The Big Tech Lending Model

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Jan 8, 2023

Motivation

- The new global trend of big techs offering lending
  - Cornelli et al. (2020): big tech credit volume may have been as large as USD 572 billion in 2019, at least twice that of other types of fintech credit
  - Big tech lending is fast developing in China, US, Latin America, East Asia, Southeast Asia and Africa

- Big tech lenders are substantially different from other fintech lenders
  - Extensive customer bases, powerful brands
  - Superior **information** about borrowers from data and algorithms
  - Great capacities to **monitor** customer activities inside the ecosystems

Research Questions

- Little direct evidence on the performance of big tech loans
  - Luohan Academy Report (2019), Frost et al. (2019), Ghosh et al. (2021), Ouyang (2021), Hau et al. (2019, 2021), Chen et al. (2021), Huang et al. (2020), Gambacorta et al. (2020)

- We compare big tech business loans to SMEs made by MyBank with regular and online business loans made by a large traditional bank
  - How risky is big tech lending?
  - Is big tech lending robust to severe economic shocks?
  - What are the likely mechanisms contributing to big tech loans' performance?

Overview

- The big tech loans are not excessively risky, despite the borrowers' lower credit quality
- Compared to traditional bank loans, big tech loans originated after the COVID-19 shock showed smaller increase in overdue risks
- The big tech lending model
  - Standard mechanisms: screening and monitoring
  - Unconventional mechanisms: convenience and high interest rates

Background - Lending by MyBank

- MyBank had lent to over 35 million SMEs
  - Most borrowers are merchants who use Alipay or vendors on Alibaba's e-commerce platforms
- MyBank has unique and extensive information about each borrower's business: cashflow, customer ratings, data along its business chain…
- Alibaba's ecosystem helps MyBank to monitor loan use and repayment
- Convenience in borrowing and repayment
  - 310 model: 3 minutes to apply, 1 second to approve, and zero human intervention

Background – Syndicated Loans

- MyBank's lending is primarily funded by syndication with traditional banks

- Our data come from one of its major co-lenders, Bank X
  - MyBank is responsible for acquiring borrowers, assessing risk, processing loan applications, and setting interest rates and credit limits
  - MyBank is also responsible for managing the loans after origination
  - Bank X provides the majority of funding
  - Bank X can reject a loan application, but does not determine the interest rate or credit limit

Background – Bank X

- A large commercial bank with national coverage across China

- Bank X has two lending programs to SMEs of its own
  - Regular loans
    - Applications filed in a bank branch and assessed by loan officers in person
    - The process may take one week
  - Online loans
    - A borrower can apply online, and the bank assess the application based on a variety of traditional and unconventional information through machine learning models
    - Obtaining credit limit or loans may still take half a day

The Data

- Proprietary loan data from Bank X
  - Loans originated in Aug 2019 – Dec 2020

- The main sample： 10% random sample of borrowers with business loans in three groups:
  - 843,678 big tech loans (syndicated loans by MyBank and Bank X)
  - 34,933 regular loans (excluding policy loans) by Bank X
  - 113,233 online loans by Bank X

- The overlapped sample:
  - The full set of big tech borrowers who have taken at least one online or regular loan from Bank X

Borrower Characteristics (Main Sample)

Panel B: First Loans

	First Loan	First Business Loan	First Uncollateralized Business Loan
Big Tech Borrowers	27%	81%	91%
Online Borrowers	4%	5%	6%
Regular Borrowers	30%	43%	58%

- Big tech loans are more likely to be the first business loans, especially the first non-collateralized business loans, of their borrowers

Borrower Characteristics (Main Sample)

Panel C: Other Loans by Each Borrower

	Collateralized Business Loans	Uncollateralized Business Loans	Collateralized Consumption Loans	Uncollateralized Consumption Loans	Mortgage Loans	Others	All
Big Tech Borrowers	117,172	36,099	40,467	97,946	13,661	28,807	334,152
Online Borrowers	741,676	180,595	160,123	49,872	96,760	96,760	1,325,786
Regular Borrowers	429,065	159,087	73,096	30,252	65,385	65,385	822,270

