Loan Spreads and Interest Rates: The Role of the Deposit Channel and Lending Market Power[1]

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[1] Any views expressed are solely those of the authors and should not be taken to represent those of the Bank of England or of its policy committees.

Motivation

- Negative correlation between bank loan spreads over market rates and short-term interest rates in US and EA aggregate data
- Implies weakened transmission of monetary policy through bank lending.

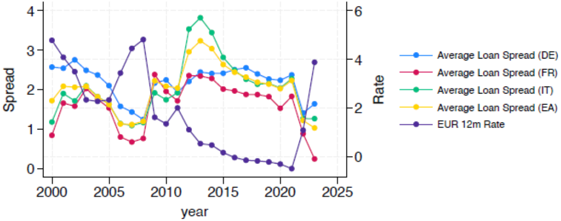


Figure: Loan spreads and short-term interest rates in the Euro Area

Research Questions

Why are bank loan spreads negatively correlated with short-term interest rates?

- What mechanisms can explain this impaired pass-through? We investigate two: (i) the deposit channel and (ii) lending market power.
- Do these mechanisms have real effects on borrowing firms?

Preview of Results

- **Negative Correlation between Loan Spreads and Interest Rates in French loan-level data:**
  A 100 bp drop in the 3-month Euribor is associated with a 15 bp increase in average loan spreads.
- **Supply-Side Explanation:**
  Banks with larger increases in loan spreads experience slower credit growth when rates decline (Khwaja-Mian regressions).
- **Potential Mechanisms**:
  - **Deposit Channel:**
    Banks with lower initial deposit rates see larger declines in deposit spreads, higher loan spreads, and lower credit growth. Effects are stronger for lowly-capitalized banks.
  - **Lending Market Power:**
    Banks with higher market share display lower interest rate pass-through. Within banks, firms more subject to hold-up problems (small, young) face lower pass-through.
  - Deposit Channel $>$ Lending Market Power
- **Real Effects:**
  Firms borrowing from banks with lower pass-through experience weaker debt and investment growth after rate drops.

Literature

- Loan stickiness to changes in market interest rates (Berger & Udell 1992; Wang 2024; Roberts & Schwert 2020; Dougal et al. 2015; Demiroglu et al. 2022)
- Monetary policy impairement at low interest rates (Wang 2024; Abadi et al. 2023; Ulate 2021; Eggertsson et al. 2019)
- Role of deposits spreads and bank equity (Wang 2024; Balloch & Koby 2023; Van den Heuvel et al. 2002; Gertler & Karadi 2011)
- Role of market power in monetary policy transmission (Drechsler et al. 2017; Scharfstein & Sunderam 2015; Wang et al. 2022)

Data

Loan-level data (Crédits Nouveaux aux Entreprises (NCE)):

- All new loans granted during the first month of each quarter by a representative sample of bank branches, 2006Q1-2023Q4.
- Interest rate, loan size, purpose of financing, maturity, fixed or variable rate (only fixed considered).
- Unique lending institution and borrowing firm identifiers
- $147'146$ loans with average maturity of 4.5 years and average interest rate of 2.53%

Data on bank-firm credit relationships (French credit registry (SCR)):

- Monthly data on the credit exposure of all credit institutions to firms with total credit of more than EUR 25'000 to at least one bank.
- Focus exclusively on term loans

Data

Bank-level data (Compte de resultat and situation):

- Balance sheet and income statement
- Annual frequency from 2010 to 2021
- Individual credit establishment level
- Balanced panel of 75 unique banks

Firm-level data (FIBEN compiled by Banque de France using tax filings):

- Firms with a turnover exceeding EUR 0.75 million or bank debt surpassing EUR 0.38 million.
- Total assets, leverage, age, industry.
- Credit assessment of individual firms calculated by Banque de France and validated by the Eurosystem.

