The Effect of Instant Payments on Banks: Liquidity Transformation and Risk-Taking

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The views expressed here do not reflect those of the Central Bank of Brazil.

Instant Payment Systems

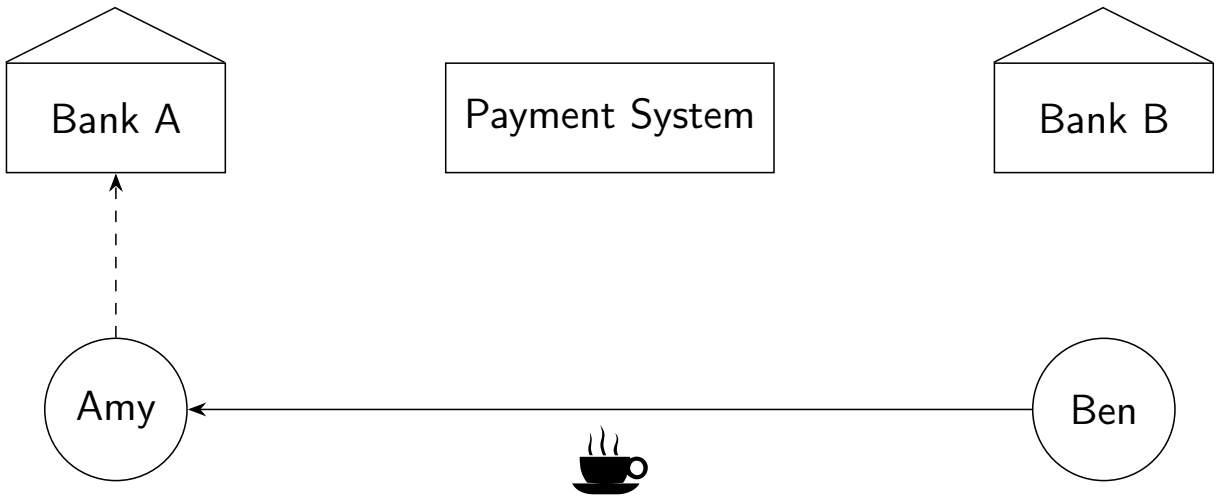
- There has been a recent rise in instant payment systems
  - 2016: UPI by the Reserve Bank of India
  - 2020: Pix by the Central Bank of Brazil
  - 2023: FedNow by the Federal Reserve
- Widespread attention because they may provide functionalities of CBDCs without defunding banks
  - CBDC
    - Assets are on central bank's balance sheet
  - Instant payments
    - Assets remain on bank balance sheets

Research Question

- At the same time, the means of payment, deposits, are an essential funding source for the banking system
- This paper: What are the implications of instant payments on banks as liquidity and credit intermediaries?
  - Banks' demand for liquidity
  - Bank fragility

Traditional Payments

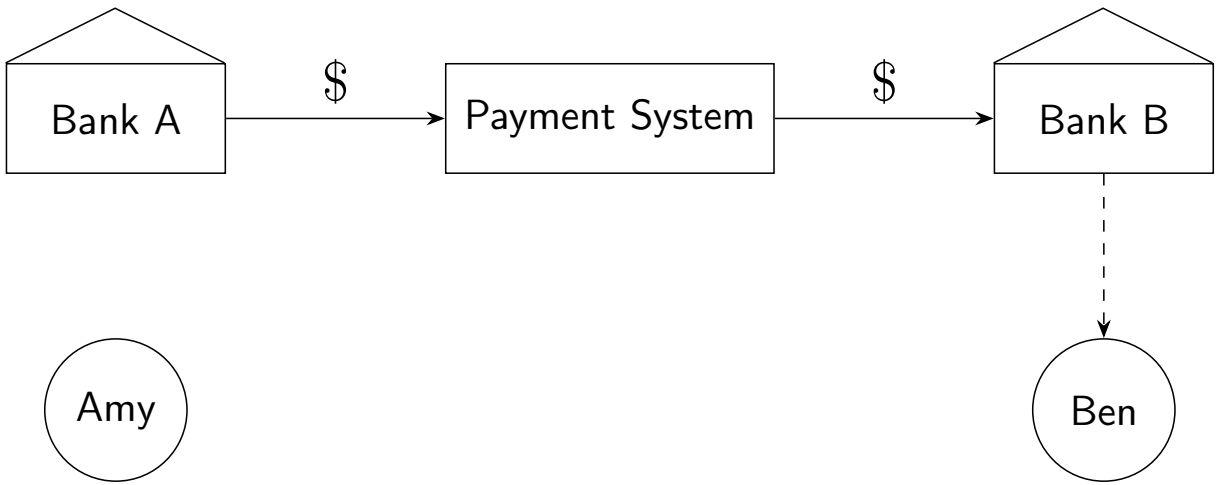
Figure: Traditional Payment System



- Customers request banks to send payments for them using their bank deposits
- E.g. Fedwire, ACH in the US; TED and DOC in Brazil

