The Consequences of Online Payday Lending

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Abstract:
Payday lenders offer a few hundred dollars in credit for one pay cycle with triple-digit annualized interest rates. Lenders are increasingly moving online as regulators restrict this controversial form of subprime credit. We study the consequences of borrowing on online payday loans using a fuzzy regression-kink design. This quasi-experimental approach exploits the fact that how much a customer borrows is determined by two factors: a) endogenous choice on the customer's part and b) exogenous constraints of company rules and with state loan caps. Our technique allows us to estimate the causal effect that caps on loan sizes have on subsequent borrowing and default. Our first-stage estimates reveal that online customers are extremely credit constrained, borrowing the majority of the dollar amount offered to them. We then estimate the effect of exogenously restricting the size of the loan on total subsequent indebtedness on any type of subprime credit, late payment, and default. Together our results suggest that for low-income, credit-constrained borrowers, a larger loan may help alleviate credit problems, at least at the state cap of $425. We discuss the regulation of traditional and online payday lending in light of these results.

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I. Introduction

Payday loans have been controversial since their inception in the 1990s. Traditional 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 mature in one pay cycle. With interest rates of 15-20% for the typical 14-day pay cycle, the annualized interest rates are 300-500%.[1]

Because of their high interest, their short maturation, and the low income of the customer base, state regulators have attempted to limit use of payday loans, and regulation at the federal level is in the offing. The Consumer Financial Protection Bureau (CFPB) has been focused on payday lending since its formation in 2011. In March 2015 the CFPB outlined a proposal for national regulation attempting to "end payday debt traps." The CFPB rules will aim to force lenders to A) determine a borrower's ability to repay a loan in full prior to extending a loan and B) limit the duration of borrowers' indebtedness.[2] Loan caps, a relatively simple policy tool to implement, are one of the instruments that the CFPB is considering as a way to limit debt traps.[3] Our paper studies how borrowers respond to loan caps.

As much as a quarter of the payday loan industry's $7.4 billion 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

[1] The majority of borrowers do not pay their loan off in full on the subsequent payday but "roll" it over by paying just the fee on payday and extending the loan for another fourteen days after which they will owe an additional 15-20 perfect in interest. Carter, Skiba and Sydnor (2012) document rollover behavior in depth.

[2] More on the proposed "debt trap prevention requirements" and "debt trap protection requirements" here: http://files.consumerfinance.gov/f/201503_cfpb-proposal-under-consideration.pdf. Last accessed September 24, 2015.

[3] Under the Dodd-Frank Act of 2010, the CFPB does not have the authority to limit interest rates. National limits on other aspects of the loans may push lenders to establish headquarters in states without interest rate caps and "export" their rates online.

in other states. Lenders are likely to move online and offshore once the CPFB's new regulations take effect. Ours is the first paper to our knowledge to study the consequences of online payday lending.

In this paper, we study the effect of capping loan sizes on the future indebtedness and repayment rates of borrowers. If larger loans are more likely to cause borrowers to fall into a "debt trap," then limiting the size of online payday loans will decrease the likelihood of a borrower being unable to repay the loan. Even though caps limit consumers' access to a credit market, they have the potential to improve customers' welfare.

While ours is the first paper to our knowledge to study the consequences of online payday lending, numerous papers have studied the effects on consumers of traditional payday lending.[4] 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 size by using a fuzzy regression-kink (RK) design. This relatively new quasi-experimental approach exploits the fact that how much a customer borrows is determined by two factors: the endogenous choice on the customer's part and exogenous constraints of company rules and state loan caps. We use data from a large online lender operating and underwriting in Tennessee whose loan offers are 25.5% of monthly net take-home pay for monthly, biweekly, and semimonthly borrowers.[5] In addition to this institutional rule, the Tennessee state regulatory cap on payday loans is $425. Therefore anyone

[4] See Bhutta (2012); Bhutta, Skiba and Tobacman (2015); Carrell and Zinman (2008); Carter (2012); Melzer (2011); Morgan, Strain and Seblani (2012); Morse (2012); Skiba and Tobacman (2011); and Zinman (2010).

[5] 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 group of borrowers paid biweekly, bimonthly and monthly. Moreover, implementing a regression-kink design using weekly borrowers requires a sizeable sample of weekly borrowers earning more than $48,000—the annual income that gives them loan size eligibility at the statutory loan cap of $425. Most weekly borrowers earn substantially less than $48,000.

earning above $20,000/year ($1,666.67/month) is eligible for a loan of only $425 regardless of income. This creates a change in the slope of loan offers, 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 RK design in Section II.b below.

The first stage of the RK strategy provides an estimate of credit constraints, i.e., what fraction of an extra dollar of credit offered borrowers take. We find that online customers are extremely credit constrained relative to previous estimates in the literature. Customers borrow 57 cents of every dollar of additional credit offered. This is higher than previous estimates for 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 a $50 smaller 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 the $425 loan size cap, customers borrow $617.50 more in any type of credit over the next 3 months. The cap at $425, in effect, increases the future indebtedness of the borrower. This suggests that the loan cap prevents the borrower from accessing as much credit as he needs, so that he continues to borrow.

The rest of the paper is organized as follows. Section II discusses the data and the RK design. Section III presents the results of the RK design. 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

Tennessee. The data include all loans made by the company between January 2012 and July 2015. 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 a 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 borrower's income as determined by their most recent paystub. Customers upload a copy of their government issued ID, bank statement, and most recent paystub. These are verified by employees 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 to be repaid in 30 days with interest rates similar to 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 7 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.

Table 1 provides summary statistics about the 2,947 borrowers (10,212 loans) in our sample of online payday loans. Three-quarters of borrowers are paid biweekly or semimonthly. Fifty-six percent are female, which is typical of storefront payday lending borrowers as well. The typical loan size is $360, with weekly borrowers receiving smaller loans. The default rate is low at 1.5%, but the rate of late payment is much higher at 19%. The low default rate of online loans is due to the fact that the lender can more easily debit the

borrower's account repeatedly until payment is received than in the storefront payday loan situation, when the lender is using a personal check as collateral.

b. Regression-Kink Design

The challenge in estimating the effect of loan size on loan repayment and future indebtedness is that the borrower chooses the size of the loan, making loan size endogenous. Loan demand will depend partially 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: [6]

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

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

[6] 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).

