

# Tracing the Impact of Payment Convenience in Deposits: Evidence from Depositor Activeness

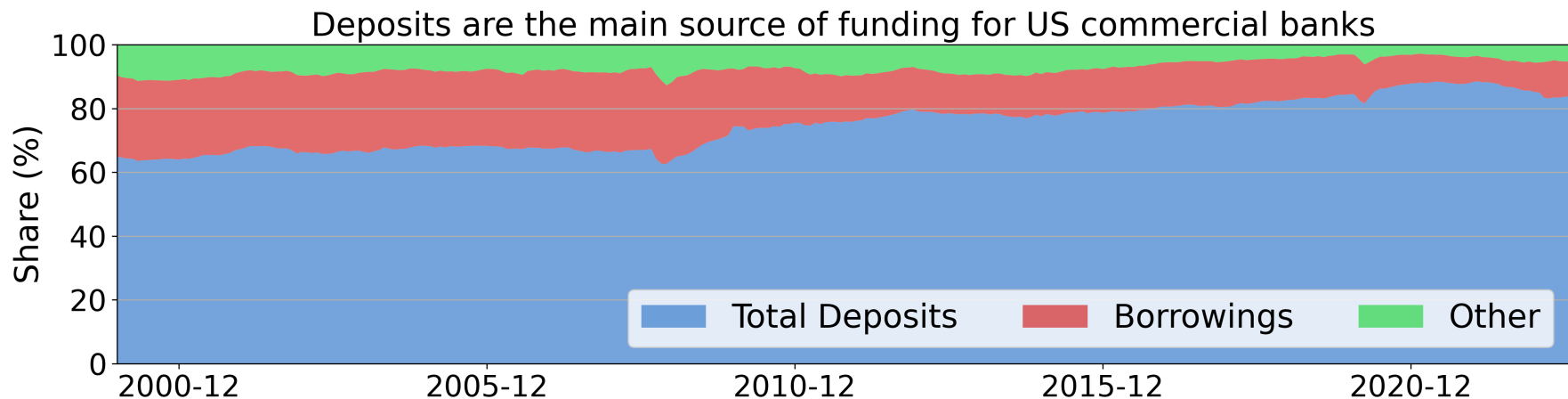
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Workshop on the Future Monetary System, Bank of Canada, September 2024

## Depositors: crucial in bank funding

- Depositors are often viewed as “sleepy”
  - Deposit rates and aggregate deposit flows insensitive to policy rates
  - Banks heavily reliant on deposits as a cheap and stable source of funding



Data source: FRED.

## New challenges amid “better” deposits

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- But the rise of digital banks and the 2023 regional bank crisis revealed new risks



- Indeed, depositors seem to be “flighty” even insured and during normal times:
  1. Banks that provide better **payment** services appear to be riskier
  2. Bank sector appears resilient as a whole; reshuffling of **deposits across banks**
- Call for better understanding of **payments** and **depositors** to understand funding risk

## Today: new perspectives on payments and depositor activeness

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- **Depositor activeness:** how depositors switch deposits across different banks
  - New **account-level dataset** across 1,400+ banks, covering 1m+ depositors
  - Introducing new **metrics** to quantify depositor-level depositing activities
  - New **stylized facts** regarding the magnitude and types of depositing activities
- Understanding drivers and impacts of depositor activeness empirically
  - Linking to the fundamental role of deposits as money: **means of payment**
  - **Payment convenience induces activeness:** faster payments, more active
  - Interacting with higher interest rate dispersion or repayments
- A model to illustrate the channels and quantify the aggregate effects



## **Data and stylized facts**

## Data: depositor/account-level data on monthly bank statements

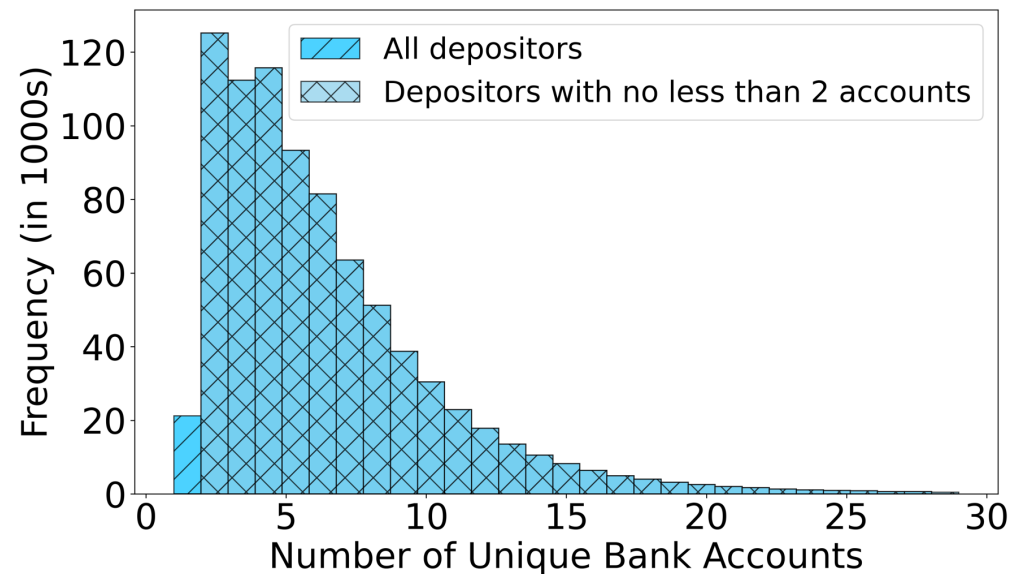
- **Monthly bank statements** from a leading financial analytics firm
  - Unique user ID, with detailed transaction labels and balance

| Date         | Description   | Type                | Amount    |
|--------------|---|---------------------|-----------|
| Oct 16, 2023 | CHASE CREDIT CRD AUTOPAY PPD ID: 4760039224                       | ACH debit           | -\$21.98  |
| Oct 12, 2023 | TESLA MOTORS TESLA MOTO PPD ID: 5912197729                        | Misc. debit         | -\$9.99   |
| Oct 10, 2023 | Online Transfer to SAV ...8919 transaction#: 18687025251<br>10/10 | Account<br>transfer | -\$100.00 |
|              | Online Transfer from SAV ...8919 transaction#: 18687026297        | Account<br>transfer | \$100.00  |

- Covers: 1,400+ banks and credit unions, 1.26m+ users, billions of transaction records
- Sample period: January 2013 to October 2022
- Caveat: can't merge with bank-level data (e.g., Call Reports)

## Fact I: the intensive margin of deposit dynamics

### I. How many checking and savings accounts do American depositors have?



- 95%+ depositors in the sample have 2+ bank accounts
- Cross-verification: 5.3 accounts per depositor in Mercator Survey of American Deposits

## Measuring depositor activeness

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- **Example:** Ana vs. Bob at Citi and BoA. Both had a **net inflow of \$500** in May.
  - Ana: Transferred \$100 from Citi to BoA every other day and revert the transaction the second day.
  - Bob: Spent \$100 on food.



