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What Do A Billion Observations Say About Distance and Relationship Lending?

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01 | Introduction



02 | Background

2.1. Banking System in China

- big five national commercial banks
- twelve joint equity banks
- municipal commercial banks

2.2. Bank Branches Development

- On the one hand, the big five banks were established earlier and have higher political rankings than joint equity banks. twelve joint equity banks.
- On the other hand, the joint equity banks' branch openings have been strictly regulated.
- The distant lending is prevalent in China.

03 | Data and Summary Statistics

3.1. CBRC Branch Data and Loan Level Data

CBRC Branch Data:

- over 200 thousand branches
- around 2,800 banking financial institutions
- between 1949 and 2016.
- branch name, ID, hierarchy, full addresses, and the exact opening and closing dates

3.1. CBRC Branch Data and Loan Level Data

CBRC Loan Level Data:

- over 7 million loan contracts granted by 19 largest Chinese banks.
- All borrowers with an annual credit line over RMB 50 million
- between October 2006 and June 2013
- over 80% of the total bank credit in China
- over 160,000 borrowing firms located in all 31 provinces in China across all 20 different sectors
- the unique firm identifier, firm-level fundamentals (e.g., size, leverage and location), banks' information (e.g., the names and location of branches), and loan level characteristics (e.g., loan amount, loan maturity, credit guarantee providers, internal ratings, issuing date, maturity date on contracts, and loan delinquency status).
- for each loan application, the borrower needs to disclose its most related firms (e.g., shareholders, sibling firms with the common shareholder, and firms with other relationships such as related party transactions).
- The loan information is mandatorily updated at month frequency.

3.2. GIS and Lender-Borrower Distance

- for each loan, we can identify the city where the loan was issued.
- we use the GIS technology to locate the exact longitude and latitude of each borrower and each bank branch on the map.
- Distance = $r \times \arccos[\sin(\text{firmlat}) \times \sin(\text{banklat}) + \cos(\text{firmlat}) \times \cos(\text{banklat}) \times \cos(\text{banklon} - \text{firmlon})]$

3.3. Summary Statistics

	N	Mean	Median	Std. Dev.	P25	P75
Panel A: Firm-Bank-Month Sample						
Distance (100KM)	7,623,859	0.597	0.024	1.972	0.007	0.117
Bank_Num	7,623,883	3.194	2.000	2.735	1.000	4.000
LoanAmount_Share	6,161,111	0.446	0.500	0.386	0.167	1.000
LoanFreq_Share	6,161,111	0.448	0.495	0.389	0.184	1.000
Recent_Lending	7,623,883	0.808	1.000	0.394	1.000	1.000
Panel B: Loan Issuance Sample						
Default	5,581,460	0.012	0.000	0.108	0.000	0.000
Loan Amount	6,824,375	14.921	4.000	30.889	0.600	13.000
Rating	6,824,375	0.978	1.000	0.146	1.000	1.000
Maturity	6,824,375	11.552	6.000	21.019	4.000	12.000
Guarantee	6,824,375	0.210	0.000	0.408	0.000	0.000
Assets (Billion RMB)	6,824,375	4.055	0.799	9.361	0.273	3.049
Leverage	6,824,331	0.613	0.611	0.187	0.490	0.734
SOE	5,613,464	0.104	0.000	0.306	0.000	0.000
Employees	5,613,464	1777.710	374.000	3985.735	70.000	1471.000
Connection #	6,823,955	0.744	0.000	0.931	0.000	1.000
Sibling Firms Connected	6,823,955	0.166	0.000	0.372	0.000	0.000
Other Relation Connected	6,823,955	0.398	0.000	0.489	0.000	1.000
Stock Holder Connected	6,823,955	0.180	0.000	0.384	0.000	0.000
Panel C: Delinquent Loan Sample						
Early Downgrade	19,051	0.418	0.000	0.493	0.000	1.000
Months Earlier	19,051	3.299	0.000	5.578	0.000	5.000



04 | Empirical Analysis and Results

4.1. Non-monotonic Lending over Lender-Borrower Distance

Panel A: Firm-Bank-Month Sample

		1	2	3	4	5
LogDistance	1	1.00				
Bank_Num	2	0.04	1.00			
LoanAmount_Share	3	-0.05	-0.51	1.00		
LoanFreq_Share	4	-0.04	-0.52	0.97	1.00	
Recent_Lending	5	0.00	0.05	0.53	0.54	1.00