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, then 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 to a change in income.

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 and the state lending cap. 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, or 2.1% of their annual pay. At the same time, there is a $425 legal cap on the size of payday loans. 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. The first stage in fuzzy RK is estimating the size of these effects. 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 by $1 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 are testing what would have happened to the borrower with income above $20,000 if he had 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 assumption underlying these estimates is 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 regression discontinuity designs or other regression-kink designs, in which there is a clear benefit to being on one side of the cutoff point, here it is not clear 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 Results

Figure 2 represents the first stage for monthly, biweekly, and semimonthly borrowers (who are all subject to the same institutional lending rules). It 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 red lines are 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. Perhaps learning of their loan eligibility adjusts their perceived immediate credit need. Alternatively borrowers could use liquidity defensively, choosing to borrow less than the full loan offer in case they need to borrow more in the future. 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. While this result may seem surprising, it suggests 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 that the customer chooses to borrow is 0.01214. 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 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% of $83.33) larger loan. The first-stage regression results reveal that borrowers take $12.14 of that $21.25, or 57% 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 that storefront payday borrowers take about 50 cents on the dollar of additional offering (Dobbie and Skiba, 2013). Fritzdixon (2014) finds a 54% increase in borrowing for an additional dollar of auto-title credit. In the credit card market, this marginal propensity to consume was also about 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.

b. Second-Stage Results

Because regulators are particularly concerned about a borrower's ability to repay a loan, we pick measures of future borrowing and repayment behavior to capture these concerns. The outcomes we look at are the number of total loans taken from this lender in the next six months; the total dollar

amount of those loans; delinquency of 30 days or longer; number of rollovers and default. We restrict our analysis to the first time a borrower took an online payday loan at this company.

Figures 3 and 4 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 and 3. Table 2 displays 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.[8] Table 3 shows the effect on default and delinquency. As shown in Table 2 column one, we find that being prohibited from borrowing an extra $50 today leads the borrower to borrow $617 (12.35 x $50) more on any type of loan in the next 3 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, around the size of $425, 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 0.1 percentage points (0.002*50). Considering an average delinquency frequency of 19.3%, this effect is economically insignificant. The effect on the number of rollovers is economically and statistically insignificant.

IV. Robustness Checks

One of the benefits of regression-kink design is that we can test the key underlying assumption in multiple ways. The critical assumption for RK is that the borrowers just to the right of the kink are the same as the borrowers just to the left of the kink; borrowers should not be able to perfectly assign themselves to one side of the cutoff. To examine this assumption, we perform

[8] Recall that this lender offers online and storefront payday loans, online and storefront installment loans and auto-title loans.

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). Additionally, we plot densities of the covariates (APR, gender, age, months at current residence, months at current job, hair color and pay frequency) to test whether other borrower characteristics experience a trend break at $20,000 (Figure 10). Because this involves running several regressions, and it is possible that a covariate will appear to be significant when it is not, we run seemingly unrelated regressions. This tests whether the covariates are all different from zero.

The RK procedure requires the econometrician to select 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.

Finally, rather than using the $20,000 kink, we run regressions with arbitrarily chosen income thresholds, (so-called pseudo-kinks) and show that the results do not hold for these arbitrarily chosen kinks. If there is 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. We show that this does not appear to be the case.

V. Discussion

In this paper, 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 for 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. Because the CFPB does not have the ability to regulate interest rates and must regulate other

features of these loans, understanding the effect of capping loan size is critical to knowing how new regulations will play out.

One limitation of this study is that the lender who provided data appears to "play by the rules," whereas some online lenders conduct their operations 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-bank" or "rent-a-tribe" models whereby storefronts employee banks in locations with friendlier lending rules to originate loans (Martin and Schwartz 2012).

A broader question is why borrowers use online payday loans over storefront payday loans. The Pew study (2012) argued that strict state-level regulations on storefront payday loans did not cause borrowers to move online even though their options were broader there. This suggests that online lenders do not exist simply to escape regulation, but may offer additional convenience benefits to customers. Recent work has shown that other types of loans such as pawnshop loans and auto-title loans are substitutes to storefront payday loans. The new federal regulations will certainly change the shape of both the storefront and online payday lending industries.

VI. References

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Table 1: Summary Statistics of Online Payday Loan Borrowers

Pay cycle	Percent	Average loan size	Average net paycheck
Biweekly	58.4	$363	$1,562
Bimonthly	17.0	$369	$,1858
Monthly	13.4	$361	$,2860
Weekly	11.2	$278	$711
		Default rate	1.5%
		Late payment frequency	19.3%
		Female	56.1%
		Number of borrowers	2,947
		Number of loans	10,212

Notes: Data provided by an online payday lender.

Table 2: Estimates of the Effect of Online Payday Loan Size

	(1)	(2)
	Dollar amount of subsequent loans	Number of subsequent loans
Loan size		
One month	1.97	0.00930**
	(1.338)	(0.00363)
Three months	12.35**	0.0391**
	(6.298)	(0.0163)
Six months	33.44*	0.0843**
	(18.01)	(0.0408)
One year	45.8	-0.183
	(104.50)	(0.390)

Notes: This table presents regression kink estimates of the effect of loan size on subsequent borrowing behavior at different time intervals from a borrower's first online loan. Each coefficient is from a separate iv regression. Coefficients represent the effect of receiving a $1 smaller loan. See text for details. Robust standard errors in parentheses. * p<0.1; ** p<0.05; *** p<0.01

Table 3: Estimates of the Effect of Online Payday Loan Size

	(1)	(2)	(3)	(4)
	Default	Delinquent	30 days or more delinquent	Number of rollovers
Loan size	-0.0000927	-0.00205*	-0.000708	-0.00552
	(0.000373)	(0.00121)	(0.000741)	(0.00517)

