Do Payday Loans Cause Bankruptcy?*

Paige Marta Skiba — Vanderbilt University Law School

Jeremy Tobacman — University of Oxford

November 13, 2007

Abstract

An estimated ten million American households borrow on payday loans each year. Despite the prevalence of these loans, little is known about the effects of access to this form of short-term high-cost credit. We match individual-level administrative records on payday borrowing to public records on personal bankruptcy, and we exploit a regression discontinuity to estimate the causal impact of access to payday loans on bankruptcy filings. Though the size of the typical payday loan is only $300, we find that loan approval for first-time applicants increases the two-year Chapter 13 bankruptcy filing rate by 2.48 percentage points. There appear to be two components driving this large effect. First, payday loan applicants are financially stressed. Second, approved applicants borrow repeatedly on payday loans and pawn loans, which carry very high interest rates. For the subsample that identifies our estimates, the cumulative interest burden from payday and pawn loans amounts to roughly 10% of the total liquid debt interest burden at the time of bankruptcy filing.

JEL Codes: D14 (Personal Finance), K35 (Personal Bankruptcy Law), D12 (Consumer Economics: Empirical Analysis)

*Earlier versions of this paper circulated under the title, "Measuring the Individual-Level Effects of Access to Credit: Evidence from Payday Loans." We would like to thank Dan Benjamin, David Card, Michael Clemens, Raj Chetty, Stefano DellaVigna, Ed Glaeser, Michael Greenstone, Zack Grossman, Joseph Hennawi, Pamela Jakiela, Kory Kroft, David Laibson, Ulrike Malmendier, Paco Martorell, Markus Mobius, Sendhil Mullainathan, Devin Pope, Matthew Rabin, Steve Raphael, Emmanuel Saez and Justin Sydnor for many helpful conversations, and seminar audiences at Berkeley, Harvard, Vanderbilt, IFS, Oxford, the Chicago Fed, and RAND for valuable feedback. Jonathan Leung and Chandini Singh provided excellent research assistance. We are also grateful to Elizabeth Warren for facilitating access to the bankruptcy data and to the Horowitz Foundation and a Warburg grant from the Harvard Economics Department for financial support.

1 Introduction

Each year ten million American unique households borrow on payday loans (Robinson and Wheeler 2003). This form of short-term, high-interest credit provides small amounts of liquidity until borrowers' next paydays. Though scarce prior to 1990, payday lenders now have more outlets in the United States than McDonald's and Starbucks combined.[1] Standard economic theory suggests that consumer credit—even high-interest credit—can facilitate consumption-smoothing, and the payday loan industry asserts that the loans help customers cope with short-term shocks that arise between paychecks.

Many policymakers and consumer advocates have a different view, deeming the loans predatory and usurious. In a typical example, State Senator Jim Ferlo of Pennsylvania argued that payday lenders "encourage you not to pay them back and they reel you in. They start the process of getting you hooked financially. You accumulate interest and it becomes a vicious cycle" (Mauriello 2005). The polarized debate on the consequences of this increasingly popular form of credit has led 11 states to pass legislation restricting payday lending, and in November 2005 the FDIC capped the number of payday loans a borrower could take out each year (FDIC 2005).[2]

In this paper, we provide individual-level estimates of the effects of access to payday loans. A regression discontinuity provides identification at the individual level, in the unique context of a proprietary dataset from a large payday and pawn lender. We match individuals from the proprietary dataset with public records, and then we exploit the regression discontinuity to estimate the effect of access to payday loans on personal bankruptcies. To interpret the mechanisms driving the bankruptcy results, we also measure the effect of payday loan access on subsequent payday and pawn borrowing.[3]

Institutional features of the loan application process at the lender that has provided our data make the regression-discontinuity approach possible.[4] Payday loan applications are approved if and

[1] Stephens, Inc., an investment bank that monitors the industry, has compiled a national database using information from state regulatory agencies and telephone listings. Most recently, they counted 30,000 payday loan outlets in the US. They also reported that the annual dollar volume of loans grew fourfold in four years to $40 billion dollars in 2003 (Robinson and Wheeler 2003, PricewaterhouseCoopers 2001).

[2] The cap depends on the loan durations. Any effect of the rule would have appeared after our period of observation.

[3] Morse (2007) and Melzer (2007) provide estimates of payday lending's effects using geographic variation in the placement of stores for identification.

[4] Regression-discontinuity analyses are becoming commonplace. For the econometric foundations, see Thistlethwaite and Campbell (1960), Hahn, Todd and der Klaauw (2001), and Porter (2003). Many modern applications stemmed from the work of Angrist and Lavy (1999); see also, especially, David Lee's many recent contributions (Lee forthcoming, Lee and Card 2006, Lee and McCrary 2005, DiNardo and Lee 2004, Lee, Moretti and Butler 2004).

only if the applicant's credit score exceeds a fixed threshold, with few exceptions. Our identifying assumption is that, controlling for flexible smooth functions of the credit score, unobservable characteristics of first-time applicants in the immediate neighborhood of the threshold are similar. If this is true, differences in outcomes between barely approved and barely rejected applicants can be attributed to payday loan access.[5]

We test whether payday loans affect probabilities of personal bankruptcy filings.[6] We begin by using individual identifying information to link the payday loan data to public records on bankruptcy. We implement numerous specifications to take advantage of the regression-discontinuity, of which our preferred approach restricts to applicants within 0.5 standard deviations of the approval threshold and instruments for approval with an dummy for being above the threshold. This preferred specification implies a statistically-significant increase in Chapter 13 bankruptcy petitions of 2.48 percentage points within two years of access to payday loans. Nonparametric estimates support the conclusion that payday loan access increases the probability of filing for bankruptcy, though those estimates introduce other puzzles. The personal bankruptcy rate among all applicants in our dataset, 2.3% per year, is greater than the rate in the general population by a factor of 6.8. Note again that payday loan interest rates exceed rates on most other forms of credit, suggesting that most payday loan applicants have exhausted other liquidity sources. Our findings are consistent with the interpretation that payday loans—and interest payments on them—might be sufficient to tip the balance into bankruptcy for a population that is already severely financially stressed.

These findings are surprising because payday loans are small (mean≈median≈$300), and bankruptcy is a cumulative financial outcome. We interpret the bankruptcy results by first examining the consequences of first-time payday loan approval for subsequent high-interest-rate borrowing. We demonstrate that approval for one payday loan results in a pattern of future payday loan applications: first-time applicants in our dataset who are approved apply, on average, for 5.2 more loans than rejected first-time applicants over the next 12 months. In dollar terms, this results in $1600 in loans and $300 in interest payments.[7] This suggests payday loan applicants have a persistent

Imbens and Lemieux (2007) provide a useful practical guide.

[5] Throughout the paper, for convenience we refer to the effect of first-application approval, conditional on applying, as the effect of "payday loan access."

[6] We study bankruptcy petitions, regardless of whether the petition was dismissed. The majority of Chapter 13 petitions are dismissed in our data. We view petitions themselves as an outcome of interest, representing a form of financial distress. Because bankruptcy law precludes creditors from contacting debtors once a petition is filed, regardless of the outcome of the process, debtors may file to protect themselves from creditors even if their debts are unlikely to be discharged. Hereafter we use "petition" and "filing" interchangeably.

[7] Short payday loans can generate high interest payments: Finance charges are typically 18 percent for the duration

demand for credit, so, having discovered a place where credit is available, they return frequently. We also estimate the effect of payday loan approval on pawn borrowing from the same company. In the short-run, rejection of a first-time payday loan application increases the probability of taking out a pawn loan from this company by a factor of two, implying payday loan applicants substitute between forms of credit. However, this effect dissipates quickly, and in dollar amounts it is small compared to the observed increase in subsequent payday borrowing.

We also examine detailed information on creditors, assets, and liabilities from the subsample of individual bankruptcy petitions that statistically identify our empirical estimates. The absence of *short-run* effects of payday loan approval on bankruptcy petitions casts doubt on the theory that payday borrowers are strategically accumulating debt in anticipation of bankruptcy. Our results are more consistent with a medium-run compromising of borrowers' overall financial stability due to repeated finance charges made to the payday lender.

Beyond these specific findings, the paper extends the literature on the effects of credit access both in terms of the range of institutions studied and in the nature of data employed. The payday loan industry, and the subprime-lending market more broadly,[8] have grown dramatically in the last decade. Data on high-interest lending are proprietary, confidential, and politically sensitive. This paper relies on an administrative dataset from a major payday lender, comprising detailed demographic and borrowing information for the full population of loan applications over a four-year period. Individual identifiers in the application records—such as name, date of birth, and Social Security number—allow us to match each applicant to public records on pertinent outcomes. This unique, large-scale, matched database and our individual-level identification strategy allow us to explore the microeconomic channels through which credit affects consumers, complementing the rich literature which identifies market-level impacts of credit.[9]

---

of the loan, and most payday borrowers are paid biweekly. This implies an APR of at least 18% x 26 = 468%, since people paid biweekly receive 26 paychecks in a year. Payday lenders typically do not allow interest to compound, but an alternative APR measure that better captures the cost of liquidity is $100 * \left(1.18^{26} - 1\right) = 7295\%$. Skiba and Tobacman (2007a, 2007b) assess, respectively from the demand side and the supply side, how these interest rates can persist in equilibrium.

[8] Payday loans are one form of "fringe banking" Caskey (1994). Like check cashing services and pawnshops, payday lenders provide alternatives to traditional banks. Caskey (1991, 1994, 2001, 2005) has studied fringe banking in great detail; Flannery and Samolyk (2005) have analyzed the profitability of the payday lending industry; Elliehausen and Lawrence (2001) conducted surveys of payday borrowers; and Stegman and Faris (2003) review the payday loan industry's business practices, but the literature on fringe banking remains sparse. Washington (2006) and Adams, Einav and Levin (2006) have studied fringe banking and subprime lending more recently.

[9] Among the vast literature in economics on borrowing and credit, there is very little empirical research on the causal impact of random individual variation in the ability to borrow money. Excellent exceptions are the work of Gross and Souleles (2002) and Ausubel (1999) on credit cards, and Karlan and Zinman's (2005, 2006a, 2006b) studies

The analysis in this paper has several limitations. First, while our research design provides clean identification, it has limited ability to address welfare issues. The social costs of Chapter 13 bankruptcy are difficult to measure.[10] The second limitation is that our data derive from a single lender that operates hundreds of payday loan outlets but is not a monopolist. Thus, our estimates represent an upper bound on any effects access to payday loans has on subsequent payday borrowing behavior and a lower bound on the effects on pawn borrowing and bankruptcy. We calibrate the size of this bias below.

Third, it is unclear how readily any results will generalize beyond the ten million working households borrowing on payday loans each year to other borrowers. Finally, a limitation common to all research employing the regression-discontinuity approach[11] is that estimates are identified off of a small range around the discontinuity. Payday loan access may affect consumers with very high or very low credit scores differently than the marginal applicants that drive this paper's estimates. We believe Karlan and Zinman (2006a) argue rightly, however, that it is particularly valuable to study the effects of credit access on marginal applicants since they are likely to be the first affected by changes in lenders' choices.

The remainder of the paper proceeds as follows. In Section 2, we provide additional background on payday loans. Section 3 outlines our estimation strategy, focusing on the credit-score discontinuity. We present our main empirical results, on the effect of payday loans on bankruptcy filings, in Section 4. Section 5 examines the mechanisms driving these results, and Section 6 concludes.

2 Payday Loans: Data and Institutional Features

The payday loan data we use are administrative records from a provider of financial services. To apply for payday loans at this company, individuals fill out loan applications and present their most recent pay stubs, checking-account statements, and utility or phone bills, along with state-issued photo IDs. The lender uses applicants' pay stubs to infer the dates of their next paydays and assign

of South African consumer credit.

[10] A companion paper (Skiba and Tobacman 2007a) develops a structural dynamic-programming model of consumption, saving, payday loan borrowing and default behavior. That paper's model includes standard features like liquidity constraints and uncertainty, and also incorporates institutionally realistic payday loans and generalizations of the discount function. Method of simulated moments estimates of the model's key parameters support the hypothesis of partially naive quasi-hyperbolic agents, and the estimated structural model permits evaluation of the welfare implications of policy alternatives.

