Regulation on the Margin: Evidence from Online Payday Lending

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Abstract:

Payday loans continue to be a commonly-used yet controversial source of credit for low-income consumers. We study the consequences of capping loan sizes using a fuzzy regression kink design. The interaction of lenders' underwriting rules with state loan caps creates exogenous variation in loan offers. We exploit this variation to estimate the effect of capping loan sizes on total subsequent indebtedness on any type of subprime credit, late payment and default. We find that a) online payday customers are severely credit constrained and b) larger payday loans may help alleviate credit problems. We discuss our findings on the costs of restricting online payday lending in light of state-level regulation *on the margin*—minor restrictions on lending rules—such as implementing ceilings on loan principals, expanding mandatory loan repayment periods and limiting the frequency of borrowing or the practice of rolling over debt from one pay cycle to the next.

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I. Introduction

Payday loans have been controversial since their inception in the 1990s. Both storefront and online payday lenders offer a few hundred dollars in cash in exchange for a personal check for the principal plus interest and fees to be deposited by the lender on the borrower's payday. The loans last just one pay cycle. With interest rates of 15-20% for the typical $300 fourteen-day payday loan, the annualized interest rates are 300-500%.

Because of their high interest, short maturation and the low income of the customer base, state regulators have attempted to limit use of payday loans, largely through "regulating at the margin," such as restricting loan sizes (Dobbie and Skiba, 2013), requiring information disclosures (Bertrand and Morse, 2011), mandating loan lengths (Carter, Liu, Skiba and Sydnor, forthcoming) and capping interest rates (Carter, 2015). Since 2014, twenty states made substantial changes to payday lending laws, acting to ban or restrict lending in some way rather than create more permissive lending terms. (Malone and Skiba, 2020). At the federal level, payday loans are subject to standard lending regulations including the Truth in Lending Act, the Fair Debt Collections Practices Act and the Equal Credit Opportunity Act.[1] Additionally, the Consumer Financial Protection Bureau (CFPB) has commenced enforcement actions against illegal practices in the payday lending market. In October 2017, the agency finalized rulemaking to target the payday lending market with the goal of "end[ing] payday debt traps."[2] The rules would have taken effect in 2019. In 2018, however, Mike Mulvaney, then interim director of the CFPB appointed by President Trump, scaled back CFPB enforcement actions and plans to restrict payday lending practices moving forward.[3] As of 2022, the CFPB has not taken direct agency action on payday lending but did

[1] http://files.consumerfinance.gov/f/201503_cfpb_truth-in-lending-act.pdf
[2] https://www.consumerfinance.gov/about-us/newsroom/cfpb-finalizes-rule-stop-payday-debt-traps/
[3] https://www.nytimes.com/2018/02/02/us/politics/payday-lenders-lobbying-regulations.html

released a report in April 2022 criticizing payday lenders and the expensive cost consumers face when "rolling over" payday loans.[4] The new director, Rohit Chopra noted that "[p]ayday lenders have a powerful incentive to protect their revenue by steering borrowers into costly re-borrowing." [5] Additional restrictions on the payday market at the federal level may be in the offing; In light of the report, the CFPB says they plan to keep monitoring the industry for regulatory violations and abuse.

The first goal of our paper is to provide empirical evidence on how borrowers respond to one type of regulation at the margin: loan caps. Second, our administrative dataset allows us to explore the interactions among several types of credit. We are able to test the effect that capping online payday loans has on the use of storefront payday lending, auto-title lending and installment loans. Below we describe these types of loans in detail. Finally, we document how borrowers use online payday loans and discuss overall welfare implications.

As much as a quarter of the payday loan industry's activity is online (Pew, 2012). Online lenders often seek to avoid state bans or interest rate caps by establishing offices in one state and making loans to customers in other states. Beyond documenting the effect loan caps have in the payday loan market, our paper is the first to our knowledge to study the consequences of online payday lending.

Several papers have studied the effects of traditional payday lending.[6] These papers have used changes in payday lending laws or individual-level administrative data to study the effect of having access to or receiving a

[4] https://files.consumerfinance.gov/f/documents/cfpb_market-snapshot-payday-loan-extended-payment-plan_report_2022-04.pdf/

[5] https://www.consumerfinance.gov/about-us/newsroom/cfpb-finds-payday-borrowers-continue-to-pay-significant-rollover-fees-despite-state-level-protections-and-payment-plans/

[6] See Bhutta (2012); Bhutta, Skiba and Tobacman (2015); Carrell and Zinman (2014); Carter (2015); Melzer (2011); Morgan, Strain and Seblani (2012); Morse (2012); Skiba and Tobacman (2011); and Zinman (2010).

storefront payday loan. No consensus on the net welfare consequences of small-dollar, short-term, high-interest loans has emerged from these studies.

We are able to estimate the causal effect of capping online payday loan sizes by using a so-called fuzzy regression kink (RK) design. This relatively new quasi-experimental approach exploits the fact that how much a customer borrows is determined in part by two exogenous factors: lender's underwriting rules and state-determined loan caps. We use data from an online lender operating in the Southeast whose loan offers are 25.5% of monthly net take-home pay for monthly, biweekly and semimonthly borrowers.[7] In addition to this institutional rule, the applicable state (Tennessee) regulatory cap on payday loans is $425. Therefore, anyone earning above $20,000/year ($1,666.67/month) is eligible for a loan of $425 regardless of income. Together these rules create a change in the slope of loan offers (i.e., the "kink" in our regression kink design), which allows us to estimate the causal effect of being exogenously constrained in how much one can borrow. We show this change in slope of loan offers in Figure 1 and describe in detail the empirical strategy and assumption required for the regression kink design in Section II.b below.

The first stage of the regression kink strategy is informative in itself. It provides an estimate of credit constraints, i.e., what fraction of an extra dollar of credit offered borrowers take. If consumers have as much access to credit as they would like, the first-stage estimates would reveal that an additional dollar of credit offered results in no increase in actual loan size taken.

We find that online customers are severely credit constrained, much more so than previous estimates among other types of borrowers. Customers borrow 57 cents of every dollar of additional credit offered. This is higher than

[7] Customers paid weekly are eligible for 10.625% of their monthly net pay. Just 11% of our sample is paid weekly, so we focus on the larger part of the sample. Moreover, implementing a regression kink design using weekly borrowers requires a sizeable sample of weekly-paid borrowers earning more than $48,000/year—the annual income that gives them loan size eligibility at the statutory loan cap of $425. Most weekly-paid borrowers earn substantially less than $48,000/year.

previous estimates from storefront payday lending customers (Dobbie and Skiba, 2013), auto-title lending customers (Fritzdixon, 2015) and credit card holders (Gross and Souleles, 2002).

The second stage of our RK strategy estimates the effect of capping an online payday loan on total subsequent indebtedness on any type of subprime credit, late payment and default. We find that for a $50 decrease in loan size around a $425 loan size cap, customers borrow $615 more on *any* type of credit from this lender over the next 6 months. The cap at $425, in effect, increases the future indebtedness of the borrower substantially. This suggests that the loan cap prevents the borrower from accessing as much credit as she needs, so that she continues to borrow on other types of subprime credit.

The rest of the paper is organized as follows. Section II discusses the data and the RK design. Section III presents the results. Section IV discusses the assumption testing and robustness checks. Section V concludes.

II. Empirical Strategy

a. Data

We use data from a large provider of financial services operating in the southeastern United States. The data include all loans made by the company between January 2012 and July 2015. We restrict the analysis to Tennessee where the $425 loan cap is binding. To be eligible for an online payday loan, a borrower must have verifiable income and receive their income through direct deposit. A bank account and debit card are required as the lender electronically debits the borrower's account when the loan is due. Loans always mature on the borrower's next payday, so they typically last a week or two. This lender does not use any credit scoring or risk-based pricing; all lending and pricing decisions are based on the borrower's income as determined by their most recent pay stub. Customers upload a copy of their government-issued ID, bank statement and most recent pay stub. These are verified by employees in house and loans are approved based on these documents within 15 minutes. Cash is

deposited into borrowers' checking accounts within 24 hours.

In addition to online and storefront payday loans, the lender offers auto-title loans, in which a borrower receives cash in exchange for his car's title as collateral, to be repaid in 30 days with interest rates similar to those of payday loans. Auto-title loan sizes are determined by the value of a borrower's car and can be as large as $2,500. This lender also offers installment loans, which are larger than payday loans ($575 on average with a $2,000 state cap) and require monthly interest payments. The typical installment loan lasts seven months with an APR of 100%. Borrowers can and often do use multiple types of loans concurrently or in succession. In Section II.b we test the effect that receiving a larger online payday loan has on subsequent indebtedness including all types of loans at this company (storefront payday, online payday, auto-title and installment).

Table 1 provides summary statistics about the 1,251 borrowers (10,212 loans) in our sample of online payday loans. Sixty-five percent of borrowers are paid biweekly or semimonthly. Biweekly and semi-monthly borrowers have an average paycheck size $1,077 and $1,251, respectively. The majority (68 percent) are female, which is typical of storefront payday lending borrowers as well. The typical loan size is about $360, with weekly borrowers receiving smaller loans ($278 on average). The default rate is low at 1.5%, but the rate of late payment is much higher at 18%. The low default rate of online loans reflects the fact that the lender can more easily debit the borrower's account until payment is received than using a personal check as collateral as is done in storefront lending.

b. Regression Kink Design

The challenge in estimating the effect of loan size on loan repayment and future indebtedness is that loan size is endogenous. Given a loan offer for their income level, customers choose how much they want to borrow. Thus loan demand will depend partly on the borrower's income, so separating the effect

of income and loan size is not possible with a simple OLS regression. If the relationship between income and loan size is known and takes a certain form, however, we can use a regression kink design to estimate the effect of loan size on future borrowing or repayment for some values of income. In this case, there is a change in slope in the relationship between annual income and loan size that we can exploit.

