EUROPEAN CENTRAL BANK
EUROSYSTEM

As Interest Rates Surge: Flighty Deposits and Lending*

Monetary and Financial Stability Policies in a Changing Economic Landscape

3rd ChaMP Workstream
* Usual disclaimers apply

Giuseppe Cappelletti, David Marques-Ibanez, Alessio Reghezza, Carmelo Salleo

The Transmission of Monetary Policy

Textbook approach of the bank lending channel

CB increases policy rates => banks pass through the increase in their cost of funding to their borrowers => reduction in lending.

Qualifiers:

- Banks smooth the impact of rate hikes on borrowers with whom they have an established relationship
- Better capitalized banks are able to cut lending by less after an increase in policy rates

Deposit channel (Drechsler et al QJE 2017)

CB increases policy rates => banks don't pass it through to deposits (market power) => some depositors exit looking for higher yield => banks don't tap alternative funding at market rates but decrease lending (shock to lending supply).

Our Paper

Drechsler et al. show the existence of the deposit channel supporting a causal relation from deposits to lending.

But how does the deposit channel work, i.e. how do banks transform a funding shock into a lending shock?

- What are the main drivers of banks' reaction to a shock to deposits: the maximization of the deposits franchise value, the minimization of credit risk …

- How do banks reach their goals: do they work across the board on the asset side or do they target certain types of borrowers/contracts? Do they increase rates or ration borrowers?

- Which banks are more likely to reduce lending – banks with a larger deposit franchise value, less capitalized banks, less profitable banks …

Empirical Strategy

- Exogenous funding shock: the increase in policy rates of 2022-2023. It was unexpected (exogeneity) and so large (the largest in the past 40 years) that banks were stretched enough that a clear picture emerges of banks' reaction function net of confounding effects.

- Deposit outflow: the largest in the past 20 years

- Causation from deposits to lending: two IVs:
  - Individual banks' deposit beta measured before the rate hike.
  - A change in the design of a CB program designed to provide banks with cheap and stable funding.

- Impact on lending: use of a credit register to exploit differential impact on lending to the same borrower by banks with and without persistent deposit outflows (Khwaja and Mian AER 2008).

- Use of bank, borrower and contract characteristics to identify banks' drivers.

- Robustness: Propensity Score Matching (PSM).

Data and sample

- Our sample involves 1,620 banks and almost 750 thousand firms over 2021Q1 to 2023Q1.

- Bank-firm level data are collected from *AnaCredit*.

- Bank balance sheet data are gathered from ECB Supervisory data while overnight deposits data are retrieved from Individual Balance Sheet Items (IBSI) statistics.

- Our bank-firm level dataset yields more than 11.5 million observations

| Country	N.Banks	N.Firms
AT	345	20,467
BE	12	29,699
CY	9	2,924
DE	787	126,482
EE	8	1,360
ES	40	159,102
FI	10	15,588
FR	57	87,867
GR	9	1,241
IE	12	4,982
IT	214	261,697
LT	4	662
LU	48	6,909
LV	9	296
MT	9	297
NL	12	1,935
PT	14	36,029
SI	13	3,979
SK	8	3,658
TOT	1,620	746,315

Key Results

- As predicted by the deposit channel the recent rate hike caused a significant deposit outflow and a reduction in lending.

- Banks don't increase interest rates on loans, they target directly certain borrowers and contracts. The transmission of monetary policy to the corporate sector is via credit rationing rather than via interest rates.

- Banks reduce loans with longer maturities and with fixed interest rates. These loans have higher duration – this is consistent with banks trying to preserve their duration gap, which is normally insulated from rate changes (Drechsler et al JF 2021 , Hoffmann et al RFS 2019).

Key Results (continued)

- Banks reduce lending to new borrowers. This is consistent with adverse selection in credit markets, which increases when rates increase and the economy slows down (Crawford et al AER 2018).

- Banks with higher duration gaps reduce lending by more. Loans with lower expected returns don't seem affected. This confirms that banks seek to protect their deposit franchise rather than preserve short term profits.