Negative Correlation between Loan Spreads and Short-Term Market Interest Rates

	Loan interest rate spread on maturity-matched swap rate							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
EUR3M rate	-0.12** (0.05)	-0.15*** (0.05)						
DF rate			-0.18** (0.07)	-0.21*** (0.07)				
Swap rate					-0.17*** (0.04)	-0.18*** (0.04)	-0.77*** (0.13)	-0.75*** (0.11)
No FE	✓	–	✓	–	✓	–	–	–
Maturity FE	–	✓	–	✓	–	✓	✓	✓
Bank FE	–	✓	–	✓	–	✓	✓	–
Rating FE	–	✓	–	✓	–	✓	✓	–
CZ FE	–	✓	–	✓	–	✓	✓	–
Industry FE	–	✓	–	✓	–	✓	✓	–
Time FE	–	–	–	–	–	–	✓	–
Bank x Time FE	–	–	–	–	–	–	–	✓
Rating x Time FE	–	–	–	–	–	–	–	✓
CZ x Time FE	–	–	–	–	–	–	–	✓
Ind. x Time FE	–	–	–	–	–	–	–	✓
Ind. x CZ x Time FE	–	–	–	–	–	–	–	✓
Observations	147146	147133	147146	147133	147146	147133	147133	88534
Adjusted R^2	0.030	0.323	0.028	0.320	0.059	0.346	0.570	0.623

Figure: Loan interest rate spread on maturity-matched swap rate

- 12bp to 21bp increase in loan spreads following a 1pp decrease in short rates
- Homogeneous effect across maturities and credit ratings

Charts | Controlling for risk and maturity

Supply or Demand Side Narrative?

- Negative correlation could come from increased demand from firms.
- Supply-side story if low pass-through banks are also those that experience a lower volume growth as short-term rates decrease.

$$\log(\text{Credit}_{bit}) = \gamma \cdot i_t \times \text{LoanSpreadBeta}_b + \eta_{bi} + \nu_{it} + \epsilon_{bit},$$

where

$$\text{Spread}_{lbit} = \underbrace{\beta_b}_{\text{LoanSpreadBeta}_b} \cdot i_t + \epsilon_{lbit}$$

	(1) log(Credit)	(2) log(Credit)	(3) log(Credit)
EUR3M × Loan Spread Beta	-0.11***	-0.12***	-0.13***
	(0.03)	(0.03)	(0.02)
Year FE	✓	✓	–
Firm x Bank FE	✓	✓	✓
Firm x Year FE	–	–	✓
Observations	6424488	1339544	1329798
Adjusted R^2	0.687	0.718	0.727

Figure: Negative correlation between loan spreads and credit supply across banks

A Supply Side Narrative

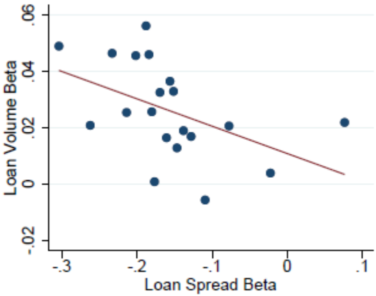


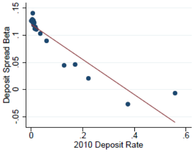
Figure: Loan spread betas and loan volume betas

$$\text{Spread}_{lbit} = \underbrace{\beta_b}_{\text{LoanSpreadBeta}_b} \cdot i_t + \epsilon_{lbit}$$

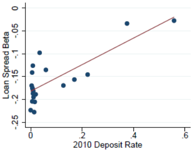
$$\log(\text{Loan}_{bit}) = \underbrace{\beta_b}_{\text{LoanVolumeBeta}_b} \cdot i_t + \epsilon_{bit}$$

Mechanism 1: Deposit Channel

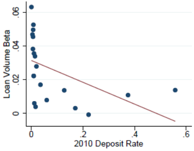
- Interest rates $\downarrow$ $\rightarrow$ Deposit spreads $\downarrow$ $\rightarrow$ Bank profits & equity valuations $\downarrow$
- Credit supply tied to equity because of regulation $\rightarrow$ Credit supply $\downarrow$ & loan spreads $\uparrow$ (Wang, 2024)
- Test: instrument banks' deposit betas with their initial deposit rate at the beginning of the sample (Balloch & Koby 2023)



(a) Low deposit rates, low deposit spread betas



(b) Low deposit rates, low loan spread betas



(c) Low deposit rates, high loan volume betas

Figure: Initial deposit rates, deposit spread betas, loan spread betas, and loan volume betas