For clarity, consider the following separable model:[8]

$$Y = y(L, I, U) = \tau L + g(I) + U$$

where L is the variable of interest (loan size), I is another observable covariate (annual income) and U is an unobserved covariate. I is referred to as the running variable, because it is assumed to vary smoothly along its support. If L is a function of the other observable characteristic I with a kink in the slope of the relationship, as in

$$L = l(I, \varepsilon) = \begin{cases} \rho_1 I + \varepsilon \; if \; I \leq i_0 \\ \rho_2 I + \varepsilon \; if \; I > i_0 \end{cases}$$

then it will not be possible to separately estimate the effect of L from the effect of I in a simple OLS regression. But we can use the change in slope in the relationship between income and loan size that occurs at i_0 to separate the effect of an increase in loan size from the effect of an increase in income using a regression kink design. The error term in $l(I, \varepsilon)$ represents the fact that the relationship between income and loan size is not deterministic, but subject to some randomness. Since the running variable, annual income, is smooth across the cutoff i_0, it cannot induce a kink in the conditional expectation function $y(L, I, U|i)$. If there is a causal relationship between income and the outcome of interest Y, then any change in slope in $y(L, I, U|i_0)$ that we observe at i_0 can, in the limit, be attributed to the change in loan size rather than a change in income.

[8] The results hold under a more generalized non-separable model as well, but we present the linear separable model for simplicity. See Card et al. (2015).

In the case of online payday loans, we observe this type of change in slope in the relationship between income and loan size because of the institutional features of the online payday lending market. Figure 1 is a representation of these institutional rules. The graph presents annual pay on the *x*-axis and loan offer on the *y*-axis. By company rules, customers are offered 25.5% of their monthly pay. At the same time, there is a $425 state cap on the size of payday loans in our sample. For borrowers who make more than $20,000, therefore, an increase in annual income does not translate into a higher loan offer. These borrowers are constrained by the legal cap of $425. That is, above $20,000, the offer curve is flat.

This kink in the offer curve creates a kink in the relationship between annual income and actual loan size. Even though not all borrowers take the maximum loan they are offered, they are still influenced by the offer they receive. The first stage in fuzzy RK is estimating the size of this effect. Here we run local linear regressions of loan size on annual income and an interaction between annual income and a dummy variable for having annual income above the cutoff of $20,000. The coefficient on the interaction term is the estimate of the size of the kink in the relationship between income and loan size.

Next, to estimate the effect of capping loan size on our outcomes of interest, we run local linear regressions to estimate the size of the kink in the conditional expectation function for the outcome at the cutoff of $20,000. In effect, we look at what would have happened to the borrower with income above $20,000 had he not been affected by the loan size cap. We divide the estimate of the change in slope in the conditional expectation function by the estimate of the size of the kink in the first stage. In practice, this is done through instrumental variable regression, using the interaction of annual income and the dummy variable for income above $20,000 as the instrument for loan size.

The assumptions underlying these estimates are very similar to assumptions needed in a regression discontinuity design. Here, we must assume that borrowers cannot perfectly manipulate their income to pick their

position relative to the location of the kink at $20,000. We explicitly test this assumption in Section IV. We note, however, that unlike in many regression discontinuity designs or other regression kink designs in which there is a clear benefit to being on one side of the cutoff, it is not clear here why a borrower would choose to be on one side or the other. Just crossing the threshold (in either direction) does not lead to a larger loan or improved loan terms.

The next section presents results from the regression kink design.

III. Results

a. First Stage

Figure 2 represents the first stage for monthly, biweekly and semimonthly borrowers (who are all subject to the same institutional lending rules). Figure 2 shows the relationship between annual income and actual loan size for these borrowers. The dots represent average loan size in $100 bins of annual income. The solid, green line is the predicted values from a local linear regression of loan size on annual income. It is clear from the figure that, although not all customers borrow the full amount they are offered, they are affected by the change in slope in loan offer. There is a positive relationship between annual income and loan size below $20,000, where a higher income results in a higher loan offer. At incomes above $20,000, where a higher income still results in a loan offer of $425, there is a negative relationship between income and amount borrowed, suggesting that as income increases, demand for borrowing on online payday loans decreases.

Regressions underlying Figure 2 reveal that the proportion of any increase in annual income than the customer chooses to borrow is 0.012.[9] To interpret this coefficient meaningfully, we must translate it into the proportion of an increase in loan offer that is actually borrowed. Recall that the offer curve allows for borrowers paid monthly, semimonthly, and biweekly to obtain an

[9] The results presented are for local linear regressions. The coefficients for local quadratic and local cubic regressions look similar in sign and magnitude. Results are available upon request.

online payday loan of 25.5% of their monthly income. Consider a monthly borrower, for example: A $1,000 increase in annual income would represent an $83.33 increase in *monthly* income. Borrowers with this higher income would be eligible for a $21.25 (25.5 percent of $83.33) larger loan. The first stage regression results reveal that borrowers take $12.14 of that $21.25 or 57 percent of the additional offering.

These results suggest online borrowers are severely credit constrained, even compared to previous literature documenting credit constraints among other low-income consumers. Previous work in this line of research has shown storefront payday borrowers take about 50 cents on the dollar of additional offering (Dobbie and Skiba, 2013). Fritzdixon (2014) finds a 54 percent increase in borrowing for an additional dollar of auto-title credit. In the credit card market, this marginal propensity to consume has been estimated to be around 0.5 among borrowers whose credit lines were close to maxed out (Gross and Souleles, 2002). Next we explore the subsequent borrowing and repayment behavior using our RK strategy.

The first stage regressions also provide an estimate of the size of the kink in the relationship between annual income and actual amount borrowed. The coefficient on the interaction term gives the estimate of the change in slope between annual income and loan size. The size of the kink is -0.018. If loan size were to perfectly match the loan offer, we would expect the kink to be -0.2125. We use the estimate of -0.018 to scale the kinks from the second stage.

c. Second Stage Results

Because regulators appear to be particularly concerned about a borrower's ability to repay a loan, we use outcomes measuring future total indebtedness and repayment behavior. These include total loans taken from this lender in the next 12 months; the total dollar amount of those loans; delinquency of 30 days or longer; and default. We restrict our analysis to the first time a borrower took an online payday loan at this company.

Figures 3, 4 and 5 reveal that being constrained by how much you can borrow leads to additional borrowing in the future. The results are confirmed in regression results, shown in Tables 2, 3, and 4. In our main results we look at two subsamples, all first-time borrowers and borrowers who maxed out their loan offer, i.e. those that appear most credit constrained. This sub-sample of maximum borrowers is defined as first-time borrowers who borrowed at least 95% of their total loan offer.[10] Figure 3 shows that these borrowers follow the offer curve more closely and therefore provide more precise results. Table 2 and 3 display the effect of a $1 decrease in loan size on the subsequent number of loans and size of those loans (over all types of loans at this lender) for several time frames after the borrower's first online payday loan. Table 4 shows the effect on default and delinquency. As shown in Table 2, we find that being prohibited from borrowing an extra $50 today leads the borrower to take out $615 more (12.29 *x* $50) on any type of loan in the next 6 months. These results are statistically significant at the 10% level. In Table 3, we find that for maximum borrowers, being prohibited from borrowing an extra $50 today leads the borrower to take out $1,144 more (22.89 *x* $50) on any type of loan in the next 6 months. These results are statistically significant at the 5% level.

The results for default and delinquency are not significant at conventional levels, but are suggestive that receiving a smaller loan close to the $425 cap may alleviate some trouble with repaying the initial loan. Receiving a $50 smaller loan, around the $425 cap, may decrease the probability of being delinquent on the loan by 0.05 percentage points (0.001*50). From an average delinquency frequency of 19.3 percent, this effect is not economically large. Recall that lenders directly debit borrowers' checking accounts, so default is rare.

IV. Robustness Checks

[10] Figure 12 shows more information about how close borrowers were to maxing out loan offer.

One of the benefits of regression kink designs is that we can test the key underlying assumption in multiple ways. The critical assumptions for a regression kink design (as in the more familiar regression discontinuity design[11]) are that: 1) borrowers just to the right of the kink are the similar on all attributes to borrowers just to the left of the kink and 2) borrowers should not be able to perfectly assign themselves to one side of the cutoff. If the first assumption fails, i.e. if borrowers differ on either side of the cutoff, we may be estimating the effect of some factor other than the effect of loan size. Second, we would worry about selective sorting if borrowers can and do manipulate their income to fall on either side of the change in slope.

To examine these assumptions, we perform several tests. We first test for bunching of borrowers around the change at $20,000. Motivated by McCrary's (2008) test for regression discontinuity designs, we test that the density of borrowers varies smoothly across the $20,000 annual income cutoff (Figure 9). We do not see bunching near the change in slope. Furthermore, in our setting, we worry less about this so-called manipulation of the running variable because unlike in traditional regression discontinuity designs, movement from one side of the $20,000 threshold to the other does not dramatically affect a borrower's loan offer; being just to the either side of the threshold merely changes the marginal contribution to the loan offer due to an additional $1 in income.

