FinTech Adoption and Household Risk-Taking

NYU China Initiative

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Based on joint work with **Claire Yurong Hong** (SAIF) and **Xiaomeng Lu** (FISF)

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    - Free of traditional financial advisors.
    - All-in-one ecosystems with a wide range of products.

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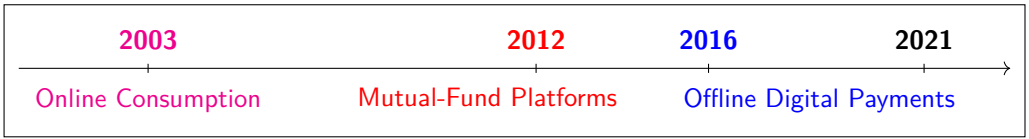
    - ⋆ All-in-one ecosystems with a wide range of products.
- In China, activities central to household finance taking place on FinTech platforms:
  - **Consumption:** online consumption accounts for 25% of the total.
  - **Investments:** 30% of mutual fund purchases takes place on FinTech platforms.
  - **Payments:** digital payments everywhere.



Alipay as a One-Stop FinTech App

Imagine if

1. Main-street banks
2. Wall Street's brokers
3. Boston's asset managers
4. Connecticut's insurers

all shrunk to fit into

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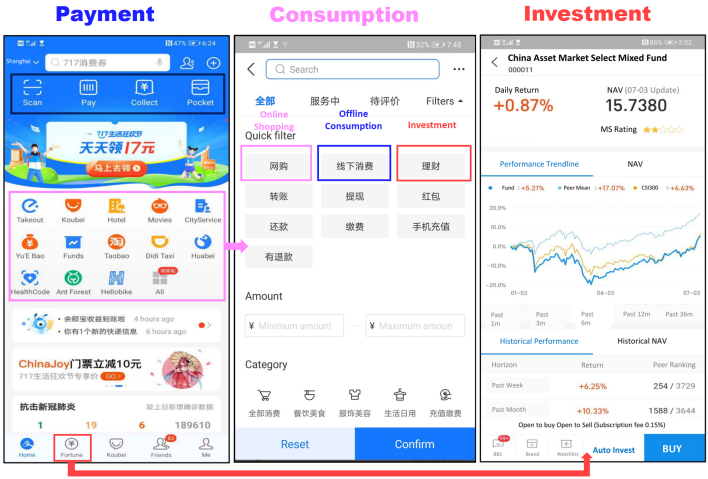

Motivations and Research Questions

"*The study of household finance is challenging because household behavior is* **difficult to measure**, *and households face* **constraints** *not captured by textbook models.*"

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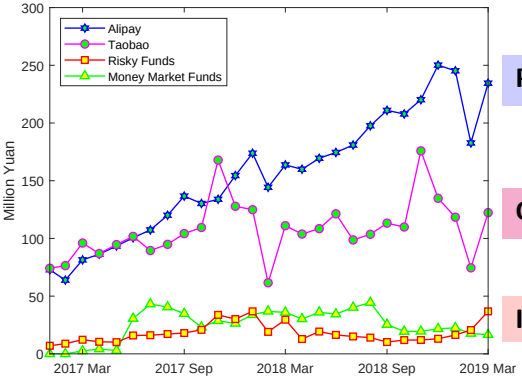
- A random sample of 50,000 individuals from Ant Group.
- Consumption:
  - Basic
  - Development
  - Enjoy
- Investments:
  - Risky funds: Bond, Mixed, Equity, Index, QDII, Gold.
  - Riskfree: Money market funds.



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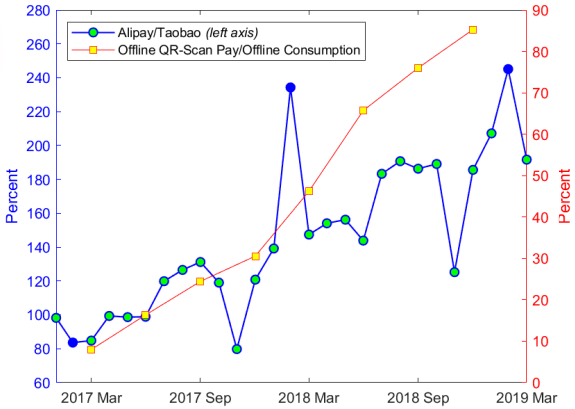
- **Can FinTech lower investment barrier and improve household risk-taking?**
  - Physical costs: convenience, transaction costs, and access to information.
  - Psychological costs: familiarity, trust, and financial literacy.
- **Who benefits more from FinTech Inclusion?**
  - The otherwise more constrained investors prior to the arrival of FinTech.
  - Individuals who are more risk-tolerant.
  - Individuals living in areas under-served by financial institutions.