## Measuring depositor activeness

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- **Example:** Ana vs. Bob at Citi and BoA. Both had a **net inflow of \$500** in May.
  - Ana: Transferred \$100 from Citi to BoA every other day and revert the transaction the second day.
  - Bob: Spent \$100 on food.
- We compute deposit turnover from **paired deposit transactions**:
  - a. Different accounts (further separate intra- and inter-bank), same depositor.
  - b. Both transactions  $\geq \$50$ .
  - c. Abs. difference between credit (C) and debit (D)  $\leq \$50$  for same-day settlement OR  $\leq \$10$  otherwise; verified by transaction labels as much as possible.
  - d. Transfer initiated and received within 5 business days (one calendar week).

## Measuring depositor activeness: interbank deposit turnover

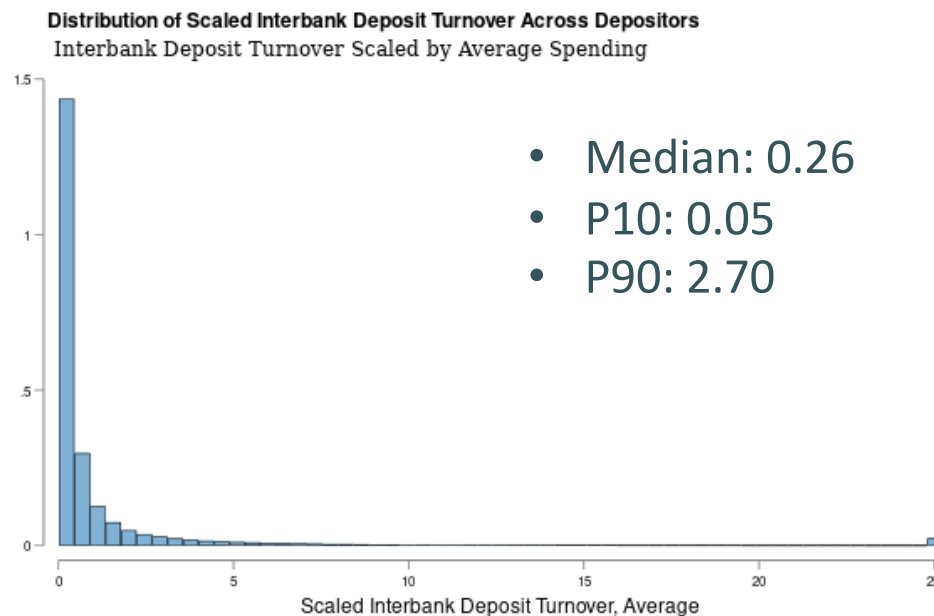
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- **Example:** Ana vs. Bob at Citi and BoA. Both had a **net inflow of \$500** in May.
  - Ana: Transferred \$100 from Citi to BoA every other day and revert the transaction the second day. → **total turnover: \$3,000**
  - Bob: Spent \$100 on food. → **total turnover: \$0**
- We compute deposit turnover from **paired deposit transactions**:
  - a. Different accounts (further separate intra- and inter-bank), same depositor.
  - b. Both transactions  $\geq \$50$ .
  - c. Abs. difference between credit (C) and debit (D)  $\leq \$50$  for same-day settlement OR  $\leq \$10$  otherwise; verified by transaction labels as much as possible.
  - d. Transfer initiated and received within 5 business days (one calendar week).
- **Interbank deposit turnover** = Sum of all credit values from paired deposit transactions, except for transactions settled intraday without differences in values between C & D.

## Fact II: the intensive margin of deposit dynamics

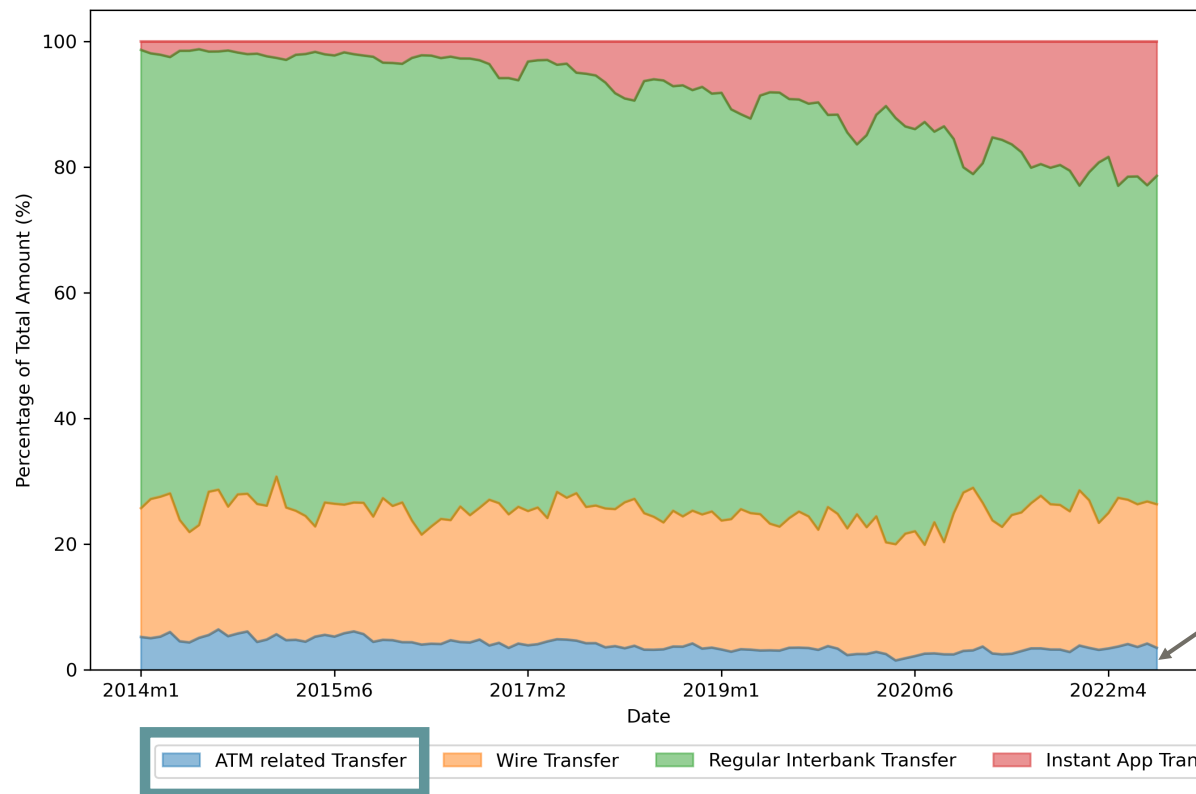
### II. How active are depositors in terms of inter-bank transfers?

