

# Default and Punishment: Incentives and Lending Behavior in Indian Banks

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# Motivation

- Credit allocation important for economy
- Neoclassical model misses many agency and information problems

# Today

- How do incentives in the banking sector affect lending decisions?
- Providing incentives to loan officers is difficult
  - Salary small relative to amounts lent
  - Unions or norms may limit positive incentives
  - Significant private information
  - Limited liability
- Role for both internal controls and external audits
  - Both cases—keep monitors at arms length to prevent collusion
- More general problem:
  - Investment banks, credit unions, microcredit, etc.

# Today

- Theory and empirics on lending incentives in Indian banks
- CVC (like FBI) investigates and punish misbehavior
- Bankers report fear:
  - Loss of government property considered corruption; presumption of guilt
  - “Fear of prosecution for corruption hangs over every loan officer’s head like the sword of Damocles”
- CVC reassures:
  - Out of every 100 cases coming before it, the Commission would advice major penalty proceedings in 28 cases, minor penalty proceedings in 32 cases, and administrative warning/exoneration in 40 cases...These figures reveal that a person is not damned the moment his case is referred to the Commission.

# Contribution

- Theory: a model of loan-officer decision-making
  - Bankers are rewarded for lending, but punished for making bad loans
  - Loan officers may 'gamble for revival' by bailing out failed firms
  - Comparative statics and predictions:
    - Monitoring distorts lending for honest bankers
    - Punishment may increase or decrease bailouts, depending on parameters
    - Vigilance leads to U-shaped pattern in defaults
    - Monitoring decreases risk-taking
- Empirics
  - Exploit an unusual data set (on lending from 55,000 bank branches over 20 years, and 1,400 bank frauds)
  - Provide novel information about the extent and scope of fraud
  - Test the model by using variation in the probability of monitoring

# Banking in India

- Government Banks Dominate Banking in India
  - 80% of Market
- Incentive System for Government Bank Employees is Limited
  - Promotions typically based on tenure
  - Very limited scope for pecuniary incentives
  - Strong unions, which tend to advocate equal treatment
- Similar system for many Private Sector Banks

# Model Overview

- Fundamental tension when a firm fails:
  - Bail out, gambling for revival in the second period?
  - Behave: let it fail, take your punishment, and give small loan
- Understand how vigilance affects incentives to lend
  - Likelihood of audit
  - Shape of penalty function if caught with a bad loan
- Key features
  - Bailouts can succeed
  - Micro-level predictions

# Ingredients

- Everyone is risk-neutral
- Firms
  - Live for two periods, then die
  - Two types,  $\theta_H$  and  $\theta_L$ . A fraction  $p$  of the population is  $\theta_H$
  - No moral hazard; types not observable.
  - $f(k, \theta) \begin{cases} = \mu k & \text{with probability } p(k, \theta) \\ 0 & \text{otherwise} \end{cases}$
  - Production function concave:  $f_k(k, \theta) > 0$ ,  $f_{kk}(k, \theta) < 0$
  - Larger projects are more likely to fail:  $p_k(k, \theta) < 0$
  - This effect is greater for worse firms:  $p_k(k, \theta_L) < p_k(k, \theta_H)$
  - No equity / retained earnings / savings for firms

# Ingredients

- Central Vigilance Commission
  - Audits with some probability  $\tau$
  - Penalty when finding bad loans is  $F(k)$ , with  $F'(k) \geq 0$ 
    - $F()$ ,  $\tau$  are exogenous
- Auditing regime ( $\tau$ ) changes over time
  - Begin in high  $\tau$  regime
  - Next period, with probability  $q$ , switch to low regime
  - Following period, low regime

# Ingredients

- Loan Officers
  - Long lived
  - Reward for lending of  $C * k$ , where  $k$  is amount lent
  - Expected penalty if loan goes bad is  $\tau F(k)$
- Priors and Posteriors
  - Loan officers form beliefs on quality of firm
  - Success suggests high quality firm
  - Success with larger projects suggests higher quality firm