- Big tech borrowers have much smaller amount of loans from other institutions
- Overall, big tech loans make credit more accessible to borrowers unserved or underserved by traditional banks

Loan Terms (Main Sample)

Panel A: Overall Statistics

	Number of Loans	Interest Rate	Credit Limit (RMB)	Loan Size (RMB)	Maturity (Months)	Repay Once
Collateralized						
Big Tech	12,099	9.0%	840,509	135,741	11.2	63%
Online	37,917	5.1%	1,186,890	296,619	13.4	93%
Regular	152,991	5.5%	1,277,106	352,571	14.9	90%
Uncollateralized						
Big Tech	843,678	14.6%	71,963	8,367	10.0	15%
Online	113,233	8.6%	180,858	99,487	9.9	90%
Regular	34,933	8.5%	183,644	120,284	13.0	71%

- Bank X's regular loans are mostly collateralized, while big tech and Bank X's online loans are mostly uncollateralized
- Big tech loans tend to have lower credit limit and much higher interest rate

Repayment Risk

Panel A: Summary Statistics of Payment Overdue

	Number of Loans			Ever Overdue >= 30days		
	w/o payback record	w payback record	Total	w/o payback record	w payback record	Total
Big Tech	215,135	239,272	454,407	4.2%	1.2%	2.6%
Online	4,048	64,769	68,817	1.1%	1.1%	1.1%
Regular	6,706	12,629	19,335	1.5%	1.7%	1.6%

- The risk of payment overdue is concentrated among borrowers without prior payback history
- For borrowers with payback history, there is no difference in overdue risk across the three types of loans

Repayment Risk

- After controlling for paying off an existing loan, there is no difference in the overdue risk

Panel B: Regression Analysis

	Ever Overdue >=30 days *100			
Big Tech	1.33***	0.56**	-0.60**	-0.84***
	(0.22)	(0.24)	(0.26)	(0.25)
Online	-0.27*	-0.01	0.65***	0.46*
	(0.16)	(0.23)	(0.25)	(0.25)
Loan Term: 6 months		-1.75***	-1.72***	-1.78***
		(0.48)	(0.47)	(0.47)
Loan Term: 12 months		0.22	0.26	0.17
		(0.53)	(0.53)	(0.54)
Repay Once		-2.00***	-1.63***	-1.62***
		(0.22)	(0.16)	(0.15)
Ever Clear			-2.77***	-2.77***
			(0.33)	(0.33)
Exist Loan			1.20***	1.19***
			(0.18)	(0.18)
Ever Overdue			8.34	9.39
			(6.93)	(6.92)
Has Large Deposit			-0.95***	-0.93***
			(0.07)	(0.08)
Log(age)			-0.30**	-0.39***
			(0.13)	(0.14)
Male			0.01	0.01
			(0.08)	(0.08)
County			-0.55***	-0.43***
			(0.06)	(0.07)
Rural			-0.54***	-0.43***
			(0.09)	(0.09)
Origination Month FEs	Yes	Yes	Yes	No
Industry* Origination Month FEs	No	No	No	Yes
City* Origination Month FEs	No	No	No	Yes
Cluster Variable	Origination Month	Origination Month	Origination Month	Origination Month
Adjusted R-squared	0.00	0.01	0.02	0.03
Observations	542,559	542,559	542,559	542,559

Loan Performance After COVID-19

- There is no evidence of overdue risk rising for big tech loans originated after the COVID-19 shock
  - By contrast, Ben-David et al. (2021) and Bao and Huang (2021) find that p2p lending in the US and China during the COVID-19 crisis was not as robust as bank lending