- Monthly inter-bank depositor turnover scaled by monthly spendings in preceding year
  - Following recommendations of Attanasio/Pistaferri 16



## Fact III: the intensive margin of deposit dynamics

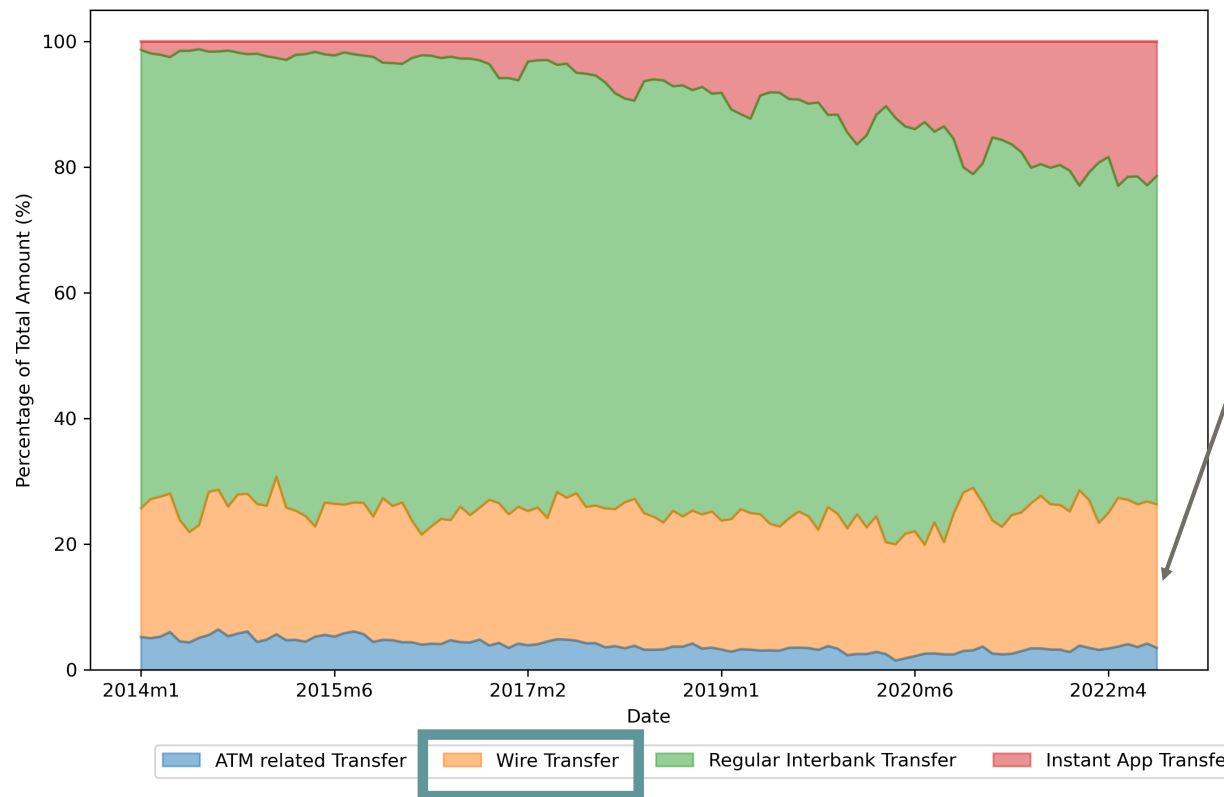
### III. What types of inter-bank transfers do depositors make?



**ATM** transfers remain stable yet small

## Fact III: the intensive margin of deposit dynamics

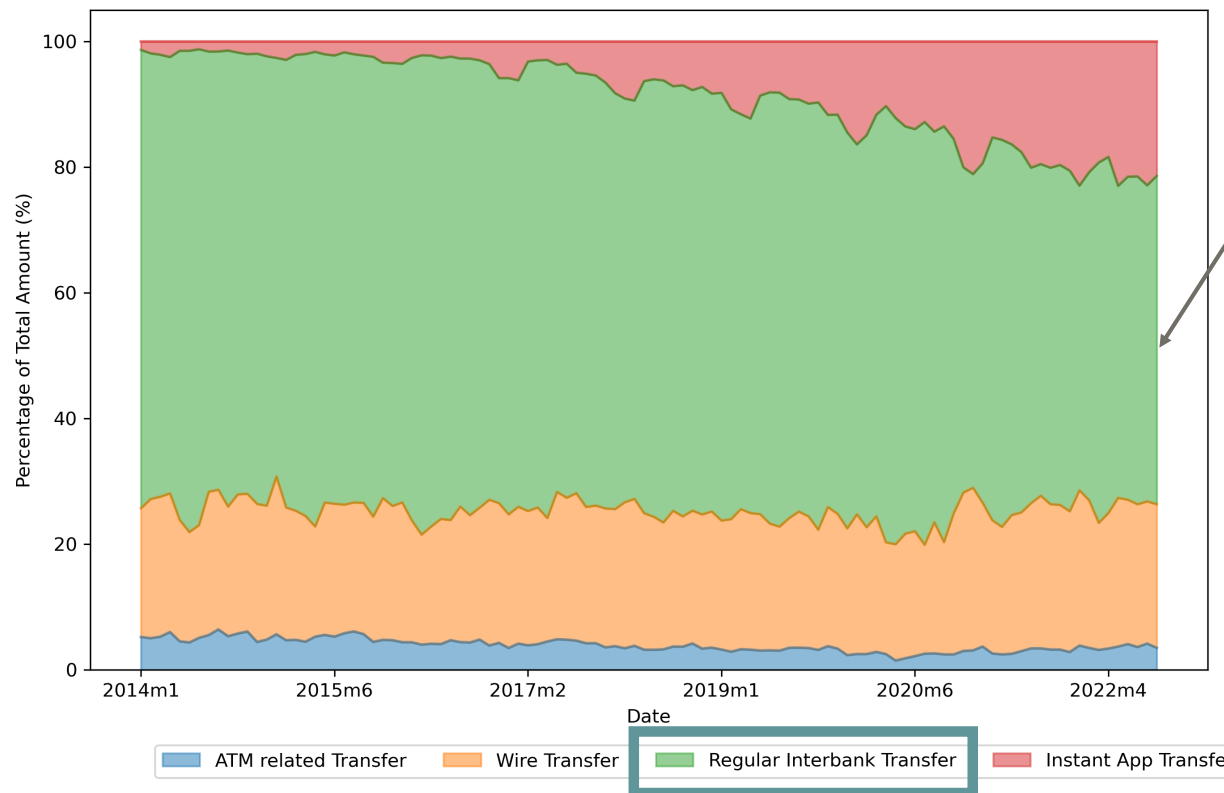
### III. What types of inter-bank transfers do depositors make?