[11] More generally, discrete instrumental variables identify only local average treatment effects (Imbens and Angrist 1994).

loan due dates. The duration of payday loans is thus extremely short, ranging from one week to one month depending on how frequently the borrower is paid. Payday loans are collateralized with personal checks dated on borrowers' upcoming paydays.[12]

We study individuals whose first loan application at this company occurred at an outlet in Texas. This universe of data includes over 1 million loan applications by about 145,000 individuals. Table 1 presents demographic and background characteristics of this population and summary information about their applications and loans. All data are deflated with the CPI-U to January 2002 dollars. We censor and replace with missing the top 0.1% of the distributions of bank balance and take-home pay. We also replace age with missing if age is less than 18. Consistent with independent survey evidence on payday borrowers, women are slightly more common than men in our population, and a large share of the applicants are Black or Hispanic. Median annualized individual income is about $20,000, and the median balance in applicants' checking accounts is $66.[13]

3 Identification

3.1 The Credit-Score Regression Discontinuity

Access to payday loans depends on a credit score calculated at the time of the loan application by a third party, Teletrack.[14] Scores above a fixed threshold result in loan approval, while applications with scores below that threshold are rejected. Among the 17.4% of first-time applicants with scores below the threshold, 99.6% are rejected, while 96.9% of first-time applicants scoring above the threshold are approved. The credit scoring formula and the threshold for approval were adjusted at all shops once during our period of observation, in August 2002. Throughout the paper we focus on a variable called *CreditScore*, which is equal to the raw Teletrack score minus the approval threshold that was in force at the time of the application, normalized by the corresponding pre-

[12] The longstanding practice of some employers who provide advances against upcoming paychecks is distinct from the topic studied here: payday lenders do not directly garnish paychecks to obtain loan repayment.

[13] Having a checking account is a precondition for receiving a payday loan: each applicant must have an account against which to write her postdated personal check. As a result, payday loans are not used by the unbanked (Washington 2006), though that population is targeted by services like check cashing that some payday lenders also offer.

[14] The credit-scoring formula is proprietary, but we understand these scores to differ from FICO scores in depending on a shorter history of behavior and focusing on borrowing histories in the subprime market. Though Teletrack serves all major payday lenders, the lenders establish their own criteria for approving loan applications. Skiba and Tobacman (2007b) discuss more details of the credit-scoring process in the context of the profitibility of payday lenders.

or post-August 2002 standard deviation of raw scores.[15] We will often refer to *CreditScore* as "the credit score." Figure 1 plots a histogram of *CreditScore* for first-time payday loan applicants.[16]

Consistent with the company's stated policy, the credit score has a discontinuous effect on the probability a payday loan application is approved. Figure 2 displays the probability of approval among first-time applicants, *Approved*, as a function of *CreditScore*. Two quartic polynomials, fit independently to the data on either side of the credit score threshold, are superimposed on the figure.

We quantify the discontinuity by examining the coefficient on an indicator for being above the threshold, *AboveThr*, in regressions of *Approved* on *AboveThr*, functions of *CreditScore*, and control variables presented in Table 2. Most generally, for first-time applicants we estimate:

$$Approved_i = \beta_0 + \beta_1 AboveThr_i + f\left(CreditScore_i\right) + \gamma X_i' + \delta M_i'^t + \varepsilon_i, \tag{1}$$

where $f(\cdot)$ is a function of the credit score; X_i is a vector of demographics and background characteristics including gender, race dummies, age, monthly income, job tenure, pay frequency dummies, checking account balance, the number of "not sufficient funds" events on the most recent bank statement, months in current residence, and dummies for homeownership, direct deposit, and garnishment of paycheck, and dummies for missing for each of these variables; and M^t is a full set of dummies for month of first payday loan application, so $M_i^t = 1$ if i's first application was in month t and $M_i^{t'} = 0$ for $t' \neq t$. In our benchmark specifications, $f(\cdot)$ is a quartic in $CreditScore_i$ interacted with $AboveThr_i$.[17]

Columns 1-5 of Table 2 report OLS (linear probability model) regressions based on this specification. In every specification, the coefficient on *AboveThr* is highly significant and equal to slightly less than 1. The R-squared in Column 1 equals 0.84 when only *AboveThr* is included on the RHS. As the subsequent columns add in a quartic in *CreditScore* fully interacted with *AboveThr*, the demographics listed above, and the dummies for month of first payday loan application, the coefficient on *AboveThr* hardly changes and the R-squared increases by only 1%. Probits in Columns

[15] Though standard tests indicate the pre- and post-August 2002 distributions of $CreditScore$ differ, we assume for simplicity in the rest of the paper that the functional form of the effects of $CreditScore$ did not change. Quantitative conclusions change little, and qualitative conclusions not at all, if we interact functions of $CreditScore$ with a post-August-2002 dummy in all of the regressions.

[16] We focus on credit scores at the time of first payday loan applications for reasons discussed below.

[17] Equivalently, since $AboveThr_i = I\left(CreditScore_i \geq 0\right)$, $f(\cdot)$ equals independent quartics on either side of the threshold.

6-8 (run with the dprobit command, so the coefficient on *AboveThr* has the same interpretation as in the OLS regressions) reveal the same pattern.

Other institutional features permit us to exploit the exogeneity of *AboveThr* conditional on $f(CreditScore_i)$. During the application process, the payday loan company's employee submits information about the applicant electronically to the company's central servers, which in turn send a query to Teletrack. Within minutes, a yes-or-no notification of whether the application was approved or declined is returned. Neither applicants themselves nor the employees in the store are informed of the applicants' scores or the passing credit-score threshold. Moreover, Teletrack uses additional information from other lenders, which is not available to this lender's employees, to compute the score: An OLS regression of the Teletrack scores of first-time payday loan applicants on the demographic and background variables listed in Table 1, including a full set of month dummies, yields an R-squared of 0.365. Thus *AboveThr* likely impacts an individual's future choices only insofar as *AboveThr* affects application approval. The regressions reported above therefore constitute the first stage of an IV strategy, with a plausible exclusion restriction, that we use throughout the rest of the paper. See also the Identification Appendix for further discussion.

3.2 Empirical Specifications

Using the credit-score discontinuity described in the previous section, we estimate the effect of payday loan approval on each outcome of interest at horizons from $\tau = 1d$ to $\tau = 3y$ after the first payday loan application. We denote the outcome by individual i between the date of first payday loan application and horizon τ by $Outcome_i^\tau$. We consider several specifications. First, we estimate this equation using OLS:

$$Outcome_i^\tau = \beta_0 + \beta_1 Approved_i + f(CreditScore_i) + \gamma X_i' + \delta M_i'^t + \varepsilon_i. \tag{2}$$

Second, in our "reduced form" specification we replace *Approved* in Equation 2 with *AboveThr*. Third, we run IV regressions, instrumenting for *Approved* with *AboveThr*. Fourth, in the OLS and IV specifications we restrict to subsets of the data, narrowing in to +/-0.5 and +/-0.1 standard deviations around the credit-score threshold.

We perform seven robustness checks in all cases. First, we consider alternative functional forms for $f(\cdot)$. Instead of the benchmark quartic in $CreditScore_i$ interacted with $AboveThr_i$, we

try quadratics and cubics interacted with $AboveThr_i$ and quadratics, cubics, and quartics *not* interacted with $AboveThr_i$. Second, instead of the linear probability models that we run in the benchmark OLS, reduced-form, and IV regressions, we implement probits for binary outcomes, and probits for $I\left(Outcome_i^{\tau} > 0\right)$ for non-binary outcomes. Third, for discrete, non-binary outcomes (e.g., the number of pawn loans taken and the number of Chapter 13 bankruptcy filings), we run count regressions (Poisson and negative binomial). Fourth, as suggested above, we fully interact a Post-August-2002 dummy with $f\left(CreditScore_i\right)$ and $AboveThr_i$. Fifth, we run locally weighted polynomial regressions to nonparametrically estimate the treatment effect (Fan and Gijbels 1996, Hahn et al. 2001, Porter 2003, Imbens and Lemieux 2007). Sixth, we run regressions for time τ *before* each outcome, checking for the *absence* of effects on these "placebo outcomes."

Seventh, finally, it should be noted that throughout the paper we focus on identification from $first$ loan applications. In principle, more power would be available if our first stage included *all* applications. However, there is more slippage between $AboveThr$ and application approval after the first loan application: the lender is more likely to have a history on a repeat applicant that informs its approval choice. In addition, the regression results reported above indicate we already have considerable power in the first stage, and using all applications would require correcting for intra-applicant correlation structure in the effect of $AboveThr$ on application approval and the effect of approval on the outcome variables of interest. We do replicate all the analysis using a new endogenous variable, an indicator for whether an individual *ever* has an application approved.

In cases where any of these seven modifications to the benchmark specification matter materially we discuss them below. A full set of the results is available upon request.

4 Bankruptcy

Using the procedures described above, we measure the effect of payday loan access on Chapter 7 and Chapter 13 personal bankruptcy filings. Payday loan approval could affect the probability of bankruptcy in several ways.[18] First, people with little outstanding credit are unlikely to file for

[18] The literature on personal bankruptcy filings has largely focused on two questions. First, do filers act strategically when they file, i.e., do they accumulate debt which will be discharged in the event of bankruptcy, hold assets up to and not above the state's exemption limit, and choose the optimal Chapter for their case? Second, to what extent does bankruptcy serve as a form of social insurance? Papers in the former literature are divided. White (1998), for example, concludes that at least 10% of households would gain financially from bankruptcy filing. By contrast, using state-level variation Lehnert and Maki (2002) find that filers optimally "negative estate plan," by converting liquid assets into dischargeable debts before filing. Literature examining the social insurance aspect of bankruptcy

court protection from creditors, implying that *any* loan approval, by providing a creditor, could increase the probability of bankruptcy. Second, loan approval could temporarily alleviate financial pressure—for instance until labor supply can be increased. In this case we might expect *rejection* of a payday loan to increase bankruptcy petitions. Third, payday loans could also have a medium-term effect on the personal finances of borrowers as interest payments (at very high rates) add up. Because payday loans mature each pay period (typically two weeks), whereas payments on other loans are generally due each month, payday interest payments may take priority and borrowers may fall further behind on other accounts. We next evaluate these hypotheses.

4.1 Data

Personal bankruptcy petitions are public record, and are available online through Public Access to Court Electronic Records (PACER). We study the universe of 641,521 Chapter 7 and Chapter 13 personal bankruptcy filings in the four United States Bankruptcy Courts in Texas from January 2001 through June 2005. The data include the date of filing, the Chapter of filing (7 or 13), the disposition of the bankruptcy case (generally, dismissal or discharge of debts), and individual identifiers that permit linkage to the payday loan data. We supplement these data with a small sample of the detailed bankruptcy petitions debtors submit during the filing process. The sample consists of the 100 applicants closest to the credit-score threshold, with 50 on each side. These data include the names of the creditors (loan-collection agencies in some cases), and the amount and description of the type of debt for each creditor.

Our approach complements existing empirical work on the determinants of bankruptcy, for example by distinguishing between Chapter 7 and 13 bankruptcy petitions.[19] Chapters 7 and 13 result in different private and social benefits and costs. Chapter 7 bankruptcy relieves a debtor of all dischargeable debts.[20] Non-exempt assets must be turned over to the filer's trustees at the time of filing. A trustee sells these assets and repays creditors. Texas has homestead and car exemptions, allowing debtors to protect these assets. Debtors can file for Chapter 7 bankruptcy

is limited. Himmelstein, Warren, Thorne and Woolhandler (2005) survey bankruptcy filers and find that half cite medical debt as a factor in their filings. Domowitz and Sartain (1999) find that employment and medical shocks account for some bankruptcies, supporting the "bankruptcy as insurance" point of view.

[19] The Bankruptcy Abuse Prevention and Consumer Protection Act of 2005 made it harder to file for bankruptcy and particularly for Chapter 7. Implementation of the act occurred after the end of our sample period and any anticipatory effects of the Act would have been orthogonal to $AboveThr$.

[20] Back taxes, most student loans, and child-support and alimony obligations are non-dischargeable.

no more than once every 6 years. Chapter 13 bankruptcy, by contrast, does not result in the erasure of dischargeable debt. Instead, each filer proposes a several-year repayment plan to the court, and the judge determines whether the repayment plan is reasonable based on income, assets, etc. After successful completion of the repayment plan, the remainder of debts are discharged. Judges determine whether debtors can afford repayment under a Chapter 13 reorganization and, if so, judges do not permit filing under Chapter 7. Debtors can file for Chapter 13 bankruptcy as often as they wish, i.e., they can revise their repayment plan and submit changes to the judge repeatedly. Debtors can file Chapter 7 bankruptcy following a Chapter 13 filing and often do so if they find they cannot afford their original repayment plan. Bankruptcy filings appear on debtors' credit reports for 10 years.

