Bank Monitoring with On-Site Inspections

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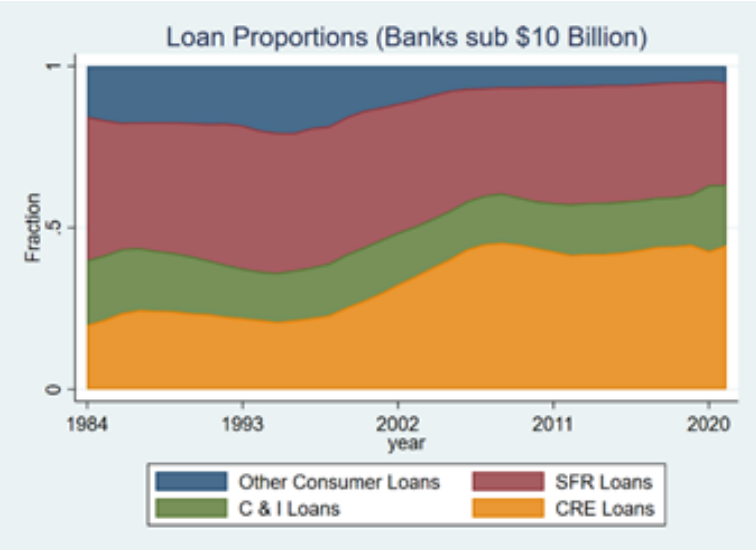
[1]Views and opinions expressed in this presentation reflect those of the authors and do not necessarily reflect those of the FDIC or the United States.

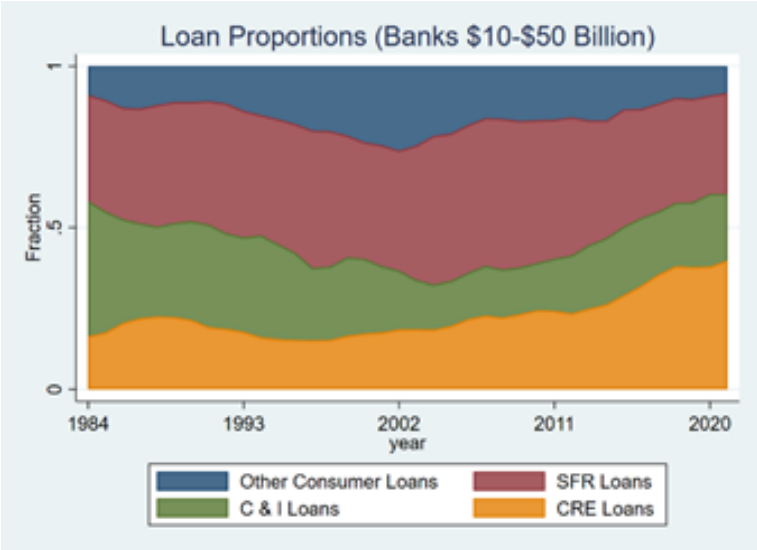
Background: Bank Lending

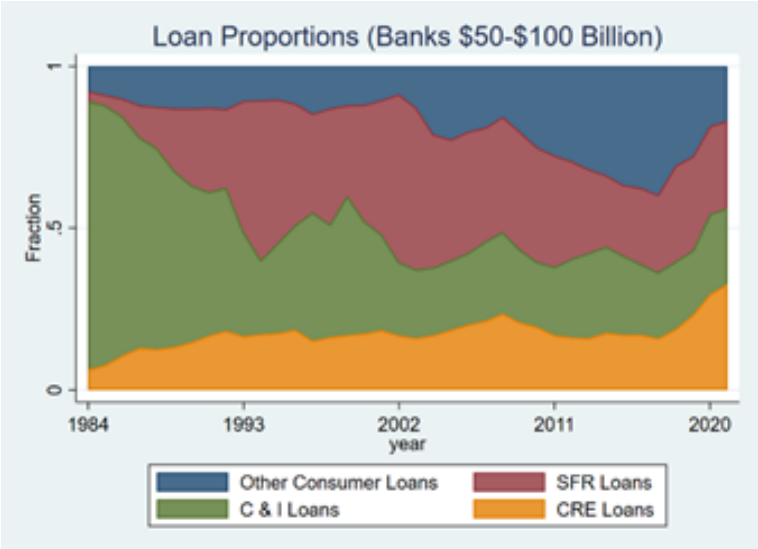
- Increasing amounts of lending activity are migrating away from banks
- Loans are increasingly originated by other Fintechs or non-bank lenders
  - Common for these loans to be securitized or sold
  - Mortgages: Buchak, Matvos, Piskorski, and Seru (2018)
  - Student loans: Berman and Stivers (2016)
  - Automobile and credit cards: Cetorelli, Mollineaux and Peristani (2012)
- Bank balance sheets are becoming more concentrated in a few categories non-bank lenders have chosen not to enter
  - Commercial and industrial loans
  - Commercial real estate loans
    - Riskiest asset class: construction loans (Balla, Mazur, Prescott, and Walter, 2019)

