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# The Effect of Student Loan Payment Burdens on Borrower Outcomes

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# The Effect of Student Loan Payment Burdens on Borrower Outcomes*

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**Abstract**

Rising student loan debt and concerns over unaffordable payments provide a rationale for the broad class of "income-driven repayment" (IDR) plans for federal student loans. These plans aim to protect borrowers from delinquency, default, and resulting financial consequences by linking payments to income and providing forgiveness after a set repayment period. We estimate the causal effect of IDR payment burdens on loan repayment and schooling outcomes for several cohorts of first-time IDR applicants using a regression discontinuity design. Federal student loan borrowers who are not required to make payments see short-run reductions in delinquency and default risk, but these effects fade or reverse in the longer run as some borrowers become disconnected from the student loan repayment system when not required to make payments.

*Keywords: student debt, inattention, income-driven repayment*
*JEL codes: I22, G51, G41*

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# 1 Introduction

Many countries offer publicly funded student loans for higher education, with the aim of facilitating human capital investments. In the United States, federal programs provide over 85 percent of annual student loan disbursements (Ma and Pender, 2022) and outstanding federal student loan debt now exceeds $1.6 trillion (U.S. Department of Education, 2023a). A growing body of research suggests that student loan aid can increase undergraduate students' attainment and earnings.[1] At the same time, sustained growth in outstanding debt and adverse consequences of some borrowers' increased repayment difficulties may generate negative spillovers to the broader economy.[2]

Concerns over unaffordable payments provide a rationale for the broad class of income-driven repayment (IDR) plans for federal student loans. These plans aim to protect borrowers from delinquency, default, and resulting financial consequences by linking payments to income. In addition to allowing borrowers to smooth consumption over transitory periods of low earnings, IDR plans also provide insurance against permanently low income by forgiving any remaining debt after a set repayment period. The extent to which borrowers receive these benefits, however, will depend on their understanding of repayment options and ability to comply with program requirements, including the need to resubmit an IDR application every 12 months. The hassle cost and complexity involved with remaining on the program may interact with borrowers' behavioral biases and could be especially binding for those who stand to benefit the most, such as lower-income borrowers, drop outs, and those with past repayment difficulties, as has been documented in other policy contexts (Congdon et al., 2011).

In this study, we evaluate the contemporaneous and longer-run insurance value of IDR for several cohorts of first-time IDR applicants. To provide evidence on borrowers' trade-offs between lowering payments in the short- versus longer-term, we estimate causal effects of IDR payment burdens using detailed administrative data on debt, repayment, and continued participation in IDR (required for forgiveness). We leverage the discontinuities in the relationship between IDR

[1] In the U.S. context, see, for example, Marx and Turner (2019), Barr et al. (2021), and Black et al. (2023). International evidence includes Solis (2017), Chu and Cuffe (2021), Card and Solis (2022), and Gurgand et al. (2023).

[2] Looney and Yannelis (2015) document increases in student loan default and reductions in repayment following the Great Recession. Several papers document a negative relationship between student loan debt and other life-cycle outcomes, such as graduate school enrollment (Chakrabarti et al., 2022), homeownership (Mezza et al., 2020), job match quality (Field, 2009; Rothstein and Rouse, 2011; Luo and Mongey, 2019), entrepreneurship (Krishnan and Wang, 2019), marriage (Gicheva, 2016; Sieg and Wang, 2018).

payments and income in a regression discontinuity (RD) design. Most IDR applicants with income below 150 percent of the Federal Poverty Line (FPL) are eligible for a \$0 payment, resulting in a discontinuous increase in the probability of not being required to make any payment. Further, the minimum monthly payment for borrowers with income above this threshold is \$10, which leads to a discontinuous decrease in the amount of borrowers' monthly payments at this same threshold.

In the short run, eligibility for a \$0 payment leads to improvements in repayment outcomes, including significant reductions in delinquency, default, and use of forbearance.[3] These improvements are largely mechanical in nature, stemming from the relaxation of the requirement to make any payment. In the longer run, however, these benefits decrease or are even reversed. For instance, treated borrowers see significant increases in delinquency risk as soon as 15 months after their initial application. We estimate that approximately 93 percent of the fall in delinquency risk and 100 percent of the reduction in defaults from initial eligibility for a \$0 payment is due to a shift in the timing of payment difficulties rather than an overall reduction over the longer term. We also show that these effects are heterogeneous. Black borrowers, undergraduate drop outs, and those with a history of default see the largest short-run reductions in delinquency and default risk. However, heterogeneity in treatment effects is generally absent for longer-run outcomes.

The timing of the increase in repayment difficulties corresponds to a significant increase in scheduled payments. Twelve months after their initial application, borrowers who were initially eligible for a \$0 payment face significantly *higher* monthly payments when compared to those whose income was just above the \$0 payment income threshold. Consistent with the increase in payment burdens, borrowers not required to make payments in their first year of IDR are 2 percentage points (3 percent) less likely to reapply ("recertify") for IDR and, as a result, remain 2 percentage points (4 percent) less likely to be in an IDR plan over the following two years.

Decreases in reapplication rates could indicate that these borrowers saw sufficient income growth that they no longer benefited from lower payments in IDR. Alternatively, removing the requirement to make monthly payments could have increased the likelihood that borrowers who were initially

[3]Forbearance is a more costly, time-limited way for borrowers to pause their payments, as unpaid interest is capitalized into a borrower's principal balance when they exit forbearance. The reduction in forbearances for \$0 payment-eligible borrowers are driven by borrower-requested ("discretionary") forbearances, suggesting that even borrowers facing payments as small as \$10 per month are willing to pay to further reduce their current obligations.

eligible for a $0 payment became disconnected from the student loan system. The increase in repayment difficulties that coincides with the fall in IDR participation is most consistent with the second explanation. Additionally, borrowers initially eligible for a $0 payment also were less likely to engage in the student loan system in other ways during their first year on IDR. For instance, despite the potential interest-related benefits from signing up for automatic payments, these borrowers are significantly less likely to sign up for "auto-debit".

Because the IDR payment schedule includes both a discontinuity and kink in monthly payments, we can formally test whether the effect of a marginal reduction in monthly payments on repayment outcomes and IDR persistence is statistically distinguishable using these two sources of identifying variation. Across outcomes, we can reject this hypothesis, suggesting that the effect of a $0 payment operates through more than just the reduction in scheduled monthly payments. We propose a simple model in which eligibility for a $0 payment affects borrower outcomes through two channels. First, borrowers experience a relaxation of their budget constraint due to lower monthly payments. Second, in the short run, eligibility for a $0 payment also relaxes borrowers' need to attend to the requirement of submitting a payment each month. In the longer run, however, a $0 payment increases the likelihood that an inattentive borrower becomes disconnected from the student loan system. Under the assumption of additive separability and locally constant "inattention" effects, we use both the discontinuity and kink in the IDR payment schedule to separately identify the effect of payment reduction from the effect of not being required to make any payment for a year.

We estimate that most of the short-run benefits of initial eligibility for a $0 payment come from reducing the consequences of inattention to payment obligations rather than through a relaxation of borrowers' budget constraints. In the longer run, this channel also dominates but with adverse impacts on borrowers' outcomes. These findings suggest that waiving payment requirements provides insurance to struggling borrowers against immediate financial consequences, but when paired with the requirement of an annual IDR recertification, some borrowers experience increased risk of longer run financial distress.

We also test whether initial eligibility for a $0 payment affects further postsecondary enrollment, degree receipt, or outstanding debt for up to 3.5 years after a borrower's initial application. We find some evidence of small but significant reductions in reenrollment during the first 12 months on

IDR but no longer run effects. Estimated effects on degree receipt and outstanding debt are small and statistically insignificant in the short and longer run.

There is limited empirical evidence on the causal effects of IDR participation or payment amounts on borrower outcomes. Herbst (2023) shows that among older cohorts of borrowers who struggle with making payments, IDR take-up reduces the risk of student loan default, improves other measures of financial well-being, and, over the longer-run, leads to increases in student loan payments. Mueller and Yannelis (2019) provide evidence consistent with the availability of IDR plans muting the negative effects of housing price shocks on financial well-being during the Great Recession. Within a selective institution, Murto (2023) finds that male borrowers who gained access to a more generous IDR plan were more likely to choose majors that had lower initial earnings but steeper earnings trajectories. Internationally, although linking loan payments to income imposes a higher effective marginal tax rate on earnings, research suggests that, in practice, borrowers do not alter their labor supply in response (Chapman and Leigh, 2009; Britton and Gruber, 2020). Several theoretical examinations of optimal student loan repayment schemes suggest that linking payments to income is generally welfare improving.[4] We contribute to this literature by providing novel evidence on the effect of the IDR payment structure on the repayment outcomes of program participants. Additionally, our findings illustrate the importance of incorporating administrative costs and behavioral biases like inattention into these theoretical models.

Options that lower repayment burdens may also have effects beyond the borrower's own circumstances if their financial or labor market decisions are affected by student debt obligations. Rothstein and Rouse (2011) provide evidence that early career liquidity constraints lead college completers with undergraduate student debt to select into higher paying but less socially valuable occupations. There is also evidence that — holding constant attainment — higher student debt burdens may reduce graduate school attendance (Chakrabarti et al., 2022), entrepreneurship (Krishnan and Wang, 2019), and homeownership (Mezza et al., 2020). If these negative effects are at least in part caused by repayment burdens, then, in theory, increased IDR take-up could mitigate these costs to borrowers and the economy. Our findings, however, show the trade-off between the short-run benefits from eliminating the need to make payments and the longer-run costs imposed

[4] See, for instance, Gary-Bobo and Trannoy (2015), Findeisen and Sachs (2016), Lochner and Monge-Naranjo (2016), Athreya et al. (2021), and Ji (2021).

by the complexity of IDR program requirements.

