Enhancing Transmission of Monetary Policy Through Deposit Competition

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Recent tightening in EA - divergences in transmission across countries

- **The transmission of monetary policy can vary significantly across countries that form a monetary union**

Figure 1: Change in HH deposit rates (2022M6-2023M10), p.p.

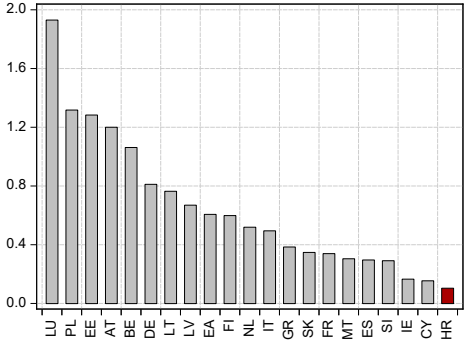
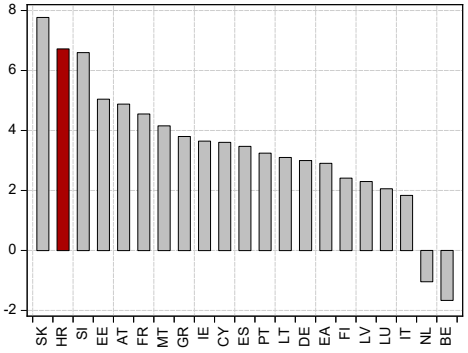


Figure 2: Inflation (2023Q4), YoY%



We study how government pressure to increase deposit rates can amplify MP transmission

Institutional context

- September 2023 - the **government in talks with banks** to increase deposit rates (similarly in other countries, e.g. Spain, Italy)

- **State owned bank** responded first and with an increase of 2.5 p.p., kicking off **competition for deposits with other banks**

"Following constructive discussions with the Ministry of Finance and the Government of the Republic of Croatia on the effects of inflation on our citizens... The introduction of such a product will contribute to curbing inflation by immobilizing time-deposited funds while, on the other hand, allowing savers to achieve an attractive return that mitigates the negative effects of inflation on the value of money."

Official press release of HPB

This paper explores...

1. What was the policy's effect on deposit competition?
2. Has the policy incentivised savings, thereby affecting consumption and/or portfolio rebalancing?
3. Were there unintended effects on bank loan supply?

Contribution

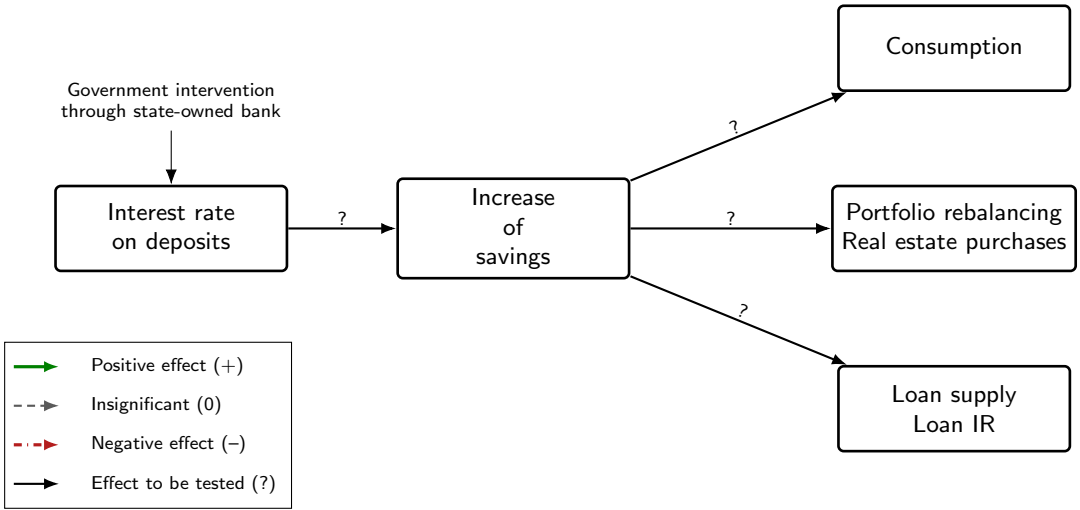
We examine a government policy designed to increase deposit competition and strengthen monetary policy transmission

We identify the portfolio-rebalancing channel of standard monetary policy between term deposits and housing

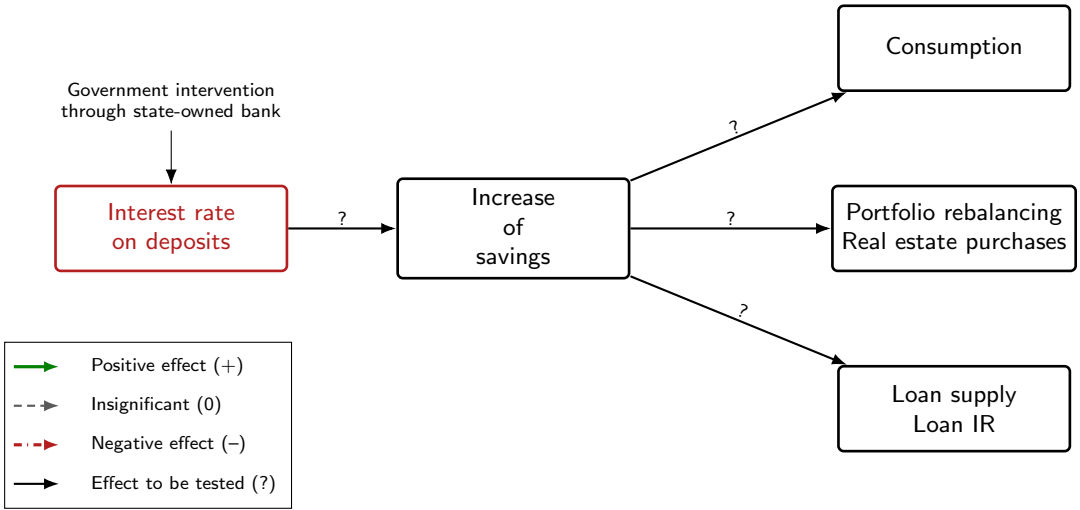
Data sources

1. **Bank-depositor records** (Croatian National Bank)
   - Individual balances, interest rates, term deposit dates, depositor characteristics
   - Daily value and count of transactions
2. **House purchase transactions** (Croatian Tax Authority)
   - Transaction-level data on real estate purchases
3. **Loan-level data** (Croatian National Bank)
   - Bank-firm and bank-household loans
   - Loan amounts and interest rates (new & outstanding)
4. **County-level VAT data** (Croatian Tax Authority)

Theoretical framework

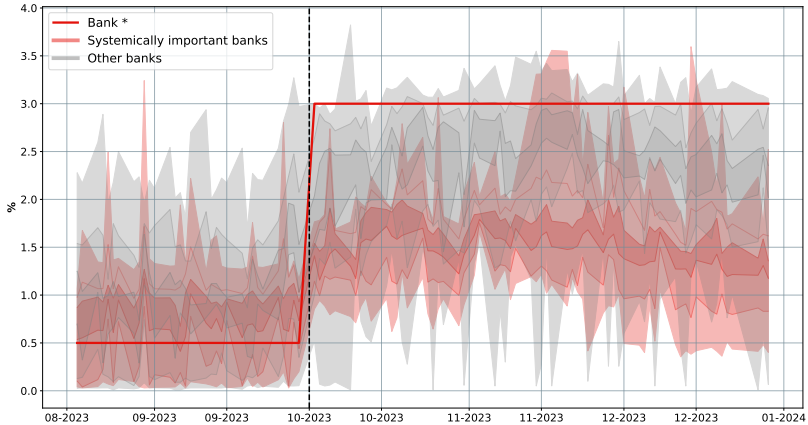


Effects on deposit rates



The state owned bank strongly increased it's deposit rates in October 2023...

