	-6.761***	-7.368***	
	(2.052)	(2.064)	
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- Foreign subsidiaries contract credit more than domestic ones for the same euro amount of losses.
- This is consistent with the finding that foreign subsidiaries do not benefit from liquidity redistribution.

Conclusion

- We document a collateral channel in the bank-based transmission of monetary policy.
- Monetary tightenings reduce the value of securities, limiting interbank liquidity and lowering credit supply.
- Internal capital markets help domestic subsidiaries mitigate the adverse effects of security losses.

Additional Material

Security losses vary significantly by bank type

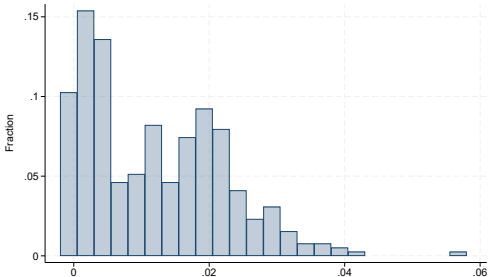

Figure 1: Domestic Subsidiaries of Banking Groups

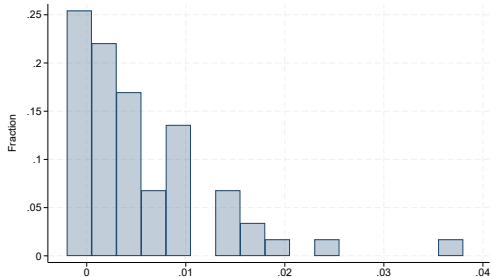

Figure 2: Foreign Subsidiaries of Banking Groups

Back

Security Losses by Country

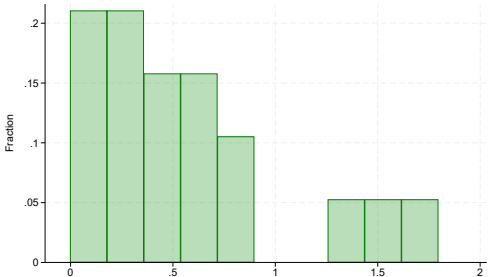

Figure 3: Median Bank

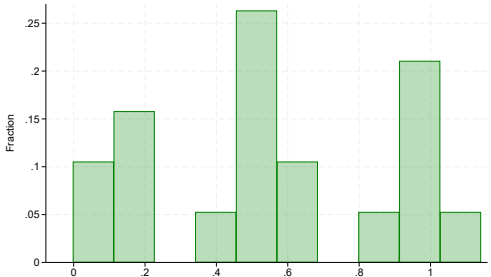

Figure 4: Weighted Average

Back

Security Holdings by Country

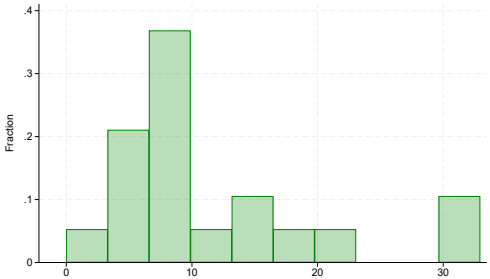

Figure 5: All Securities (Median Bank)

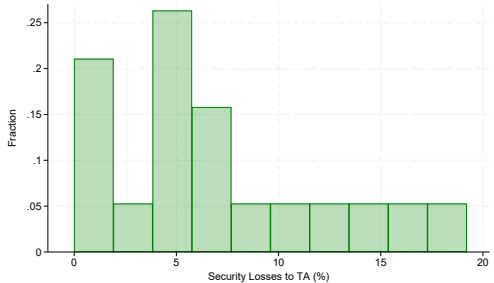

Figure 6: Long-Term Securities (Median Bank)

Back