Finally, our paper contributes to a broad literature examining the importance of psychological and behavioral factors for households' financial decisions (DellaVigna, 2009). Although participation in IDR plans has increased, from around 10 percent of borrowers in repayment in 2013 to just over 30 percent in 2019, take-up among borrowers who could benefit still lags (Gunn et al., 2021; Collier et al., 2022). Potential explanations include the requirement to actively opt-into application (Cox et al., 2020), application complexity (Mueller and Yannelis, 2022), and framing of costs and benefits (Abraham et al., 2020). Our results suggest that borrowers who have struggled to make payments in the past (i.e., prior defaulters, likely drop outs) do indeed benefit from lower payments on IDR, while also highlighting the potential trade-off of failing to retain these benefits when a $0 payment reduces the salience of annual reapplication requirements (Gabaix, 2019). This finding is consistent with a broader literature showing that behavioral/psychological factors can play a major role in educational investment decisions.[5]

The remainder of the paper proceeds as follows: Section 2 provides an overview of federal student loans and repayment options. We describe the data and sample in Section 3 and research design in Section 4, respectively. Section 5 presents results, and Section 6 describes our approach to decomposing the mechanisms through which a $0 payment affects borrowers' outcomes. In Section 7, we conclude and discuss policy implications.

## 2 Federal Student Loans and Repayment

Publicly provided student loans are intended to solve a classic market failure by offering credit to young adults who would otherwise be un(der)served by private credit markets. Because human capital cannot serve as collateral, prospective students who wish to borrow to finance high-return, human-capital investments may not be able to do so. But not all borrowers who have high returns in expectation will realize the benefits of these investments, either due to idiosyncratic risk (e.g., a need to drop out before completing their program) or aggregate shocks (e.g., the Great Recession).

[5] In the case of postsecondary investments, see, for instance, Bettinger et al. (2012), Pallais (2015), Marx and Turner (2019, 2020), and Dynarski et al. (2021). Lavecchia et al. (2016), French and Oreopoulos (2017), and Damgaard and Nielsen (2018), and Page and Nurshatayeva (2022) provide reviews of this literature.

IDR options provide insurance against these shocks by linking loan payments to income.

### 2.1 Federal student loans

In recent years, student loans have become one of the largest sources of debt for U.S. consumers, second only to outstanding mortgage liabilities (Federal Reserve Bank of New York, 2023). The vast majority of student loans are issued directly by the federal government, as authorized by Title IV of the 1965 Higher Education Act.[6] To borrow federal student loans, students must complete a Free Application for Federal Student Aid (FAFSA), but access to funds from the main source of loan aid – the Stafford Loan Program – is not otherwise rationed or linked to creditworthiness. Federal student loan terms, such as limits and interest rates, are set by legislation and only vary by type of loan and student level.[7]

Over the last 15 years, total outstanding federal student loan debt more than doubled in inflation-adjusted terms,and the number of borrowers with outstanding federal student loans likewise increased from approximately 28 million to 44 million (Appendix Figure A.1). The number of unique borrowers has leveled off in recent years, but outstanding debt continued to climb through 2020.

### 2.2 Student loan repayment options

Historically, most borrowers repaid their loans through the ”standard” 10-year plan characterized by fixed monthly payments with interest amortized over 10 years. This plan remains the ”default” option in that borrowers who do not actively choose another plan are automatically enrolled in it. Options for borrowers with higher balances allow interest amortization and repayment to extend up to 25 years in the ”extended” repayment plan and for payments to increase over time on a set

[6]Prior to the Great Recession, 15-to-25 percent of annual loan disbursements came from non-federal sources, but this share fell precipitously between 2008-09 and 2009-10 to 7 percent as many private lenders exited from student loan markets (Consumer Financial Protection Bureau, 2012; Ma and Pender, 2022).

[7]There are three main federal loan programs: Stafford, Parent PLUS, and Grad PLUS. Stafford Loans are available to both undergraduate and graduate students, Grad PLUS Loans are limited to graduate students, and only parents of dependent students can borrow through the Parent PLUS Loan program. Annual Stafford Loan limits for undergraduates vary with dependency status and level (i.e., freshman, sophomore, upper level), while lifetime limits only vary with dependency status. Annual and lifetime Stafford Loan limits for graduate students only depend on whether the borrower is enrolled in a designated health program. Parent PLUS and Grad PLUS Loans do not have lifetime limits and annual borrowing is only limited by cost of attendance. For undergraduates, the composition of Stafford Loans depends on a student’s unmet need. Subsidized Stafford Loans do not accrue interest, while the student is enrolled but are only available to students with unmet need. Students with no unmet need can still receive unsubsidized Stafford Loans as long as their full cost of attendance is not covered by other forms of financial aid. See Hegji (2021) for additional details.

schedule in the "graduated" repayment plan. Conditional on choosing the standard, extended, or graduated repayment plan, monthly payments are increasing in the amount borrowed and interest rate. In contrast, monthly payments in IDR plans are determined by a borrower's income and family size. Specifically, payments are set as a percentage of "discretionary income" (DI) – defined as income relative to some multiple of the FPL — with the percentage ranging from 10 to 20 percent. Any balance remaining after a set period of time — 20 to 25 years — is forgiven. Importantly, borrowers must apply for IDR and provide documentation of their income and family size on an annual basis. Appendix B includes paper IDR applications for the years we examine; borrowers could also submit an electronic application and provide consent for the IRS to share their prior-year tax return.[8]

As more generous IDR options were introduced in 2014 and 2015, IDR take-up increased. The share of borrowers in an IDR plan grew rapidly over this period, from around 10 percent in 2013-Q3 to over 30 percent in 2019-Q4 (Appendix Figure A.2). In contrast, the share of borrowers in fixed payment plans (standard/extended) fell from just over 70 percent to 50 percent over the same period. Trends in student loan debt being repaid in IDR and fixed payment plans follow a similar pattern, with the share in IDR plans increasing from 20 to 50 percent (Appendix Figure A.3).[9]

Growth in IDR-plan use coincided with rising student debt burdens and changes in the socioeconomic composition of borrowers. Borrowers in IDR plans tend to have higher balances. In 2018, borrowers on an IDR plan had a mean balance of $60,000, whereas borrowers in other repayment

[8] For the cohorts and years we examine, there were four IDR options: income-contingent repayment (ICR), income-based repayment (IBR), pay as you earn (PAYE), and revised pay as you earn (REPAYE). ICR defines discretionary income as 100% FPL while all of the other plans set it at 150% FPL. Payments are 20 percent of discretionary income in ICR and are capped at an amount that is based on a borrower's balance and income. In PAYE and REPAYE, payments equal 10 percent of discretionary income. Payments are capped at the amount a borrower would pay on the standard 10-year plan in PAYE and are uncapped in REPAYE. In all plans but ICR, undergraduate borrowers receive forgiveness after 20 years of payments. In PAYE, graduate borrowers also receive forgiveness after 20 years, while in REPAYE, the repayment period for graduate borrowers is 25 years. All borrowers receive forgiveness after 25 years in ICR. IBR includes two varieties, commonly referred to as "old IBR" and "new IBR".

New IBR is essentially the same as PAYE, while old IBR sets payments at 15 percent of discretionary income (capped at the standard plan amount) over a 25 year period for all borrowers. Appendix B provides additional details on the differences in IDR options. Borrowers could choose among these plans when applying or indicate that their servicer should select the IDR plan with the lowest payment. Because payments under REPAYE and PAYE/new IBR are the same, in practice, borrowers who selected this option were placed in REPAYE if they only had undergraduate loans and PAYE/new IBR if they had debt from graduate school.

[9] As shown in Appendix Figure A.4, the increase between 2013 and 2016 appears to come from borrowers entering IBR and, to a lesser extent, PAYE, while the growth between 2016 and the end of 2019 is driven by entry into REPAYE. Appendix Figures A.2, A.3, and A.4 are based on data from the Federal Student Aid Data Center and are limited to borrowers with Direct Loans as information on repayment plans for borrowers with other types of federal loans is not available on the Data Center.

plans had a mean balance of only $26,000. IDR users also tend to have low income. Among borrowers on an IDR plan in 2018, the average income was approximately $27,000 and 36 percent qualified for a $0 payment.

In addition to IDR, borrowers have other options available to reduce or stop payments, namely forbearance and deferrals. When payments are unaffordable, a borrower can contact their loan servicer and request a discretionary forbearance to temporarily pause payments. Deferrals are limited to specific circumstances (e.g., in school, military service). Most forbearances and deferrals do not stop the accumulation of interest and do not count as payments contributing to eventual loan discharge in IDR. Further, unpaid interest is capitalized into outstanding principal when a borrower exits a forbearance spell. Thus, borrowers are faced with an intertemporal trade-off when deciding to enter forbearance: $0 payments in the near term at the expense of higher in expected lifetime payments.

## 3 Data, Sample, and Descriptive Statistics

To study the loan repayment outcomes of IDR program applicants, we leverage administrative records from Federal Student Aid (FSA). FSA began systematically storing IDR application data in 2014.[10] IDR applications collect all information required for determining eligibility and payments, most importantly, annual income and family size.

Using servicing records of the federally held student loan portfolio, we measure the evolution of borrowers' outcomes over time on a monthly basis, including total principal and accrued interest, repayment plan, scheduled monthly payment, and loan repayment status (e.g., whether the loan is current, in forbearance, in a deferral, delinquent, or in default).[11] We observe borrowers' outcomes

[10] In earlier years, application data were only stored in PDF scans of paper applications.

[11] In theory, a borrower may have multiple loans in different statuses or even repayment plans. We aggregate this loan-level servicing data to the borrower level, measuring total outstanding debt and creating indicators of whether a borrower has a loan in each type of status or repayment plan. We do not observe repayment plans for borrowers who only have loans from the commercial Federal Family Education Loan (FFEL) Program but do observe commercial FFEL balances. The FFEL Program operated in parallel with the Direct Loan Program until it was discontinued in 2010. FFEL loans were provided by private banks but guaranteed by the federal government with essentially the same terms from the borrower's perspective (e.g., interest rates, origination fees). More recent IDR plans, however, exclude FFEL loans (see Appendix B). The U.S. Department of Education was authorized to purchase a portion of FFEL loans in 2009 and 2010 through the 2008 Ensuring Continued Access to Student Loans Act, total approximately $110 billion as of 2011 (U.S. Department of Education, 2011). Most students with FFEL loans can also consolidate their debt into a Direct Consolidation Loan. As of 2023-Q3, Direct Loans (inclusive of Consolidation Loans) made up over 88 percent

up to 46 months after their initial IDR application, but do not include months after March 2020 (the start of the payment pause due to the pandemic). These data are also used to construct a number of baseline characteristics as of the date of initial IDR application submission, including whether the borrower had ever defaulted prior to applying for IDR, the length of time in repayment, and outstanding debt at the time of application.

