Tracing the Effect of Scores on Small Loan Production

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Barriers to Small Firm Lending

- Large lenders target large borrowers
  - Fixed cost per borrower of collecting information
  - Small firm lending requires "soft information"

- Micro-lenders do not "scale borrowers up"
  - Reasons are not well understood
  - Technology, organization, loan officer/managerial skills, risk, capital?

This Paper

- Measure effect of credit scoring on productivity and output of bank specialized in small firm loans

  - Mechanism?

- Empirical design: randomized introduction of scores in application folders

Setting

- BancaMia
  - For-profit bank in Colombia
  - Focused on micro and small enterprise loans
  - During October 2010 (month prior to RCT)
    - 143 branches
    - 20,219 new loans, US$25.9 million
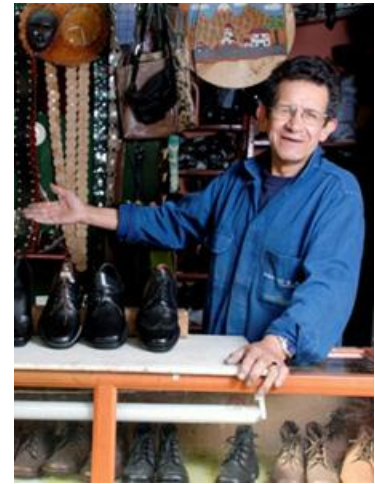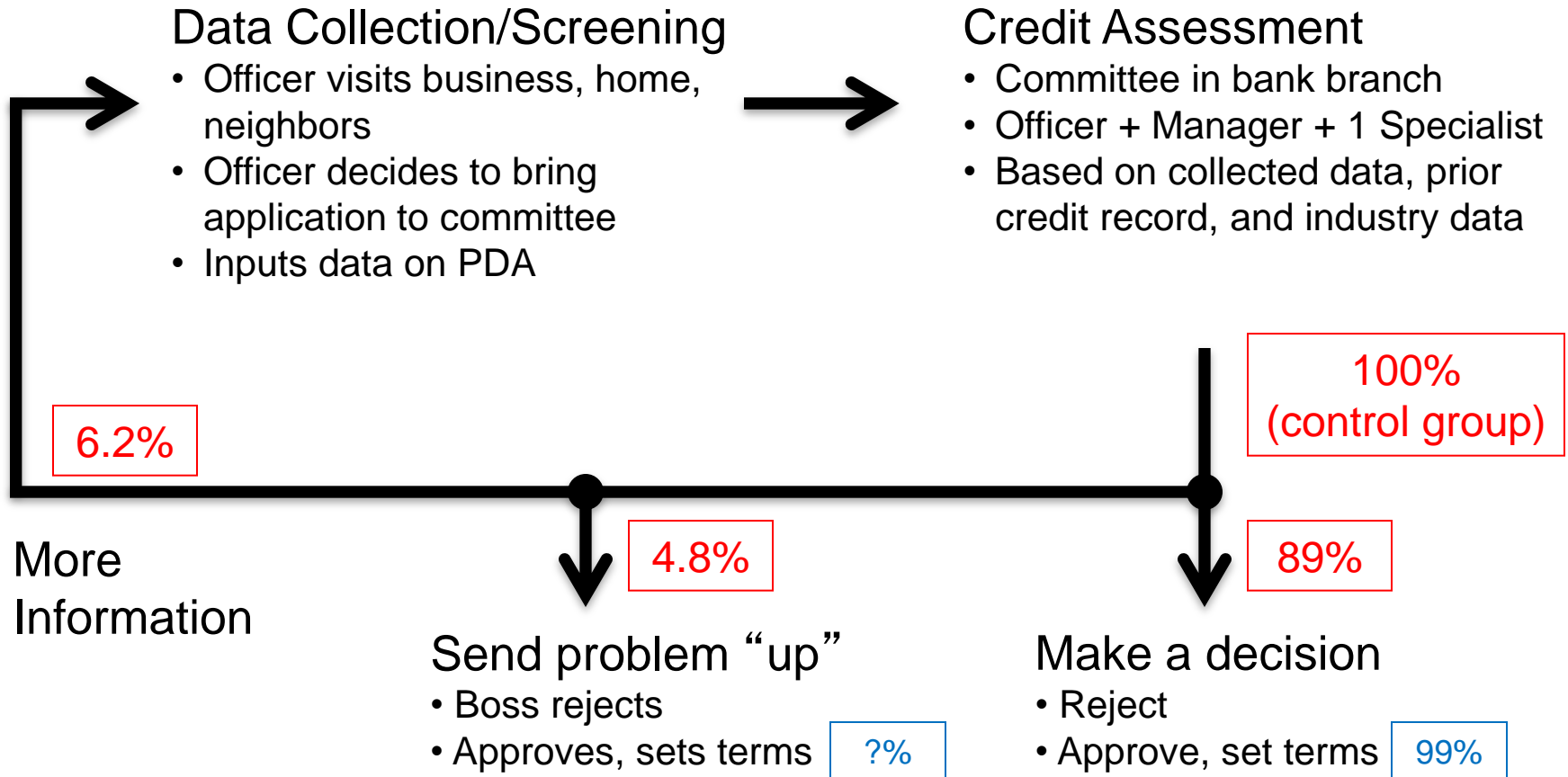
Client Examples