Additionally, we plot densities of the covariates including APR, gender, age, and income and test whether other borrower characteristics experience a trend break at $20,000 (Figure 10). Formal regression results for these tests area shown in Table 5. None of the results are statistically significant. Because testing the quasi-random assignment of covariates in this way involves running several regressions, we run seemingly unrelated regressions to test whether the covariates are all different from zero. In results available upon

[11] See Lee and Lemieux 2010 for foundational work on regression discontinuity designs.

request, these tests fail to reject the null that the coefficients are not equal to zero at the 15% level.

The RK procedure involves selecting an optimal bandwidth, i.e., a range of income to focus our analysis on. We test the sensitivity of our results to this choice. We also explore various alternative choices around the optimal bandwidth for including observations in the local linear regressions. Figure 11 shows these bandwidth sensitivity tests.

Finally, rather than using the $20,000 kink, we run regressions with arbitrarily chosen income thresholds, (i.e. pseudo-kinks) and show the results do not hold for these arbitrarily chosen kinks. If there were an underlying curved relationship between income and future borrowing or repayment, then we may be capturing that relationship rather than a trend break with our estimates. In results available upon request, we show that this does not appear to be the case.

V. Discussion

We study the effects of being restricted in online payday loan credit on future borrowing and repayment. First, we find that online payday borrowers are highly credit constrained. Second, we show effects on ability to repay and subsequent borrowing. Together, our results suggest that for low-income, credit-constrained borrowers, a larger loan may help alleviate credit problems, at least at the small loan size of $425.

One limitation of this study is that the lender who provided data appears to "play by the rules," whereas some online lenders operate online in order to skirt regulation. This suggests that the issue is not with online lending, per se, but with companies operating outside of regulations through the "rent-a-tribe" models or "rent-a-bank" operations.[12]

[12] In "rent-a-tribe" agreements, lenders use tribal sovereign immunity to avoid state law by opening payday outlets on reservations. (See Martin and Schwartz, 2012 for more details). In

Any new federal or state restrictions on payday lending will certainly change the landscape of both the storefront and online industries. A broader question is why borrowers use online payday loans over storefront payday loans. A Pew study (2012) argued that strict state-level regulations on storefront payday loans did not cause borrowers to move online. This suggests that online lenders do not exist simply to escape regulation and avoid low overhead costs, but may offer additional convenience benefits to customers.

"rent-a-bank" operations, online lenders in states with strict usury laws partner with a bank holding a national charter to avoid state interest rate caps.

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Table 1: Summary Statistics

Pay Cycle	Average Loan Size	Average Net Paycheck	Percent
Biweekly	$363	$1,077	51%
Bimonthly	$369	$1,251	14%
Monthly	$361	$2,237	16%
Weekly	$278	$465	18%
		Default Rate	1.5%
		Late Payment Frequency	18%
		Male	32%
		Number of Borrowers	1,251
		Number of Loans	10,212

Note: Includes all online payday loans in sample.

Table 2: Subsequent Borrowing for All Borrowers

Outcome	Amount Borrowed	Number of Loans
In Next Month	1.39	0.0037
	(0.88)	(0.0027)
In Next 3 Months	-2.08	-0.0059
	(2.67)	(0.0067)
In Next 6 Months	-12.29*	-0.0303**
	(6.37)	(0.015)
In Next Year	27.92	0.0501
	(23.14)	(0.049)

Note: Robust standard errors in parentheses. Amount borrowed is dollars. Coefficients indicate the effect of a one dollar decrease of the original loan size.
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Subsequent Borrowing for Max Borrowers

Outcome	Amount Borrowed	Number of Loans
In Next Month	-0.60	-0.003
	(1.87)	(0.004)
In Next 3 Months	-8.26	-0.0240**
	(6.54)	(0.012)
In Next 6 Months	-22.89*	-0.067**
	(6.37)	(0.015)
In Next Year	-97.36	-0.19
	(115.5)	(0.20)

Note: Sample only includes borrowers who borrowed at least 95% of total loan offer. Robust standard errors in parentheses. Amount borrowed is dollars. Coefficients indicate the effect of a one dollar decrease of the original loan size.
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Effect of Loan Size on Other Outcomes

Variable	All Borrowers	Maximum Borrowers
Default	-0.00067* (0.0004)	-0.0015** (0.0006)
Number of Rollovers	-0.00019 (0.0011)	-0.0039* (0.002)
Paid Late	0.00033 (0.0011)	0.0022 (0.0020)
Delinquent 15 Days or More	-0.0010 (0.0009)	0.0003 (0.0019)
Delinquent 30 Days or More	-0.00071 (0.0009)	0.000011 (0.0018)
Delinquent 60 Days or More	-0.00075 (0.0009)	-0.00021 (0.0017)
Observations	N = 459	N = 174

Note: Maximum borrowers sample only includes borrowers who borrowed at least 95% of total loan offer. Robust standard errors in parentheses. Amount borrowed is dollars. Coefficients indicate the effect of a one dollar decrease of the original loan size.
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Test of Quasi-random Assignment of Covariates

Variable	All Borrowers	Maximum Borrowers
APR	0.0028 (0.018)	0.044* (0.026)
Male	0.000009 (0.00005)	0.00007 (0.00008)
Age	0.51 (0.56)	-0.38 (0.33)
Months at Residence	0.0002 (0.002)	0.0017 (0.003)
Months of Experience	0.003 (0.003)	0.0014 (0.002)
Biweekly Pay Cycle	-0.00003 (0.00002)	-0.00005 (0.00003)
Bimonthly Pay Cycle	0.000006 (0.00001)	0.00005*** (0.00002)
Monthly Pay Cycle	0.00002 (0.00002)	0.000001 (0.00003)

Note: Maximum borrowers sample only includes borrowers who borrowed at least 95% of total loan offer. Robust standard errors in parentheses. Amount borrowed is dollars. Coefficients indicate the effect of a one dollar decrease of the original loan size.
*** p<0.01, ** p<0.05, * p<0.1

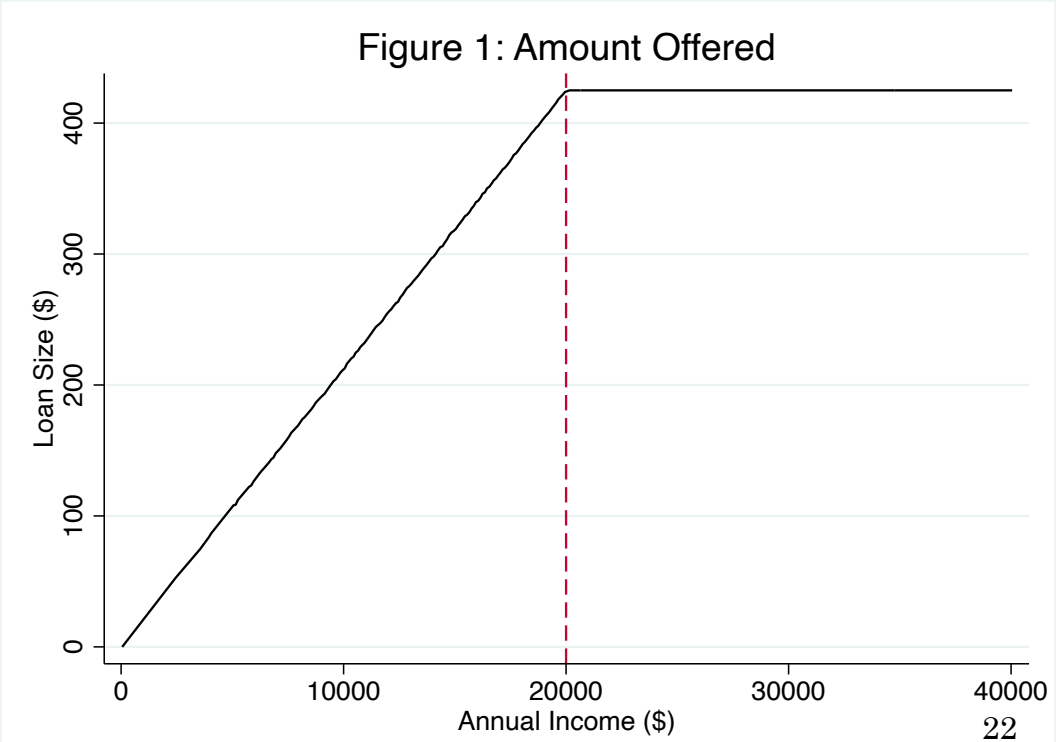


Figure 1: Amount Offered
Loan Size ($)
0
100
200
300
400
0
10000
20000
30000
40000
Annual Income ($)