Offline Digital Payments via QR-Code Scan

买菜也能扫码支付了 绍兴首家智慧农贸市场下月使用

2017-12-22 17:16 | 绍兴晚报

"You can use QR-Code Scan payment at local farmer's markets in Shaoxing."

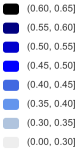


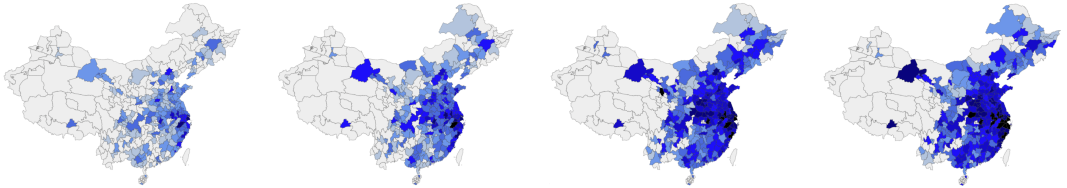
Individual-Level Measures of FinTech Adoption

- Individual i's consumption on Alipay and Taobao during month t :

$$\text{AliFrac}_t^i = \frac{\text{Alipay}_t^i}{\text{Alipay}_t^i + \text{Taobao}_t^i}$$

- Aggregated to the city level using individuals' location information:





2017Q2 **2017Q4** **2018Q2** **2018Q4**

Determinants of FinTech Adoption

	AliFrac				**ΔAliFrac**			
	All Users		Active users		All Users		Active users	
σ_C	0.032***	0.034***	0.033***	0.035***	-0.010***	-0.010***	-0.008***	-0.009***
	(11.13)	(12.31)	(9.47)	(10.52)	(-3.87)	(-3.77)	(-2.43)	(-2.55)
Log(C)	-0.104***	-0.107***	-0.107***	-0.109***	-0.026***	-0.026***	-0.023***	-0.022***
	(-81.59)	(-94.95)	(-72.19)	(-80.70)	(-18.29)	(-18.19)	(-12.74)	(-12.57)
Female	-0.054***	-0.050***	-0.055***	-0.051***	-0.016***	-0 016***	-0.017***	-0.017***
	(-16.95)	(-16.18)	(-16.00)	(-15.21)	(-6.79)	(-6.86)	(-5-41)	(-5.61)
Log(Age)	0.000	-0.002	-0.015	-0.017*	0.102***	0.101***	0.103***	0.102***
	(0.03)	(-0.27)	(-1.61)	(-1.86)	(16.32)	(16.26)	(14.90)	(14.78)
Log(GDP)	0.023**		0.022**		-0.004		-0.009**	
	(2.50)		(2.18)		(-1.61)		(-2.54)	
Log(Income)	0.029***		0.029***		-0.005***		-0.005**	
	(4.32)		(4.45)		(-3.24)		(-2.55)	
Log(Population)	0.006		0.005		0.002		0.001	
	(0.90)		(0.71)		(1.10)		(0.61)	
Log(#Branch)	-0.003		-0.004		-0.006**		0.002	
	(-0.35)		(-0.34)		(-2.10)		(0.45)	
Citylevel=1	-0.059**		-0.059**		0.005		0.003	
	(-2.50)		(-2.65)		(1.31)		(0.68)	
City FE	N	Y	N	Y	N	Y	N	Y
Adjusted R^2	0.210	0.208	0.230	0.230	0.021	0.021	0.019	0.019
N	49,087	50,000	27,886	28,393	49,087	50,000	27,886	28,393

Summary of Main Findings

- Use **AliFrac** and **ΔAliFrac** to capture the speed and intensity of FinTech adoption.
- **Higher FinTech adoption results in increased risk-taking.**
  - One-std increase of AliFrac leads to increases of **2.8%** in participation (avg=38%); **2.9%** in risky share (avg=45%).
  - One-std increase of ΔAliFrac leads to increases of Δparticipate=**0.3%** and Δrisky share=**1.5%**.
  - Instrumented with Distance to Hangzhou, one-std increase of $\widehat{\text{AliFrac}}$ leads to increases of **2.6%** in participation and **4.1%** in risky share.
- **Who benefits more from FinTech inclusion?**
  - Individuals with higher risk tolerance.
  - Cities under-served by traditional banks.
  - Mature and high risk tolerance individuals living in under-banked cities.

