Financial Incentives and Loan Officer Behavior: Multitasking and Allocation of Effort under an Incomplete Contract

Patrick Behr, EBAPE
Alejandro Drexler, Federal Reserve Bank of Chicago
Reint Gropp, Goethe University Frankfurt
Andre Guettler, University of Ulm

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Motivation

• How do loan officers react to financial incentives?
  – Literature focuses on top executives’ compensation
  – Financial crisis shows that non-top level employees affect financial stability
  – New regulations have been implemented, but
• Evidence of how financial incentives affect loan officers’ behavior is limited
  – Data limitations?
  – Was not perceived as a first order question?
• Recent increase in availability of data
  – Some questions remain unanswered
The tasks of a loan officer

- Loan origination: generate loan applications
- Screening: evaluate borrowers’ creditworthiness
- Monitoring: Follow borrower behavior over time → action in case of arrears

Monitoring is time consuming
Literature focuses mostly on other two tasks
Trade-off between these tasks?

Loan maturity
Research setting

• Loan officers at a large European commercial lender
• Discretion in origination, screening and monitoring decisions
• Compensation: fixed salary + volume & performance-based bonus
  – Bonus increases with lending volume
  – Bonus is cancelled if performance is too bad
• Optimization problem:
  – Allocate limited time to the three tasks
  – Maximize expected benefit
• We observe three dimensions
  – study how loan officers solve the optimization
Contribution

- Consider three tasks separately (origination, screening, monitoring)
  - Previous literature focuses mostly on screening
  - Monitoring might be more important (relative to screening) than extant literature suggests
  - Effect of other dimensions might be overstated
- Relax assumption of fixed “type” borrower
  - Implicit assumption in previous work
- Monitoring may change the “type” of the borrower (Drexler and Schoar, 2013)
- First to study the effect of volume & performance-based compensation in a “real” setup
- Relatively clean identification
  - Initial variable compensation is not lineal
  - Compensation plan changes over time
Data

• Proprietary dataset of a European commercial lender
• 56,000 loan applications and 43,000 approved loans between 2003-2007
• 240 loan officers and 22 branches of the bank
• Loan officers have discretion about approval, and contract terms and are accountable for borrowers’ performance
• Detailed repayment data on a monthly basis
Data - Loan officer compensation

• January 2003 to December 2004 ("bonus period")
  – Fixed salary and a bonus payment
  – Bonus based on loan volume and performance (value weighted arrear)
  – Bonus cancelled above 3% of loan volume in arrears
• January 2006 to October 2007 ("no-bonus period")
  – Fixed salary

<table>
<thead>
<tr>
<th>Bonus period</th>
<th>Transition period</th>
<th>No bonus period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 2003</td>
<td>Dec 2004</td>
<td>Dec 2005</td>
</tr>
<tr>
<td>Unlimited cash bonus</td>
<td>Bonus capped to 50% of fixed salary</td>
<td>Fixed salary only</td>
</tr>
</tbody>
</table>
Identification strategy

• Compensation structure
  – Non-linearity in compensation (bonus dropped to zero if arrears > 3%)
    → comparison of behavior above and below the threshold
  – Replacement of the bonus compensation plan with a fixed salary

• Difference-in-differences approach
  – Loan officer behavior during bonus regime and fixed salary
  – Loan officer behavior above and below the 3% arrears
Identification strategy cont’d

• Loan officer FE $\rightarrow$ within loan officer variation
• For monitoring, loan FE (rules out borrower selection)
• Potential problem:
  – Identification relies on loan officers that are above and below the 3% arrears under both compensation regimes.
  – To some extent we might be capturing the effect on the “riskier” loan officers
• Additional assumption for difference-in-differences estimator to uncover causal effects
  – There is no within loan officer time varying unobservable
  – We control for important observable time varying loan officer characteristics (workload, experience)
  – Plus branch characteristics
Monitoring

• 486,000 loan-month observations
• Monthly information about missed payments
• Dependent variable
  – Monthly change in arrears
    • Arrears defined as 30 days overdue
    • Negative change → portfolio quality improves [takes on the value of minus one if the quality of the portfolio improved from t to t+1]
• Loan FE → within loan variation
## Monitoring

<table>
<thead>
<tr>
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<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
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<tbody>
<tr>
<td>Defaults</td>
<td>-0.0124</td>
<td>-0.0122</td>
<td>-0.0276</td>
<td>-0.0779***</td>
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<tr>
<td></td>
<td>(0.0133)</td>
<td>(0.0135)</td>
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<tr>
<td>AboveCutoff</td>
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<td>-0.0011</td>
<td>-0.0003</td>
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<td>(0.0010)</td>
<td>(0.0012)</td>
<td>(0.0016)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0003)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AboveCutoff*Bonus</td>
<td>-0.0055**</td>
<td>-0.0055**</td>
<td>-0.0045*</td>
<td>-0.0096**</td>
</tr>
<tr>
<td></td>
<td>(0.0021)</td>
<td>(0.0022)</td>
<td>(0.0027)</td>
<td>(0.0048)</td>
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<td>Time fixed effects</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Loan officer fixed effects</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Loan fixed effects</td>
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<td>No</td>
<td>No</td>
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</tr>
<tr>
<td>Covariate set 1</td>
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<td>Yes</td>
<td>Yes</td>
<td>No</td>
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<tr>
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<td>Yes</td>
<td>Yes</td>
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<td>Covariate set 3</td>
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<td>Yes</td>
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<tr>
<td>Observations</td>
<td>486,555</td>
<td>486,555</td>
<td>486,555</td>
<td>486,555</td>
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<tr>
<td>Adj. R square</td>
<td>0.0019</td>
<td>0.0024</td>
<td>0.0025</td>
<td>0.0013</td>
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</table>