Figure 2: Actual Amount Borrowed

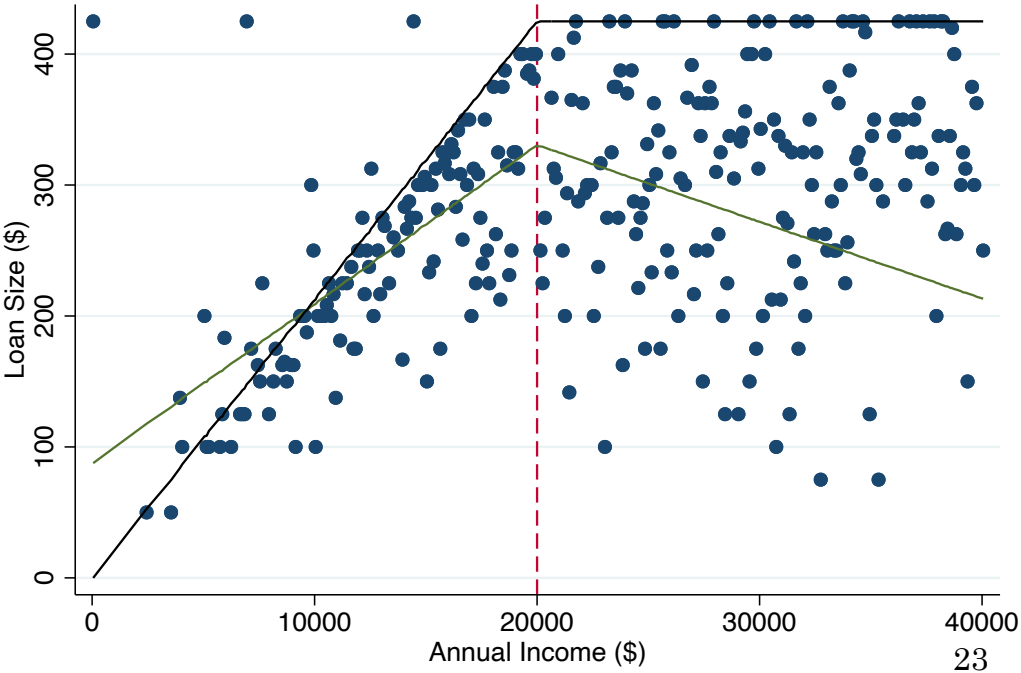
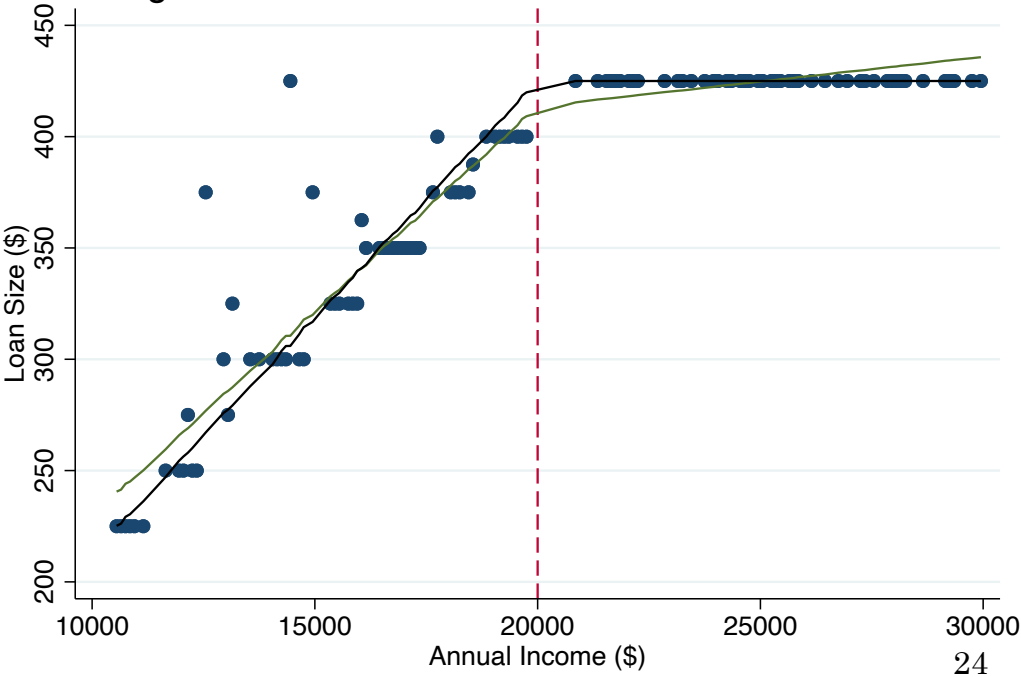


Figure 3: Actual Loan Size for Maximum Borrowers



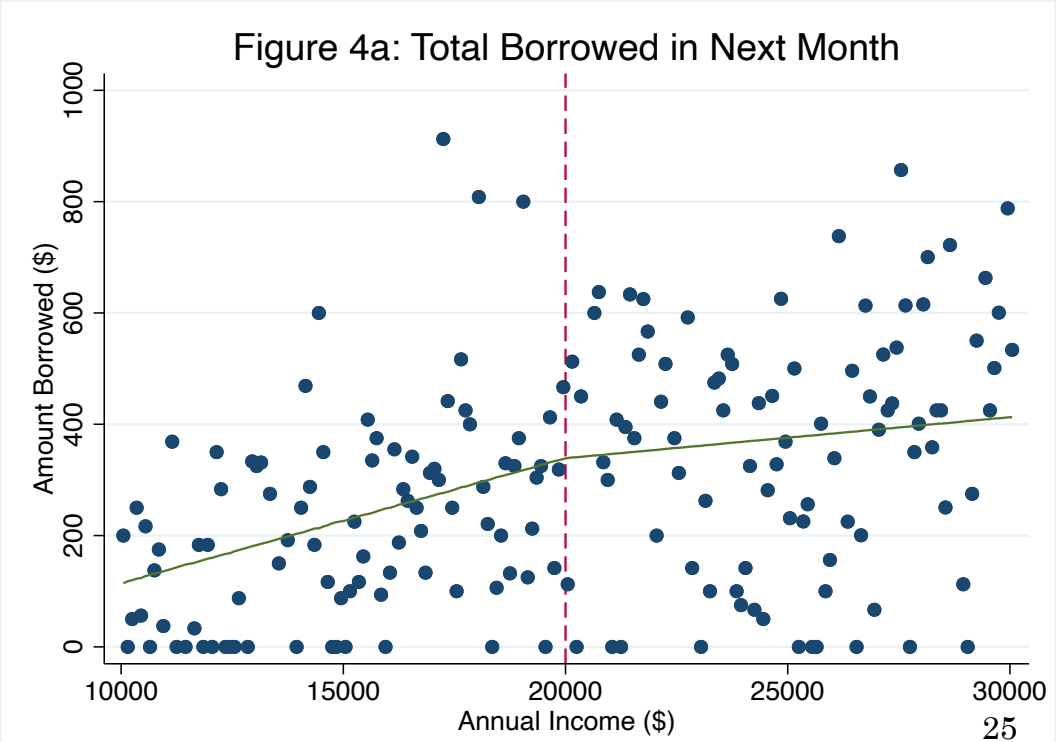


Figure 4a: Total Borrowed in Next Month
Amount Borrowed ($)
0
200
400
600
800
1000
10000
15000
20000
25000
30000
Annual Income ($)

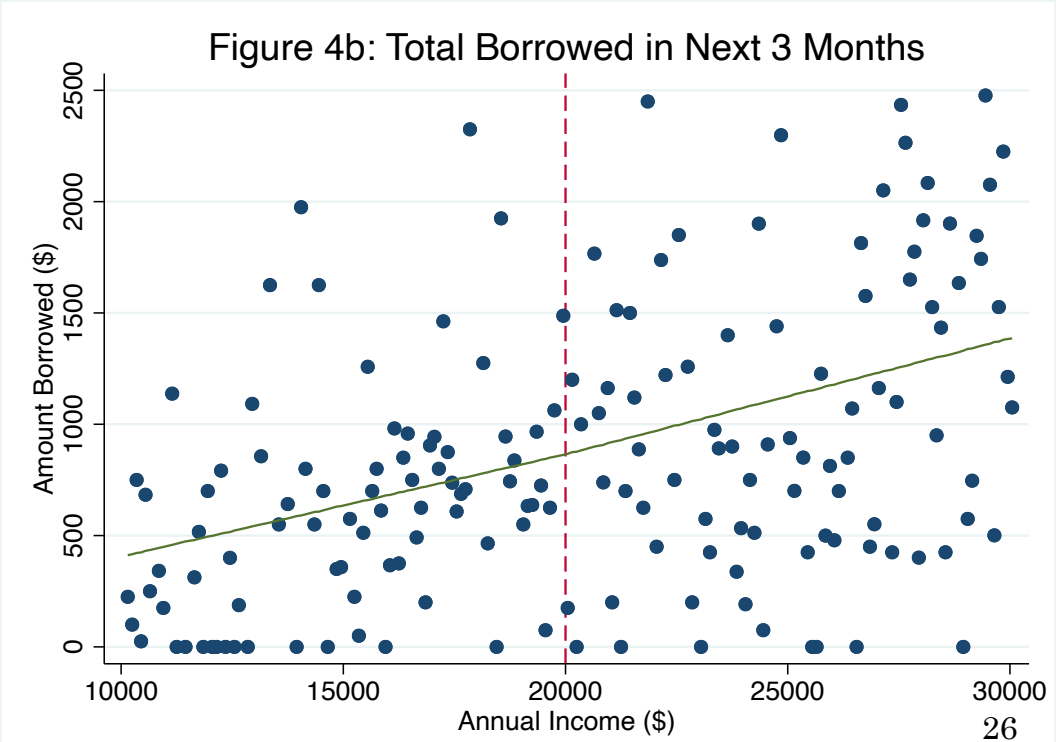


Figure 4b: Total Borrowed in Next 3 Months
Amount Borrowed ($)
0
500
1000
1500
2000
2500
10000
15000
20000
25000
30000
Annual Income ($)

