

Mitigating the Risks of Financial Inclusion with Loan Contract Terms

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Second Consumer Financial Protection Bureau Conference

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PRELIMINARY, COMMENTS WELCOME!

Policy Priority: Expanding Credit

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- Expanding credit to new borrowers:
 - ✓ Smooth consumption, allows investment. Welfare-improving by revealed preference.
 - ✗ High risk population due to asymmetric information problems. Unsophisticated or time-inconsistent individuals could borrow “too much” relative to unbiased benchmark.

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 - Effect of variation in interest rates and minimum payments on purchases, payments, debt and default.

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 - for 47% this was the first banking product.
 - Relatively new to formal credit of any sort, lower-than-average credit scores.

See credit score distribution

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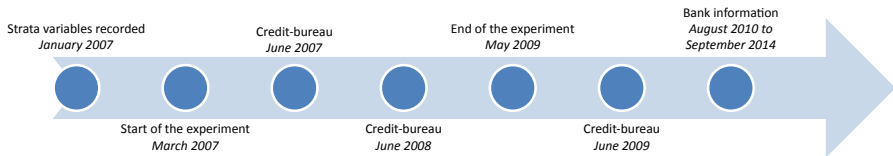
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- Arm assignment ran from March 2007 to May 2009. All clients returned to standard terms.
- **Data:**
 - Monthly bank statement data (03/07 – 05/09, 06/13 – 06/14).
 - Annual Credit Bureau data (2007 – 2013). Match 99% of sample.
 - ENIGH, MxFLS (unmatched)

Timeline



Summary statistics

	(1)
	Start of experiment
<i>Credit bureau-supplied information</i>	
<i>Demographic information</i>	
Age	39
% Male	53
% Married	63
Monthly Income (Pesos)	13,842
	(1)
	Beginning of the experiment
<i>Credit card information (Pesos)</i>	
Payments	711
	(1,473)
Purchases	338
	(1,023)
Debt	1,198
	(3,521)
Credit limit	7,879
	(6,117)
Credit score	645
	(52)

Results

Environment: High Rates of Card Exit



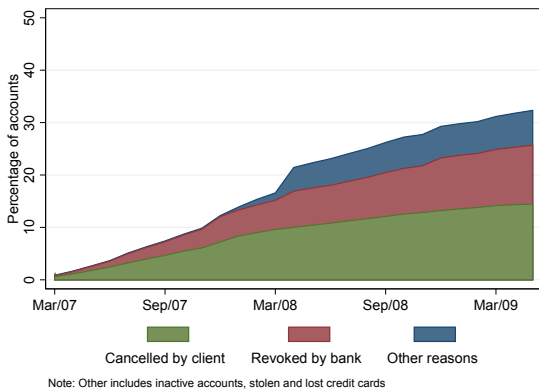
Note: Other includes inactive accounts, stolen and lost credit cards

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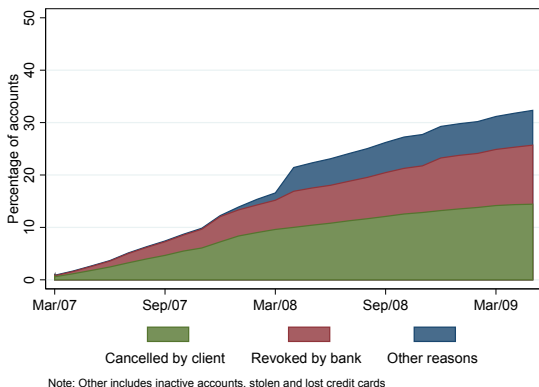
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- 33% of control group exits bank during the experiment \simeq 15% annual exit rate.

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- 33% of control group exits bank during the experiment \approx 15% annual exit rate.
- Similar rates for similar populations also in other data. Market card Exits

Estimation Outline

- Estimate treatment effects (and Lee (2009) Bounds to deal with card exits):

$$Y_{it} = \sum_{g=1}^8 \beta_{gt} T_{ig} + \sum_{s=1}^9 S_{is} + \epsilon_{it}$$

and graph for each treatment arm g $\{\hat{\beta}_{gt}\}_{t=1}^{26}$ and Lee Bounds.