Notes: This table presents regression kink estimates of the effect of loan size on default, delinquency and the number of rollovers. Each coefficient is from a separate iv regression. Coefficients represent the effect of receiving a $1 smaller loan. See text for details. Robust standard errors in parentheses. * p<0.1; ** p<0.05; *** p<0.01

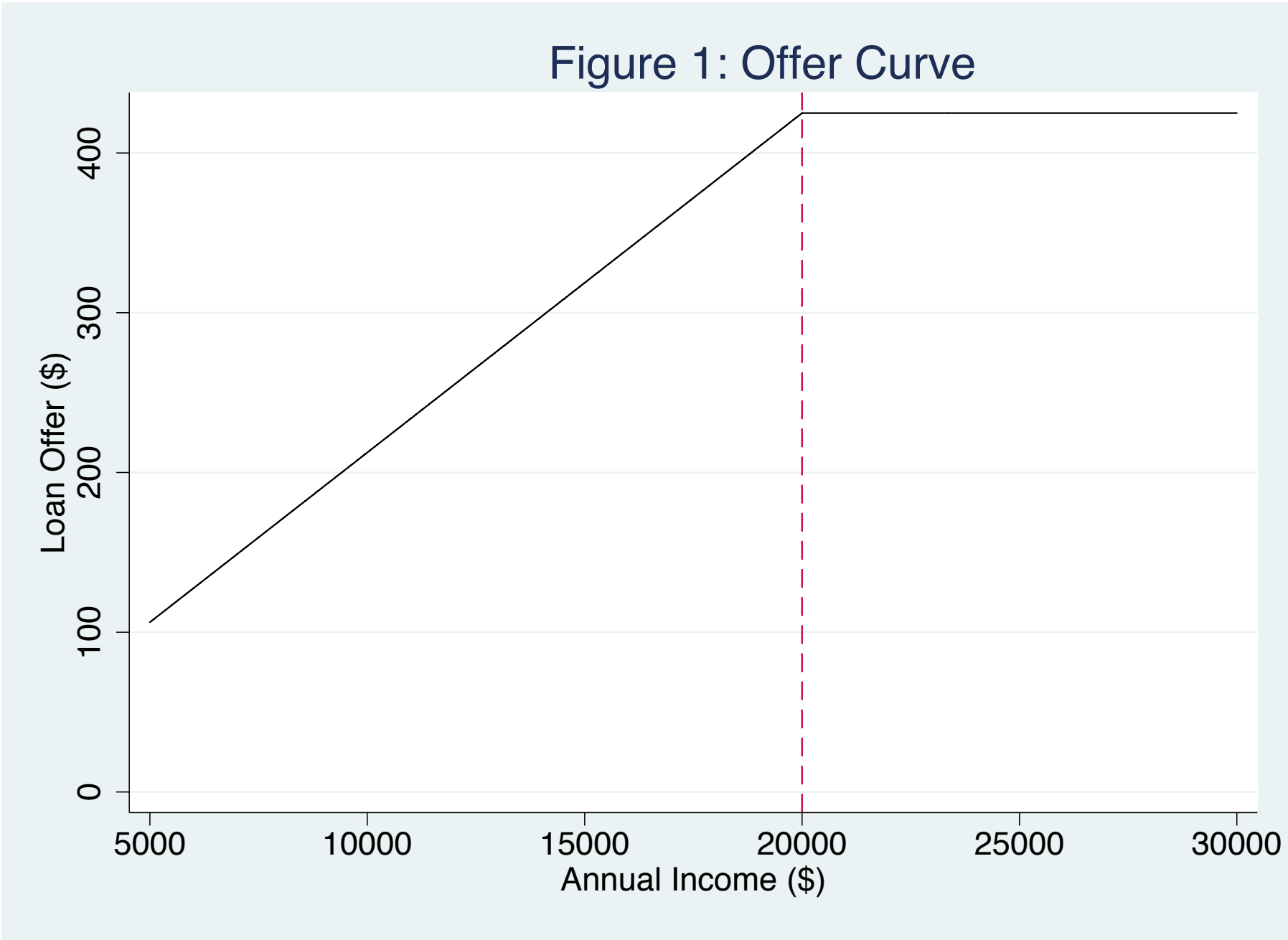
Figure 1: Offer Curve
Loan Offer ($)
0
100
200
300
400
5000
10000
15000
20000
25000
30000
Annual Income ($)