Garment

Restaurant

Taxi

Retail

Credit Assessment Process

Data Collection/Screening
- Officer visits business, home, neighbors
- Officer decides to bring application to committee
- Inputs data on PDA

Credit Assessment
- Committee in bank branch
- Officer + Manager + 1 Specialist
- Based on collected data, prior credit record, and industry data

100% (control group)

6.2%

More Information

4.8%

89%

Send problem "up"
- Boss rejects
- Approves, sets terms   ?%

Make a decision
- Reject
- Approve, set terms   99%

Committee Incentives

- Explicit
  - Wage
  - Bonus related to loans issued (not approved):
    - Number of credits issued (+)
    - Value of credits issued (+)
    - % of value late in repayment (-)
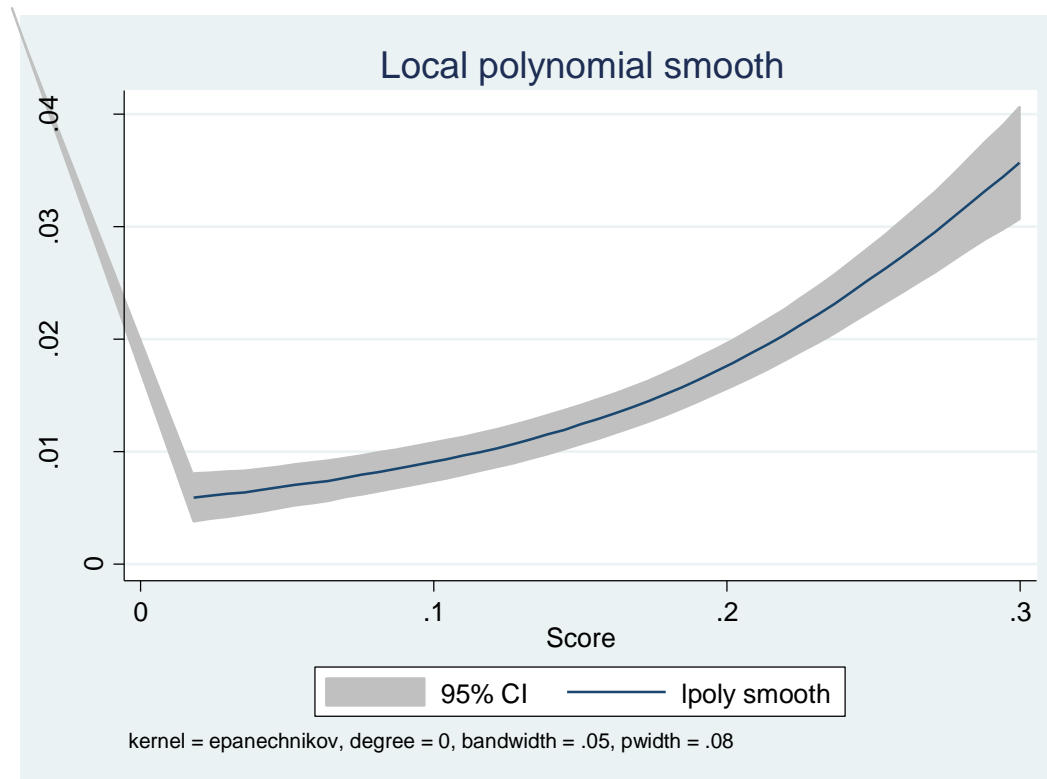
- Implicit
  - Firing, promotions
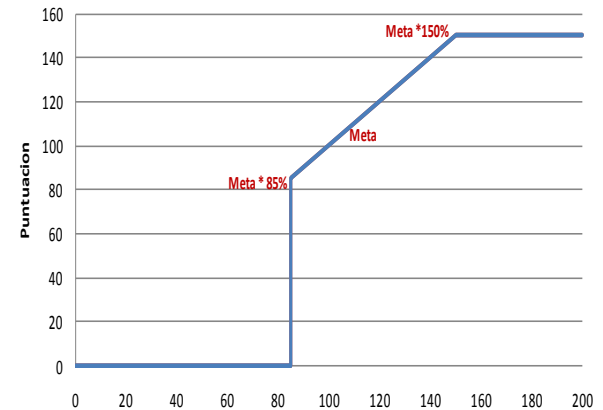
Credit Scores