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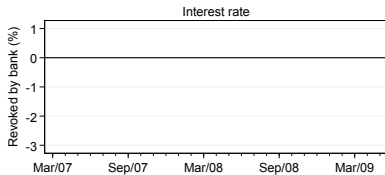
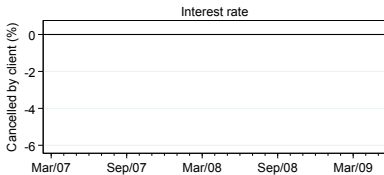
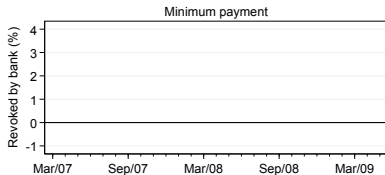
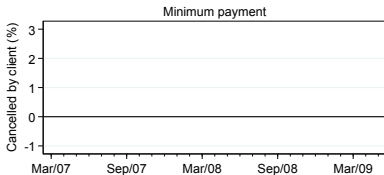
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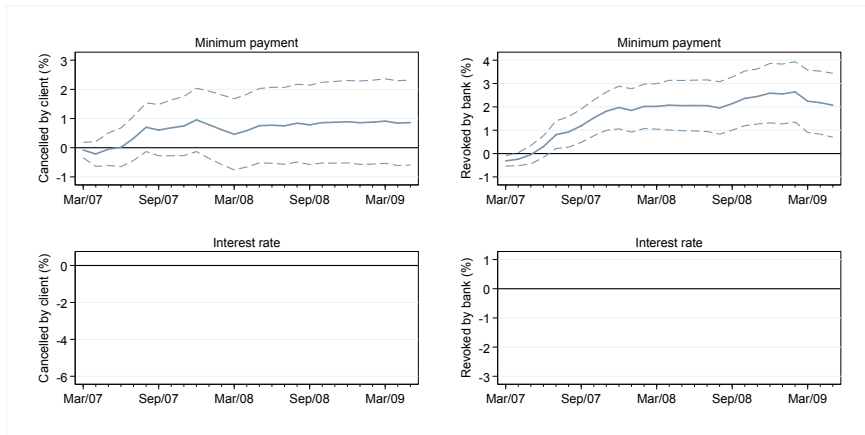
- Effect of a minimum payment increase holding interest rate fixed at 45%:

$$\beta_{(r=45\%, MP=5\%), t} - \beta_{(r=45\%, MP=10\%), t}$$

Effects on Card Exit

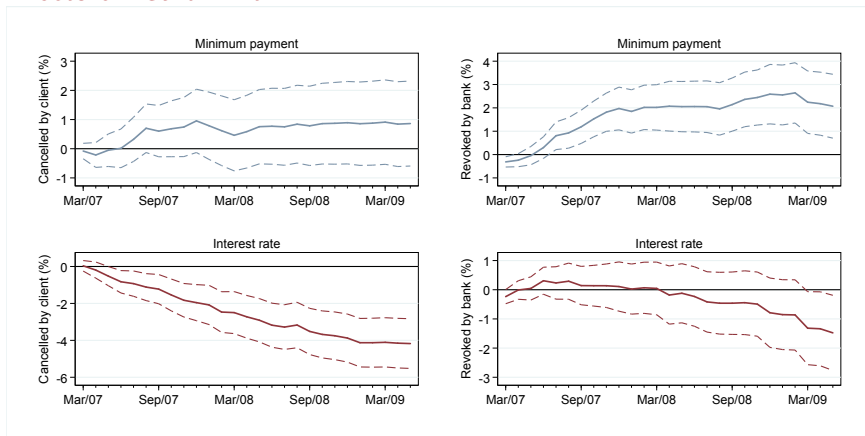


Effects on Card Exit



- \uparrow **MP** \implies \uparrow Cancellations (14%, 1.6 pp^{**}), \uparrow Revocations (10%, 1.2 pp^{***}).

Effects on Card Exit



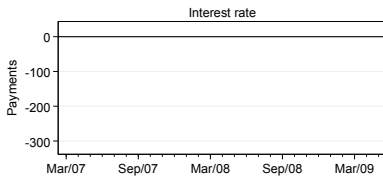
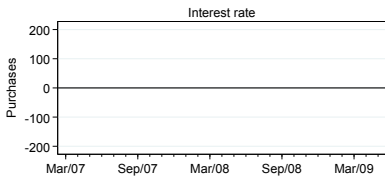
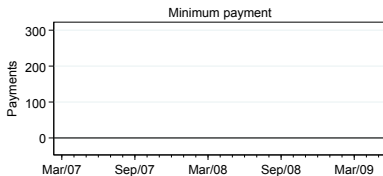
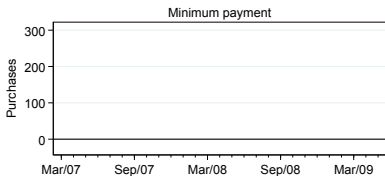
- \uparrow **MP** \implies \uparrow Cancellations (14%, 1.6 pp**), \uparrow Revocations (10%, 1.2 pp***).
- \downarrow **R** \implies \downarrow Cancellations (30%, 3.3 pp***), \downarrow Revocations (6%, 2.1 pp***).