Figure 2: Kink between Income and Loan Size

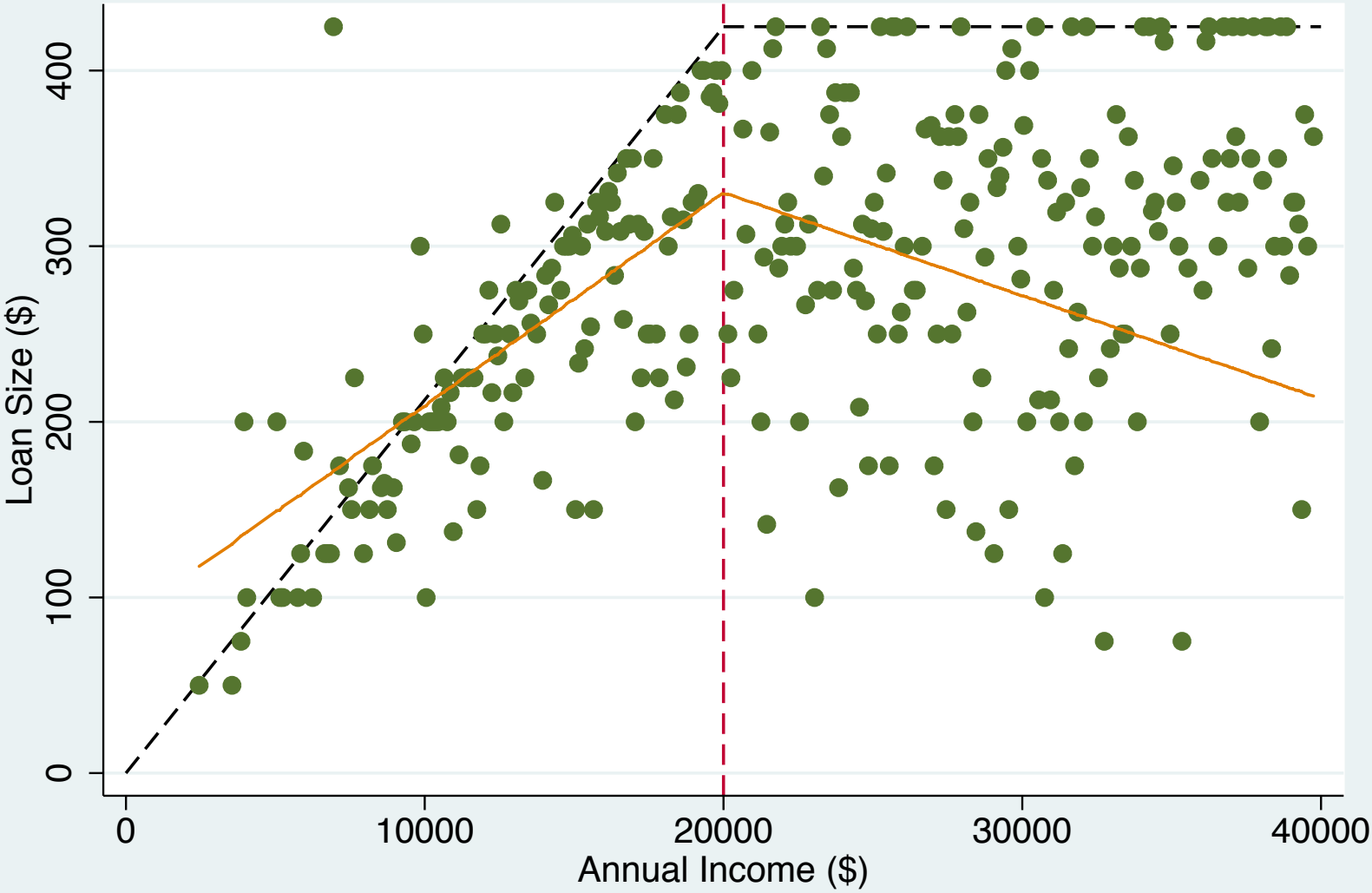

Figure 3: Total borrowed in next 1 month