- Developed by independent third-party consulting firm

- Observable characteristics → historical default probabilities

  - Objective:

    Gender, age, number of years in business, overall indebtedness, house expenditures as % of income, late payments during past 3 years, …

  - Subjective:

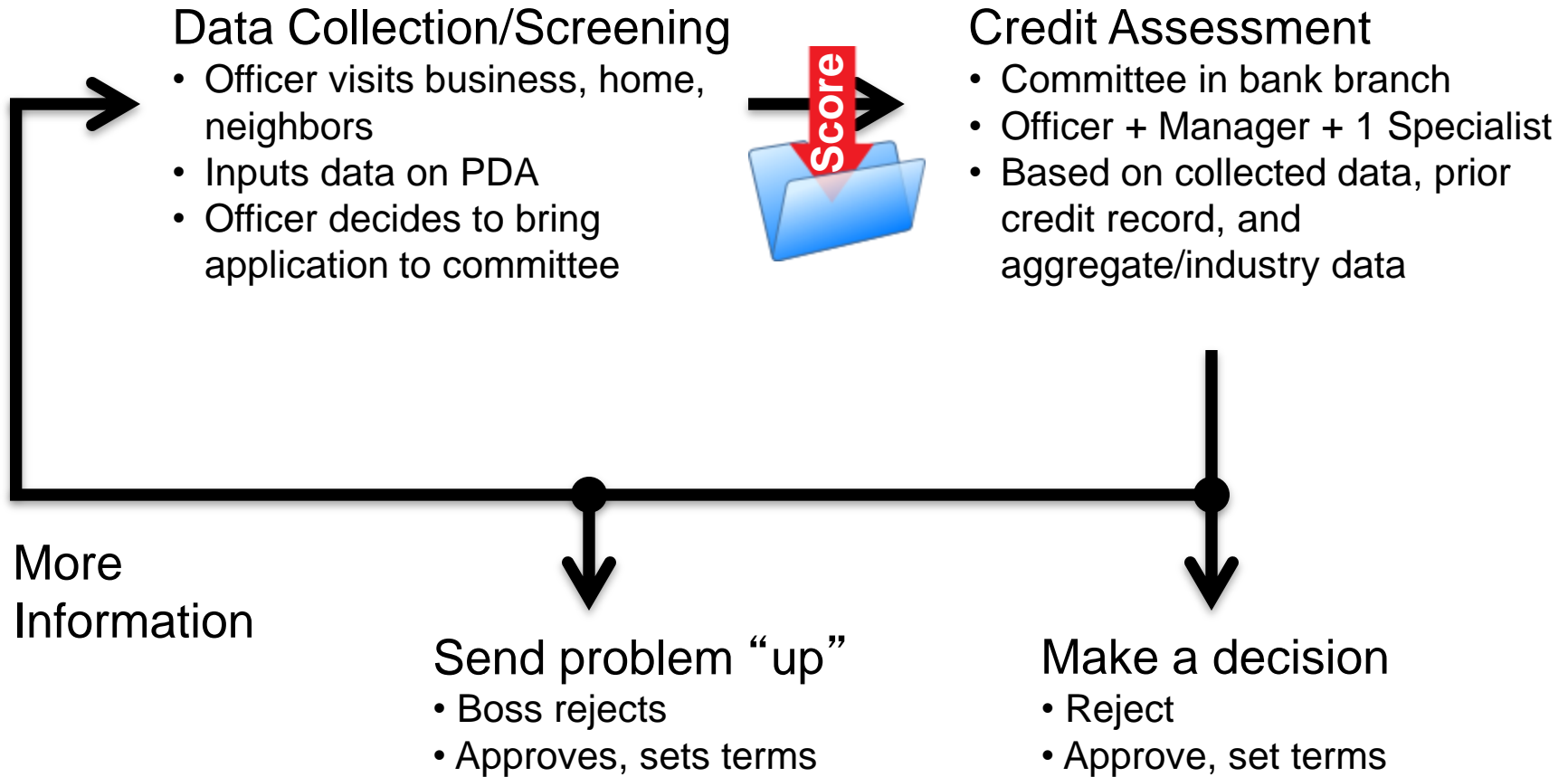   Business knowledge, quality of information provided, stability and diversity of household income, …