Table 3 provides an overview of the data we use. Panel A shows an individual bankruptcy rate (as a fraction of population) for Texas as a whole of 0.38% per year (about $\frac{3}{4}$ of the national bankruptcy rate). Panel A also reports the fraction of Chapter 7 versus Chapter 13 fillings. (According to informal communications with the PACER Service Center, debtors file under Chapter 13 in order to protect their homes from foreclosure.)[21]

We identify debtors in the PACER bankruptcy dataset with payday loan applicants if the following variables in the two datasets match exactly: first name, last name, zip code of home residence, and last four digits of Social Security number.[22] By these criteria, as reported in Panel A of Table 3, 8,331 of the 145,519 payday loan applicants filed for personal bankruptcy during the bankruptcy sample period.[23] Given that the average amount of time from first payday loan application to the end of the bankruptcy data period is 2.48 years, we compute an average rate of $\frac{8831}{145519*2.48} = 0.023$ bankruptcy petitions per payday applicant per year. Comparing to Panel A of Table 3, we see that payday loan applicants have a bankruptcy base rate that is $0.023/0.0038 \approx 6$ times the average rate in the population.

[21] On average there are 3.8 parties to each case. The raw PACER dataset and online documentation do not explicitly distinguish between debtors and creditors. Staff at the PACER Service Center helpfully explained that the first party to be added to a case, who has the lowest value of an internal PACER identifier called the "party sequence number," is a debtor; and if a co-debtor is present, he or she has the second-lowest value of the party sequence number. We assume that a second party is a co-debtor (ie, a joint filer) if his or her street address is nonempty and matches that of the first party. By this definition, 50,886 of the bankruptcies were filed jointly in the Northern District, for example.

[22] Alternatively, we could obtain slightly different numbers of matches using different combinations of individual identifiers. In all cases the results we report below are unchanged.

[23] Of the 3,768 people who match in the Northern District for example, included are 244 couples in which both spouses applied for payday loans. Our analysis below ignores the intra-household correlation structure of bankruptcy filing.

4.2 Main Estimation Results

Using the credit-score regression discontinuity, we estimate the effect of payday loan approval on Chapter 7, Chapter 13, and total personal bankruptcy filings at horizons from $\tau = 1d$ to $\tau = 3y$. We denote the cumulative number of filings by individual i between the date of first payday loan application and horizon τ by $Bkcy7_i^\tau$, $Bkcy13_i^\tau$, and $BkcyAll_i^\tau$ for Chapter 7, Chapter 13, and all personal bankruptcies, respectively.[24] Our basic specification is

$$Bkcy\left(Ch\right)_i^\tau = \beta_0 + \beta_1 Approved_i + f\left(CreditScore_i\right) + \gamma X_i' + \delta M_i'^t + \varepsilon_i, \tag{3}$$

where (Ch) could be 7, 13, or All, and the dependent variables are as above. The RHS variables are as described in Section 3.2 above.

Table 4 reports estimates of Equation 3 for $Ch \in \{7, 13, All\}$ and $\tau \in \{1y, 2y\}$. We multiply the outcome variables by 100, so coefficients in the table can be interpreted as the increase in bankruptcies in percentage points associated with unit increases in the independent variables. Note that in all columns the sum of the Chapter 7 and Chapter 13 coefficients for a given time horizon roughly equals the "All" coefficient for that time horizon, since bankruptcy filings are roughly evenly split between Chapters 7 and 13.

Column 1 presents the OLS results for the full sample, which shows little association between loan approval and Chapter 7 bankruptcy, and a strong and significant association between loan approval and Chapter 13 bankruptcy. Specifically, approval is associated with an increase of 0.336 (0.332) percentage points in Chapter 13 bankruptcies over one year (two years). Relative to the baseline bankruptcy rate among payday loan applicants of 2.3%, this is an increase of $\frac{0.33}{2.3} = 14.3\%$; relative to the much lower baseline rate in the general population, it is an increase of $\frac{0.33}{0.382} = 88\%$.

However, the OLS results could well be biased. For example omitted characteristics that affect bankruptcy declarations, like household assets, could be correlated with *Approved* even beyond their correlation with $f\left(CreditScore\right)$ and X. As a result, we focus more closely on individuals with credit scores close to the threshold for loan approval. For them, there is more reason to believe that approval may be randomly assigned conditional on the other independent variables. Specifically, Columns 2 and 3 restrict to the subsample with credit scores no more than 0.5 and 0.1 standard

[24] As τ rises our number of observations falls: we compute $Bkcy\left(Ch\right)_i^\tau$ for individual i only if i's first PDL application is at least τ before the end of the bankruptcy sample period. This induces cohort effects which we control for by including dummies for month of first PDL application in our regressions.

deviations, respectively, from the credit-score threshold for loan approval. For both Chapter 7 and Chapter 13 bankruptcy, the standard errors on *Approved* rise in these columns as the number of observations falls.

Section 3 demonstrated that a large share of the variation in *Approved* can be explained by *AboveThr*, an indicator for whether the credit score is above a lender-defined threshold. (Recall that *Approved* is the probability that an applicant's first payday loan application is approved.) To the extent individual characteristics cause slippage between *AboveThr* and loan approval, correlation between those characteristics and propensity or ability to declare bankruptcy (e.g., if loan approval is correlated with resourcefulness at paperwork, which is also necessary for completing a bankruptcy filing) could bias even the restricted-range OLS estimates. However, controlling for $f(CreditScore)$ and X, which do change discontinuously at the credit-score threshold, we can estimate the causal impact of *AboveThr* on bankruptcy propensities. In Column 4 of Table 4 we show that this "reduced-form" effect of *AboveThr* on $Bkcy7^{2y}$ is smaller than the full-sample OLS coefficient on *Approved* and statistically insignificant. Column 4 in Table 4 shows the reduced form effect for Chapter 13 which is the same as the OLS coefficient; *AboveThr* increases Chapter 13 bankruptcies by 0.44 percentage points over two years, or $\frac{0.344}{2.3} = 15\%$ above their baseline rate. Again, the increase relative to the baseline rate in the general population is roughly 90%. The standard errors of these reduced-form OLS regressions fall by an order of magnitude if we use Poisson or negative binomial regression instead.

Finally, to obtain another measure of the impact of *Approved* we instrument for it with *AboveThr*. The IV regressions with the full sample, in Column 5 of this table, use all of the available data but identify the parameter of interest only off of the variation in *Approved* induced at the credit-score threshold by *AboveThr*. As we would predict given the first stage regressions (reported in Section 3), these regressions yield results almost identical to the reduced-form in magnitude and significance. Columns 6 and 7 again narrow the range of observations to 0.5 and 0.1 standard deviations around the credit-score threshold. The coefficients rise in both cases and are significant when restricting to data within a 0.5 sd range. These estimates (from Column 6) can be interpreted as a 1.89 percentage-point increase in Chapter 13 filings within the first year after access to payday loans, and a 2.28 percentage-point increase in Chapter 13 filings within two years of access to payday loans. These estimates are statistically significant at the 1-percent level.

These regression findings are also reflected in Figures 3a and 3b, which plot 2-year Chapter 7

and Chapter 13 filing rates versus credit-score centiles. Points shown are at the medians of their quantiles on the x-axis and at the means of their quantiles on the y-axis. In addition, the figures plot a predicted bankruptcy rate generated from the reduced form regression. We view the figures as reinforcing the conclusions of the regression analysis and identifying their limitations: a large effect of payday loan approval on bankruptcy appears to be present, but the effect may be sensitive to the range around the threshold that is examined and to the functional form of the credit-score controls (i.e., to the form of $f\left(CreditScore\right)$).

One interesting feature of these figures is that among this entire population, the probability of filing for bankruptcy *increases* in the first application credit score. We conjecture this overall positive correlation is present because the sample of payday loan applicants is selected to have had difficulties in regular (prime) credit markets; individuals with higher subprime credit scores are more likely to have prime debt they would like to erase; and individuals with higher subprime credit scores are more likely to have the financial savvy to figure out how to file for bankruptcy.

We have examined this dependence on functional form further. In the context of the IV regressions with dependent variable $Bkcy13^{2y}$, we experiment with constraining $f\left(CreditScore\right)$ to be identical on either side of the threshold; removing $f\left(CreditScore\right)$ entirely; removing the dummies for month of first payday loan application; and removing the financial and demographic control variables. We use also use probits; linear probability models; and non-parametric locally weighted polynomial (lowess) regressions. Most of the coefficients in these specifications go in the same direction and are significant, including the best-practice lowess regressions.

Specifically, the locally-weighted polynomial regressions of bankruptcy filing rates on the credit score, computed using Stata's lowess command with a bandwidth of 0.8, are run separately above and below the credit score threshold. The fitted values of these regressions close to the threshold represent the best available numeric approximations of the limits, from above and below the threshold, of the bankruptcy filing rates. The difference between the two limits is the estimator; and its standard error is estimated by bootstrapping. Specifically, we take 50 bootstrap samples of the population within 0.2 standard deviations of the threshold, keeping fixed proportions on each side. For each sample we compute the difference between the estimated filing rate immediately to the right of the threshold and immediately to the left. The reported standard error is the standard deviation of the estimates from each of the 50 bootstrap samples.

Because of the computational intensity of this analysis, we only report estimates for our bench-

mark case of Chapter 13 bankruptcies within two years of the first payday loan application. The nonparametrics confirm the linear analysis reported above: the lowess point estimate of the effect on Chapter 13 filings within two years is 2.39 percentage points with a standard error of 1.01.

All of the analysis so far has focused on the cumulative effect until $\tau = 1y$ or $\tau = 2y$ after the first payday application. Effects on Chapter 7, Chapter 13 and all bankruptcies at horizons from $\tau = 1d$ to $\tau = 3y$ are presented in Figures 4a-4c, which plot the estimated coefficients on *Approved* in IV full-range regressions.[25]

Heterogeneity in these results could also be measured. Specifically, we could estimate the regressions separately by homeownership status, year of first application, race, and gender.

5 Mechanisms and Interpretation

As discussed above the typical payday loan is quite small: in our dataset the mean and median principal are approximately $300. This section investigates how such small loans might impact cumulative financial outcomes like bankruptcy. First, we show that approval of a single loan application initiates a pattern of subsequent borrowing from this lender. Second, we provide suggestive evidence that borrowers only partially substitute toward other sources of credit, perhaps because of costs of search. Third, we compare the interest costs from payday loans and applicants' total debt interest burden at the time of bankruptcy filing, and find that payday loan interest constitutes a nontrivial share.

5.1 Subsequent Payday Loan Applications

The identification strategy used to measure the effect of payday loan access on bankruptcy can also be used to measure effects on subsequent borrowing from this lender. We observe more subsequent loans than bankruptcies, so results are more precisely identified and less sensitive to the choice of specification. Analogously to bankruptcy analysis above, our main regression specification is:

$$(nbr\ pdl\ applications)_i^\tau = \beta_0 + \beta_1 Approved_i + f\left(CreditScore_i\right) + \gamma X_i' + \delta M_i'^t + \varepsilon_i,$$

[25] The number of observations shrinks as τ grows since we drop individuals for whom our sample period ends before the full τ duration after their applications. This induces cohort effects, which we control for by including dummies for month of first payday loan application in our regressions.

where the RHS variables are as described above.

The sharp discontinuity we obtain from estimating this equation for subsequent payday applications and subsequent amount borrowed make the results easy to see graphically. Full regression results are available upon request. Estimation results are presented for $\tau = 2y$ in Figures 5a and 5b. When comparing first-time payday loan applicants who are approved and rejected, $\hat{\beta}_1$ equals the number of additional applications, within two years, caused by first-application approval. The OLS specification using the full range of credit scores implies that $\hat{\beta}_1 = 4.606$ and is highly significant. Rejected first-time applicants apply again at very low rates, so the coefficient mostly reflects the subsequent applications made by those who are approved. The reduced-form and IV estimates confirm these findings. In addition, they have nearly identical coefficients and standard errors, as expected given the strength and precision of the first stage. We also restrict the sample to +/-0.5 and +/-0.1 standard deviations in the credit score using the OLS specification, as in the bankruptcy specifications. Similarly we restrict the sample for the IV estimates. In each case, standard errors rise as sample sizes fall, though all coefficients remain positive and significant. Summary statistics on these outcomes are found in Table 3. Panel B summarizes, by various credit-score ranges, the subsequent payday applications and amounts borrowed for one year and two years after the first payday loan application.

