

“If You Don’t Know Me by Now ...”

Information Collection by Banks in Lending to Private Firms

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BCBS – ECB – CEPR Joint Conference

December 9, 2025

The views expressed in this presentation are those of the authors only and do not reflect those of their affiliated institutions.

Motivation

Banks are special in overcoming information asymmetries in lending.

- ▶ e.g., [Leland and Pyle, 1977](#); [Fama, 1985](#)

Through interaction with corporate borrowers, banks makes own private assessment of the creditworthiness of the borrowers.

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- 1. What's in banks' credit assessment about private borrowers?**
- 2. How does credit assessment evolve over time?**
- 3. What's the implication?**

- ▶ e.g., [Hauswald and Marquez, 2003](#)

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- ▶ Simple theory to guide the discussion.
- ▶ Identification
 - ▶ Exploit the nature of banks' credit assessment embedded in the rating of corporate loans on balance sheets.

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 - ▶ measure of private assessment, key characteristics.
- ▶ Simple theory to guide the discussion.
- ▶ Identification
 - ▶ Exploit the nature of banks' credit assessment embedded in the rating of corporate loans on balance sheets.
 - ▶ Compare at a given point in time, the implication of assessment contained in loans to the **same private borrower** by **distinct** banks, who differ in private assessments.
 - ▶ Khwaja and Mian, 2008

Key Findings

1. What's in banks' credit assessment about private firms?
 - ▶ Depth, Positivity, and Negativity.
2. How does credit assessment evolve over time?
 - ▶ The “learning process” varies across banks and firms characteristics.
3. What's the implication?
 - ▶ Private assessment has significant implications on lending outcomes.

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This paper contributes to the literature on the role of relationship and distance in lending, and banks' credit assessment of private borrowers.

- ▶ Sharpe, 1990; Rajan, 1992; Petersen and Rajan, 1995; von Thadden, 2004; Hauswald, 2006; Nakamura and Roszbach, 2018; Boot, 2000; Ongena and Smith, 2000; Petersen and Rajan, 2002; Berger and Udell, 2002; Elyasiani and Goldberg, 2004

Policy Implication

- ▶ Information asymmetries matter for financial intermediation, esp. for banks.
 - ▶ Overcoming asymmetries a key function in bank learning.
 - ▶ Distance and (the lack of) of relationship barriers are often noted in the literature.
- ▶ Finding is relevant not just for the banking sector:
 - ▶ Private assessment practices by banks vs other FIs (NBFIs, fintech).
 - ▶ Potential drivers of private assessment and rents.

Methodology

- ▶ Model is multiplicative heteroskedasticity
 - ▶ Mean equation: $y_i = \beta' X_i + u_i$
 - ▶ Variance equation $\sigma_i^2 = \exp(\gamma' Z_i)$
- ▶ X is a set of observables/financial information; residual is private assessment
- ▶ Extreme cases:
 - ▶ “All financial information”: R^2 of mean equation $\rightarrow 1$
 - ▶ “All private assessment”: R^2 of mean equation $\rightarrow 0$
- ▶ Model estimated by MLE (normality assumption)

How Do They Find It?

$$\text{Rating}_{ibt} = X_{ibt}\beta + \varepsilon_{ibt}$$

$$\text{Depth} \equiv \ln(\varepsilon_{ibt}^2) = Z_{ibt}\gamma + \nu_{ibt}$$

$$\text{Better}_{ibt} \equiv \max(-\varepsilon_{ibt}, 0) = Z_{ibt}\theta + \eta_{ibt}$$

$$\text{Worse}_{ibt} \equiv \max(\varepsilon_{ibt}, 0) = Z_{ibt}\phi + \chi_{ibt}$$

Then

- ▶ Loan Outcomes $\sim \{\text{Depth}, \text{Better}, \text{Worse}\}$
- ▶ $\{\text{Depth}, \text{Better}, \text{Worse}\} \sim \text{Relationship Length}$
 $\times \{\text{FirmSize}, \text{Leverage}, \text{Distance}\}$

Identify Banks' Private Assessment from Loan Rating

- ▶ Firm and bank characteristics, as well as the distance between the them are strong predictors for banks' internal ratings
- ▶ [Liberti and Petersen, 2018](#); [Plosser and Santos, 2018](#).