Panel B: Loan Sample

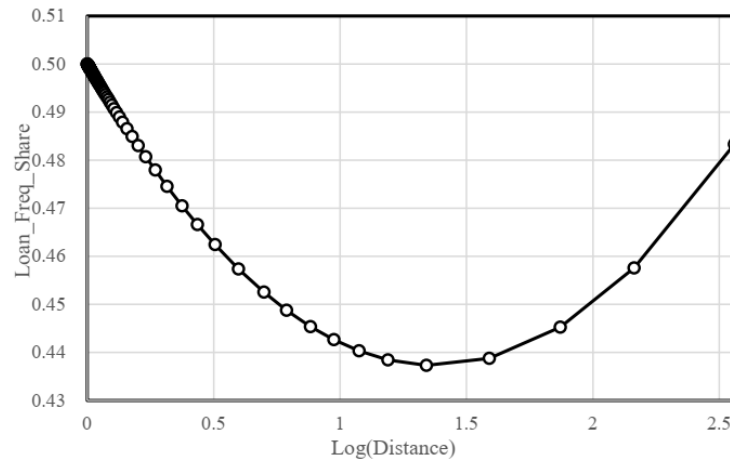
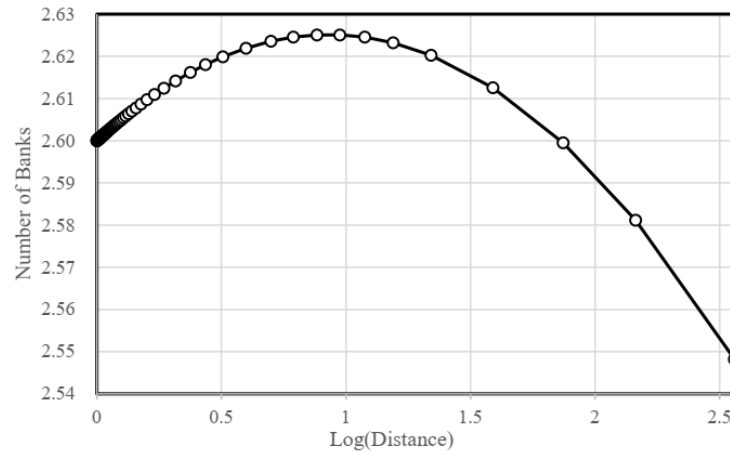
		1	2	3	4	5	6	7	8	9	10
Loanamt	1	1.00									
Rating	2	-0.03	1.00								
Maturity	3	0.30	-0.03	1.00							
Guarantee	4	0.10	-0.08	0.07	1.00						
Default	5	0.05	-0.17	0.02	0.03	1.00					
LogDistance	6	-0.03	0.03	-0.04	-0.05	-0.01	1.00				
Bank_Num	7	0.19	0.04	0.04	-0.04	-0.02	-0.05	1.00			
LoanAmount_Share	8	-0.18	0.00	-0.07	-0.03	-0.02	-0.01	-0.31	1.00		
LoanFreq_Share	9	-0.13	-0.01	-0.05	0.00	-0.01	-0.01	-0.39	0.92	1.00	
Recent_Lending	10	-0.06	0.02	-0.08	-0.02	-0.04	-0.05	0.17	0.64	0.60	1.00

4.1. Non-monotonic Lending over Lender-Borrower Distance

$$Y_{i,j,t} = \beta_1 \times \text{LogDistance}_{i,j,t} + \beta_2 \times \text{Log}^2\text{Distance}_{i,j,t} + \text{Firm} \times \text{Year FE} + \text{Bank FE} + \varepsilon \quad (1),$$

	(1)	(2)	(3)	(4)
	Bank_Num	LoanFreq_Share	LoanAmount_Share	Recent_Lending
Log ² (Distance)	-0.029*** (-3.61)	0.033*** (15.97)	0.016*** (8.71)	0.004** (2.14)
Log(Distance)	0.054*** (3.17)	-0.091*** (-20.86)	-0.037*** (-9.32)	-0.030*** (-7.25)
Firm×Year FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Observations	7,615,119	6,154,977	6,154,977	7,615,119
Adj. R-squared	0.869	0.700	0.717	0.225