Because *AboveThr* is correlated with subsequent loan approval probabilities, the effect of *Approved* on the total dollar value of subsequent payday loans is strictly not identified. In addition, in some sense the *demand* for credit reflected in the number of subsequent applications is the quantity of primary interest. However, we may still estimate the subsequent dollar amounts of borrowing predicted by *Approved*. Access to payday loan credit, conditional on application, predicts roughly $2300 of additional payday borrowing at this company within two years.

Figures 5a and 5b plot these results. Each point represents a centile in the credit score, and the points shown are at the medians of their quantiles on the x-axis and at the means of their quantiles on the y-axis. Overlaid are the best-fitting quartic polynomials on either side of the credit-score threshold.

We repeat this analysis for time horizons from $\tau = 1d$ to $\tau = 3y$. To summarize the estimated coefficients over this full range of time horizons, Figures 6a, 6b and 6c plot the IV full range $\hat{\beta}_1$'s. The line is above zero, implying payday loan applicants who were approved for their first loan applied more subsequently than those whose first application was denied. Two-standard-error

bands are also shown on the graph. Our preferred approach, the IV regression with range restricted to +/-0.5 standard deviations, implies that approval of first-time payday loan applications causes 6.11 (1.56) more payday loan applications within the next two years.

These findings are consistent with a search or switching-cost story being operative: payday loan applicants who discover credit is available at this company continue to patronize it.

5.2 Substitution, Competition, and Search

One potential concern with our results is that our data come from a single lender. Rejected applicants may be able to obtain payday loans elsewhere. However, this observation *strengthens* our qualitative findings about the effect of payday loan access on bankruptcy: if rejected applicants may borrow anyway, our estimates represent a lower bound on the true effect of payday loan access. The rest of this subsection discusses three sources of evidence about the quantitative size of the underestimate.

First, all major payday lenders use the same subprime credit-rating agency, Teletrack Inc., to provide information on loan applicants. Each lender may, however, choose its own threshold for approving loan applications (and may use a smoother decision rule), and we lack information about those practices.[26] If all lenders do choose exactly the same threshold, our estimated coefficients will not reflect bias due to substitution opportunities. To the extent the firms have comparable costs (Flannery and Samolyk 2005) and the industry is competitive (Skiba and Tobacman 2007b), they would adopt identical thresholds in equilibrium.

Second, we provide some specific evidence, which is of independent interest, on the extent to which applicants who are denied access to payday loans substitute to another form of credit. One type of *collateralized* subprime credit is readily available to many of these consumers: pawn loans.[27] We use pawn data from the same company that provided the payday loan data. The data extend from January 1997 through November 2004 and contain 7,860,491 pawns loans for 1,310,018 individuals. For each loan we observe the start date, the maturation date, the store where the loan

[26] Endogeneity of the approval decision rules does not matter for our estimates. The distribution of credit scores is smooth near the credit score approval threshold.

[27] Pawn loans are collateralized with personal items like jewelry, electronics, tools or guns. The loan principal typically equals half of the item's (secondhand) retail value. At the time the loan is made, the lender receives and stores the collateral. Items are stored at the pawnshop as long as the borrower continues to service the loan, and in this way loans can be renewed indefinitely. The borrower receives the item back ("redeems" the item) upon repaying the loan. When a loans becomes 30 days past due, the collateral is removed from storage and put on sale at the pawnshop.

originated, the loan principal, the times and amounts of all payments, and an internal customer number that allows us to match the data to the company's payday business.

The average loan size is $76. Loans range in size from $1 to several thousand dollars. Thirty-seven percent of first-time pawns are redeemed, while fifty-eight percent result in default. Seventy-eight percent of pawnors borrowed five or fewer times. The average number of loans per customer during the entire sample is 5.8. We find that 33,817 of payday loan applicants (23%) ever pawned; and 20,739 of payday loan applicants (14%) ever pawned *subsequent* to their first payday loan. The average loan size for payday loan applicants who pawned is $88. Payday loan applicants averaged 4.5 pawn loans. Among payday loan applicants whose first application was approved and who ever pawned subsequently, average total pawn loan principal was $84.30. Among declined applicants who subsequently pawned, the comparable total was $56.90. Approved applicants repaid 42.7% of their pawn loans and declined applicants 45.8%. Approved applicants paid $9.70 in pawn interest while declined applicants paid $5.91. Panel B of Table 3 summarizes, by various credit-score ranges, short-term pawnshop borrowing behavior by payday loan applicants.

Exploiting the credit-score discontinuity again, we estimate the effect of payday loan approval on the number of pawn loans ($PawnNbr_i^\tau$) and the dollar amount of pawn borrowing ($PawnAmt_i^\tau$) at horizons from 1 day to 3 years after the first payday loan application:

$$PawnNbr_i^\tau = \beta_0 + \beta_1 Approved_i + f\left(CreditScore_i\right) + \gamma X_i' + \delta M_i'^t + \varepsilon_i, \tag{4}$$

and

$$PawnAmt_i^\tau = \beta_0 + \beta_1 Approved_i + f\left(CreditScore_i\right) + \gamma X_i' + \delta M_i'^t + \varepsilon_i, \tag{5}$$

where $f\left(\cdot\right)$, X_i, and M_i^t are as above. The results, which are fairly consistent across OLS, reduced form, IV, and restricted-range specifications, reveal a small but significant negative effect of payday loan access on the number of pawn loans taken out within 2 days. Specifically, at this short horizon, approval causes a decrease of two percentage points in pawn loan use and a decrease in borrowing magnitudes (unconditional on borrowing) of $3.07. Some rejected payday loan applicants substitute toward pawn loans at this company in the short term.

However, conditional on taking out a pawn loan following a payday loan rejection, the pawn loan is only 10% larger than the average pawn loan. Thus, this effect on pawn loan amounts is driven primarily by the probability of taking out a pawn loan. Since pawn loans are 1/3 the size of

payday loans, even at the shortest of horizons, and even for the people who use them, pawn loans only partially substitute for payday loans.

We highlight the short-run results in Figures 7a and 7b. An appendix of full results is available upon request. Figure 7a plots the number of pawn loans taken within two days of the payday loan application against the credit score, for each centile in the credit score. Points shown are at the medians of their quantiles on the x-axis and at the means of their quantiles on the y-axis. In addition, the figure plots a predicted pawn rate generated from the reduced-form regression. Figure 7b plots the estimated coefficients on *Approved* in the IV full-range regressions for each horizon. Two-standard-error bands are also shown. The figure reflects the short-run substitution to pawn loans when payday loans are not available. However, in the medium run the effect dissipates: within one year there are no significant differences between approved and rejected first-time payday loan applicants; and after two years, though not significant, the point estimates go in the other direction. In the medium term, substitution to pawn loans by rejected payday loan applicants does not mitigate their relatively reduced access to subprime credit.

The third reason we suspect the underestimate of the effect of payday loan approval on bankruptcy to be small is that this company's loans remain attractive to rejected applicants. Of the 20% of applicants who were first declined, 48% re-apply. Only 9% of re-applicants were ever approved, but those who were approved borrowed on average $2485 and paid $415 in interest, comparing near par with initially approved applicants, who cumulatively borrowed $2793 and paid $477 in interest.

These findings are also consistent with a search and switching cost interpretation(Hortacsu and Syverson 2004). Search costs may be significant for this population; once people find access to credit at one location, they are likely to stay. Applicants denied access to payday loans turn to pawn loans to meet their short-term credit needs. In the medium term, payday loan approval causes continued visits to the company's stores, shrinking or reversing the short-term pawn loan substitution effect. The results that payday loan applicants who were rejected on their first payday loan application at this company borrow more on pawn loans is not surprising, given even moderate search costs. Without data on loan applications at other providers, estimation of a search model is impossible. However, we do have observations about search at other store locations for the same lender. Just one percent of approved payday applicants went to a different store for their second application, compared to six percent for denied applicants.

5.3 Detail Sample

Together, these findings paint a picture of substantial high interest rate borrowing following payday loan approval, and a substantial differential in high interest rate borrowing between initially approved and initially rejected applicants. Detailed data on creditors, debts, and assets for a sample of the 100 bankruptcy filers closest to the credit-score threshold provide additional information.[28] Thirty-two percent of these individuals had payday loan debt at the time they filed for bankruptcy, and fifteen percent had outstanding payday loan debt at the company that supplied our data. Average outstanding payday loan balances at all payday lenders and at our data provider conditional on borrowing were respectively $1011 and $478.

Payday loan debt outstanding is therefore a small fraction of the $33,000 of unsecured debt that these bankruptcy filers had on average.[29] However, cumulative *interest payments* on payday and pawn loans, because of their very high interest rates and very short durations, were significant. If we assume the filers' unsecured debt carried 15% APRs, the payday loan interest burden would have been approximately $\frac{\$477}{0.15*\$33,000} \approx 10\%$ of these individuals' total annual interest burden. We consider it plausible that this could suffice to tip financially stressed payday loan applicants into bankruptcy.

6 Conclusion

We find that payday loan applicants approved for their first loans file for Chapter 13 bankruptcy significantly more often than rejected first-time applicants. The magnitude of the effect is very large, representing an increase of between 0.3 and 3.3 percentage points in bankruptcy filing rates. In our preferred specification the estimated effect size is 2.48 percentage points. Opportunities for rejected applicants to substitute toward credit elsewhere imply that our quantitative estimates are lower bounds on the true effects.

These results are consistent with the interpretation that payday loan applicants are financially stressed; first-time loan approval precedes significant additional high interest rate borrowing; and the consequent interest burden tips households into bankruptcy. Though some strategic bank-

[28] Reported numbers pertain to the 100 closest filers in the Northern, Eastern, and Western bankruptcy districts, since data from the Southern district have just been received.

[29] Strategic gaming of the bankruptcy system implies debtors would accumulate as much debt as possible before filing. This hypothesis receives no more than tentative support from our results.

ruptcy filings may occur, our findings suggest that households generally do not borrow on payday loans to take advantage of an upcoming bankruptcy filing. This paper's results contribute to our understanding of the individual-level effects of access to credit and inform discussion of the impacts of payday loans.

A Identification Appendix

We first report further tests of the exogeneity of *AboveThr* and demographic characteristics of payday loan applicants. A potential source of bias in this research design is selection close to either side of the threshold. If payday loan applicants knew both their credit score and the passing threshold used to approve loans, we could expect applicants who knew they would be declined not to apply, and lots of mass in the distribution in credit scores just above the threshold. The histogram of the credit score, Figure 1, showed that while there are some credit scores that are common because of the discrete nature of the scoring process, there is not bunching near the threshold which would suggest selection bias.

Table A1 reports the values of the control variables on either side of the credit score threshold. Each pair of columns reports average values of the control variables below and above the credit score threshold, for shrinking credit score ranges around the threshold. Differences between the columns generally shrink and become less significant going from left to right across the table. It is not surprising that some significant differences remain, since the credit score is correlated with many of the control variables.

The discontinuity is not sensitive to the inclusion of control variables. We also performed two sets of first stage placebo regressions. In both types, we regressed *Approved* on the usual pair of quartics in *CreditScore*, the usual X's, and the usual month dummies. In the first set of placebo regressions, we included modified versions of *AboveThr*, one by one, for every value of the credit score. The coefficient on the pseudo-*AboveThr*, and its statistical significance, was maximized when it was equivalent to the true *AboveThr*. The true version of *AboveThr* was included in every element of the the second set of placebo regressions, but in that set we again included, one by one, pseudo-*AboveThr*'s defined for every possible value of the credit score. In this case, the coefficient on the true *AboveThr* was always larger and more highly significant than the coefficient on the pseudo-*AboveThr*.

References

Adams, William, Liran Einav, and Jonathan Levin, "Liquidity Constraints and Their Causes: Evidence from Subprime Lending," November 2006. Working Paper.

Angrist, Joshua D. and Victor Lavy, "Using Maimonides' Rule to Estimate the Effect of Class Size on Scholastic Achievement," *Quarterly Journal of Economics*, May 1999, *114*, 533–575.

Ausubel, Lawrence, "Adverse Selection in the Credit Card Market," 1999. University of Maryland mimeo.

Caskey, John P., "Pawnbroking in America: The Economics of a Forgotten Credit Market," *Journal of Money, Credit, and Banking*, February 1991, *23* (1), 85–99.

___ , *Fringe Banking: Check-Cashing Outlets, Pawnshops, and the Poor*, New York: Russell Sage Foundation, 1994.

___ , "Payday Lending," *Association for Financial Counseling and Planning Education*, 2001, *12* (2).

___ , "Fringe Banking and the Rise of Payday Lending," in Patrick and Howard Rosenthal, eds., *Credit Markets for the Poor*, Russell Sage Foundation, 2005.