Table 1. Main Results: Bank Rating of Firm, Depth and Direction of Private Information

Model	(1)
<i>Sample</i>	<i>All bank ratings of firms</i>
Definition	Standardized bank rating of firm (1 = best, 10 = worst)
<i>Dependent Variable Name</i>	<i>Bank Rating of Firm</i>
<u>Independent variables</u>	
<u>Firm Variables</u>	
<i>Ln(Firm assets)</i>	-0.110*** (-36.30)
<i>Firm ROA</i>	-1.942*** (-88.48)
<i>Firm leverage</i>	0.449*** (43.92)
<i>Green</i>	-0.032* (-1.85)
<i>Brown</i>	0.057 (1.60)
<u>Bank Variables</u>	
<i>Ln(Bank assets)</i>	0.099*** (36.09)
<i>Bank equity ratio</i>	3.535*** (18.63)
<i>Bank NPL ratio</i>	-4.994*** (-31.15)
<i>Bank liquid asset ratio</i>	0.475*** (9.18)
<i>Bank ROA</i>	12.326*** (13.13)
<u>Static Bank-Firm Variable</u>	
<i>Distance bank HQ to firm</i>	0.008*** (3.68)
Observations	2,717,102
Adjusted R-squared	0.129

Heterogeneity in Banks' Private Assessment Formation

- ▶ We derive three measures for banks' private assessment of the borrowers: **depth, positivity, and negativity**.
- ▶ Private assessment can vary across banks, given different incentives.
- ▶ It can also vary depending on the type of borrowers banks deal with.
- ▶ How does the formation process differ across:
 - ▶ Firms, Banks, and geographic distances

The Formation of Private Assessment

- ▶ Banks, in general, update the assessment as they learn about the borrowers over time.
 - ▶ The private assessment tends to be positive in nature.

Table 2a. Bank-firm Relationship Length and Banks' Private Information

<i>Dependent Variable</i>	(1)	(2)	(3)
	<i>Depth of Private Information</i>	<i>Better Private Information</i>	<i>Worse Private Information</i>
Independent variables			
<u>Dynamic Bank-Firm Variable</u>			
Length bank-firm relationship	3.693*** (3.31)	6.760*** (19.98)	-5.492*** (-20.95)
Bank and Firm Controls	YES	YES	YES
Observations	2,715,622	2,715,622	2,715,622
Adjusted R-squared	0.010	0.016	0.007

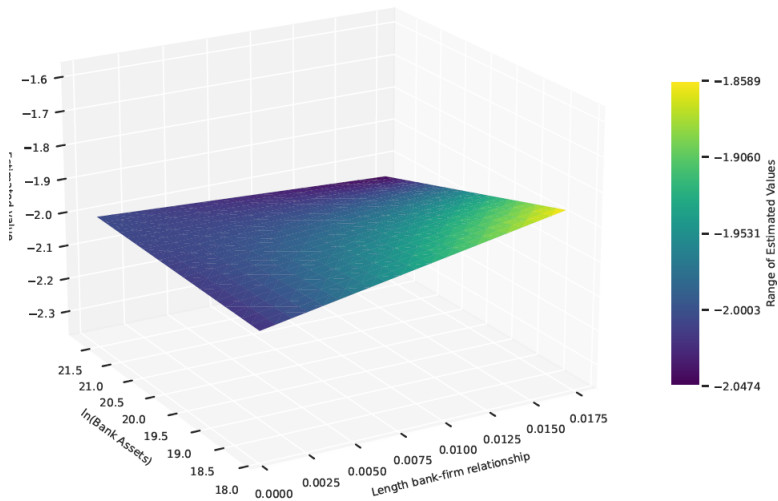
Bank Characteristics and the Updating of Credit Assessment

- ▶ Smaller banks are more likely to form their own credit assessment.

