

# Minimum Payments and Debt Paydown in Consumer Credit Cards

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# Credit Card Market is Crucial for Consumers

- Over 400 million open accounts in United States, roughly \$700 billion in outstanding debt
- Most common credit market households use to smooth consumption
- Yet ultimate costs of borrowing are far from straightforward:
  - Promotional offers
  - Multiple interest rates
  - Penalty fees and other fees
- Two key margins for understanding credit card indebtedness
  - Borrowing
  - Repayment

# Minimum Payments Are Shown On All Credit Card Statements

PAYMENT INFORMATION		
New Balance		\$783.50
Minimum Payment Due		\$35.00
Payment Due Date		02/04/13
<p><b>Late Payment Warning:</b> If we do not receive your minimum payment by the date listed above, you may have to pay a late fee of up to \$35.00 and your APRs may be increased up to the Penalty APR of 29.90%.</p> <p><b>Minimum Payment Warning:</b> If you make only the minimum payment each period, you will pay more in interest and it will take you longer to pay off your balance. For example:</p>		
If you make no additional charges using this card and each month you pay	You will pay off the balance shown on the statement in about ...	And you will end up paying an estimated total of ...
Only the minimum payment	3 years	\$1,100.00
<p>If you would like information about credit counseling services, call 1-888-898-9506 or log on to the United States Trustee's website at <a href="http://www.justice.gov/ust/eo/bapcpa/ccde/cc_approved.htm">www.justice.gov/ust/eo/bapcpa/ccde/cc_approved.htm</a>.</p>		

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# Minimum Payments are Suspected To Play An Important Role in Repayment

Does paying the minimum simply reflect liquidity constraints? Or...

“[Minimum payments] can serve as an anchor, and as a nudge that this minimum payment is an appropriate amount”

- *Nudge*, Thaler and Sunstein



**Some experimental evidence (Stewart 2009), but little systematic empirical analysis of actual credit card borrowers.**

# Our Goals: Describe Payment Behavior, Estimate Effects of Policy Changes

1. Describe taxonomy of borrower repayment behavior
  - Persistence of behavior within account
  - Distribution of payments by balance, income, FICO
2. Estimate impact of policy changes on payment behavior
  - a) Issuer-level increases in minimum payment formulas
  - b) Payment-related disclosures mandated by the CARD Act of 2010
3. Interpret the effects of both “policy rules” and “nudges”
  - Intended vs. unintended consequences
  - Note that claims regarding welfare are tricky in this context

# Key Findings

- Changes had expected effects
  - Formula changes led to small increase in payments for low-balance accounts, driven by mechanical effect. Small increase in delinquencies, suggestive of extreme liquidity constraints.
  - All disclosures led to some upward shift in payment distribution
    - Information alone matters!
- Both changes also had (presumably) unintended effects
  - Formula changes led 2% of high-balance account-months to move from full payments to low-payments
  - 3-year calculation disclosure led to 1% *decline* in account-months paid in full
- Net effects
  - New evidence of anchoring behavior (“incomplete bunching”)
  - No overall effect of formula changes on payment amounts, likely indicating mild effect on issuer profits
  - Average \$2-19 per month increase in payments due to CARD Act disclosures

# Sample Description and Payment Behavior Taxonomy

# Sample: General-Purpose Cards From Most Large Issuers

## CFPB Credit Card Database (CCDB)

- Full database: 18 of the largest credit card issuers
  - Account-level monthly summaries from 2008-2012
- Analysis sample
  - 16 million account-month observations of general-purpose consumer cards
- Linked to TransUnion quarterly snapshots of credit records
  - Cannot link multiple accounts per customer (yet), but can look at substitution effects

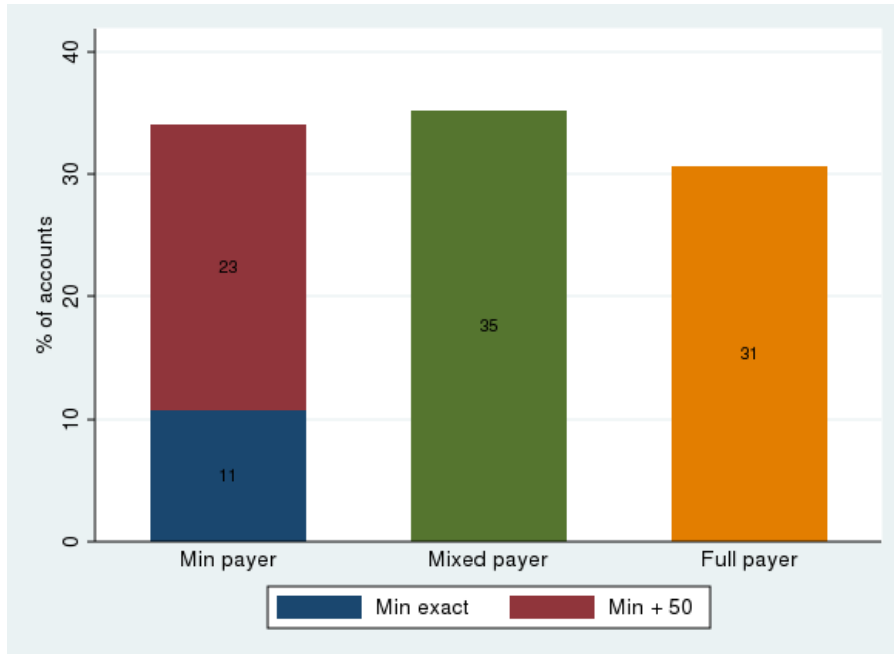


# Sample is Representative of U.S. Consumer Cards

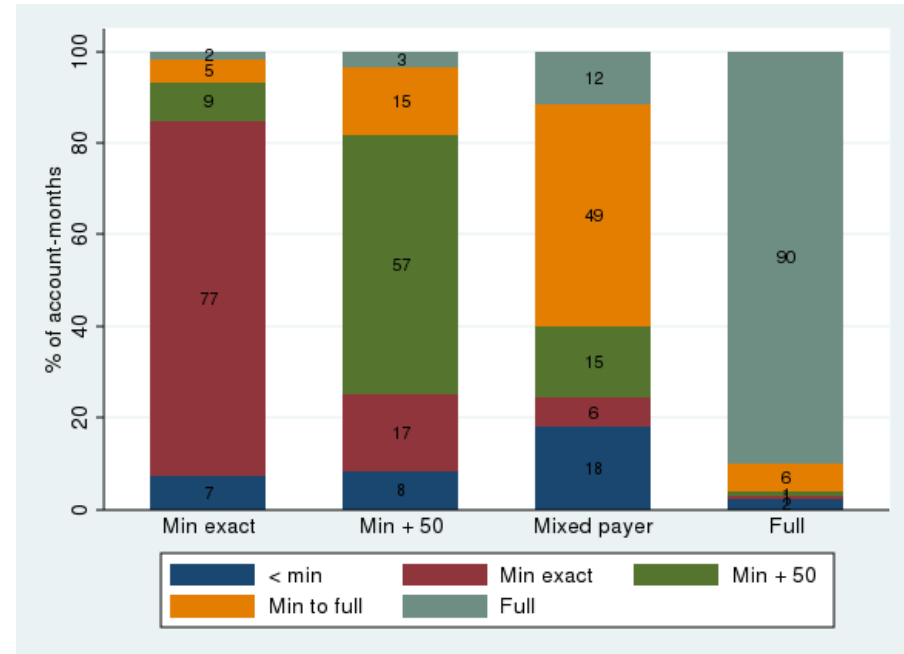
	<b>Mean</b>	<b>Median</b>	<b>Std. Dev.</b>
Cardholder Income	\$71,151	\$56,000	\$473,245
Fico	712	724	86
Retail APR	16.12%	15	8.1
Multiple relationships	31%		
Multiple cards	33%		
Balance	\$3,233	\$1,413	\$4,588
Fraction paid	39%	9%	40%
Minimum payment	\$88	\$39	\$275
Payment:			
< min	10%		
Minimum exact	15%		
Minimum + 50	35%		
Min to full	23%		
Full	33%		

# Most Accounts Exhibit Consistent Payment Behavior

## % of Accounts

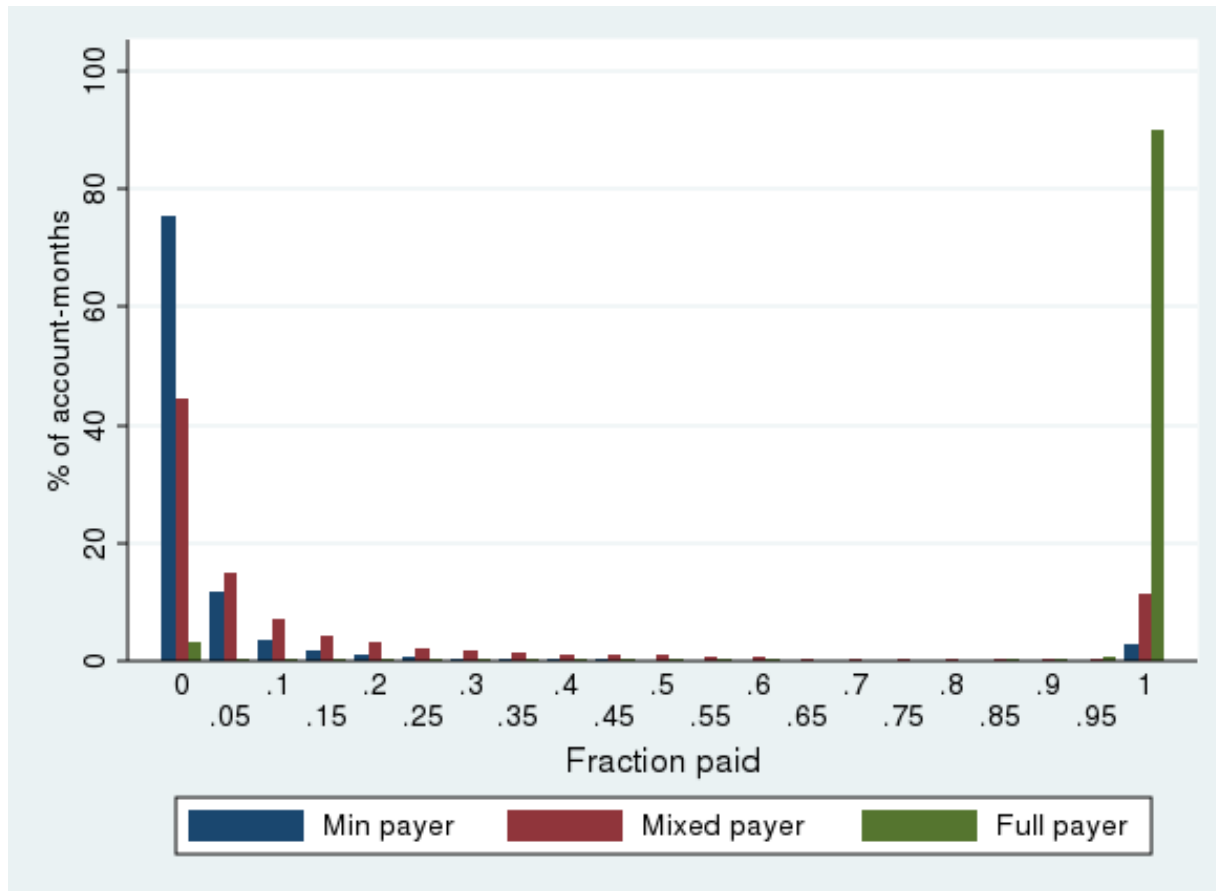


## % of Observations



Payer types defined based on whether more than 50% of an account's statement months with positive balances were paid in full, paid with the minimum amount, or paid within \$50 of the minimum.