Further, we observe enrollment reports from colleges receiving federal student loan dollars, which we use to construct postsecondary enrollment spells for IDR applicants, including the level of enrollment and institution attended, and graduation. We use these data to determine a borrower's highest level of attainment when they first apply for IDR and to measure the effects of IDR payments on the likelihood of reenrollment and graduation after initial entry into the IDR program.

From borrowers' previous federal student aid applications, we observe many demographic characteristics, including gender, age as of first IDR application, and family-adjusted gross income (AGI).[12] Borrowers were not asked to report their race/ethnicity during the period we study. Instead, we use predicted probabilities of belonging to one of the major racial/ethnic groups (Monarrez and Matsudaira, 2023).[13] Appendix C contains additional details on data sources and variable construction.

### 3.1 Analysis Sample

We focus on borrowers who first applied for IDR in 2015 through 2018, excluding borrowers who are recorded as being in an IDR plan prior to their first observed application.[14] We also exclude from our analysis sample borrowers with loans serviced by a particular (unidentified) servicer,

of outstanding federal student debt. Department of Education-managed loans (i.e., Direct and Department-held FFEL) made up over 93 percent of outstanding federal loan debt (U.S. Department of Education, 2023b).

[12] We use a borrower's FAFSA to measure family AGI. For most traditional-aged undergraduate entrants, this will be their parents' income. Thus, this measure should be viewed as a proxy for family socioeconomic status rather than the borrower's own income during repayment.

[13] Race/ethnicity probabilities, as developed by Monarrez and Matsudaira (2023), stem from the coefficients in a multinomial logistic regression model of self-reported race in the 2016 National Postsecondary Student Aid Study as a function of demographics associated with characteristics of borrowers, including their first and last name, zip code on first FAFSA, high school, and college. Analyses by race and ethnicity are conducted using the logit racial and ethnic probabilities as weights in the analysis, an approach that has been shown to provide an underestimate of outcome gaps by race (Elzayn et al., 2023).

[14] Although our data contain applications from 2014, the measure of discretionary income constructed from the elements provided does not yield any discontinuity in the probability of a $0 payment or payment amount at the $0 discretionary income threshold, suggesting that household size, marital status, household income, or some combination of these factors is not accurately reported.

due to issues with the reporting of scheduled payments in the initial months on IDR. Because the assignment of borrowers to servicers is essentially random, this only serves to reduce the size of our analysis sample and the precision of our estimates. Our results are robust to keeping borrowers with this servicer in the main analysis sample (available upon request).

Our analysis sample is defined by applicants' discretionary income, or the distance between an applicant's AGI and the 150 percent FPL threshold.[15] We use the full set of first-time applicants to calculate the optimal bandwidth for regression discontinuity estimates of the effects on our main repayment outcomes, following Calonico et al. (2014b) (hereafter, CCT).[16] We report the results using a fixed bandwidth, equal to the median CCT optimal bandwidth across outcomes, rounded to the nearest $50 ($4,350). For all of our analyses, we fix the running variable to discretionary income based on a borrower's first IDR application.

Table 1 presents summary statistics for the full set of first-time IDR applicants and applicants in our main analysis sample. Prior to submitting their first IDR application, borrowers in our main analysis sample had $44,082 in outstanding debt, on average, and relatively low income ($27,717). Only 7 percent of applicants were married and, on average, lived in 2-person households. About one in 5 applicants had borrowed for graduate studies. Most first-time IDR applicants entered repayment recently, 68 percent within the two years prior to submitting their first IDR application. The share of applicants in our sample who previously defaulted on their student loan payments is relatively high at 17 percent. Around 61 percent of applicants were classified as dependent students when they first received federal student aid and came from families with an income of $55,292 on average. Characteristics of the population of first-time IDR applicants are relatively similar to our analysis sample, although the population is slightly less advantaged, with higher debt balances and lower incomes.

Panel A of Figure 1 shows the share of all first-time applicants in an IDR plan by months elapsed since their initial IDR application.[17] Most applicants (about 89 percent) are approved and enroll the program within 6 months of their application, and only a small share (11 percent) ultimately

[15] All dollar amounts are adjusted for inflation using the CPI-U (Bureau of Labor Statistics, 2023) and reported in constant 2022 dollars.

[16] We implement the bandwidth selection procedure with the `rdbwselect` Stata routine (Calonico et al. 2014a).

[17] Patterns are similar if we limit these analyses to borrowers in the main analysis sample.

do not enroll (due to incomplete, withdrawn, or rejected applications). Approximately 12 months after the initial application, there is a stark drop in IDR participation, with under 50 percent of initial applicants remaining on an IDR plan at the 18-month mark.[18] Panel B shows the number of IDR recertification applications over the same time period. Recertification application submission rates are highly cyclical, corresponding closely with the annual recertification requirement, reaching their peak near the 12-month mark, and waning 2 and 3 years after. These patterns motivate our delineation between the short- and longer-run effects of borrowers' initial IDR payments, including the decision to reapply for IDR after a borrower's initial 12 months of lower payments have passed.

# 4 Research Design

We leverage the discontinuity in the relationship between discretionary income and IDR payments to identify the causal effects of payment obligations on borrower outcomes via a regression discontinuity (RD) design. At the 150 percent FPL threshold, the IDR payment formula results in a discontinuous decrease in monthly payments and a discontinuous increase in the probability of a $0 scheduled payment. Most, but not all, applicants are approved for IDR, so our design will be fuzzy and estimates can be interpreted as intent-to-treat effects.

## 4.1 Identifying variation

In standard repayment plans, scheduled monthly payments depend on the amount borrowed, the interest rate, and the repayment term. These factors may be correlated with unobservable borrower characteristics that also influence debt repayment outcomes, making it unlikely that a naïve regression of outcomes on scheduled payments could recover causal effects. Likewise, outside of IDR, the requirement to make payments is only waived for borrowers in a forbearance or deferral, which are almost always triggered by borrowers' endogenous choices. In IDR plans, the scheduled payment ($P$) for borrower $i$ who applies for IDR in year $t$ is a function of discretionary

[18] Herbst (2023) finds that approximately 50 percent of borrowers who entered an IDR plan after missing payments remained on the plan after one year. Conkling and Gibbs (2019) estimate a higher IDR persistence rate of around 70 percent for a broader set of borrowers, but among borrowers who initially had a $0 payment, only around half remained on IDR after a year.

income $(DI)$ and the IDR payment rate $(r)$:

$$P_{it} = \begin{cases} 0 & \text{if } DI_{it} \leq 0 \\ rDI_{it} & \text{if } DI_{it} > 0, \end{cases} \tag{1}$$

where $DI_{it} = AGI_{it} - 1.5FPL_t(n)$, $n$ is the applicant's family size, and $r \in \{0.10, 0.15\}$.[19]

When a borrower's monthly IDR payment – as calculated in equation (1) – falls below \$5 per month, it is set to \$0.[20] Thus, borrowers with an income of \$399 above 150 percent FPL will also have \$0 payments (i.e., 15 percent of \$400 is \$60 per year or \$5 per month), and so we adjust the \$0 discretionary income threshold by this amount. However, we do not know *ex ante* whether a borrower is eligible for a plan that sets payments to 15 percent versus 10 percent of discretionary income, and borrowers with income \$200 above the revised threshold who have a 10 percent payment rate would also have their payments set to \$0. Thus, we also exclude a "donut" of the small number of applicants who have incomes \$0 to \$200 above the (updated) discretionary income threshold.

Figure 2 shows that scheduled payments largely follow the formula in equation (1). Each marker represents the probability of a \$0 payment (Panel A) or average scheduled payment (multiplied by 12 to represent an annual amount) (Panel B) for applicants within a \$250 income bin. Solid lines are a linear fit of the binned data, estimated separately on either side of the eligibility threshold and limited to the median CCT optimal bandwidth; dashed gray lines delineate its 95 percent confidence interval.[21] Borrowers with an income just below 150% FPL see a large, discontinuous increase in the probability of a \$0 scheduled payment compared to borrowers with income just above this threshold, approximately 70 percentage points in magnitude (Panel A). There is also an approximately \$60 drop in the average scheduled payment amount (Panel B).[22]

[19] REPAYE, PAYE, and new IBR have a 10 percent payment rate while an "old" IBR has a 15 percent rate. ICR has a different discretionary income threshold (100% FPL) and a higher rate (20%). See Appendix B for additional details.

[20] When a borrower's scheduled payment falls between \$5 and \$10 per month, it is rounded up to \$10 per month.

[21] Figure 1 indicates that, for some applicants, it takes several months for their IDR application to be approved. We focus on month 9 here because the share of applicants who are on an IDR plan peaks 7 to 10 months after the initial application submission.

[22] The kink in the relationship between distance from the threshold and payment amounts implies that for every \$1,000 increase in income relative to the threshold, average scheduled payments increase by approximately \$75. There is no kink in the probability of a \$0 payment at the threshold.