- Bank capitalization doesn't seem to play much of a role (perhaps because of their high levels of capital).

Rate Hikes
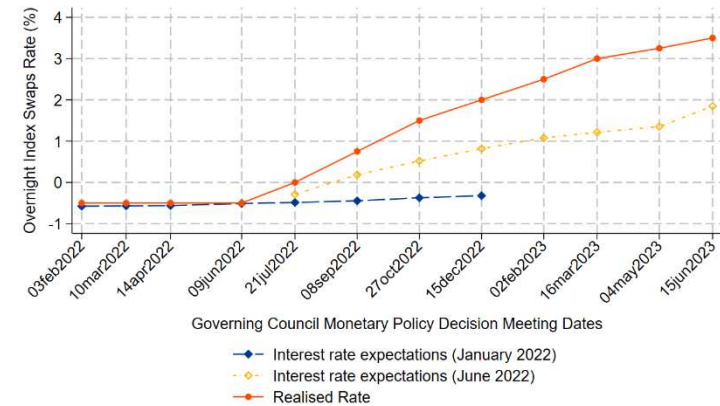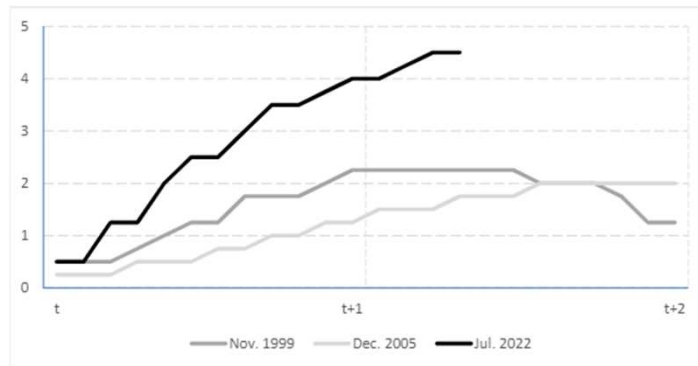
Euro area monetary policy rates during tightening cycles

Expected and realized monetary policy rates

The 2022-23 increase in interest rates was large and unanticipated and caused massive deposit outflows and a reduction in lending.

Deposit outflow
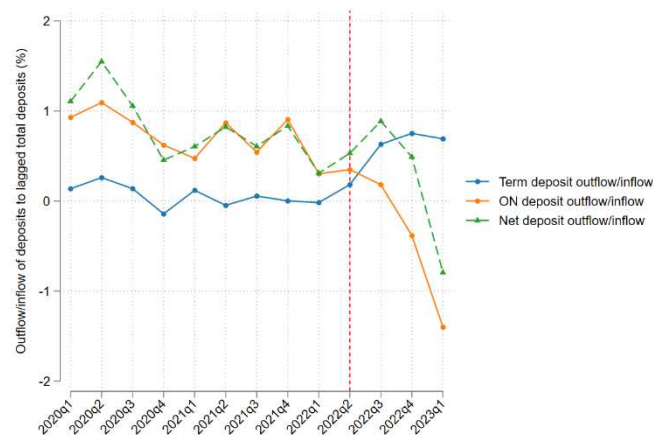
Flow of overnight, term and total deposits
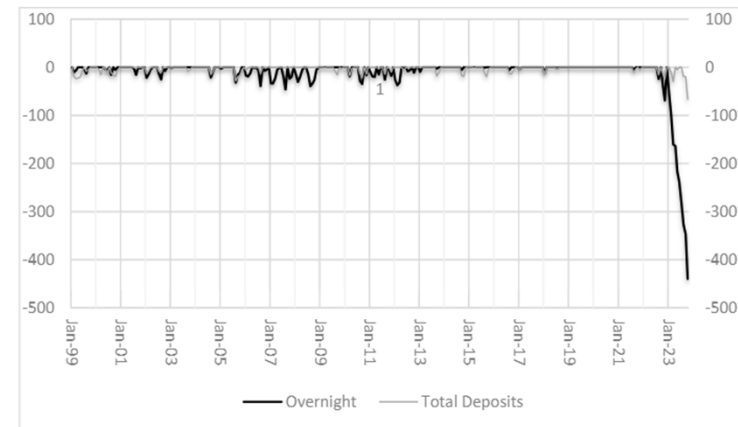
Net flow of overnight deposits and total deposits from its peak

The 2022-23 increase in interest rates was large and unanticipated and caused massive deposit outflows and a reduction in lending.