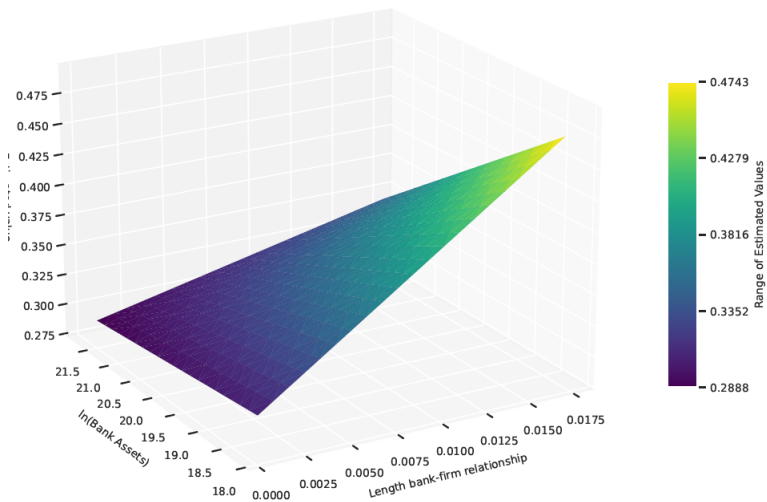
Dependent Variable	Depth	Better	Worse
Independent variables			
Ln(Bank assets)	0.006 (0.86)	-0.004* (-1.92)	-0.012*** (-5.73)
Ln(Bank assets) * Length bank-firm relationship	-3.434*** (-3.98)	-1.903*** (-7.59)	0.630*** (2.87)
Firm, Bank, and Bank-Firm Relationship Controls	Yes	Yes	Yes
Adjusted R-squared	0.010	0.017	0.007

Notes: The table reports the coefficients with t-statistics in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

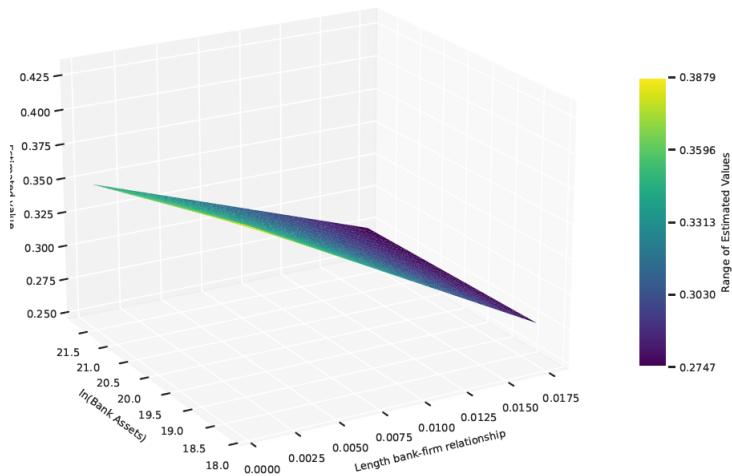
Depth of Private Information



Better Private Information

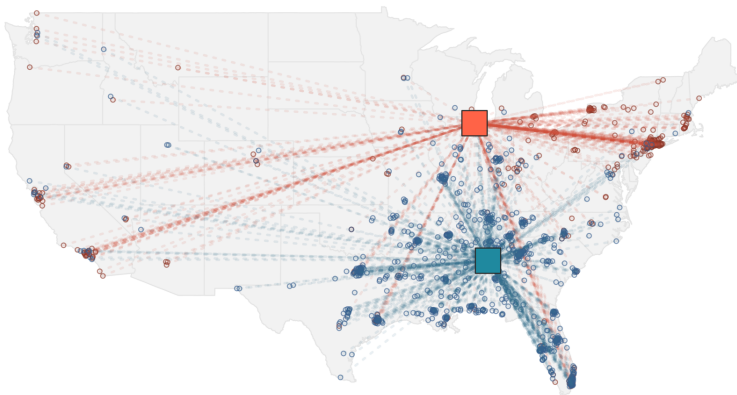


Worse Private Information



Geographic Distance

- ▶ Firms located far away are disadvantaged in the beginning.
- ▶ Does the situation change as the relationship between the bank and the firm becomes more intense?
- ▶ Classic literature on relationship lending suggests the answer is yes (e.g. Petersen and Rajan, 1995; Berger and Udell, 1996)