DiNardo, John and David S. Lee, "Economic Impacts of New Unionization on Private Sector Employers: 1984-2001," *Quarterly Journal of Economics*, 2004, *119*, 1383–1442.

Domowitz, Ian and Robert L. Sartain, "Determinants of the Consumer Bankruptcy Decision," *The Journal of Finance*, February 1999, *54* (1), 403–420.

Elliehausen, Gregory and Edward C. Lawrence, *Payday Advance Credit in America: An Analysis of Customer Demand*, Credit Research Center, Georgetown University, 2001.

Fan, Jianqing and Irene Gijbels, *Local Polynomial Modelling and Its Applications*, London: Chapman and Hall/CRC, 1996.

FDIC, "Payday Lending Programs: Revised Examination Guidance," 2005, *FIL-14-2005.* Financial Institution Letter.

Flannery, Mark and Katherine Samolyk, "Payday Lending: Do the Costs Justify the Price?," *Federal Reserve Bank of Chicago Proceedings*, Apr 2005.

Gross, David and Nicholas Souleles, "Do Liquidity Constraints and Interest Rates Matter for Consumer Behavior? Evidence from Credit Card Data," *Quarterly Journal of Economics*, February 2002, *117* (1), 149–185.

Hahn, Jinyong, Petra Todd, and Wilbert Van der Klaauw, "Identification and Estimation of Treatment Effects with a Regression-Discontinuity Design," *Econometrica*, 2001, *69* (1), 201–209.

Himmelstein, David, Elizabeth Warren, Debbie Thorne, and Steffie Woolhandler, "Illness and Injury as Contributors to Bankruptcy," *Health Affairs*, 2 February 2005, *10*, W5–63–73.

Hortacsu, Ali and Chad Syverson, "Product Differentiation, Search Costs, and Competition in the Mutual Fund Industry: A Case Study of the SP500 Index Funds," *Quarterly Journal of Economics*, 2004, *119* (2), 403–456.

Imbens, Guido and Joshua Angrist, "Identification of Local Average Treatment Effects," *Econometrica*, 1994, *62*, 467–475.

___ **and Thomas Lemieux**, "Regression Discontinuity Designs: A Guide to Practice," Working Paper 13039, National Bureau of Economic Research April 2007.

Karlan, Dean and Jonathan Zinman, "Elasticities of Demand for Consumer Credit," Working Papers 926, Economic Growth Center, Yale University Oct 2005. Available at http://ideas.repec.org/p/egc/wpaper/926.html.

___ **and** ___ , "Expanding Credit Access: Using Randomized Supply Decisions to Estimate the Impacts," 2006. Working Paper.

___ **and** ___ , "Observing Unobservables: Identifying Information Asymmetries with a Consumer Credit Field Experiment," 2006. Working Paper.

Lee, David S., "Randomized Experiments from Non-Random Selection in U.S. House Elections," *Journal of Econometrics*, forthcoming.

___ **and David Card**, "Regression Discontinuity Inference with Specification Error," 2006. NBER Technical Working Paper No. 322.

___ **and Justin McCrary**, "Crime, Punishment, and Myopia," 2005. NBER Working Paper No. 11491.

___ **, Enrico Moretti, and Matthew J. Butler**, "Do Voters Affect or Elect Policies? Evidence from the U.S. House," *The Quarterly Journal of Economics*, 2004, *119*, 807–859.

Lehnert, Andreas and Dean M. Maki, "Consumption, Debt and Portfolio Choice: Testing the Effect of Bankruptcy Law," Finance and Economics Discussion Series 2002-14, Board of Governors of the Federal Reserve System (U.S.) 2002. Available at http://ideas.repec.org/p/fip/fedgfe/2002-14.html.

Mauriello, Tracie, "State House, Senate Differ on Reining in Payday Loans," *Pittsburgh Post-Gazette*, 2005, *December 5.*

Melzer, Brian, "The Real Costs of Credit Access: Evidence from the Payday Lending Market," 2007. Available at http://www.chicagogsb.edu/research/workshops/finance/docs/Melzer-CreditAccess.pdf.

Morse, Adair, "Payday Lenders: Heroes or Villians?," 2007. Working Paper.

Porter, Jack, "Estimation in the Regression Discontinuity Model," *Manuscript*, 2003.

PricewaterhouseCoopers, "The Payday Advance Industry: 1999 Company Survey Findings," October 2001. Prepared for Community Financial Services Association of America and Financial Service Centers of America, Inc.

Robinson, Jerry and John Wheeler, "Update on the Payday Loan Industry: Observations on Recent Industry Developments," Technical Report, Stephens, Inc. September 2003.

Skiba, Paige Marta and Jeremy Tobacman, "Payday Loans, Uncertainty, and Discounting: Explaining Patterns of Borrowing, Repayment and Default," 2007. University of Oxford mimeo.

___ **and** ___ , "The Profitability of Payday Lending," 2007. University of Oxford mimeo.

Stegman, Michael A. and Robert Faris, "Payday Lending: A Business Model That Encourages Chronic Borrowing," *Economic Development Quarterly*, February 2003, *17* (1), 8–32.

Thistlethwaite, D. and Donald Campbell, "Regression-Discontinuity Analysis: An Alternative to the Ex Post Facto Experiment," *Journal of Educational Psychology*, 1960, *51*, 309–317.

Washington, Ebonya, "The Impact of Banking and Fringe Banking Regulation on the Number of Unbanked Americans," *Journal of Human Resources*, Winter 2006, *41* (1), 106–137.

White, Michelle, "Why Don't More Households File for Bankruptcy?," 1998. Department of Economics Working Paper 98-03, University of Michigan.

Table 1: Payday Loans

	Mean	Median	SD	N
Demographic Characteristics:				
Age	36.46	35	11.25	145,154
Black	0.43	0	0.49	65,528
Hispanic	0.34	0	0.48	65,528
Female	0.62	1	0.49	65,780
Monthly Pay ($)	1699	1545	1047	93,997
Months at Current Job	4.28	2	7.23	94,384
Paid Weekly	0.13	0	0.34	94,384
Paid Biweekly	0.51	1	0.50	94,384
Paid Semimonthly	0.19	0	0.39	94,384
Paid Monthly	0.17	0	0.37	94,384
Wages Garnished	0.03	0	0.17	67,908
Direct Deposit	0.69	1	0.46	94,384
Checking Account Balance ($)	235	66	552	142,407
NSF's on Bank Statement	1.09	0	3.00	145,159
Owns Home	0.34	0	0.47	67,908
Months at Current Residence	66.85	36	91.41	145,157
Month of Application	12/2002	1/2003	One year	145,159
Loan and Application Characteristics:				
Approved (First Application)	0.80	1		145,159
Approved (All Applications)	0.89	1		1,097,330
Loan Size ($)	301.41	289	139.60	1,097,330
$ Loans Per Person	2278.52	978	3493.67	145,159

Notes: Data provided by a company that makes payday loans. Included are all available demographics for the universe of payday-loan applicants in Texas between 9/2000 and 8/2004. Quantities are calculated from each individual's first application. These variables, with the exception of Month of First Application, represent the full set of "demographic controls" included in most regression specifications reported in this paper. Whenever we include these controls, we also include dummies for missing for each of them. Dummies for each value of Month of First Application are often included as well, and indicated separately. "NSF's" are "Not Sufficient Funds" events like bounced checks.

Table 2: The Credit-Score Regression Discontinuity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All Columns: Dependent Variable = First Application Approved							
	OLS					Probit		
Above Threshold Indicator	0.966	0.968	0.953	0.954	0.944	0.966	0.972	0.979
	(0.001)**	(0.002)**	(0.003)**	(0.003)**	(0.003)**	(0.001)**	(0.002)**	(0.001)**
Quartic in Credit Score		x	x	x	x		x	x
(Quartic in Credit Score) x AboveThr			x	x	x		x	x
Demographic Controls				x	x			x
Month Dummies					x			x
Observations	145,159	145,159	145,159	145,159	145,159	145,159	145,159	145,157
R-squared	0.84	0.85	0.85	0.85	0.85			

Source: Authors' calculations based on data from a payday lending company. This table documents the discontinuous effect of the credit score on approval of candidate payday borrowers' first applications. The key independent variable is the Above Threshold Indicator, a dummy for whether Credit Score >=0. Columns 1-5 perform OLS regressions; Columns 6-8 report marginal effects from probit regressions. Demographic controls include: gender, race dummies, age, sex, monthly income, job tenure, log pay frequency dummies, log checking account balance, the number of "not sufficient funds" events on the most recent bank statement, months in current residence, and dummies for homeownership, direct deposit, and garnishment of paycheck, and dummies for missing for each of these variables. "Month Dummies" refer to dummies for the month of first payday loan application. Standard errors are in parentheses. * implies significant at 5%; ** implies significant at 1%.

Table 3: Outcome Variable Summary Statistics

Panel A: Bankruptcy Data

	All Texas Individuals		Payday Loan Applicant Sample	
	Number of Bankruptcies	Annual Personal Bankruptcy Rate	Number of Personal Bankruptcy Filings	Annual Personal Bankruptcy Rate
All Bankruptcies	641,521	0.38%	8,331	2.31%
Chapter 7	382,654	0.23%	2,705	0.75%
Chapter 13	258,867	0.15%	5,626	1.56%

B: Outcome Around the Credit Score Approval Threshold

	All Credit Scores		Within 1 s.d. of Approval Threshold		Within 0.1 s.d. of Approval Threshold	
	Below Threshold	Above Threshold	Below Threshold	Above Threshold	Below Threshold	Above Threshold
Number of Payday Applicants	25,305	119,854	18,060	84,490	2,957	3,430
Bankruptcy Filing Rates (%)						
Within 1 Year after First PDL Application						
All Bankruptcies	1.32	1.81	1.32	1.55	1.52	2.45
Chapter 7	0.30	0.49	0.35	0.42	0.41	0.26
Chapter 13	1.02	1.32	0.97	1.13	1.12	2.19
Within 2 Years after First PDL Application						
All Bankruptcies	1.88	2.88	1.91	2.42	2.27	3.67
Chapter 7	0.40	0.79	0.47	0.66	0.51	0.50
Chapter 13	1.48	2.09	1.45	1.77	1.76	3.18
Subsequent Payday Loans						
Within 1 Year after First PDL Application						
Average Subsequent Applications	2.09	8.85	1.80	8.42	1.89	7.48
Average Borrowed ($)	68.32	2,376.21	40.57	2,192.58	49.29	1,953.19
Within 2 Years after First PDL Application						
Average Subsequent Applications	3.03	12.50	2.91	11.63	2.80	9.48
Average Borrowed ($)	202.03	3,346.15	167.70	3,000.31	154.81	2,446.46
Subsequent Pawn Loans						
Within 2 Days after First PDL Application						
Average Subsequent Pawnshop Loans	0.029	0.016	0.027	0.014	0.027	0.011
Average Borrowed ($)	2.779	1.929	2.637	1.615	3.234	1.585

Sources and Notes: In Panel A, bankruptcy data are from the American Bankruptcy Institute (http://www.abiworld.org/), Texas population data are from the US Census Bureau, http://www.census.gov/popest/states/tables/NST-EST2005-01.xls, and the matched sample consists of bankruptcy filers that have the same first name, last name, zip code and final four SSN digits as individuals who applied for loans from a national payday lender. Panel B uses bankruptcy data from Public Access to Court Electronic Records (PACER) and additional payday and pawn loan data from the same lender. The PACER data include 1.6% more cases than the aggregate bankruptcy statistics. All dollar amounts are unconditional on subsequent borrowing, i.e., zeros for non-borrowers are included when computing averages.