**Wires**, regulated under Reg CC, are required to settle within a business day yet typically require a fee with a cap of \$50. Banks settle them via Fedwire or CHIPS

## Fact III: the intensive margin of deposit dynamics

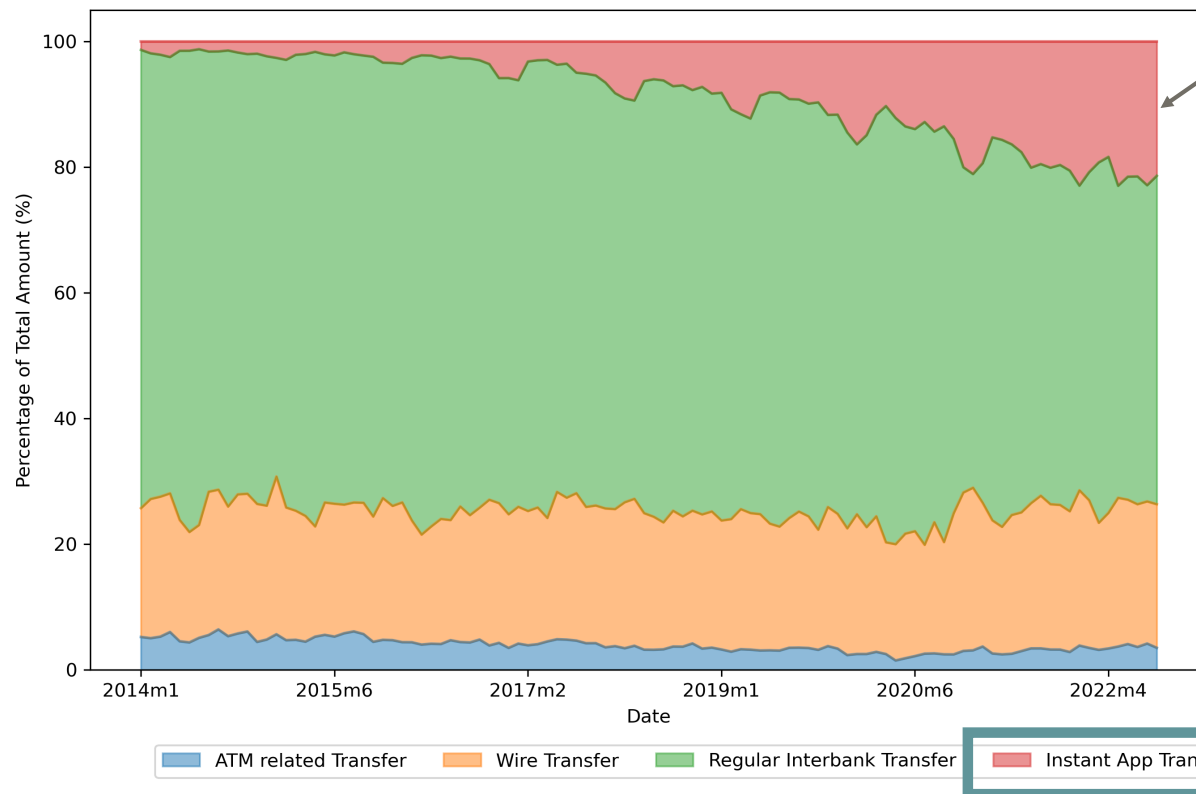
### III. What types of inter-bank transfers do depositors make?



Regular interbank transfers are typically settled via **ACH** and could involve significant delays before banks submit the orders. ACH fees are capped at \$10 but many are free

## Fact III: the intensive margin of deposit dynamics

### III. What types of inter-bank transfers do depositors make?



Past decade witnesses drastic growth in **instant payments**, including Zelle, PayPal, Venmo, and Cash, which we identify using the transaction labels in our sample

## Assessing delay in payment processing

- For each paired inter-bank transaction with credit transaction C and debit transaction D:
  - Payment lag for transaction  $k$ :

$$Lag_k = BusinessDay_{C_k} - BusinessDay_{D_k}.$$

- **Account level payment delay:**

- For account  $a$  of depositor  $i$  in month  $t$ :

$$Delay_{i,a,t} = \frac{\sum_k Lag_k \mathbf{I}(D_k \text{ is originated from account } a)}{\sum_k \mathbf{I}(D_k \text{ is originated from account } a)}.$$

- **Depositor level payment delay:**

- For depositor  $i$  in month  $t$ :

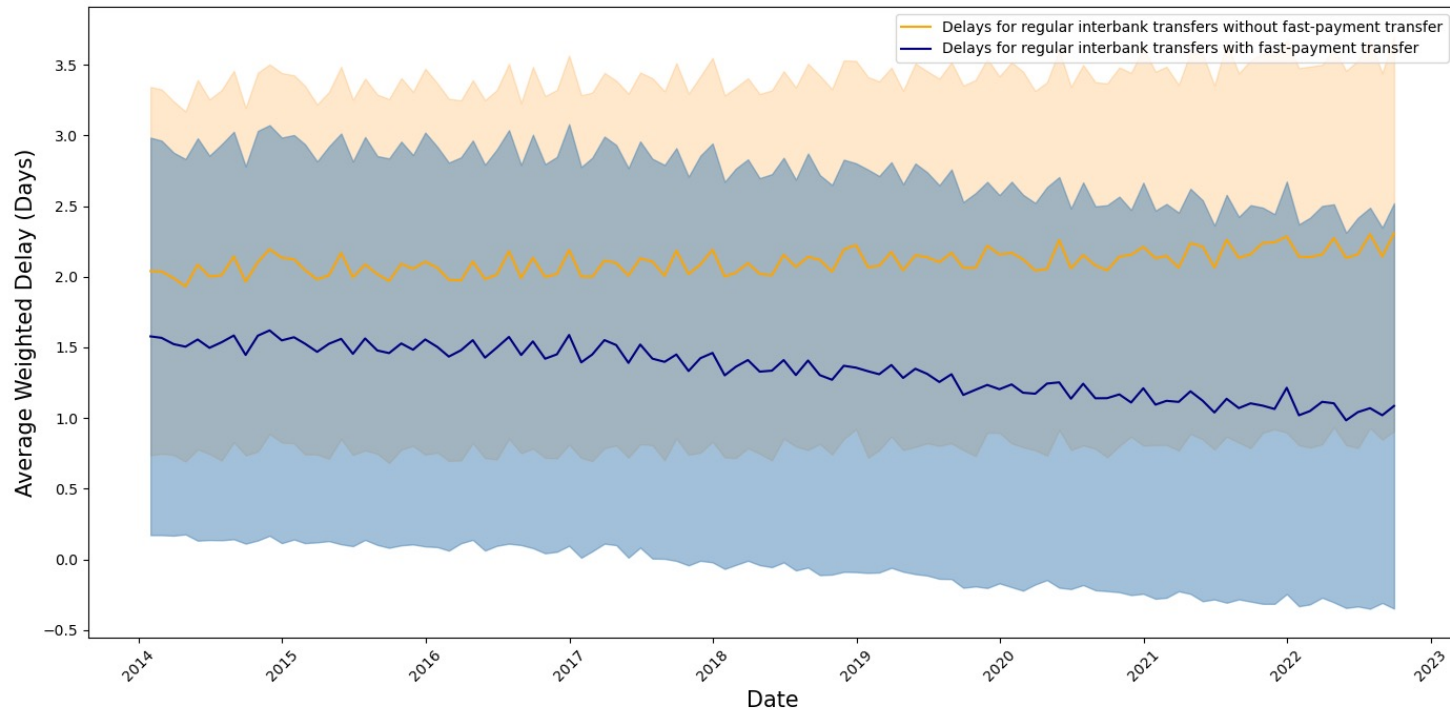
$$Delay_{i,t} = \frac{\sum_a Delay_{i,a,t} Deposit \ Turnover_{i,a,t}}{\sum_a Deposit \ Turnover_{i,a,t}}.$$



## Fact IV: the intensive margin of deposit dynamics

### IV. How slow are inter-bank transfers?

- An average of 2.12 business days with large variation across accounts



## Interest metrics for depositors

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- **Account-level interest rates**

- Imputed from interest income and balance.

$$i_{i,a,t} = Interest_{i,a,t} / Balance_{i,a,t-1}.$$

- **Depositor-level interest rate dispersion**

- Imputed from account-level interest rates.

$$\Delta i_{i,t} = \max_a \{i_{i,a,t}\} - \min_a \{i_{i,a,t}\}.$$

- **Interest payments in liabilities**

- Imputed from transactions specifically labeled as mortgage and loan payments.