4.1. Non-monotonic Lending over Lender-Borrower Distance



4.2. Distant Lending and Inter-firm Network Connection

	(1)	(2)	(3)	(4)
	Connection #	Sibling Firms Connected	Other Relation Connected	Stock Holder Connected
Log(Distance)	0.034*** (23.26)	0.015*** (26.08)	0.020*** (24.72)	0.000 (0.11)
Loan Controls	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes
Firm×Year FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Observations	6,784,908	6,784,908	6,784,908	6,784,908
Adj. R-squared	0.678	0.624	0.627	0.648

4.3. Inter-firm Network Connection and Soft Information

Panel A: Early Downgrade

	Early Downgrade							
	Long Distance Borrowers				Short Distance Borrowers			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Connection #	0.136** (2.09)				0.001 (0.04)			
Sibling Firms Connected		0.270* (1.90)				0.031 (0.42)		
Other Relation Connected			0.272* (1.69)				0.017 (0.26)	
Stock Holder Connected				0.633*** (5.32)				-0.047 (-0.72)
Firm×Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	949	949	949	949	14,651	14,651	14,651	14,651
Adj. R-squared	0.627	0.627	0.627	0.626	0.695	0.695	0.695	0.695

(To be continued)

4.3. Inter-firm Network Connection and Soft Information

Panel B: Log(Months Earlier)

	Log(Months Earlier)							
	Long Distance Borrowers				Short Distance Borrowers			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Connection #	0.336*** (5.82)				-0.025 (-0.57)			
Sibling Firms Connected		0.733*** (4.96)				-0.061 (-0.54)		
Other Relation Connected			0.791*** (5.23)				-0.068 (-0.57)	
Stock Holder Connected				-0.153 (-1.17)				-0.028 (-0.24)
Firm×Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	949	949	949	949	14,651	14,651	14,651	14,651
Adj. R-squared	0.771	0.771	0.772	0.766	0.801	0.801	0.801	0.801

4.4. Interaction of Distance and Firm Network in Soft Information

$LogDistance_{i,j,t}$

$$= \beta_1 \times Shock2009_{i,j,t} + \beta_2 \times Treatment_{i,j,t} + \beta_3 \times After2009_t + Firm \times YearFE + BankFE + \varepsilon, (2)$$

Panel A: OLS

	Early Downgrade				Log(Months Earlier)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(Distance) × Connection #	0.057** (2.29)				0.104*** (2.83)			
Log(Distance) × Sibling Firms Connected		0.111* (1.73)				0.191** (2.15)		
Log(Distance) × Other Relation Connected			0.129** (2.29)				0.271*** (3.16)	
Log(Distance) × Stock Holder Connected				0.150* (1.91)				0.224* (1.80)
Log(Distance)	-0.271*** (-4.86)	-0.239*** (-4.50)	-0.278*** (-4.70)	-0.251*** (-4.70)	-0.357*** (-3.46)	-0.297*** (-3.02)	-0.387*** (-3.51)	-0.313*** (-3.13)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,605	15,605	15,605	15,605	15,605	15,605	15,605	15,605
Adj. R-squared	0.687	0.687	0.687	0.687	0.797	0.797	0.797	0.797

(To be continued)

4.4. Interaction of Distance and Firm Network in Soft Information

$LogDistance_{i,j,t}$

$$= \beta_1 \times Shock2009_{i,j,t} + \beta_2 \times Treatment_{i,j,t} + \beta_3 \times After2009_t + Firm \times YearFE + BankFE + \varepsilon, (2)$$

Panel B: IV

	Early Downgrade				Log(Months Earlier)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(Distance) × Connection #	0.223*** (3.99)				0.507*** (5.40)			
Log(Distance) × Sibling Firms Connected		0.705*** (4.32)				0.852*** (3.35)		
Log(Distance) × Other Relation Connected			0.747*** (4.12)				1.693*** (5.13)	
Log(Distance) × Stock Holder Connected				0.150 (0.92)				1.086*** (3.95)
Log(Distance)	-0.343** (-2.11)	-0.346** (-2.04)	-0.401*** (-2.94)	-0.347** (-2.05)	-0.223 (-0.69)	-0.254 (-0.77)	-0.329 (-1.17)	-0.174 (-0.52)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,605	15,605	15,605	15,605	15,605	15,605	15,605	15,605
Wald F-stat	339.0	386.3	247.7	338.2	403.4	378.7	294.8	402.5