We leverage this variation for identification by estimating local linear regressions using a uniform kernel using ordinary least squares (OLS). Let $Y_i$ be the outcome of interest for borrower $i$. Our estimating equation is:

$$Y_i = \alpha_t + \beta_0 DI_i + \beta_1 \mathbf{1}\left[DI_i \leq 0\right] + \beta_2 DI_i \mathbf{1}\left[DI_i \leq 0\right] + \epsilon_{it}, \tag{2}$$

where $DI_i$ is the discretionary income of applicant $i$, defined above, $\mathbf{1}\left[DI_i \leq 0\right]$ is a binary variable indicating that the applicant has \$0 (or lower) discretionary income, and $\alpha_t$ is a vector of application year fixed effects. For each of our main outcomes, we calculate the optimal CCT bandwidth and report estimates using the median CCT-optimal bandwidth (\$4,350). We estimate heteroskedasticity-robust standard errors.

### 4.2 Testing key identifying assumptions

The key assumption required for the regression discontinuity (RD) design to identify causal effects is for potential outcomes to be continuous through the treatment assignment threshold. While we cannot directly test for the continuity of unobservables across the \$0 discretionary income threshold, we can do so for observed characteristics. Figure 3 shows the number of IDR applicants by distance to the \$0 discretionary income threshold and year of initial application. Applicant density is continuous across the threshold for every cohort, indicating that borrowers applying for IDR cannot finely manipulate their incomes in order to achieve a \$0 payment. This is not surprising, given that for most applicants, discretionary income is verified through prior-year tax returns.

As an additional test of the identifying assumption, we show that applicants' observable predetermined characteristics are also continuous across this threshold. Table 2 displays corresponding estimates of $\beta_1$ from placebo regressions of equation (2) on applicants' baseline characteristics. We find no evidence of discontinuities in most predetermined characteristics, including age, family income on first FAFSA, predicted race/ethnicity, educational attainment, household size, marital status, the probability of prior default, or use of auto debit. Two coefficients are significant at conventional levels, representing a 0.6 percentage point (0.9 percent) decrease in the probability of being female and a \$658 (1.5 percent) increase in outstanding debt. To account for the role of multiple hypothesis testing, we test for discontinuities in an index of observable baseline characteristics based on predictions from a logistic regression of the probability of defaulting in the 2 years after initially applying for IDR (Appendix Figure A.5). The estimated change in the predicted probability of default — shown in column (16) — is statistically insignificant and economically small, with a 95 percent confidence interval excluding effects larger in magnitude than a 0.2 percentage point increase or a 0.1 percentage point decrease.

Finally, as additional placebo tests, we present estimates for borrower outcomes taking place over 12 months *prior* to their first IDR application. Under the assumption that the probability of having income on either side of the $0 discretionary income threshold is random within a small bandwidth, outcomes should be perfectly balanced (up to the sampling error) when measured prior to a borrower's initial application. In the following section, we show that this is indeed the case for each of our loan repayment outcomes of interest.

### 4.3 First stage effects on monthly payments

Figure 4 shows scatter plots of the share of applicants with $0 payments as of 6, 12, 18, and 24 months after the initial IDR application by distance from the $0 discretionary income threshold. There is a clear discontinuity in the share of applicants with a $0 dollar payment six months post application. About 90 percent of applicants with income lower than 150 percent of the FPL have a $0 payment, compared to about 20 percent for those with income just above this cutoff.[23] This implies a nearly 70 percentage point effect on the likelihood of a $0 payment at the cutoff. A year after initial application, the magnitude of this discontinuity has shrunk to 55 percentage points, driven by a decrease in the $0 payment share to the left of the cutoff. Eighteen months later, the discontinuity has almost completely disappeared and applicants with income below the 150 percent FPL cutoff are only slightly more likely to have a $0 payment than those with income just above the threshold.[24]

[23] There are several reasons why the probability of having a $0 payment does not change from 0 to 1 at the threshold. First, applications might be denied by servicers or cancelled by applicants changing their mind about IDR participation. Second, there may be measurement error in the data we observe on household size. Third, borrowers who initially have a non-zero scheduled payment (i.e., fall to the right of the $0 discretionary income threshold) and experience an unexpected shock to their income (e.g., job loss) can request a payment adjustment from their servicer. Finally, by requesting a discretionary forbearance, borrowers can temporarily bring their payments to $0.

[24] The persistent increase in the probability of having a $0 payment for borrowers with an income below the $0 discretionary income threshold on their first application could be due to an increased likelihood of remaining on IDR, an increase in the probability of $0 payments due to higher forbearance take-up, or a combination of these outcomes. We explore these outcomes in the following section.

Similarly, Figure 5 plots average (annualized) scheduled payments against applicant discretionary income. The dynamics driving the reduction in the $0 payment first stage over time become clear. In the first 12 months after initial application, the empirical payment schedule largely resembles the pattern expected from the IDR payment formula: low payments that are flat with respect to discretionary income to the left of the cutoff, with a jump and kink immediately above the $0 discretionary income cutoff, resulting in payments increasing with the distance between income and the threshold. At the one-year mark, this pattern is still present, albeit more muted. However, as applicants enter their second year, there is a sharp shift in scheduled payments for applicants with income just below the threshold (on their initial application) facing *higher* payments than those with baseline income just above.

We summarize the dynamics of first stage effects on the probability of having a $0 payment and scheduled monthly payments by plotting point estimates of $\beta_1$ from equation (2), where outcomes are measured on a monthly basis. Panel A of Figure 6 displays these estimates of effects on the probability of a $0 scheduled payment, by months since initial IDR application, and corresponding 95 percent confidence intervals. The plot also includes placebo estimates for the 12 months prior to a borrower's first IDR application, showing precisely estimated null effects. The first stage effect on the probability of having a $0 payment peaks at approximately 6 months after initial application submission and remains stable until about month 11, at which point there is a sharp decline in the magnitude of the estimated discontinuity.

Panel B of Figure 6 shows month-by-month estimates of the discontinuity in scheduled payment at the $0 discretionary income threshold. If all borrowers "complied" with the payment predicted from their initial application, the jump in the monthly payment should be $10. Estimated effects are approximately 40 percent of this amount. Starting in the second year after initially submitting an application, borrowers whose initial application income was below the $0 discretionary income threshold experience a large, statistically significant increase in monthly scheduled payments. The discontinuous increase in payments persists until almost the end of a 42-month panel, suggesting that initial eligibility for a $0 payment leads to higher payments over the longer term.

Finally, in Table 3, we provide a summary of estimated first stage effects on $0 payment probability and average scheduled payment amounts over the 12 months after initial application. Consistent with the patterns shown in Figure 6, borrowers with an income below the threshold see an approximately \$3 reduction in scheduled monthly payments – a 5 percent reduction relative to payment burdens for ineligible borrowers – and a 64 percentage point increase in the probability of not being required to make any payment.

## 5 Main results

In this section, we first provide evidence on the reduced form effects of income eligibility for a \$0 payment on repayment-related outcomes, including delinquency, default, and use of forbearance to pause payment obligations. We then turn to examine effects on the probability of reapplying for and remaining on an IDR plan and take-up of automatic (”auto debit”) payments as a measure of ”connectedness” with the federal student loan system. Next, we discuss the effects on outstanding debt and educational attainment and conclude with an examination of heterogeneity in repayment and IDR persistence outcomes for different groups of borrowers.

### 5.1 Reduced form effects on repayment outcomes

One of the main goals of IDR plans is to provide insurance against unaffordable payments in times when a borrower’s income is low. Thus, we examine the extent to which scheduled payments in IDR affect the probability that a borrower is delinquent with a payment – defined as at least 30 days late – as an early sign of repayment difficulties. Panel A of Figure 7 plots the relationship between the distance from the \$0 discretionary income threshold and the probability of delinquency in the ninth month after a borrower submits their first IDR application. This is the point in time when treatment effects on the probability of a \$0 payment and scheduled monthly payments are at their largest (i.e., Figure 6). There is a clear discontinuity in delinquency rates at the \$0 discretionary income threshold, approximately 6 percentage points (60 percent) in magnitude.

Looking ahead to 18 months after initial application submission – a point in time when borrowers who originally qualified for a \$0 payment now face significantly higher payments on average – this pattern is reversed (Figure 7, Panel B). Borrowers with income on their initial application just below the \$0 discretionary income threshold are 2 percentage points (14 percent) more likely to be delinquent with their student loan payments than borrowers who had income just above the threshold, suggesting that the insurance benefits of a $0 payment may be short lived. Nevertheless, Panel A of Table 4 suggests the effect on cumulative (i.e., "ever") delinquency is negative and significant for at least three years since the initial application.

Panel C of Figure 7 plots estimates of $\beta_1$ from equation (2) (and corresponding 95 percent confidence intervals) in each month, over the 12 months before initial application submission and the 42 following months. Differences in delinquency risk for borrowers above and below the $0 discretionary income threshold in the months before they submit their first application are small and largely insignificant. Effects during the first 12 months can be interpreted as combined effects of pausing payment obligations and relaxing borrowers' budget constraints through a reduction in payment amounts. Beginning one month after they submit their first IDR application, borrowers with an income just below the threshold see a significant reduction in delinquency risk, which persists until month 14. Starting in month 16, treatment effects on borrowers who were initially eligible for a $0 payment follow a starkly different pattern, with these borrowers seeing a significant increase in delinquency rates that last for the following 6 months. Estimated treatment effects remain elevated but small in magnitude for the remainder of the panel.[25]

Student loan default occurs after 270 days of nonpayment. Thus, treatment effects on default rates should occur at an approximately 8-month lag. Consistent with this timing, Panel A of Figure 8 shows an approximately 2 percentage point (50 percent) drop in the probability of default at the $0 discretionary income threshold in the 18th month after initial application submission.[26] As shown in Panel B, the reduction in default risk peaks 21 months after initial IDR application submission. Similar to the interpretation of treatment effects on delinquency, we view this as reflecting the combined effect of lower payments and the (mechanical) effect of not being required to make payments. Estimated treatment effects approximately 270 days after a $0 borrower would be required to reapply for IDR – around month 22 – will provide insight into any changes resulting from a $0 payment following a borrower's first year on IDR. In month 22, borrowers treated with

[25] The reduction and subsequent increase in delinquency rates for borrowers with income below 150% FPL are consistent with the descriptive findings of Conkling and Gibbs (2019), who show that IDR participants with a $0 payment experience increased financial distress five quarters after they first entered IDR.