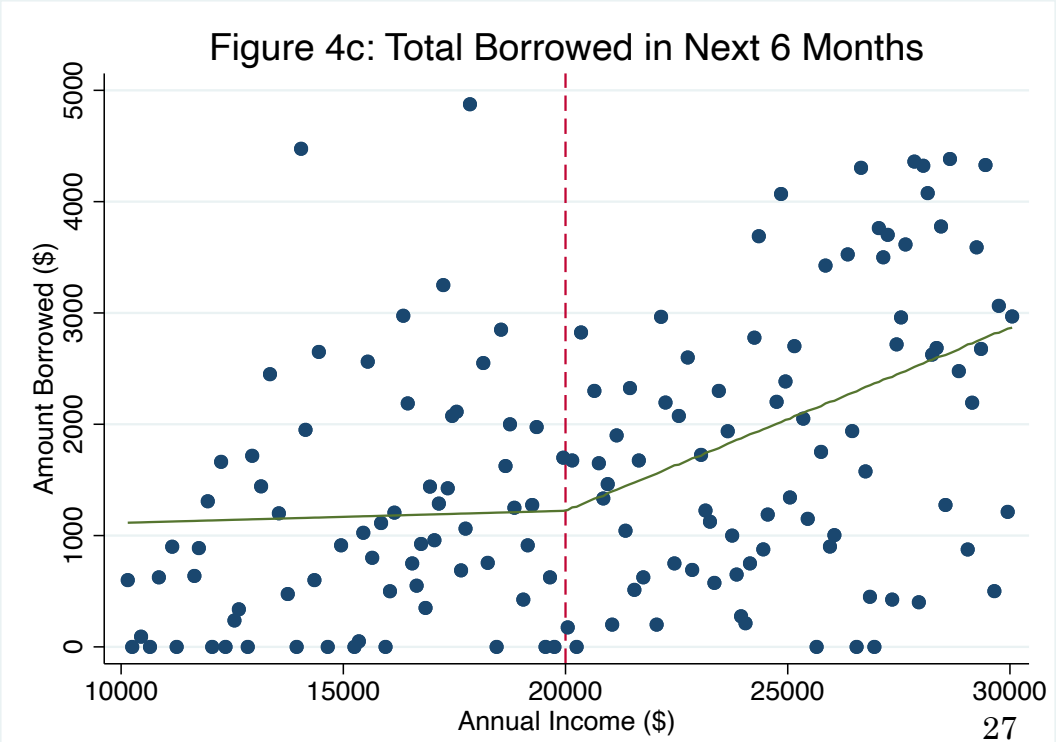


Figure 4c: Total Borrowed in Next 6 Months
Amount Borrowed ($)
0
1000
2000
3000
4000
5000
10000
15000
20000
25000
30000
Annual Income ($)

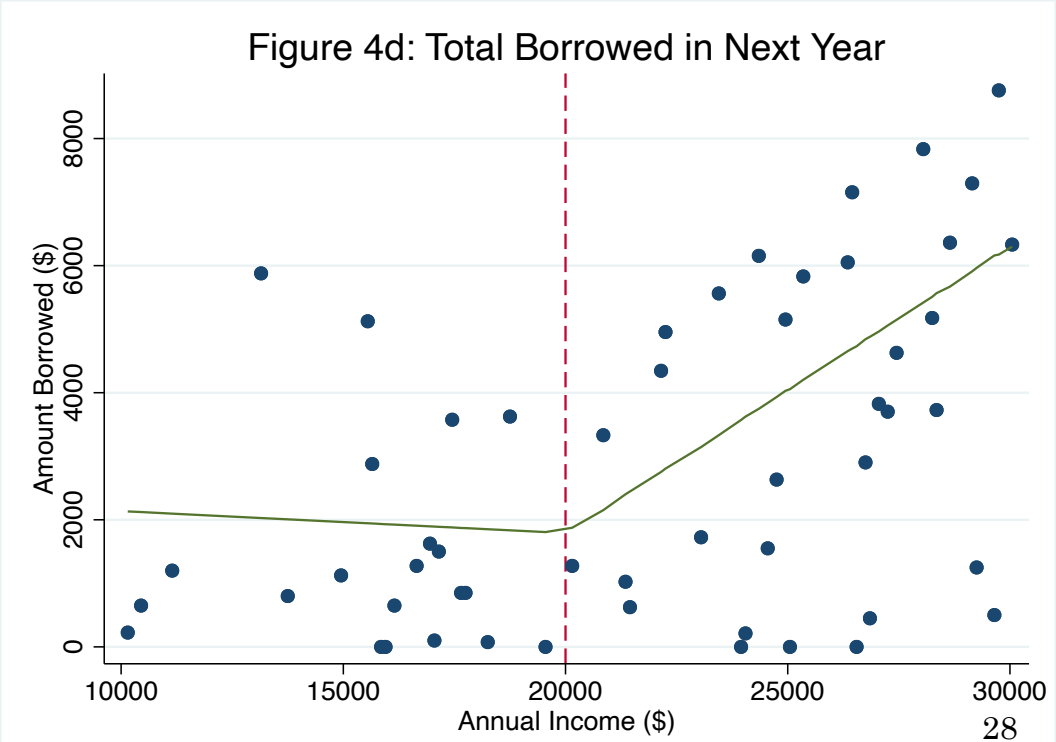


Figure 4d: Total Borrowed in Next Year
Amount Borrowed ($)
0
2000
4000
6000
8000
10000
15000
20000
25000
30000
Annual Income ($)

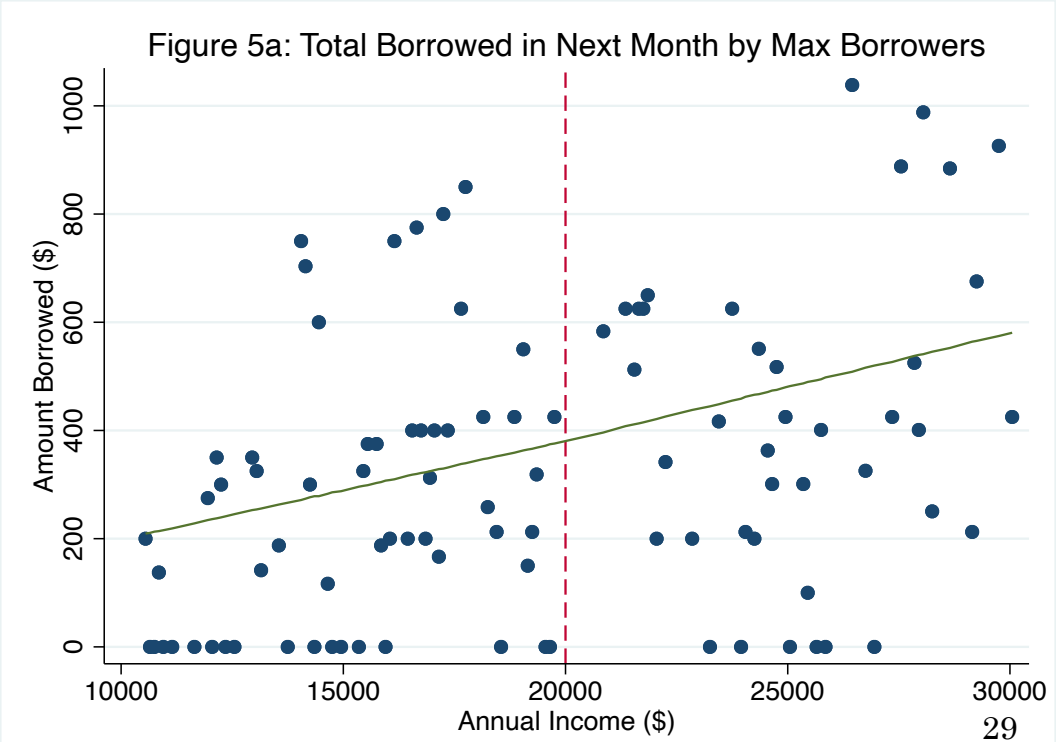


Figure 5a: Total Borrowed in Next Month by Max Borrowers
Amount Borrowed ($)
0
200
400
600
800
1000
10000
15000
20000
25000
30000
Annual Income ($)

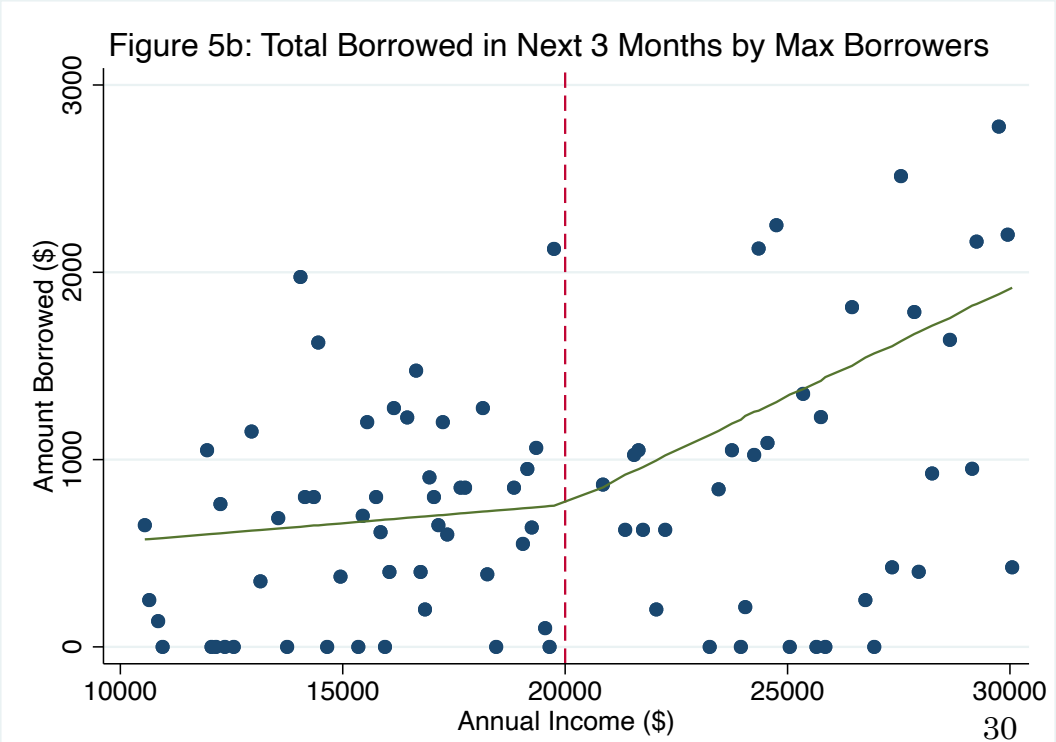


Figure 5b: Total Borrowed in Next 3 Months by Max Borrowers
Amount Borrowed ($)
0
1000
2000
3000
10000
15000
20000
25000
30000
Annual Income ($)