Geographic Distance

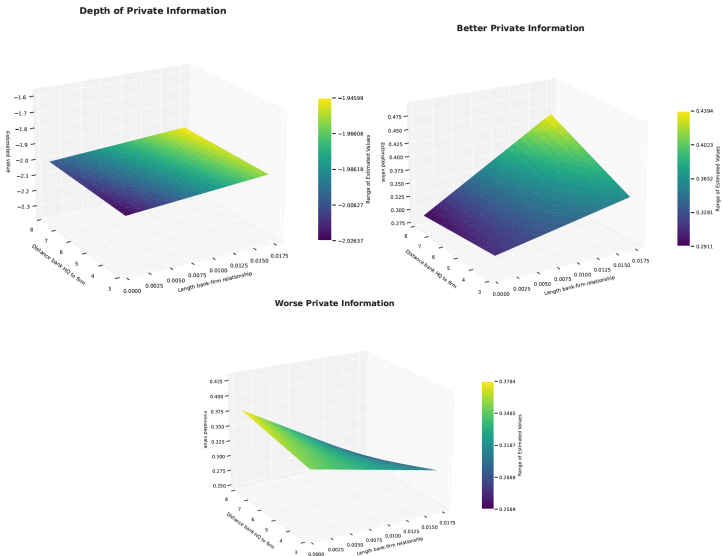
- ▶ A more private assessment is formed for distant borrowers as the relationship lengthens.

Dependent Variable	Depth	Better	Worse
Independent variables			
Distance bank HQ to firm	-0.019 (-1.51)	-0.000 (-0.60)	0.001** (2.27)
Distance bank HQ to firm * Length bank-firm relationship	5.601*** (3.67)	0.224*** (3.85)	-0.065 (-1.11)
Firm, Bank, and Bank-Firm Relationship Controls	Yes	Yes	Yes
Adjusted R-squared	0.027	0.014	0.013

Notes: The table reports the coefficients with t-statistics in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

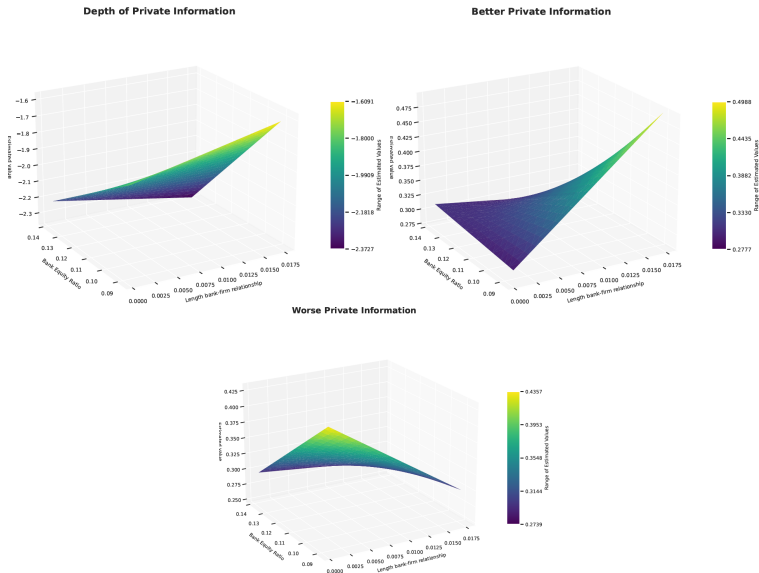
Geographic Distance

Firms located far away initially face disadvantages, but banks gradually update their assessments to be mainly positive over time.



Bank Capital

Less well-capitalized banks are more likely to form a positive private assessment.



Firm Size

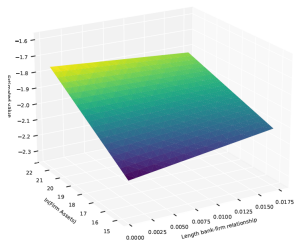
- ▶ Interestingly, more positive assessment for larger private firms over time.

Dependent Variable	Depth	Better	Worse
Independent variables			
Ln(Firm assets)	0.058*** (10.27)	0.003 (1.59)	0.012*** (7.34)
Ln(Firm assets) * Length bank-firm relationship	-1.671** (-2.24)	0.603** (2.12)	-0.916*** (-4.21)
Firm, Bank, and Bank-Firm Relationship Controls	Yes	Yes	Yes
Adjusted R-squared	0.010	0.016	0.007

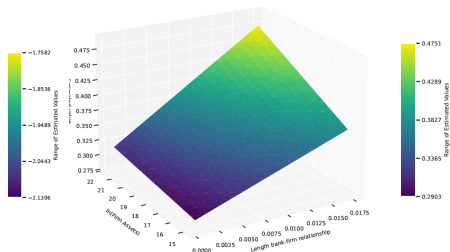
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Firm Size

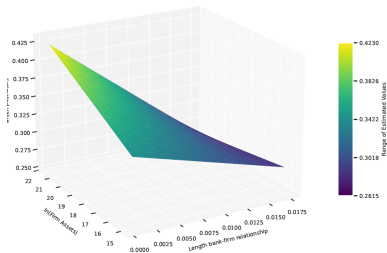
Depth of Private Information



Better Private Information



Worse Private Information



COVID-19

- ▶ A smaller amount of private information during the COVID-19 lockdown, especially worse private assessment.

