Deposit flows during monetary tightening. The role of digital banking and social media

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*"**Social media (…) and technology may have fundamentally changed the speed of bank runs**. Social media enabled depositors to instantly spread concerns about a bank run, and technology enabled immediate withdrawals of funding.*
Michael Barr, Federal Reserve, April 2023

Our findings:
- Commercial banks with greater digitalization exhibit:
    - greater fluctuations in deposits;
    - weaker deposit growth in response to the tightening;
    - higher deposit rates' sensitivity to policy rates.
- Negative Twitter sentiment leads to:
    - weaker deposit growth;
   - weaker deposit growth turmoil in March 2023.

Data:
- monthly deposits of a sample of EA banks, web-scraped app reviews, Twitter/news sentiment, supervisory business models.

Method:
- Hainmueller (2012) to address potential selection bias;
- control for many confounding drivers, e.g., returns, PD and news sentiment.

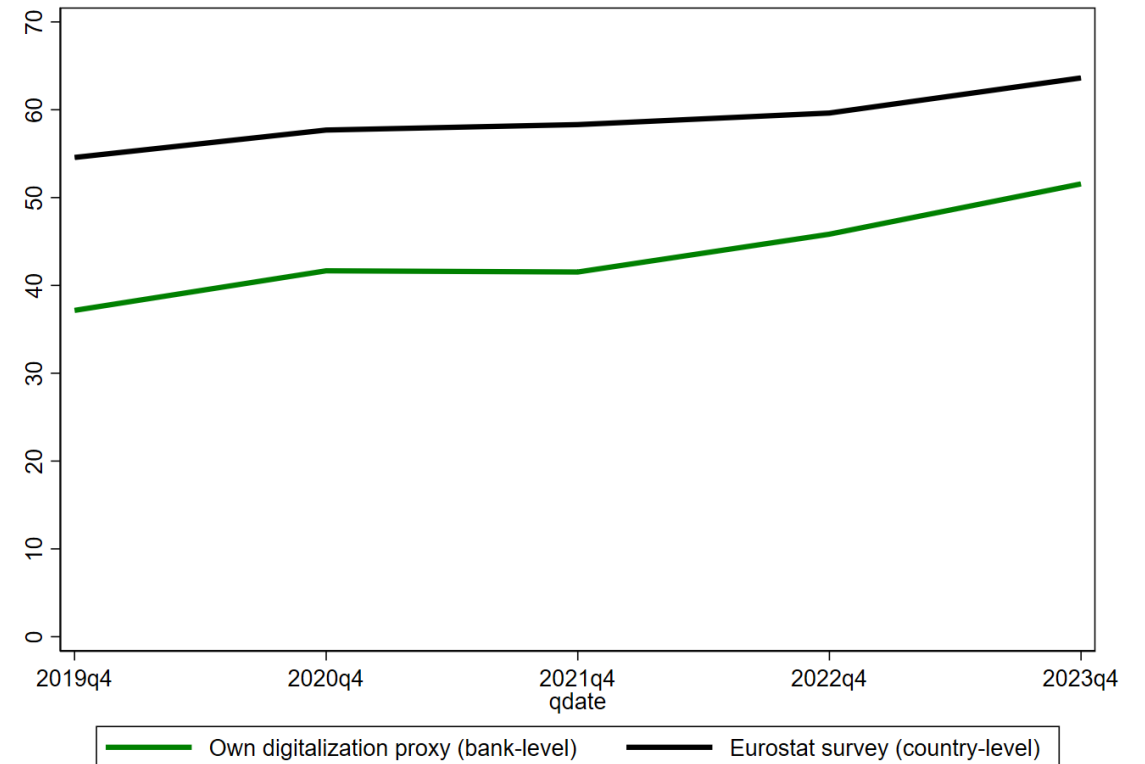**Deposits of selected EA banks, digitalization and Twitter**
(euro billion)
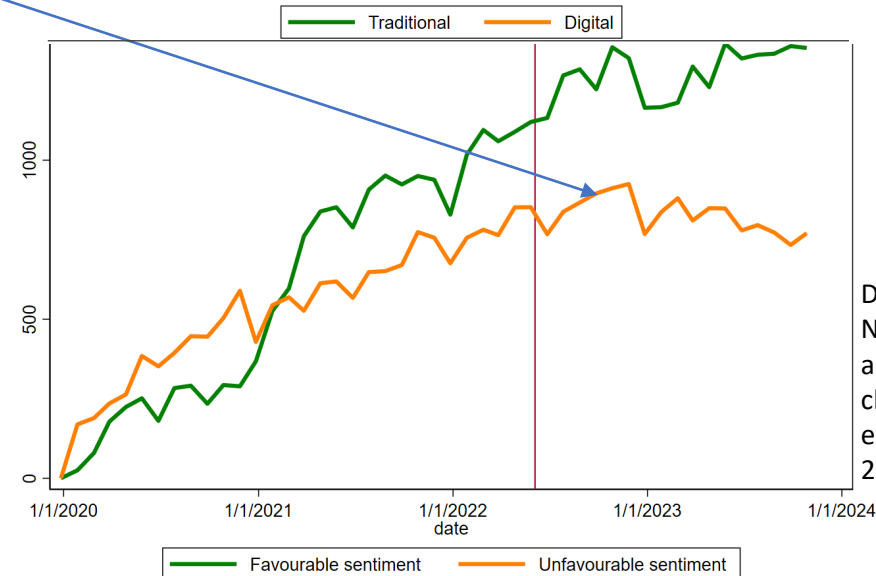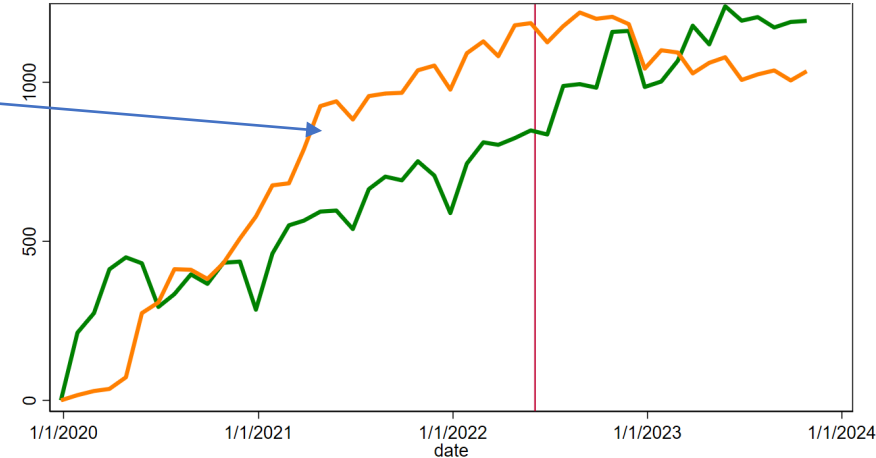
Data: IBSI, Google, Bloomberg.
Notes: Deposits on the y-axis are defined as the monthly change in euro billion, equalised to 0 in December 2019.