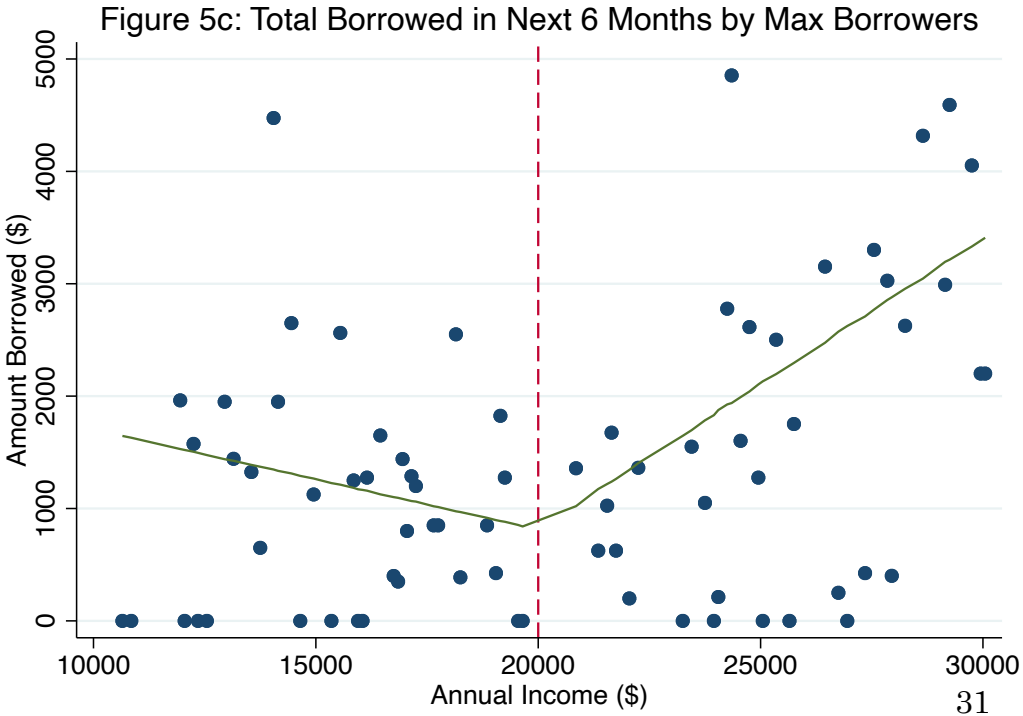


Figure 5c: Total Borrowed in Next 6 Months by Max Borrowers
Amount Borrowed ($)
0
1000
2000
3000
4000
5000
10000
15000
20000
25000
30000
Annual Income ($)

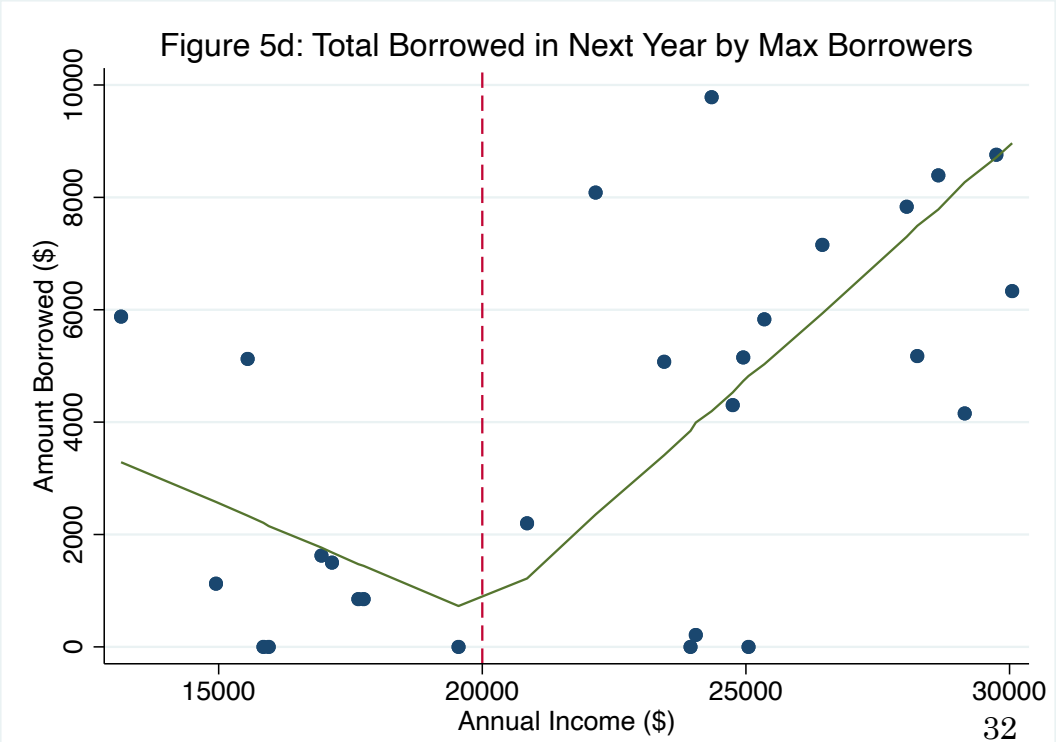


Figure 5d: Total Borrowed in Next Year by Max Borrowers
Amount Borrowed ($)
0
2000
4000
6000
8000
10000
15000
20000
25000
30000
Annual Income ($)