Related Literature

- **Portfolio Choice:** Markowitz (1952), Tobin (1958), and Merton (1969, 1971).
- **Household Finance:** Campbell (2006).
- **Risk-Taking and**
  - **Consumption Volatility:** Mankiw and Zeldes (1991).
  - **Familiarity:** Hong, Kubic and Stein (2004).
  - **Trust:** Guiso, Sapienza, and Zingales (2008).
- **Technology and Investor Behavior:**
  - Internet and stock trading: Barber and Odean (2002).
  - FinTech platforms and mutual fund flows: Hong, Lu, and Pan (2020).
  - Mobile money in developing economies: Suri (2017).
  - Digital loans in Kenya: Suri, Bharadwaj, and Jack (2021).

Data and Key Measures

- Unique FinTech data:
  - Account-level for a random sample of 50,000 individuals (age, gender, location).
  - Monthly consumption, investment, and payments from Jan 2017 to Mar 2019.
  - Out of all users, 28,393 active users with at least 100 RMB fund purchases.
- Risk-taking measures:
  - **Participate:** 1 for active users with a positive investment in risky funds
  - **Risky Share:** Portfolio weight on the risky funds.
  - **Portfolio Volatility** (σ_W): Estimated from monthly returns.
- Risk tolerance:
  - Proxied by **consumption volatility** (σ_C).
  - Individuals with higher σ_C are more risk tolerant.
    - Explicit under the complete-market setting of Merton: $\sigma_C = \sigma_W = \frac{1}{\gamma}\frac{\mu - r}{\sigma_R}$.
    - Valid under more general settings with certain assumptions.

Data and Key Measures

	Female	Age	C (¥)	σ_C	AliFrac	ΔAliFrac	Participate	Risky Share	σ_W (%)
			Consumption		FinTech		Risk-Taking		
28,393 Active Users (> 100 RMB Fund Purchases)									
Mean	0.61	31.1	2,292	1.21	0.55	0.08	0.66	0.45	1.77
Median	1.00	30.0	1,396	1.16	0.57	0.07	1.00	0.15	0.18
Std	0.49	7.8	4,732	0.40	0.22	0.17	0.47	0.47	2.97
All 50,000 Users									
Mean	0.61	30.4	2,155	1.21	0.54	0.08	0.38		
Median	1.00	29.0	1,259	1.16	0.56	0.07	0.00		
Std	0.49	7.8	17,063	0.40	0.22	0.22	0.48		

Can FinTech Improve Household Risk-Taking? Individual-Level Findings

- FinTech adoption from zero to one corresponds to an increase of
  - **12.7%** in risky participation (average=38% among 50,000 individuals)
  - **13.1%** in risky share (average=45% among 28,393 individuals)
  - **0.43%** in portfolio volatility (average=1.77% among 28,393 individuals)

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	Participate		Risky Share		σ_W (%)	
AliFrac	0.127***	0.239***	0.131***	0.146***	0.431***	0.446***
	(10.47)	(17.94)	(7.65)	(7.80)	(4.76)	(4.59)
σ_C	0.037***	0.019***	0.052***	0.018***	0.345***	0.163***
	(7.37)	(3.69)	(7.87)	(2.72)	(8.43)	(4.07)
Log(C)		0.076***		0.031***		0.128***
		(30.06)		(9.03)		(5.46)
Female		-0.067***		-0.102***		-0.542***
		(-12.24)		(-15.12)		(-15.52)
Log(Age)		0.007		-0.171***		-0.861***
		(0.57)		(-11.11)		(-10.50)
City FE	Y	Y	Y	Y	Y	Y
Adjusted R2	0.004	0.024	0.006	0.025	0.004	0.016
N	50,000	50,000	28,393	28,393	28,393	28,393