20% of a standard deviation
Loan origination and screening

• Does the increase in monitoring come at the expense of other activities?
• For example reducing screening (which might have a negative effect on loan performance down the road)
• Or reducing loan volume by originating fewer loans
Loan origination

• Data are at the loan officer-month level
• 5,476 observations
• Loan origination: Monthly loan application volume as a fraction of outstanding loan volume
Loan origination

<table>
<thead>
<tr>
<th></th>
<th>Value 1</th>
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<tr>
<td>ArrearFrequency</td>
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<td>(0.1231)</td>
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<tr>
<td>AboveCutoff</td>
<td>0.0017</td>
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<td></td>
<td>(0.0157)</td>
<td>(0.0146)</td>
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<tr>
<td>AboveCutoff * Bonus</td>
<td>-0.1346***</td>
<td>-0.1163***</td>
</tr>
<tr>
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<td>(0.0339)</td>
<td>(0.0320)</td>
</tr>
</tbody>
</table>

- Time fixed effects: Yes, No
- Loan officer fixed effects: Yes, Yes
- Time-by-branch fixed effects: No, Yes
- Loan officer experience: Yes, Yes
- Observations: 5,476, 5,476
- Adj. R square: 0.4220, 0.3666

68% of a standard deviation
Rejection rate – Screening

• Sample: 55,946 loan applications
• Dependent variable:
  – Rejection rate: equals 1 if loan was rejected and 0 otherwise
  – Processing time: time needed to screen loan application in days
# Rejection rate - Screening

<table>
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<tr>
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<th>ArrearFrequency</th>
<th>AboveCutoff</th>
<th>AboveCutoff * Bonus</th>
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<tbody>
<tr>
<td></td>
<td>0.0536</td>
<td>0.0022</td>
<td>-0.0266***</td>
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<tr>
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<td>(0.0486)</td>
<td>(0.0049)</td>
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</tr>
<tr>
<td></td>
<td>0.0371</td>
<td>0.0026</td>
<td>-0.0174*</td>
</tr>
<tr>
<td></td>
<td>(0.0409)</td>
<td>(0.0034)</td>
<td>(0.0090)</td>
</tr>
<tr>
<td></td>
<td>0.0332</td>
<td>0.0033</td>
<td>-0.0202**</td>
</tr>
<tr>
<td></td>
<td>(0.0440)</td>
<td>(0.0043)</td>
<td>(0.0080)</td>
</tr>
</tbody>
</table>

- **AboveCutoff * Bonus**:
  - -0.0266***
  - -0.0174*
  - -0.0202**
  - (0.0094)
  - (0.0090)
  - (0.0080)

- **Time fixed effects**: Yes, Yes, Yes
- **Loan officer fixed effects**: No, Yes, Yes
- **Reduced covariate set 1**: Yes, Yes, No
- **Covariate set 1**: No, No, Yes
- **Observations**: 55,946, 55,946, 45,826
- **Adj. R square**: 0.9731, 0.9722, 0.9141
Does the quality of the granted loans change?

- It seems loan officers originate less volume, but maybe they originate better loans
- This would indicate *cherry picking* behavior
- We develop a model to predict the ex ante credit quality of borrowers based on observables and then analyze whether this changes across arrear frequencies
- We estimate an out-of-sample logit model to predict the credit quality (arrear occurrence) using observable borrower characteristics and macroeconomic data
- We use data from 1996 to 2002 to estimate the model and then predict the PD’s for 2003
- We recalibrate the model for each year
- Resulting predicted PDs are used as dependent variable in the regression
- We find indeed that loan officers seem to engage in cherry picking
Other tests

• We also find evidence that ex-post loan performance was better for loans screened and monitored by loan officers above the cutoff during the bonus period
• Analyses of loan contract terms do not yield conclusive results
• Placebo tests to validate the identifying assumption do not yield results
• We however find evidence for the incomplete nature of the bonus scheme:
  – Loan officers did not intensify monitoring for unsecured loans
  – Loan officers seem to be myopic, they do not show any of the presented effects below the bonus threshold of 3 percent
Summary

• Our results indicate that loan officers solve their time allocation problem by focusing more on monitoring and on careful selection of borrowers in loan origination and reduce “screening” if payment depends on loan performance

• Both cherry-picking and more monitoring effort increase loan performance

• Incentive based contracts do seem to work on first sight

• But: We also find some *unintended* consequences of the incentive contract that show the incompleteness of such contracts