Mobile apps: some problems discourage users. What are the common critiques by users?

- A topic analysis of the apps' reviews with less than 3 stars. Preliminary analysis for five large banks.
- Results:
  - *Technical Reliability* is the top critique for four out of five large banks.
  - *Transaction Failures* are the second top critique for three out of five large banks.
  - ING app users' reviews appear different from other banks.

	BNP PARIBAS	INTESA SAN PAOLO	DEUTSCHE BANK	SANTANDER	ING GROEP
1	Technical Reliability Concerns	Technical Reliability Concerns	Technical Reliability Concerns	Technical Reliability Concerns	Update Problems
2	Transaction Failures	Transaction Failures	Transaction Failures	Update Problems	Login and Authentication Challenges
3	Customer Support	Compatibility	Missing Key Features	Login and Authentication Challenges	Transaction Failures
4	Compatibility	Customer Support	User-Friendliness and Design	Transaction Failures	Advertising and Notifications
5	Missing Key Features	Login and Authentication Challenges	Customer Support	Compatibility	Technical Reliability Concerns

Data: Google Reviews, ChatGPT 4.

Twitter might spread negative information in abrupt ways

$$NegTwitterSentiment_{i\,t} = \frac{NegativeTweets_{i\,t}}{NegativeTweets_{i\,t} + PositiveTweets_{i\,t}}$$

- The negative Twitter ratio shows large fluctuations around 51 percent, in aggregate.
- Spikes in negative Twitter sentiment in:
  - March 2023, US and Swiss banking turmoil
  - March 2020, COVID-19
  - December 2022, energy crisis in Europe.
- The negative news sentiment is correlated with the Twitter sentiment, although the magnitude of the shocks of the Twitter sentiment ratio is more pronounced during the 2023 banking turmoil.