Scores and Default Probability
Empirical Relationship

Local polynomial smooth

kernel = epanechnikov, degree = 0, bandwidth = .05, pwidth = .08

Legend: 95% CI — lpoly smooth

- Sample: 20K+ loans issued in October 2010
- Default = > 60 days late six months after issued
- Note: score ≈ default probability x 10

Research Design

Data Collection/Screening
- Officer visits business, home, neighbors
- Inputs data on PDA
- Officer decides to bring application to committee

Score

Credit Assessment
- Committee in bank branch
- Officer + Manager + 1 Specialist
- Based on collected data, prior credit record, and aggregate/industry data

More Information

Send problem "up"
- Boss rejects
- Approves, sets terms

Make a decision
- Reject
- Approve, set terms

Trial Design

- Pilot program: eight branches

- Randomize at the application level

- Three groups (observable by committee):
  - C: no score
  - T1: disclose score at the beginning of evaluation
  - T2: withhold score until committee chooses *interim* action, then disclose score and allow committee to revise

Results (1)

- Scores change committee productivity and the organization of loan production
  - Committees spend 16% more time evaluating the average application
    - From baseline of 4.7 minutes
  - Committees make more decisions
    - "Punt" on 6.8 per 100 cases (down from 11 per 100)
    - Reject 2.1 per 100 cases (up from 0.3 per 100)
  - Overall outcomes unchanged
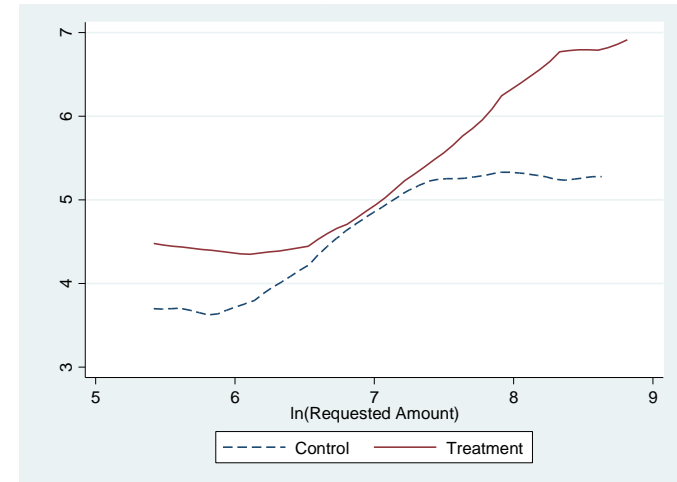   - Same overall rejection rate and default rate