[26] Interestingly, there is no evidence of a kink in delinquency rates despite the clear kink in scheduled payments at this same point. As we discuss in Section 6, this suggests that the reduction in delinquency risk can be attributed to the effect of not having to make payments (versus a marginal reduction in monthly payment amounts) – a purely mechanical effect – as borrowers with a $0 payment by definition cannot be delinquent.

a $0 payment are still less likely to default than their counterparts with initial application income above the threshold, but one month later, effects on monthly default risk fall to zero and remain small and largely insignificant until the end of the panel.[27]

Borrowers with a nonzero scheduled monthly payment have a second path for pausing payment obligations if their payment on IDR is still unaffordable. Specifically, they can request that their loans be placed in forbearance. This method of pausing payments is more costly than qualifying for a $0 scheduled payment in IDR: Borrowers forgo the interest subsidies available in many IDR plans (see Appendix B), and any unpaid interest is capitalized into their outstanding principal when they exit forbearance.[28]

In the short run, forbearance use is increasing in monthly payment obligations. Panel A of Figure 9 shows a clear discontinuity in the probability of forbearance, 9 months after initial application submission.[29] Borrowers who were eligible for a $0 payment based on their initial application are less likely to use forbearance to pause payments in the short run, but 2 years after submitting their first application, they are significantly more likely to be in forbearance (Panel B) and this pattern persists up to month 36 (Panel C). Treatment effects on forbearance use are driven by discretionary forbearance spells, which are initiated at the request of the borrower, rather than administrative forbearances, which may be initiated by servicers or automatically in response to major disasters (results available upon request).

Table 4 shows reduced form estimates of $\beta_1$ from equation (2) for summary repayment outcome measures by years since initial application. Focusing on first row of Panel A, the first three columns contain estimated effects on the probability of any delinquency in each 12-month period after initial

[27] While Panel B of Figure 8 shows significant positive estimated effects on default beginning at month 36, Appendix Figure A.6 does not show a clear discontinuity in the probability of default at the $0 discretionary income threshold at this point in time.

[28] There two broad categories of forbearances: general/discretionary and mandatory. Borrowers experiencing financial difficulties, medical issues, job loss, or other extenuating circumstances can request a discretionary forbearance from their servicer. Discretionary forbearance spells are limited to 12 months at a time and a cumulative limit of 3 years. Mandatory forbearance requests are linked to a specific set of circumstances, such as National Guard duty, medical residencies, and AmeriCorps, and must be granted by servicers if requested. A limited set of circumstances, such as living in an area affected by a federally declared major disaster, can trigger automatic placement in an administrative forbearance. See https://studentaid.gov/manage-loans/lower-payments/get-temporary-relief/forbearance (accessed 9/7/2023) for details.

[29] There is also a kink in the relationship between forbearance use and distance from the $0 payment eligibility threshold, mirroring the kink in scheduled payments (Figure 2). The kink in forbearance use is notable given the lack of a kink in delinquency or default risk during this same period and is consistent with borrowers responding to a marginal increase in monthly payments by using forbearance, which enables them to avoid default.

application submission. Columns (4) and (5) provide estimated effects on an additional outcome: the probability of ever having a delinquent payment since initial IDR application. Comparing the estimates for the two measures can provide insight into whether the increase in delinquency risk for \$0 payment eligible borrowers after their first year represents a retiming of delinquencies that would have otherwise been experienced at an earlier point. The 18 percentage point drop in cumulative delinquency risk in the year after application (Panel A, column 1) falls to 3.5 percentage points by the end of year 2 – an 80 percent reduction – and to 1.3 percentage points by the end of year 3 – a 93 percent reduction. Thus, although initial eligibility for a \$0 payment does reduce cumulative risk of delinquency significantly over the longer run, most of the decrease in borrowers' first year after applying for IDR comes from a shift in the timing, rather than incidence, of delinquency.

Panel B of Table 4 shows estimated effects on the probability of default in a given 12-month period and the probability of ever defaulting since initial application.[30] Consistent with Figure 8, After the initial 2.4 percentage point drop in default risk in the first year of IDR, borrowers initially eligible for a \$0 payment are equally likely to default over the subsequent 12-month period and remain 0.5 percentage points (6 percent) less likely to have defaulted at any point since submitting their first IDR application. By year 3, the estimated effects on default risk are positive and significant (albeit small in magnitude) and the effects on ever defaulting are small and statistically insignificant, suggesting that while borrowers eligible for a \$0 payment on IDR initially receive protection from default, any insurance value of not being required to make payments ultimately fades. Estimated effects on forbearance (Panel C) follow a similar pattern: Initial eligibility for a \$0 payment shifts the timing of forbearances but has much smaller effects on long run use.

In summary, the short and long run effects of initially qualifying for a \$0 payment on repayment outcomes differ not only in magnitude but also in sign. The dynamics of treatment effects on these outcomes are similar to month-by-month effects on scheduled payments (Figure 6, Panel B), with borrowers with income below the threshold on their initial application experiencing significant increase in monthly payment obligations after the first 12 months. There are multiple potential

[30] Note that we lag the timing of measured effects on default to reflect the 9-month lag between the initial missed payment and default, such that year 1 covers the 9th through 18th month since repayment entry, year 2 covers the 19th through 30th, and year 3 covers month 31 through 42.

explanations for these patterns. First, borrowers who originally qualify for a $0 payment may see significant income gains relative to those who just barely missed qualifying, resulting in a discontinuous increase in monthly payments when eligible borrowers need to recertify for IDR after their first year. Alternatively, these borrowers may be less likely to recertify for IDR, also resulting in an increase in their monthly payments.[31] The increase in repayment difficulties after the first year on IDR is most consistent with the latter explanation. In the next subsection, we provide additional evidence by examining reappplications to and persistence in IDR.

### 5.2 Initial eligibility for a $0 payment reduces persistence in IDR

During the time period our study covers, borrowers were required to reapply for IDR every 12 months. This recertification process is essentially the same as the initial application process – borrowers either must fill out the online application or submit a paper application and provide their tax records or alternative documentation of income. Herbst (2023) finds that many borrowers who enter IDR after a period of financial distress are no longer in the program one year later, and the patterns in Figure 1 suggest that, among first-time applicants, there is a similar fall in IDR participation. For some borrowers, failure to recertify may be optimal (e.g., those who experience an increase in their income may face a lower payment under a non-IDR plan), while for others, it may be a consequence of administrative barriers, hassle costs, and/or inattention to the requirement to reapply. While we do not observe income for borrowers who do not recertify for IDR, delinquencies and defaults subsequent to failure to remain on IDR provide an indication of whether going off IDR was an active choice or a result of other factors.

Figure 10 displays estimates of initial eligibility for a $0 payment ($\beta_1$) on the probability of being on an IDR plan, by months since the initial application.[32] In the 13th month after initial application submission, there is a significant drop in the probability of being in an IDR plan (1.2 percentage points or 4 percent relative to the average IDR participation rate for borrowers with initial incomes just above the $0 payment threshold). Treatment effects on IDR participation continue to fall

[31] When a borrower fails to recertify for IDR but does not actively switch to an alternative plan, the scheduled payments will no longer depend on their income, and the amount is dependent on the specific IDR plan they were on. See Appendix B for details.

[32] Appendix Figure A.7 plots the average IDR participation rate by income over three intervals: 7-12 months after initial application (Panel A), 13-18 months (Panel B), and 19-24 months (Panel C).

for the next 5 months, reaching 2.5 percentage points (6 percent) in month 17. The gap in IDR participation decreases in magnitude but persists and remains significant at the 5 percent level for the remainder of the panel.

The drop in IDR participation is driven by failure to recertify, and not by increases in income that may make a borrower ineligible for (some) IDR options. Figure 11 plots the probability that a borrower submits any IDR reapplication (Panel A) and a reapplication that was successful (Panel B) in the 7th through 12th month after initially applying and in the following 6 months (Panels C and D, respectively). Those eligible for a \$0 payment based on their initial application income are significantly less likely to reapply in either period.

Reduced form effects on summary measures of IDR reapplication and persistence are shown in Table 5. Treatment effects on IDR participation are similar in magnitude to the reduction in the probability of (re)applying for IDR. While the probability of submitting a successful application is lower overall, the discontinuity in this probability is similar in magnitude to the discontinuity in the probability of submitting any application.

Although the IDR recertification process is the same for borrowers eligible for a \$0 payment and those who are not, borrowers who are required to make monthly payments will likely have more opportunities to interact with the student loan system, and, as a result, the need to recertify may be more salient. We examine enrollment in "auto debit" payments as a measure of the extent to which borrowers are interacting with their loan servicers and the student loan system after they first apply for IDR. Borrowers sign up for auto debit with their servicer. Auto debit allows their monthly payments to be automatically deducted from their bank account and results in a 0.25 percentage point reduction in their interest rate. Even borrowers with a \$0 payment can enroll in auto debit and, in doing so, receive the interest rate reduction and see their balances grow by less during their time on IDR.[33]

One month before submitting their first IDR application, around 5 percent of borrowers with income just below the threshold and a similar share of borrowers with income just above the

[33] Although most IDR plans have at least partial subsidies for accrued interest not covered by the borrower's scheduled monthly payment in the first three years on IDR, the only borrowers who would not experience any interest accumulation during this period are those on REPAYE with only subsidized loans. See Appendix B for additional details.

threshold were signed up for auto debit (Figure 12, Panel A). In stark contrast, 13 months later, borrowers eligible for a $0 payment were over 15 percentage points (60 percent) less likely to be enrolled in auto debit than those with income just above the threshold (Panel B). Notably, in the month after initial application submission, this gap is quite small and continues to grow over the entire year (Panel C), suggesting that requiring borrowers to make payments increases the likelihood that they will continue to engage with their servicer during their first year in an IDR plan. While the gap in auto debit enrollment narrows after the first 12 months, it remains at 6 percentage points by the end of our panel, 3.5 years after initial application.