# Fraction of Balance Paid is Bimodal Within All Payer Types



This is also true within-borrower

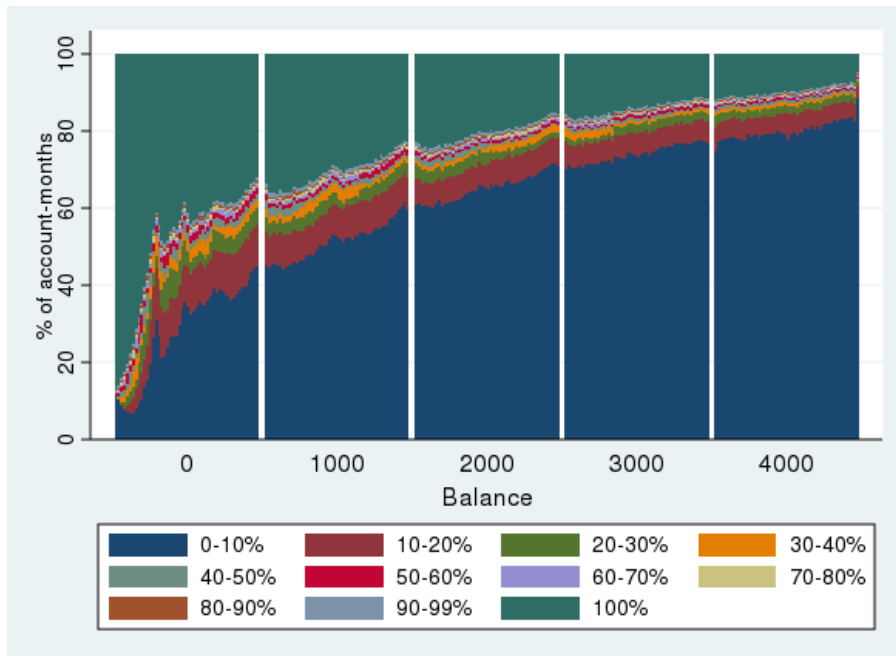
# Paying The Minimum Generates Substantial Interest Costs

- Interest costs range from \$0 if paid in full to greater than the initial principal if only the minimum is paid
- Example:
  - Borrow \$2000 @ 18% APR
  - Minimum formula:  $\max(\$20, 1\% \cdot \text{balance})$

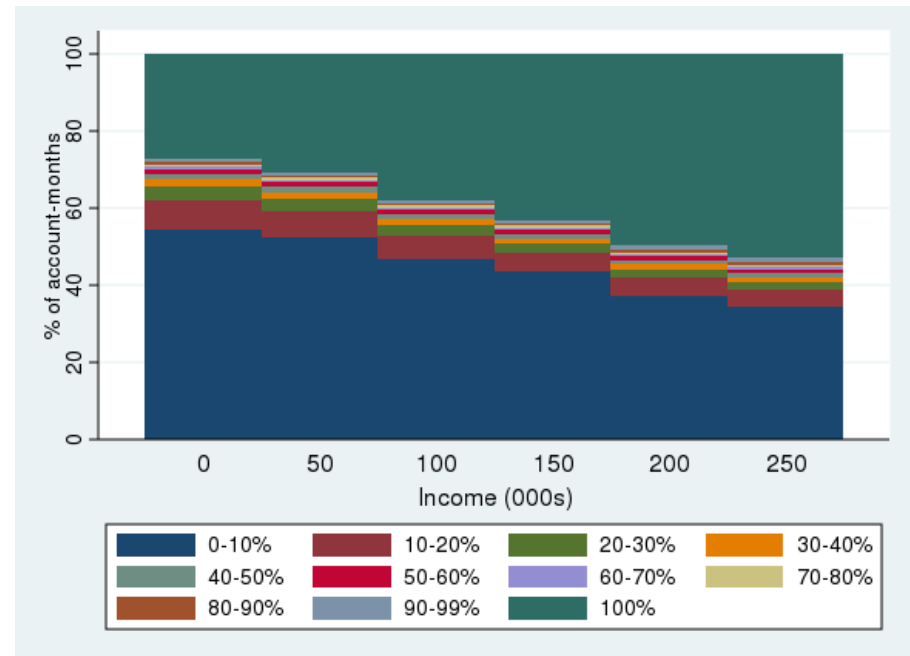
<u>Payment</u>	<u>Avg payment</u>	<u>Total cost</u>
Full payment	\$2,000	\$0
Pay back over 36 mos	\$72.30	\$603
Pay minimum (153 mos)	\$27.69	\$2,231

# Payments are Bimodal Across Balance and Income

## Balance

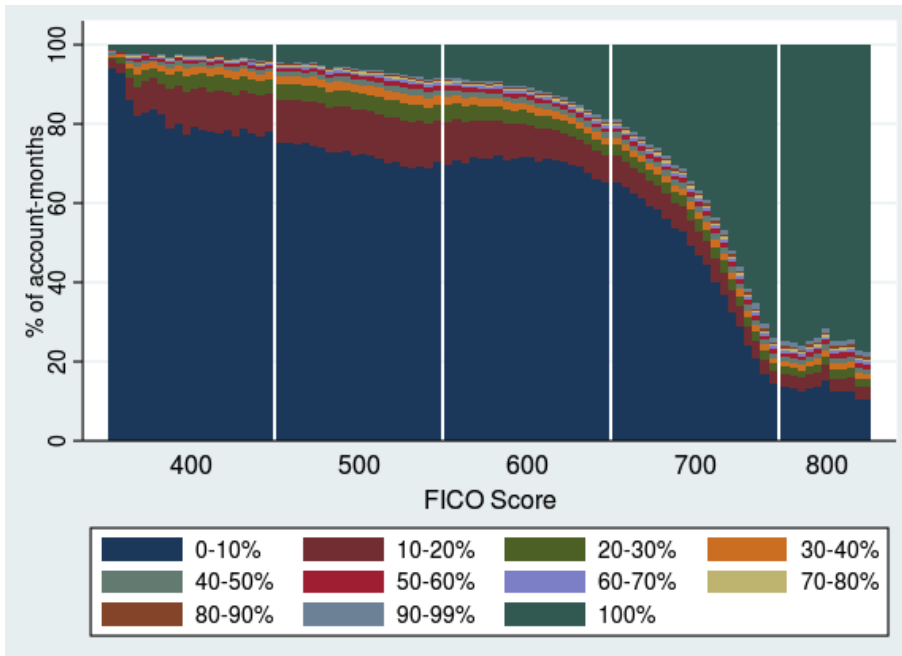


## Income

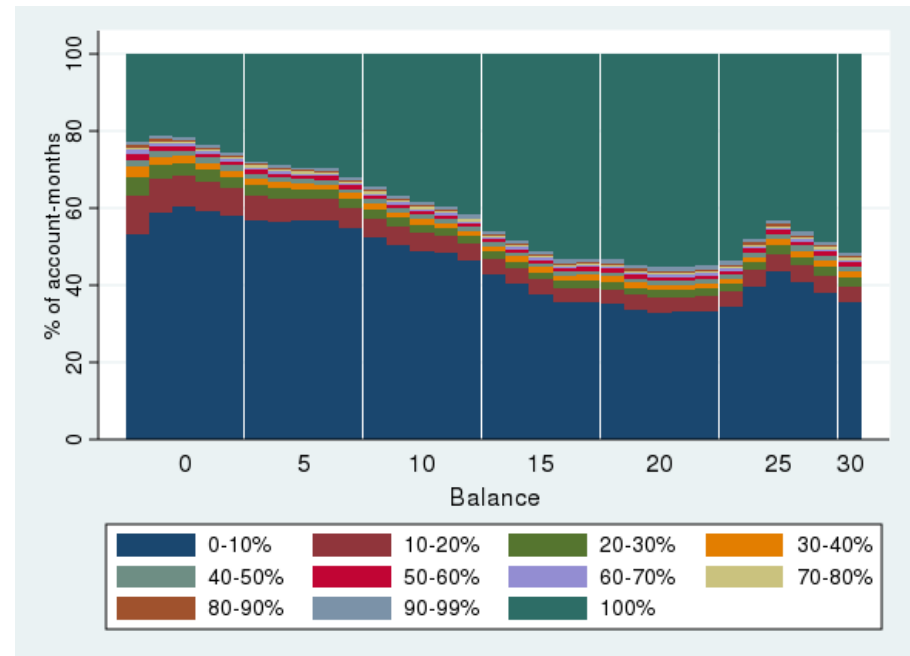


# Even Peak-Earners and High-FICO Often Pay Just the Minimum

## FICO



## Account Age



# Research Strategy #1: Changes in Minimum Payment Formulas

# Identification Comes from Changes in Minimum Payment Formulas

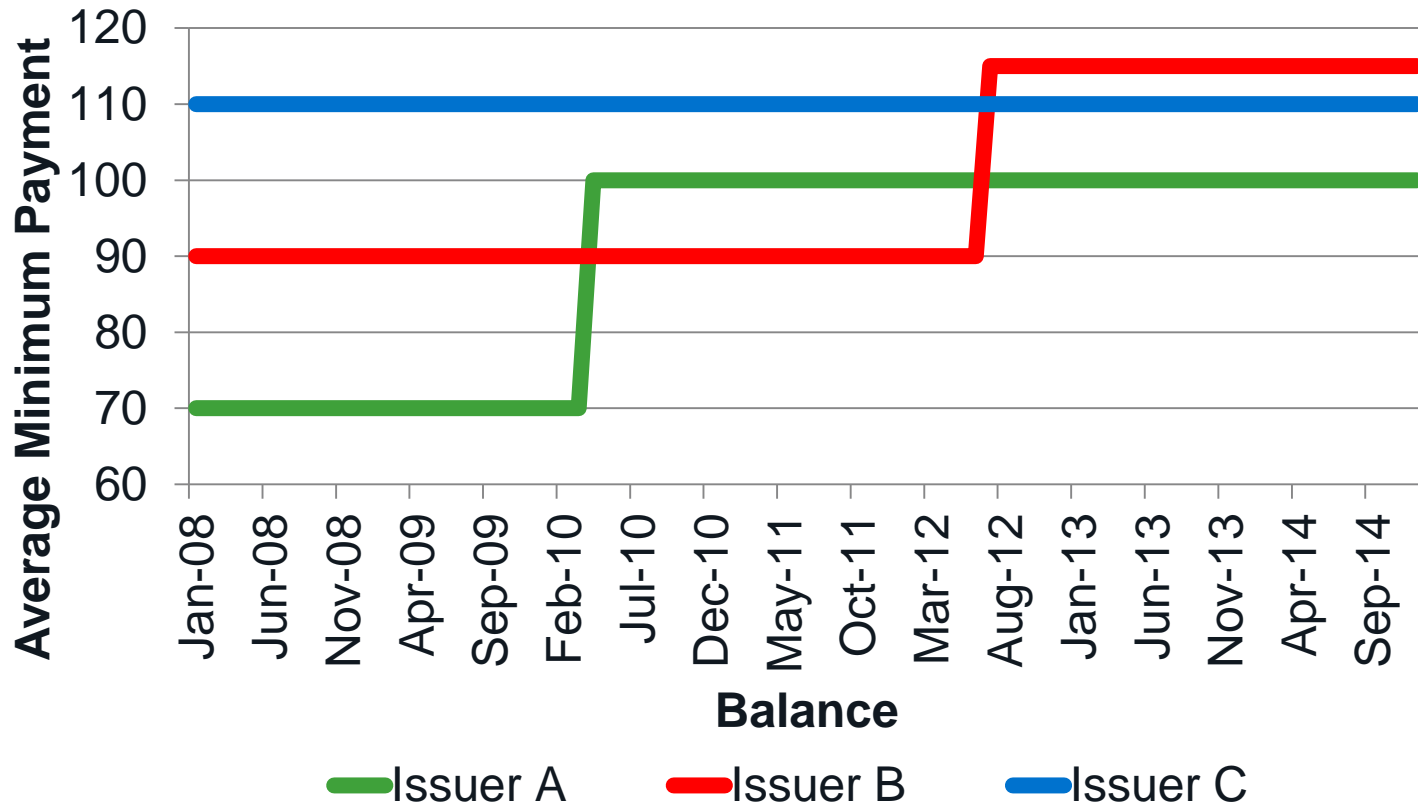
- Several issuers change formula in sample period
  - Unilaterally imposed on accounts at point in time
    - Not based on consumer behavior
- Empirical approach
  - Difference-in-differences regressions
    - Heterogeneity across borrowers based on pre-existing balance:

$$Y_{ijt} = \alpha_i + \gamma_t + \sum(\beta_b \times \text{Post} \times I_b) + f(\text{bal}) + X_{ijt} + \varepsilon_{ijt}$$

- Controls for issuer, calendar month, consumer and card characteristics, account payment behavior, time trends
- Robust to specifications with account fixed-effects
- Standard errors clustered by issuer-month

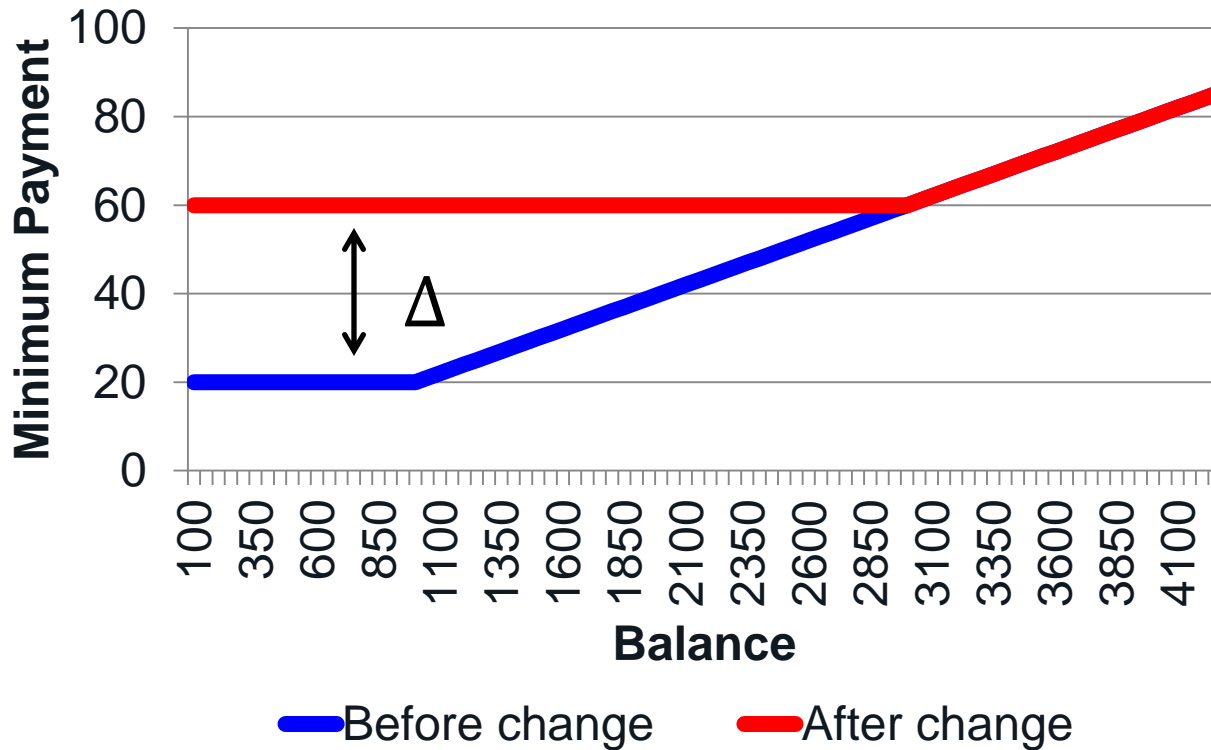


# Formula Changes Generate Discontinuities Within Issuer Over Time



Graph shows a stylized representation of the impact of changes in issuer formulas on the average minimum payment.