Twitter and news negative sentiment ratios for our sample of EA banks
(percentage)
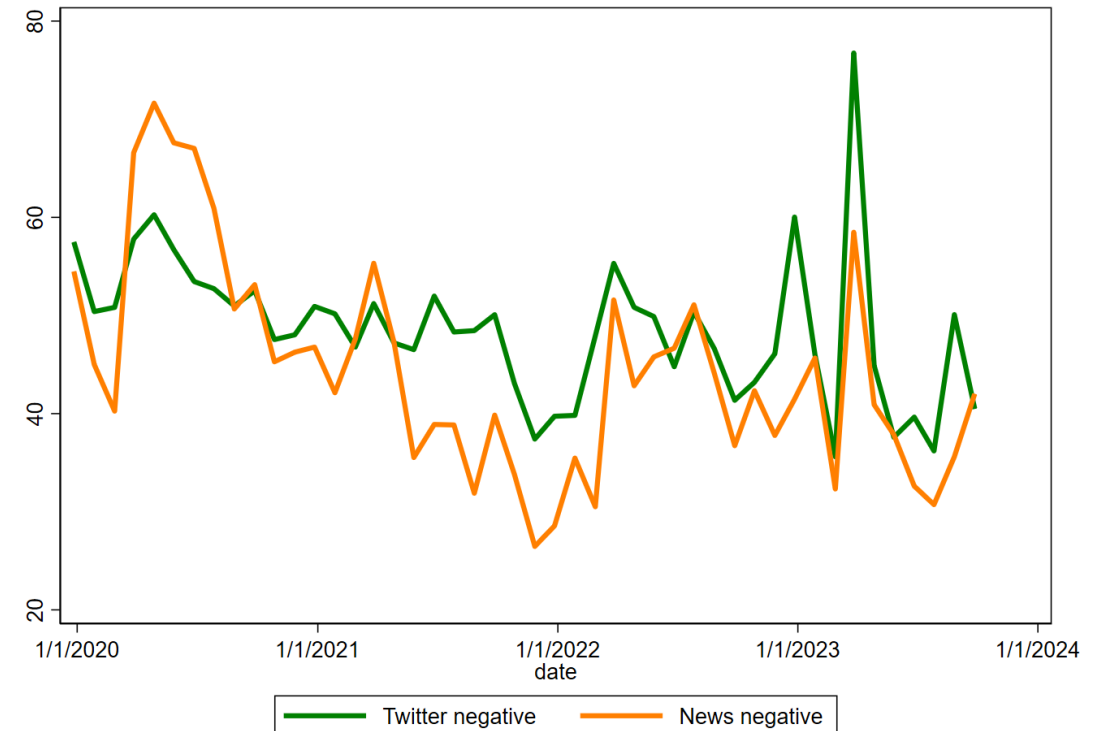
Source: Bloomberg.
Notes: ratio of negative sentiment tweets (or news) divided by the sum of positive and negative tweets (or news).

Mixed econometric evidence on the impact of digitalization and social media on deposits

International evidence (mostly on US banks):

- Effects of branch density and mobile apps on deposits (Koont et al. (2024), Erel et al. (2024), Benmelech et al. (2023)).

- Negative Twitter sentiment affects banks' stocks (Cookson et al. (2024)).

- Ongoing FSB's work on the impact of social media and digitalization on deposit, which will by presented at the G20.

- Banks with high deposit rates show better flows (Kundu et al. (2024)). Branch closures and lending (Becker et al. (2024)).

- Drivers of bank deposit flows (Rose (2023), Jiang et al. (2023), Rochet & Vives (2004)).

Evidence on the euro area banking system:

- Correlation between Twitter sentiment and stock returns (Cera et al. (2024)).

- Ongoing ECB-DGMF's analysis of deposit and LCR during the tightening, including Twitter and digital payments (Fascione et al. (2024)).

- Ongoing ESRB-ASC's analysis of deposit flows and rates during the monetary tightening.

- Drivers of bank runs (Bindseil & Senner (2024)) and bank profitability (Andersson et al. (2018)).

