

# From Competitors to Partners: Banks' Venture Investments in Fintech

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# Motivation

- Unlike traditional venture capital funds, banks' investments have strategic motives (Hellmann et al. (2008)).
- The banking industry's competitive landscape has undergone significant transformations, primarily due to the emergence of fintech competition.
- Has the strategic focus of banks' venture investment also evolved?

# Motivation

- We hypothesize that venture investments in fintech startups can be a solution to banks' fintech challenges.
- There are several reasons:
  - First, access to fintech's technology.
  - Second, rather than engaging in direct competition for customers, can combine strength to offer more comprehensive financial services.

## Main findings

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2. Banks are more likely to invest in fintech startups when banks face higher fintech competition.
3. A bank and a fintech startup are more likely to form an investment relationship when they have higher technological and business relatedness.
4. Financial investments by banks in fintech startups result in a strikingly higher likelihood of business partnerships between banks and fintech startups. In addition, the two firms' new patents tend to have higher technological relatedness following an investment relationship.

# Contributions

- This paper adds to the literature how banks adapt to a changing financial market:
  - invest more in information technologies (Jiang, He, Yin, and Xu (2022b); Vives and Ye (2021))
  - change hiring strategies (Jiang, Tang, Xiao, and Yao (2021))
  - provide more digital service (Jiang, Yu, and Zhang (2022a))
- This paper adds to recent papers on banks' investments in fintech firms:
  - bank preference of later-stage deals (Bellardini et al. (2022))
  - post-investment performance: IPO exit, stock return, etc (Carlini et al. (2022), Li et al. (2023), Chemmanur et al. (2023))
- This paper also adds to the broader fintech literature:
  - Buchak et al. (2018), Fuster et al. (2019), Tang (2019), Di Maggio and Yao (2021), Jagtiani et al. (2021), Allen et al. (2022), etc.



# Data Sources

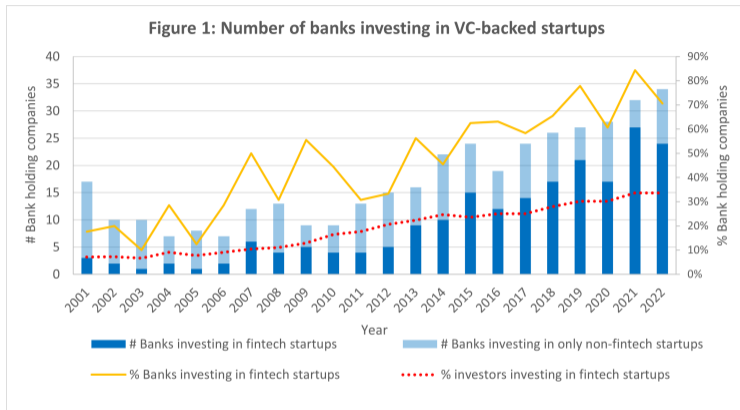
1. Fintech startups and their financing information from Crunchbase
  - Sample period: 2001 - 2022
  - Sample selection: we focus on equity deals on US-based VC-backed startups
2. Bank sample from Call report
  - fuzzy name match to the investors in Crunchbase
  - financial information from Compustat and stock information from CRSP
3. Fintech competition data:
  - mortgage loan: Public HMDA loan data
  - bank branch data from FFIEC
4. Hand-collected data on business collaborations for 3500+ bank-fintech pairs through company websites and Google news search

# Sample

- Fintech startups: defined based on Cruchbase industry and industry group descriptions
  - classify fintech space into “Payments,” “Bank & Lending,” “Wealth Management,” “Crypto-related,” “Exchanges & Trading,” “AI, Cloud & IT,” and “Others
- Banks: public BHCs or banks
  - investing entities: banks and BHCs, their CVCs, their bank divisions, other divisions.
- Sample:during 2001-2022, 51 banks participated in 475 financing rounds of 323 unique fintech firms, and formed 622 observations bank-fintech round combinations