Which are the Marginal Loans?
Kernel-weighted local polynomial regressions, by Treatment Status
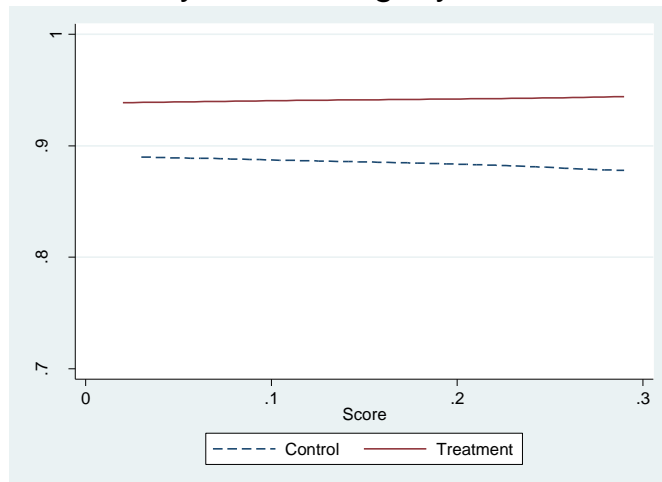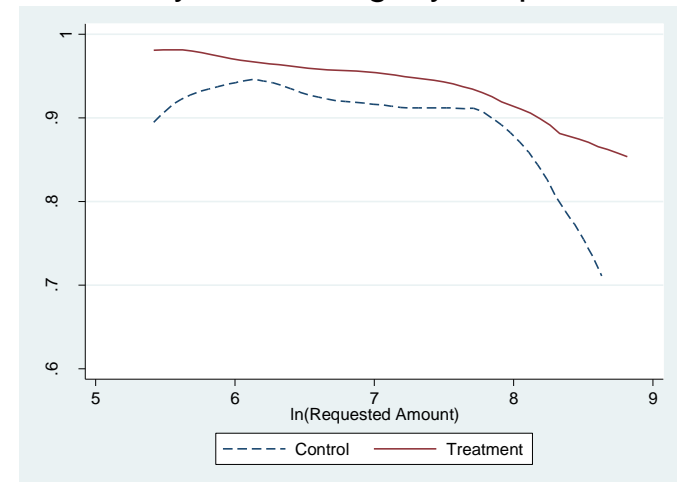
Evaluation Time, by Score
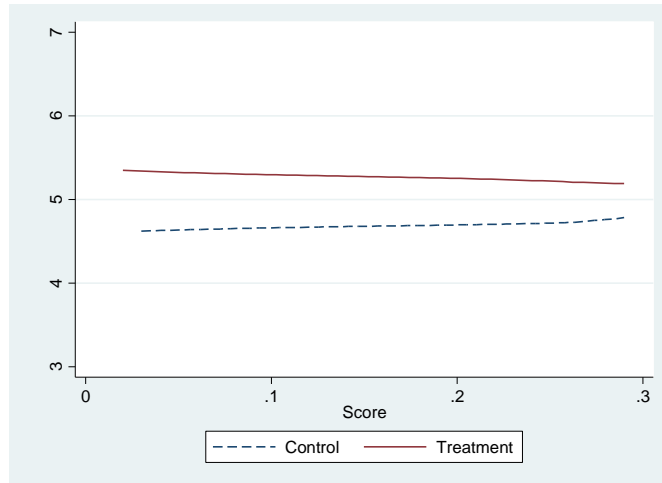
Evaluation Time, by Requested Amount

Probability of Deciding, by Score

Probability of Deciding, by Requested Amount

Trial Design

- Pilot program: eight branches

- Randomize at the application level

- Three groups (observable by committee):
  - C: no score
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Information Content of Score Versus Use of Existing Information