Digital banks are more profitable, larger, "safer", but with more unstable deposits

	(1)		(2)		(3)	
	Digital banks		Traditional banks		Digital vs. traditional	
	Mean	Std.	Mean	Std.	Difference in mean	N
PD	0.17	0.41	0.41	1.21	-0.23***	2663
Asset (EUR mil)	295,533	462,305	293,045	609,428	2,488	2663
ln TA	11.14	1.93	10.24	2.39	0.90***	2663
Stock Return	1.54	15.47	1.21	18.38	0.33	2663
CET1	16.7	3.53	15.41	3.55	1.29***	2663
ROE	7.67	9.24	4.84	13.43	2.83***	2663
GoogleTrends	49.23	23.67	51.41	22.26	-2.18	2663
GovFundInflow	0.08	2.14	0.25	3.65	-0.18	2663
IGFundInflow	0.01	2.69	0.07	2.27	-0.05	2663
MMFInflow	0.76	7.37	0.79	15.08	-0.03	2663
St.Dev. deposit	3.32	3.63	2.65	3.62	0.67***	2663

Impact of digitalization on deposit flows and rates in response to monetary tightening

$$Y_{i,t} = \alpha + \beta(\text{MonTight}_t \times \text{Digit}_{i,t-1}) + \gamma\text{Digit}_{i,t-1} + \theta X_{i,t-1} + \rho(\text{MonTight}_t \times X_{i,t-1})$$

$$+\text{bankFE}_i + \text{monthFE}_t \times \text{BusinModelFE}_i + \epsilon$$

- Y is a vector of four bank-level monthly dependent variables:
  (a) growth rate of the deposit-to-assets ratio;
  (b) growth rate of deposits;
  (c) change in net NFC deposit rate: monthly change in the NFC deposit rate, net of the monthly change in ECB rates;
  (d) change in net HH deposit rate.
- Digit: treatment dummy separating digital banks from traditional ones.
- MonTight: time dummy identifying the monetary tightening, i.e., post-June-2022 period.
- We control for:
  - bank- and month-and-business-model;
  - stock returns, ROE, CET1, PD, total assets, Google Trends, flows into NBFI, deposit variability and deposit rates.
- Many robustness checks:
  - Alternative measures of monetary tightening, digital banks (different weights of three indicators, deposit-to-branch, constant threshold of 500 Google Reviews, not clustered at country-level) or Twitter sentiment;
  - Only banks>30 bn euro, or exclusion of controls.

Impact of digitalization during the monetary tightening, with fixed effects and control variables

In response to the tightening, (i) weaker deposit growth and (ii) greater sensitivity for HH deposit rates.

	(1) Dep_Growth	(2) DepRatio_Growth	(3) NFCRate_Delta	(4) HHRate_Delta	(5) DepRatio_Growth	(6) NFCRate_Delta	(7) HHRate_Delta	(8) Dep_Growth	(9) DepRatio_Growth
Digit x MonTight	-1.456***	-1.939**	0.01	-0.005	-1.287***	0.013*	-0.001	-1.539***	-2.092**
	(0.523)	(0.806)	(0.009)	(0.006)	(0.462)	(0.008)	(0.005)	(0.515)	(0.811)
Bank FE	x	x	x	x	x	x	x	x	x
Month X Business model FE	x	x	x	x	x	x	x	x	x
Controls	x	x	x	x	x	x	x	x	x
Control for deposit stability	x	x	x	x	x	x	x		
Controls for deposit rates	x	x	x	x					
N	1520	1520	1520	1520	2663	1520	1520	2663	1520
R-sq	0.22	0.25	0.86	0.89	0.19	0.86	0.89	0.21	0.23

In response to the tightening, (i) weaker deposit growth and (ii) greater sensitivity for HH deposit rates.

	(1) DepRatio_Growth	(2) NFCRate_Delta	(3) HHRate_Delta	(4) DepRatio_Growth	(5) NFCRate_Delta	(6) HHRate_Delta	(7) DepRatio_Growth	(8) NFCRate_Delta	(9) HHRate_Delta
Digit x MonTight	-1.973**	0.012	-0.005	-1.337**	0.014*	-0.002	-1.356***	0.014*	-0.002
	(0.737)	(0.009)	(0.006)	(0.519)	(0.007)	(0.005)	(0.500)	(0.007)	(0.005)
Digit	0.148	-0.004	-0.004	0.403	-0.006	-0.004*	0.449	-0.006	-0.004*
	(0.717)	(0.003)	(0.002)	(0.434)	(0.004)	(0.002)	(0.417)	(0.004)	(0.002)
Bank FE	X	X	X	X	X	X	X	X	X
Month X Business model FE	X	X	X	X	X	X	X	X	X
Hainmueller (2012)	X	X	X	X	X	X	X	X	X
Controls	X	X	X	X	X	X	X	X	X
Control for deposit stability	X	X	X	X	X	X			
Controls for deposit rates	X	X	X						
N	1520	1520	1520	2663	1520	1520	2663	1520	1520
R-sq	0.25	0.86	0.89	0.2	0.86	0.89	0.2	0.86	0.89