Figure 3: Daily interest rates on HH term deposits

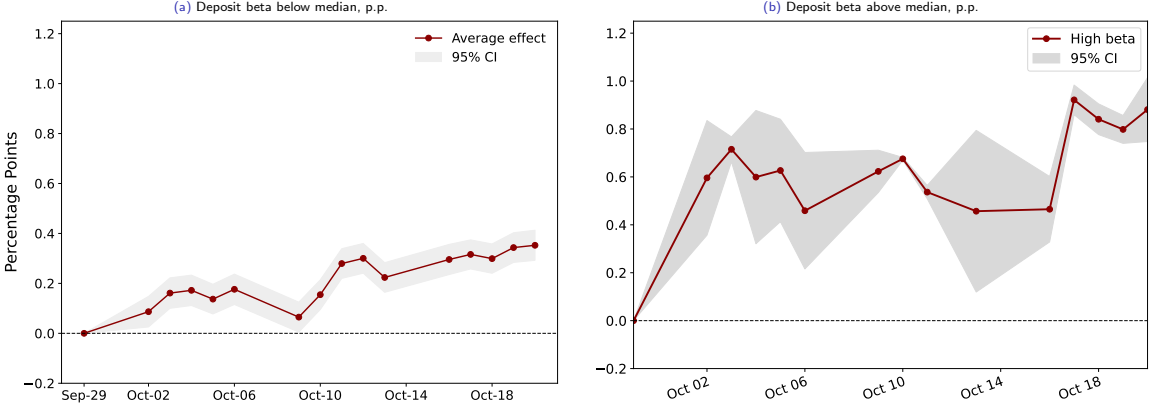


Notes: Bank quintile groups are shown in red and grey. Bank* refers to the interest rate of a systemically important bank derived from the publicly available *Excerpts from decisions on interest rate levels* (12-month time deposits in euro). As a consequence, this series does not exhibit usual daily oscillations that can be caused by different characteristics of deposits and special arrangements with individual clients. The shown group of systemically important banks excludes the Bank*. Sources: Households Deposit and Credit registry; excerpts from decisions on interest rate levels for the Bank*.

Effects on deposit rates I.

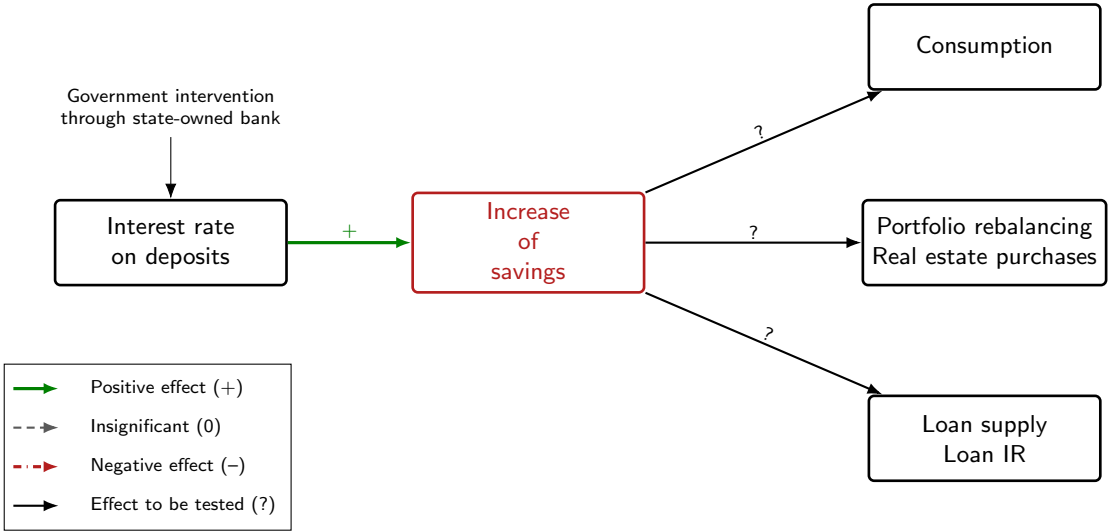
- Evidence of spillover effect on other banks
  → **Banks with higher market power adjusted deposit rates less**

Figure 4: Daily changes in deposit rates



Note: Each dot in graph represents one business day. Impulse responses are calculated using local projections method, accounting for deposit size, within a bank. The shown group of systemically important banks excludes the Bank*. Source: Households Deposit and Credit registry.

Effects on deposit inflows/outflows



Effects on deposit inflows/outflows

Significant increase of inflows in term deposits

- Mainly conversion from overnight to term deposits (left figure)
- Overnight to term conversions and transfers to other banks fell after the initial surge

Figure 5: Inflows of term deposits (total)

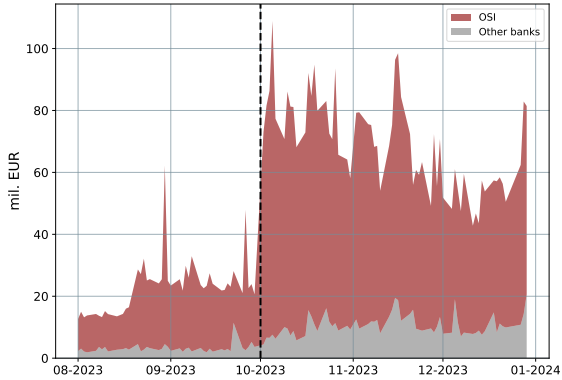
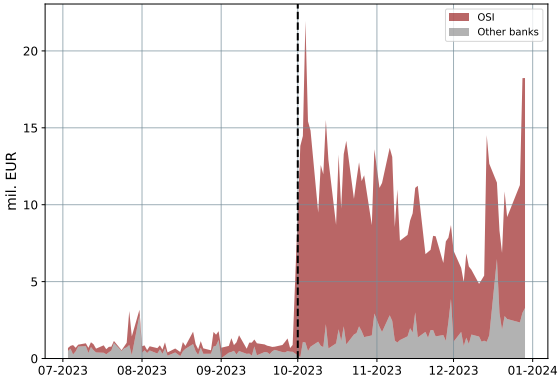