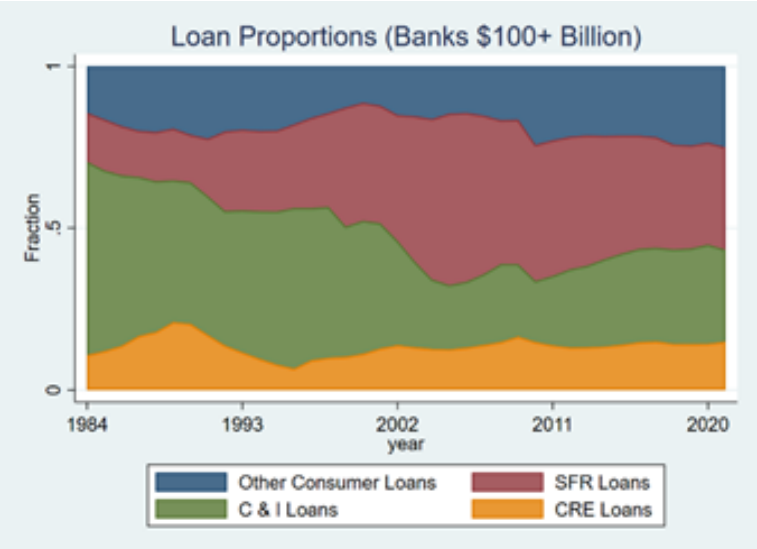
Banks may showcase their strengths in loan categories without non-banks.

Asset Composition by Bank Size









Source: Call Reports

Motivation: Why do we care about banks?

What is so special about a bank?

1. Superior lending technologies.
2. Superior ability to match up liquidity needs between deposit-taking and loan-making
3. Superior monitoring abilities

Diamond (1984), Diamond and Rajan (2001) and Kashyap, Rajan, and Stein (2002) suggest a role played by all three

Research Question

1) What determines bank monitoring actions?
2) Do banks use information they collect while monitoring?
3) Does monitoring affect loan performance?

To answer these questions, we analyze nearly 30,000 construction loans

- We observe frequency, timing, and reports associated with *on-site inspections*
- Bank incentives to monitor these loans are high
  - Riskiest asset class within commercial real estate loans
  - Unsyndicated, unsecuritized, and illiquid asset class
  - Loans are without many traditional covenants that could mitigate bank incentives to monitor because the underlying collateral does not generate income

What Do We Theoretically Know About Monitoring?

Extant theory literature on bank monitoring is vast

- Banks have a comparative advantage in producing information (monitoring), as compared to dispersed depositors, equityholders, or debtholders
  - Diamond (1984), Fama (1985), James (1987), Diamond (1991), Rajan (1992), Rajan and Winton (1995)
- Determinants of monitoring include collateral, covenants, bank asset concentration, moral hazard problems, and loan terms
  - Smith and Warner (1979), Smith (1993), Rajan and Winton (1995), Boot and Thakor (1997)
- Monitoring can positively influence loan performance
  - Leland and Pyle (1977), Diamond (1984), Diamond (1991), Calomiris and Kahn (1991), Gorton and Kahn (2000), Byers et. al., (2008), Branzoli and Fringuellotti (2019), Kashyap et. al, (2019)

Empirical literature struggles to directly test these theories

Existing proxies for monitoring determinants include:

- Syndicate structure: Lee and Mullineaux (2004), Sufi (2007), Gustafason, Ivanov, and Meisenzahl (2021)
- Distance: Petersen and Rajan (2002), Degryse and Ongena (2005)
- Montoring incentives (covenant design): Wang and Xia (2014) Prilmeier (2017)

Indirect effectiveness of monitoring attributed to:

- Stock returns: James (1987), Focarelli et al. (2008), Addoum and Murfin (2019)
- Debt yields: Datta et al. (1999)

More direct monitoring measures (covenant violations or unique data):

- Covenant Violations: Acharya, Almeida, Ippolito, and Perez Orive (2020), Bird, Ertan, Karolyi, and Ruchti (2022a,b), Chodorow-Reich and Falato (2022)
- Textual analysis: Gustafason, Ivanov, and Meisenzahl (2021)
- Intervals between borrower or collateral reviews: Mester, Nakamura, Renault (2006), Cerqueiro, Ongena, Roszbach (2016)