	Ever Overdue >= 30 days*100			
Big Tech	2.01***	-0.85***	-0.88***	-2.21***
	(0.01)	(0.17)	(0.18)	(0.30)
Big Tech × Post COVID-19 Shock	-0.53***	-0.79**	-1.20***	-1.10***
	(0.18)	(0.35)	(0.26)	(0.17)
Online	-0.52***	0.92***	1.00***	0.91***
	(0.00)	(0.20)	(0.21)	(0.20)
Online × Post COVID-19 Shock	0.03	-0.13	-0.61*	-0.51*
	(0.24)	(0.42)	(0.35)	(0.30)
Loan Term: 6 months		-1.53***	-1.54***	-1.38***
		(0.44)	(0.48)	(0.52)
Loan Term: 12 months		0.45	0.41	0.62
		(0.59)	(0.61)	(0.66)
Repay Once		-2.20***	-2.16***	-1.80***
		(0.13)	(0.13)	(0.10)
Interest Rate				6.79***
				(1.27)
Log(Loan Size)				-0.40***
				(0.08)
Borrower Variables	No	Yes	Yes	Yes
Origination Month	Yes	Yes	No	No
Industry × Origination Month	No	No	Yes	Yes
City × Origination Month	No	No	Yes	Yes
Cluster Variable	Origination Month	Origination Month	Origination Month	Origination Month
Adjusted *R*-squared	0.00	0.02	0.03	0.03
Observations	191,616	191,616	191,616	191,616

Mechanisms

- How does the big tech lender manage to make loans, without incurring excessive risks, to a pool of borrowers that traditional banks are unwilling to cover?
- A set of mechanisms
  - Information advantage to screen potential borrowers in its ecosystem
  - Monitoring through its ecosystem
  - Convenience
  - High interest rates

Information Asymmetry

- **Hypothesis**: big tech loans face more severe information asymmetry than conventional bank loans

- The correlation test of Chiappori and Salanié (2000)
  - In each of the lending programs, the lender commonly approves the borrower of a credit line with a given interest rate
  - Are those who have chosen to use up their credit limits more likely to default later?

Information Asymmetry

	BigTech loan		Bank X FinTech loan		Bank X Regular loan	
	Ever overdue >=30 days	Use up credit limit	Ever overdue >=30 days	Use up credit limit	Ever overdue >=30 days	Use up credit limit
Control Variables (skipped)						
Origination Month FEs	Yes	Yes	Yes	Yes	Yes	Yes
Industry FEs	Yes	Yes	Yes	Yes	Yes	Yes
Province FEs	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R-squared	0.10	0.33	-7.93	0.10	0.04	0.07
Observations	447955	447955	61229	61229	17968	17968
Correlation between the residuals of the two equations	-0.004		0.002		0.04	
Chi-squared test of zero correlation	10.382		0.206		27.375	
P Value of test statistics	0.001		0.650		0.000	

- No evidence of information asymmetry in big tech loans
  - Possibly reflecting both screening and monitoring

Early Repayment

- If a borrower takes a loan to finance its business expansion, it is unlikely to repay the loan before the short maturity of 6 or 12 months.

- **Hypothesis:** there is no difference in the repayment speed of the big tech loans and the conventional loans.

Early Repayment

Panel A: Distribution of the Ratio of Repayment Time to Loan Maturity

	N	Mean	Std.	Min	5%	10%	25%	50%	75%	90%	95%	Max
Big Tech	515,711	0.46	0.44	0.00	0.00	0.01	0.04	0.28	1.00	1.00	1.00	11.13
Online	74,921	0.74	0.37	0.00	0.03	0.10	0.48	0.96	1.00	1.00	1.00	18.48
Regular	21,253	0.77	0.32	0.00	0.06	0.18	0.60	0.93	1.00	1.00	1.00	2.54

- Half of the big tech loans are paid off at 28% of the scheduled maturity
  - i.e., 6 weeks for a 6-month loan
- A quarter of the big tech loans are paid off at 4% of the maturity
  - i.e., 1 week for a 6-month loan

Early Repayment

- Big tech borrowers are more likely to repay before maturity
  - More likely to meet short-term liquidity needs, rather than long-term financing
- Fast repayment reduces loan risk