Mechanism 1: Deposit Channel

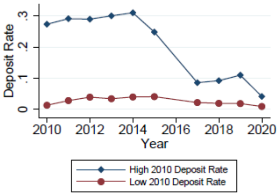
	All banks		Low Capitalization Tercile	High Capitalization Tercile
	(1)	(2)	(3)	(4)
	Spread β	Vol. β	Spread β	Spread β
2010 Dep. Rate	0.040***	-0.009**	0.064**	0.043***
	(0.012)	(0.004)	(0.024)	(0.014)
Constant	-0.159***	0.026***	-0.149***	-0.182***
	(0.008)	(0.004)	(0.015)	(0.014)
Observations	75	75	25	25
R^2	0.256	0.052	0.421	0.340

Figure: Initial deposit rates, rate pass-through and credit supply in the cross-section of banks

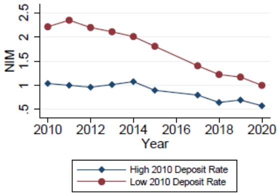
A 1 sd decrease in deposit rates is associated with:

- A 4bp lower loan rate pass-through of a 100bp decrease in the short-term rate (i.e. loan spread beta) = half of the standard deviation of loan spread betas across banks.
- A 90bp higher loan volume beta = one fourth of the standard deviation of loan volume betas across banks.
- Stronger results in sample of lowly-capitalized banks.

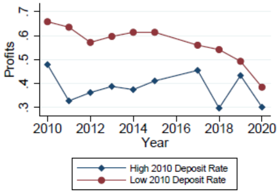
Mechanism 1: Deposit Channel



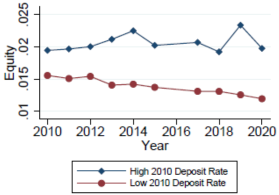
(a) Deposit Rates



(b) Net Interest Margin



(c) Profits



(d) Equity (Share Capital)

Figure: Dynamics for bank profitability and bank equity

▸ Regressions

Mechanism 2: Lending Market Power - Bank-Level Variation

- Is market power able to explain the aggregate time series variation in loan spreads?
- Compare interest rate pass-through of banks with more or less exposure to concentrated markets

$$\text{LoanSpreadBeta}_b = \gamma_0 + \gamma_1 \text{Concentration}_b + \epsilon_b,$$

where

$$\text{Concentration}_b = \sum_{cz} \omega_{b,cz} \cdot \text{Concentration}_{cz}$$

	Loan spread β			Loan volume β		
	(1)	(2)	(3)	(4)	(5)	(6)
Bank HHI	-0.004			-0.002		
	(0.008)			(0.003)		
Bank Top4Share		-0.005			-0.002	
		(0.008)			(0.003)	
Bank Market Share			-0.009**			0.001
			(0.004)			(0.001)
Constant	-0.159***	-0.159***	-0.159***	0.026***	0.026***	0.026***
	(0.009)	(0.009)	(0.009)	(0.003)	(0.003)	(0.003)
Observations	75	75	75	75	75	75
R^2	0.002	0.004	0.011	0.004	0.008	0.003

Figure: Bank-level measure of market power and loan rate pass-through

Mechanism 2: Lending Market Power - Horse Race Regression

	Loan spread β			
	(1)	(2)	(3)	(4)
2010 Dep. Rate	0.040***	0.040***	0.040***	0.041***
	(0.012)	(0.012)	(0.012)	(0.012)
Bank HHI		-0.002		
		(0.007)		
Bank Top4Share			-0.005	
			(0.007)	
Bank Market Share				-0.011**
				(0.005)
Constant	-0.159***	-0.159***	-0.159***	-0.159***
	(0.008)	(0.008)	(0.008)	(0.008)
Observations	75	75	75	75
R^2	0.256	0.256	0.260	0.276

Figure: Loan rate pass-through: horse races

- The cross-sectional variation across banks in deposit rate appears to be more important in explaining the cross-sectional variation in the loan rate pass-through than the cross-sectional variation in our measure of bank market power.