# Formula Kinks Generate Within-Issuer Variation in Treatment Intensity



Graph shows a stylized version of a typical issuer minimum payment formula before and after an increase in the formula “floor.”

# Outcomes Measure Fraction Paid and Payment Relative to Minimum

## Outcome measures:

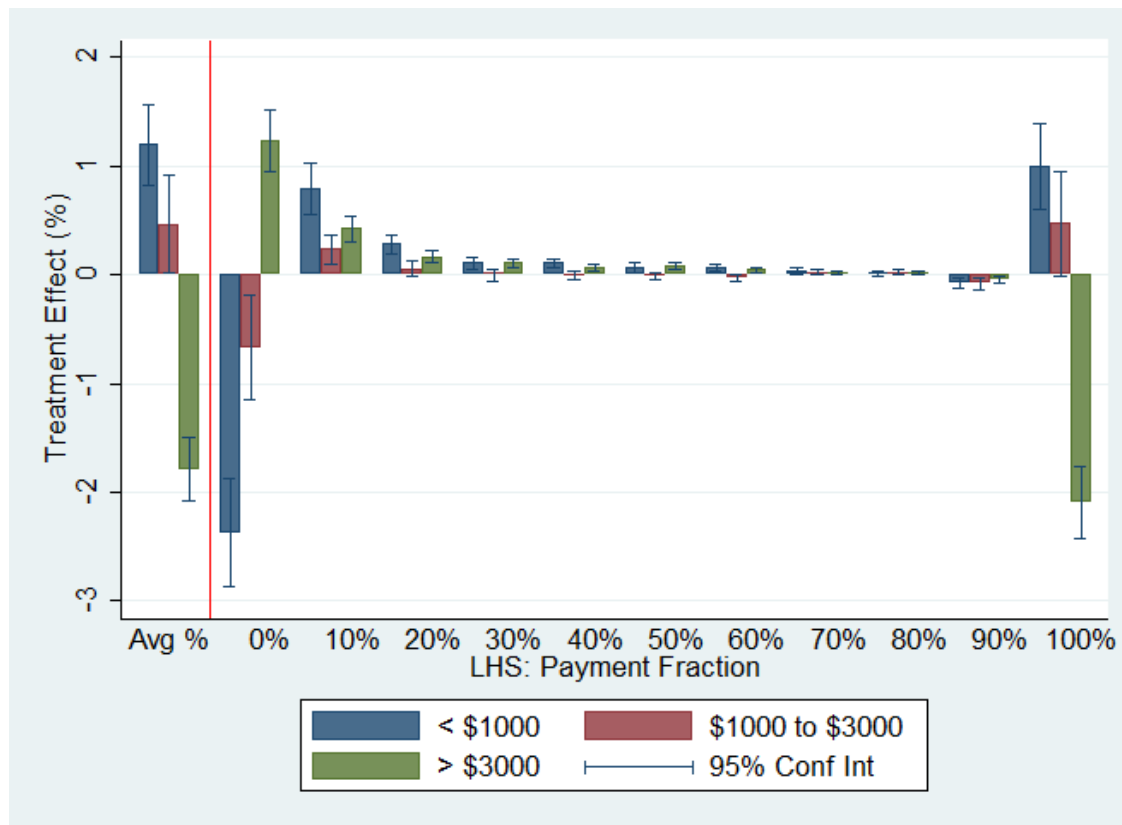
- First-stage:
  - Dollar amount of minimum
  - Minimum as fraction of balance
- Overall payment:
  - Amount paid
  - Fraction of balance paid
- Indicators for payment relative to minimum and full
  - Paid < minimum
  - Paid (within \$50 of) minimum
  - Paid between minimum and full
  - Paid in full

# Average \$18 Increase in Minimum, No Net Effect on Actual Payments



Coefficients of difference-in-differences regressions interacted by balance. Dependent variables are minimum payment due and actual dollar amount paid.

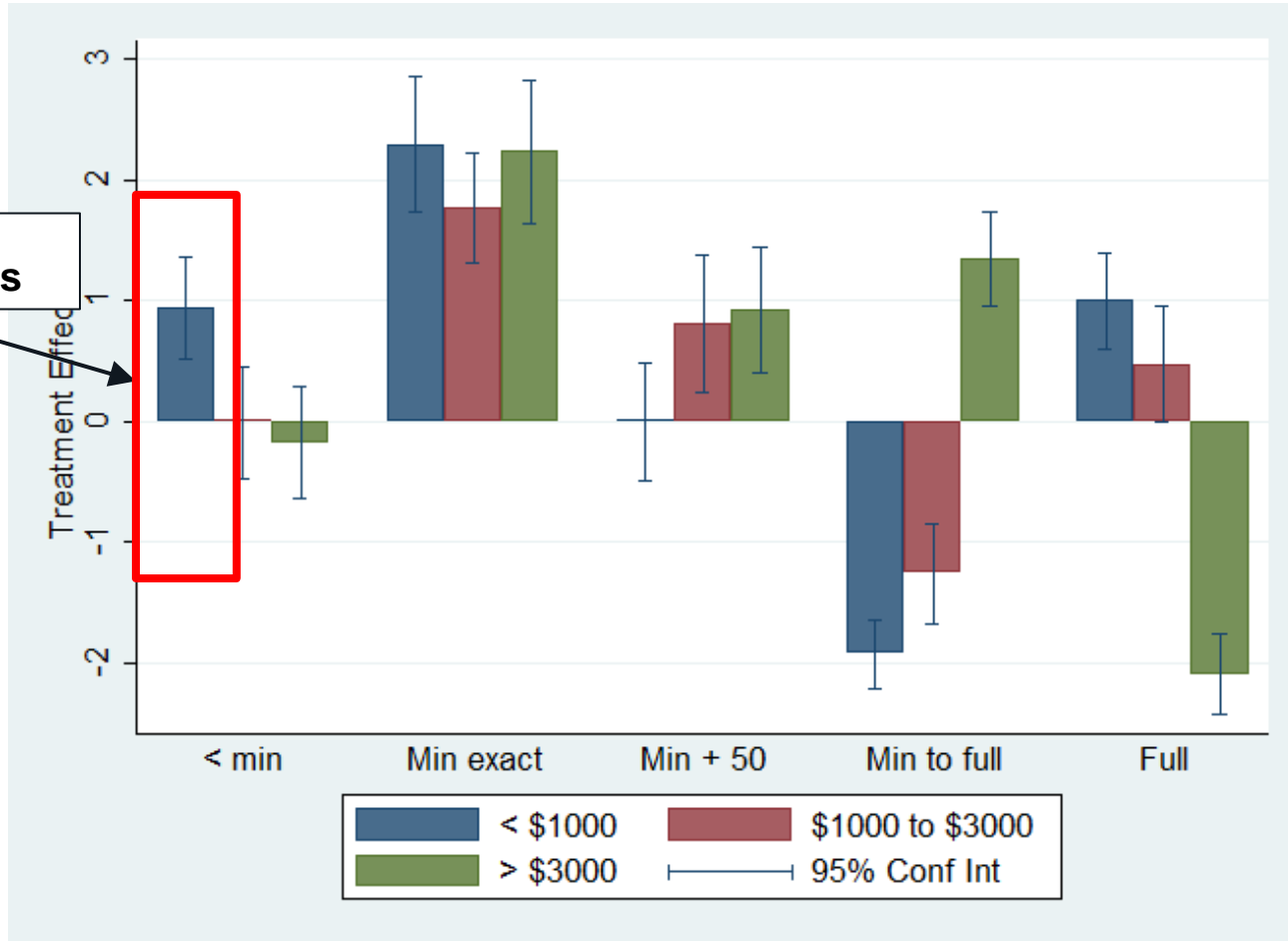
# 2% of High-balance Account-Months Move From Full to Low Payments



Coefficients of diff-in-diff regressions interacted by balance. Dependent variables are indicators for actual payments within 10% bins by fraction of balance.

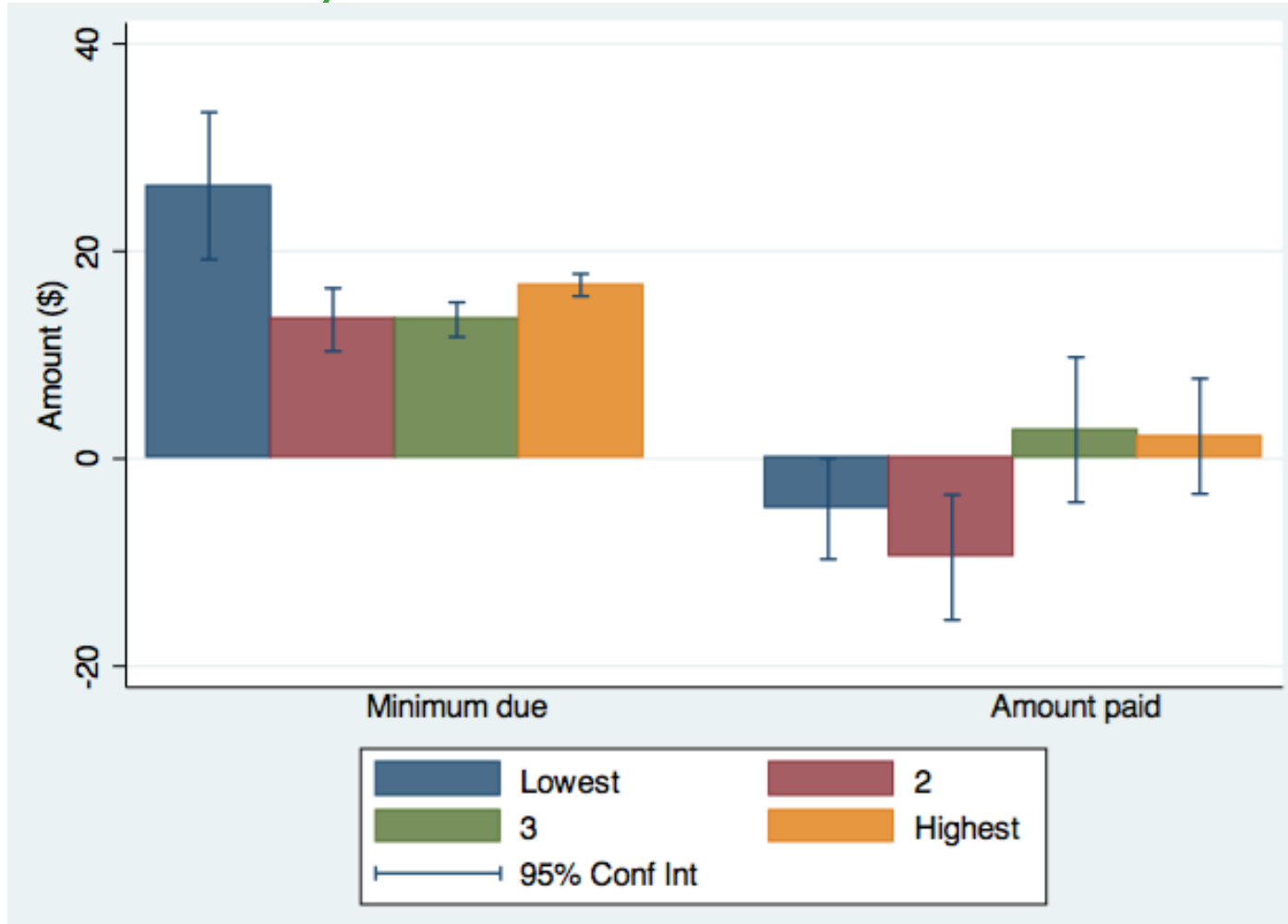
# Increased Incidence of Minimum Payment and Delinquency

Increase in delinquencies



Coefficients of diff-in-diff regressions interacted by balance.