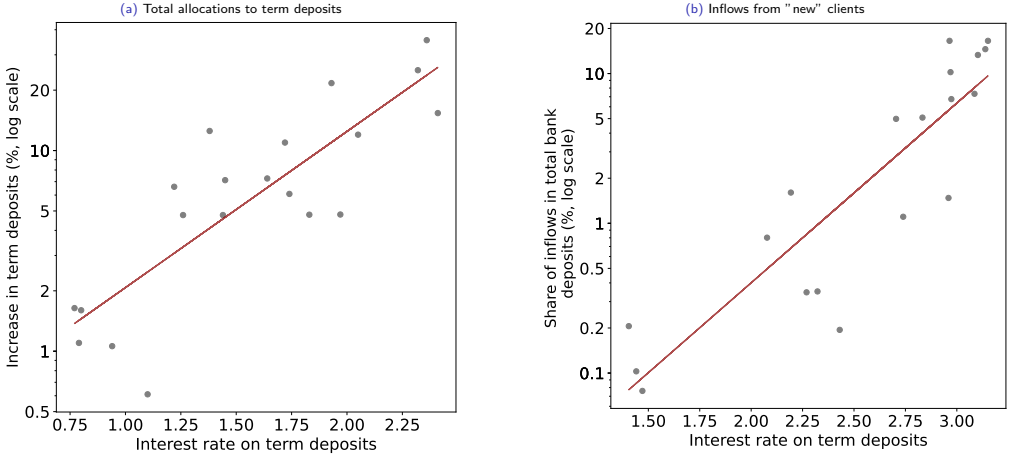
Figure 6: Inflows of term deposits (new clients)



Note: OSI denotes systemically important banks (including the Bank*). "New clients" denote persons holding new deposits in a bank in which they previously held no transaction or savings accounts. Source: Households Deposit and Credit registry.

Banks which chose high(er) interest rates attracted more term deposits and new clients

Figure 7: Relationship between interest rates and deposit inflows

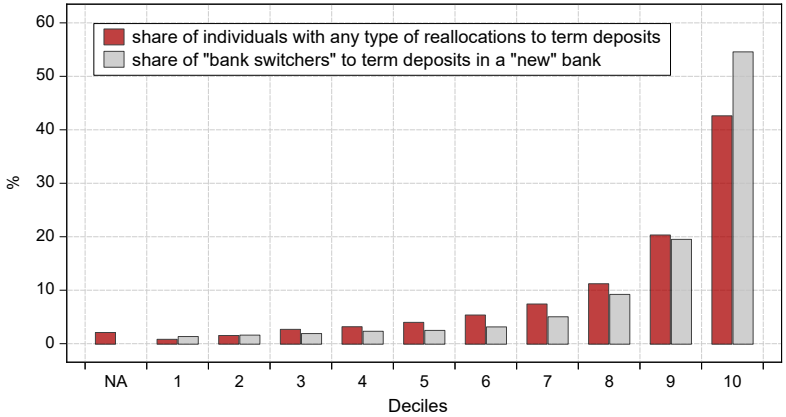


Note: "New clients" denote persons holding new deposits in a bank in which they previously held no transaction or savings accounts. Observed period: June – December 2023. Source: Households Deposit and Credit registry.

Liquidity-rich were driving most of the reallocation to term deposits...

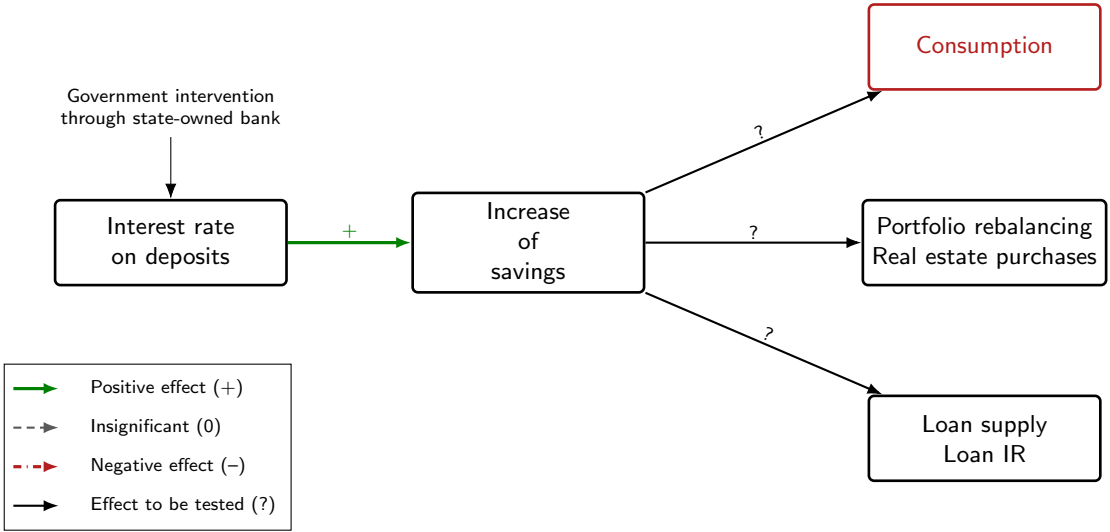
▸ Absolute numbers ▸ "Wealth" and interest rates ▸ Interest rate sensitivity regression ▸ Shares of term deposits in "wealth" ▸ Reallocated amounts by deciles

Figure 8: Reallocation to term deposits across "wealth" deciles



Note: All individuals are allocated into deciles based on their total liquidity in a bank, which serves as a proxy for wealth. Total liquidity is measured as the sum of overnight and term deposits pre each individual, across all banks, as of June 30, 2023. The first decile includes individuals with the lowest liquidity, while the tenth decile includes those with the highest. Source: Household Deposit and Credit Registry.

Effects on consumption



Effects on consumption - the idea...

Does consumption fall more in counties with larger increases in term-deposit shares?

- **Treatment**: SOB's rate increase (October - 2023)
- **Treated group**: Counties with *above-median* increase in time-deposit share
- **Control group**: Counties with *below-median* increase in time-deposit share
- **Empirical strategy:** Synthetic control
- **Identification assumption**: Parallel trends between treated and synthetic control would continue in the absence of the event

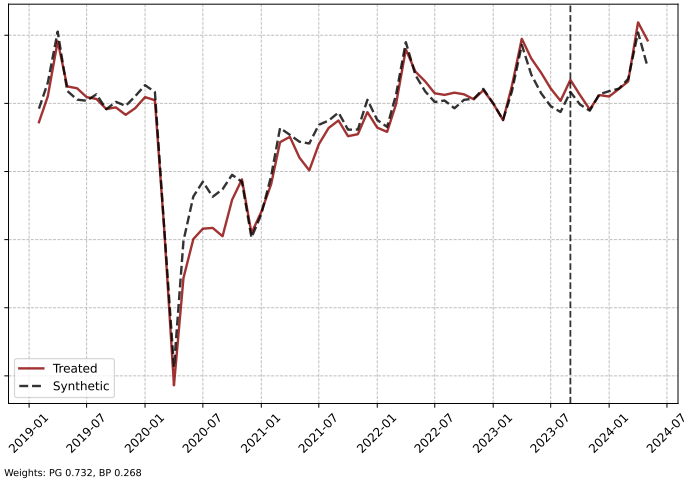
▸ Table of treated and control counties ▸ Seasonal adjustment