Table 4: Effects of Payday Loan Approval on Bankruptcy Filings

	(1) OLS full range	(2) OLS range = 0.5sd	(3) OLS range = 0.1sd	(4) Reduced Form full range	(5) IV full range	(6) IV range = 0.5sd	(7) IV range = 0.1sd
Chapter 7, One Year	-0.037726	0.004168	0.092243	-0.048729	-0.050461	0.180880	0.467126
	(0.084747)	(0.170509)	(0.519063)	(0.119977)	(0.124170)	(0.304169)	(1.908588)
Chapter 7, Two Years	0.023152	0.136418	-0.204896	-0.092401	-0.095701	0.454798	2.517492
	(0.105829)	(0.203591)	(0.640119)	(0.149822)	(0.155060)	(0.363188)	(2.356983)
Chapter 13, One Year	0.335979*	0.802947**	0.760889	0.212766	0.220092	1.889178**	2.392707
	(0.141613)	(0.287651)	(1.171218)	(0.200486)	(0.207490)	(0.513207)	(4.307040)
Chapter 13, Two Years	0.331891	0.949324**	-0.328424	0.343624	0.355433	2.483018**	3.326897
	(0.179339)	(0.356550)	(1.470914)	(0.253893)	(0.262765)	(0.636162)	(5.410956)
All Bankruptcies, One Year	0.298253	0.807115*	0.853132	0.164037	0.169631	2.070058**	2.859833
	(0.164471)	(0.333616)	(1.276841)	(0.232846)	(0.240982)	(0.595215)	(4.695655)
All Bankruptcies, Two Years	0.355043	1.085742**	-0.533319	0.251223	0.259731	2.937816**	5.844389
	(0.207779)	(0.410913)	(1.604634)	(0.294157)	(0.304436)	(0.733170)	(5.907357)
Number of observations	145,159	47,434	6,387	145,159	145,159	47,434	6,387
Standard errors in parentheses							
* significant at 5%; **significant at 1%							

Notes: Cells report regression coefficients that are the estimated treatment effects, in percentage points, of first payday loan approval ("*CreditScore* ") on bankruptcy filings, and their standard errors . These effects are computed from regressions that include a quartic in the credit score, a quartic in the credit score interacted with the abovethr dummy, demographic controls and a full set of dummies for month of loan application. Demographic controls include dummies for pay frequency, direct deposit, homeownership, race, paycheck garnishment, and dummies for missing values of these; log monthly pay, log checking-account balance, job tenure, age, sex, months at current residence, and number of non-sufficient funds on checking statement. "Range" refers to the number of standard deviations around the credit-score threshold to which the sample is restricted. The IV regressions instrument for *CreditScore* with an indicator for whether the credit score exceeds the approval threshold ("*AboveThr* "). Column (4) reports the coefficient on the "above threshold" indicator.

Appendix Table 1: Demographic Characteristics and the Threshold

	All			Within 1sd			Within 0.1 sd		
	Below	Above		Below	Above		Below	Above	
Age	34.032	36.976	**	33.714	34.443	**	33.984	36.022	**
	10.376	11.358		10.487	10.800		10.188	11.605	
Black	0.189	0.193		0.177	0.197	**	0.178	0.211	*
	0.392	0.395		0.381	0.398		0.383	0.408	
Hispanic	0.113	0.165	**	0.112	0.147	**	0.086	0.168	**
	0.317	0.371		0.315	0.354		0.280	0.374	
Female	0.228	0.292	**	0.217	0.274	**	0.208	0.276	**
	0.419	0.454		0.412	0.446		0.406	0.447	
Monthly Pay ($)	878.615	1147.138	**	725.063	944.194	**	789.272	838.439	
	1039.932	1190.408		982.089	1034.300		950.915	1056.526	
Months at Current Job	1.216	3.115	**	0.855	1.366	**	1.145	1.098	
	3.761	6.528		2.739	3.911		3.233	3.317	
Paid Weekly	0.082	0.089	**	0.069	0.089	**	0.068	0.085	
	0.275	0.284		0.253	0.285		0.252	0.278	
Paid Biweekly	0.291	0.339	**	0.248	0.315	**	0.262	0.274	
	0.454	0.473		0.432	0.464		0.440	0.446	
Paid Semimonthly	0.107	0.128	**	0.090	0.116	**	0.099	0.097	
	0.309	0.334		0.287	0.320		0.299	0.296	
Paid Monthly	0.073	0.116	**	0.059	0.090	**	0.065	0.090	**
	0.261	0.320		0.236	0.286		0.247	0.287	
Wages Garnished	0.378	0.503	**	0.245	0.414	**	0.276	0.321	**
	0.519	0.525		0.459	0.517		0.464	0.489	
Direct Deposit	1.481	1.807	**	1.246	1.616	**	1.344	1.427	
	1.375	1.321		1.372	1.346		1.396	1.350	
Checking Account Balance ($)	41.680	270.378	**	-10.507	132.231	**	53.627	77.242	
	370.903	570.110		302.296	438.501		328.233	460.626	
NSF's on Bank Statement	2.055	0.889	**	2.273	1.269	**	1.803	1.862	
	4.423	2.557		4.737	3.251		4.165	3.939	
Owns Home	0.074	0.176	**	0.036	0.073	**	0.060	0.080	*
	0.261	0.381		0.187	0.260		0.238	0.272	
Months at Current Residence	48.847	70.646	**	42.250	48.223	**	46.805	82.858	**
	59.045	96.444		51.259	76.797		60.179	104.245	

Notes: Data provided by a company that makes payday loans. Included are all available demographics for the universe of payday-loan applicants in Texas between 9/2000 and 8/2004. Quantities are calculated from each individual's first application. These variables, with the exception of Month of First Application, represent the full set of "demographic controls" included in most regression specifications reported in this paper. Whenever we include these controls, we also include dummies for missing for each of them. Dummies for each value of Month of First Application are often included as well, and indicated separately. "NSF's" are "Not Sufficient Funds" events like bounced checks. One and two stars respectively imply significant differences (in t-tests) at the 5% and 1% levels.

Figure 1: Distribution of Credit Scores

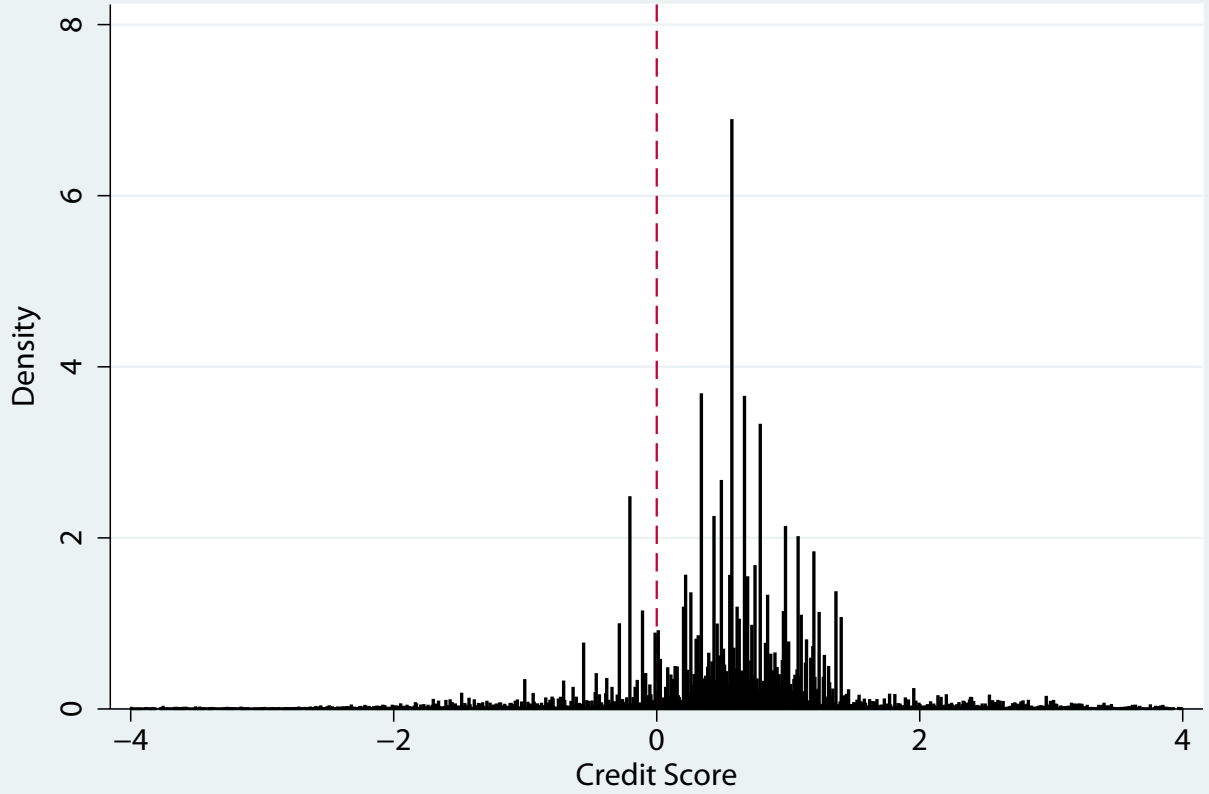
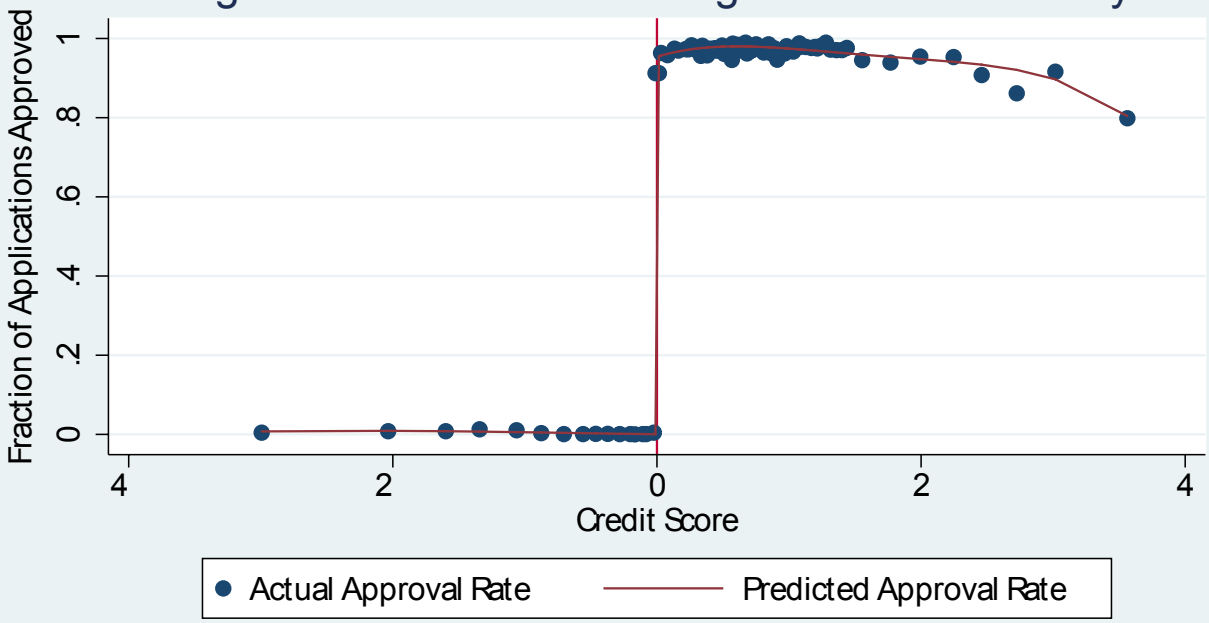


Figure 2: The Credit Score Regression Discontinuity



Source and notes: Authors' calculations based on data from a national payday lending company. Figure 1 plots the distribution of *CreditScore* for first-time payday loan applicants. *CreditScore* is equal to the raw credit score provided by Teletrack minus the threshold for loan approval chosen by the lender, divided by the standard deviation of scores among this lender's first-time applicants. We normalize by different standard deviations for applications before and after an August, 2002, change in the scoring formula. The dashed line marks the threshold for loan approval; about 80% of first-time applications are approved.

Figure 2 plots the probability of approval for first-time payday loan applicants as a function of *CreditScore*. Each point represents one of 100 quantiles in the credit score. Points shown are at the medians of their quantiles on the x-axis and at the means of their quantiles on the y-axis. The predicted approval-rate function plots the best-fitting quartic polynomials on both sides of the credit score threshold.