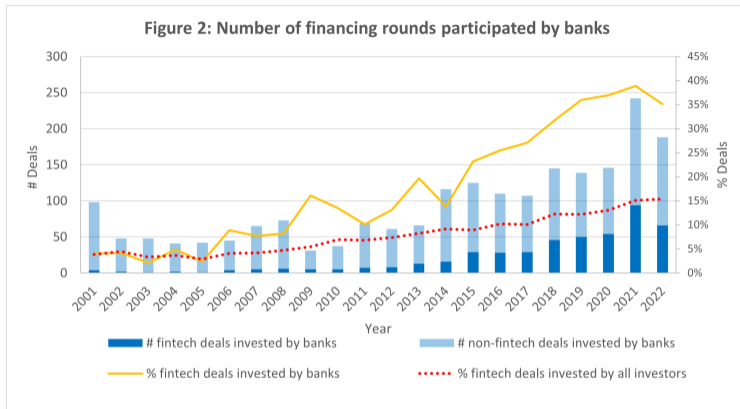
Time trend

# Banks' venture investment over time



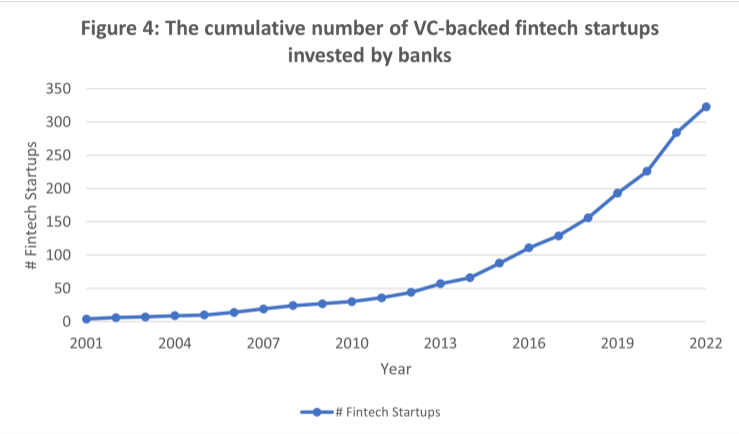
- # banks investing in fintech grew from less than 5 banks before 2011 to 24 banks in 2022
- % banks investing in fintech has surged from about 20% in 2001 to over 70% in 2022
- % all investors investing in fintech has only increased from 7% in 2001 to 34% in 2022

# Number of financing rounds participated by banks



- # fintech deals by banks grew from less than 5 before 2014 to 66 in 2022
- % fintech deals invested by banks have increased from 4% in 2001 to about 35% in 2022.
- % fintech deals invested by all investors have increased from 4% in 2001 to about 15% in 2022.

# The cumulative number of fintech firms invested by banks



- By 2022, 51 banks have invested in 323 unique fintech firms

What drives banks to invest in fintech?

## Empirical Design

- Our treatment sample includes 511 bank-fintech round actual investment combinations during 2001-2022.
- For each actual bank-fintech investment deal, we create 10 pseudo deals by matching the actual bank investor with 5 pseudo investees and matching the actual fintech investee with 5 pseudo investors.
  - The candidates for pseudo investees: fintech firms that have had financing rounds in the same year as the actual investment deal but have not received investments from banks.
  - The candidates for pseudo investors: banks and BHCs in Compustat that have not made fintech investments in that year.



## Two Control Samples

We construct two control samples, following the methods of Bena and Li (2014).

1. A random control sample.

- The five pseudo investees are randomly drawn from the pool of fintech candidates
- The five pseudo investors are randomly drawn from the pool of bank candidates.

2. A propensity score matching (PSM) control sample.

- We select five pseudo investees from the pool of fintech candidates, using PSM based on firm age and the size of the financing round.
- We select five pseudo investors from the pool of bank candidates, using PSM based on firm size and book-to-market ratio.

Fintech competition and bank investments in fintech

# Measuring fintech competition

- We measure fintech competition with the growth rate of the market share of fintech shadow banks in mortgage lending
  - mortgage lending is part of banks' core business in which fintech shadow banks present a fierce competition and for this market comprehensive data is available.
- Different banks can face different levels of fintech competition.
  - We first compute the growth rate of mortgage loans originated by fintech lenders in a given county and year.
  - We then compute the average growth rate of the market share of fintech lenders across counties, weighted by the number of branches a bank has in each county.

## Summary stats: bank characteristics

	Actual investor	Random pseudo investor	PSM pseudo investor
	Mean	Mean	Mean
Fintech Competition [t-1]	0.346	0.238***	0.246***
# New Patents [t-1]	25.925	0.022***	2.696***
Sales Growth [t-1]	0.080	0.131***	0.121***
ROA [t-1]	0.013	0.010***	0.012**
Stock Return [t-1]	0.136	0.060***	0.052***
Total Asset (Millions) [t-1]	417,009	13,594***	63,382***
Ln(Total Asset) [t-1]	12.896	8.236***	10.178***
BM [t-1]	0.806	0.884***	0.836*
Observation	511	2555	2555