## Additional metrics for depositors (cont'd)

- Labor income
  - Constructed from credit transactions under "Salary/Regular Income"
  - Excludes social security, tax refunds, UI benefits, etc.

- Consumption stability

- Consumption smoothing efficiency (CSE):

$$CSE = \frac{\text{Rolling Mean of Consumption}}{\text{Rolling Standard Deviation of Consumption}},$$

- The rolling period is based on monthly data from the previous 12 months.
    - A consumption "Sharpe ratio": evaluates the efficiency of consumption relative to its variability.

- Financial constraint. and sophistication

$$\text{Debt-to-Income Ratio} = \frac{\text{Monthly Debt Payments}}{\text{Monthly Salary}}, \text{ Digital Adoption Ratio} = \frac{\text{Non-Physical Transactions}}{\text{Total Transactions}},$$

- Metrics consider a depositor's financial behavior and digital transaction preferences



## **Drivers of depositor activeness**

## Baseline estimates: testing the channels

- Faster payments, more active inter-bank deposit turnover

|   | (a) Interbank Deposit Turnover |                       |                       | (b) Log(Scaled Interbank Deposit Turnover) |                        |                        |
|---|--------------------------------|-----------------------|-----------------------|--|------------------------|------------------------|
|   | (1)                            | (2)                   | (3)                   | (4)  | (5)                    | (6)                    |
| Transfer Delay                          | -151.9***<br>(2.986)           | -150.3***<br>(3.395)  | -145.0***<br>(3.217)  | -0.134***<br>(0.0113)                      | -0.133***<br>(0.0112)  | -0.113***<br>(0.00983) |
| Rate Dispersion                         | 537.8***<br>(19.25)            | 537.8***<br>(19.25)   | 505.4***<br>(18.70)   | 0.573***<br>(0.0166)                       | 0.566***<br>(0.0163)   | 0.492***<br>(0.0148)   |
| Transfer Delay $\times$ Rate Dispersion | -67.90***<br>(5.918)           | -67.91***<br>(5.920)  | -66.03***<br>(5.825)  | -0.0995***<br>(0.0129)                     | -0.0928***<br>(0.0127) | -0.0924***<br>(0.0119) |
| Debt Repayment                          |                                | 0.00545<br>(0.00409)  | 0.00486<br>(0.00401)  |  | 0.588***<br>(0.0112)   | 0.545***<br>(0.0105)   |
| Transfer Delay $\times$ Debt Repayment  |                                | -0.00133<br>(0.00132) | -0.00138<br>(0.00129) |  | -0.0157<br>(0.0105)    | -0.0145<br>(0.00978)   |
| Month fixed effect                      | Y                              | Y                     | Y                     | Y  | Y                      | Y                      |
| Depositor controls                      | Y                              | Y                     | Y                     | Y  | Y                      | Y                      |
| N                                       | 1181728                        | 1181728               | 1181728               | 458241                                     | 458241                 | 458241                 |
| Adj. $R^2$                              | 0.0217                         | 0.0217                | 0.0309                | 0.0676                                     | 0.0891                 | 0.138                  |

## Baseline estimates: testing the channels

- Higher rate dispersion, more active inter-bank deposit turnover

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## Baseline estimates: testing the channels

- Effect of higher rate dispersion amplified by faster payments

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## Do uninsured deposits drive activeness?

- **Full sample** v.s. sub-sample with balance of less than 250k:

|                                  | (b) Log(Scaled Interbank Deposit Turnover) |                        |                        | (b) Log(Scaled Interbank Deposit Turnover) |                        |                        |
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| Rate Dispersion                  | 0.573***<br>(0.0166)                       | 0.566***<br>(0.0163)   | 0.492***<br>(0.0148)   | 0.553***<br>(0.0169)                       | 0.546***<br>(0.0165)   | 0.472***<br>(0.0151)   |
| Transfer Delay × Rate Dispersion | -0.0995***<br>(0.0129)                     | -0.0928***<br>(0.0127) | -0.0924***<br>(0.0119) | -0.0968***<br>(0.0128)                     | -0.0901***<br>(0.0126) | -0.0897***<br>(0.0118) |
| Debt Repayment                   |  | 0.588***<br>(0.0112)   | 0.545***<br>(0.0105)   |  | 0.571***<br>(0.0111)   | 0.523***<br>(0.0105)   |
| Transfer Delay × Debt Repayment  |  | -0.0157<br>(0.0105)    | -0.0145<br>(0.00978)   |  | -0.0170<br>(0.0108)    | -0.0152<br>(0.00996)   |
| Month fixed effect               | Y  | Y                      | Y                      | Y  | Y                      | Y                      |
| Depositor controls               | Y  | Y                      | Y                      | Y  | Y                      | Y                      |
| N                                | 458241                                     | 458241                 | 458241                 | 426089                                     | 426089                 | 426089                 |
| Adj. $R^2$                       | 0.0676                                     | 0.0891                 | 0.138                  | 0.0677                                     | 0.0889                 | 0.139                  |

## Do uninsured deposits drive activeness?

- Full sample v.s. **sub-sample** with balance of less than 250k:

|   | (b) Log(Scaled Interbank Deposit Turnover) |                        |                        | (b) Log(Scaled Interbank Deposit Turnover) |                        |                        |
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| Rate Dispersion                         | 0.573***<br>(0.0166)                       | 0.566***<br>(0.0163)   | 0.492***<br>(0.0148)   | 0.553***<br>(0.0169)                       | 0.546***<br>(0.0165)   | 0.472***<br>(0.0151)   |
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| Month fixed effect                      | Y  | Y                      | Y                      | Y  | Y                      | Y                      |
| Depositor controls                      | Y  | Y                      | Y                      | Y  | Y                      | Y                      |
| N                                       | 458241                                     | 458241                 | 458241                 | 426089                                     | 426089                 | 426089                 |
| Adj. $R^2$                              | 0.0676                                     | 0.0891                 | 0.138                  | 0.0677                                     | 0.0889                 | 0.139                  |

- Effects coming from payment function but not uninsured deposits; different from runs

# Identifying the impact of payment convenience: causal effects

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- Endogeneity concerns
  - Payment delay correlated with deposit activeness via bank-depositor sorting
- Causal identification using exogenous shocks to adoption of fast payment technologies
- **Instrument:** first time of receiving incoming fast-payment funds
  - Includes: Zelle, PayPal, Venmo, and Cash App
  - **Relevance:** adoption of faster payment technology encourages inter-bank transfers
  - **Exclusion:** timing of first fast-payment inflow uncorrelated with deposit activeness and the formation of social networks