Traditional Payments

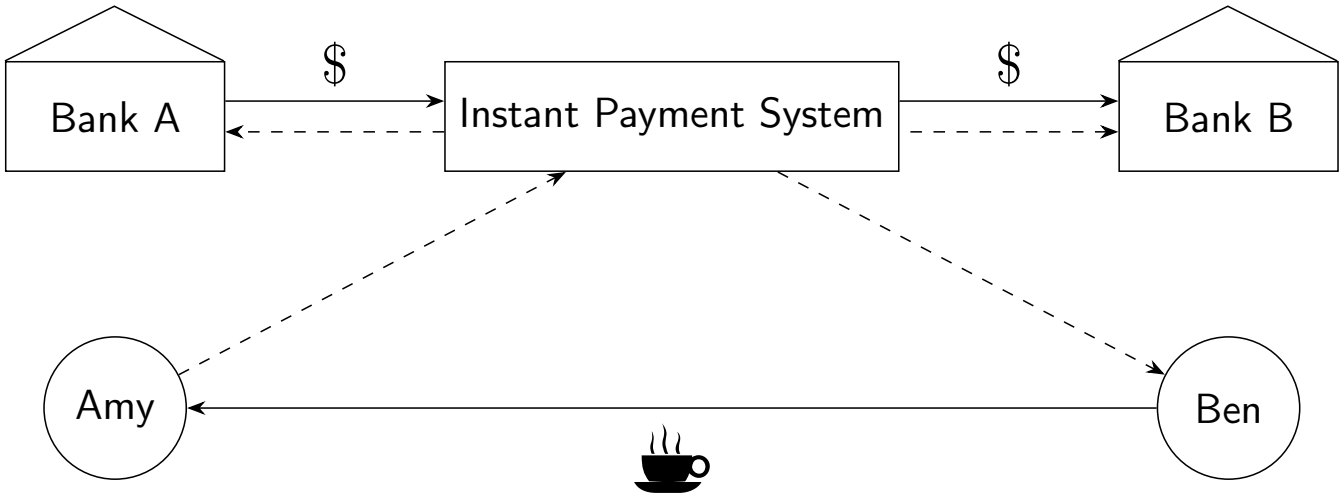
Figure: Traditional Payment System



- Customers request banks to send payments for them using their bank deposits, and banks may voluntarily delay
- E.g. Fedwire, ACH in the US; TED and DOC in Brazil

Instant Payments

Figure: Instant Payment System



- Customers directly and instantaneously send payments to other customers using their bank deposits
- E.g. FedNow in the US; Pix in Brazil
- **Payment convenience is improved by removing banks' ability to manage the timing of payments**

Main Predictions

Our model shows that

1. Increases banks' demand for holding liquid assets
   - Instant payments expose banks to more volatile payment shocks because they can no longer delay and net payment flows
2. Increases banks' risk-taking in their loan portfolios
   - Incentivized by higher liquid asset buffers and larger distance to default

$\rightarrow$ Payment convenience may come with unintended costs for banks

Data

- Main sample: November 2020 to March 2023
- Transaction-level Pix data
  - Includes failed transactions
- Regulatory bank balance sheet and income data