Panel B: Regression Analysis of Early Repayment

	Repayment Time to Maturity	
Big Tech	-0.40***	-0.46***
	(0.01)	(0.01)
Online	-0.01	0.06***
	(0.01)	(0.01)
Interest Rate	-0.01	-0.03
	(0.06)	(0.04)
Log(Credit Limit)	-0.00	-0.00
	(0.00)	(0.00)
Loan Term: 6 month	0.04***	0.03***
	(0.01)	(0.01)
Loan Term: 12 month	0.00	-0.02*
	(0.01)	(0.01)
Loan Term: greater than 12 month	-0.12***	-0.06
	(0.04)	(0.04)
Repay Once	-0.13***	-0.09***
	(0.01)	(0.00)
Log(Age)		0.06***
		(0.01)
Male		-0.01***
		(0.00)
County		-0.01***
		(0.00)
Rural		-0.03***
		(0.00)
Ever_Clear_BigTech		-0.35***
		(0.01)
Exist_Clear_BigTech		0.11***
		(0.01)
Ever_OVD_BigTech		0.25***
		(0.04)
Has Large Deposit		-0.05***
		(0.00)
Industry*Origination Month	No	Yes
City* Origination Month	No	Yes
Cluster Variable	Origination Month	Origination Month
Adjusted R-squared	0.07	0.23
Observations	611,885	611,885

Overlapped Borrowers

- A small set of big tech borrowers also have access to Bank X's regular or online loans

Panel A: Summary Statistics

	No. of Borrowers	No. of Loans	Interest Rate	Credit Limit	Loan Size	Repay Once	Maturity	Payback to Maturity	No. of Loans Per Borrower	Ever Overdue >=30 days
Big Tech	6,684	42,548	14.5%	97,762	15,097	22.9%	10.0	41.4%	6.4	0.4%
Online	4,929	12,768	8.7%	169,447	82,916	75.3%	9.8	77.5%	2.6	0.9%
Regular	1,829	3,165	9.0%	179,186	125,293	66.1%	12.8	83.0%	1.7	1.5%

- The sample of overlapped borrowers show the same patterns: small loans, high interest rates, fast repayment

Overlapped Borrowers

- Perhaps these borrowers have run out of credit limits from Bank X?
  - A substantial fraction of loans are made to borrowers with cheaper Bank X credits available, revealing their preference for big tech loans' convenience

Panel B: Summary statistics by whether the borrower has credit limit from Bank X at the time of borrowing BigTech loans

	Number of loans	Number of borrowers	Interest rates	Loan size	Remaining Bank X credit limit	Loan Term	Pay back to Maturity
Bank X Credit Available	24,302	4,669	14.7%	14,493	171,632	9.9	39.8%
Bank X Credit Unavailable	18,246	4,356	14.3%	15,900	9,840	10.1	44.3%

Analysis of the Overlapped Sample

- Big tech loans on the overlapped sample have lower overdue risks

Panel D: Compare payment overdue

	Ever overdue >=30 days × 100			
	Big Tech vs. Regular		Big Tech vs. Online	
Big Tech	-0.66*	0.53	-0.73**	-0.13
	(0.38)	(0.45)	(0.34)	(0.33)
Big Tech × Bank X Credit Available	-1.04***	-0.57**	-0.42***	-0.15
	(0.23)	(0.26)	(0.16)	(0.19)
Loan Term: 6 months	0.89***	-0.66**	0.14	0.29*
	(0.35)	(0.30)	(0.29)	(0.17)
Loan Term: 12 months	1.79***	0.36	0.75**	0.71***
	(0.36)	(0.22)	(0.30)	(0.18)
Repay Once	-0.82***	0.08	-0.41**	0.39**
	(0.20)	(0.19)	(0.16)	(0.17)
Borrower FE	No	Yes	No	Yes
Origination Month FE	Yes	Yes	Yes	Yes
Cluster Variable	Origination month	Origination month	Origination month	Origination month
Adjusted *R*-squared	0.01	0.53	0.00	0.50
Observations	5724	5724	19365	19365