## Identifying the channels: causal effects

(a) Interbank Deposit Turnover (levels)

|                                     | 2SLS                    |                              |
|-------------------------------------|-------------------------|------------------------------|
| Transfer Delay                      | -64.68***<br>(1.353)    |                              |
| Rate Dispersion                     | 492.8***<br>(5.940)     | -0.151***<br>(0.00848)       |
| Transfer Delay<br>× Rate Dispersion | -70.06***<br>(2.693)    |                              |
| Debt Repayment                      | 0.00153<br>(0.00160)    | -0.000000198<br>(0.00000232) |
| Transfer Delay × Debt Repayment     | 0.0000582<br>(0.000669) |                              |
| $I_{PostFirstInflow}$               |                         | -0.0130***<br>(0.00487)      |
| $I_{PostFirstOutflow}$              |                         |                              |
| Month FE                            | Y                       |                              |
| Depositor Controls                  | Y                       |                              |
| N                                   | 1339432                 |                              |

- Future transfer delay decreases after first fast-payment inflow

First-stage F-stat: 79.49; passing the Stock-Yogo test

## Identifying the channels: causal effects

(a) Interbank Deposit Turnover (levels)

|                                     | 2SLS                    |                              |
|-------------------------------------|-------------------------|------------------------------|
| Transfer Delay                      | -64.68***<br>(1.353)    |                              |
| Rate Dispersion                     | 492.8***<br>(5.940)     | -0.151***<br>(0.00848)       |
| Transfer Delay<br>× Rate Dispersion | -70.06***<br>(2.693)    |                              |
| Debt Repayment                      | 0.00153<br>(0.00160)    | -0.000000198<br>(0.00000232) |
| Transfer Delay × Debt Repayment     | 0.0000582<br>(0.000669) |                              |
| $I_{PostFirstInflow}$               |                         | -0.0130***<br>(0.00487)      |
| $I_{PostFirstOutflow}$              |                         |                              |
| Month FE                            | Y                       |                              |
| Depositor Controls                  | Y                       |                              |
| N                                   | 1339432                 |                              |

- Faster payments, more inter-bank deposit turnover

IV estimate smaller than OLS estimate in magnitude

## Identifying the channels: causal effects

(a) Interbank Deposit Turnover (levels)

|                                     | 2SLS                    |                              |
|-------------------------------------|-------------------------|------------------------------|
| Transfer Delay                      | -64.68***<br>(1.353)    |                              |
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| Transfer Delay<br>× Rate Dispersion | -70.06***<br>(2.693)    |                              |
| Debt Repayment                      | 0.00153<br>(0.00160)    | -0.000000198<br>(0.00000232) |
| Transfer Delay × Debt Repayment     | 0.0000582<br>(0.000669) |                              |
| $I_{PostFirstInflow}$               |                         | -0.0130***<br>(0.00487)      |
| $I_{PostFirstOutflow}$              |                         |                              |
| Month FE                            | Y                       |                              |
| Depositor Controls                  | Y                       |                              |
| N                                   | 1339432                 |                              |

- Effect of higher rate dispersion amplified by faster payments

IV estimate smaller than OLS estimate in magnitude

## Identifying the channels: causal effects

| (a) Interbank Deposit Turnover (levels) |            |              |            |              |             |
|---|------------|--------------|------------|--------------|-------------|
|   | 2SLS       |              | 3SLS       |              |             |
| Transfer Delay                          | -64.68***  |              | -64.68***  |              |             |
|   | (1.353)    |              | (1.353)    |              |             |
| Rate Dispersion                         | 492.8***   | -0.151***    | 492.8***   | -0.143***    | -0.00279*** |
|   | (5.940)    | (0.00848)    | (5.940)    | (0.00733)    | (0.000323)  |
| Transfer Delay<br>× Rate Dispersion     | -70.06***  |              | -70.05***  |              |             |
|   | (2.693)    |              | (2.693)    |              |             |
| Debt Repayment                          | 0.00153    | -0.000000198 | 0.00153    | -0.00000108  | 0.000000116 |
|   | (0.00160)  | (0.00000232) | (0.00160)  | (0.00000207) | (9.36e-08)  |
| Transfer Delay × Debt Repayment         | 0.0000582  |              | 0.0000580  |              |             |
|   | (0.000669) |              | (0.000669) |              |             |
| $I_{PostFirstInflow}$                   |            | -0.0130***   |            |              | 0.957***    |
|   |            | (0.00487)    |            |              | (0.000471)  |
| $I_{PostFirstOutflow}$                  |            |              | -0.0108**  |              |             |
|   |            |              | (0.00443)  |              |             |
| Month FE                                | Y          |              | Y          |              |             |
| Depositor Controls                      | Y          |              | Y          |              |             |
| N                                       | 1339432    |              | 1339432    |              |             |

- Exogenous inflows strongly predict outflows



## Identifying the channels: causal effects

| (a) Interbank Deposit Turnover (levels) |            |              |            |              |             |
|---|------------|--------------|------------|--------------|-------------|
|   | 2SLS       |              | 3SLS       |              |             |
| Transfer Delay                          | -64.68***  |              | -64.68***  |              |             |
|   | (1.353)    |              | (1.353)    |              |             |
| Rate Dispersion                         | 492.8***   | -0.151***    | 492.8***   | -0.143***    | -0.00279*** |
|   | (5.940)    | (0.00848)    | (5.940)    | (0.00733)    | (0.000323)  |
| Transfer Delay<br>× Rate Dispersion     | -70.06***  |              | -70.05***  |              |             |
|   | (2.693)    |              | (2.693)    |              |             |
| Debt Repayment                          | 0.00153    | -0.000000198 | 0.00153    | -0.00000108  | 0.000000116 |
|   | (0.00160)  | (0.00000232) | (0.00160)  | (0.00000207) | (9.36e-08)  |
| Transfer Delay × Debt Repayment         | 0.0000582  |              | 0.0000580  |              |             |
|   | (0.000669) |              | (0.000669) |              |             |
| $I_{PostFirstInflow}$                   |            | -0.0130***   |            |              | 0.957***    |
|   |            | (0.00487)    |            |              | (0.000471)  |
| $I_{PostFirstOutflow}$                  |            |              |            | -0.0108**    |             |
|   |            |              |            | (0.00443)    |             |
| Month FE                                | Y          |              | Y          |              |             |
| Depositor Controls                      | Y          |              | Y          |              |             |
| N                                       | 1339432    |              | 1339432    |              |             |