Figure 6a: Delinquency Rate for Max Borrowers

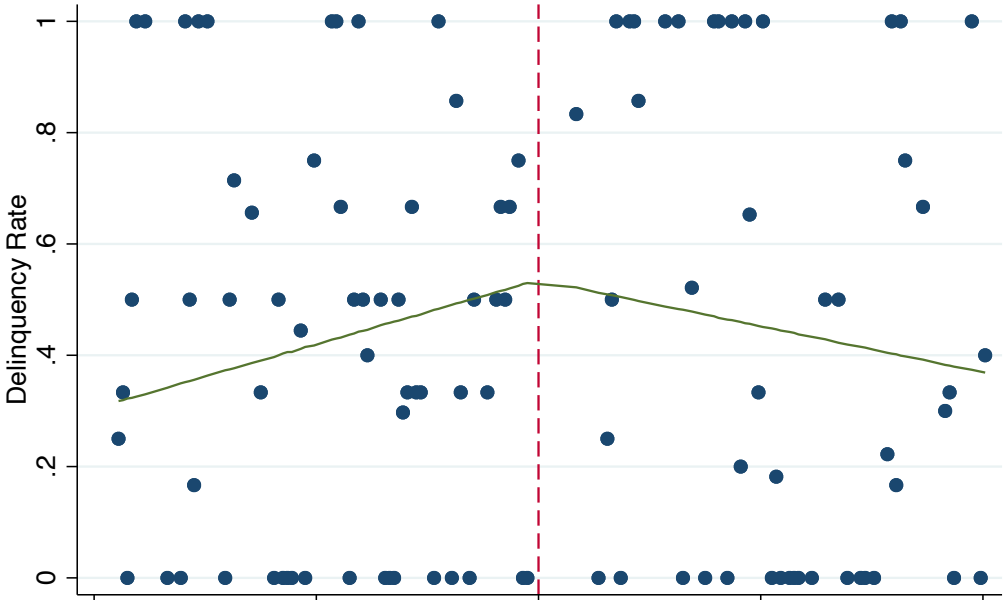


Figure 6b: Delinquency Rate for All Borrowers

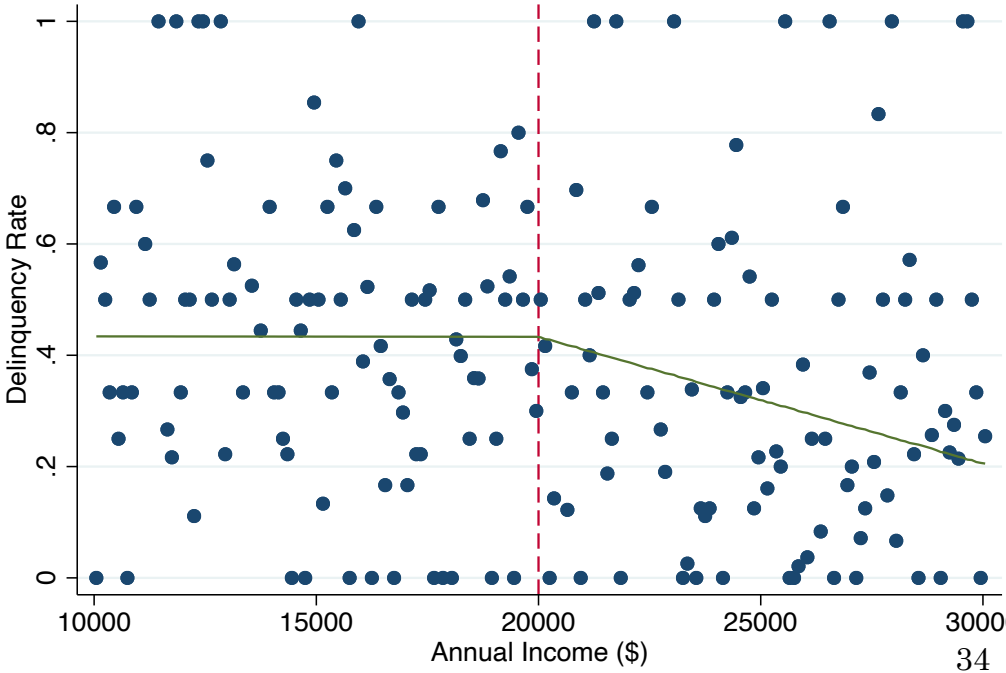


Figure 7a: Default Rate for Max Borrowers

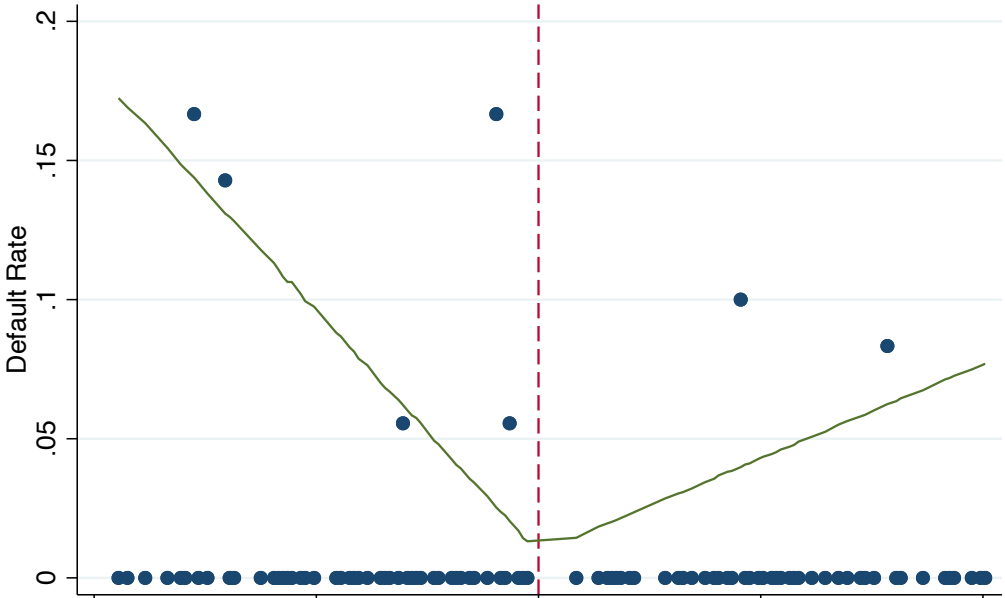


Figure 7b: Default Rate for All Borrowers

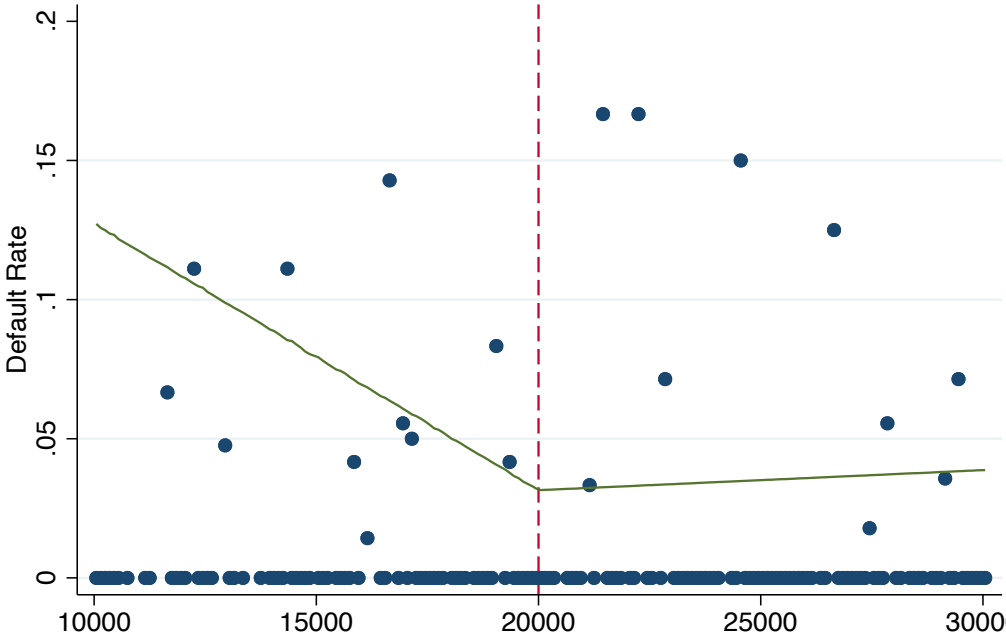


Figure 8a: Rollovers for Max Borrowers

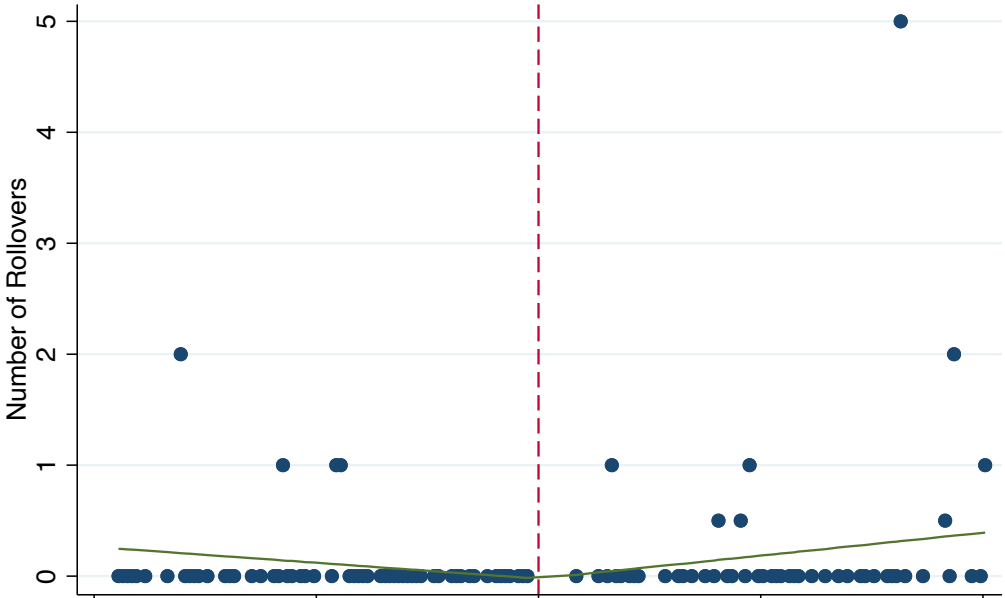


Figure 8b: Rollovers for All Borrowers

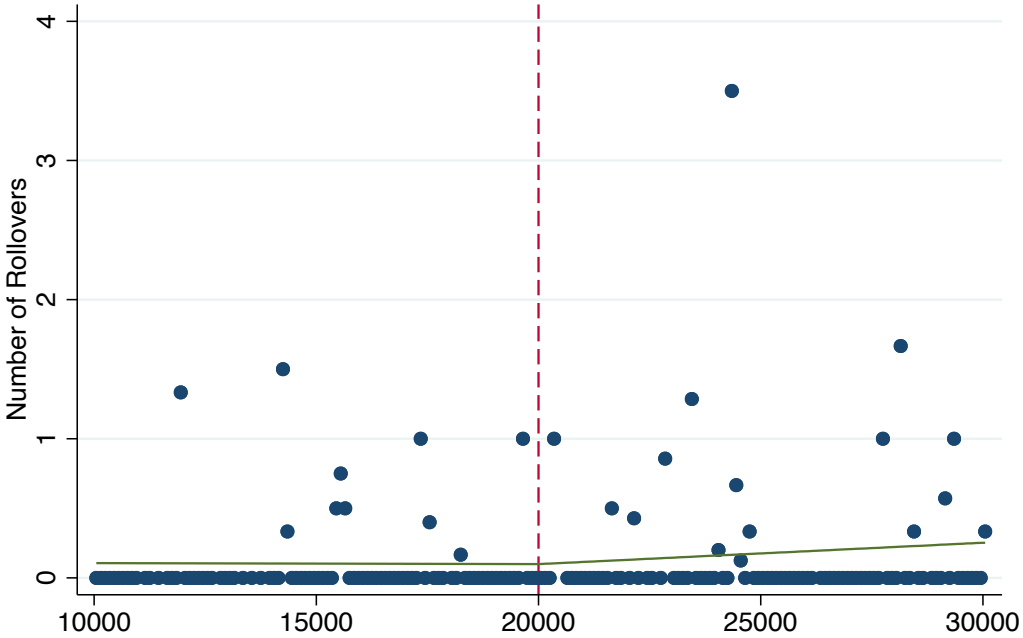


Figure 9: Distribution of Annual Income

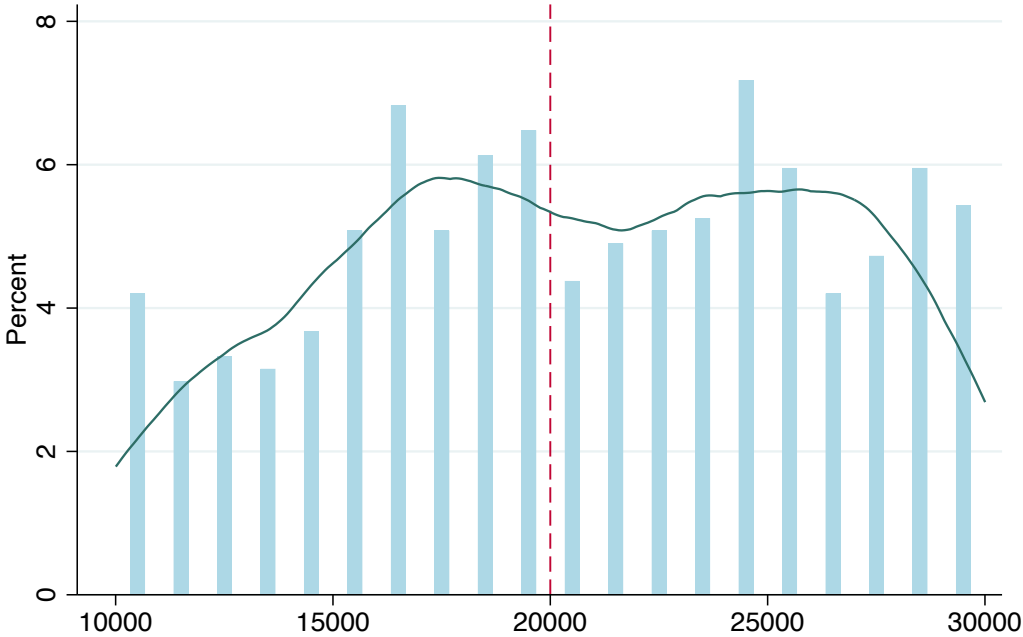