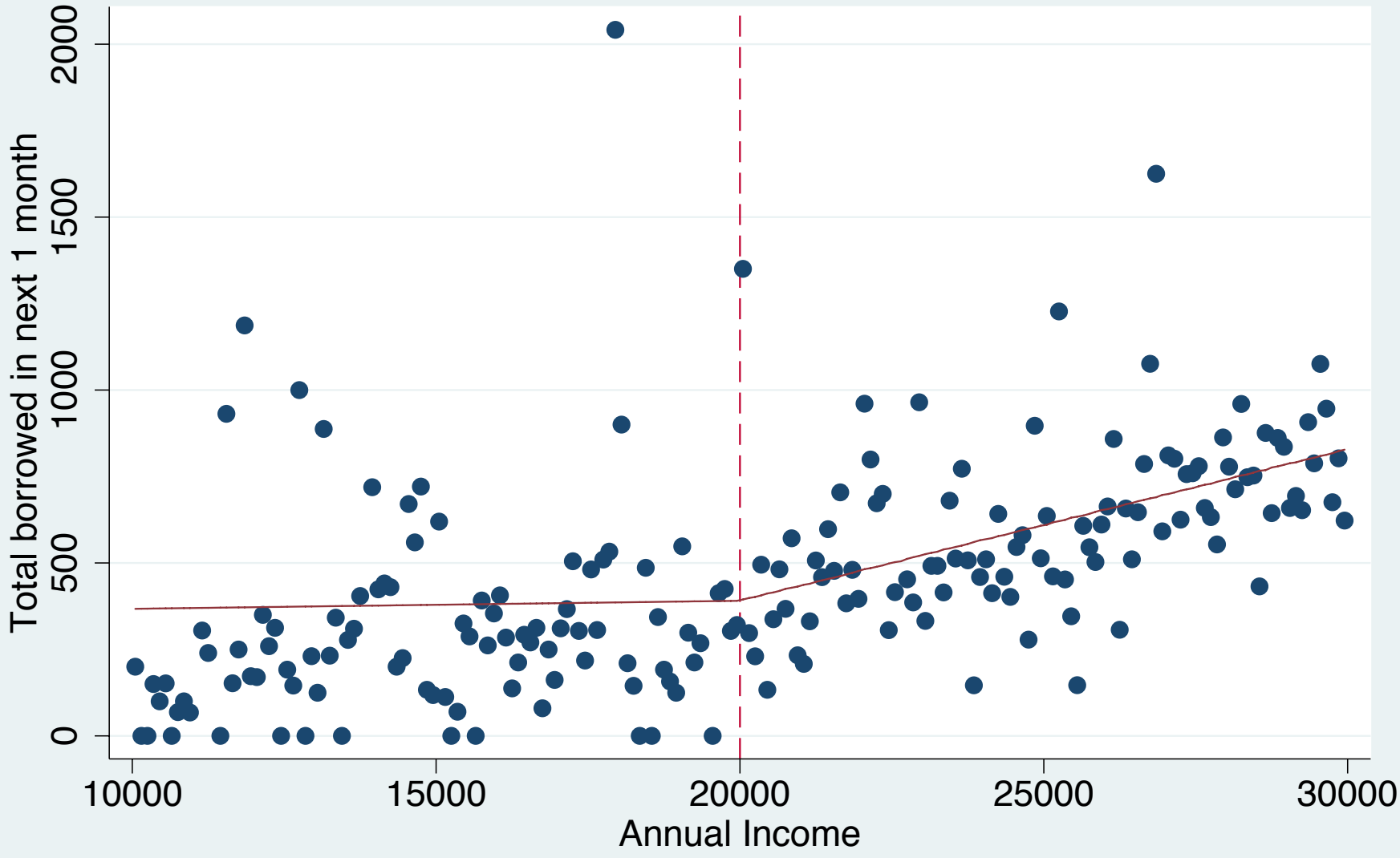

Figure 4: Total borrowed in next 3 months

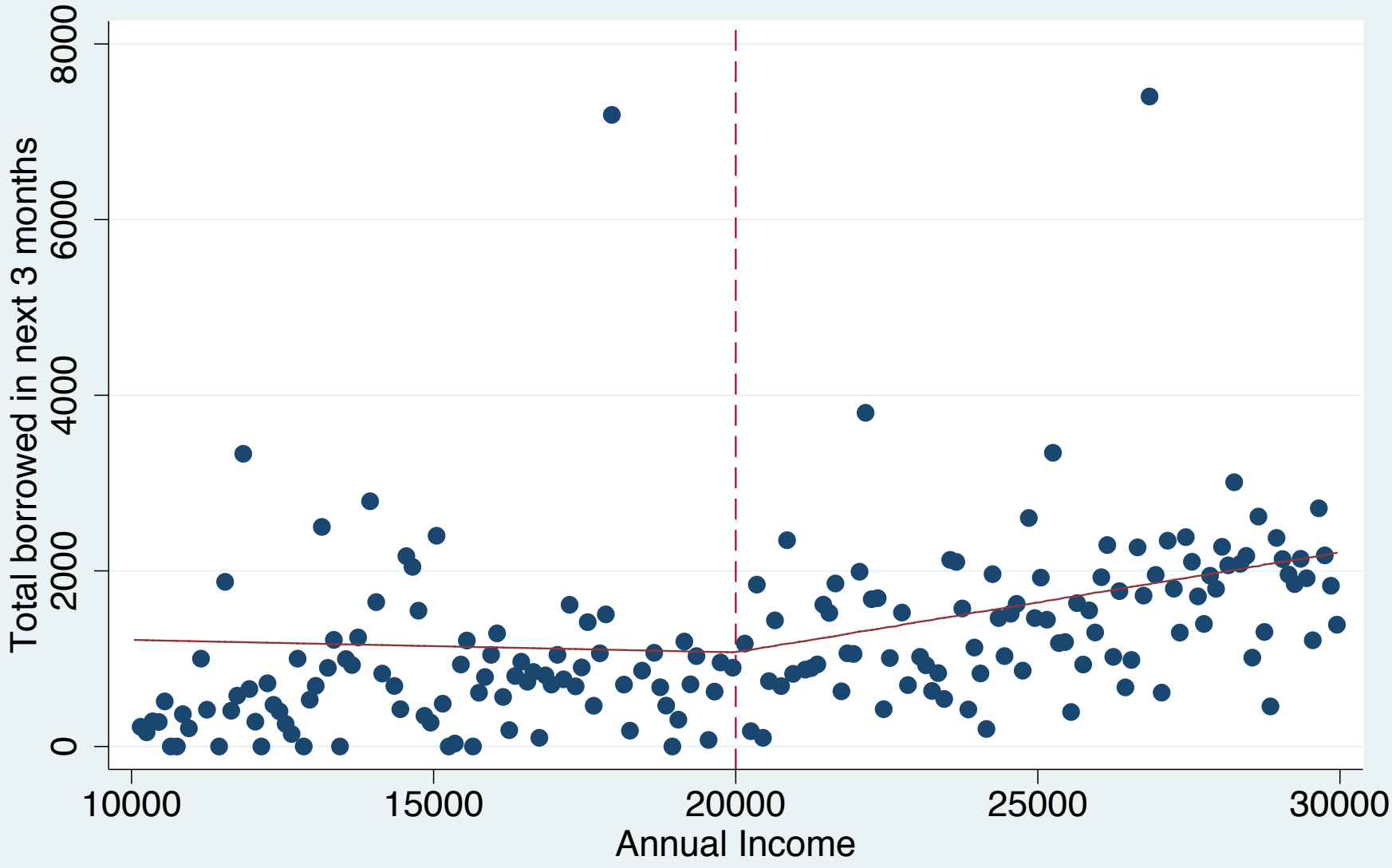