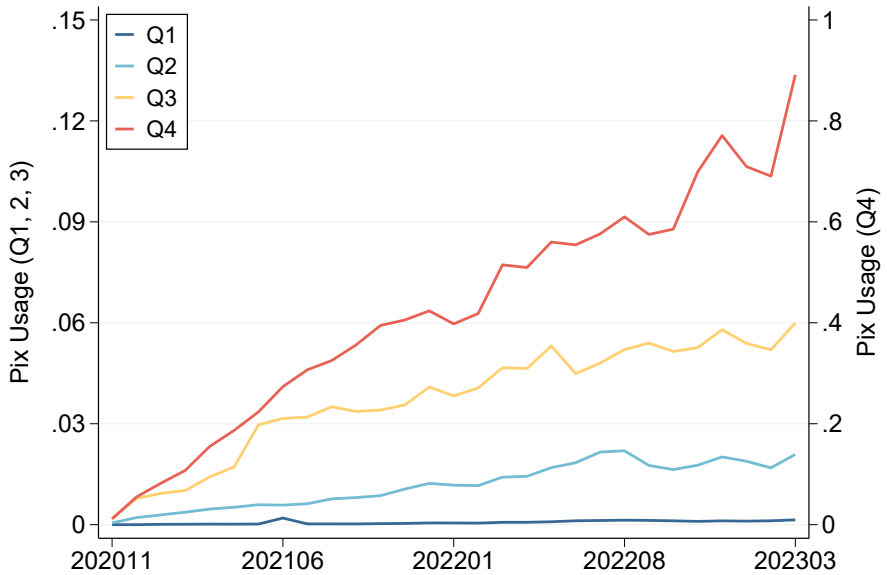
Defining Pix Usage

- In month t for bank i,

$$PixUsage_{it} = \frac{\sum_{d \in t} \min(Outflows_{id}, Inflows_{id})}{TotalAssets_{it}} \quad (1)$$

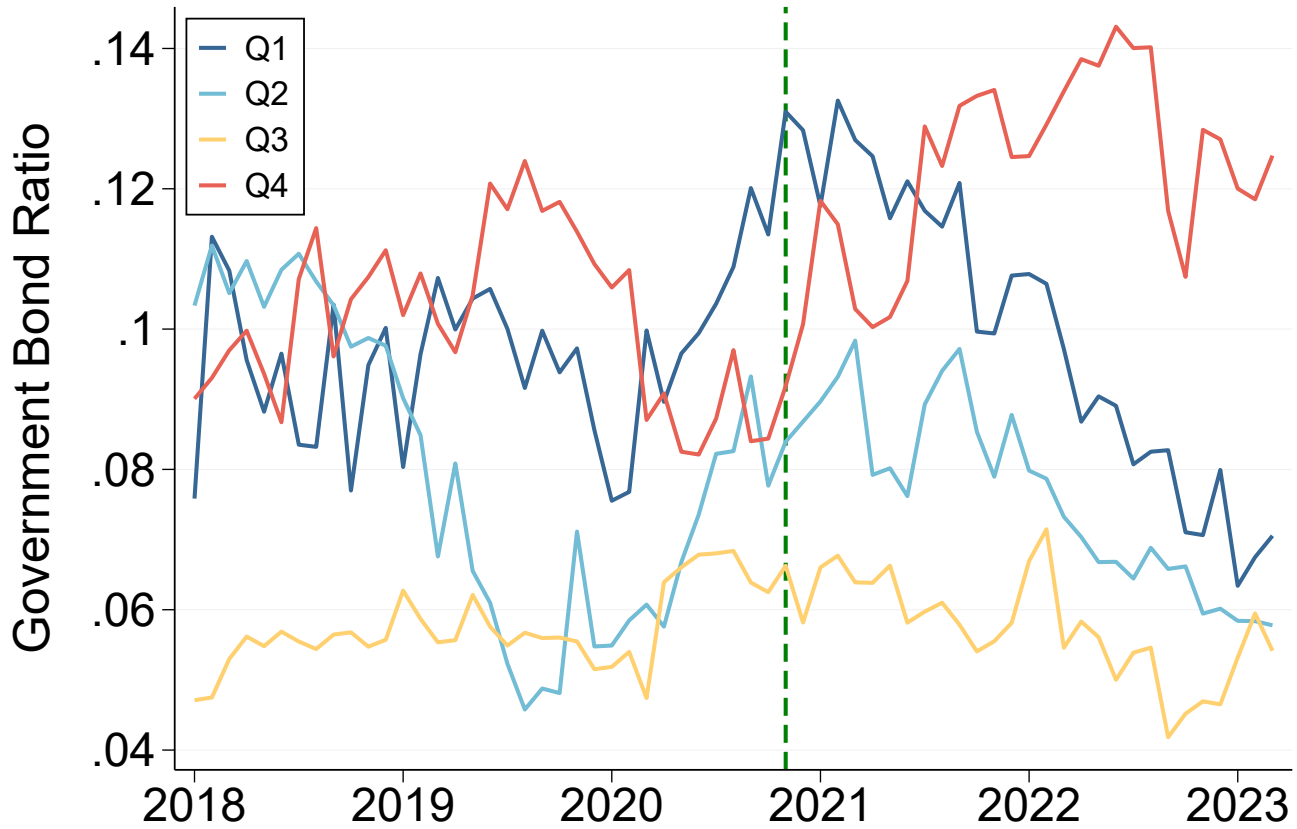
  - $=$ per unit exposure to gross payment flows from Pix
  - $=$ potential per unit loss in nettable payment flows due to Pix