Cancellations by Payment Behavior

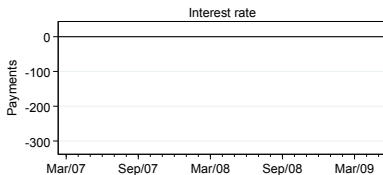
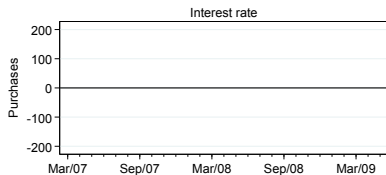
Revocations by Payment Behavior

Treatment Estimations

Effect on Purchases and Repayment

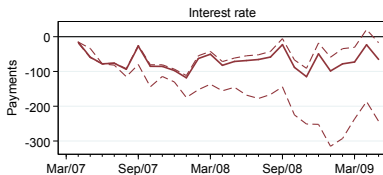
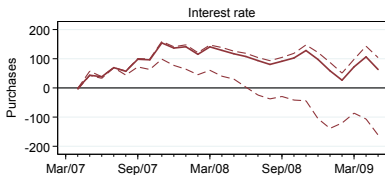


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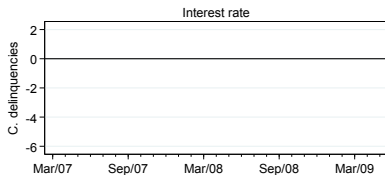
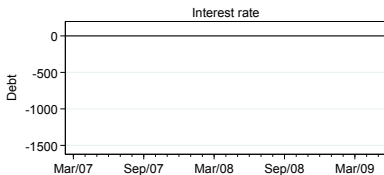
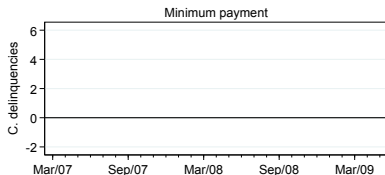
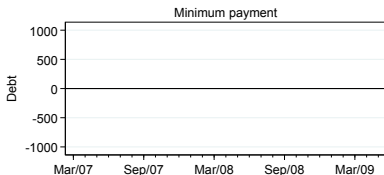
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- \downarrow **R** \implies \uparrow Purchases (13%, MXN \$65^{***}), \downarrow Repayments (9%, MXN \$64^{***}).

Purchases by Payment Behavior

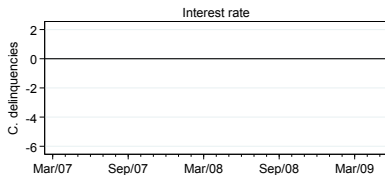
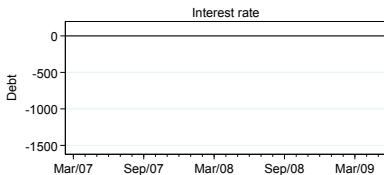
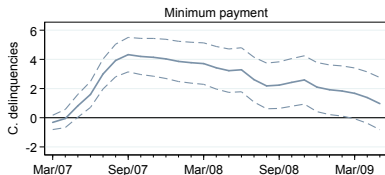
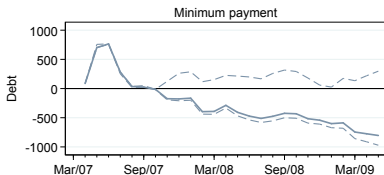
Payment by Payment Behavior

Treatment Estimations

Effect on Debt and Delinquencies

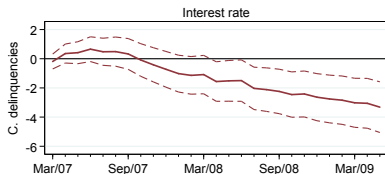
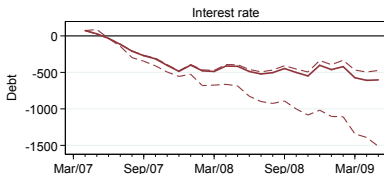
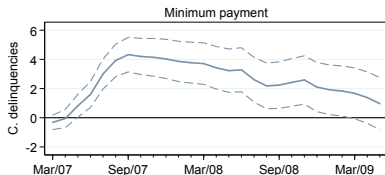
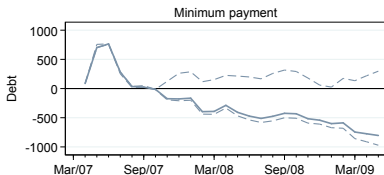


Effect on Debt and Delinquencies



- \uparrow **MP** \implies \downarrow Debt (35%, MXN \$789^{***}), – Delinquency (3%, 1pp).

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- \downarrow **R** \implies \downarrow Debt (27%, MXN \$604^{***}), \downarrow Delinquency (10%, 3.3pp^{***}).