# Fintech competition

Dependent variable	Actual Investment		
	(1)	(2)	(3)
Fintech Competition	0.047*** (3.11)	0.121*** (4.65)	0.058** (2.26)
Firm Size [t-1]	0.150*** (41.86)	0.195*** (52.50)	0.192*** (38.01)
BM [t-1]	-0.065*** (-3.00)	-0.079** (-2.51)	-0.098*** (-2.92)
# New Patents: Bank [t-1]	0.200 (1.49)	-0.122 (-0.41)	-0.110 (-0.47)
Sales Growth[t-1]	0.119*** (3.03)	0.112** (2.31)	0.040 (0.93)
ROA [t-1]	3.147*** (3.29)	7.216*** (4.63)	7.936*** (5.12)
Stock Return [t-1]	-0.042** (-1.97)	0.151*** (4.17)	0.159*** (4.33)
Deal FE	No	Yes	Yes
Bank State FE	No	No	Yes
Number of observations	2883	2883	2883
Adjusted $R^2$	0.4263	0.4845	0.5725

- Sample: 1 actual deal + 5 PSM pseudo-bank deals
- 1 S.D.  $\uparrow$  in fintech competition  $\Rightarrow$  increases the fintech investment likelihood by 2 percentage points
- Large and more profitable banks tend to invest in fintech
- Similar results for 1+10 PSM control sample

# Technological/business relatedness and bank investments in fintech

## Measuring bank-fintech firm technological relatedness

- The first measure for the technological relatedness between a bank and a fintech startup looks at the similarity of their innovation scopes.

- Following **Jaffe (1986)**, we define *Technological Overlap*:

$$\frac{S_{fintech} S'_{bank}}{\sqrt{S_{fintech} S'_{fintech}} \sqrt{S_{bank} S'_{bank}}}$$

- $S_{fintech,k}$  is the ratio of the number of patents granted to the fintech startup in technology class  $k$  to the total number of patents granted to the fintech startup in all technology classes.
- The variable measures the cosine similarity between the technology classes spanned by the two firms' patents.

## Measuring bank-fintech firm technological relatedness

- The second set of measures of technological relatedness looks at cross-citations between the two firm's patents:
  1. *Cross Citation*: equals one if either any patent granted to the bank cites any patent of the fintech startup or any patent granted to the fintech startup cites any patent of the bank
  2. *Cross Citation by Bank*: equals one if any patent granted to the bank cites any patent of the fintech startup
  3. *Cross Citation by Fintech*: equals one if any patent granted to the fintech startup cites any patent of the bank
- For all these variables, we restrict to patents granted before the bank invests in the fintech firm.



# Measuring bank-fintech business relatedness

- We measure a bank and a fintech firm's business relatedness based on the descriptions of their industries
  1. *Overlap Business (#)*: the number of keywords that are in both firms' industry descriptions
  2. *Overlap Business (%)* : the number of keywords that are in both firms' industry descriptions, divided by the total unique keywords from the two firms' industry descriptions

# Technological Overlap

Dependent variable	Actual Investment		
	(1)	(2)	(2)
Technological Overlap	0.058** (2.26)	0.056** (2.21)	0.054** (2.13)
<i>Fintech startup characteristics</i>			
# New Patents: Fintech [t-1]	0.840 (0.67)	1.060 (0.83)	1.037 (0.80)
Ln(Age at Deal)	0.043*** (6.43)	0.039*** (5.59)	0.032*** (4.32)
Ln(Deal Amount)	0.130*** (28.23)	0.130*** (27.41)	0.124*** (22.77)
Fintech Space: Payments		-0.013 (-0.80)	-0.013 (-0.81)
Fintech Space: Banking & Lending		0.028* (1.86)	0.029* (1.93)
Fintech Space: Insurance		-0.072*** (-3.70)	-0.072*** (-3.71)
Fintech Space: Wealth Management		-0.006 (-0.32)	-0.005 (-0.27)
Fintech Space: Crypto		-0.028 (-1.36)	-0.026 (-1.28)
Fintech Space: Trading & Exchanges		-0.031 (-1.37)	-0.031 (-1.36)
Fintech Space: AI, Cloud & IT		0.033 (1.57)	0.034 (1.62)
Fintech Space: Others		0.054** (2.32)	0.056** (2.39)