- There is significant cross-sectional variation in Pix usage



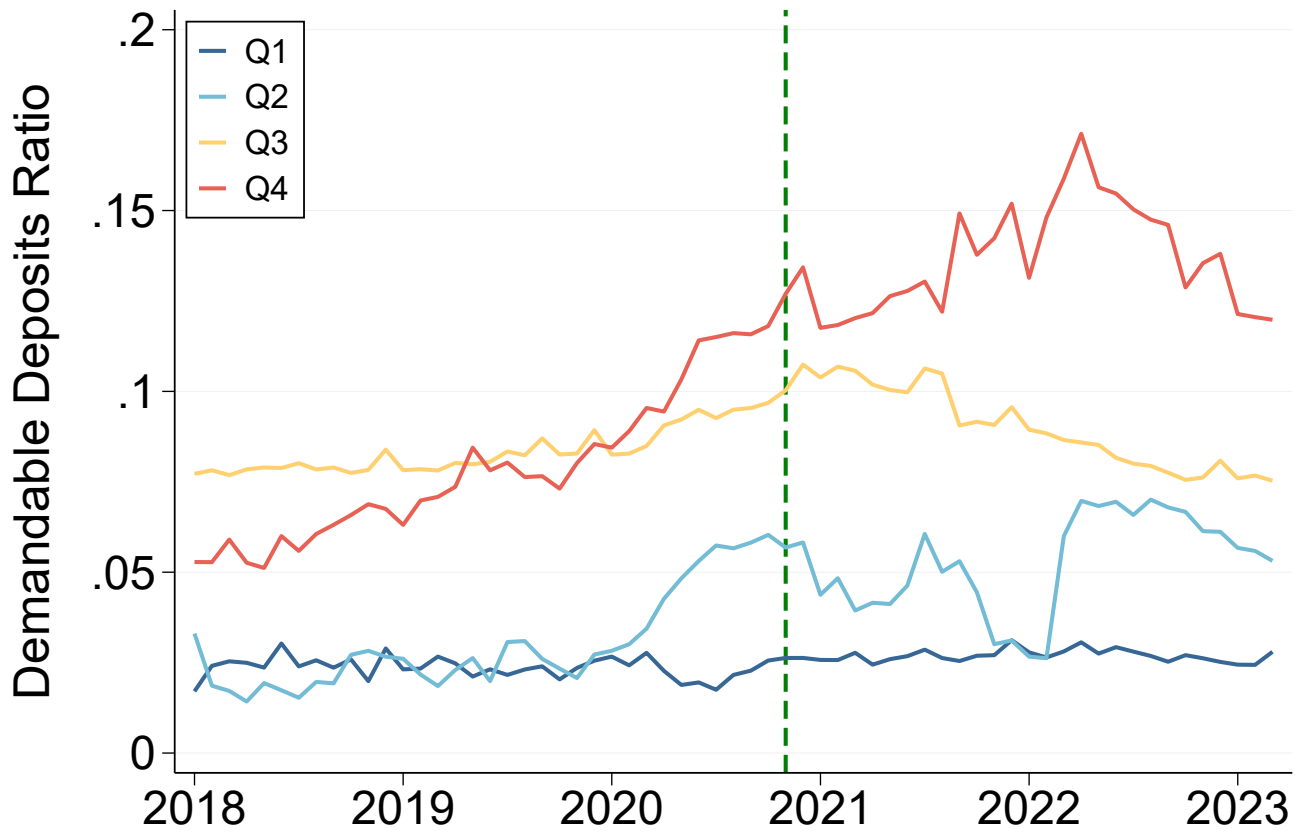
Fact 1: Ratio of Liquid Assets ↑ with Pix Usage