Effects on consumption - synthetic control (pooled treated group)

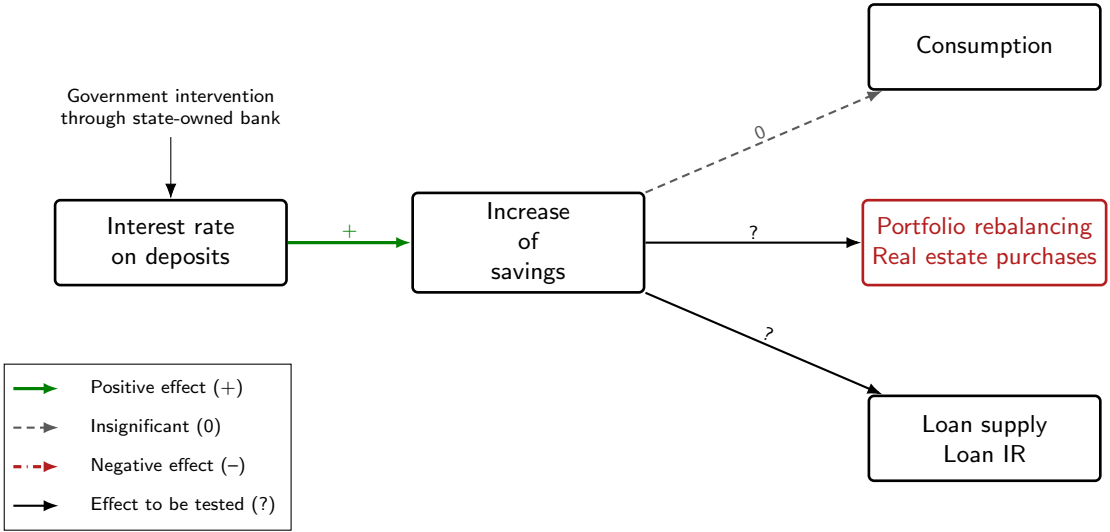
No effects on consumption!

▸ Synthetic control for each county

Figure 9: Synthetic control for consumption



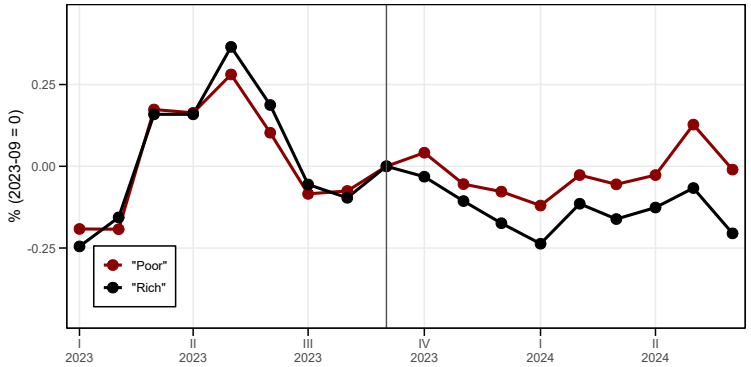
Effects on portfolio rebalancing



Did this induce the rich to rebalance their portfolios?

Liquidity-rich individuals reduced their house purchases by around 13% (on average)

Figure 10: House Purchases (values) - liquidity-rich vs liquidity-poor



Note: "rich" denotes counterparties that are above the median by liquidity in a bank (measured as the sum of all deposits on the 30th of June). The lines in the figure denote log changes compared to September 2023. The vertical line denotes the event of an increase in deposit rates by Government banks. Sources: Tax Administration for data about house purchases at counterparty level; Household deposit and credit registry for data about total liquidity of the counterpart.

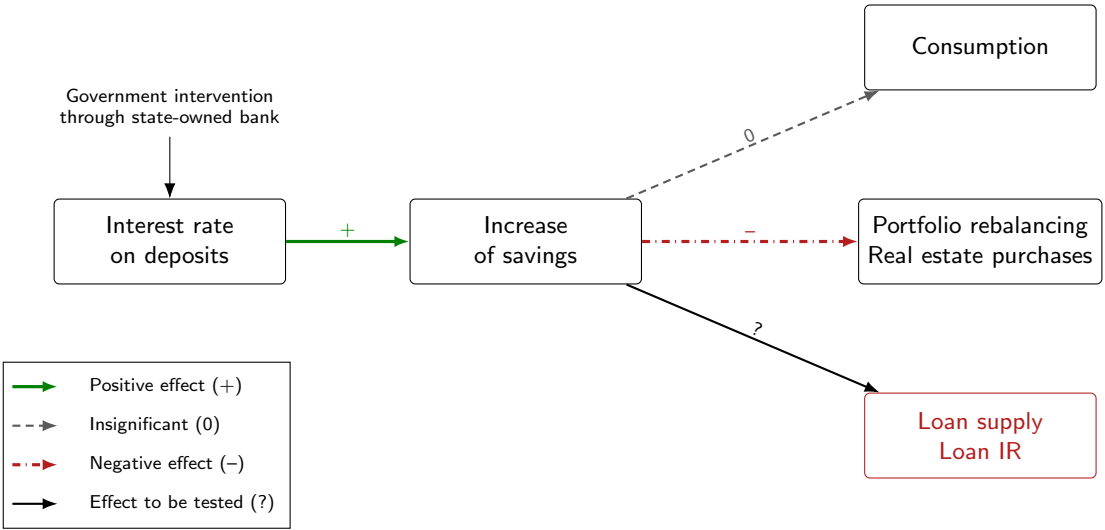
The rich reduced the probability of buying a house substantially

▸ Probability - graph ▸ Without county × time FE ▸ Extensive margin
▸ Demand controls ▸ Bank supply controls ▸ Without housing loans ▸ Wealth categories

	FIRST STAGE		REDUCED FORM	IV	
	(1) INTEREST RATE	(2) ln(T. DEPOSIT)	(3) HOUSE PURCHASE	(4) HOUSE PURCHASE	(5) HOUSE PURCHASE
Post x Rich	0.097***	0.21***	-0.001***		
	(0.000)	(0.002)	(0.000)		
Interest rate				-0.01***	
				(0.001)	
ln(T. DEPOSIT)					-0.005***
					(0.000)
Counterparty FE	x	x	x	x	x
County x Time FE	x	x	x	x	x
R^2	0.568	0.735	0.531	-	-
Obs.	6.7M	6.7M	6.7M	6.7M	6.7M

Note: Std. Errors in parentheses. *** p<0.001. Obs. in Millions (M). House purchase is a dummy variable with value 1 if counterparty purchased a house in specific time period and 0 otherwise. "Rich" counterparties are those with total liquidity in bank account (overnight + term deposits) above median. Standard errors are clustered at counterparty level. Sources: Tax Administration for data about house purchases at counterparty level; Household deposit and credit registry for data about total liquidity of the counterpart.