### 5.3 Reduced form effects on outstanding debt and attainment

Herbst (2023) shows that switching into an IDR plan led to decreases in both payment obligations and outstanding debt. In our setting, however, although borrowers initially eligible for a $0 payment have lower scheduled monthly payments compared to those with an income above the threshold, they do not have significantly higher amounts of outstanding debt after their first 12 months on IDR (Appendix Figure A.8). In fact, despite significant increases in payment obligations after their first year on IDR, estimated effects on outstanding debt remain small and insignificant over 24 months. By the end of our panel, we find some evidence of statistically significant — albeit modest in magnitude — reductions in total outstanding debt, but estimates are relatively imprecise. Overall, we do not find strong evidence that eligibility for a $0 payment has beneficial or adverse effects on borrowers' loan balances or amortization.

Payment obligations could affect whether borrowers reenroll in higher education through several channels. First, borrowers who have defaulted on their federal student loans are ineligible for any form of federal student aid. By preventing default, a $0 payment could help borrowers maintain access to resources needed to finish a program or pursue an advanced degree. Second, borrowers intending to pay for additional postsecondary education out of pocket may be better able to finance reenrollment via savings with lower or $0 payments, even if they are not at risk of default. Finally, borrowers who enrolled on a half-time basis or higher are eligible for an in-school deferment (i.e., pause) on their loan payments. Eligibility for a $0 payment could reduce incentives to return to college by offering an alternative way to pause payment obligations. Estimated effects on reenrollment in any postsecondary institution are most consistent with the last mechanism. As shown in Panel A of Appendix Figure A.9, borrowers initially eligible for a \$0 payment are significantly less likely to reenroll in months 6 through 16. In the longer run, estimated effects on enrollment are largely negative but insignificant. We find no evidence of significant effects on degree receipt (Panel B).

### 5.4 Heterogeneity

We test for heterogeneity in treatment effects with the goal of understanding the distributional consequences of the short run insurance benefits and longer run costs of initial eligibility for a \$0 IDR payment. We focus on three dimensions of heterogeneity: predicted race/ethnicity, educational attainment, and whether a borrower has previously defaulted on a loan. We focus on delinquency and default, since these are the most consequential outcomes for borrowers' credit scores.

We first test for heterogeneity in treatment effects by race and ethnicity. Conditional on educational attainment, Black borrowers take on more student loan debt (Scott-Clayton, 2018), and Black and Hispanic borrowers face a higher risk of default (Haughwout et al., 2019), both factors that may lead to larger benefits from a lower or \$0 IDR payment. Panel A of Figure 13 shows estimates of $\beta_1$ from equation (2), in which observations are weighted by the predicted probability of belonging to the indicated racial/ethnic group. The left two panels plot estimated effects on the probability of delinquency or default after initial application submission through the end of our panel, measured in 6-month intervals. In the short run, those with a high predicted probability of being Black borrowers see the largest reductions in delinquency and default risk, but over the longer run, the effects are fairly similar across racial groups. The right two panels show effects on the probability of ever being delinquent or ever defaulting since initially applying and suggest that benefits for Black borrowers are largest over the longer run, although sufficiently imprecise by the end of the panel that they are not statistically distinguishable from estimates for those with a high predicted probability of being Hispanic or White borrowers.

Next, we turn to examine heterogeneity by educational attainment. Although borrowers who do not complete their undergraduate degrees tend to take on less student loan debt, they also default at a higher rate (Hillman, 2014; Mezza and Sommer, 2016). Panel B of Figure 13 displays estimated effects on default and delinquency for three mutually exclusive subgroups defined by educational attainment at the time of initial IDR application: first-year undergraduates (i.e., likely drop outs), other undergraduates, and graduate borrowers. The initial benefits from a $0 payment are larger for borrowers with lower attainment. In their first year after applying, undergraduate drop outs experience substantially larger reductions in delinquency and default than borrowers from other groups when they are eligible for a $0 payment. Likewise, other undergraduate borrowers receive larger benefits than graduate borrowers. Longer-term effects on the probability of ever becoming delinquent or defaulting following initial IDR application remain significantly larger in magnitude for drop outs, but differences in effects between other undergraduates and graduate borrowers are no longer statistically distinguishable.

In the final set of analyses, we test for heterogeneity by whether a borrower has ever defaulted on a student loan in the past. Past default is a strong predictor of future repayment difficulties. For instance, Consumer Financial Protection Bureau (2017) reports that over 40 percent of borrowers who enter and leave default will ultimately default again in the next 3 years. Panel C of Figure 13 shows that prior defaulters see significantly larger short run benefits from initial eligibility for a $0 payment in terms of reductions in defaults and delinquency risk. longer run effects on the probability of ever defaulting remain significantly larger in magnitude for prior defaulters over the remainder of the panel.

In summary, borrowers who may be more likely to struggle to keep up with their student loan payments and those who have struggled in the past experience larger benefits when they are eligible for a $0 payment on IDR.

# 6 Mechanisms

Thus far, we have remained agnostic as to the channels through which eligibility for a $0 payment affects borrowers outcomes. At the 150 percent FPL threshold, borrowers potentially are exposed to two different treatments: a reduction in monthly payments (and corresponding relaxation of their budget constraint) and a relaxation of the requirement to remit any payment to their loan servicer. Why are these considered different treatments? In the short run, even a borrower who could afford a monthly payment of \$10 could forget to make the payment in a given month, especially if they are not signed up for automatic payments. For such a borrower, waiving the requirement to make any payment would reduce their risk of delinquency and default by eliminating the cost of their inattention. Further, removing the requirement to make monthly payments for an entire year may increase the risk that a borrower becomes disconnected from the federal loan system over the longer term by reducing the salience of the requirement to reapply. In both cases, the additional dimension of treatment that operates through a \$0 payment comes from borrowers' inattention.

We cannot separately identify these effects using the discontinuity alone in an instrumental variables strategy. This is because the existence of the additional treatment dimension represents a violation of the exclusion restriction, i.e., having income below the \$0 DI threshold potentially affects outcomes through multiple mechanisms. However, our identifying variation also results in a discontinuous change in the *slope* of the relationship between discretionary income and scheduled payments. Given additional assumptions, this kink can be used as an additional source of identifying variation. In this section, we outline these assumptions and show how estimates using the kink and discontinuity can be combined to separately identify these treatment dimensions.

We first test whether estimates of the effect of a marginal increase in monthly payments is the same when using the discontinuity versus the kink for identification. To use the kink in the IDR payment schedule for identification, additional assumptions are required beyond those discussed in Section 4. Analogous to the RD design, using a discontinuity in first derivatives requires the assumption of continuity in the first and second derivatives of potential outcomes across the \$0 DI threshold. Figure 3 provides support for this assumption, as there is no evidence of a kink in the density of first-time applicants. Although the change in the slope of the composite index of baseline characteristics – shown in Appendix Figure A.5 – is marginally significant, it is small in magnitude, representing a 0.001 decrease in the predicted probability of default per \$1,000 increase in AGI above the threshold.[34]

We estimate instrumental variables (IV) models in which average scheduled payments over the 12 months following a borrower's initial application is the endogenous regressor and either $\mathbf{1}\left[DI_i \leq 0\right]$

[34] Appendix Table A.1 contains point estimates of the change in the slope of baseline observable characteristics and the index.

(the discontinuity) or $DI_i \mathbf{1}[DI_i \leq 0]$ (the kink) serves as the omitted variable. Equation (2) is the reduced form equation. The first stage estimating equation is:

$$P_i = \delta_t + \gamma_0 DI_i + \gamma_1 \mathbf{1}[DI_i \leq 0] + \gamma_2 DI_i \mathbf{1}[DI_i \leq 0] + \varepsilon_{it}, \tag{3}$$

where $P_i$ is borrower $i$'s monthly payment in their first year on IDR and $DI_i$ is their discretionary income. The hypothesis we test is:

$$\mathrm{H}_0 : \frac{\beta_1}{\gamma_1} = \frac{\beta_2}{\gamma_2}. \tag{4}$$

Table 6 shows IV-RD (Panel A) and IV-RK (Panel B) estimates for the effect of a marginal increase in monthly payments on delinquency, default, forbearance, and IDR reenrollment, by years since initial application submission. Heteroskedascity-robust standard errors are in parentheses and the $p$-value from the test of the hypothesis in equation (4) is shown below each set of estimates.[35]

In the first year after initial application submission, we reject the hypothesis of equal IV-RD and IV-RK treatment effects with $p < 0.01$ for delinquency, default, and reapplication for IDR, and with $p < 0.05$ for forbearances. Treatment effects on repayment outcomes all indicate that reductions in payments also reduce the risk of delinquency, default, and forbearance, but the magnitude of IV-RD estimates are substantially larger. For instance, using the discontinuity for identification suggests that a \$10 reduction in monthly payments leads to a 8.5 percentage point reduction in the risk of default, while the estimate obtained from IV models that use the kink for identification suggest a much smaller reduction of 0.2 percentage points per \$10 decrease in monthly payments.

Two and three years after initial application, we continue to reject the hypothesis of statistically indistinguishable effects of (initial) monthly payments for most outcomes at conventional significance levels. For 7 out of the 8 outcomes we examine, $p$-values remain below 0.1. In the case of the effects on forbearances, reapplications, and IDR persistence, the IV-RD and IV-RK estimates also have different signs, with RD estimates indicating that lower first-year payments lead to significant increases in forbearances and significant decreases in IDR persistence over the longer run and RK estimates indicating the opposite. These patterns suggest that eligibility for a \$0 payment affects

[35] Reduced form estimates of the kink in outcomes – $\beta_2$ in equation (2) – are shown in Appendix Table A.2.

outcomes through more than just a reduction in monthly payment amounts.[36]

### 6.1 Identification of multiple treatment parameters

To separately identify the effects of variation in the intensive and extensive payment margins, we impose two additional assumptions. The first is that the treatment effect of a marginal increase in monthly payments is locally constant.[37] If facing a $0 payment obligation only affects outcomes through the reduction in payment *amount*, then we should not reject the hypothesis in equation (4), but for most outcomes, we do reject this hypothesis. The second assumption is that of additive separability of the intensive and extensive margin effects of payment amounts (i.e., we rule out treatment effect interactions between the impact of *whether* payments need to be made versus impacts from the *amount* of scheduled payments).