# Reduction in Payments Driven by Low-FICO Borrowers



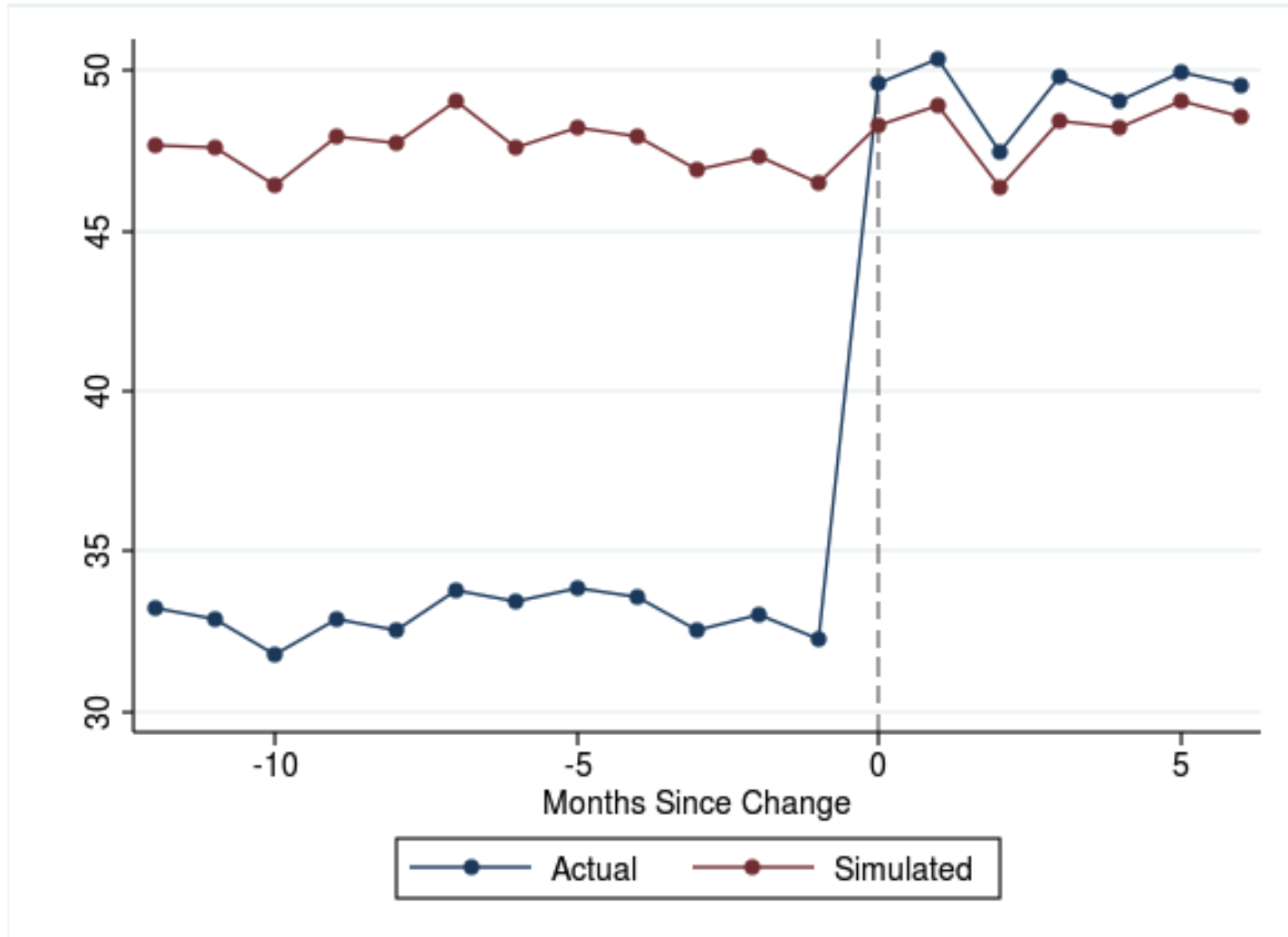
Coefficients of diff-in-diff regressions by FICO quartile

## Identifying the Extent of Anchoring (preliminary)

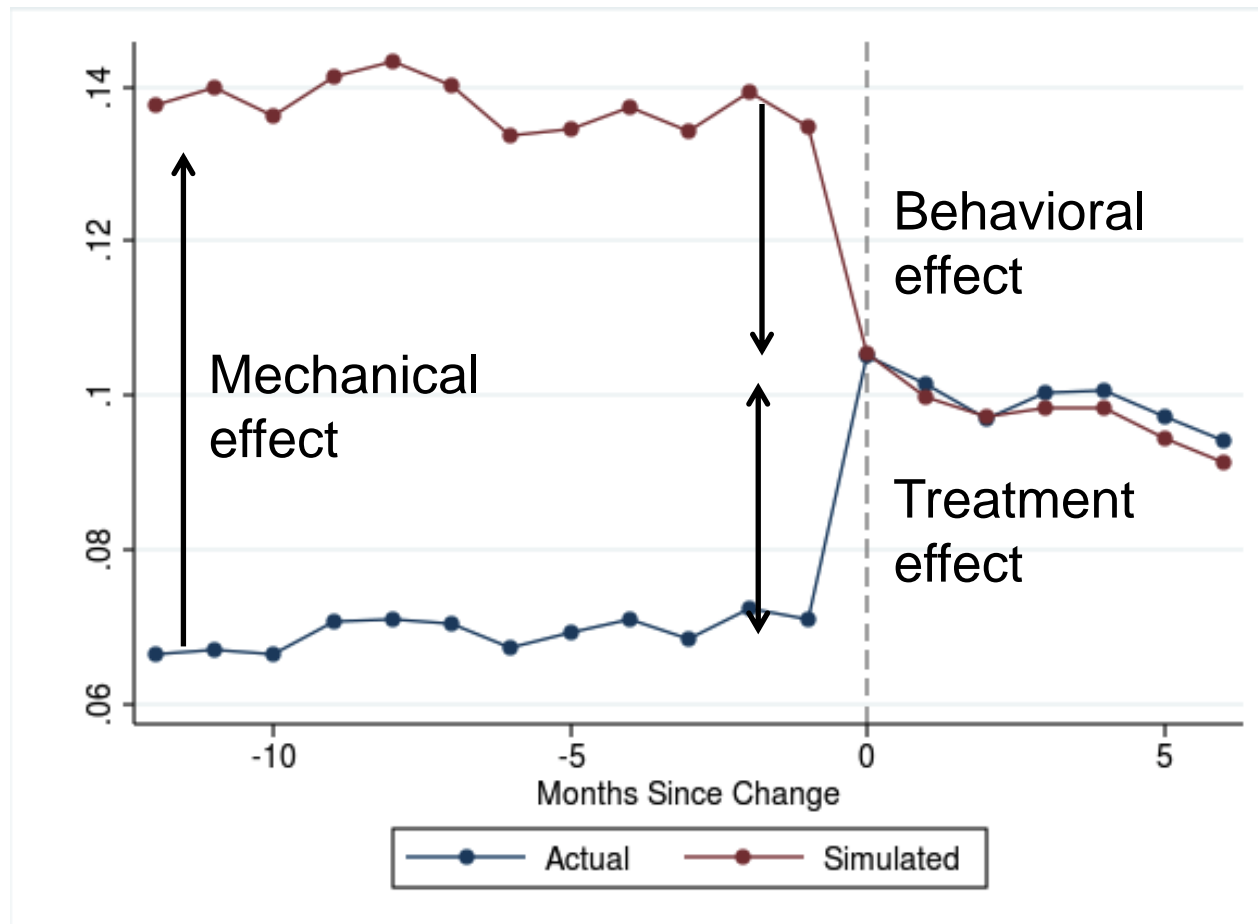
- Hypothesis: If liquidity constrained, then an increase in the minimum should either
  - 1) Mechanically increase payments to the new minimum
  - 2) Increase defaults
- First calculate “mechanical effect”
  - Use difference between pre-change and post-change formula, assuming no behavioral response (Gruber and Saez 2002; Cabral, Geruso, and Mahoney 2014)
- Decompose “non-mechanical” effect into increased delinquency and “anchoring”
  - Other “rule of thumb” behavior



# Actual and Simulated Minimum Payments Around Change in Minimum



# Fraction Paying Minimum Exactly Event Study

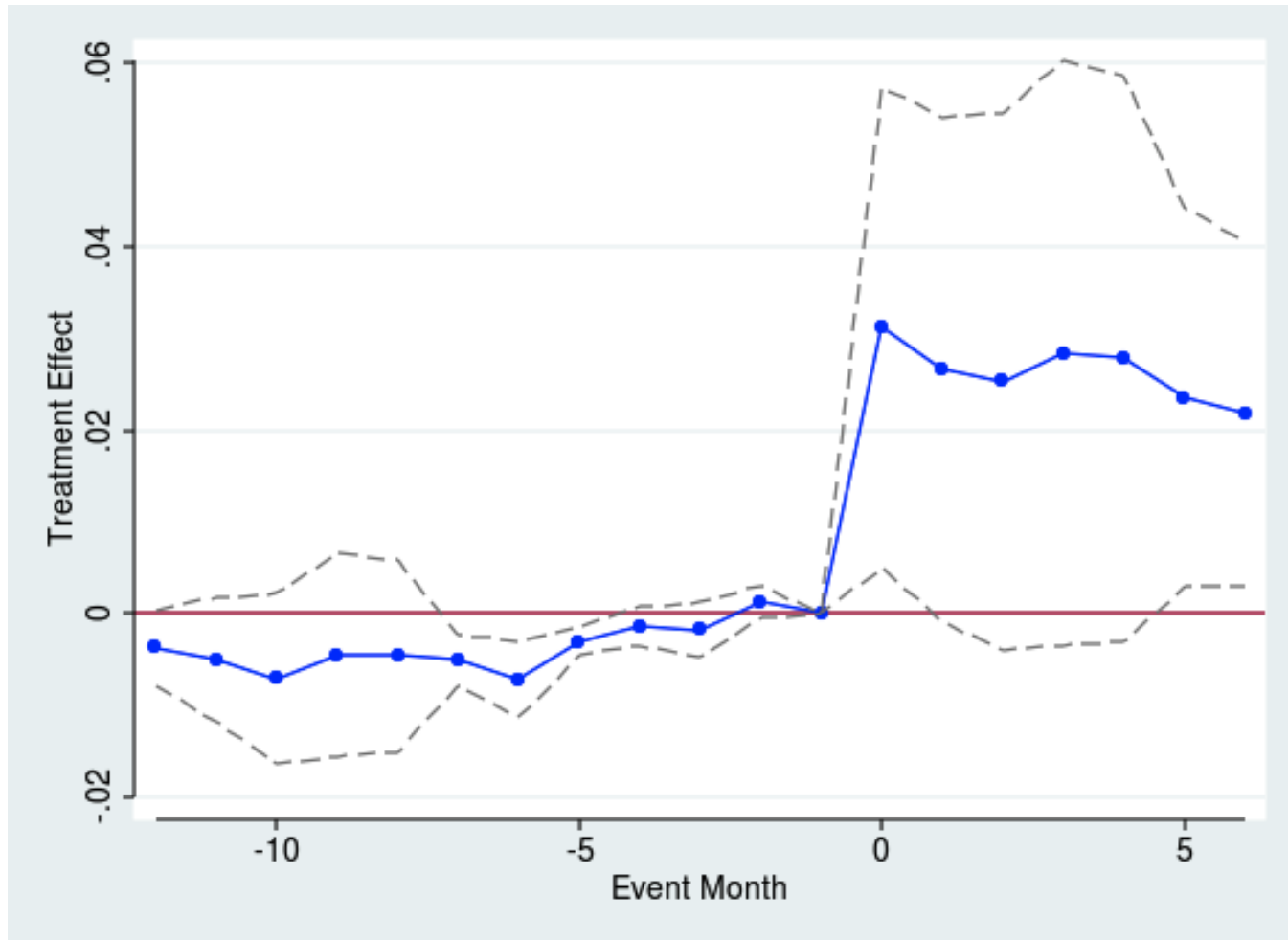


Positive mechanical effect but negative behavioral effect – consumers either default or pay more than the mechanical increase.