	Interim Decision	Final decision
C		Existing
T1		Existing + Score
T2	Existing	Existing + Score

Results 2

- Committees make more interim decisions (before seeing score)
  - Reduces the likelihood that the application is sent to zone manager
  - After seeing score, make even more decisions
  - Over ½ of the effect occurs before seeing scores

Conclusions

- Scores improve committee output and effort
  - Substitute for costlier alternatives (use of "specialist" time, collecting additional information in the field)

- Scores lower the cost of producing the largest and smallest loans
  - Potential to change the loan size composition of the portfolio
  - No effect on infra-marginal loans

- Two distinct mechanisms
  - More information
  - Use information more effectively (e.g. monitoring, standardization, confirmation)

Thank You!

Application Characteristics and Final Outcomes by Committee Choice

Without scores (Control Group)

	Decide (n = 298)		Send Up (n = 16)		More Info (n = 21)	
	mean	sd	mean	sd	mean	sd
Requested Amount (US$)	1,443	1,170	2,480	2,126	2,476	1,994
Credit Risk Score	0.152	0.069	0.155	0.060	0.137	0.047
First Loan (Dummy)	0.154		0.125		0.048	
Time to decision by Committee (min)	4.608	3.188	5.438	3.405	5.105	4.508
Loan Issued (Dummy) *	0.752		0.750		0.333	
In Default after 6 Months (Dummy) **	0.031		0.000		0.143	

* Loan appears in BancaMia's central information system as issued
** Conditional on loan being issued

Framework
(Garicano 2000 + agency)

- For each application, committee faces trade-off between
  - Solving problem itself with available/new information (cost of making mistake, effort)
  - Sending problem"up" to expert (communication cost, cost of looking incompetent)
  - → In equilibrium: committee sends difficult problems up

- Effect of score on committee output
  - Improves committee information
    - → Reduces likelihood of mistake → more (marginal) decisions
  - Standardization reduces cost of communication
    - → More problems sent to boss → fewer (marginal) decisions
  - Makes problem difficulty observable
    - →Only hard problems sent to boss → more (marginal) decisions
  - Ex ante effect on information collection
   - → Sign ambiguous: complements or substitutes?

Descriptive Statistics

|	(1) Control (n = 335)		(2) Treatments (T1, T2) (n = 1,086)		(3) p-value
	Mean	SD	Mean	SD	(1) = (2)
Panel A. Ex Ante Loan Characteristics					
Requested Amount (USD)	1,551.5	1,321.4	1,552.7	1,335.5	0.978
Credit Risk Score	0.151	0.068	0.156	0.077	0.253
First Application (Dummy)	0.146		0.153		0.774
Panel B. Committee Outcomes					
Evaluation Time (Minutes)	4.68	3.28	5.27	5.29	**0.052**
Committee Approves/Rejects (Dummy)	0.890		0.940		**0.002**
Panel C. Committee Outcomes, Conditional on Reaching decision					
Loan Approved (Dummy)	0.997		0.985		0.116
Panel D. Final Outcomes, Conditional on Loan Issued					
Disbursed Amount/Requested Amount	0.959	0.382	0.969	0.436	0.738
In Default after 6 Months (Dummy)	0.033		0.040		0.627