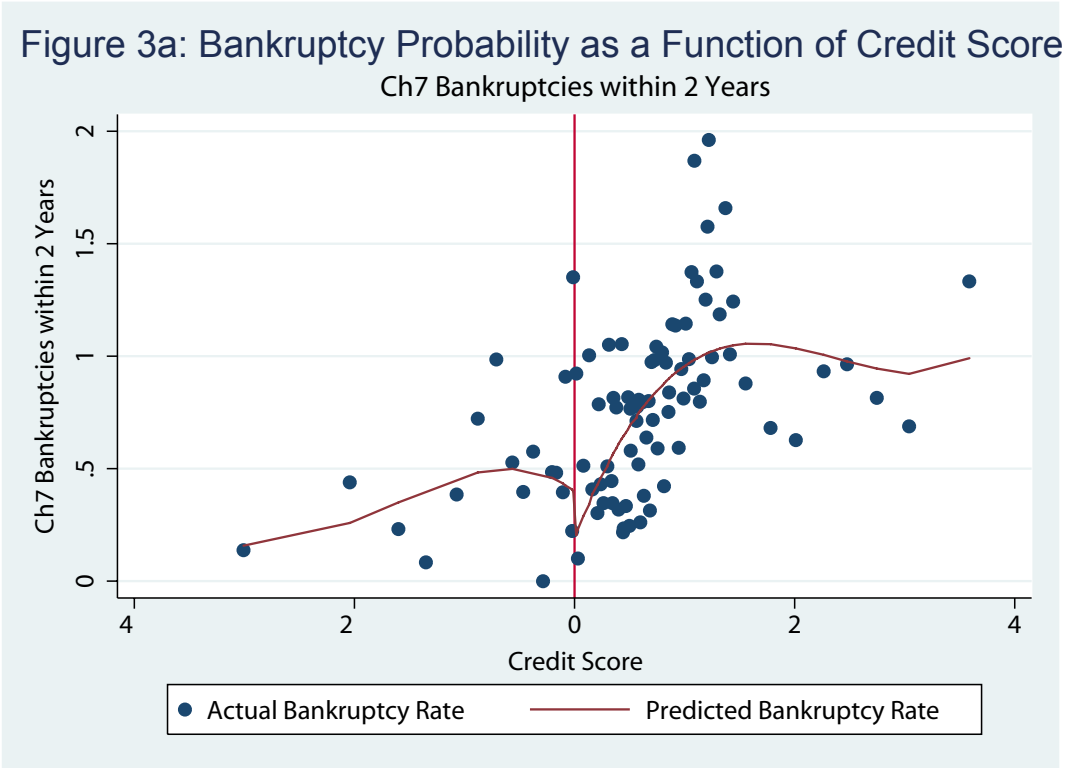


Figure 3a: The effect of payday loan access on Chapter 7 bankruptcy petitions. Figure 3a plots the effect of payday loan access on Ch. 7 bankruptcy petitions within 2 years after first payday loan application. Each point represents one of 100 quantiles. Points shown are at the medians of their quantiles on the x-axis and at the means of their quantiles on the y-axis. The predicted bankruptcy-rate function plots the best-fitting quartic polynomials on both sides of the credit-score threshold. Source; Authors' calculations based on data from a national payday lending company and the Texas Bankruptcy Courts' PACER database.

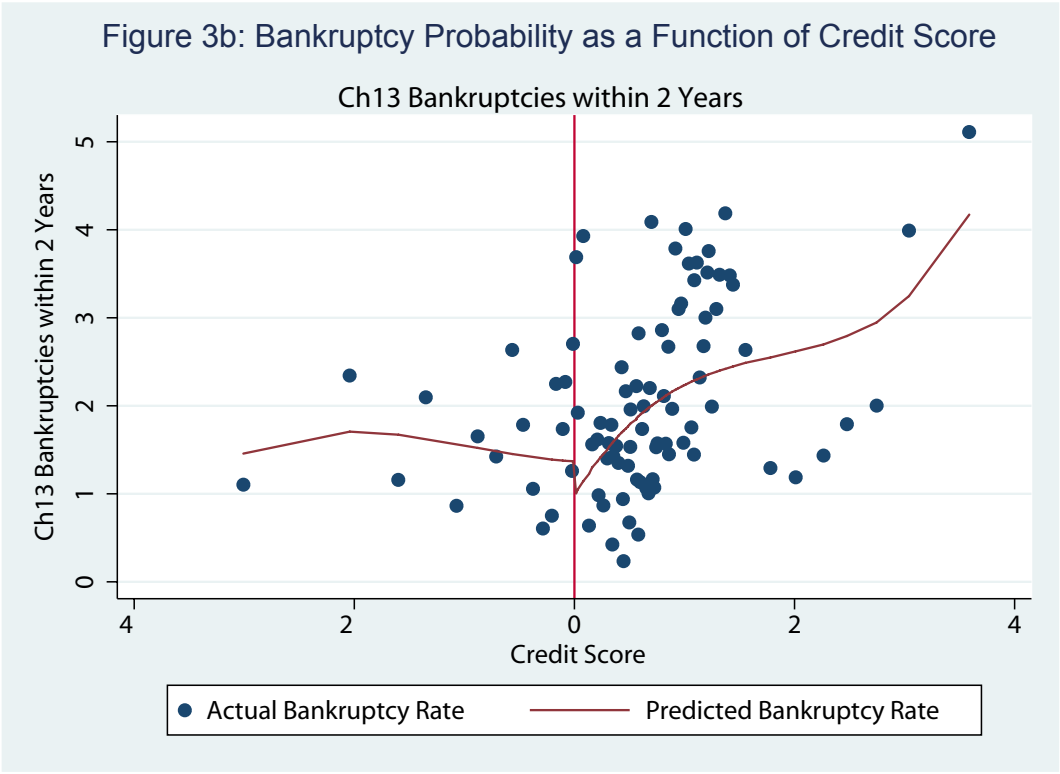


Figure 3b: The effect of payday loan access on Chapter 13 bankruptcy petitions. Figure 3b plots the effect of payday loan access on Ch. 13 bankruptcy petitions within 2 years after first payday loan application. Each point represents one of 100 quantiles. Points shown are at the medians of their quantiles on the x-axis and at the means of their quantiles on the y-axis. The predicted bankruptcy-rate function plots the best-fitting quartic polynomials on both sides of the credit-score threshold. Source; Authors' calculations based on data from a national payday lending company and the Texas Bankruptcy Courts' PACER database.

Fig 4a: Effect of Payday Loan Access Over Time: All Bankruptcies

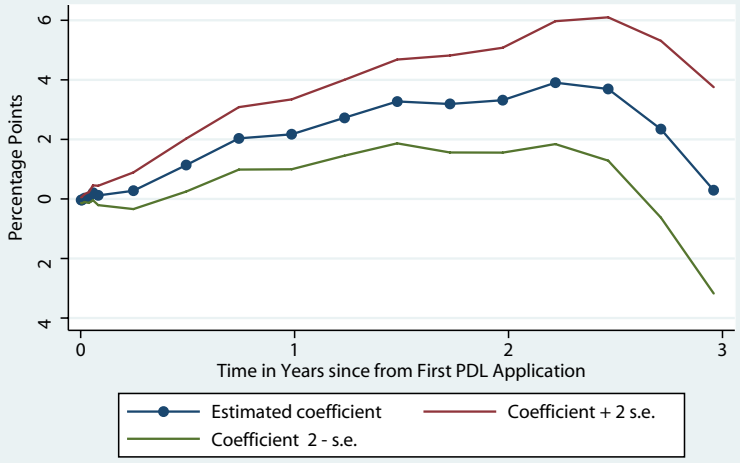


Fig 4b: Effect of Payday Loan Access Over Time: Ch7 Bankruptcies

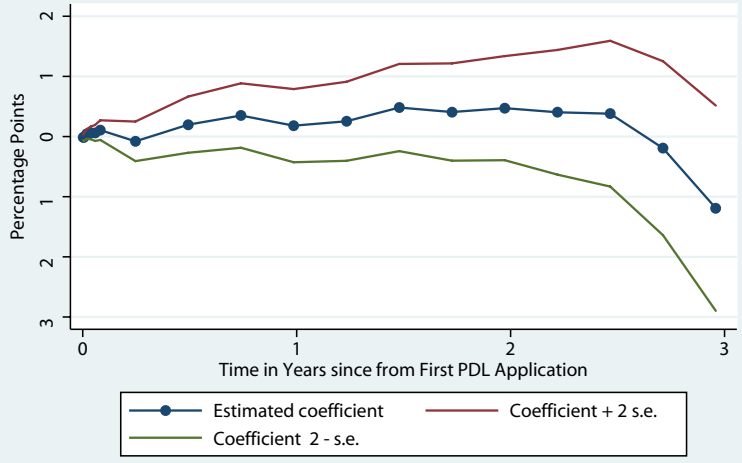
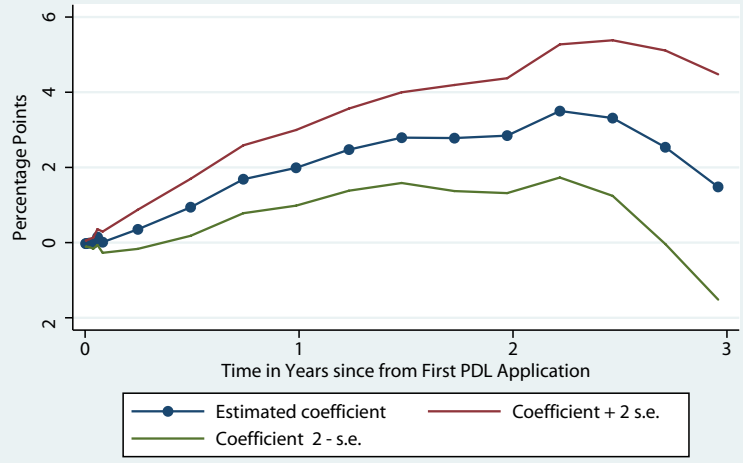
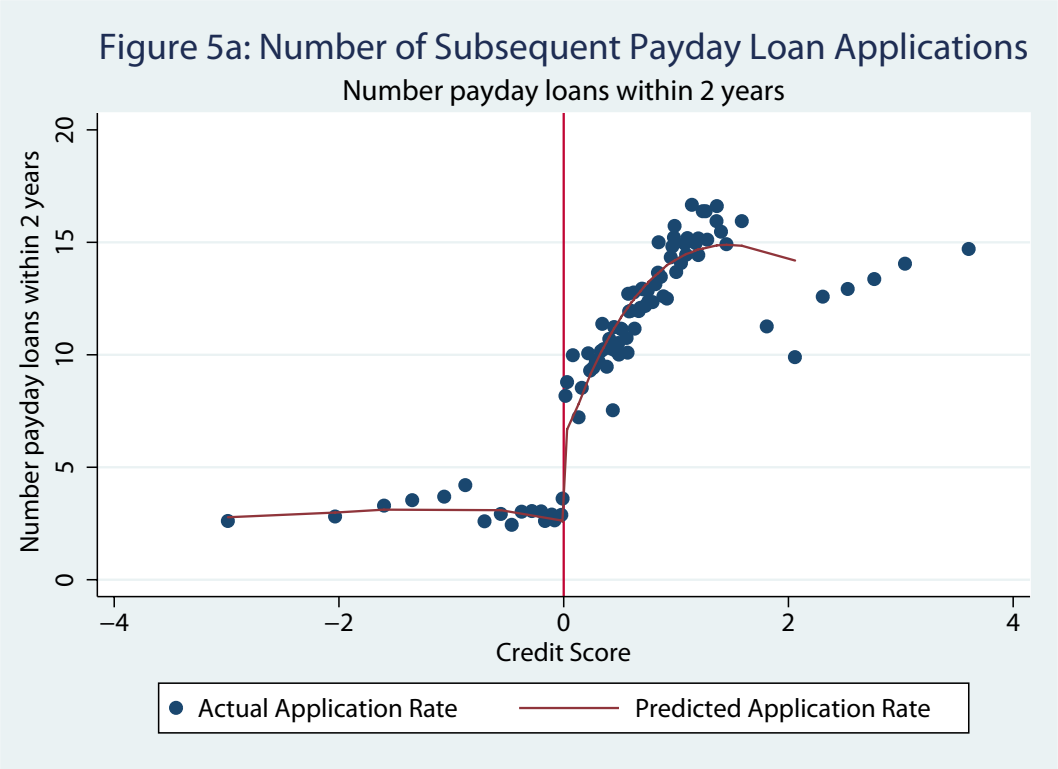
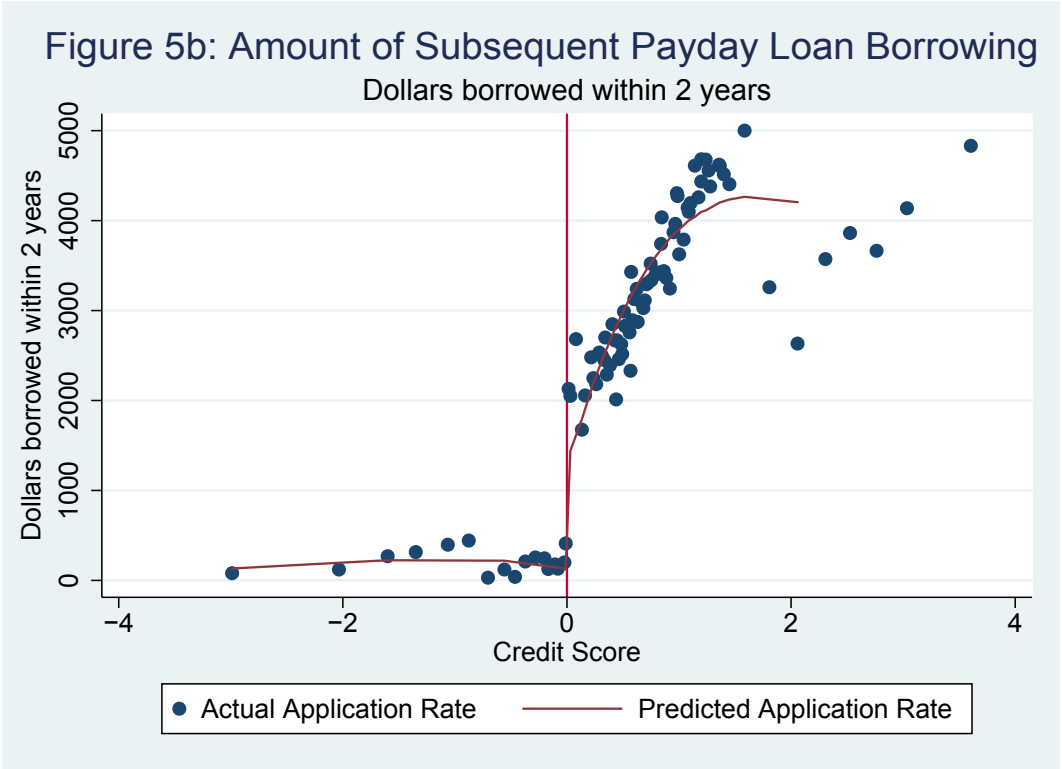