# Quantifying Minimum Formula Changes

- Mechanical Effect: 6.5% (specification with controls, time trends, account-level fixed effects)
  - On average, we would expect to see consumers paying the minimum ex-post in 6.5% more account-months if everyone moved to the new minimum
- Treatment Effect: 3.1%
  - Not everyone simply adjusts to new minimum
- Decomposition:
  - Fraction severely constrained: 17%
    - Increase in delinquency
  - Fraction potentially constrained: 48%
    - Move from old to new minimum exactly (treatment effect)
  - Fraction anchoring: 35%
    - Move from amount greater than old minimum to amount greater than new minimum

# Persistent Effects of Formula Changes



Event Study figure of Treatment Effect (paying exactly the minimum)

# Key Findings: Impacts of Minimum Formula Changes

- **First-stage:**
  - Formula change imposed \$15-20 increase in required minimum for most borrowers
- **Low-balance (<\$1k) group: “Delinquency” effect**
  - 1% increase in delinquencies -> suggests these consumers are extremely constrained
- **High-balance (>\$3k) group: “Unintended” effect**
  - -2% effect on fraction of balance paid, driven by decreased incidence of full payments
- **Overall:**
  - Roughly 4% to 6% of account-months changed their behavior
    - Low FICO borrowers most responsive in the “unintended” direction
  - Anchoring appears to be common near the minimum payment amount

# Research Strategy #2: CARD Act Disclosures

# Description of Disclosures and Empirical Strategy

# Most Statements Now Include Minimum and Late Payment Warnings

## Disclosures Implemented in February 2010:

- **Late Payment Warning (all statements):**

**Late Payment Warning:** If we do not receive your minimum payment by the date listed above, you may have to pay a \$35 late fee and your APRs may be increased up to the Penalty APR of 28.99%.

- **General minimum payment warning (75% of statements):**

**Minimum Payment Warning:** If you make more than the minimum payment each period, you will pay less in interest and pay off your balance sooner

- **Non- or negatively-amortizing minimum payment warning (7% of statements):**

**Minimum Payment Warning:** Even if you make no more charges using this card, if you make only the minimum payment each month we estimate you will never pay off the balance shown on this statement because your payment will be less than the interest charged each month



# More Than Half of Statements also Include a 3-year Repayment Calculation

## Sample Calculation:

<b>If you make no additional charges using this card and each month you pay. . .</b>	<b>You will pay off the balance shown on this statement in about. . .</b>	<b>And you will end up paying an estimated total of. . .</b>
Only the minimum payment	11 years	\$4,745
\$103	3 years	\$3,712 (Savings = \$1,033)

Source: [http://www.federalreserve.gov/consumerinfo/wyntk\\_creditcardrules.htm](http://www.federalreserve.gov/consumerinfo/wyntk_creditcardrules.htm)

# Difference-in-Differences Strategy Exploits Disclosure Eligibility Rules

- All disclosures were implemented on February 22, 2010
- Whether a consumer received a given disclosure is given by precise rules
  - Endogenous selection on measured observables
- Rules generate time-series and cross-sectional variation
  - Assumption: consumers do not change behavior in order to receive certain disclosures
  - Rules interact with issuer minimum policies (which we control for)
- We code the effects of combinations of disclosures (built-in interactions)
  - Minimum only
  - Minimum + 3-year
  - Non-amortization

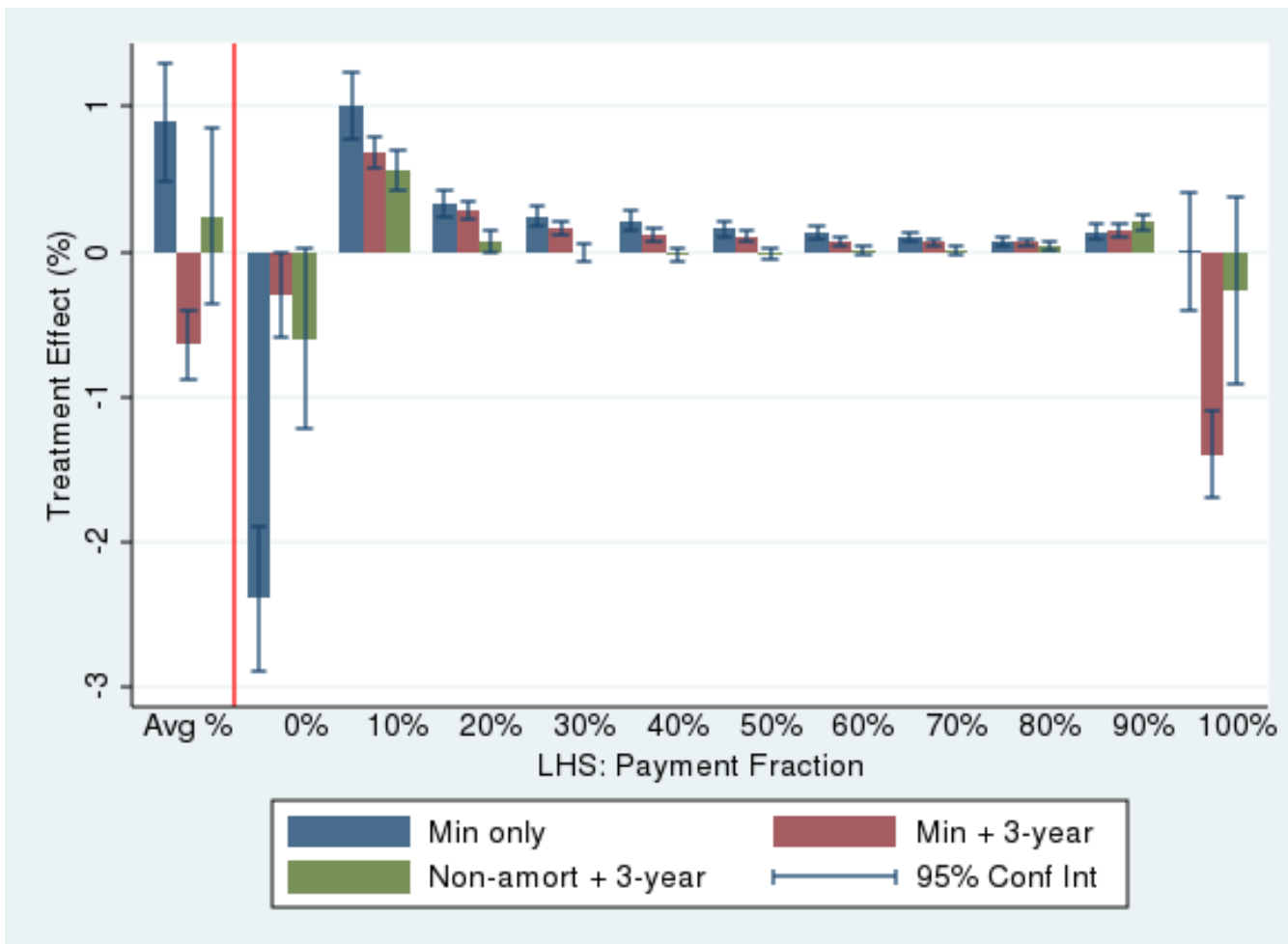
# Differences-in-Differences Strategy Exploits Disclosure Exemption Rules

- All disclosures were implemented on February 22, 2010
- Regulation Z provides rules for and exemptions from the requirement to provide disclosures:
  - Minimum payment warning: Exempt if immediately following two consecutive cycles with full payment, or if the minimum payment due is equal to the balance
  - 3-year calculation: Exempt if the repayment period for the minimum payment is three years or less, or if the 3-year payment is less than the minimum
  - Non-amortization warning: Billing cycles where negative or no amortization occurs by making the minimum payment are given the non-amortization warning instead of the minimum payment warning

$$Y_{ijt} = \alpha_i + \gamma_t + \sum \beta_d \times \text{Post} \times I_d + \sum \theta_d \times I_d + \lambda X_{ijt} + \varepsilon_{ijt}$$