Analysis of the Overlapped Sample

- After including borrower fixed effects, similar overdue risks

Panel D: Compare payment overdue

	Ever overdue >=30 days × 100			
	Big Tech vs. Regular		Big Tech vs. Online	
Big Tech	-0.66*	0.53	-0.73**	-0.13
	(0.38)	(0.45)	(0.34)	(0.33)
Big Tech × Bank X Credit Available	-1.04***	-0.57**	-0.42***	-0.15
	(0.23)	(0.26)	(0.16)	(0.19)
Loan Term: 6 months	0.89***	-0.66**	0.14	0.29*
	(0.35)	(0.30)	(0.29)	(0.17)
Loan Term: 12 months	1.79***	0.36	0.75**	0.71***
	(0.36)	(0.22)	(0.30)	(0.18)
Repay Once	-0.82***	0.08	-0.41**	0.39**
	(0.20)	(0.19)	(0.16)	(0.17)
Borrower FE	No	Yes	No	Yes
Origination Month FE	Yes	Yes	Yes	Yes
Cluster Variable	Origination month	Origination month	Origination month	Origination month
Adjusted *R*-squared	0.01	0.53	0.00	0.50
Observations	5724	5724	19365	19365

Analysis of the Overlapped Sample

- Big Tech loans borrowed with cheaper Bank-X credit available have lower default risks

Panel D: Compare payment overdue

	Ever overdue >=30 days × 100			
	Big Tech vs. Regular		Big Tech vs. Online	
Big Tech	-0.66*	0.53	-0.73**	-0.13
	(0.38)	(0.45)	(0.34)	(0.33)
Big Tech × Bank X Credit Available	-1.04***	-0.57**	-0.42***	-0.13
	(0.23)	(0.26)	(0.16)	(0.19)
Loan Term: 6 months	0.89***	0.66**	0.14	0.29*
	(0.35)	(0.30)	(0.29)	(0.17)
Loan Term: 12 months	1.79***	0.36	0.75**	0.71***
	(0.36)	(0.22)	(0.30)	(0.18)
Repay Once	-0.82***	0.08	-0.41**	0.39**
	(0.20)	(0.19)	(0.16)	(0.17)
Borrower FE	No	Yes	No	Yes
Origination Month FE	Yes	Yes	Yes	Yes
Cluster Variable	Origination month	Origination month	Origination month	Origination month
Adjusted *R*-squared	0.01	0.53	0.00	0.50
Observations	5724	5724	19365	19365

Analysis of the Overlapped Sample

Panel E: The correlation between loan characteristics and borrower overdue ex post

	Big Tech vs. Regular				Big Tech vs. Online			
	Log(Avg. credit limit)	Log(Avg. interest rates)	Log(Avg. loan size)	Log(No. loans)	Log(Avg. credit limit)	Log(Avg. interest rates)	Log(Avg. loan size)	Log(No. loans)
Big Tech	-1.06***	0.06***	-2.61***	0.80***	-0.68***	0.06***	-1.87***	0.62***
	(0.03)	(0.00)	(0.05)	(0.04)	(0.02)	(0.00)	(0.03)	(0.02)
Big Tech × Borrower Overdue	-0.26	-0.01	-0.56***	-0.23	-0.24***	0.01***	-0.65***	-0.10
	(0.22)	(0.01)	(0.23)	(0.16)	(0.11)	(0.00)	(0.19)	(0.16)
Borrower FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Origination Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cluster Variable	Month	Month	Month	Month	Month	Month	Month	Month
Adjusted *R*-squared	0.54	0.51	0.7	0.27	0.41	0.57	0.59	0.24
Observations	1724	1724	1724	1724	4894	4894	4894	4894

- Borrowers overdue ex post receive lower big tech credit limits, and also borrow less big tech loans.
- Evidence of better screening by the big tech lender

Conclusion

- The big tech loans are not more risky, despite their higher interest rates and the borrowers' lower credit quality
  - Different from p2p lending, e.g., Tang (2019), De Roure et al. (2021), Di Maggio and Yao (2021), Wang and Overby (2021), Ben-David et al. (2021) and Bao and Huang (2021)

- The big tech lending model:
  - The big tech loans are used to meet short-term liquidity needs, as borrowers repay quickly, far before the maturity, and borrow frequently
  - Confirm standard mechanisms: screening and monitoring
  - Confirm the importance of convenience, e.g., Buchak et al. (2018)
  - Suggest a new mechanism of high interest rates screening borrowers with short-term liquidity needs

- This current model focuses on financing of activities inside the lender's ecosystem
  - Not competing with banks for more general financing needs
  - How big tech lenders and conventional banks may compete with each other in the future may depend on data sharing regulations, e.g., He et al. (2021), Parlour et al. (2021).