Effects on loan supply



Impact on loan supply and interest rates

Impact on the banking system

- Liquidity reshuffling and higher deposit costs, but profits changed moderately

Redistribution of excess liquidity | Interest rates | Impact on RoE | Deposit maturity composition

Outcomes:

- Household & corporate loan volumes and interest rates

Treatment variables:

- Δ **HH deposit funding costs** and **Ex-ante deposit beta**

Identification strategy:

- Assumes deposit competition is the sole loan-supply shock (Degryse et al., 2019)
- **We find no significant impact on lending and interest rates** Impact on lending

Conclusion

- We evaluate the effects of a **government policy that increased competition for deposits** and transmission of monetary policy through deposit rates
- Banks **with lower market power** adjusted deposit rates more
- **Liquidity-rich individuals** drove deposit flows, shifting funds to banks offering higher rates
- We show **no discernible** effects **on consumption**, but we document **substantial portfolio rebalancing** from housing towards term deposits
- **Loan-supply was unaffected** due to the characteristics of the banking system

Thank you!

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Appendix

Relevant Literature: Key Papers

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State-Owned Banks and Monetary Policy

- **Carvalho (2014)**:
  - State-owned banks direct credit to politically aligned local governments before elections.
  - Beneficiary firms increase employment, especially with strong incumbent opposition.
  - State banks also lend more during downturns, cushioning shocks.
- **Deng et al. (2015)**:
  - State-owned banks in China can both amplify and dampen monetary policy effects, depending on political directives and economic conditions.
  - Their lending behavior significantly influences credit allocation, impacting sectors like real estate and state-owned enterprises.

Portfolio Rebalancing and Monetary Policy

- **Agarwal et al. (2020)**:
  - When interest rates fall, households increase consumption by 6% and shift 36% more of their wealth into risky assets after term deposits expire.
  - New investors tend to invest in high-beta and volatile stocks, indicating a "reach for yield" behavior.

Liquidity-rich were driving most of the reallocation to term deposits...

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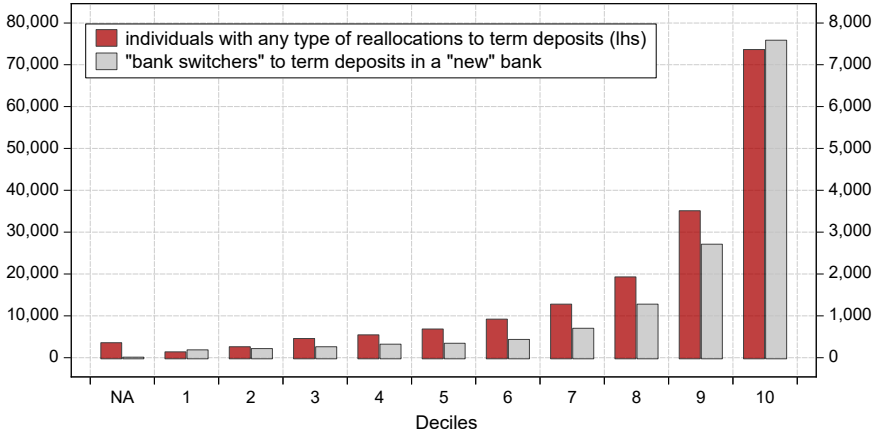
Figure 11: Reallocation to term deposits across "wealth" deciles



Note: All individuals are allocated into deciles based on their total liquidity in a bank, which serves as a proxy for wealth. Total liquidity is measured as the sum of overnight and term deposits pre each individual, across all banks, as of June 30, 2023. The first decile includes individuals with the lowest liquidity, while the tenth decile includes those with the highest. Source: Household Deposit and Credit Registry.

Liquidity-rich were driving most of the reallocation to term deposits...

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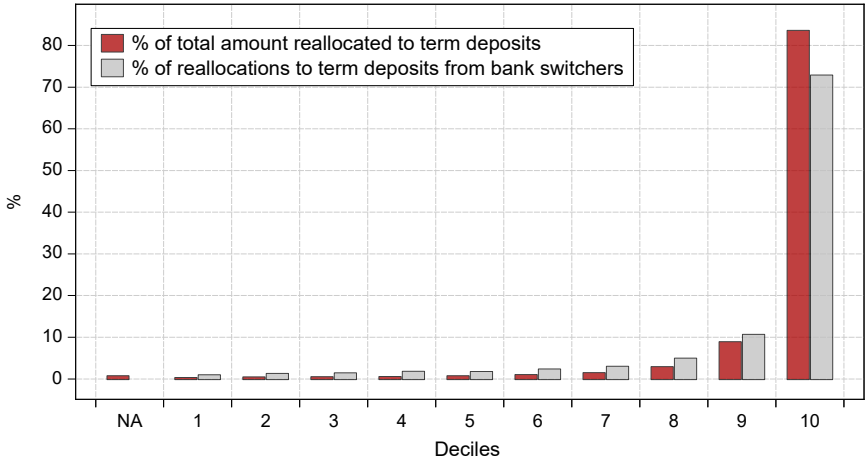
Figure 12: Reallocation to term deposits across "wealth" deciles



Note: All individuals are allocated into deciles based on their total liquidity in a bank, which serves as a proxy for wealth. Total liquidity is measured as the sum of overnight and term deposits pre each individual, across all banks, as of June 30, 2023. The first decile includes individuals with the lowest liquidity, while the tenth decile includes those with the highest. Source: Household Deposit and Credit Registry.

Liquidity-rich were driving most of the reallocation to term deposits...

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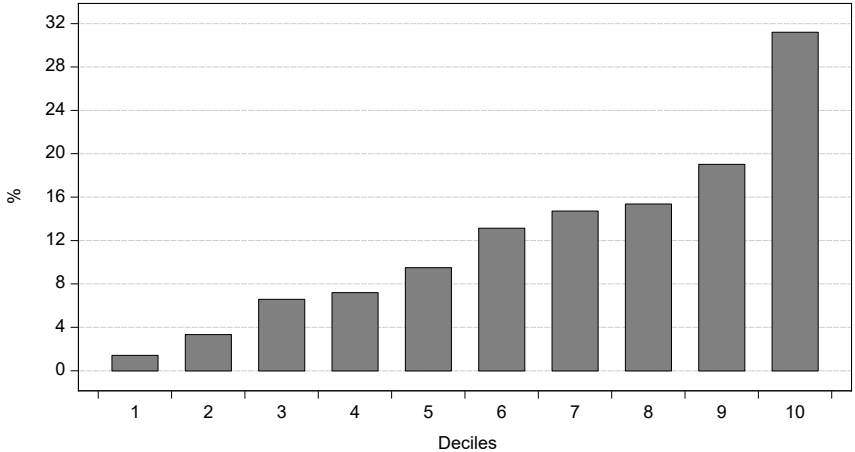
Figure 13: "Savings rate" across "wealth" deciles (June, 2023)



Note: All individuals are allocated into deciles based on their total liquidity in a bank, which serves as a proxy for wealth. Total liquidity is measured as the sum of overnight and term deposits pre each individual, across all banks, as of June 30, 2023. The first decile includes individuals with the lowest liquidity, while the tenth decile includes those with the highest. Proxy for savings rate is calculated as term deposits over total liquidiy in a bank. Source: Household Deposit and Credit Registry.