Figure 10

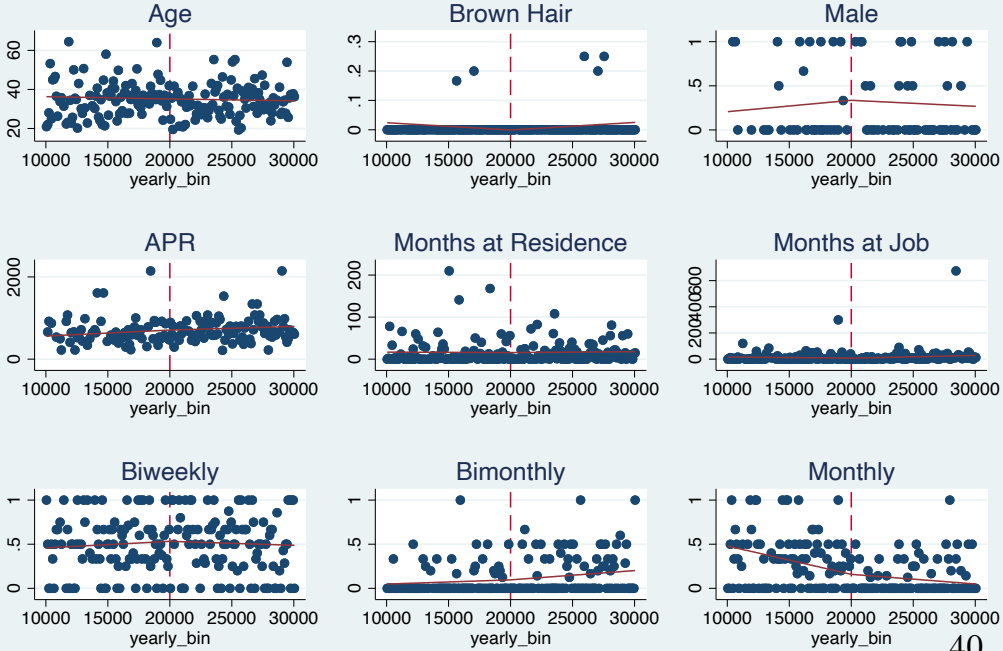
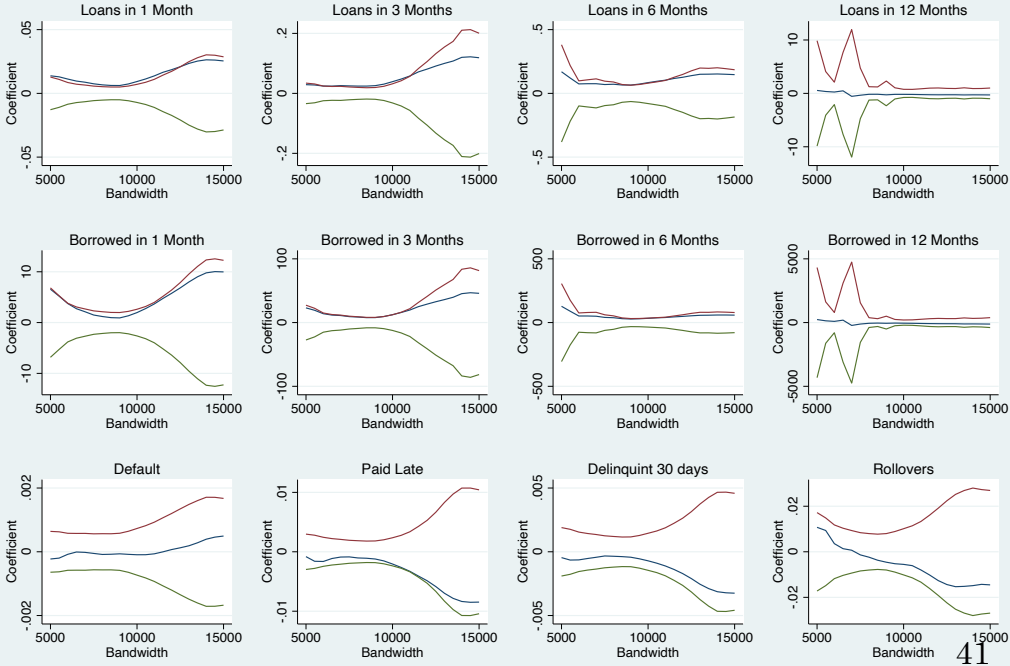

Age
20
40
60
Brown Hair
0
.1
.2
.3
Male
0
.5
1
APR
0
2000
Months at Residence
0
100
200
Months at Job
0
200
400
600
Biweekly
0
.5
1
Bimonthly
0
.5
1
Monthly
0
.5
1
10000
15000
20000
25000
30000
yearly_bin

Figure 11: Bandwidth Sensitivity



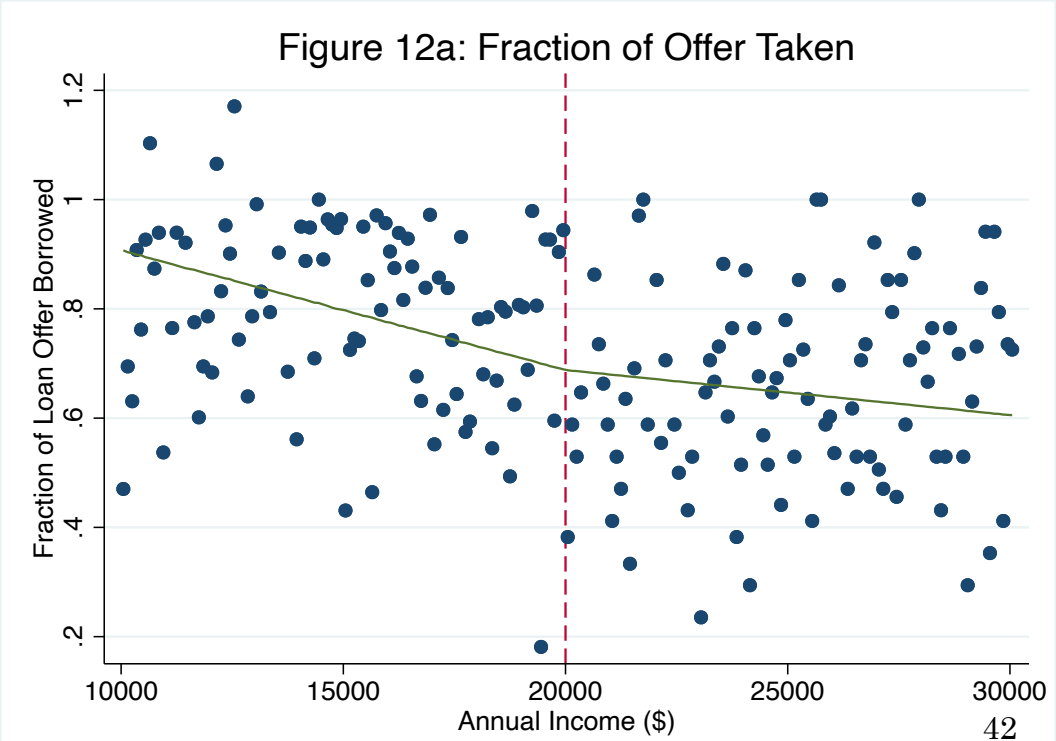


Figure 12a: Fraction of Offer Taken
Fraction of Loan Offer Borrowed
.2
.4
.6
.8
1
1.2
10000
15000
20000
25000
30000
Annual Income ($)

Figure 12b: Percent of Borrowers Who Took Maximum Loan