Effects on Bank Revenues

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- Across different definitions, treatment effects are negative.
- Implied elasticity of bank net revenues about with respect to interest rates $\approx .7$.
- Implied elasticity with respect to minimum payments $\approx -.15$

	Revenues
r=15% MP=5%	-925.5*** (81.63)
r=45%, MP=10%	-292.7*** (29.91)
r=45%, MP=5%	1860.9*** (163.3)
R-squared	0.0186

Summary

- Extremely high rates of card-exit.
 - 33% of the sample exit the experiment.
 - Exit rates comparable in Credit Bureaus for similar populations.
- Decreasing interest and increasing minimum payments both rates reduced debt.
- Elasticity of debt with respect to interest rate $\approx .4$
- Elasticity of debt with respect to minimum payments $\approx -.35$
- Elasticity of card exit with respect to interest rate and minimum payments are $\approx .18$.
- Elasticity of bank net revenues about with respect to interest rates $\approx .7$ and with respect to minimum payments $\approx -.15$
- Exit caused by contractual variation only small part of overall exit rates.

Other Findings and To Dos

- **Heterogeneity:** Significant heterogeneity by stratum. Negligible exit and zero ATEs for older clients who paid their balances in full pre-experiment. Strongest effects for newer clients who made low monthly payments pre-experiment.
- **Cost of default:** Bank revocation associated with a 3 times lower probability of getting a new card ± 5 months from date of revocation. Credit score decreases sharply for those with revoked cards (from 620 ten months before to 550 five months after).
- **External effects:** No treatment effect on other loans or bills (e.g. phone bills), in the total amount in arrears for other loans and other credit cards or credit scores.
- **Payment habit formation:** After the experiment, all cardholders were returned to the same interest rate (around 47%) and minimum payment levels (around 4%). Using 2011 data to estimate the effects of previous treatment on current debt and purchase behavior (controlling for current debt?).
- How to reconcile large underlying default rates with insensitivity to relatively large changes in contractual terms.

THANKS!

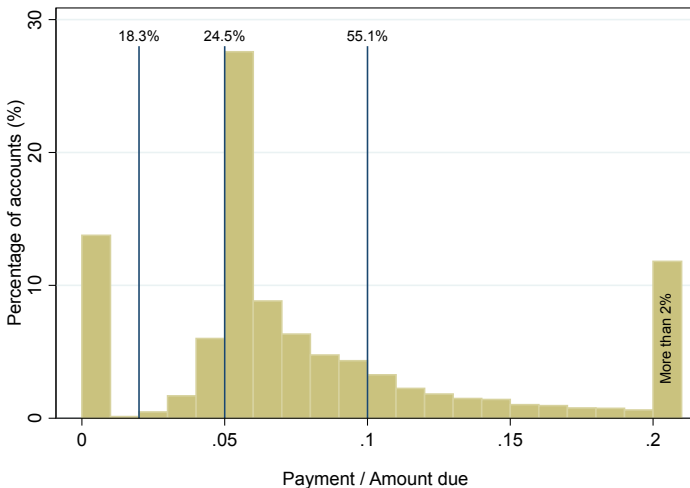
Appendix

Sampling weights by strata

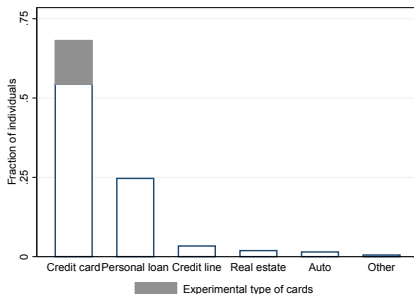
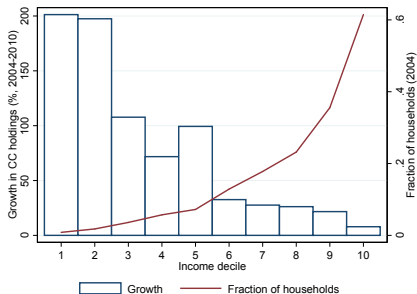
[Return to slide](#)

	Cardholder's payment behavior			Total (4)
	Minimum payer (1)	Part-balance payer (2)	Full-balance payer (3)	
Months of credit card use				
6 to 11 months	9.8	1.6	0.6	12
12 to 23 months	10.7	1.7	0.7	13
24+ months	61.5	9.8	3.8	75
Total	82	13	5	100

Payment as a proportion of debt in the beginning of the experiment



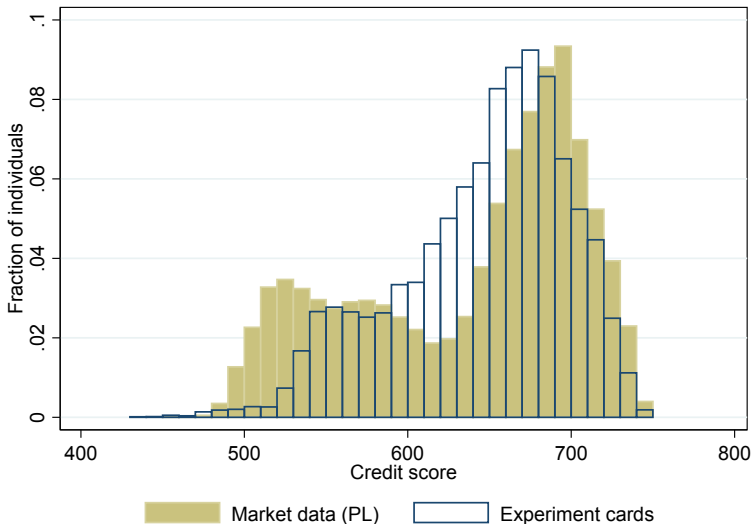
Level and growth in credit cards by deciles