Contribution

1. We empirically test theories predicting circumstances under which banks monitor.
   - The bank's incentives to monitor construction loans are high
     - Concentrated portfolio, risky loans, collateral does not generate income, no standard covenants that may temper monitoring incentives
   - We are the only study to examine monitoring in non-syndicated loans to small borrowers
   - Banks trade off favorable loan characteristics with monitoring
2. We show that banks use information they collect monitoring.
3. We show that monitoring improves loan performance
   - Our instrumental variable framework provides identification and allows for a causal interpretation
4. We are the first study examining the determinants of construction loan default (PD)
   - Construction lending on Call Reports was $403 billion as of Q4 2021
   - Primary contributor to bank failures
   - Our study complements Johnston-Ross, Nichols, and Shibut (2021) who look at loss given default (LGD)

What is a Construction Loan?

Construction loans are unique loans

- Investors typically form a project-specific LLC to act as the official borrower
  - Individuals may not be this sophisticated
- Underlying collateral does not generate income until completion
- Borrowers commonly pledge a parcel of land or cash
- Draw schedule is set at loan origination

Structure of construction loans

- Terms include an interest rate, committed amount, term to maturity
- Hard underwriting criteria: CLTV, FICO
- Can be built for a predetermined borrower or "on spec"
- Buyer does not pay principal until maturity date
- Two types of default: maturity and term

Monitoring in Construction Loans

On-site inspections

- Monitoring is intense for construction loans
- Draws must be approved by the bank and are often subject to inspections
- Conducted by specialized third-parties
- Inspectors document project progress
  - Check for accuracy of the draw request
  - Assess the condition of the job site
  - Evaluate the project's stage of completion
  - Write up their reports and include photos

Data Source

FDIC proprietary data from a large failed bank

- Bank failed primarily due to performance of residential lending
- Data collected by the FDIC
- Bank had a large lending portfolio in construction loans
- Includes data at the frequency the bank recorded it

Construction loan portfolio

- Transaction-level data spanning approximately 10 years
- 28,939 loans covering 11.6 million loan-days
- On-site inspection reports
- Loan origination characteristics
- Borrower actions such as payments and drawdowns
- Loan outcomes

Variables of Interest

Monitoring measures

- INSPECTIONDATE: Indicator variable that takes a value of 1 on days where there is an on-site inspection
- LOG(ALLINSPECTIONS): Loan-level variable of total number of inspections
- ALLTOTERMINAL: Percentage of active loan days on which an on-site inspection occurred
- TIMETOFIRST: Number of months between the loan origination date and the first on-site inspection

Origination Variables:

- Standard variables: loan amount, origination spread, term to maturity, origination fees, CLTV, and FICO
- Unique variables: Speculative loan, whether the borrower was the builder, and number of budget items
- Relationship variables: Relationships between the bank and the borrower borrower or contractor

Loan-Level Variables

Loan-Level Variables			
Variable	N	Mean	SD
ALLDRAWS	28,939	12.52	8.33
ALLINSPECTIONS	28,939	8.15	5.17
Log(ALLINSPECTIONS)	27,803	1.97	0.62
ALLTOTERMINAL	28,939	2.31	1.54
TIMETOFIRST	27,567	3.01	2.93
EVENTUALDEFAULT	28,939	0.05	0.22
LOANAMT	28,939	448,303	416,068
LOG(LOANAMT)	28,939	12.76	0.7
ORIGSPREAD	28,939	3.69	1.12
TERM	28,939	13.68	5.62
FEES	28,939	0.2	0.66
FICO	28,939	712.5	48.62
CLTV	28,939	75.36	13.09
SPECULATING	28,939	0.09	0.28
OWNERBUILDER	28,939	0.46	0.498
BUDGETITEM	28,939	58.9	15.1

Loan-Day Variables

Loan-Day Variables			
Variable	N	Mean	SD
INSPECTIONDATE	11,585,108	0.02	0.14
COMMENTLENGTH	143,074	177.3	196.5
POSITIVEWORDS	143,074	1.40	1.47
NEGATIVEWORDS	143,074	2.33	2.11
DRAW DENIED	355,890	0.12	0.32
HOUSING PRICE INDEX	10,805,736	8.96	11.6
FORECLOSURE RATE	11,537,601	0.6	1.04
YEARBEFOREFAILURE	11,585,108	0.18	0.28
STARTOFYEARBEFOREFAILURE	11,585,108	0.08	0.39

Origination Characteristics

Do banks trade-off monitoring intensity with loan origination characteristics, such as price, quantity, and fees?