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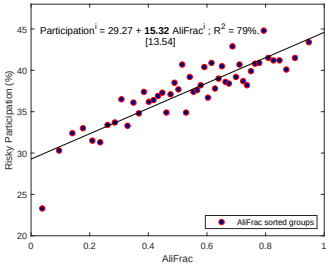
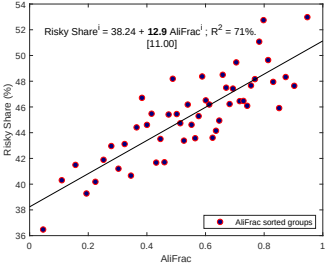
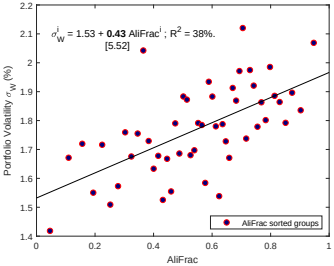


Participate



Risky Share



σ_W

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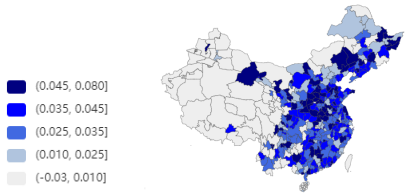

ΔAliFrac: 2018 minus 2017

	ΔParticipate	ΔRisky Share
ΔAliFrac	0.014**	0.087***
	(2.08)	(5.30)
σ_c	0.009**	-0.010
	(2.23)	(-1.32)
Log(C)	0.013***	0.000
	(8.25)	(0.10)
Female	-0.025***	-0.004
	(-8.31)	(-0.68)
Log(Age)	-0.041***	0.012
	(-5.98)	(0.98)
City FE	Y	Y
Adjusted R2	0.004	0.154
N	50,000	28,393

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- Monthly panel regressions with high-dimensional fixed effects:

Fixed Effect	Participate	Risky Share
none	**12.6%**	**11.1%**
individual	**9.53%**	**3.90%**
month×city	**6.95%**	**9.17%**
individual+month×city	**0.57%**	**1.95%**

Can FinTech Improve Household Risk-Taking? City-Level Findings

- FinTech adoption at city level: less affected by individual's self-selection.
  - Results consistent with our individual-level findings, both in levels and changes.

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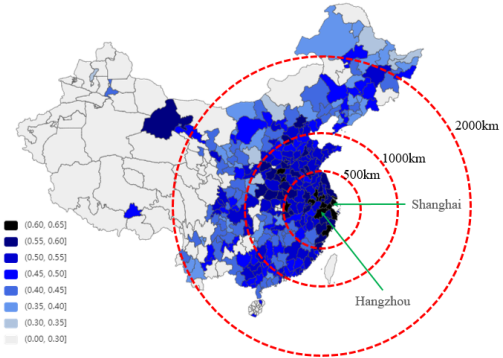

First Stage: Y=AliFrac					
	≤200	≤500	≤1000	≤2000	All
Log(Distance to HZ)	-0.392***	-0.437***	-1.096**	-1.955**	-1.995**
	(-5.99)	(-3.99)	(-2.31)	(-2.14)	(-2.16)
Controls	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y
Observations	238	799	2,278	4,624	4,879
R-squared	0.85	0.66	0.54	0.51	0.50

First Stage: Y=AliFrac					
	≤200	≤500	≤1000	≤2000	All
Log(Distance to SH)	0.124	0.129	-0.936*	-1.731*	-1.766*
	(0.54)	(0.70)	(-1.84)	(-1.77)	(-1.77)
Controls	Y	Y	Y	Y	Y
Time FE	Y	Y	Y	Y	Y
Observations	238	799	2,278	4,624	4,879
R-squared	0.81	0.65	0.53	0.49	0.48

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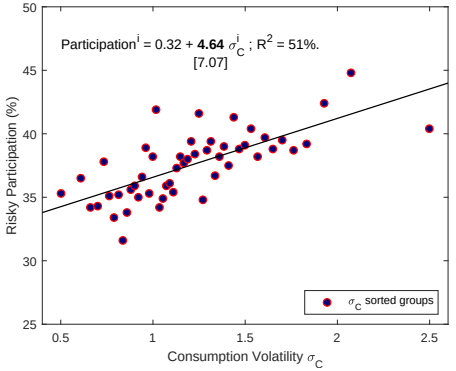
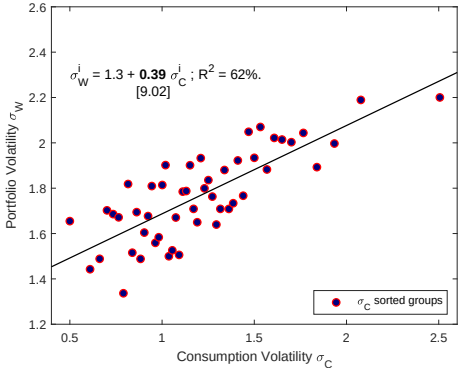
- FinTech adoption at city level: less affected by individual's self-selection.
  - Results consistent with our individual-level findings, both in levels and changes.
- IV test: Use distance to Hangzhou as an instrument for FinTech penetration.
- Comparing the economic significance of IV vs OLS tests:

	FinTech (one-std)	Risky Share All Cities	Risky Share $\leq$500km
OLS	AliFrac	**1.17%**	**2.34%**
		(3.04)	(2.21)
IV	$\widehat{\text{AliFrac}}$	**1.16%**	**4.10%**
		(2.32)	(5.26)

Who Benefits More from FinTech Inclusion? Risk Tolerance

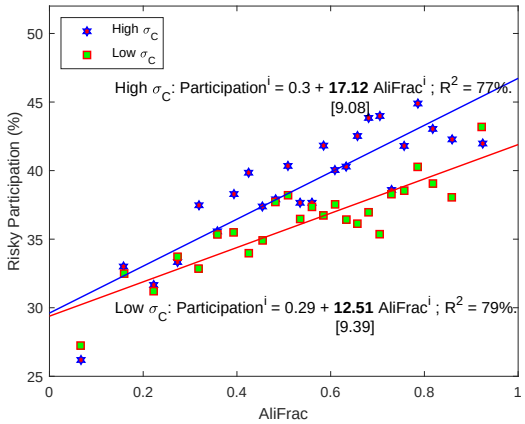
- Optimal portfolio weight $w^* = \frac{\mu - r}{\gamma \sigma_R^2}$. *Higher for more risk-tolerant individuals.*
- Proxy risk tolerance using consumption volatility σ_C.
  - Male and young investors have higher σ_C.
  - More risk-taking by individuals with higher σ_C.

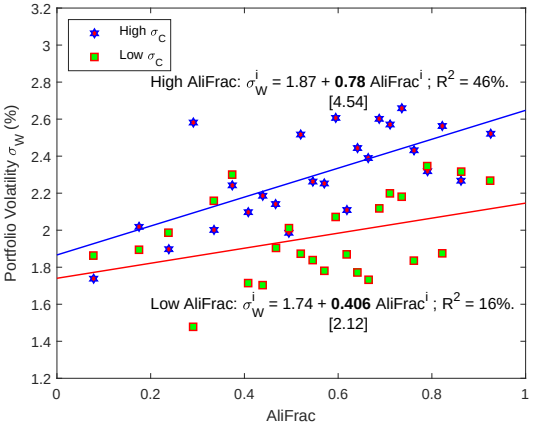




Who Benefits More from FinTech Inclusion? Risk Tolerance

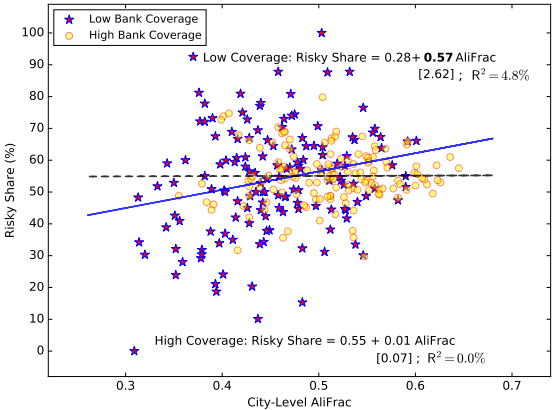
FinTech benefits stronger for more risk-tolerant individuals

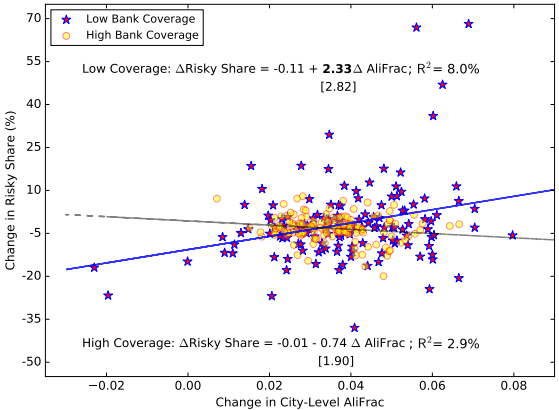




Who Benefits More from FinTech Inclusion? Under-Banked Cities

FinTech benefits stronger for cities with low bank coverage





Who Benefits More from FinTech Inclusion? Under-Banked Population

Matching samples of individuals living under low and high bank coverage.