[Return to motivation](#)
[Return to experiment description](#)


Growth in credit cards by income decile
(2002-2010)

First loan distribution by type of credit
(2010)

Credit score for experimental sample (2007) and market data (2016)

[Return to experiment description](#)

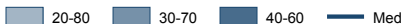
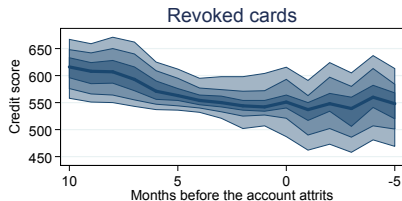
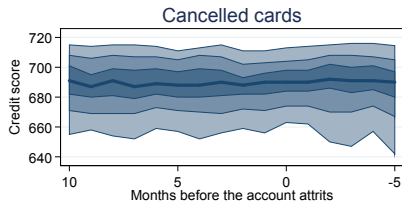
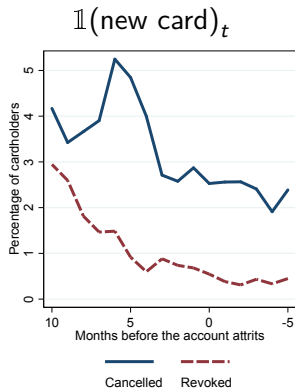
Experiment description

[Return to experiment description](#)

- Bancarization of these clients was done through commercial stores.



Long Term Effects: Getting a New Card?



Treatment Regressions

[Return to results](#)

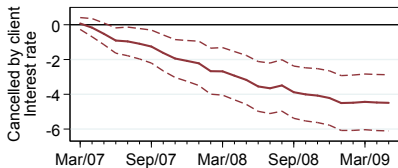
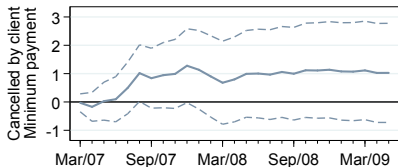
	Payments	Purchases	Debt	Net revenue	Cost	Delinquencies	Cumulative delinquencies	Revoked cards	Cancelled cards	Credit score	Attrition
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
I:15% P:5%	-64*** (25)	65** (26)	-604*** (123)	-544*** (57)	-352*** (57)	-0.024*** (0.008)	-0.033*** (0.009)	-0.021*** (0.007)	-0.033*** (0.006)	1.93 (1.69)	-0.049*** (0.010)
I:15% P:10%	106*** (29)	254*** (30)	-902*** (118)	-407*** (56)	-501*** (56)	-0.030*** (0.008)	-0.025*** (0.009)	-0.008 (0.008)	-0.012* (0.007)	4.74*** (1.7)	-0.005 (0.010)
I:25% P:5%	-61** (25)	9.81 (23)	-319** (138)	-409*** (59)	-263*** (61)	-0.019** (0.009)	-0.032*** (0.009)	-0.018** (0.007)	-0.021*** (0.007)	3.45** (1.71)	-0.034*** (0.010)
I:25% P:10%	90*** (26)	175*** (26)	-857*** (117)	-251*** (59)	-409*** (59)	-0.015* (0.009)	-0.007 (0.009)	-0.001 (0.008)	-0.004 (0.007)	3* (1.70)	0.007 (0.010)
I:35% P:5%	11 (29)	18 (26)	-333*** (128)	-194*** (63)	-66 (64)	-0.011 (0.009)	-0.003 (0.009)	0.002 (0.008)	-0.019*** (0.007)	0.376 (1.71)	-0.014 (0.010)
I:35% P:10%	99*** (32)	151*** (28)	-677*** (124)	-183*** (59)	-314*** (59)	-0.007 (0.009)	-0.000 (0.009)	0.003 (0.008)	-0.003 (0.007)	2.41 (1.71)	0.013 (0.010)
I:45% P:10%	53** (26)	92*** (26)	-789*** (119)	-0.593 (63)	-229*** (62)	-0.006 (0.009)	0.010 (0.009)	0.012 (0.008)	0.016** (0.007)	2.91* (1.71)	0.039*** (0.010)
Constant	677*** (22)	506*** (26)	2240*** (100)	745*** (49)	1470*** (50)	0.132*** (0.007)	0.310*** (0.007)	0.205*** (0.006)	0.111*** (0.005)	612*** (1.33)	0.393*** (0.008)
Observations	87093	87093	87093	144000	144000	87093	144000	144000	144000	135361	144000
p-value Treatments	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
p-value Strata	0.000	0.000	0.000	0.000	0.000	0.004	0.000	0.000	0.000	0.100	0.000
R-squared	0.023	0.029	0.019	0.009	0.042	0.018	0.048	0.030	0.005	0.065	0.009
Dependent Variable Mean	655	510	1559	623	968	0.117	0.276	0.178	0.119	615	0.374