- Theoretical predictions suggest banks derive more value from monitoring shorter term loans (Rajan and Winton, 1995; Barclay and Smith, 1995; and Park, 2000)

OLS framework with fixed effects

- Monitoring: Monitoring measure
- Origination: LOG(LOANAMT), ORIGSPREAD, TERM, FEES, CLTV, FICO, SPECULATING, OWNERBUILDER, BUDGETITEMS
- Relationships: REPEATBORROWER or REPEATCONTRACTOR
- X_l : Vector of fixed effects including loan origination day, property zip code (3 digit), borrower zip code (3 digit)

$$\text{Monitoring}_l = \gamma_1' \, \text{Origination}_l + \beta X_l + \epsilon_l \tag{1}$$

Results: Banks Trade-off Monitoring with Favorable Loan Origination Terms

	(1) Log(ALLINSPECTIONS)	(2) ALLTOTERMINAL	(3) TIMETOFIRST
LOG(LOANAMT)	0.132***	0.242***	-0.508***
	(18.68)	(14.92)	(-15.71)
ORIGSPREAD	-0.0126***	-0.0413***	0.0371**
	(-2.96)	(-4.02)	(1.91)
TERM	0.0182***	-0.0890***	0.278***
	(24.91)	(-50.77)	(83.40)
FEES	-0.0113*	-0.0261*	-0.187***
	(-1.83)	(-1.81)	(-6.60)
CLTV	0.00251***	0.00419***	0.0162***
	(8.62)	(5.93)	(12.18)
FICO	-0.00163***	-0.00327***	0.00116***
	(-22.27)	(-18.36)	(3.48)
SPECULATING	0.105***	0.344***	-0.846***
	(7.77)	(10.37)	(-13.62)
OWNERBUILDER	0.126***	0.249***	-0.286***
	(16.52)	(13.44)	(-8.20)
BUDGETITEM	0.00615***	0.0158***	-0.000766
	(20.7)	(24.25)	(-0.56)
Property Zip Fixed Effects	YES	YES	YES
Borrower Zip Fixed Effects	YES	YES	YES
Loan Origination Day Fixed Effects	YES	YES	YES
Observations	27,803	28,939	27,567
Observations	0.352	0.347	0.399

Do Relationships Affect Monitoring?

Bank-borrower

- A vast literature has focused on the relationship between banks and borrowers (Berger and Udell, 1993)
- A primary reason relationships are valuable is that banks have greater capabilities to monitor these loans (Holstrom and Tirole, 1997; Boot and Thakor, 2000).

Repeated interactions (relationships)

- Allow a bank to transfer information between projects
- Give the bank more exposure to parties with multiple interactions

We define a relationship to be a repeated construction loan

Banks Monitor Relationship Loans Less

	(1) Log(ALLINSPECTIONS)	(2) ALLTOTERMINAL	(3) TIMETOFIRST
REPEATBORROWER	-0.06669***	-0.114***	0.294**
	(-3.46)	(-2.45)	(3.32)
Table 3 Controls	YES	YES	YES
Property Zip Fixed Effects	YES	YES	YES
Borrower Zip Fixed Effects	YES	YES	YES
Loan Origination Day Fixed Effects	YES	YES	YES
Observations	27,803	28,939	27,567
R-squared	0.353	0.347	0.399

Do Banks Use the Information They Collect Monitoring?

On-Site inspection report text

- These reports may contain valuable information!
- Borrower draw requests may trigger on-site inspections

Draw-level empirical framework links on-site inspection reports to draw requests

$$\text{DRAWDENIED}_{dlt} = \gamma_1' \, \text{TextMeasure}_{dlt} + \beta X_t + \zeta Z_l + \epsilon_{dlt} \tag{2}$$

- Each loan has multiple draws so we use a panel framework
- TextMeasure_l: report-level measures of textual sentiment (POSITIVEWORDS, NEGATIVEWORDS, COMMENTLENGTH)
- X_t: daily fixed effects
- Z_l: loan-level fixed effects

Draw Requests are Denied More When Reports are Less Positive (More Negative)

	(1) DRAWDENIED	(2) DRAWDENIED	(3) DRAWDENIED	(4) DRAWDENIED
POSITIVEWORDS	-0.00181**	-0.00206**	-0.00243***	-0.000913
	(-2.15)	(-2.45)	(-2.98)	(-0.76)
NEGATIVEWORDS	0.00164***	0.00149***	0.00234***	0.00372***
	(2.84)	(2.65)	(4.06)	(5.11)
COMMENTLENGTH	0.00000179	0.00000172	0.0000131*	0.0000185
	(0.26)	(0.25)	(1.76)	(1.63)
Day Fixed Effects	NO	YES	YES	YES
Loan Fixed Effects	NO	NO	NO	YES
Inspector Fixed Effects	NO	NO	YES	NO
Table 3 and 4 Controls	YES	YES	NO	NO
Standard Errors Clustered at Loan Level	YES	YES	YES	YES
Observations	143,074	143,074	143,074	143,074
R-Squared	0.048	0.088	0.048	0.044

What Does Monitoring Accomplish?