Interest rates sensitivity - all depositors

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	POST				INTERST RATE			
	<10K	10K–100K	100K–500K	>500K	<10K	10K–100K	100K–500K	>500K
					log(amount)			
POST	0.025***	0.416***	1.169***	1.520***				
	(0.001)	(0.005)	(0.024)	(0.117)				
Interest rate					3.194***	3.408***	3.561***	3.784***
					(0.009)	(0.009)	(0.019)	(0.068)
Counterparty FE	x	x	x	x	x	x	x	x
R^2	0.731	0.704	0.678	0.661	0.840	0.829	0.825	0.832
Obs.	5.0M	1.1M	107K	6.4K	5.0M	1.1M	107K	6.4K

Note: Std. Errors in parentheses. *** p<0.001. "Post" is a dummy for post-policy period. Interest rate regression controls for same set of fixed effects. Amount is log of transaction value. Observations rounded for readability.

Interest rates sensitivity - term deposits only

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	POST				INTERST RATE			
	<10K	10K–100K	100K–500K	>500K	<10K	10K–100K	100K–500K	>500K
	log(amount)							
POST	0.151***	0.081***	0.135***	0.399***				
	(0.007)	(0.006)	(0.016)	(0.068)				
Interest rate					0.253***	0.228***	0.310***	0.489***
					(0.009)	(0.005)	(0.010)	(0.044)
Counterparty FE	x	x	x	x	x	x	x	x
R^2	0.977	0.935	0.873	0.871	0.977	0.939	0.887	0.893
Obs.	118.7K	152.8K	28.7K	2.1K	118.7K	152.8K	28.7K	2.1K

Note: Std. Errors in parentheses. *** p<0.001. "Post" is a dummy for post-policy period. Interest rate regression controls for same set of fixed effects. Amount is log of transaction value. Observations rounded for readability.

The rich reduced the probability of buying a house substantially

Back

	FIRST STAGE		REDUCED FORM	IV	
	(1) INTEREST RATE	(2) ln(T. DEPOSIT)	(3) HOUSE PURCHASE	(4) HOUSE PURCHASE	(5) HOUSE PURCHASE
Post x Rich	0.097***	0.212***	-0.001***		
	(0.000)	(0.002)	(0.000)		
Interest rate				-0.021***	
				(0.001)	
ln(T. DEPOSIT)					-0.010***
					(0.000)
Counterparty	x	x	x	x	x
R^2	0.567	0.734	0.535	-	-
Observations	6.7M	6.7M	6.7M	6.7M	6.7M

Note: Std. Errors in parentheses. *** p<0.001. Obs. in Millions (M). House purchase is a dummy variable with value 1 if counterparty purchased a house in specific time period and 0 otherwise. "Rich" counterparties are those with total liquidity in bank account (overnight + term deposits) above median. Standard errors are clustered at counterparty level. Sources: Tax Administration for data about house purchases at counterparty level; Household deposit and credit registry for data about total liquidity of the counterpart.

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	(1) INTEREST RATE	(2) ln(T. DEPOSIT)	(3) ln(HH PURCHASE)	(4) ln(HH PURCHASE)	(5) ln(HH PURCHASE)
Post x Rich	0.097***	0.211***	-0.017***		
	(0.000)	(0.002)	(0.001)		
Interest rate				-0.180***	
				(0.015)	
ln(T. DEPOSIT)					-0.083***
					(0.007)
Counterparty FE	x	x	x	x	x
Country x Time FE	x	x	x	x	x
R^2	0.567	0.734	0.532	-	-
Observations	6.7M	6.7M	6.7M	6.7M	6.7M

Note: Std. Errors in parentheses. *** $p<0.001$. Obs. in Millions (M). "Rich" counterparties are those with total liquidity in bank account (overnight + term deposits) above median. Standard errors are clustered at counterparty level. Sources: Tax Administration for data about house purchases at counterparty level; Household deposit and credit registry for data about total liquidity of the counterpart.

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	(1) INTEREST RATE	(2) ln(T. DEPOSIT)	(3) HOUSE PURCHASE	(4) HOUSE PURCHASE	(5) HOUSE PURCHASE
Post x Rich	0.0965***	0.21***	-0.0010***		
	(0.0004)	(0.002)	(0.0001)		
Interest rate				-0.010***	
				(0.0008)	
ln(T. DEPOSIT)					-0.0047***
					(0.0004)
Counterparty FE	x	x	x	x	x
County x Time FE	x	x	x	x	x
DSTI x Time FE	x	x	x	x	x
Income x Time FE	x	x	x	x	x
R^2	0.568	0.735	0.531	-	-
Obs.	6.7M	6.7M	6.7M	6.7M	6.7M

Note: Std. Errors in parentheses. *** $p<0.001$. Obs. in Millions (M). House purchase is a dummy variable with value 1 if counterparty purchased a house in specific time period and 0 otherwise. "Rich" counterparties are those with total liquidity in bank account (overnight + term deposits) above median. Standard errors are clustered at counterparty level. Sources: Tax Administration for data about house purchases at counterparty level; Household deposit and credit registry for data about total liquidity of the counterpart.

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Post x Rich	0.0965***	0.21***	-0.0010***		
	(0.0004)	(0.002)	(0.0001)		
Interest rate				-0.010***	
				(0.0008)	
ln(T. DEPOSIT)					-0.0047***
					(0.0004)
Counterparty FE	x	x	x	x	x
County x Time FE	x	x	x	x	x
DSTI x Time FE	x	x	x	x	x
Income x Time FE	x	x	x	x	x
Bank x Time FE	x	x	x	x	x
R^2	0.568	0.735	0.531	-	-
Obs.	6.7M	6.7M	6.7M	6.7M	6.7M

Note: Std. Errors in parentheses. *** p<0.001. Obs. in Millions (M). House purchase is a dummy variable with value 1 if counterparty purchased a house in specific time period and 0 otherwise. "Rich" counterparties are those with total liquidity in bank account (overnight + term deposits) above median. Standard errors are clustered at counterparty level. Sources: Tax Administration for data about house purchases at counterparty level; Household deposit and credit registry for data about total liquidity of the counterpart.

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Post x Rich	0.0966***	0.21***	-0.0007***		
	(0.0004)	(0.002)	(0.0001)		
Interest rate				-0.0077***	
				(0.0007)	
ln(T. DEPOSIT)					-0.0036***
					(0.0004)
Counterparty FE	x	x	x	x	x
County x Time FE	x	x	x	x	x
DSTI x Time FE	x	x	x	x	x
Income x Time FE	x	x	x	x	x
R^2	0.568	0.735	0.534	-	-
Obs.	6.7M	6.7M	6.7M	6.7M	6.7M

Note: Std. Errors in parentheses. *** $p<0.001$. Obs. in Millions (M). House purchase is a dummy variable with value 1 if counterparty purchased a house in specific time period and 0 otherwise. "Rich" counterparties are those with total liquidity in bank account (overnight + term deposits) above median. Standard errors are clustered at counterparty level. Sources: Tax Administration for data about house purchases at counterparty level; Household deposit and credit registry for data about total liquidity of the counterpart.