# Timeline

- A new firm is assigned to a loan officer
- Period 1:
  - Observe monitoring regime (initially 'high')
  - Make optimal loan
  - Observe outcome
  - Decide whether to bailout
    - If no bailout, take penalty, and lend optimal amount for second period
    - If bailout, make loan, and risk taking larger lumps in future
- Period 2:
  - Observe outcome of second loan
  - If fails, take penalty at  $\tau_2$

# Lending to Old, Successful Firms

- Consider time period when monitoring is high (but expected to go down)
- We show:
  - Result 1: Loan officers increase lending as perceived firm quality increases
  - Result 2: More stringent punishment reduces lending to old firms

# Lending to Failed Old Firm: Bailouts Possible

- Assume bailouts are technologically possible
- Banker trades off punishment now against risk of larger punishment in the future
- Attractiveness of Bailouts Depends on:
  - Result 3: Shape of  $F()$  function
    - $F$  concave  $\implies$  more attractive to roll the dice, because penalty won't increase much
    - $F$  very convex  $\implies$  Take punishment now, rather than risk higher punishment
  - Result 4: Bailouts are more likely to be attractive when  $q$  (probability auditors will go away in subsequent period) is high
  - Result 5: In times of high monitoring, lending to new firms will decline, and this decrease may persist

# Data

- Corruption Data
  - All banks must report all acts of corruption to Reserve Bank of India
  - Matched to specific bank branch
  - 1387 Credit-related corruptoin investigations from 1980-2005
- Quarterly credit data
  - Branch-level, 1981 to 2006, on a quarterly basis
  - ca. 43,000 branches in India, 56 quarters, or 2.5 million observations
- Annual credit data
  - Loan Level

# Infer parameters from data

- $q$
- Fraud Discovery  $\Rightarrow$  Increased Probability of Investigation in Subsequent year
  - The probability of discovery of fraud is much higher: 2.2%, an increase in likelihood by a factor of 27
  - Declines rapidly afterwards

## Parameter: Shape of $F()$ function

- Monthly salary of loan officer relatively low
- Penalties in our dataset are primarily reductions in pay grades, or transfers to rural areas
- Quite invariant to size of loan; similar penalties for major and minor frauds
- Suggests  $F()$  is concave, and bailouts may payoff

# Testable Predictions

- Prediction 1: Lending will decline when monitoring levels are high (Results 2 and Result 5)
- Prediction 2: Banks will prefer to lend to less risky firms (Result 1)
- Prediction 3: Because  $F(\cdot)$  concave and  $q$  is high, increased monitoring should lead to bailouts
  - Initial drop in measured bad credit, followed by an increase

# Monitoring Reduces Lending: Event Study Approach

- Event study approach
- Study credit growth in branch office  $o$ , belonging to bank  $b$ , in credit market  $c$ , in quarter  $t$ .
- Dummy out the 8 quarters prior to and following the discovery of the fraud

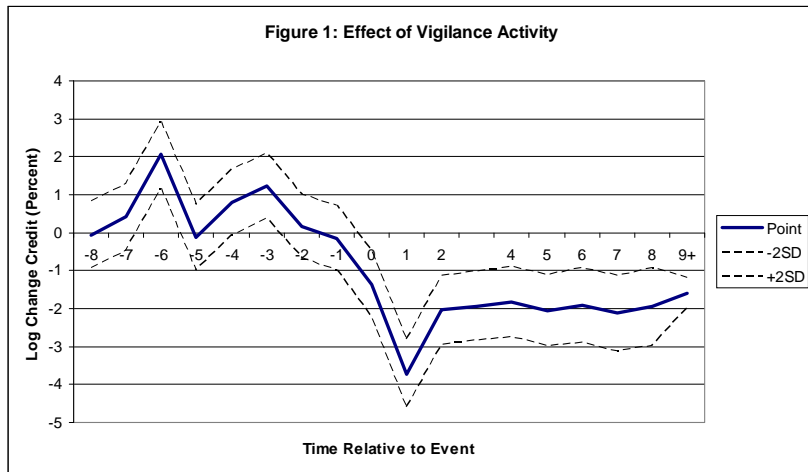
$$y_{obct} = \alpha_o + \sum_{k=-8}^8 \beta_k \theta_{o,t,k} + \beta_{\geq 9} \theta_{o,t,\geq 9} + \gamma_t + \varepsilon_{obct}$$