Mechanism 2: Lending Market Power - Firm-Level Hold-up Problem?

$$s_{lbit} = \beta_1 \cdot i_t + \beta_2 \cdot \mathbf{Z}_{i,2006} \times i_t + \epsilon_{lbit}$$

	Loan interest rate spread on maturity-matched swap rate							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
EUR3M	-0.184***		-0.177***		-0.164***		-0.199***	
	(0.004)		(0.006)		(0.003)		(0.005)	
Size=2 × EUR3M	0.044***	0.046***					0.032***	0.038***
	(0.004)	(0.003)					(0.005)	(0.003)
Size=3 × EUR3M	0.054***	0.042***					0.039*	0.032***
	(0.021)	(0.006)					(0.023)	(0.007)
Age=2 × EUR3M			0.020***	0.022***			0.014*	0.015***
			(0.007)	(0.003)			(0.007)	(0.003)
Age=3 × EUR3M			0.043***	0.033***			0.027***	0.019***
			(0.008)	(0.004)			(0.009)	(0.004)
EUR3M × Multi-bank					0.025***	0.018***	0.013**	0.007**
					(0.006)	(0.003)	(0.005)	(0.003)
Maturity FE	✓	✓	✓	✓	✓	✓	✓	✓
Bank FE	✓	–	✓	–	✓	–	✓	–
Rating FE	✓	✓	✓	✓	✓	✓	✓	✓
Commuting Zone FE	✓	✓	✓	✓	✓	✓	✓	✓
Industry FE	✓	✓	✓	✓	✓	✓	✓	✓
Bank x Time FE	–	✓	–	✓	–	✓	–	✓
Observations	147133	146548	147133	146548	147133	146548	147133	146548
Adjusted R^2	0.356	0.634	0.335	0.618	0.333	0.617	0.362	0.637

Figure: Firm-level measures of hold-up problem and loan rate pass-through

Mechanism 2: Lending Market Power - Within-Bank Across-Firms Variation

$$s_{lbit} = \beta_1 \cdot i_t + \beta_2 \cdot \text{Concentration}_{i,2006} \times i_t + \epsilon_{lbit}$$

	Loan interest rate spread on maturity-matched swap rate					
	(1)	(2)	(3)	(4)	(5)	(6)
EUR3M	-0.150***			-0.152***		
	(0.005)			(0.006)		
EUR3M × Local HHI	-0.015**	-0.008***	-0.002			
	(0.007)	(0.003)	(0.002)			
EUR3M × Local Top4Share				-0.021***	-0.008**	-0.002
				(0.006)	(0.003)	(0.002)
Maturity FE	✓	✓	✓	✓	✓	✓
Bank FE	✓	✓	–	✓	✓	–
Rating FE	✓	✓	✓	✓	✓	✓
Commuting Zone FE	✓	✓	✓	✓	✓	✓
Industry FE	✓	✓	✓	✓	✓	✓
Time FE	–	✓	✓	–	✓	✓
Bank x Time FE	–	–	✓	–	–	✓
Observations	147133	147133	146548	147133	147133	146548
Adjusted R^2	0.324	0.560	0.612	0.325	0.560	0.612

Figure: Measures of local concentration and loan rate pass-through

Real Effects

- Do low pass-through banks influence the real outcomes of their borrowers?

$$\log(y_{it}) = \beta \cdot i_t \times \text{LoanSpreadBeta}_i + \eta_i + \nu_{jt} + \epsilon_{it}$$

$$\begin{aligned}
y_{it} & \quad \text{Total firm debt } \textit{or} \text{ Net PP\&E} \\
i_t & \quad \text{3-month Euribor} \\
\eta_i & \quad \text{Firm FE} \\
\nu_{jt} & \quad \text{Industry-Time FE} \\
\text{LoanSpreadBeta}_i & = \sum_{b \in \mathcal{B}_{i,2006}} \omega_{ib,2006} * \text{LoanSpreadBeta}_b
\end{aligned}$$