Note: These are cross-sectional regressions where the dependent variable is below the column number. Probability weights are used according to the population. Robust standard errors are shown in parenthesis. Monetary variables are measured in 2007 MXN pesos.

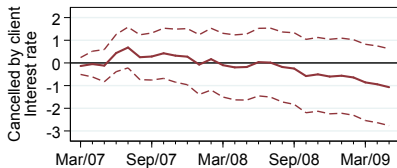
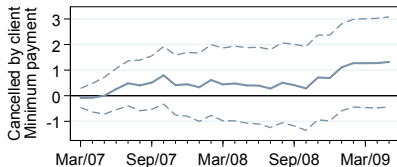
Cancellations by client

[Return to results](#)

Minimum-payers



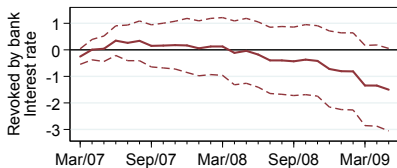
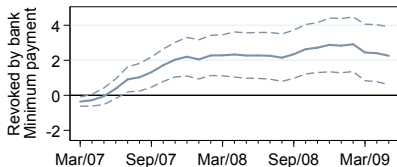
Full-payers



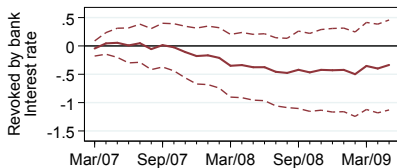
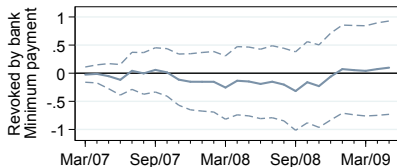
Revoked by bank

[Return to results](#)

Minimum-payers



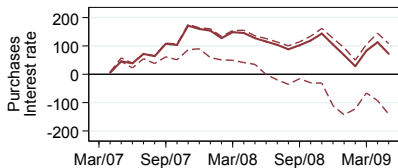
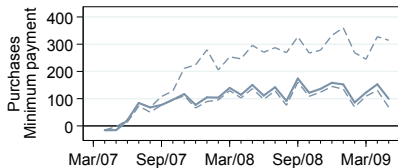
Full-payers



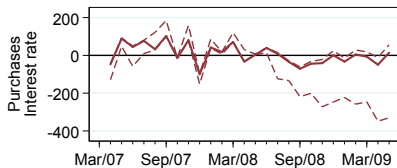
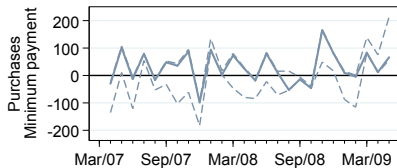
Purchases

[Return to results](#)

Minimum-payers



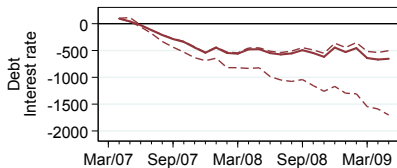
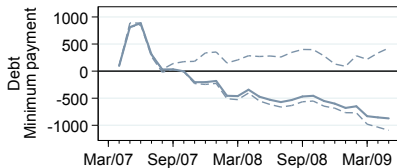
Full-payers



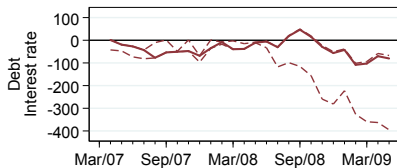
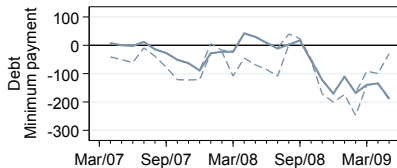
Debt

Return to results

Minimum-payers



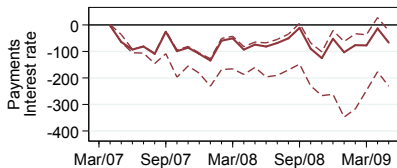
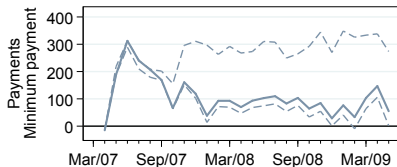
Full-payers