Application Characteristics
Cumulative Distributions

1. Score
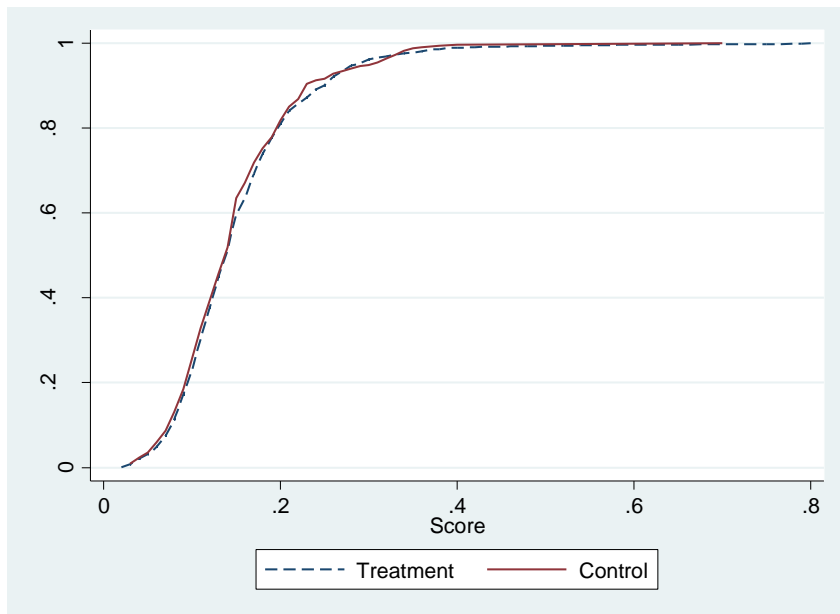
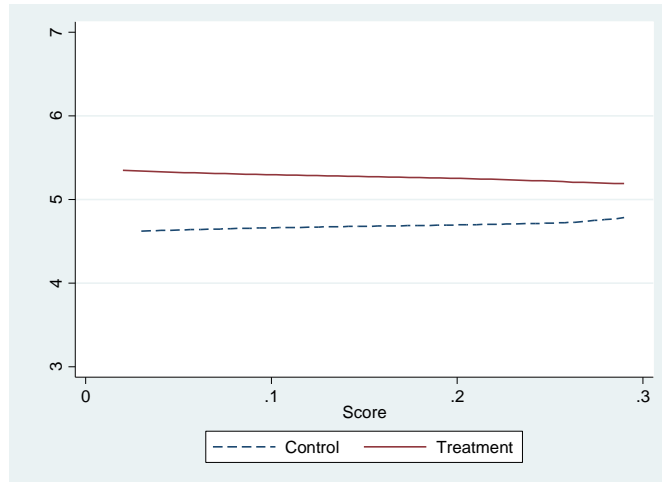K-S test p-value = 0.816

2. Requested Amount
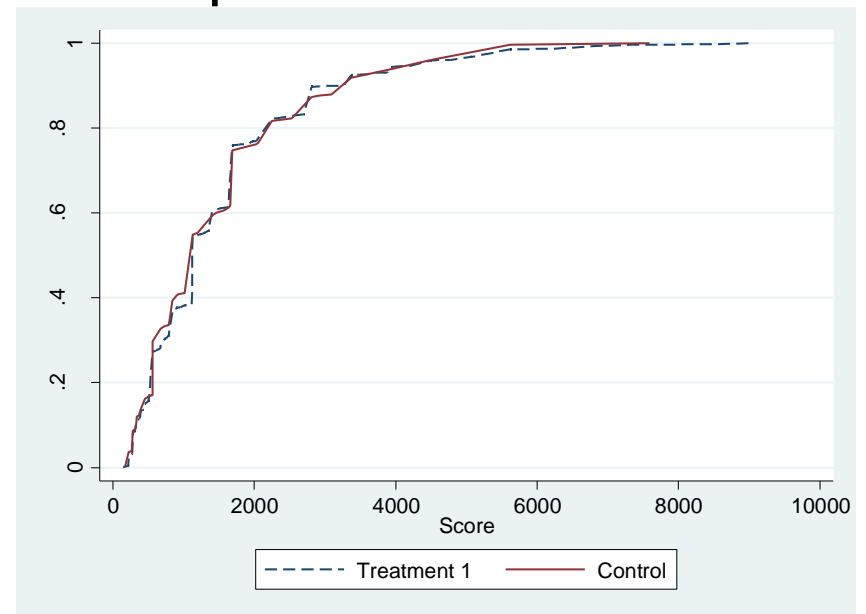
K-S test p-value = 0.942

Evaluation Time by Score and Amount
Kernel-weighted local polynomial regressions, by Treatment Status

Evaluation Time, by Score

Evaluation Time, by Amount