Impact of digitalization on deposit flows and rates:

$$Y_{i,t} = \alpha + \beta \times \text{UnfavourableTwitter}_{i,t-1} + \gamma \times \text{UnfavourableNews}_{i,t-1}$$

$$+\theta \times \text{X}_{i,t-1} + \text{bankFE}_i + \text{monthFE}_t \times \text{BusinModelFE}_i + \epsilon$$

- Y is a vector of four bank-level monthly dependent variables:
    (a) growth rate of the deposit-to-assets ratio;
    (b) growth rate of deposits;
    (c) change in net NFC deposit rate: monthly change in the NFC deposit rate, net of the monthly change in ECB rates;
    (d) change in net HH deposit rate.
- Unfavourable Twitter: treatment dummy identifying banks with Twitter sentiment ratio above median.
- Specifications include:
    - bank- and month-and-business-model-levels;
    - stock returns, ROE, CET1, PD, total assets, Google Trends, flows into NBFI, deposit variability and deposit rates.

Impact of negative Twitter sentiment, with fixed effects, controls and re-balancing a' la Hainmueller (2012)

Negative impact of the Twitter negative sentiment on deposit flows

	(1) DepRatio_Growth	(2) NFCRate_Delta	(3) HHRate_Delta	(4) DepRatio_Growth	(5) DepRatio_Growth	(6) DepRatio_Growth	(7) DepRatio_Growth	(8) NFCRate_Delta	(9) HHRate_Delta
Tweet	-0.986* (0.569)	-0.001 (0.004)	0.000 (0.003)		-0.725* (0.403)	-0.988* (0.568)	-2.209** (0.869)	0.001 (0.004)	-0.001 (0.004)
News	-0.356 (0.387)	-0.002 (0.004)	-0.001 (0.002)		-0.283 (0.336)	-0.343 (0.389)			
Tweet continuous				-1.621* (0.826)					
News continuous				-0.043 (0.493)					
Digit						-0.412 (0.496)			
Bank FE	X	X	X	X	X	X	X	X	X
Month X Business model FE	X	X	X	X	X	X	X	X	X
Controls	X	X	X	X	X	X	X	X	X
Control for deposit stability	X	X	X	X		X	X	X	X
Controls for deposit rates	X	X	X	X		X	X	X	X
Hainmueller (2012)							X	X	X
N	1520	1520	1520	1520	2663	1520	1520	1520	1520
R-sq	0.25	0.86	0.89	0.25	0.18	0.25	0.25	0.86	0.89

The negative sentiment amplified outflows in March 2023, but not in the monetary tightening

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	DepRatio Growth	NFCRate Delta	HHRate Delta	DepRatio Growth	NFCRate Delta	HHRate Delta	DepRatio Growth	NFCRate Delta	HHRate Delta
Tweet x MonTight	0.926	-0.004	-0.001						
	(0.967)	(0.009)	(0.007)						
Tweet x March				-4.041**	-0.016	0.02	-4.477**	-0.011	0.014
				(1.881)	(0.037)	(0.013)	(1.865)	(0.040)	(0.013)
Bank FE	x	x	x	x	x	x	x	x	x
Month X Business model FE	x	x	x	x	x	x	x	x	x
Controls	x	x	x	x	x	x	x	x	x
Control for deposit stability	x	x	x	x	x	x	x	x	x
Controls for deposit rates	x	x	x	x	x	x	x	x	x
Controls for digitalization							x	x	x
Hainmueller (2012)	x	x	x	x	x	x	x	x	x
N	1520	1520	1520	169	169	169	169	169	169
R-sq	0.29	0.96	0.99	0.34	0.93	0.99	0.33	0.93	0.99

We find that:

A higher degree of bank digitalization leads to:
- Larger fluctuations in deposits.
- Amplification of deposit flows in response to the tightening. Results are economically relevant.
- Higher deposit rates' sensitivity. Results are not economically significant.

Negative Twitter sentiment leads to:
- Weaker deposit growth.
- Weaker deposit growth March US turmoil. Results are economically relevant.
- Not statistically significant impact on deposit rates' sensitivity.

Further work:
- More comprehensive data on Twitter sentiment is needed to fully assess the risks arising from social media.

Thank you for the attention!