Impact on Lending
(volumes)

Banks reduce lending (lhs) but don't increase interest rates (rhs)

	Dependent variable: $\Delta Log(loans)$		
	(1)	(2)	(3)
DEP_OUTFLOW	0.0050		
	(0.004)		
DEP_OUTFLOW × Tightening	-0.0188**	-0.0167**	-0.0167**
	(0.008)	(0.008)	(0.008)
L.CET1 ratio	-0.0719***	0.0013	-0.0003
	(0.019)	(0.049)	(0.049)
L.DEP/TA	0.0343***	0.1119*	0.1132*
	(0.011)	(0.067)	(0.068)
L.TA (log)	0.0020***	0.0004	0.0010
	(0.001)	(0.012)	(0.012)
L.LOAN/TA	-0.0179**	-0.0254	-0.0254
	(0.008)	(0.040)	(0.040)
L.ROA	0.0049*	0.0132***	0.0132***
	(0.002)	(0.003)	(0.003)
L.NPLs ratio	0.0007	0.0018	0.0018
	(0.001)	(0.001)	(0.001)
L.CASH/TA	-0.0035	-0.0085	-0.0089
	(0.015)	(0.037)	(0.037)
Constant	-0.0519***	-0.1074	-0.1152
	(0.018)	(0.152)	(0.153)
Observations	11,529,195	11,529,182	11,529,182
Bank FE	No	Yes	Yes
Borrower*time FE	Yes	Yes	Yes
Country*time FE	No	No	Yes

	Dependent variable: Δ interest rate					
	Unmatched			Matched		
	(1)	(2)	(3)	(4)	(5)	(6)
DEP_OUTFLOW	-0.0000			0.0001		
	(0.000)			(0.000)		
DEP_OUTFLOW × Tightening	0.0001	0.0002	0.0002	0.0002	0.0003	0.0003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
L.CET1 ratio	-0.0013	0.0039	0.0040	-0.0038**	-0.0016	-0.0016
	(0.001)	(0.003)	(0.003)	(0.002)	(0.006)	(0.006)
L.DEP/TA	0.0005	0.0017	0.0015	0.0008	-0.0081	-0.0090
	(0.000)	(0.003)	(0.003)	(0.001)	(0.007)	(0.007)
L.TA (log)	-0.0000	0.0003	0.0003	0.0000	-0.0007	-0.0009
	(0.000)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
L.LOAN/TA	-0.0010**	0.0011	0.0012	0.0006	-0.0054	-0.0052
	(0.000)	(0.002)	(0.002)	(0.001)	(0.005)	(0.005)
L.ROA	-0.0001	-0.0000	-0.0000	-0.0009***	-0.0007**	-0.0007**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
L.NPLs ratio	-0.0001***	-0.0002***	-0.0002***	-0.0001	-0.0006***	-0.0006***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
L.CASH/TA	-0.0005	0.0001	0.0001	0.0018	0.0012	0.0016
	(0.001)	(0.002)	(0.002)	(0.001)	(0.003)	(0.003)
Constant	0.0025***	-0.0037	-0.0033	0.0011	0.0220	0.0242
	(0.001)	(0.008)	(0.008)	(0.002)	(0.018)	(0.018)
Observations	11,529,195	11,529,182	11,529,182	2,199,608	2,199,606	2,199,597
Bank FE	No	Yes	Yes	No	Yes	Yes
Borrower*time FE	Yes	Yes	Yes	Yes	Yes	Yes
Country*time FE	No	No	Yes	No	No	Yes

Impact on Lending - 2

Banks reduce loans with fixed interest rates (lhs) and with longer maturities (rhs).