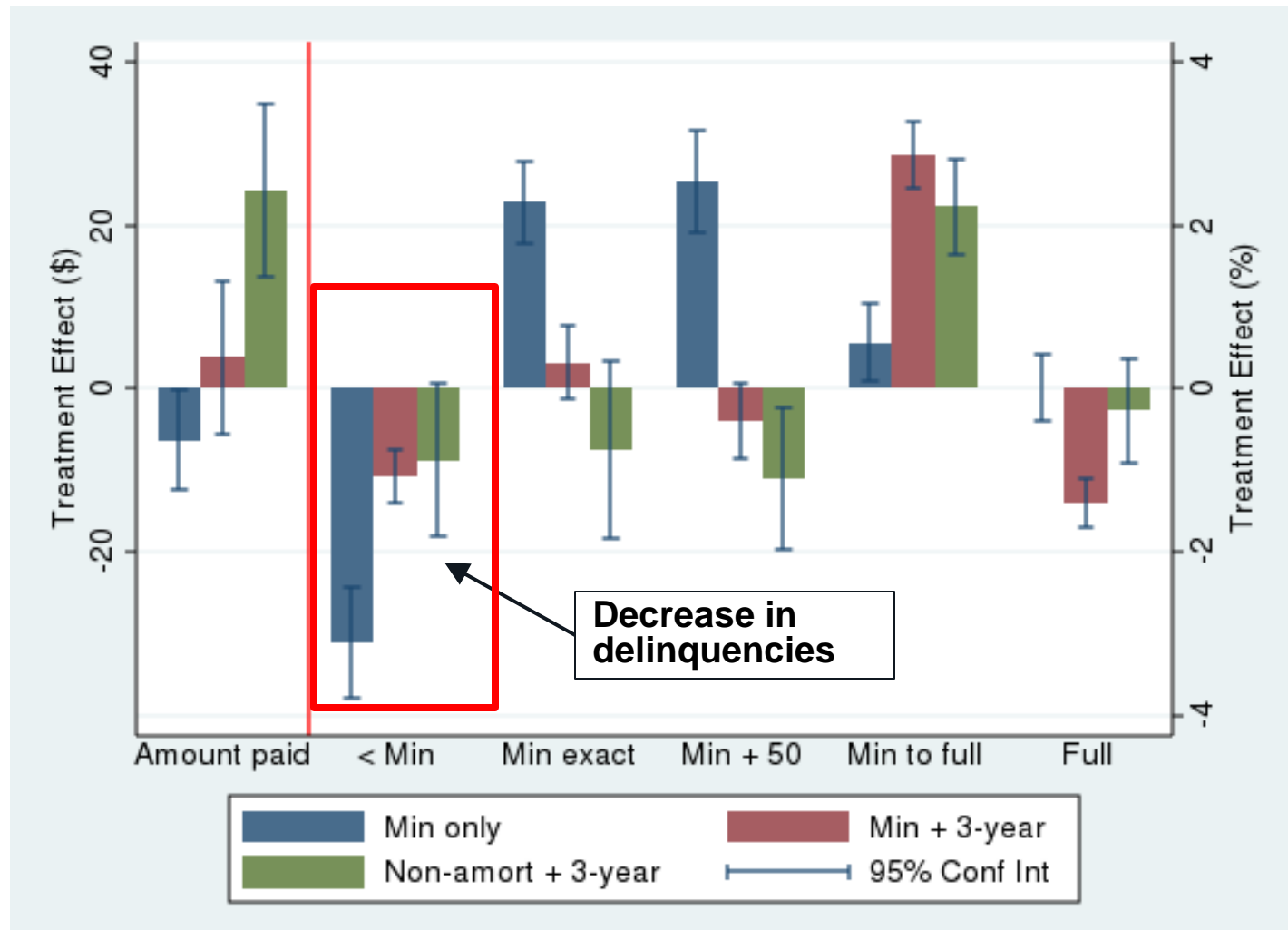
# Results: Impacts of Disclosures

# Minimum Warnings Push Payments Up, 3-year Calculation Pulls Payments Down



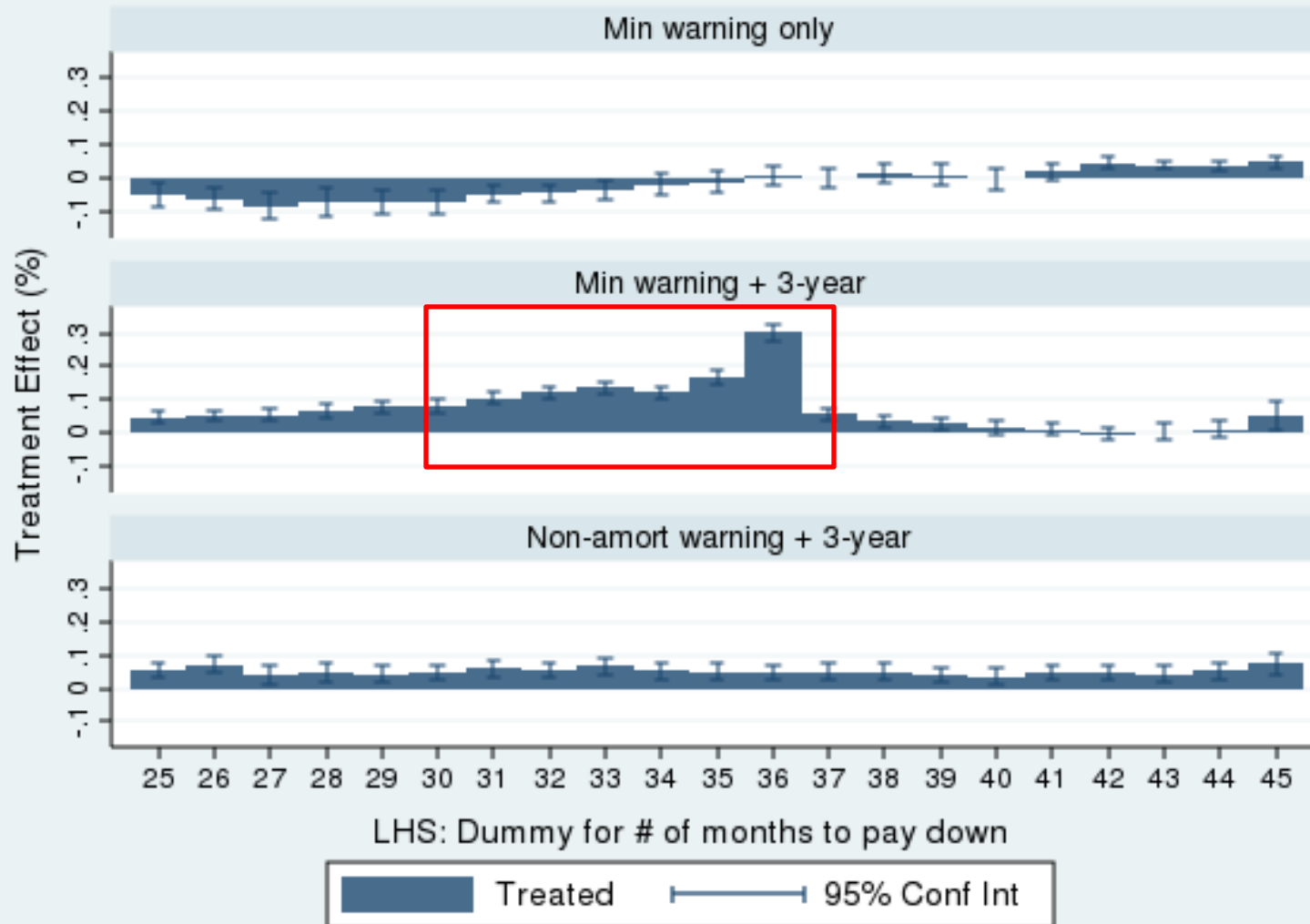
Coefficients of difference-in-differences regressions by disclosure eligibility. LHS variables indicate payments within 10% bins by fraction of balance.

# Delinquencies Decreased As A Result of All Three Disclosures

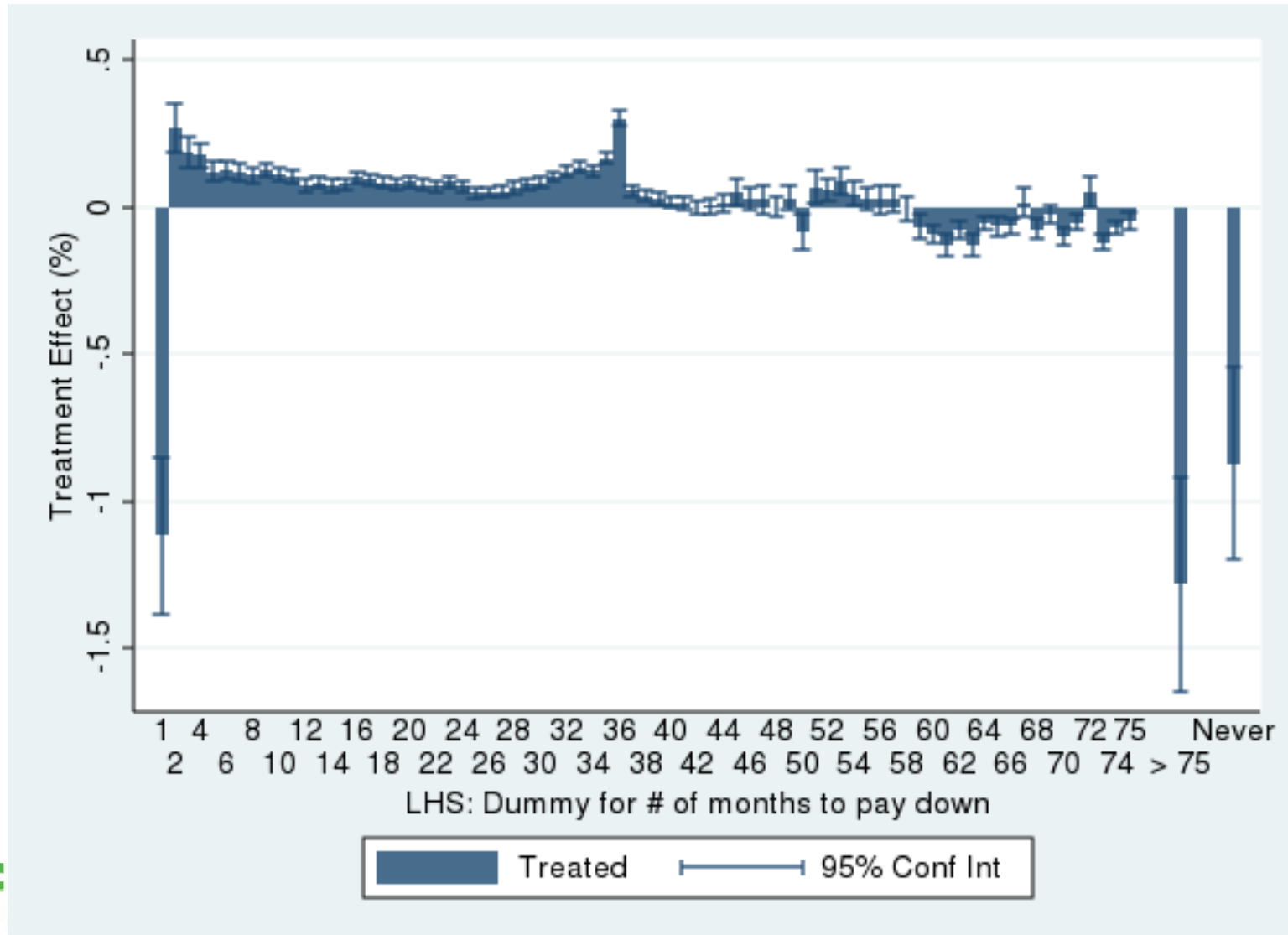


Coefficients of difference-in-differences regressions by disclosure eligibility.

# 0.3%-1% of Consumers Moved to the 3-year Repayment Amount

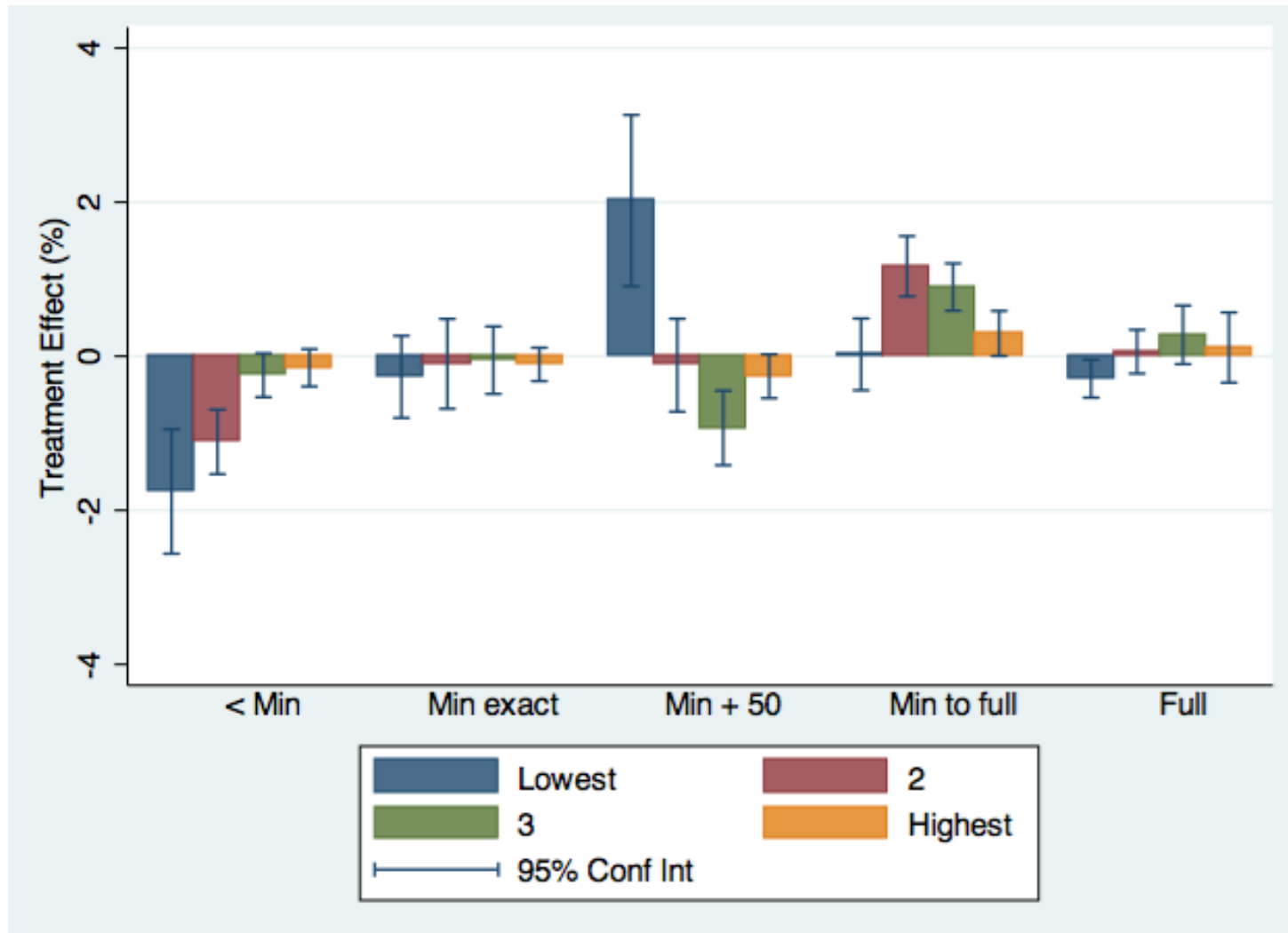


# Full Duration Distribution Shows Movement from Both Extremes



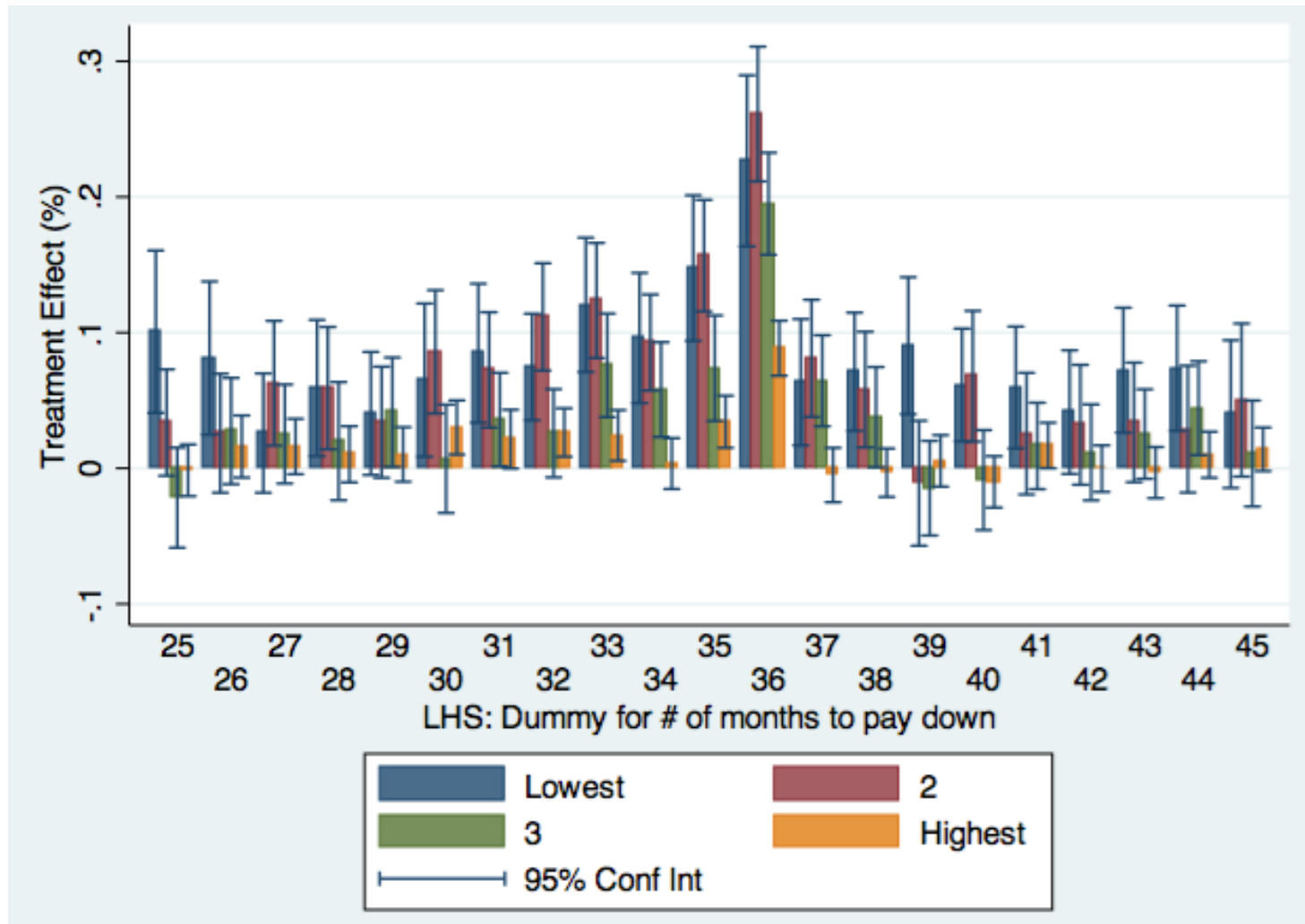


# Who is Most Responsive? Low-FICO Borrowers



Coefficients of difference-in-differences regressions by FICO quartile

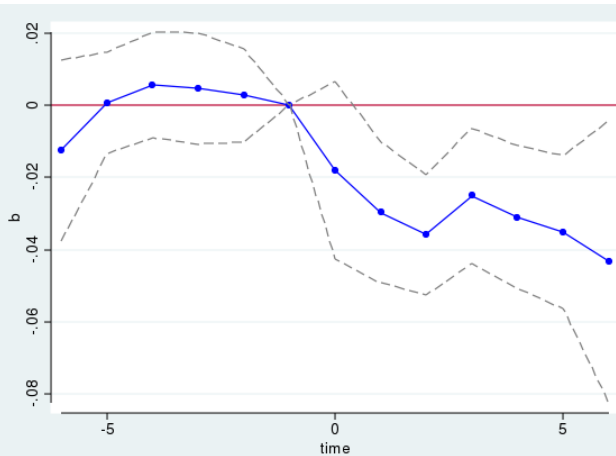
# Everyone Bunches, but Low-FICO Borrowers Bunch Most