Let $\tau_P$ represent the effect of a marginal increase in the payment burden on a given outcome and $\tau_0$ be the extensive margin effect. During the first 12 months on IDR, $\tau_0$ can be thought of as the effect of waiving the requirement to make payments, above and beyond the effect of the payment burden on a borrower's budget constraint, e.g., through reducing the cost of inattention. After a borrower's first year on IDR, $\tau_0$ can be interpreted as the remaining impact on the probability that a borrower attends to the requirement to reapply for IDR (i.e., a "disconnection" effect). Under the assumptions of additive separability and locally constant treatment effects, outcome $Y$ for borrower $i$ with discretionary income $DI_i$ and monthly payment $P_i$ can be written as:

$$Y_i = \mathbf{1}\left[P_i = 0\right]\tau_0 + P_i\tau_P + f(DI_i) + \epsilon_i, \tag{5}$$

where $P_i = g(DI_i)$ as defined in equation (1).[38]

[36] Card et al. (2015) show that in the presence of a discontinuity and a kink, additional restrictions on treatment effect heterogeneity are required for the regression kink (RK) estimator to identify a causal effect. Thus, one interpretation of the results in 6 is that of heterogeneous treatment effects of monthly payments. In the following subsection, we outline additional assumptions about the functional form of this heterogeneity that allow us to separately identify the effect of waiving payment requirements from a marginal reduction in monthly payments.

[37] An example of a violation of this assumption is the case in which a marginal increase in monthly payments from $10 to $11 has a different effect than a marginal increase in monthly payments from $1 to $2.

[38] For the case of imperfect compliance, payments are not a fully deterministic function of discretionary income, so that $P_i = g(DI_i, v_i)$, where $v_i$ is an unobserved factor that may be correlated with borrower outcomes but is continuous and continuously differentiable at the $0 payment threshold.

Given equation (5), the reduced form RD estimator can be written as:

$$\begin{aligned}
&\lim_{di \uparrow 0} E\left[Y|DI = di\right] - \lim_{di \downarrow 0} E\left[Y|DI = di\right] \\
&= \tau_0 \left( \lim_{di \uparrow 0} \Pr(P = 0|DI = di) - \lim_{di \downarrow 0} \Pr(P = 0|DI = di) \right) \\
&\quad + \tau_P \left( \lim_{di \uparrow 0} E\left[P|DI = di\right] - \lim_{di \downarrow 0} E\left[P|DI = di\right] \right).
\end{aligned} \tag{6}$$

With perfect compliance to the IDR payment formula in Section 4, the expression in the first set of parentheses in equation (6) will resolve to 1 and the expression in the bottom set of parentheses will resolve to \$10 (the minimum monthly IDR payment). In the absence of perfect compliance, the empirical counterpart of the second term will be $\gamma_1$ in equation (3). Similarly, the empirical counterpart to the first term will be $\pi_1$ in the additional first-stage equation:

$$\mathbf{1}\left[P_{it} = 0\right] = \lambda_t + \pi_0 DI_{it} + \pi_1 \mathbf{1}\left[DI_{it} \leq 0\right] + \pi_2 DI_{it} \mathbf{1}\left[DI_{it} \leq 0\right] + \nu_{it}. \tag{7}$$

Replacing population parameters in equation (6) with their empirical counterparts yields an expression for the RD estimand that is a function of the two treatment dimensions and first stage estimates of the discontinuities in payments and the probability of a \$0 payment: $\pi_1\tau_0 + \gamma_1\tau_P$. If $\tau_0 \neq 0$ and $\pi_1 \neq 0$, IV-RD estimates of the effect of a marginal increase in payments will equal $\frac{\pi_1}{\gamma_1}\tau_0 + \tau_P$ and will not recover the causal effect of a marginal increase in scheduled payments ($\tau_P$).

The regression kink (RK) estimator can be written as:

$$\begin{aligned}
&\lim_{di \uparrow 0} \left[\frac{\partial Y|DI = di}{\partial DI}\right] - \lim_{di \downarrow 0} \left[\frac{\partial Y|DI = di}{\partial DI}\right] \\
&= \tau_P \left( \lim_{di \uparrow 0} \left[\frac{\partial P|DI = di}{\partial DI}\right] - \lim_{di \downarrow 0} \left[\frac{\partial P|DI = di}{\partial DI}\right] \right).
\end{aligned} \tag{8}$$

The empirical counterpart to the term inside the parentheses in equation (8) is the change in the slope of the relationship between scheduled payments and distance to the \$0 discretionary income threshold, or $\gamma_2$ in equation (3). This implies that the IV-RK estimator will represent a causal effect of a marginal increase in scheduled payments.

Note that equations (6) and (8) are interpretable as the reduced form change in the level and the reduced form change in the slope of the outcome at the \$0 discretionary income threshold, or $\beta_1$ and $\beta_2$ in equation (2). These expressions can be combined to produce expressions for $\tau_0$ and $\tau_P$ that are only functions of estimatable parameters:

$$\tau_P = \frac{\beta_2}{\gamma_2} \tag{9}$$

$$\tau_0 = \frac{\beta_1}{\pi_1} - \left(\frac{\beta_2}{\gamma_2}\right)\left(\frac{\gamma_1}{\pi_1}\right). \tag{10}$$

The first term in equation (10) — $\frac{\beta_1}{\pi_1}$ — is equivalent to the IV-RD estimand when $\mathbf{1}[P_i = 0]$ is the endogenous regressor. The second term — $\frac{\beta_2}{\gamma_2}$ — is equivalent to the IV-RK estimand when $P$ is the endogenous regressor. The third term — $\frac{\gamma_1}{\pi_1}$ — is the ratio of the first stage discontinuity in payment amounts to the first stage discontinuity in the probability of a \$0 payment. Intuitively, if a \$0 payment affects a borrower through both a reduction in payment burden and through modifying the cost of inattention, then the RD estimate of \$0 payment treatment effects will represent the combined effects of these parameters. The assumption of locally constant treatment effects and additive separability means that we can partial out the payment portion of the effect using the IV-RK estimate (i.e., since these assumptions imply there is no kink in the effect of waiving payment requirements) scaled by the relative magnitude of the first stages.

### 6.2 Estimation and results

To generate estimates of $\tau_0$, we jointly estimate the two first stage equations (3) and (7) with the reduced form equation (2) and replace the quantities in equation (10) with estimates of each coefficient. Standard errors are calculated using the delta method. The IV-RK estimates shown in Table 6 can be interpreted as estimates of $\tau_P$.

Table 7 contains these estimates. The results in Panel A indicate that in a borrower's initial year on IDR, eliminating the requirement to make payments reduces delinquency risk by 26 percentage points. In comparison to the estimates of $\tau_P$ (i.e., IV-RK estimates in Table 6), this is approximately the same effect as a \$330 reduction in monthly payments. Waiving payment requirements leads to smaller but still significant reductions in default risk (approximately 3 percentage points) and forbearance use (approximately 7 percentage points). If the benefits of removing the payment requirement accrue through reducing the cost of inattention to monthly payment requirements, these results suggest that the cost of such inattention is quite high.

The estimates of $\tau_P$ in Table 6 suggest that a marginal decrease in monthly payments increases the likelihood that a borrower reapplies for IDR by 0.6 percentage points per $10 reduction in monthly payments. In contrast, estimates of $\tau_0$ shown in Table 7 suggest that waiving the requirement to make payments has the opposite effect and results in a 1.7 percentage point reduction in the probability of reapplying in year 1 and a 3.4 percentage point reduction in year 2. The resulting effect on IDR participation is a 3-to-3.5 percentage point reduction in both the second and third years after initial application. The consequence is a significant increase in delinquency (4 and 2 percentage points in years 2 and 3, respectively) and forbearance (2 and 1 percentage points). Increases in default are only present in year 3 (0.8 percentage points). These effects are also consistent with a sizable cost of inattention, in this case, to the requirement to reapply for IDR.

# 7 Conclusion

The IDR program impacts an increasingly large share of student loan borrowers who hold the majority of outstanding student loan debt. Many IDR participants qualify for $0 payments. A key question is whether lower (or no) monthly loan payments on IDR helps improve borrower repayment outcomes. We show that $0 payments do protect borrowers by staving off delinquency and default in the short term. Nonetheless, the dynamics over time suggest that in the presence of annual reapplication requirements, many borrowers see only temporary protection from repayment difficulties. Borrowers who initially qualify for a $0 monthly payment are significantly less likely to submit an IDR recertification application and, as a result, see significant reductions in persistence on IDR. We provide evidence that the short-run benefits from $0 payments come from both a relaxation of borrowers' budget constraints and through reducing the cost of inattention to payment requirements, with the latter channel dominating. Our results are consistent with inattention (to reapplication requirements) driving the longer-run effects of $0 payments as well, likely due to borrowers becoming disconnected from the loan repayment system.

The timing and frequency of recertification requirements has been studied in the context of other U.S. means-tested benefit programs, such as the Supplemental Nutrition Assistance Program, cash welfare, and public health insurance (Ribar et al., 2008; Pei, 2017; Gray, 2019). In addition to examining the traditional trade-offs between type I and type II errors (Kleven and Kopczuk, 2011), recent papers also shed light on the role of behavioral factors such as misperceptions of estimated benefits or inattention (Homonoff and Somerville, 2021; Finkelstein and Notowidigdo, 2019). Our results suggest that policies that reduce the cost of inattention – either through longer recertification periods or policies that increase the salience of recertification requirements – may provide substantial benefits to borrowers. One such policy is the provisions for automatic recertification due to the 2019 FUTURE Act. Beginning in 2023, borrowers in IDR will be able to provide consent for their income to be provided on an annual basis such that they will automatically be recertified for IDR. Our results suggest this policy has the potential to increase the longer-run insurance benefits of IDR participation.