4.5. SME vs. Large Firms

Panel A: OLS

	Early Downgrade							
	SMEs				Large Firms			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(Distance) × Connection #	0.051** (2.02)				0.151 (0.70)			
Log(Distance) × Sibling Firms Connected		0.111* (1.71)				-1.024 (-1.41)		
Log(Distance) × Other Relation Connected			0.113** (1.99)				0.330 (1.41)	
Log(Distance) × Stock Holder Connected				0.125 (1.52)				-1.146* (-1.75)
Log(Distance)	-0.282*** (-4.55)	-0.256*** (-4.31)	-0.280*** (-4.40)	-0.265*** (-4.36)	-0.036 (-0.15)	0.070 (0.52)	-0.159 (-0.62)	0.056 (0.41)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm×Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,343	9,343	9,343	9,343	6,270	6,270	6,270	6,270
Adj. R-squared	0.649	0.649	0.649	0.649	0.744	0.744	0.744	0.745

(To be continued)

4.5. SME vs. Large Firms

Panel B: IV

	Early Downgrade							
	SMEs				Large Firms			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(Distance) × Connection #	0.182*** (3.19)				-1.638 (-0.95)			
Log(Distance) × Sibling Firms Connected		0.707*** (4.16)				-15.401 (-0.71)		
Log(Distance) × Other Relation Connected			0.505*** (2.73)				-8.9 (-0.87)	
Log(Distance) × Stock Holder Connected				0.076 (0.41)				45.705 (1.31)
Log(Distance)	-0.596*** (-10.35)	-0.608*** (-10.44)	-0.593*** (-9.98)	-0.629*** (-10.73)	5.246** (2.16)	-13.586 (-0.54)	13.120 (1.00)	3.324 (1.52)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm×Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,343	9,343	9,343	9,343	6,270	6,270	6,270	6,270
Wald F-stat	114.4	245.0	56.43	104.5	6.039	0.171	0.679	1.563

without vs. with guarantee

Panel A: Early Downgrade

	Early Downgrade							
	Without Guarantee				With Guarantee			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Connection #	0.055*** (2.71)				-0.043* (-1.85)			
Sibling Firms Connected		0.115* (1.73)				-0.040 (-0.60)		
Other Relation Connected			0.140*** (3.73)				-0.107** (-2.10)	
Stock Holder Connected				0.061 (1.04)				-0.112* (-1.66)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm×Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,954	8,954	8,954	8,954	6,249	6,249	6,249	6,249
Adj. R-squared	0.784	0.784	0.784	0.783	0.658	0.658	0.659	0.658

(To be continued)

without vs. with guarantee

Panel B: Log(Months Earlier)

	Log(Months Earlier)							
	Without Guarantee				With Guarantee			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Connection #	0.065* (1.84)				-0.106*** (-2.81)			
Sibling Firms Connected		0.155 (1.45)				-0.254** (-2.53)		
Other Relation Connected			0.169*** (2.81)				-0.274*** (-3.05)	
Stock Holder Connected				0.051 (0.48)				-0.114 (-1.01)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm×Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,954	8,954	8,954	8,954	6,249	6,249	6,249	6,249
Adj. R-squared	0.865	0.865	0.865	0.865	0.800	0.800	0.800	0.799

4.6. Inter-firm Network Connection and Loan Performance

	(1)	(2)	(3)	(4)
Connection #	-0.001*** (-8.51)			
Sibling Firms Connected		-0.002*** (-8.08)		
Other Relation Connected			-0.001*** (-9.23)	
Stock Holder Connected				0.000 (0.01)
Loan Controls	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes
Firm×Year FE	Yes	Yes	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Observations	5,563,124	5,563,124	5,563,124	5,563,124
Adj. R-squared	0.267	0.267	0.267	0.267



05 | Conclusion



谢谢!

THANK YOU!