Fig 4c: Effect of Payday Loan Access Over Time: Ch13 Bankruptcies

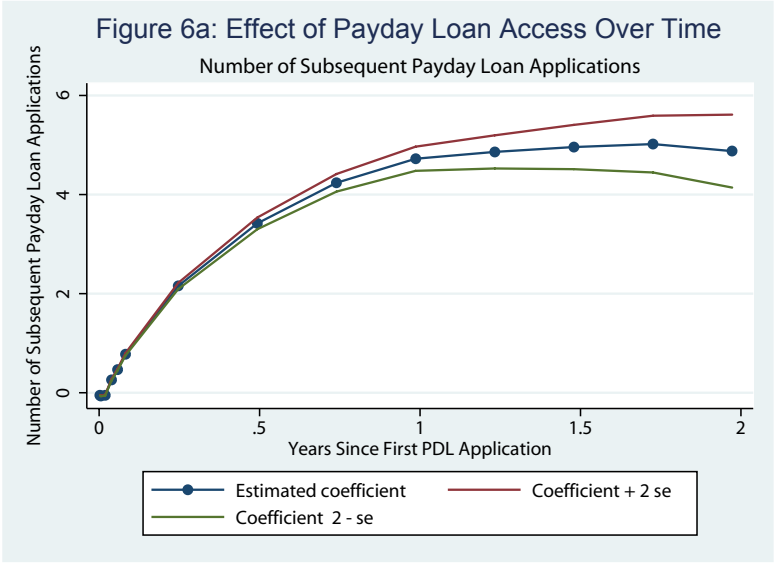


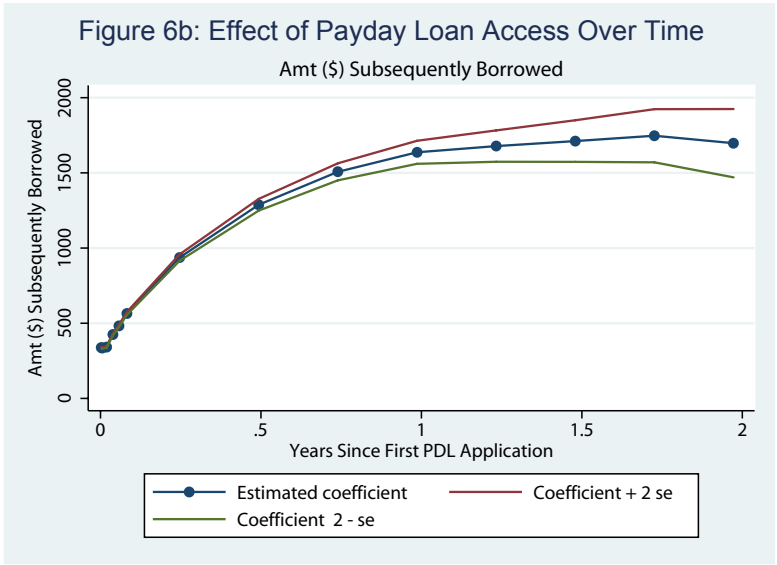
Figures 4a, 4b, 4c. Source: Authors' calculations based on data from a national payday lending company and the electronic records from Texas Bankruptcy Courts via PACER. The middle line represents the IV estimated effect of First Application Approved. The other lines are two-standard-error bands. Regressions producing these estimates include quartic polynomials on both sides of the credit-score threshold, demographic controls, and dummies for month of first application. Figures 4a, 4b, and 4c plot bankruptcy petitions for all Chapters, Chapter 7 and Chapter 13, respectively.

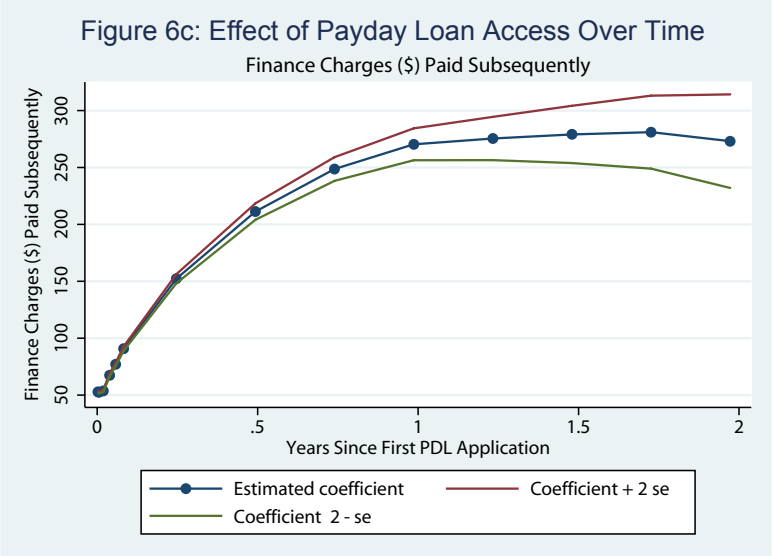




Figures 5a and 5b. Source: Authors' calculations based on data from a national payday lending company. Each point represents one of 100 quantiles. Points shown are the medians of their quantiles on the x axis and at the mean of their quantiles on the y-axis. The predicted line plots the best-fitting quartic polynomials on both sides of the credit-score threshold. All data are from Texas, 9/2000-8/2004. Figure 5a plots the effect of payday loan access on the number of subsequent payday loan applications made. Figure 5b plots the dollar amount subsequently borrowed.







Figures 6a, 6b, 6c. Source: Authors' calculations based on data from a national payday lending company The middle line represents the IV estimated effect of First Application Approved on subsequent behavior in the payday loan market. The other lines are two-standard-error bands. Regressions producing these estimates include quartic polynomials on both sides of the credit-score threshold, demographic controls, and dummies for month of first application. Figures 6a, 6b and 6c plot the number of subsequent application made at this company, the dollar amount borrowed, and the finance charges paid to this company, respectively.

Figure 7a: Pawn Use as a Function of the Credit Score

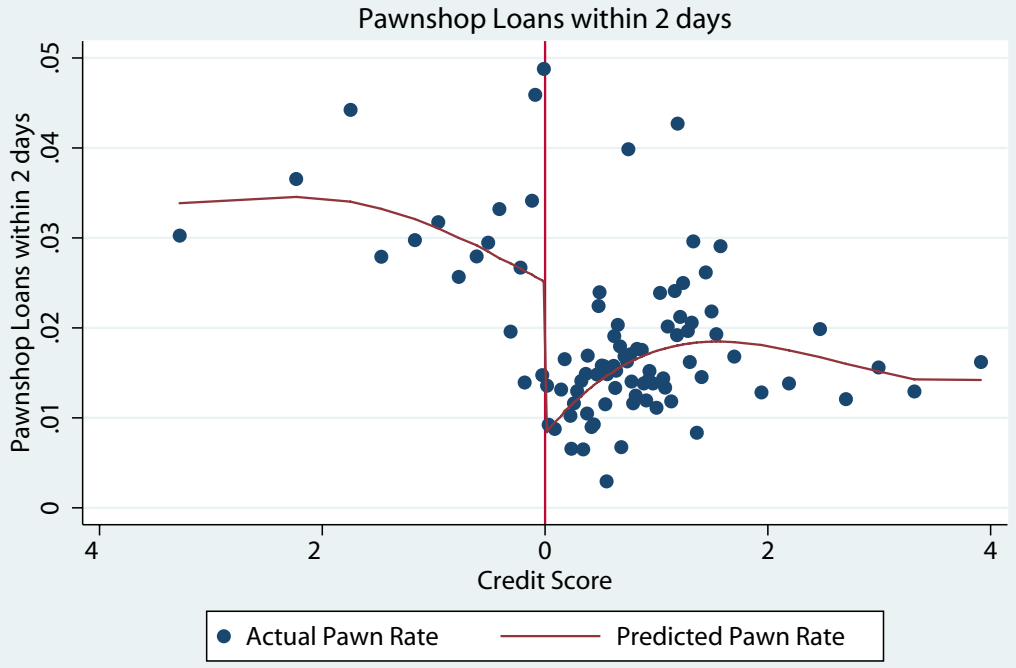
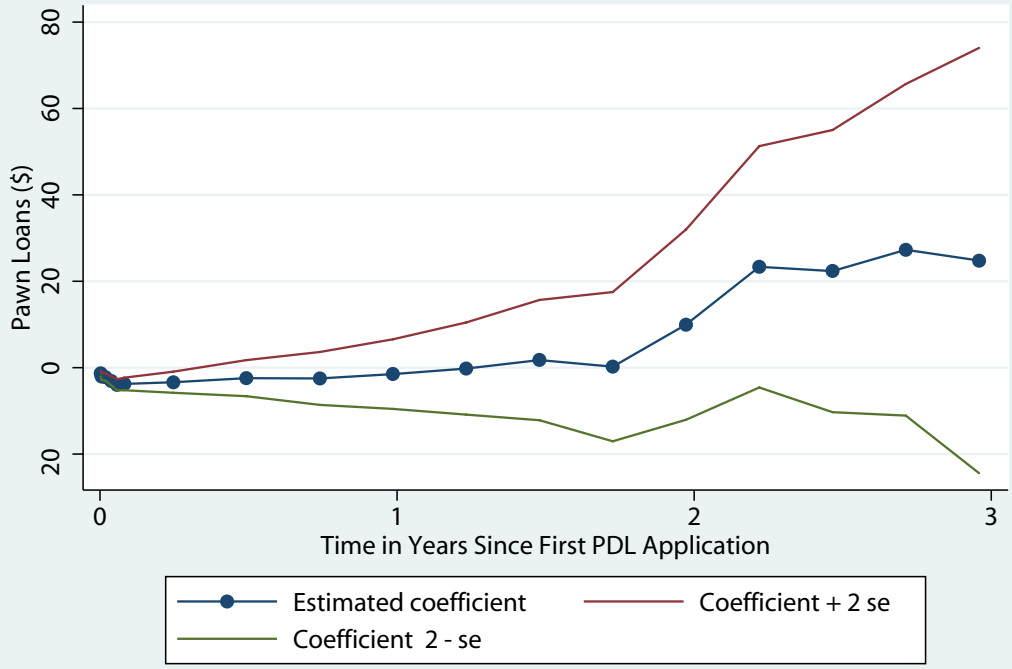


Figure 7b: Effect of Payday Loan Access on Pawn Borrowing Over Time



Figures 7a and 7b: The effect of payday loan access on pawnshop borrowing. Figure 7a shows the effect of payday loan access on the number of pawn loans within 2 days of payday loan application. Figure 7b plots the effect of payday loan access on the dollar amount of pawnshop loans borrowed over time. The middle line represents the IV estimated effect of First Application Approved. The other lines are two-standard error bands. Regressions producing these estimates include quartic polynomials on both sides of the credit-score threshold, demographic controls, and dummies for first month of application. Source: Authors' calculations based on data from a national payday lender. All data are from Texas, 9/2000-8/2004.