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	(1)	(2)	(3)	(4)
	Dependent variable: *House purchase*			
	Baseline	Wealth >50K	Wealth >100K	Wealth >250K
Post × Rich	-0.0010***	-0.0006***	-0.0007***	-0.0009***
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Post × Wealth		-0.0045***	-0.0076***	-0.0059**
		(0.0004)	(0.0007)	(0.0020)
Counterparty FE	x	x	x	x
County × Time FE	x	x	x	x
DSTI × Time FE	x	x	x	x
Income × Time FE	x	x	x	x
R^2	0.5313	0.5313	0.5314	0.5313
Obs.	6.7M	6.7M	6.7M	6.7M

Notes: Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$. All regressions include the listed fixed effects. Observations reported in millions.

Probability of buying a house...

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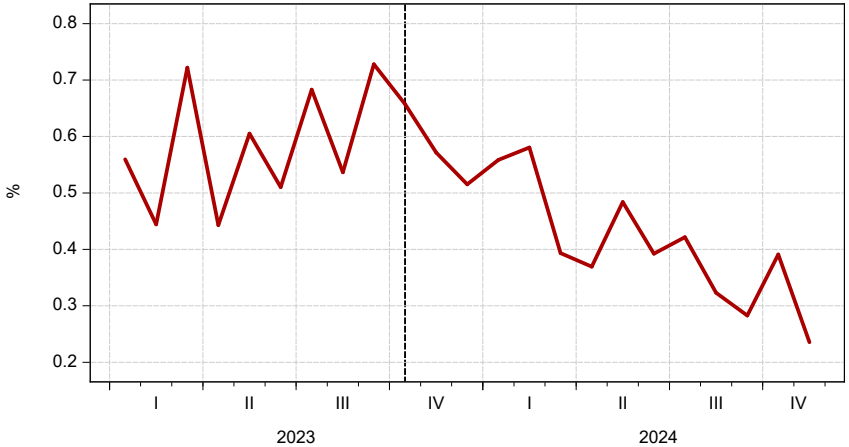
Figure 14: Probability of buying a house, for "rich" individuals



Note: "Rich" individuals are those with more than 10K EUR of total liquidity in a bank, which serves as a proxy for wealth. Total liquidity is measured as the sum of overnight and term deposits pre each individual, across all banks, as of June 30, 2023. Probability is calculated as share of "rich" individuals who bought a house in particular month. Source: Tax Administration for data about house purchases and Household Deposit and Credit Registry for calculation of total liquidity.

Treated and control counties

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Change in share of term deposits (in total deposits, %) from 30.09.2023. to 31.12.2023.

County	Change	Treated median	Treated Q1-Q4
Koprivničko-križevačka	6.37	1	1
Šibensko-kninska	6.22	1	1
Splitsko-dalmatinska	4.87	1	1
Dubrovačko-neretvanska	4.59	1	1
Zadarska	4.49	1	1
Istarska	3.82	1	1
Grad Zagreb	3.74	1	
Karlovačka	3.71	1	
Osječko-baranjska	3.57	1	
Varaždinska	3.42	1	
Meimurska	2.98	1	
Zagrebačka	2.95	0	
Virovitičko-podravska	2.87	0	
Ličko-senjska	2.49	0	
Požeško-slavonska	2.49	0	
Primorsko-goranska	2.38	0	0
Vukovarsko-srijemska	2.36	0	0
Krapinsko-zagorska	2.14	0	0
Brodsko-posavska	1.82	0	0
Bjelovarsko-bilogorska	1.40	0	0
Sisačko-moslavačka	1.23	0	0

Seasonal chart of change in share of term deposits

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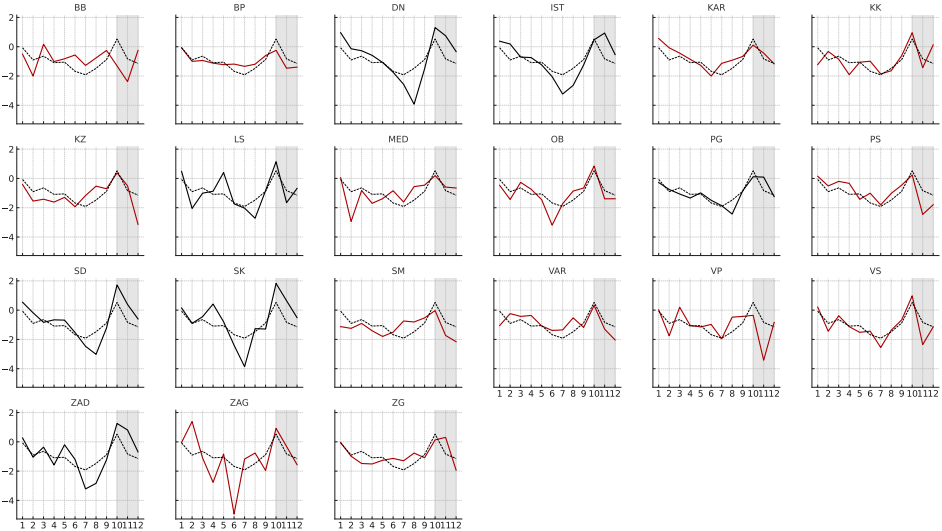

Synthetic Control on each county from treated group

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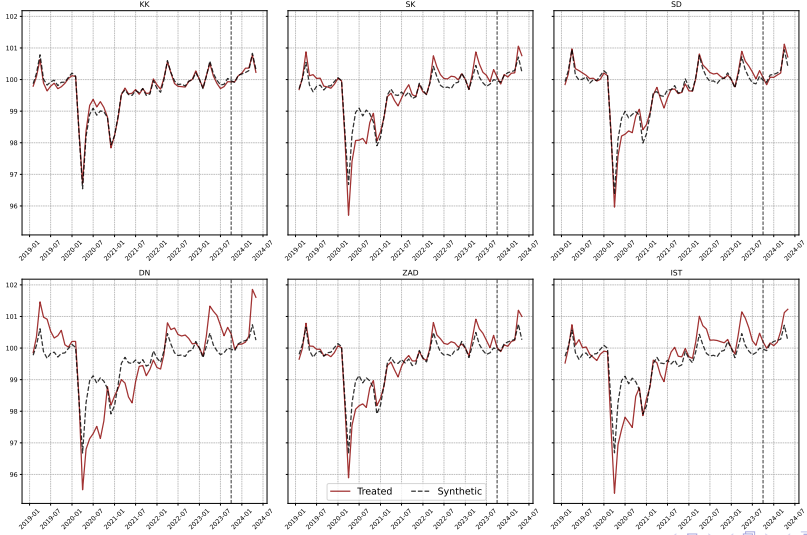
Figure 15: "Synthetic consumption" per county (only treated counties)