- Exogenous use of fast payments reduce future payment delays

## Identifying the channels: causal effects

(a) Interbank Deposit Turnover (levels)

|                                     | 2SLS                    |                              | 3SLS                    |                             |
|-------------------------------------|-------------------------|------------------------------|-------------------------|-----------------------------|
| Transfer Delay                      | -64.68***<br>(1.353)    |                              | -64.68***<br>(1.353)    |                             |
| Rate Dispersion                     | 492.8***<br>(5.940)     | -0.151***<br>(0.00848)       | 492.8***<br>(5.940)     | -0.143***<br>(0.00733)      |
| Transfer Delay<br>× Rate Dispersion | -70.06***<br>(2.693)    |                              | -70.05***<br>(2.693)    |                             |
| Debt Repayment                      | 0.00153<br>(0.00160)    | -0.000000198<br>(0.00000232) | 0.00153<br>(0.00160)    | -0.00000108<br>(0.00000207) |
| Transfer Delay × Debt Repayment     | 0.0000582<br>(0.000669) |                              | 0.0000580<br>(0.000669) |                             |
| $I_{PostFirstInflow}$               |                         | -0.0130***<br>(0.00487)      |                         | 0.957***<br>(0.000471)      |
| $I_{PostFirstOutflow}$              |                         |                              | -0.0108**<br>(0.00443)  |                             |
| Month FE                            | Y                       |                              | Y                       |                             |
| Depositor Controls                  | Y                       |                              | Y                       |                             |
| N                                   | 1339432                 |                              | 1339432                 |                             |

- Exogenous faster payments, higher deposit turnover, amplified responses to rate dispersions

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## **A model of depositor activeness and quantification**

## Depositor activeness with transfer delays: setup

- A representative depositor has two bank accounts, account  $C$  and account  $S$ .
  - Deposits in  $C$  are non-interest-bearing and used to repay consumer debt  $cr > 0$ .
  - Deposits in  $S$  bear interest rate  $r > 0$  (interest rate dispersion).
  - Balance of account  $C$ :  $m \geq 0$ .
- Deposit turnover: sum of transfers  $x_i$  between  $C$  and  $S$ .
- Transfer settlement happens at i.i.d. Poisson rate  $0 < \kappa < 1$  in both directions.
  - Yet-to-settle delayed transfers bear no interest;
  - A transfer from  $S$  to  $C$  at  $m = 0$  has no delays but a penalty  $b > 0$ .
- Looking for an optimal policy that minimize the expected present cost

$$V(m) = \min_{x_i, t_i} E_0 \left[ r \int_0^\infty m(t) e^{-rt} dt + r \sum_i E_{t_i} \left[ \int_{t_i}^{t'_i} |x_i| e^{-rt} dt \right] + b \sum_j e^{-rt_j} \right]$$

## Depositor activeness with transfer delays: “S-s”-type solution

Solution characterized by two thresholds  $(\underline{m}, \bar{m})$  and target balance  $m^*$

$$rV(m) = \begin{cases} rm - crV'(m) + \kappa(V(m^*) - V(m)) + r(m^* - m), & 0 \leq m \leq \underline{m}, \\ rm - crV'(m), & \underline{m} \leq m \leq \bar{m}, \\ rm - crV'(m) + \kappa(V(m^*) - V(m)), & m \geq \bar{m}, \end{cases}$$

s.t. boundary condition and smooth pasting for  $V(m^*)$ ,

and value matching and super contact at  $\underline{m}$  and  $\bar{m}$ .

→ Closed-form solution when  $r \ll \kappa$ :

$$\Delta m = m^* - \underline{m} = c \cdot f\left(\frac{\kappa}{r+\kappa}\right) \approx \frac{c}{\kappa+r} - \frac{c}{r} \sqrt{\frac{2r}{\kappa+r}} + O\left(\frac{\kappa}{\kappa+r}\right).$$

# Depositor activeness with transfer delays: “S-s”-type solution

Solution characterized by two thresholds ( $\underline{m}$ ,  $\bar{m}$ ) and target balance  $m^*$

$$rV(m) = \begin{cases} rm - crV'(m) + \kappa(V(m^*) - V(m)) + r(m^* - m), & 0 \leq m \leq \underline{m}, \\ rm - crV'(m), & \underline{m} \leq m \leq \bar{m}, \\ rm - crV'(m) + \kappa(V(m^*) - V(m)), & m \geq \bar{m}, \end{cases}$$

s.t. boundary condition and smooth pasting for  $V(m^*)$ ,  
and value matching and super contact at  $\underline{m}$  and  $\bar{m}$ .

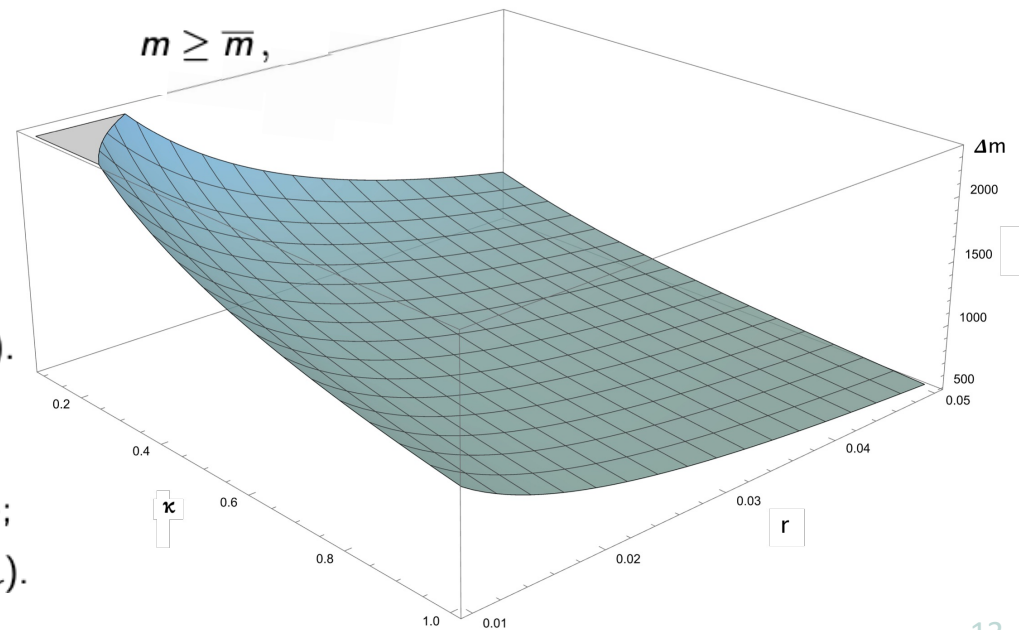
→ Closed-form solution when  $r \ll \kappa$ :

$$\Delta m = m^* - \underline{m} = c \cdot f\left(\frac{\kappa}{r+\kappa}\right) \approx \frac{c}{\kappa+r} - \frac{c}{r} \sqrt{\frac{2r}{\kappa+r}} + O\left(\frac{\kappa}{\kappa+r}\right).$$

$\Delta m$  reflects the “leeway” before depositor reacts.

Higher rate dispersion ( $r \uparrow$ ), depositor is more alert ( $\Delta m \downarrow$ );

Smaller payment friction  $\kappa \uparrow$ , depositor is more alert ( $\Delta m \downarrow$ ).