Dependent Variable	Depth	Better	Worse
Independent variables			
COVID-19 Crisis	-0.034* (-1.69)	-0.042*** (-12.16)	0.050*** (10.26)
COVID-19 Crisis * Length bank-firm relationship	-4.632** (-2.41)	0.749* (1.87)	-2.730*** (-5.98)
Firm, Bank, and Bank-Firm Relationship Controls	Yes	Yes	Yes
Adjusted R-squared	0.010	0.016	0.007

Notes: The table reports the coefficients with t-statistics in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Regression Results for the Loan Terms

- ▶ Depth, Positivity, and Negativity.
- ▶ Depth and negativity assessment increase rate and lower maturity.
- ▶ Positive assessment decreases rate and increases maturity.
 - ▶ Uncertainty about borrower's quality leads to higher risk premium and rationing. KM

Table 4. Impact of Private Information on Loan Terms

<i>Dependent Variable</i>	(1)	(2)	(3)	(1)	(2)	(3)
<i>Loan Interest Rate Spread</i>				<i>Ln(Loan Maturity)</i>		
<i>Independent variables</i>						
Depth of Private Information	0.023*** (4.31)			-0.001 (-1.04)		
Better Private Information		-0.423*** (-22.34)			0.042*** (2.80)	
Worse Private Information			0.388*** (25.78)			-0.042*** (-6.95)
<i>Firm, Bank and Loan Controls</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Bank and Industry FE</i>	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,121,365	2,121,365	2,121,365	2,713,058	2,713,058	2,713,058
Adjusted R-squared	0.112	0.121	0.128	0.283	0.283	0.283

<i>Dependent Variable</i>	(1)	(2)	(3)	(1)	(2)	(3)
<i>Ln(Loan Amount)</i>				<i>d(Collateralized)</i>		
<i>Independent variables</i>						
Depth of Private Information	-0.001 (-0.53)			-0.003*** (-8.18)		
Better Private Information		0.022 (1.45)			-0.037*** (-5.68)	
Worse Private Information			-0.013* (-1.82)			0.013*** (8.17)
<i>Firm, Bank and Loan Controls</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Bank and Industry FE</i>	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,715,622	2,715,622	2,715,622	2,715,622	2,715,622	2,715,622
Adjusted R-squared	0.393	0.393	0.393	0.148	0.151	0.148

Further Checks

- ▶ Heteroscedastic model
 - ▶ Adding controls for borrowers' loan demand (sector $\times$ time FE) does not materially change results.
 - ▶ private assessment of different banks of the same obligor (Khwaja and Mian, 2008) [more](#)
 - ▶ Controls for borrowers' loan demand (firm $\times$ time FE): Results similar.
 - ▶ But a much smaller sample (many borrow from one bank only).
- ▶ Inclusion/exclusion of COVID-19 shocks.
- ▶ Inclusion of public firms.
 - ▶ Similar regression results.

Conclusions

- ▶ Banks are special in overcoming information asymmetries in lending
- ▶ In this paper, we visualize banks' updating credit assessment embedded in their evaluation of borrowers.
- ▶ The findings are consistent with the classic banking literature.
- ▶ Banks adjust loan terms according to changes in credit assessment.

Thank you!

Regression Results for the Loan Terms - KM Test

- Similar results as compared to Table 4.