What is the incremental effect of monitoring on loan default?

First, we need to understand the determinants of construction default

- No studies show this!

Summary: typical measures of loan risk are associated with higher default

- We show this in the cross-section

Implement OLS framework in the cross section similar to Equation 1

$$EventualDefault_l = \gamma_1' Variable_l + \beta X_t + \epsilon_l \tag{3}$$

Determinants of Construction Loan Default

	(1) EVENTUALDEFAULT
LOG(LOANAMT)	-0.0396***
	(-15.42)
ORIGSPREAD	0.00221
	(1.36)
TERM	0.00626***
	(22.54)
FEES	0.0681***
	(29.93)
CLTV	0.000738***
	(6.60)
FICO	-0.000276***
	(-9.79)
SPECULATING	0.00741
	(1.32)
OWNERBUILDER	-0.0116***
	(-3.94)
BUDGETITEM	0.000423***
	(4.09)
REPEATBORROWER	-0.00462
	(-0.63)
Property Zip Fixed Effects	YES
Borrower Zip Fixed Effects	YES
Loan Origination Day Fixed Effects	YES
Observations	28,939
R-squared	0.251

Instrumental Variable Framework

There is a classical endogeneity problem between monitoring and default

- Monitoring may improve loan performance, but bad loans may be monitored more and default more frequently

We implement an instrumental variable (IV) framework

- Need an instrument correlated with monitoring
- Instrument cannot be correlated with default

Chosen instrument: Draw Schedule

- Draw schedules are determined at the loan origination
- The bank has strong incentives to monitor the loan just before the borrower can draw down
- Loan officer comments specifically say that draw requests triggered the inspection
- Draw schedule should not directly impact default conditional on controls
- Inspections are attached to draws but not all draws have inspections

Endogenity Problem

Levitt 1997 describes a classic endogeneity problem with "monitoring"

- More police in an area may indicate a higher marginal benefit to police in a high crime area.
- More inspections on a project may indicate a higher marginal benefit to inspections in a high risk project.
- More police in an area may locate more crime.
- More inspections may uncover default sooner.
- Election years exogenously raise the number of police that are hired for political reasons.
- More draws exogenously raise the number of opportunities for the bank to make an inspection.

The marginal benefit of police reducing crime should be biased in magnitude downward towards zero under OLS.

The marginal benefit of inspection should be biased in magnitude downward towards zero under OLS.

IV Monitoring and Default

	(1) IV Second Stage EVENTUALDEFAULT	(2) First Stage ALLTOTERMINAL	(3) OLS EVENTUALDEFAULT	(4) Reduced Form EVENTUALDEFAULT
ALLTOTERMINAL	-0.0363***		-0.0184***	
	(-23.35)		(-18.80)	
DRAWTOTERMINAL		0.363***		-0.0132***
		(119.62)		(-22.21)
Table 3 and 4 Controls	YES	YES	YES	YES
Property Zip Fixed Effects	YES	YES	YES	YES
Borrower Zip Fixed Effects	YES	YES	YES	YES
Loan Origination Day Fixed Effects	YES	YES	YES	YES
Observations	28,939	28,939	28,939	28,939
R-squared	0.252	0.581	0.261	0.265

Additional Analysis

Do Banks Use Time-Varying Information to Monitor Borrowers?

Project collateral deteriorations

- Inspections and draw denials happen less when housing prices (foreclosure rates) rise (decline)

Bank health deteriorations

- The bank monitors construction loans MORE as it approaches failure
- Inspections and draw denials are more common

Conclusion

1) We explore the theoretical determinants of monitoring empirically

- Borrowers trade-of loan terms with monitoring
- Riskier loans and loans without relationships are monitored more
- Monitoring increases when the value of collateral declines and bank health deteriorates

2) Banks use the information they collect monitoring to make real-time decisions

3) We show that increased monitoring decreases default probability

- Implement an instrumental variables framework for identification

Thank You!!