Figure 5: Total borrowed in next 12 months

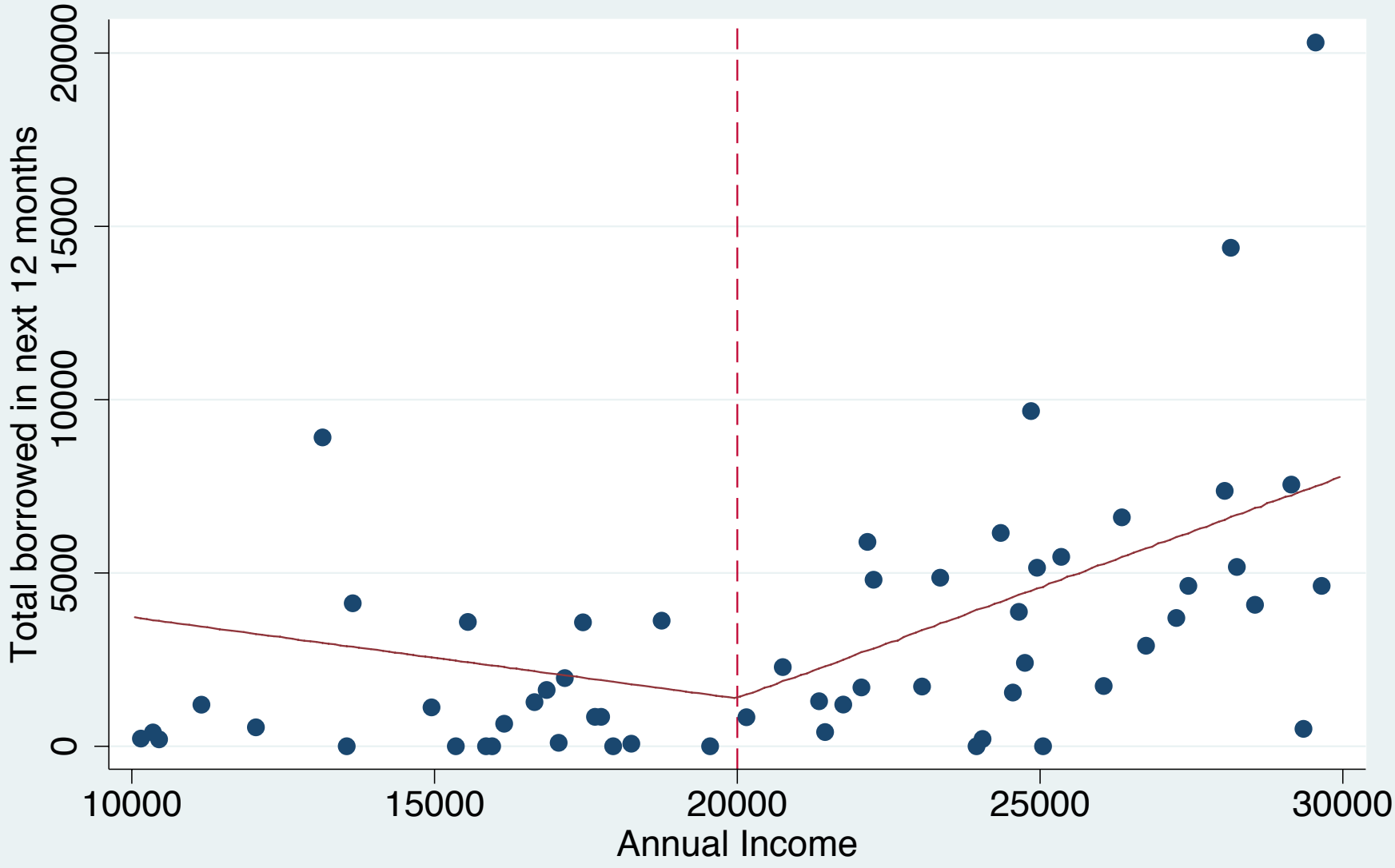

Figure 6: Delinquency Rate

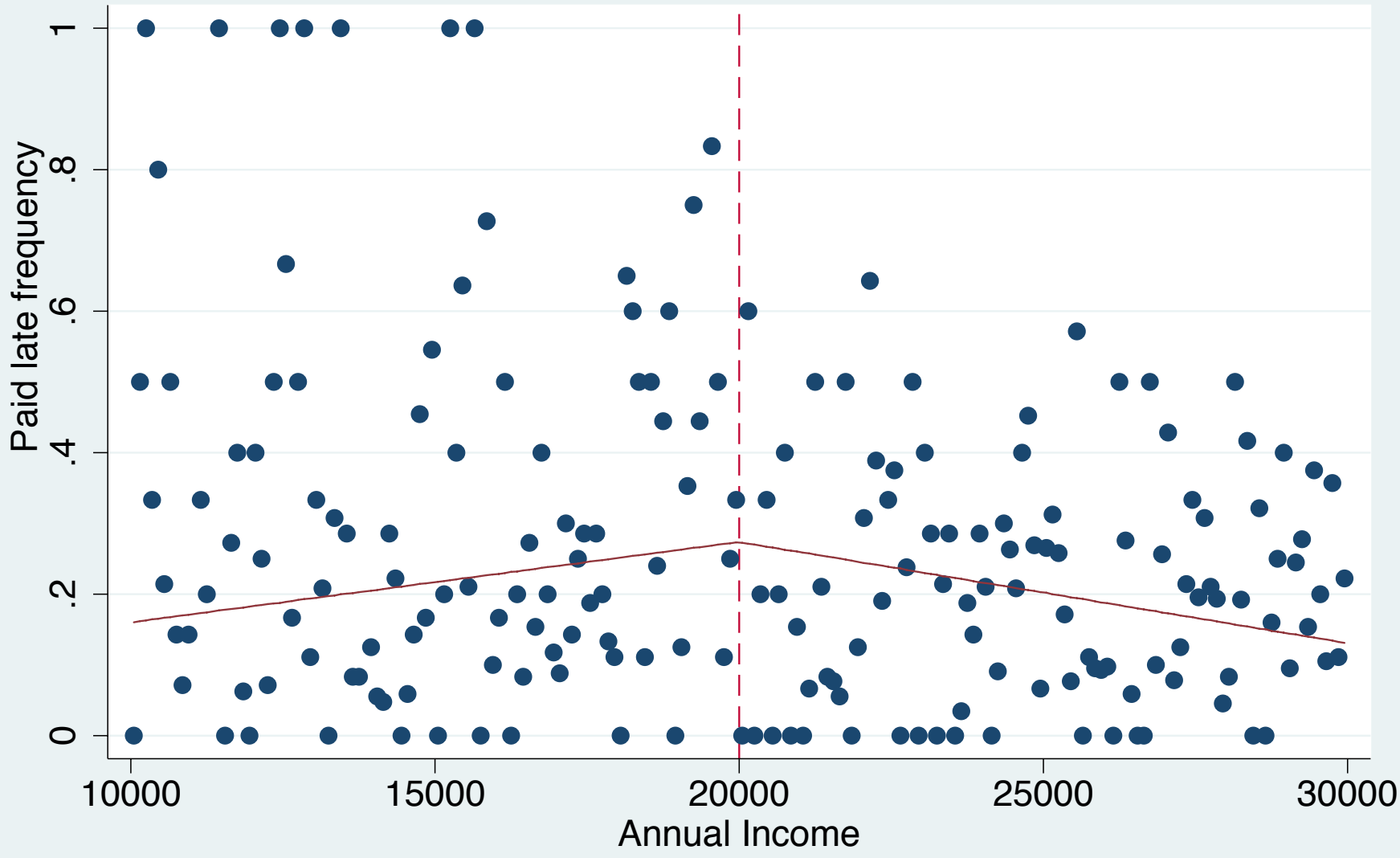