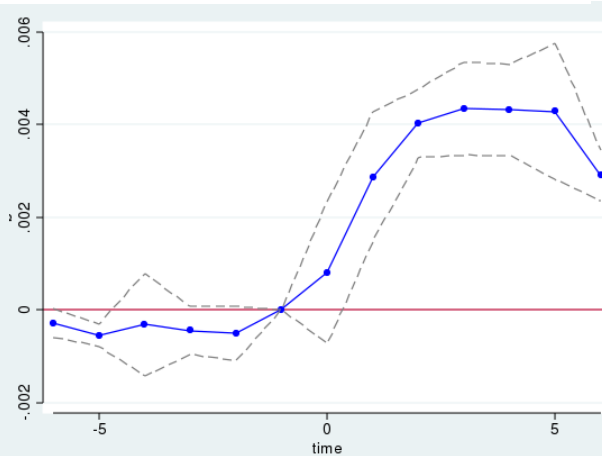
Coefficients of difference-in-differences regressions by FICO quartile

# Main Disclosure Impacts Appear Persistent

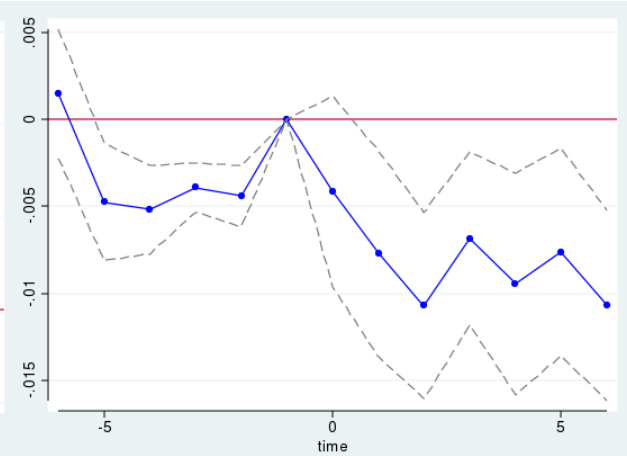
Effect of min only on delinquencies



Effect of min + 3-year on 36-month payments



Effect of min + 3-year on full payments



Month before/after February 2010

# Key Findings: Impacts of CARD Act Disclosures

- Unlike minimum formula changes, disclosures only affect information environment and framing with no change in incentives or penalties
- Minimum payment warnings affected delinquencies
  - A real response to disclosures!
- Three-year calculation:
  - 1% increase in those paying 3-year amount
  - 0.6% decrease in payment fraction, with 1.4% decline in incidence of full payment
  - Moves toward the middle from both tails of the payment distribution
- Overall:
  - Decrease in delinquencies for all groups (on top of late payment warning)
  - Only the 3-year disclosure group changed the incidence of full payments

# Discussion and Conclusion

# Minimum Payments May Act as Anchors

- Why would the minimum payment be a powerful anchor?
  - Salient signal of being in “good standing” (avoid fees)
- Anchoring heuristic as “insufficient adjustment” (Kahneman and Tversky 1974) would not predict bimodal distribution
  - Lack of support for intermediate payment amounts would suggest very high adjustment costs
- Modern anchoring literature focuses on “activation” or “priming” of responses (e.g. Chapman and Johnson 1999)
  - Minimum payment amount becomes salient potential option in the choice set, thereby distorting behavior
- Our contribution
  - Estimate the responsiveness to changes in the location of the anchor or the establishment of a new anchor

# Alternative Mechanisms Do Not Seem to Fully Explain Our Findings

- Unlikely that all minimum payments are driven by liquidity constraints
  - Those previously paying in full especially unlikely to become constrained due to formula and disclosure changes
- Unlikely to be due to mechanical effects of promotional offers
  - Similar results in a subsample removing cards less than two years old, with 0% APR, and with positive promotional balance
- Unlikely to be due to attention or present bias
  - Results are persistent, not due to short-term attention effects
  - Hyperbolic discounting does not seem to explain switching from full to minimum

# Conclusion: Increases in Suggested Payments Can Have Unintended Effects

- Takeaways
  - Nudges seem to have persistent effects
  - Anchors both push payments up and pull them down, so suggested payments at small amounts may have zero or negative net effects
    - Analogous to Madrian and Shea (2001) default 401(k) contribution result
- Policy implications
  - If consumers are underpaying credit card debt, it could be optimal to set future suggested payments at higher amounts
  - Increasing required vs. suggested payment may have a larger impact but increase delinquency and default



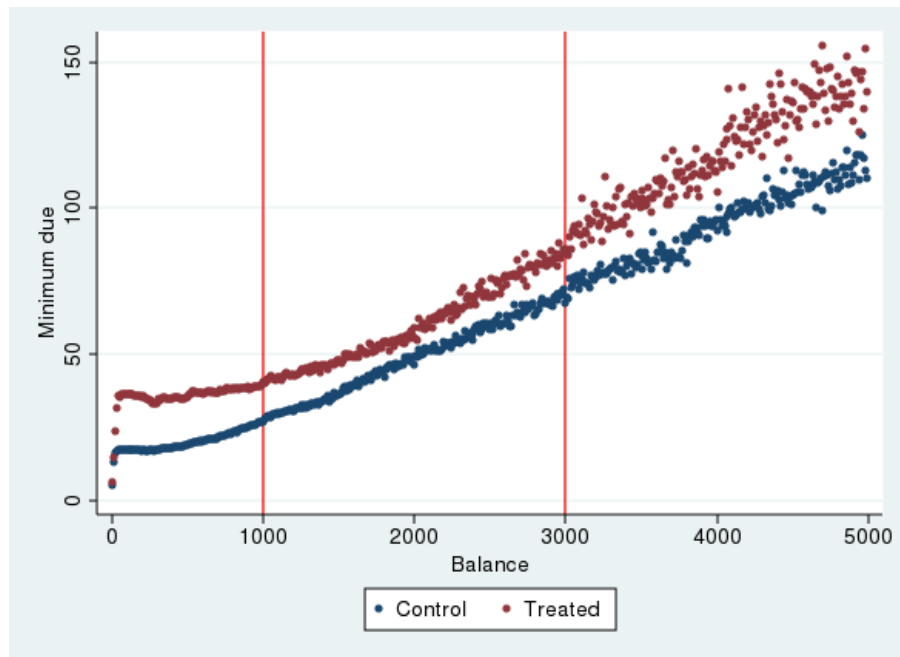
## Next Steps: Dynamic Effects, Regression Kink, and Substitution

- Theory (for better counterfactuals)
  - Formalize a model of the consumer repayment decision, with and without anchoring
- Empirical Execution
  - Dynamic effects on different margins (purchases, late fees, etc.)
  - More on Simulated Instruments approach
  - Dynamic Difference-in-regression-kink (DIRK) specification for formula changes
  - Substitution effects – TransUnion appends

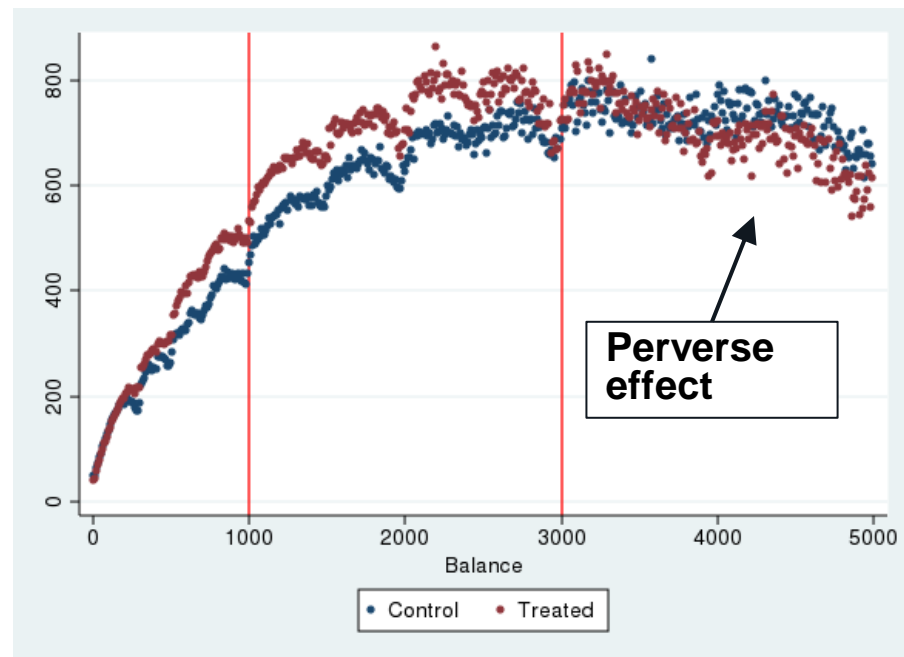
# Bonus Slides

# Graphical Diff-in-Diff: Changes in Dollar Payments by Balance

“First Stage”  
Minimum Payment



“Treatment Effect”  
Actual Payment



Means of minimum (left) and actual (right) payments in \$10 balance bins.

## Behavioral Effects May Explain Anomalies In the Liquidity Constraints Literature

- Theory and lots of evidence that MPC from stimulus payments is high, even for high-income households
  - Johnson, Parker, Souleles (2006); Kaplan Violante (2013); Parker, Souleles, Johnson, McLelland (2011);
- Impacts of tax rebates on debt paydown appear moderate
  - Agarwal, Liu, Souleles (2007), Bertrand and Morse (2009), Shapiro and Slemrod (2003)
- Increases in credit limits generate immediate increases in debt, even for those far from credit limits (Gross and Souleles, 2002)

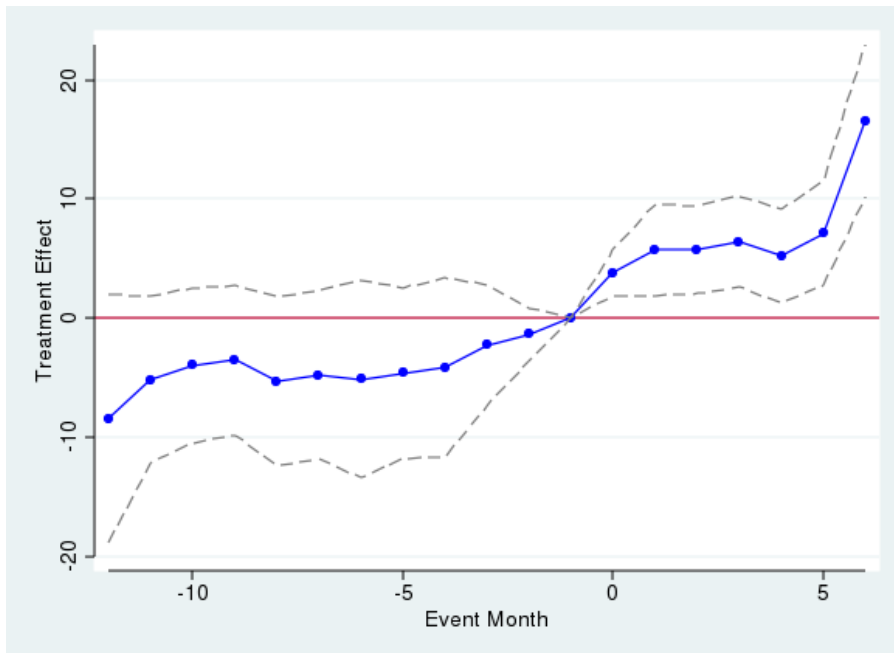
# We Contribute to the Growing “Nudge” Literature