Who Benefits More from FinTech Inclusion? Under-Banked Population

Matching samples of individuals living under low and high bank coverage.

		Low Bank		**High Bank**		Low-High	
	N	Mean	Std.	Mean	Std.	Mean	t-stat
σ_C	4,053	1.208	0.381	1.208	0.371	0.000	0.00
Log(C)	4,053	7.248	0.822	7.249	0.814	-0.001	-0.65
Female	4,053	0.592	0.491	0.592	0.491	0.000	N.A.
Log(Age)	4,053	3.425	0.237	3.426	0.237	0.000	-1.20
AliFrac	4,053	0.478	0.234	0.566	0.211	-0.089	-20.13
ΔAliFrac	4,053	0.100	0.182	0.087	0.167	0.013	3.46
Risky Share	4,053	0.457	0.475	0.443	0.470	0.014	1.34
ΔRisky Share	4,053	0.067	0.456	0.055	0.445	0.011	1.14

Who Benefits More from FinTech Inclusion? Under-Banked Population

Matching samples of individuals living under low and high bank coverage.

	Risky Share				ΔRisky share		
	Low Bank	High Bank	Low-High		Low Bank	High Bank	Low-High
AliFrac	0.183***	0.148***	0.035	ΔAliFrac	0.086**	-0.034	0.121**
	(4.87)	(2.91)	(0.55)		(2.13)	(-0.79)	(2.03)
σ_C	0.037*	0.008	0.028	σ_C	-0.015	-0.022	0.007
	(1.71)	(0.37)	(0.90)		(-0.63)	(-1.04)	(0.23)
Log(C)	0.039***	0.039***	0.000	Log(C)	0.003	-0.021**	0.024*
	(3.75)	(4.20)	(0.01)		(0.28)	(-2.23)	(1.79)
Female	-0.119***	-0.076***	-0.043*	Female	0.009	-0.016	0.026
	(-7.23)	(-3.92)	(-1.70)		(0.48)	(-1.01)	(1.02)
Log(Age)	-0.114***	-0.216***	0.102*	Log(Age)	-0.002	0.017	-0.019
	(-3.46)	(-5.22)	(1.93)		(-0.07)	(0.48)	(-0.41)
Constant	0.502***	0.849***	-0.676***	Constant	0.06	0.19	-0.125
	(3.20)	(4.52)	(5.52)		(0.44)	(1.25)	(-1.23)
City FE	Y	Y		City FE	Y	Y	
Observations	4,053	4,053		Observations	4,053	4,053	
R-squared	0.083	0.064		R-squared	0.05	0.036	

Who Benefits More from FinTech Inclusion? Under-Banked Population

Matching samples of individuals living under low and high bank coverage.

Age	Low Bank	High Bank	Low-High
Young	0.132**	0.276***	-0.144
	(2.05)	(2.97)	(-1.28)
Mature	0.192***	0.048	0.144*
	(3.85)	(0.79)	(1.83)
Consumption	Low Bank	High Bank	Low-High
Low	0.194***	0.102	0.094
	(3.35)	(1.61)	(1.10)
High	0.186***	0.159**	0.025
	(3.07)	(2.07)	(0.26)

Gender	Low Bank	High Bank	Low-High
Female	0.171***	0.152**	0.019
	(3.36)	(2.17)	(0.21)
Male	0.175***	0.104	0.071
	(3.11)	(1.36)	(0.74)
σ_C	Low Bank	High Bank	Low-High
Low σ_C	0.136**	0.202***	-0.066
	(2.47)	(3.27)	(0.80)
High σ_C	0.242***	0.058	0.184**
	(4.64)	(0.80)	(2.06)

Conclusions

- We study how FinTech can help households lower barrier and improve risk-taking:
  - FinTech adoption improves risk-taking, more for risk-tolerant individuals.
  - Cities with low banking coverage benefit more from FinTech penetration.
  - Mature and high risk tolerance individuals under-served by banks benefit more from FinTech inclusion.
- Interpretations of our findings:
  - FinTech convenience reduces physical costs, increasing participation.
  - Repeated usage of Alipay builds familiarity and trust, reducing the psychological barriers against investing in risky assets.
- Future of FinTech:
  - Brighter for emerging economies lacking financial infrastructures.
  - From Tech to Fin, more content building.