Continue from the left table

*Bank investor characteristics*

# New Patents: Bank [t-1]	0.067 (1.30)	0.057 (1.05)	0.061 (1.13)
Firm Size [t-1]	0.051*** (23.44)	0.055*** (23.70)	0.055*** (23.82)
BM [t-1]	-0.019 (-1.59)	-0.015 (-1.29)	-0.016 (-1.36)
Sales Growth[t-1]	0.060*** (2.96)	0.058*** (2.78)	0.058*** (2.78)
ROA [t-1]	2.437*** (3.76)	2.540*** (3.70)	2.536*** (3.69)
Stock Return [t-1]	0.083*** (5.45)	0.086*** (5.49)	0.085*** (5.46)
Deal FE	Yes	Yes	Yes
Fintech State FE	Yes	Yes	Yes
Bank State FE	Yes	Yes	Yes
Funding Round FE	No	No	Yes
Number of observations	5606	5606	5606
Adjusted $R^2$	0.0898	0.0995	0.0882

- Sample: 1 actual deal + 10 PSM pseudo deals
- 1 S.D.  $\uparrow$  in technological overlaps  $\Rightarrow$  increases the fintech investment likelihood by 1.6 percentage points

# Cross Citation

Dependent variable	Actual Investment		
	(1)	(2)	(2)
Cross Citation	0.213*** (2.93)	0.213*** (2.97)	0.213*** (2.97)
Controls	Yes	Yes	Yes
Deal FE	Yes	Yes	Yes
Startup State FE	Yes	Yes	Yes
Bank State FE	Yes	Yes	Yes
Funding Round FE	No	No	Yes
Number of observations	5606	5606	5606
Adjusted $R^2$	0.0922	0.1020	0.0908

Dependent variable	Actual Investment		
	(1)	(2)	(2)
Cross Citation by Bank	0.066 (0.67)	0.065 (0.68)	0.066 (0.69)
Cross Citation by Fintech	0.237*** (2.64)	0.237*** (2.67)	0.236*** (2.67)
Controls	Yes	Yes	Yes
Deal FE	Yes	Yes	Yes
Startup State FE	Yes	Yes	Yes
Bank State FE	Yes	Yes	Yes
Funding Round FE	No	No	Yes
Number of observations	5606	5606	5606
Adjusted $R^2$	0.0924	0.1022	0.0910

- Sample: 1 actual deal + 10 PSM pseudo deals
- 1 S.D.  $\uparrow$  in cross citation  $\Rightarrow$  increases the fintech investment likelihood by 1.8 percentage points

# Overlap Business

Dependent variable	Actual Investment		
	(1)	(2)	(2)
Overlap Business(#)	0.044*** (5.19)	0.040*** (4.65)	0.039*** (4.61)
Controls	Yes	Yes	Yes
Deal FE	Yes	Yes	Yes
Fintech State FE	Yes	Yes	Yes
Bank State FE	Yes	Yes	Yes
Funding Round FE	No	No	Yes
Number of observations	3491	3491	3491
Adjusted $R^2$	0.1003	0.1095	0.0903

Dependent variable	Actual Investment		
	(1)	(2)	(2)
Overlap Business(%)	0.003*** (6.43)	0.003*** (5.83)	0.003*** (5.79)
Controls	Yes	Yes	Yes
Deal FE	Yes	Yes	Yes
Fintech State FE	Yes	Yes	Yes
Bank State FE	Yes	Yes	Yes
Funding Round FE	No	No	Yes
Number of observations	3491	3491	3491
Adjusted $R^2$	0.1048	0.1131	0.0940

- Sample: 1 actual deal + 10 PSM pseudo deals
- 1 S.D.  $\uparrow$  in the number (percentage) of overlapping businesses  $\Rightarrow$  increases the fintech investment likelihood by 3.2 (4.3) percentage points

How do banks benefit from investments in fintech firms?

## Measuring bank-fintech firm partnership

- For each actual and pseudo bank-fintech investment pair, we hand collect information on their business collaborations
- We then manually read the description of the partnership, classify the partnership into three types
  - *Fintech-Bank Partnership: Utilize Fintech Technology*, equals one if the bank utilizes/incorporates the fintech firm's technology in its own website or app
  - *Fintech-Bank Partnership: Cross Sell to Bank Customers*, equals one if the fintech startup cross-sells its products to the customers of the bank
  - *Fintech-Bank Partnership: Cross Sell to Fintech Customers*, equals one if the bank cross-sells its products to the customers of the fintech startup

# Fintech-Bank Partnership: Examples

- *Fintech-Bank Partnership: Utilize Fintech Technology*
  - Live Oak Bank established a partnership with DefenseStorm in 2016 and implemented DefenseStorm's CyberSecurity and CyberCompliance for fraud prevention.
- *Fintech-Bank Partnership: Cross Sell to Bank Customers*
  - American Express offered its card members statement credits of \$2,000 (\$6,000) if they originate or refinance conforming (or jumbo) mortgage loans through Better.com.
- *Fintech-Bank Partnership: Cross Sell to Fintech Customers*
  - Sterling National Bank will participate in Goalsetter's "Drafted" initiative (a finance app that focuses on financial education for the next generation), a campaign to bring savings accounts to one million students in minority communities.