# Depositor activeness with transfer delays: quantification

## Calibrating the model to data

|                                     | Data<br>(median)<br>(1) | Benchmark<br>(2) | No Lag<br>(3) | No Lag &<br>50bps Cut<br>(4) | Indebted<br>(5) | No Lag &<br>Indebted<br>(6) |
|-------------------------------------|-------------------------|------------------|---------------|------------------------------|-----------------|-----------------------------|
| <i>Moments</i>                      |                         |                  |               |                              |                 |                             |
| Deposit Balance ( $M^*$ )           | 6,671.17                | 6,617.23         | 5,144.57      | 5,560.32                     | 8,344.53        | 6,482.21                    |
| Deposit Turnover ( $\sum_t  X_t $ ) | 1,612.68                | 1,637.82         | 1,724.76      | 1,616.96                     | 2,063.65        | 2,176.15                    |
| <i>Parameters</i>                   |                         |                  |               |                              |                 |                             |
| Interest rate ( $r$ )               |                         | 2.00%            | 2.00%         | 1.50%                        | 2.00%           | 2.00%                       |
| Payment Delay ( $-\ln(\kappa)$ )    |                         | 2.00             | 1.00          | 1.00                         | 2.00            | 1.00                        |
| Financial Obligations ( $C$ )       |                         | 900.00           | 900.00        | 900.00                       | 1,134.00        | 1,134.00                    |

# Depositor activeness with transfer delays: quantification

## Counterfactual 1: Rollovering FedNow and the “compensating” rate cut

|                                     | Data<br>(median)<br>(1) | Benchmark<br>(2) | No Lag<br>(3) | No Lag &<br>50bps Cut<br>(4) | Indebted<br>(5) | No Lag &<br>Indebted<br>(6) |
|-------------------------------------|-------------------------|------------------|---------------|------------------------------|-----------------|-----------------------------|
| <i>Moments</i>                      |                         |                  |               |                              |                 |                             |
| Deposit Balance ( $M^*$ )           | 6,671.17                | 6,617.23         | 5,144.57      | 5,560.32                     | 8,344.53        | 6,482.21                    |
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| Payment Delay ( $-\ln(\kappa)$ )    |                         | 2.00             | 1.00          | 1.00                         | 2.00            | 1.00                        |
| Financial Obligations ( $C$ )       |                         | 900.00           | 900.00        | 900.00                       | 1,134.00        | 1,134.00                    |

- FedNow **decreases** deposit balances while **increasing** deposit turnover (Col. 3)
- Need a **50bps rate cut** to **compensate** and return to initial activeness (Col. 4)



# Depositor activeness with transfer delays: quantification

## Counterfactual 1: Rollovering FedNow and the “compensating” rate cut

|                                     | Data<br>(median)<br>(1) | Benchmark<br>(2) | No Lag<br>(3) | No Lag &<br>50bps Cut<br>(4) | Indebted<br>(5) | No Lag &<br>Indebted<br>(6) |
|-------------------------------------|-------------------------|------------------|---------------|------------------------------|-----------------|-----------------------------|
| <i>Moments</i>                      |                         |                  |               |                              |                 |                             |
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| <i>Parameters</i>                   |                         |                  |               |                              |                 |                             |
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| Payment Delay ( $-\ln(\kappa)$ )    |                         | 2.00             | 1.00          | 1.00                         | 2.00            | 1.00                        |
| Financial Obligations ( $C$ )       |                         | 900.00           | 900.00        | 900.00                       | 1,134.00        | 1,134.00                    |

- FedNow **decreases** deposit balances while **increasing** deposit turnover (Col. 3)
- Need a **50bps rate cut** to **compensate** and return to initial activeness (Col. 4)

# Depositor activeness with transfer delays: quantification

## Counterfactual 2: Rollovering FedNow in a more indebted economy

| 26% increase in $C$                 |                         |                  |               |                              |                 |                             |
|-------------------------------------|-------------------------|------------------|---------------|------------------------------|-----------------|-----------------------------|
|                                     | Data<br>(median)<br>(1) | Benchmark<br>(2) | No Lag<br>(3) | No Lag &<br>50bps Cut<br>(4) | Indebted<br>(5) | No Lag &<br>Indebted<br>(6) |
| <i>Moments</i>                      |                         |                  |               |                              |                 |                             |
| Deposit Balance ( $M^*$ )           | 6,671.17                | 6,617.23         | 5,144.57      | 5,560.32                     | 8,344.53        | 6,482.21                    |
| Deposit Turnover ( $\sum_t  X_t $ ) | 1,612.68                | 1,637.82         | 1,724.76      | 1,616.96                     | 2,063.65        | 2,176.15                    |
| <i>Parameters</i>                   |                         |                  |               |                              |                 |                             |
| Interest rate ( $r$ )               |                         | 2.00%            | 2.00%         | 1.50%                        | 2.00%           | 2.00%                       |
| Payment Delay ( $-\ln(\kappa)$ )    |                         | 2.00             | 1.00          | 1.00                         | 2.00            | 1.00                        |
| Financial Obligations ( $C$ )       |                         | 900.00           | 900.00        | 900.00                       | 1,134.00        | 1,134.00                    |

- Consumer debt grew 26% in 2023 from the pre-pandemic level
- Higher debt increases payment demand, **increasing** deposit turnover (Col. 5)
- FedNow **further increases** deposit turnover (Col. 6)

# Depositor activeness with transfer delays: quantification

## Counterfactual 2: Rollovering FedNow in a more indebted economy

| 26% increase in $C$                 |                         |                  |               |                              |                 |                             |
|-------------------------------------|-------------------------|------------------|---------------|------------------------------|-----------------|-----------------------------|
|                                     | Data<br>(median)<br>(1) | Benchmark<br>(2) | No Lag<br>(3) | No Lag &<br>50bps Cut<br>(4) | Indebted<br>(5) | No Lag &<br>Indebted<br>(6) |
| <i>Moments</i>                      |                         |                  |               |                              |                 |                             |
| Deposit Balance ( $M^*$ )           | 6,671.17                | 6,617.23         | 5,144.57      | 5,560.32                     | 8,344.53        | 6,482.21                    |
| Deposit Turnover ( $\sum_t  X_t $ ) | 1,612.68                | 1,637.82         | 1,724.76      | 1,616.96                     | 2,063.65        | 2,176.15                    |
| <i>Parameters</i>                   |                         |                  |               |                              |                 |                             |
| Interest rate ( $r$ )               |                         | 2.00%            | 2.00%         | 1.50%                        | 2.00%           | 2.00%                       |
| Payment Delay ( $-\ln(\kappa)$ )    |                         | 2.00             | 1.00          | 1.00                         | 2.00            | 1.00                        |
| Financial Obligations ( $C$ )       |                         | 900.00           | 900.00        | 900.00                       | 1,134.00        | 1,134.00                    |

- Consumer debt grew 26% in 2023 from the pre-pandemic level
- Higher debt increases payment demand, **increasing** deposit turnover (Col. 5)
- FedNow **further increases** deposit turnover (Col. 6)

## Conclusion

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- **Depositor activeness:** reconciling the “sleepy” and “flighty” views of deposits
  - Novel depositor/account-level data and metrics on intensive margin of depositing
  - Key findings:
    - **Payment convenience** induces activeness: faster payments, more transfers
    - Quantifying the impact of payment convenience on deposits
  - Implications:
    - Should we introduce new payment technologies like FedNow during rate hikes or in an increasingly indebted economy? Likely bad for banks...
    - Broader trade-off between price stability and financial stability?