$\theta$  indicates discovery of corrupt act

$\gamma_t$  are quarter fixed-effects

$\alpha_o$  are branch fixed-effects

# Monitoring Reduces Lending: Event Study Approach



# Monitoring Reduces Lending: Effect Size

- Average quarterly growth rate of credit approximately 3.5%
- Cumulative effect of 20 percentage points over two years
- Effect weakens after 11 or so quarters

# Monitoring Reduces Lending: Spillover Effects

- Track lending in affiliated (and non-affiliated) branches in town in which vigilance activity occurs
- Results:
  - Lending in affected branch drops precipitously
  - Lending in affiliated branches drops one quarter after investigation
  - No consistent pattern in non-affiliated branches

## Prediction 2: Better borrowers get more credit

Measure Riskiness of a Loan

Using data for all loans in India, identify riskiness of different industries (3 digit, approximately 300 codes).

Define the riskiness of lending to industry  $i$  as:

$$pLate_i = 100 * \frac{\text{Lending in Industry } i \text{ that is Late in 1992}}{\text{Lending in Industry } i \text{ in 1992}}$$

Define the risk appetite of the bank branch as the weighted sum of these measures:

$$branchrisk_{ot} = \sum_{i \in \text{Industries}} \frac{\text{Branch } o \text{ loans to Industry } i \text{ at time } t}{\text{Total Branch } o \text{ Lending at time } t} * pLate_i$$

## Prediction 2: Better borrowers get more credit

Same identification strategy. Regression is in *levels*:

### Risk Appetite

Year - 2	-1.3 (2.42)
Year - 1	7.28 ** (3.43)
Fraud Detected	-2.12 (2.26)
Year + 1	-8.04 ** (3.91)
Year + 2	4.54 (3.06)
Year >2	-0.88 *** (0.12)
R2	0.48
N	398990

## Prediction 2: Better borrowers get more credit

- Apparent increased taste for risk prior to discovery of corruption
- Standard deviation of branch risk measure is 7 percent
- Substantial decrease in risk appetite (8 percent) year following discovery, returns to 'normal' in subsequent periods

# Prediction 3: Vigilance Induces U-Shape in Bad Credit

**Table 10: Bad Credit and Discovery of Fraud**

Time Window	Change in Log Credit		Change in Log Bad Credit	
	(1)	(2)	(3)	(4)
Year - 2	0.85 (0.82)	0.79 (0.92)	-0.64 (1.36)	-0.45 (1.65)
Year - 1	0.08 (0.85)	-0.42 (0.97)	-0.54 (1.39)	-0.98 (1.72)
Fraud Detected	-2.42 *** (0.89)	-3.03 *** (1.03)	4.39 *** (1.53)	5.99 *** (1.88)
Year + 1	-4.03 *** (0.97)	-4.66 *** (1.15)	-2.01 (1.59)	-1.58 (2.05)
	-4.52 *** (1.03)	-5.33 *** (1.24)	4.37 *** (1.66)	4.09 * (2.18)
Year >2	-3.48 *** (0.39)	-4.72 *** (1.09)	-0.81 (0.57)	-0.75 (1.88)
R2	0.04	0.2	0.01	0.29
N	357266	357266	154139	154139

# Vigilance Activity and Bad Loans

- How does vigilance activity affect the amount of bad credit?
- Reduces total credit lent by 13% and more
- Immediate jump in long-term credit
- Followed by a decline, then again a jump
- Suggests bankers are not cutting off lending to firms that would have defaulted

# Conclusion

- Incentives faced by loan officer shape decision of whether to bail-out borrowers
- Vigilance activity changes incentives, and has a marked effect on lending
  - Two (three) different data sets yield same conclusion: vigilance activity leads to decreased lending
  - Branch-level vigilance activity
    - Causes a drop of up to 20% in affected branch
    - Causes a decrease in lending in other branches of the same bank
    - Leads to less risk taking
- Vigilance activity cuts down on 'good' loans
- Consistent with model predictions of evergreening