	Dependent variable: Δ Log (loans)		
	(1)	(2)	(3)
DEP_OUTFLOW	-0.0108***		
	(0.004)		
DEP_OUTFLOW×Tightening	-0.0068	-0.0072	-0.0070
	(0.010)	(0.010)	(0.010)
Fixed rate	0.0251***	0.0294***	0.0294***
	(0.003)	(0.003)	(0.003)
DEP_OUTFLOW×Fixed rate	0.0207***	0.0230***	0.0231***
	(0.008)	(0.008)	(0.008)
Tightening×Fixed rate	-0.0092***	-0.0105***	-0.0105***
	(0.002)	(0.002)	(0.002)
DEP_OUTFLOW×Tightening×Fixed rate	-0.0152**	-0.0117*	-0.0119*
	(0.007)	(0.007)	(0.007)
L.CET1 ratio	-0.0892***	-0.0119	-0.0134
	(0.019)	(0.049)	(0.049)
L.DEP/TA	0.0336***	0.1133*	0.1148*
	(0.011)	(0.067)	(0.068)
L.TA (log)	0.0013*	-0.0052	-0.0046
	(0.001)	(0.011)	(0.012)
L.LOAN/TA	-0.0188**	-0.0239	-0.0241
	(0.008)	(0.040)	(0.040)
L.ROA	0.0056**	0.0132***	0.0132***
	(0.002)	(0.003)	(0.003)
L.NPLs ratio	0.0013**	0.0017	0.0017
	(0.001)	(0.001)	(0.001)
L.CASH/TA	-0.0026	-0.0041	-0.0046
	(0.016)	(0.037)	(0.037)
Constant	-0.0591***	-0.0669	-0.0754
	(0.018)	(0.149)	(0.150)
Observations	11,529,195	11,529,182	11,529,182
Bank FE	No	Yes	Yes
Borrower*time FE	Yes	Yes	Yes
Country*time FE	No	No	Yes

	Dependent variable: Δ Log (loans)					
	Short-term <2Y			Long-term > 2Y		
	(1)	(2)	(3)	(4)	(5)	(6)
DEP_OUTFLOW	-0.0061			0.0056		
	(0.007)			(0.004)		
DEP_OUTFLOW × Tightening	-0.0173	-0.0111	-0.0106	-0.0182**	-0.0162**	-0.0161**
	(0.014)	(0.012)	(0.012)	(0.008)	(0.008)	(0.008)
L.CET1 ratio	0.0792	0.8091***	0.8131***	-0.0810***	-0.0259	-0.0282
	(0.059)	(0.198)	(0.199)	(0.019)	(0.049)	(0.049)
L.DEP/TA	0.0597**	0.0990	0.0988	0.0352***	0.1023	0.1034
	(0.026)	(0.131)	(0.132)	(0.011)	(0.067)	(0.067)
L.TA (log)	0.0082***	-0.0025	-0.0050	0.0018**	0.0047	0.0055
	(0.002)	(0.038)	(0.038)	(0.001)	(0.011)	(0.011)
L.LOAN/TA	0.0184	0.0142	0.0122	-0.0203***	-0.0073	-0.0071
	(0.016)	(0.103)	(0.104)	(0.008)	(0.038)	(0.038)
L.ROA	0.0121**	0.0302***	0.0305***	0.0045*	0.0113***	0.0113***
	(0.005)	(0.008)	(0.008)	(0.002)	(0.003)	(0.003)
L.NPLs ratio	0.0041***	0.0026	0.0026	0.0007	0.0015	0.0015
	(0.001)	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)
L.CASH/TA	0.0526	0.0770	0.0770	-0.0154	0.0038	0.0036
	(0.033)	(0.092)	(0.093)	(0.015)	(0.036)	(0.036)
Constant	-0.1580***	-0.1770	-0.1475	-0.0489***	-0.1577	-0.1672
	(0.041)	(0.469)	(0.473)	(0.018)	(0.150)	(0.151)
Observations	276,048	275,868	275,863	10,468,749	10,468,739	10,468,739
Bank FE	No	No	Yes	No	No	Yes
Borrower*time FE	No	Yes	Yes	No	Yes	Yes
Country*time FE	No	No	Yes	No	No	Yes

Impact on Lending - 3

Banks reduce lending to new borrowers (lhs) but not to borrowers with lower risk-adjusted expected returns (rhs).