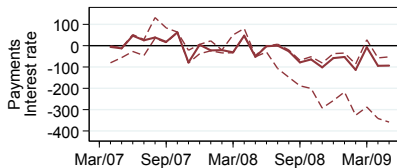
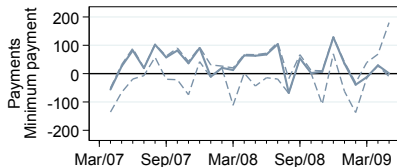
Payment

[Return to results](#)

Minimum-payers



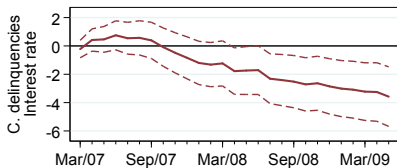
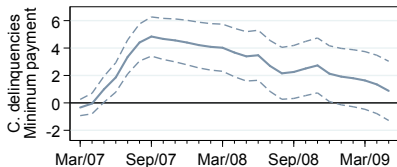
Full-payers



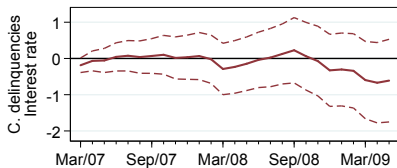
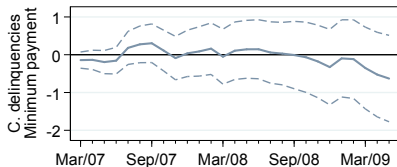
Delinquencies

[Return to results](#)

Minimum-payers



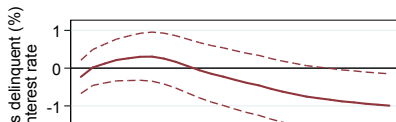
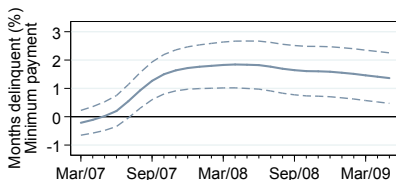
Full-payers



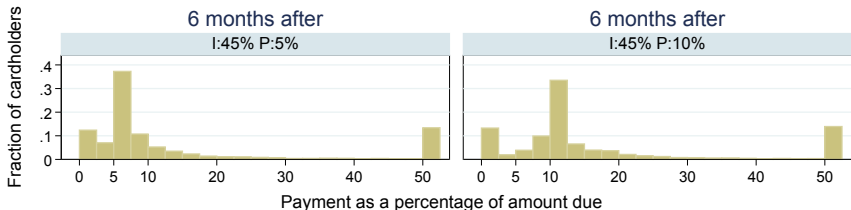
Percentage of delinquent months

Return to results

- This measure has a similar trend to cumulative delinquencies, but different magnitudes.
- After 26 months of treatment:
 - Increasing **MP** leads to a 1.36*** pp increase (13%) in the percentage of months delinquent per account.
 - Decreasing **R** leads to a 1** pp decrease (9%) in the percentage of months delinquent per account.



Payment as a proportion of amount due

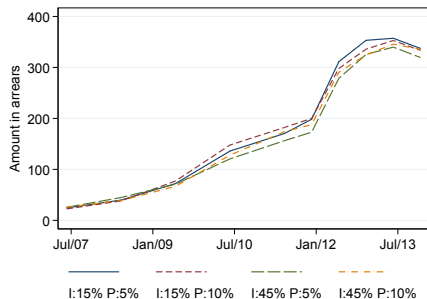
[Return to results](#)


Note:

- (1) Bins have a width of 2.5 pp each.
- (2) The rightmost bin of each graph includes those who pay more than 50 pp.

Implications for Borrower Welfare

	(1) Arrears in telephone
I:15, P:5	1.1 (6.4)
I:15, P:10	6.1 (6.6)
I:25, P:5	-6.1 (6)
I:25, P:10	1.2 (6.5)
I:35, P:5	-3.1 (6.3)
I:35, P:10	2.4 (6.4)
I:45, P:10	-4.2 (6.4)
Cons (I:45, P:5)	71*** (4.4)
R-squared	0.0001
Observations	143,916
P-value of IR	0.656
P-value of MP	0.5446