Interest rates on new business

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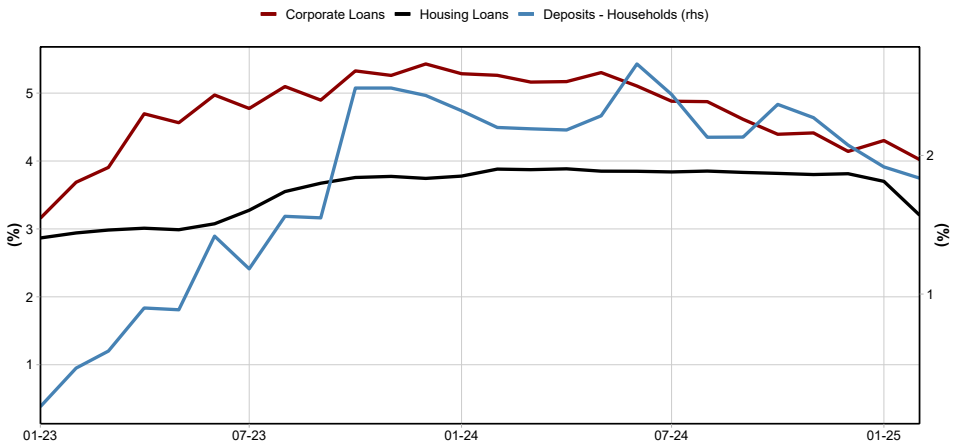
Figure 16: Interest rates on new loans and deposits



Note: The plot shows the weighted averages of interest rates on new business for corporate and household lending, as well as for new household deposits.

Maturity structure of household deposits

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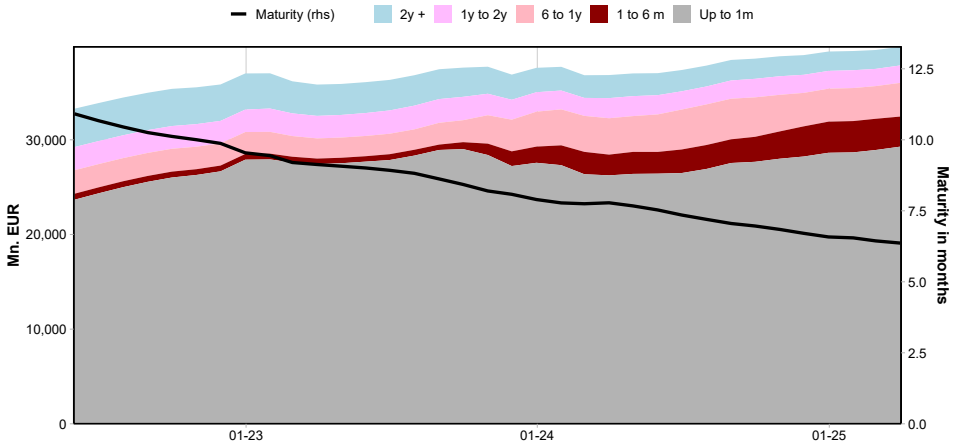
Figure 17: Maturity structure of household deposits



Note: The maturity indicator is calculated by taking a weighted average of deposit maturities within each maturity bucket. This provides an approximate measure of the average remaining time to maturity of household term deposits over time.

Excess liquidity changes

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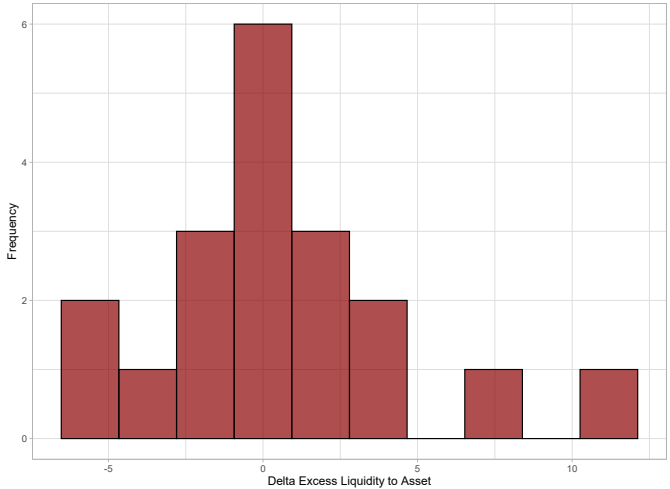
Figure 18: Histogram of excess liquidity changes by bank



Note: The maturity indicator is calculated by taking a weighted average of deposit maturities within each maturity bucket. This provides an approximate measure of the average remaining time to maturity of household term deposits over time.

Bank Profitability

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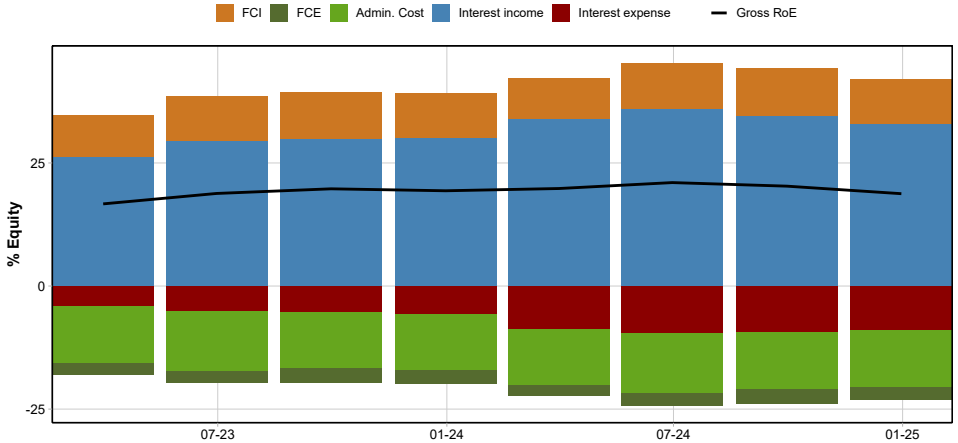
Figure 19: Bank PnL



Note: The chart shows a decomposition of gross return on equity (RoE) into its key income and cost components. Bars represent the contributions of interest income, interest expense, Fee and comission income/expenses, and administrative costs to RoE. The black line tracks the gross gross RoE over time.

Impact on lending

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	Firms				Households			
Treatments:	Deposit beta		Δ Cost of funding		Deposit beta		Δ Cost of funding	
Dep. var.:	ln(Loan Amt)	Interest rate	ln(Loan Amt)	Interest rate	ln(Loan Amt)	Interest rate	ln(Loan Amt)	Interest rate
POST × Treatment	0.121	0.589	0.002	0.216	-0.251	0.266	0.627*	0.510
	(0.188)	(0.770)	(0.039)	(0.300)	(0.832)	(0.831)	(0.303)	(0.446)
Bank controls	YES	YES	YES	YES	YES	YES	YES	YES
ILSt / LIt	YES	YES	YES	YES	YES	YES	YES	YES
Bank × Loc.	YES	YES	YES	YES	YES	YES	YES	YES
Adj. R^2	0.920	0.894	0.920	0.894	0.232	0.484	0.233	0.485
Observations	527,941	527,941	527,941	527,941	34,448	34,448	34,448	34,448

Notes: Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.
ILSt = Income × Location × Sector × time fixed effects (firms); *LIt* = Location × Income × time fixed effects (households).