Real Effects

(a) Growth in total debt

	(1) log(Debt)	(2) log(Debt)	(3) log(Debt)	(4) log(Debt)
EUR3M × Loan Spread Beta (Firm)	-0.031***			
	(0.001)			
EUR3M × Unconstrained Deposit Rate (Firm)		-0.010***		-0.007***
		(0.001)		(0.001)
EUR3M × Bank Market Share (Firm)			0.013***	0.011***
			(0.001)	(0.001)
Firm FE	✓	✓	✓	✓
Ind. x Time FE	✓	✓	✓	✓
Observations	2253195	2253195	2253195	2253195
Adjusted R^2	0.683	0.682	0.683	0.683

(b) Growth in investment

	(1) log(PPE)	(2) log(PPE)	(3) log(PPE)	(4) log(PPE)
EUR3M × Loan Spread Beta (Firm)	-0.019***			
	(0.001)			
EUR3M × Unconstrained Deposit Rate (Firm)		-0.006***		-0.004***
		(0.001)		(0.001)
EUR3M × Bank Market Share (Firm)			0.007***	0.006***
			(0.001)	(0.001)
Firm FE	✓	✓	✓	✓
Ind. x Time FE	✓	✓	✓	✓
Observations	2253195	2253195	2253195	2253195
Adjusted R^2	0.825	0.825	0.825	0.825

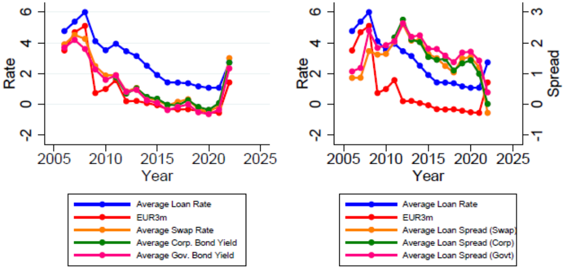
Figure: Real Effects

Unconstrained Deposit Rate

Conclusion

- Empirical evidence from France that loan spreads rise when interest rates fall.
- Implies imperfect pass-through of short-term market rate declines to loan rates.
- Consistent with a supply-side credit shock.
- Explained by:
  - Deposit channel (bank constraints)
  - Lending market power (hold-up, price discrimination)
- Both channels have significant real effects.

Appendix



(a) Loan rates and market interest rates **(b)** Loan spreads and market interest rates

Figure: Negative correlation between loan spreads and short-term interest rates

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Appendix

	Loan interest rate spread on maturity-matched swap rate	
	(1)	(2)
EUR3M rate	-0.16***	-0.15***
	(0.04)	(0.04)
Maturity=36 × EUR3M rate	0.02*	
	(0.01)	
Maturity=48 × EUR3M rate	0.00	
	(0.04)	
Maturity=60 × EUR3M rate	0.01	
	(0.05)	
Maturity=84 × EUR3M rate	-0.01	
	(0.04)	
Maturity=120 × EUR3M rate	0.01	
	(0.03)	
Rating=3 × EUR3M rate		0.03**
		(0.01)
Rating=3+ × EUR3M rate		0.00
		(0.02)
Rating=4 × EUR3M rate		0.02
		(0.02)
Rating=4+ × EUR3M rate		0.01
		(0.01)
Rating=5 × EUR3M rate		-0.06***
		(0.02)
Rating=5+ × EUR3M rate		-0.02
		(0.02)
Maturity FE	✓	✓
Bank FE	✓	✓
Rating FE	✓	✓
CZ FE	✓	✓
Industry FE	✓	✓
Observations	147133	147133
Adjusted R^2	0.323	0.324

Figure: Negative correlation between loan spreads and rates: heterogeneity by risk and maturity

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Appendix

	(1) Dep. Spread	(2) NIM	(3) Profits	(4) Equity
EUR3M × 2010 Dep. Rate	-0.37***	-1.34***	-0.28**	-0.01***
	(0.03)	(0.44)	(0.14)	(0.00)
Bank FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
Observations	734	734	734	734
Adjusted R^2	0.988	0.838	0.642	0.954

Figure: Dynamics for bank profitability and bank equity

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Appendix

$$\text{UnconstrainedDepositRate}_b = (\text{DepositRate}_{b,2010} - 1) * \mathcal{I}(\text{Capital}_{b,2010} < p25(\text{Capital}_{2010}))$$

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