Figure: Government Bond Ratio



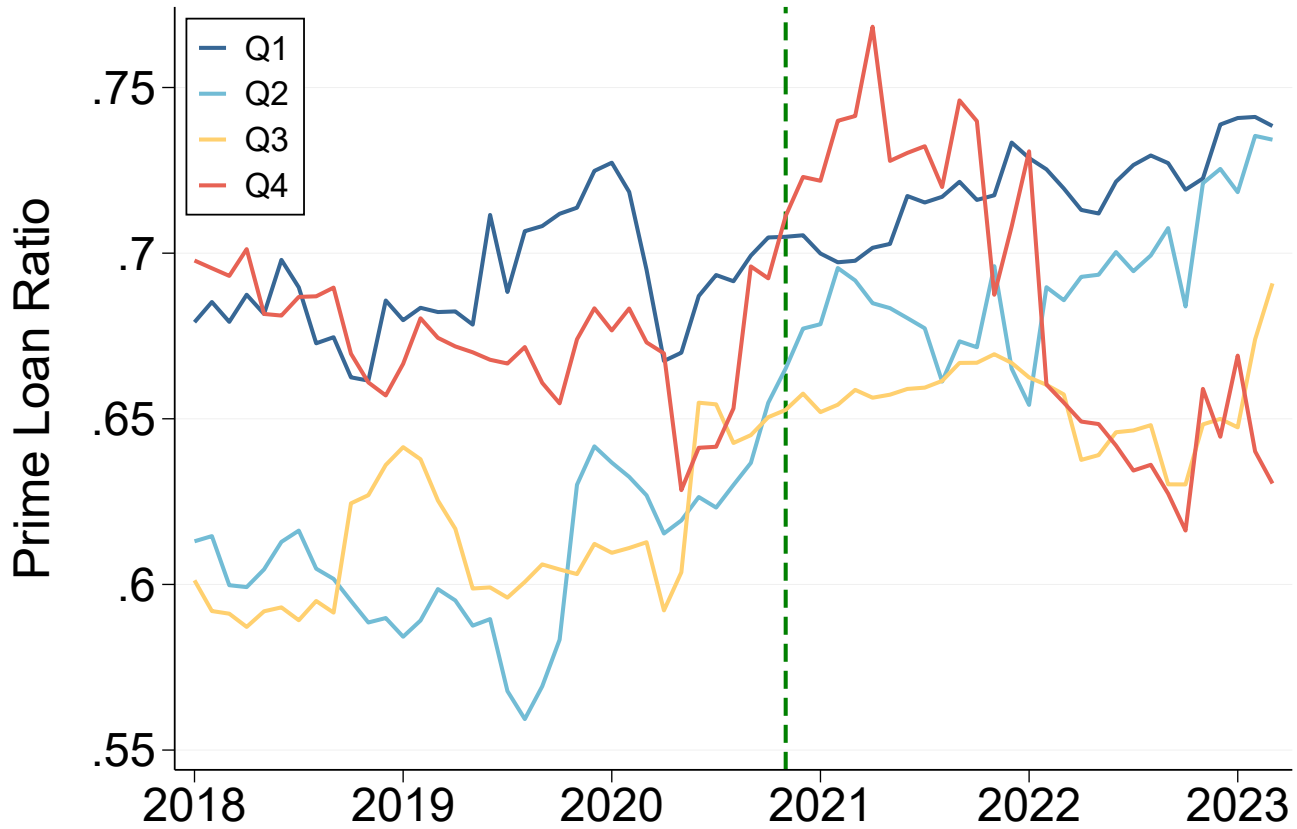
Fact 2: Ratio of Demandable Deposits ↑ with Pix Usage