## Post-investment Fintech-Bank Partnership

	N	Mean	Min.	Median	Max.	S.D.
<i>Treated sample</i>						
Post-investment Fintech-Bank Partnership	314	0.274	0	0	1	0.447
– Utilize Fintech Technology	314	0.131	0	0	1	0.337
– Cross Sell to Bank Customers	314	0.105	0	0	1	0.307
– Cross Sell to Fintech Customers	314	0.070	0	0	1	0.256
<i>Control sample</i>						
Post-investment Fintech-Bank Partnership	3,273	0.015	0	0	1	0.123
– Utilize Fintech Technology	3,273	0.008	0	0	1	0.087
– Cross Sell to Bank Customers	3,273	0.004	0	0	1	0.060
– Cross Sell to Fintech Customers	3,273	0.004	0	0	1	0.063

- Among the actual investment pairs, 27.4% of them formed business partnerships post investments; only 2.2% of them formed business partnerships prior to their investments
- The percentage of pseudo investment pairs that have formed business partnerships is less than 2%.



## An instrumental variable analysis

- To isolate the treatment effects, we employ an instrumental variable (IV) analysis.
  - We use the percentage of VC investment deals made by a bank in the fintech startup locale (CBSA, MSA) prior to the actual (pseudo) investment year to instrument the bank's fintech investment.
  - A bank's local market share, representing its availability for providing fundings to the local market, is positively correlated with a fintech's likelihood to receive investments from the bank.
  - This general funding availability, however, should not be directly related to its likelihood to collaborate with a specific fintech startup.

# Post-investment Fintech-Bank Partnership

Dependent Variable	Post-investment Fintech-Bank Partnership				
	Actual Investment				
	1st-stage	All	Utilize Fintech Technology	Cross Sell to Bank Customers	Cross Sell to Fintech Customers
	(1)	(2)	(3)	(4)	(5)
% VC Deals in Local CBSA [t-1]	10.553*** (4.74)				
Instrumented Actual Investment		0.447** (2.43)	0.398** (2.18)	0.084* (1.88)	-0.004 (-0.08)
Controls	Yes	Yes	Yes	Yes	Yes
Fintech Space Dummies	Yes	Yes	Yes	Yes	Yes
Deal Group FE	Yes	Yes	Yes	Yes	Yes
Bank State FE	Yes	Yes	Yes	Yes	Yes
Fintech State FE	Yes	Yes	Yes	Yes	Yes
Deal Stage FE	Yes	Yes	Yes	Yes	Yes
Number of observations	3557	3557	3557	3557	3557
Adjusted $R^2$	0.0739	0.0280	0.0205	0.0056	0.0073
Kleibergen-Paap $F$ -test	22.43				

# Post-investment Cross Citation

Dependent Variable	Post-investment Cross Citation		
	Cross Citation	Cross Citation by Fintech	Cross Citation by Bank
	(1)	(2)	(3)
Instrumented Actual Investment	0.148** (2.15)	0.082 (1.11)	0.147** (2.20)
Cross Citation [t-1]	0.187*** (3.20)		
Cross Citation by Fintech [t-1]		0.241*** (3.62)	
Cross Citation by Bank [t-1]			0.255** (2.58)
Controls	Yes	Yes	Yes
Fintech Space Dummies	Yes	Yes	Yes
Deal Group FE	Yes	Yes	Yes
Bank State FE	Yes	Yes	Yes
Fintech State FE	Yes	Yes	Yes
Deal Stage FE	Yes	Yes	Yes
Number of observations	3572	3572	3572
Adjusted $R^2$	0.1884	0.2069	0.2173

- Bank' innovations utilize the fintech firm's knowledge following its investments.

## Conclusion

- We document a rapidly increasing trend over the last twenty years in the number of banks making investments in fintech startups
- Bank venture investments continue to be strategic but in a different way. Banks are more likely to invest in fintech startups
  - when banks face higher fintech competition;
  - if fintech startups have business or technological relatedness with them
- Venture investments result in
  - increased probabilities of operational collaborations
  - knowledge transfer between the investing bank and the fintech investee

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