Implications for Borrower Welfare

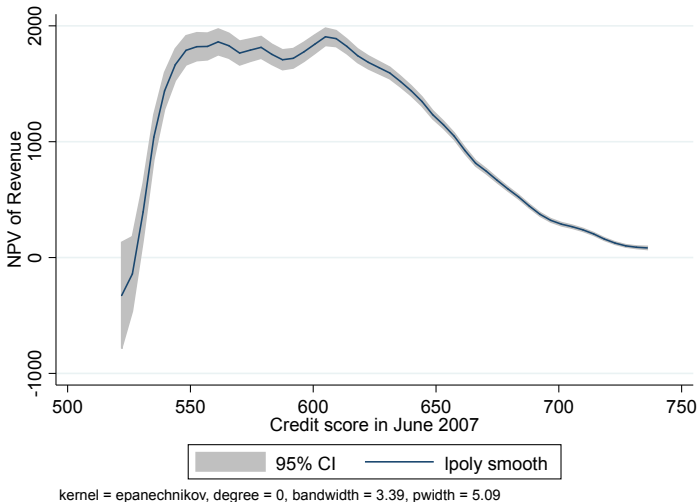
Dependent variable:	All type of loans		Only credit cards	
	At least one delinquent loan (1)	Total amount in arrears (2)	At least one delinquent loan (3)	Total amount in arrears (4)
I:15, P:5	-.0097 (.0066)	664 (536)	-.0028 (.0057)	447 (413)
I:45, P:10	-.012 (.0066)	-615 (492)	-.0044 (.0057)	-335 (384)
Cons (I:45, P:5)	.28*** (.0047)	9,450*** (351)	.19*** (.004)	6,741*** (272)
R-squared	0.0001	0.0001	0.0000	0.0001
Observations	143,916	143,916	143,916	143,916
P-value of IR	.5973	.3762	.9537	.4261
P-value of MP	.4656	.2098	.8831	.331

Credit score

	(1) Jun/07	(2) Jun/08	(3) Jun/09	(4) Jun/10	(5) Jun/11	(6) Dec/11	(7) Jun/12	(8) Dec/12	(9) Jun/13	(10) Dec/13	(11) Apr/14
I: 15, P: 5	0.26 (0.68)	-0.70 (1.02)	0.73 (1.18)	0.46 (1.26)	-0.18 (1.30)	-0.62 (1.33)	-1.19 (1.33)	-1.91 (1.31)	-1.52 (1.30)	-1.54 (1.31)	-1.44 (1.32)
I: 45, P: 10	0.45 (0.68)	1.55 (1.00)	1.79 (1.17)	2.38 (1.25)	1.47 (1.30)	0.90 (1.33)	0.58 (1.33)	0.18 (1.31)	-0.48 (1.30)	-0.32 (1.32)	-1.03 (1.32)
Constant (I:45, P:5)	668.19*** (0.48)	660.61*** (0.72)	649.88*** (0.84)	643.72*** (0.90)	639.85*** (0.93)	635.41*** (0.95)	635.90*** (0.94)	635.76*** (0.93)	638.38*** (0.91)	637.52*** (0.93)	639.20*** (0.93)
Observations	142,241	118,165	135,359	134,569	133,184	133,084	132,465	131,280	130,518	128,727	126,684
R-squared	0.0000	0.0001	0.0001	0.0001	0.0000	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
P-value of IR	.9905	.6593	.7779	.7574	.96	.8148	.8369	.604	.64	.6225	.408
P-value of MP	.6658	.1683	.5642	.4158	.6875	.4582	.6504	.2888	.3743	.2844	.3632

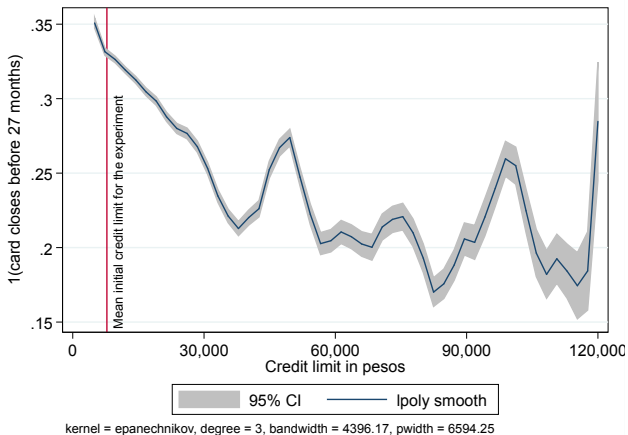
Return to slide

Prediction of NPV of Revenue by Credit Score



Credit limit and duration of the card in the market

Credit cards from all banks opened between 2004 and 2007



Other Findings: Bank Revenues

- Consider the identity for month t

$$Due_t = Due_{t-1} + Buy_t - Pay_t + (i/12) * Debt_t + Fees_t$$

where $Debt_t$ is the average (over the month) of the daily amount due.

- Rewrite

$$Pay_t - Buy_t = Due_{t-1} - Due_t + (i/12) * Debt_t + Fees_t$$

- Consider an agent observed from $t = 1$ and is in the experiment until T when the card exits or the experiment ends. Then, given a discount rate β

$$\sum_{t=1}^T \beta^t (Pay_t - Buy_t) = \sum_{t=1}^T \beta^t (Due_{t-1} - Due_t) + \sum_{t=1}^T \beta^t ((i/12) * Debt_t + Fees_t)$$

- LHS is a measure of discounted net revenue accruing to the bank. We begin by analyzing this measure of revenue to the bank.