- Automatic enrollment into **401(k)s** at 3% may decrease savings by some (Madrian and Shea 2001)
- Framing could lead to suboptimally-early **SS benefit claiming** (Brown, Kapteyn, and Mitchell, 2013)
- Peer-based nudges decrease **energy consumption** among liberal households, but increases consumption among conservatives (Costa and Kahn, 2010)
- **Calorie information** may cause dieters to eat more (Downs, Loewenstein, Wisdom 2009)
- Late pickups increased at an **Israeli preschool** after fines were imposed (Gneezy and Rustichini 2000)

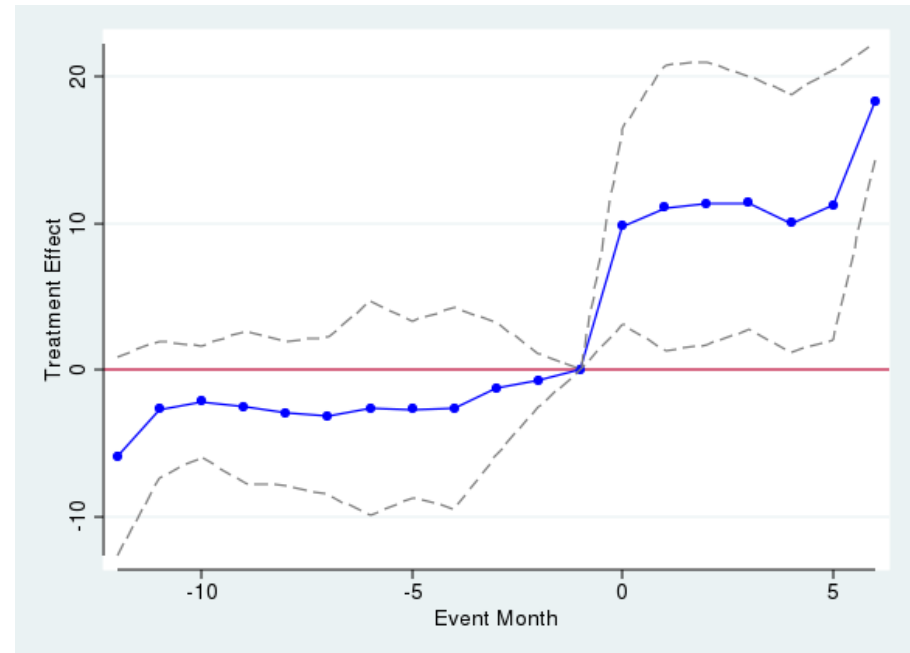
=> Common Theme: When trying to get people to take a “good” action, we may inadvertently make a “bad” action look more appealing

# Formula Change Occurs Between 4 Months Prior and 2 Months After “Treatment” Date

## All Balance Groups

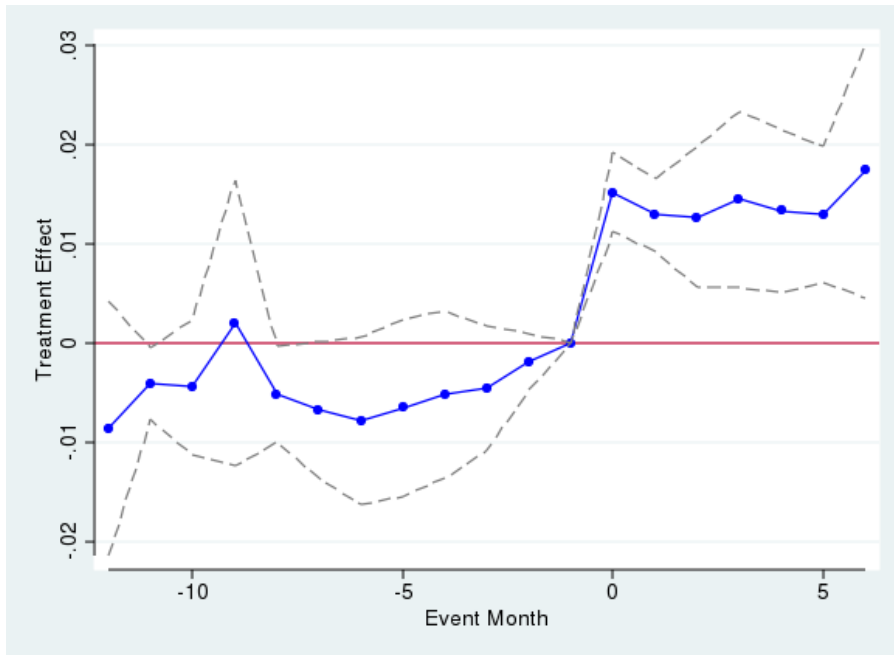


## < 1k Only

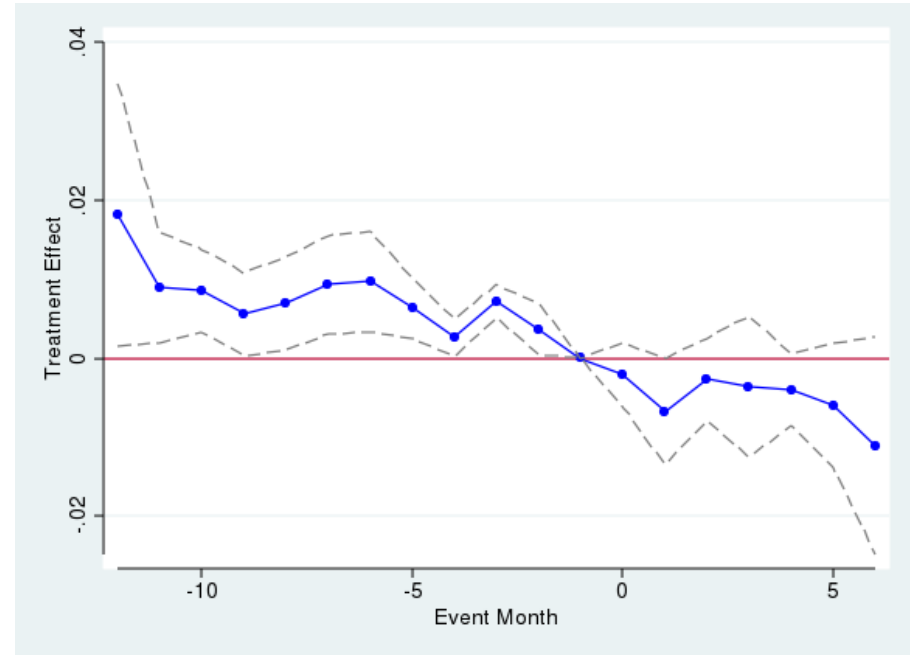


# Main Impacts Appear Persistent

Paid Min,  
All Balances

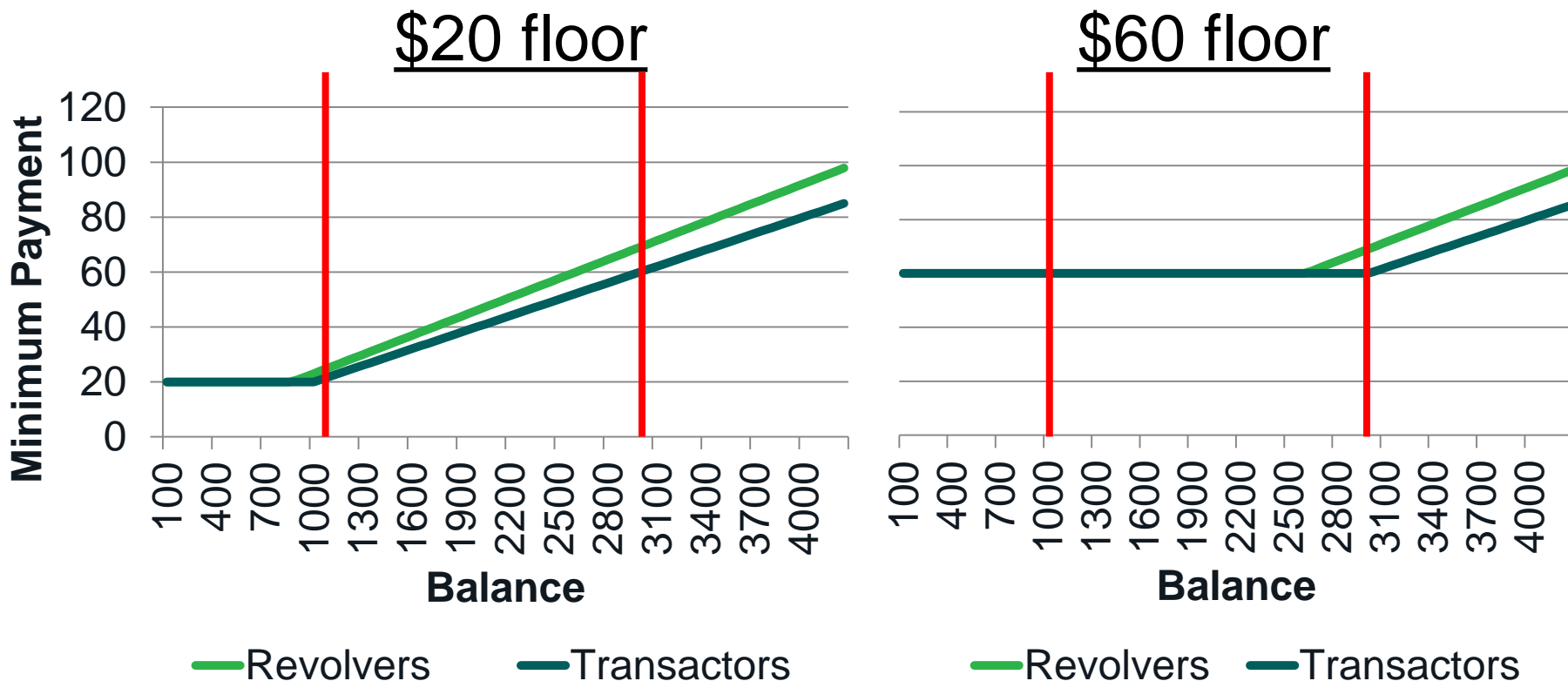


Paid full,  
> 3k only



Coefficients of event study regressions

# Identification: Changes in Minimum Payments Differ by Balance

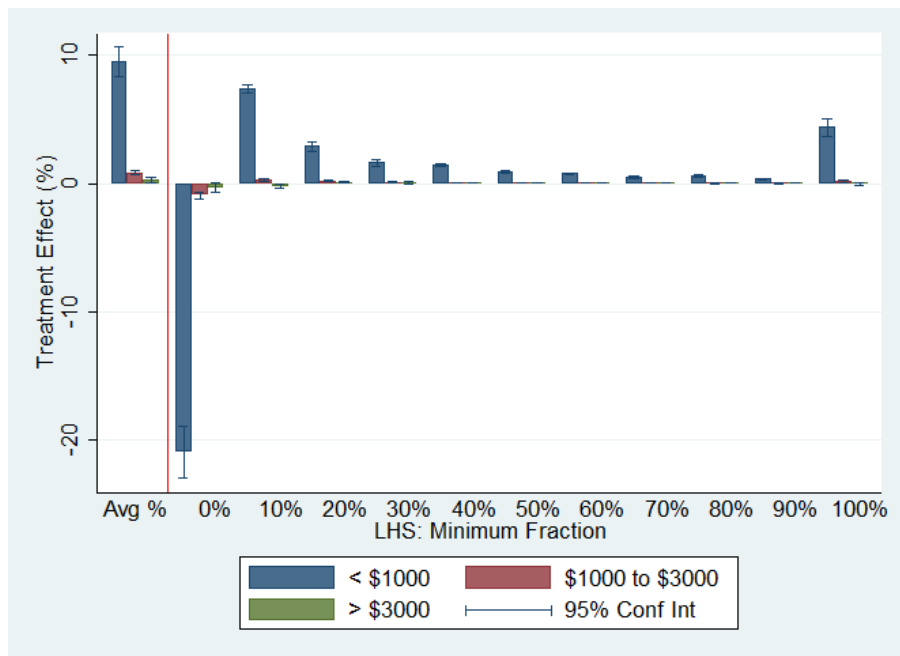


Graphs show a stylized version of typical issuer minimum payment formulas:  
 $\max(\text{floor}, 1\% \cdot \text{balance} + \text{interest} + \text{fees}, 2\% \cdot \text{balance} + \text{fees})$



# 2% of High-balance Account-Months Move From Full to Low Payments

## Minimum payment fraction



## Actual payment fraction



Coefficients of diff-in-diff regressions interacted by balance. Dependent variables are indicators for minimum (left) and actual (right) payments within 10% bins by fraction of balance.