	Dependent variable: New bank-firm relationships		
	(1)	(2)	(3)
DEP_OUTFLOW	0.0181***		
	(0.005)		
DEP_OUTFLOW × Tightening	-0.0223***	-0.0162***	-0.0161***
	(0.006)	(0.006)	(0.006)
L.CET1 ratio	-0.1431***	0.1778	0.1764
	(0.037)	(0.118)	(0.118)
L.DEP/TA	-0.0620***	-0.0483	-0.0444
	(0.020)	(0.087)	(0.085)
L.TA (log)	-0.0055***	0.0733***	0.0757***
	(0.001)	(0.025)	(0.024)
L.LOAN/TA	0.0082	0.1041	0.0995
	(0.019)	(0.076)	(0.076)
L.ROA	0.0152***	0.0019	0.0015
	(0.004)	(0.006)	(0.006)
L.NPLs ratio	-0.0004	0.0008	0.0010
	(0.001)	(0.002)	(0.002)
L.CASH/TA	0.0453*	0.0257	0.0224
	(0.026)	(0.058)	(0.059)
Constant	0.1593***	-0.8351***	-0.8619***
	(0.027)	(0.305)	(0.296)
Observations	28,521,124	28,521,122	28,521,122
Bank FE	No	Yes	Yes
ILS*time FE	Yes	Yes	Yes
Country*time FE	No	No	Yes

	Dependent variable: Δ Log (loans)		
	(1)	(2)	(3)
DEP_OUTFLOW	0.0109**		
	(0.005)		
DEP_OUTFLOW*Tightening	-0.0213**	-0.0185*	-0.0185*
	(0.010)	(0.010)	(0.010)
L.risk-adjusted return	0.0004***	0.0005***	0.0005***
	(0.000)	(0.000)	(0.000)
DEP_OUTFLOW*L.risk-adjusted return	-0.0004**	-0.0005***	-0.0005***
	(0.000)	(0.000)	(0.000)
Tightening*L.risk-adjusted return	0.0004**	0.0003	0.0003
	(0.000)	(0.000)	(0.000)
DEP_OUTFLOW*Tightening*L.risk-adjusted return	-0.0003	-0.0002	-0.0002
	(0.000)	(0.000)	(0.000)
L.CET1 ratio	-0.0641**	-0.0683	-0.0684
	(0.025)	(0.116)	(0.117)
L.DEP/TA	0.0725***	-0.1030	-0.1034
	(0.025)	(0.123)	(0.123)
L.TA (log)	0.0042***	0.0708***	0.0724***
	(0.002)	(0.026)	(0.026)
L.LOAN/TA	-0.0381*	0.1486**	0.1501**
	(0.020)	(0.073)	(0.073)
L.ROA	0.0108***	0.0109***	0.0108***
	(0.003)	(0.003)	(0.003)
L.NPLs ratio	0.0028***	0.0074*	0.0074*
	(0.001)	(0.004)	(0.004)
L.CASH/TA	0.0179	0.1358**	0.1352**
	(0.023)	(0.066)	(0.066)
Constant	-0.1131***	-0.9538**	-0.9738**
	(0.038)	(0.378)	(0.380)
Observations	5,381,057	5,381,054	5,381,054
Bank FE	No	Yes	Yes
Borrower*time FE	Yes	Yes	Yes
Country*time FE	No	No	Yes

Bank Characteristics - 1

Banks with higher duration gap reduce lending by more.