Figure 7: Number of Rollovers

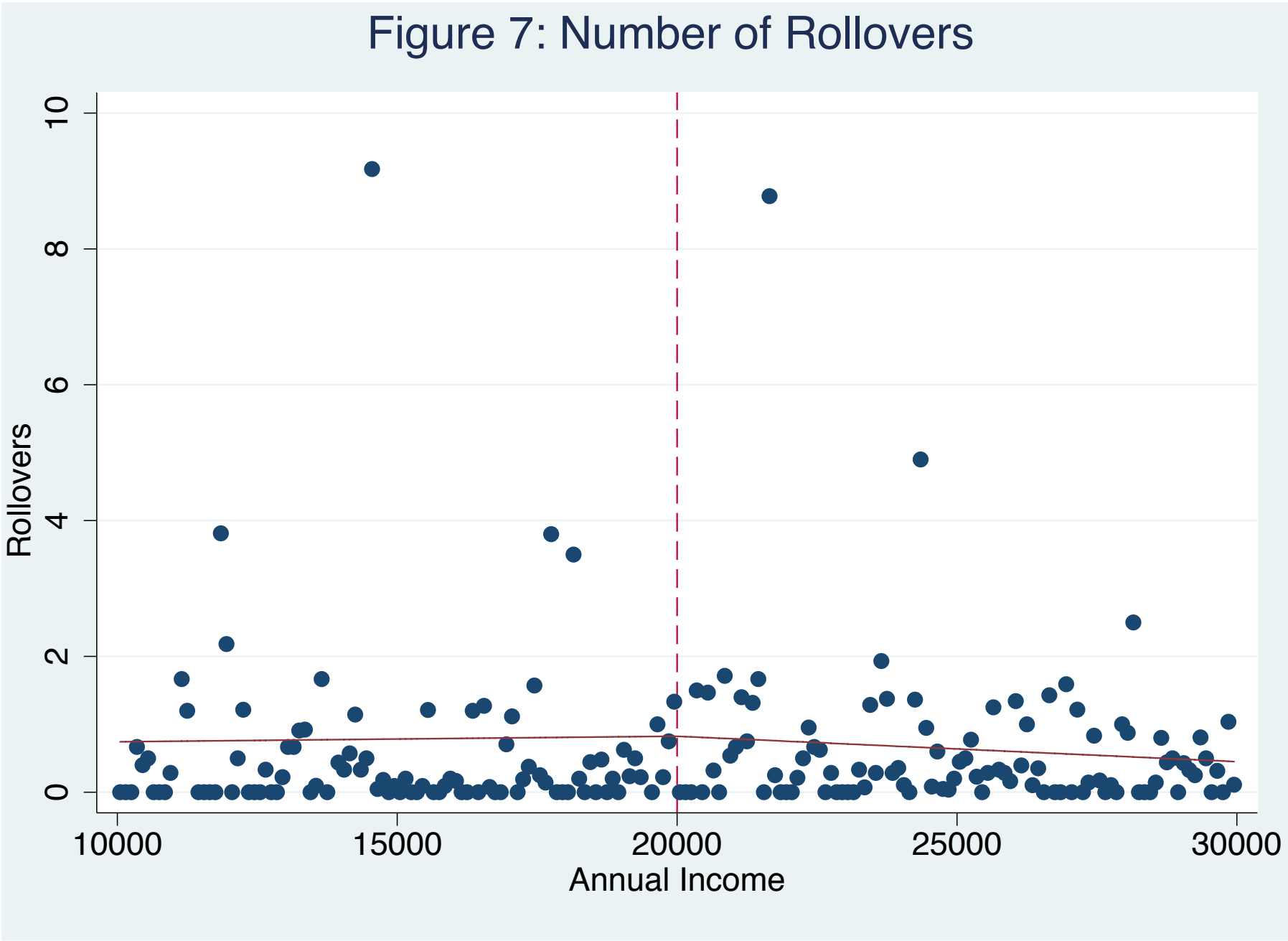

Figure 8: Default Rate