Table A4. Impact of Private Information on Loan Terms – KM test

<i>Dependent Variable</i>	(1)	(2)	(3)	(1)	(2)	(3)
<i>Loan Interest Rate Spread</i>				<i>Ln(Loan Maturity)</i>		
<i>Independent variables</i>						
Depth of Private Information	0.003** (2.33)			0.001 (1.51)		
Better Private Information		-0.084*** (-6.57)			0.012** (2.36)	
Worse Private Information			0.088*** (10.52)			-0.003 (-1.04)
<i>Firm, Bank and Loan Controls</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Bank FE</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Firm and Year FE</i>	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,011,152	2,011,152	2,011,152	2,599,364	2,599,364	2,599,364
Adjusted R-squared	0.786	0.786	0.786	0.722	0.722	0.722

<i>Dependent Variable</i>	(1)	(2)	(3)	(1)	(2)	(3)
<i>Ln(Loan Amount)</i>				<i>d(Collateralized)</i>		
<i>Independent variables</i>						
Depth of Private Information	0.000 (0.24)			-0.000 (-0.22)		
Better Private Information		0.036*** (5.53)			-0.007*** (-3.44)	
Worse Private Information			-0.022*** (-4.96)			0.008*** (5.29)
<i>Firm, Bank and Loan Controls</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Bank FE</i>	Yes	Yes	Yes	Yes	Yes	Yes
<i>Firm and Year FE</i>	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,601,836	2,601,836	2,601,836	2,601,836	2,601,836	2,601,836
Adjusted R-squared	0.692	0.692	0.692	0.677	0.677	0.677

Private Assessment at Inception

- ▶ Private assessment at inception
 - ▶ Certain firms are severely disadvantaged (e.g. firms located afar).

Table 1. Main Results: Bank Rating of Firm, Depth and Direction of Private Information			
Model	(2)	(3)	(4)
Sample	Length bank-firm relationship < 0.25 Years		
Definition	Ln(Residual squared)	Residual if Residual < 0	Residual if Residual > 0
Dependent Variable	Depth of Private	Better Private	Worse Private
Name	Information	Information	Information
<u>Independent variables</u>			
<u>Firm Variables</u>			
<i>Ln(Firm assets)</i>	0.111*** (18.33)	-0.010*** (-5.75)	0.038*** (19.76)
<i>Firm ROA</i>	0.543*** (12.11)	0.156*** (17.95)	-0.012 (-1.05)
<i>Firm leverage</i>	1.404*** (19.89)	-0.311*** (-28.33)	0.519*** (21.90)
<i>Green</i>	-0.159** (-2.33)	-0.027** (-2.25)	-0.016 (-1.27)
<i>Brown</i>	0.140 (1.05)	0.107*** (3.43)	-0.069*** (-2.78)
<u>Bank Variables</u>			
<i>Ln(Bank assets)</i>	0.084*** (6.68)	0.005** (2.19)	-0.003 (-0.94)
<i>Bank equity ratio</i>	-9.831*** (-10.54)	1.164*** (6.76)	-4.271*** (-20.69)
<i>Bank NPL ratio</i>	-2.646*** (-3.08)	1.557*** (10.73)	-1.057*** (-4.84)
<i>Bank liquid asset ratio</i>	-1.513*** (-6.23)	0.401*** (7.75)	-0.532*** (-8.97)
<i>Bank ROA</i>	-25.303*** (-3.25)	0.580 (0.44)	-2.004 (-0.93)
<u>Static Bank-Firm Variable</u>			
<i>Distance bank HQ to firm</i>	-0.012 (-1.32)	-0.007*** (-4.29)	0.001 (0.37)
Observations	61,149	61,149	61,149
Adjusted R-squared	0.019	0.030	0.043

The Updating of Credit Assessment

- ▶ Banks, in general, update the assessment as they learn about the borrowers over time.
 - ▶ The assessment collected tends to be positive in nature.

Table 2b. Bank-firm Relationship Length and Banks' Private Information

<i>Dependent Variable</i>	(1)	(2)	(3)
	<i>Depth of Private Information</i>	<i>Better Private Information</i>	<i>Worse Private Information</i>
Independent variables			
<u>Dynamic Bank-Firm Variable</u>			
Length bank-firm relationship (0.25 << 3 years)	0.176*** (14.53)	0.006*** (3.08)	0.049*** (17.15)
Length bank-firm relationship (3 << 5 years)	0.245*** (14.90)	0.036*** (11.46)	0.054*** (13.85)
Length bank-firm relationship (> 5 years)	0.210*** (12.54)	0.080*** (23.66)	-0.002 (-0.60)
Bank and Firm Controls	YES	YES	YES
Observations	2,715,622	2,715,622	2,715,622
Adjusted R-squared	0.010	0.013	0.006