	Dependent variable: Δ Log (loans)		
	(1)	(2)	(3)
DEP_OUTFLOW	0.0193***		
	(0.003)		
DEP_OUTFLOW×Tightening	-0.0420***	-0.0437***	-0.0438***
	(0.001)	(0.003)	(0.003)
Duration Gap	-0.0041		
	(0.006)		
DEP_OUTFLOW×Duration Gap	0.0403***		
	(0.012)		
Tightening×Duration Gap	0.0106***	0.0110***	0.0111***
	(0.003)	(0.004)	(0.004)
DEP_OUTFLOW×Tighening×Duration Gap	-0.0454***	-0.0359***	-0.0357***
	(0.004)	(0.005)	(0.005)
L.CET1 ratio	-0.1364**	-0.3781	-0.3793
	(0.058)	(0.283)	(0.285)
L.DEP/TA	0.0500**	-0.0511	-0.0521
	(0.022)	(0.209)	(0.210)
L.TA (log)	0.0032	-0.0073	-0.0076
	(0.002)	(0.032)	(0.032)
L.LOAN/TA	-0.0786*	0.0518	0.0522
	(0.040)	(0.117)	(0.118)
L.ROA	0.0147***	0.0144**	0.0145**
	(0.004)	(0.006)	(0.006)
L.NPLs ratio	0.0055***	0.0123***	0.0124***
	(0.002)	(0.004)	(0.004)
L.CASH/TA	0.0988*	0.1463	0.1472
	(0.055)	(0.172)	(0.173)
Constant	-0.0747	0.0652	0.0686
	(0.059)	(0.513)	(0.515)
Observations	3,812,148	3,812,148	3,812,110
Bank FE	No	Yes	Yes
Borrower*time FE	Yes	Yes	Yes
Country*time FE	No	No	Yes

Bank Characteristics - 2

Better capitalized banks (measured by the distance of their capital ratio to their MDA) don't behave significantly differently than banks with less capital.

	Dependent variable: Δ Log (loans)		
	(1)	(2)	(3)
DEP_OUTFLOW	0.0045		
	(0.005)		
DEP_OUTFLOW×Tightening	-0.0222***	-0.0220***	-0.0221***
	(0.008)	(0.008)	(0.008)
Low_D2MDA	-0.0026	0.0011	0.0010
	(0.003)	(0.003)	(0.003)
DEP_OUTFLOW×Low_D2MDA	0.0020	-0.0073	-0.0074
	(0.010)	(0.011)	(0.011)
Low_D2MDA×Tightening	-0.0033	-0.0061	-0.0062
	(0.004)	(0.005)	(0.005)
DEP_OUTFLOW×Tightening×Low_D2MDA	0.0150	0.0246	0.0250
	(0.017)	(0.017)	(0.017)
L.CET1 ratio	-0.0868***	-0.0103	-0.0124
	(0.023)	(0.051)	(0.051)
L.DEP/TA	0.0319***	0.1271**	0.1290**
	(0.010)	(0.063)	(0.063)
L.TA (log)	0.0019***	0.0039	0.0047
	(0.001)	(0.011)	(0.011)
L.LOAN/TA	-0.0145*	-0.0206	-0.0206
	(0.007)	(0.039)	(0.039)
L.ROA	0.0048**	0.0138***	0.0138***
	(0.002)	(0.003)	(0.003)
L.NPLs ratio	0.0008	0.0020*	0.0020*
	(0.001)	(0.001)	(0.001)
L.CASH/TA	-0.0000	-0.0073	-0.0077
	(0.016)	(0.038)	(0.038)
Constant	-0.0478***	-0.1605	-0.1701
	(0.017)	(0.151)	(0.152)
Observations	11,526,410	11,526,397	11,526,397
Bank FE	No	Yes	Yes
Borrower*time FE	Yes	Yes	Yes
Country*time FE	No	No	Yes