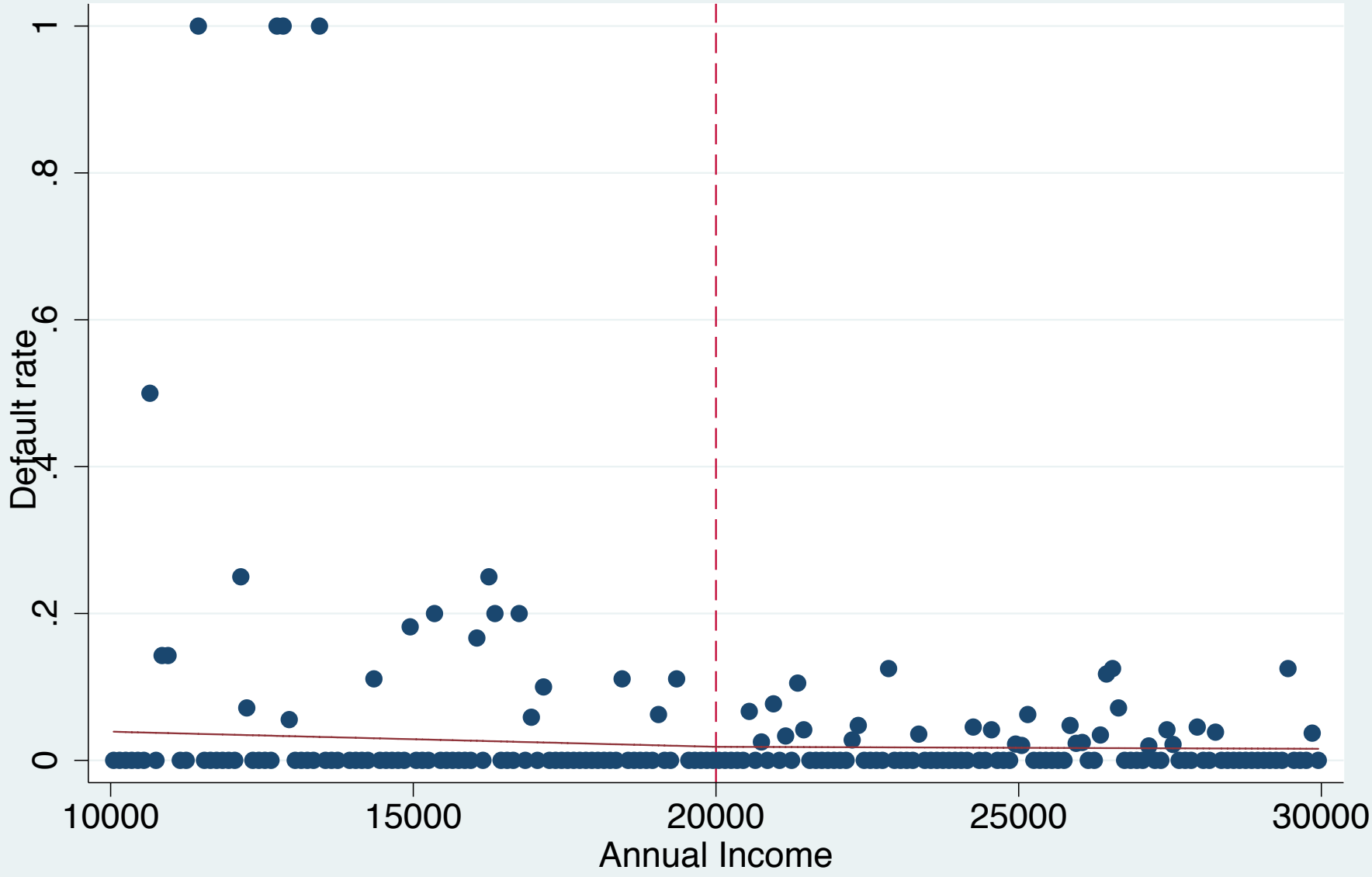

Figure 9: Density of Borrowers

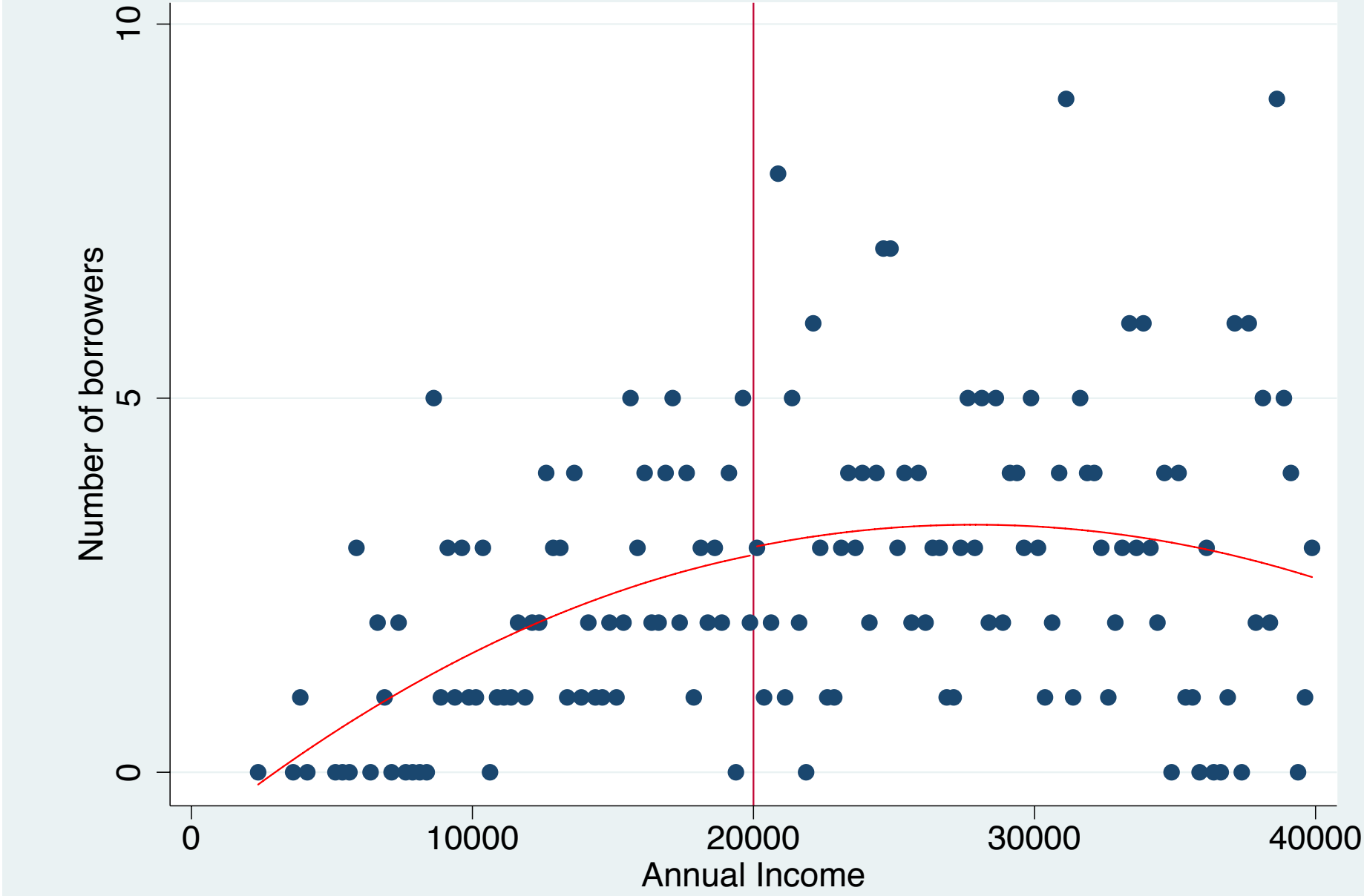

Figure 10: Covariate Densities