Figure: Demandable Deposit Ratio



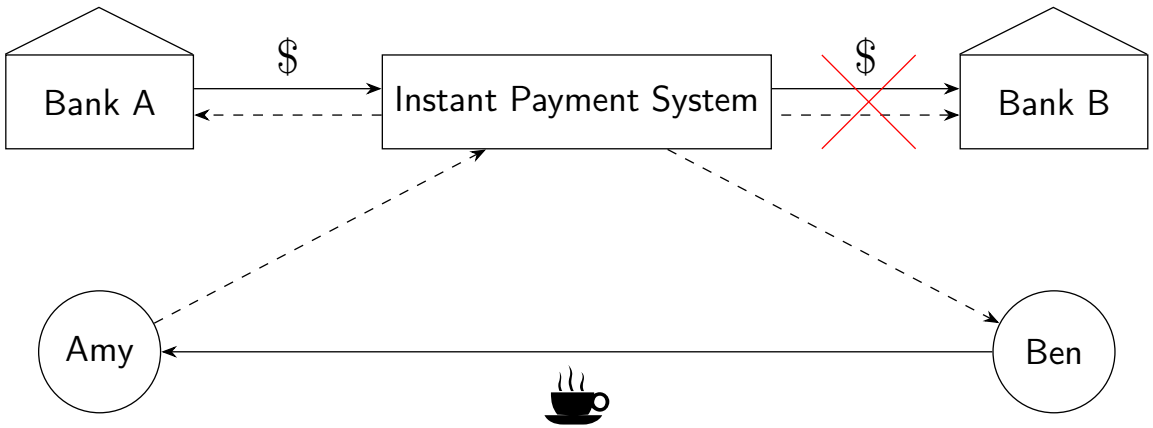
Fact 3: Ratio of Prime Loans ↓ with Pix Usage

Figure: Prime Loan Ratio



Estimation Strategy

- Challenge: banks with more Pix usage are different in many ways
- Instrument for Pix usage using transaction timeouts
  - The convenience of Pix is lost if either the sending bank fails to send or the receiving bank fails to receive
  - Banks more exposed to timeouts should have less Pix usage
  - For a given bank, only use timeouts *induced by other banks*



Pix Usage increases Bank Liquid Asset Holdings

Table: IV: The Effect of Pix Usage on Liquidity Ratios

	Liquid Ratio		Cash Ratio		Gov Bond Ratio		Loan Ratio	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pix Usage	0.151***	0.153***	0.029***	0.030***	0.122***	0.124***	-0.279***	-0.283***
	(0.021)	(0.022)	(0.011)	(0.011)	(0.016)	(0.017)	(0.029)	(0.032)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Observations	1481	1469	1481	1469	1481	1469	1481	1469

- 1 sd $\uparrow$ in Pix usage $\rightarrow$ 0.153 $\uparrow$ in liquid asset ratio

Pix Usage increases Bank Risk-Taking

Table: IV: The Effect of Pix Usage on Risk-Taking Ratios

	Prime Loan Ratio		Sub-Prime Loan Ratio		Default Loan Ratio		Loan Loss Ratio	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pix Usage	-0.216***	-0.218***	0.186***	0.186***	0.025***	0.027***	0.120**	0.123**
	(0.035)	(0.037)	(0.030)	(0.032)	(0.007)	(0.008)	(0.061)	(0.059)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Observations	1381	1369	1381	1369	1381	1369	1226	1214

- 1 sd $\uparrow$ in Pix usage $\rightarrow$ 0.027 $\uparrow$ in default loan ratio
- Risk-taking is most pronounced for less capitalized banks.

Pix Usage decreases Loan Income per Unit Asset

- Pix usage decreases loan income per unit asset

Table: IV: The Effect of Pix Usage on Loan Outcomes

	Loan Income / Loans (%)		Loan Income / Assets (%)	
	(1)	(2)	(3)	(4)
Pix Usage	2.709***	2.747***	-0.168***	-0.170***
	(0.421)	(0.448)	(0.035)	(0.037)
Controls	No	Yes	No	Yes
Bank FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
SE Cluster	Bank	Bank	Bank	Bank
Observations	1380	1368	1481	1469

Effect of Pix Usage on Bank Income

- Pix usage increases total income per unit asset

Table: IV: The Effect of Pix Usage on Bank Income Ratios

	Total Income (%)		Gov bond Income (%)		Service Fee Inc (%)		Wholesale Fund Inc (%)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pix Usage	2.181**	2.200**	2.060**	2.103**	0.623***	0.630***	-0.017***	-0.019***
	(0.905)	(0.939)	(0.892)	(0.921)	(0.064)	(0.070)	(0.004)	(0.005)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
SE Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Observations	1481	1469	1481	1469	1481	1469	1481	1469

Conclusion

- Instant payments may alter the functionalities of banks by changing the functionalities of bank deposits
- Improved convenience of instant payments to consumers = banks lost ability to delay and offset payments across time
- As Pix usage increases,
  1. Banks' demand for liquid assets increases
  2. Banks may take on more risk in their loan book
- Important considerations for the design of payment systems and CBDC going forward