Instrumental Variables

	Treated	$\Delta Log(loans)$		Treated	$\Delta Log(loans)$	
	(1)	(2)	(3)	(4)	(5)	(6)
Deposit Beta (2021Q2)	0.4505***					
	(0.005)					
TLTROBID/TA				70.751***		
				(0.302)		
DEP_OUTFLOW		0.1496			0.0045	
		(0.164)			(0.010)	
DEP_OUTFLOW × Tightening		-0.0515**	-0.0695***		-0.0339***	-0.0334***
		(0.020)	(0.026)		(0.009)	(0.008)
L.CET1 ratio	10.602***	0.0321	-0.4080**	11.950***	0.0599	-0.6512**
	(0.028)	(0.248)	(0.194)	(0.090)	(0.072)	(0.262)
L.DEP/TA	0.4005***	0.0485	-0.0233	-1.836***	0.0667**	-0.7077***
	(0.0107)	(0.097)	(0.146)	(0.030)	(0.027)	(0.251)
L.TA (log)	0.2581***	-0.0091	0.0009	1.615***	0.0090*	0.2036**
	(0.000)	(0.016)	(0.036)	(0.004)	(0.005)	(0.091)
L.LOAN/TA	0.4782***	-0.0801	-0.0852	15.303***	0.0277	0.3524
	(0.012)	(0.140)	(0.150)	(0.054)	(0.034)	(0.311)
L.ROA	-0.2767***	0.0003	0.0080	-1.848***	0.0066	0.0019
	(0.002)	(0.017)	(0.010)	(0.004)	(0.007)	(0.010)
L.NPLs ratio	-0.2322***	0.0143	0.0050	-0.424***	0.0048***	0.0004
	(0.000)	(0.011)	(0.006)	(0.001)	(0.001)	(0.009)
L.CASH/TA	-3.2484***	0.1877	0.0926	6.597***	0.0936*	0.3068**
	(0.013)	(0.236)	(0.098)	(0.046)	(0.052)	(0.150)
Observations	6,000,078	4,623,573	4,623,573	3,646,063	2,046,670	2,046,670
Bank FE	No	No	Yes	No	No	Yes
Borrower*time FE	No	Yes	Yes	No	Yes	Yes
Cragg-Donald Wald F-statistic	4276.464			6.2e+05		

Banks' deposit beta calculated before the rate hike as instrument for deposit outflows – confirms baseline results.

Change in allocation rule for TLTRO III used as instrument for deposit outflows – confirms baseline results.

Robustness - PSM

PSM analysis confirms baseline results.

	Dependent variable: Δ Log (loans)		
	(1)	(2)	(3)
DEP_OUTFLOW	0.0057		
	(0.004)		
DEP_OUTFLOW*Tightening	-0.0282***	-0.0253***	-0.0257***
	(0.009)	(0.008)	(0.008)
L.CET1 ratio	-0.0634	0.1248	0.1197
	(0.040)	(0.116)	(0.118)
L.DEP/TA	0.0097	0.1089	0.1229
	(0.011)	(0.167)	(0.173)
L.TA (log)	0.0027**	0.0561*	0.0610**
	(0.001)	(0.029)	(0.030)
L.LOAN/TA	-0.0122	0.0283	0.0169
	(0.010)	(0.087)	(0.085)
L.ROA	0.0002	0.0158**	0.0166**
	(0.003)	(0.007)	(0.007)
L.NPLs ratio	0.0006	0.0034	0.0032
	(0.001)	(0.003)	(0.003)
L.CASH/TA	-0.0180	-0.0512	-0.0585
	(0.029)	(0.092)	(0.092)
Constant	-0.0390	-0.7989*	-0.8579**
	(0.024)	(0.412)	(0.432)
Observations	2,199,608	2,199,606	2,199,597
Bank FE	No	Yes	Yes
Borrower*time FE	Yes	Yes	Yes
Country*time FE	No	No	Yes

Conclusions

- We find that also with the last hiking cycle of 2022-23 monetary policy is transmitted to the loan supply via an outflow of sight deposits that banks don't compensate with other forms of funding.

- Banks react to the increase in interest rates and the associated outflow of deposits by cutting loans rather than increasing lending rates and letting borrowers self-select. The transmission of monetary policy by banks is thus linked to movements in quantities (outflow of deposits, targeted credit rationing) more than to changes in rates, and to banks' duration gap.

- Deposits franchise value seems to be a key driver in banks' behavior. To minimize the impact of the outflow of deposits on their duration gap, banks reduce the loans with higher duration (i.e. longer maturities and fixed rates).

- The level of capitalization of banks doesn't seem to play much of a role but this could be due to their high levels of equity and to the reduced role that credit risk plays in their adjustment.