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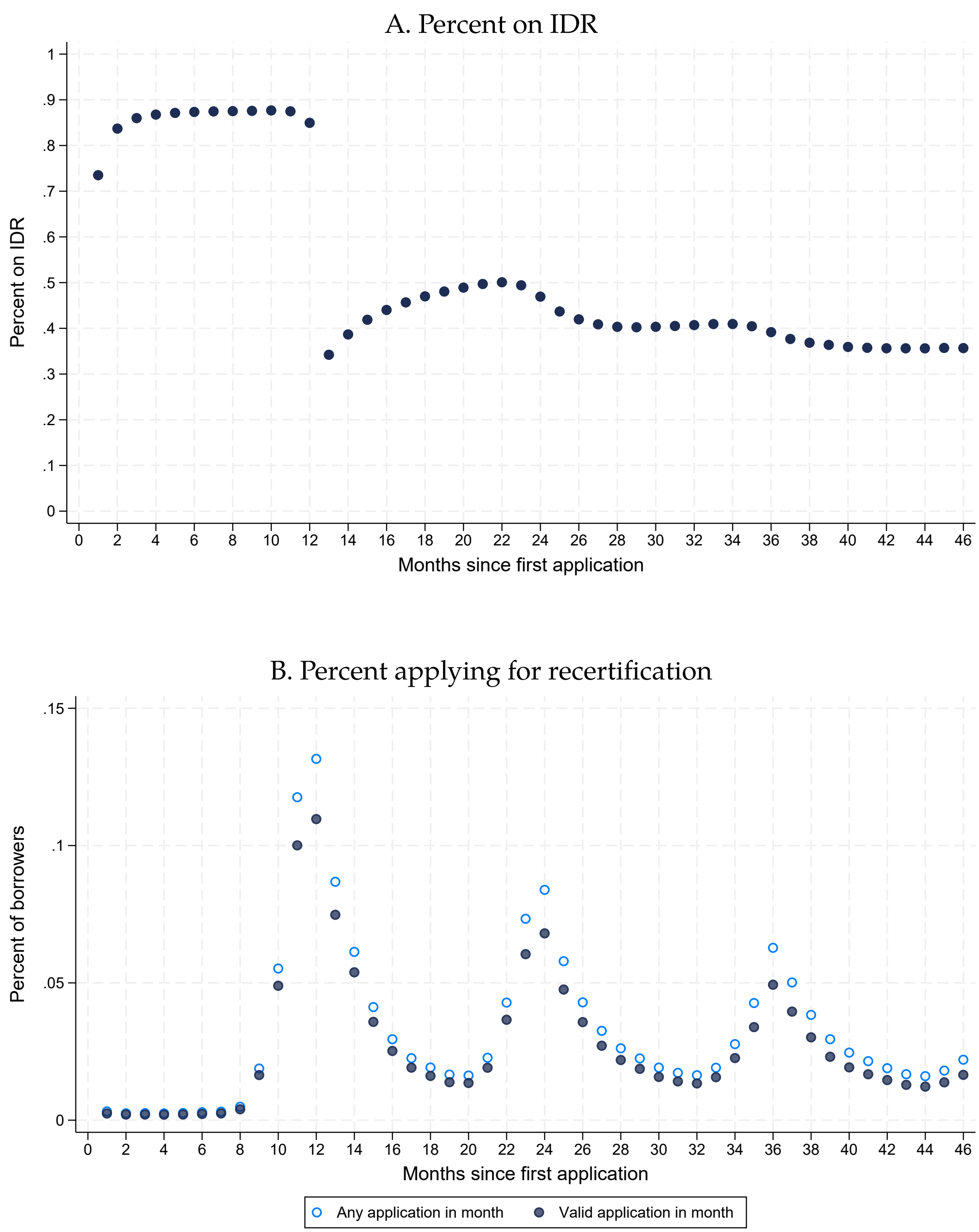
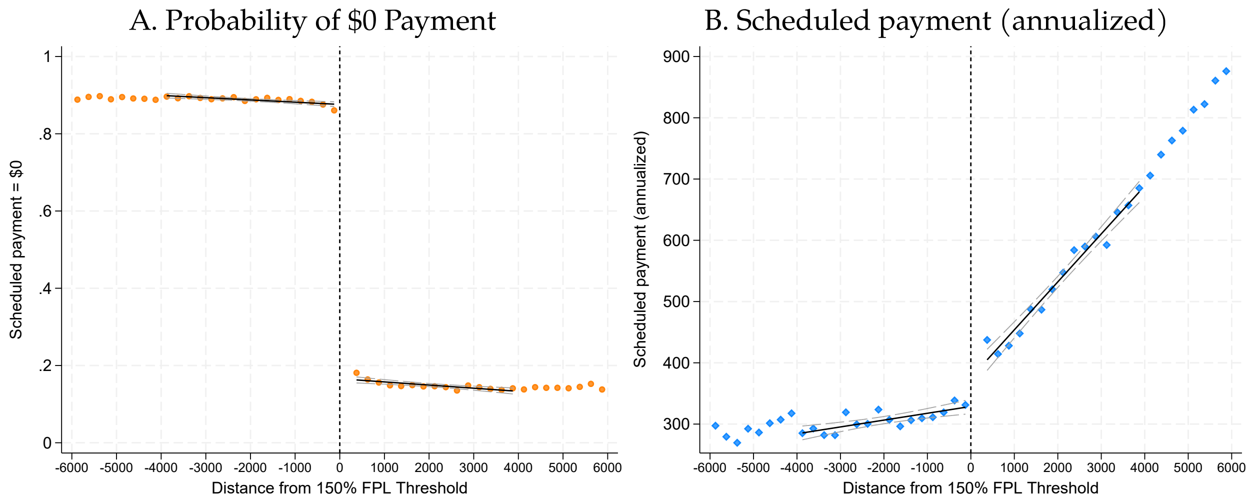
## Figures and Tables

Figure 1: IDR Participation and Recertification by Months Since Initial Application



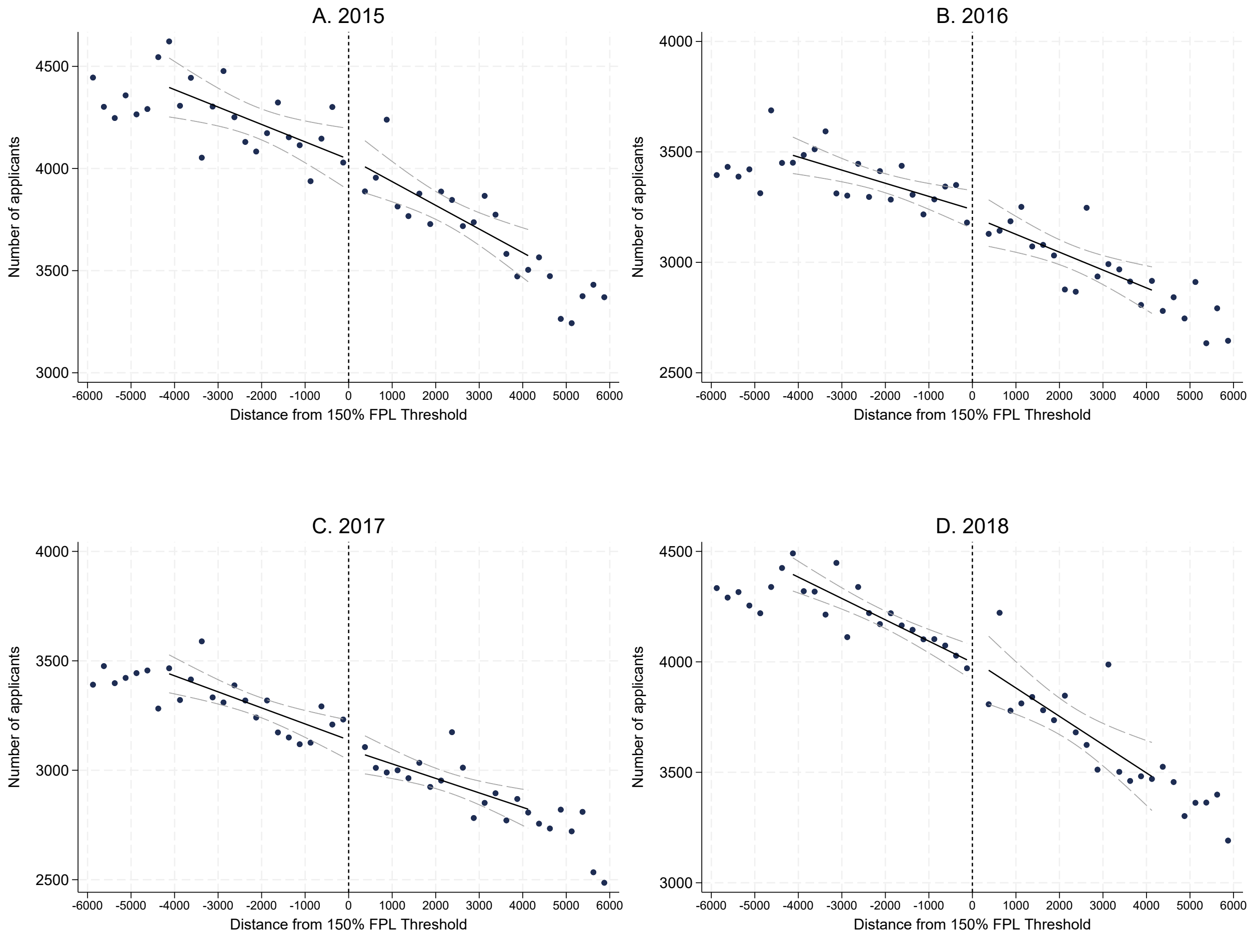

*Notes*: The sample includes first-time IDR applicants in 2015 through 2018. First-time IDR applicants are defined as those who submitted an IDR application in 2015-2018 for the first time and never had a loan in an IDR repayment plan. Recertification applications are defined as subsequent applications submitted by first-time applicants successfully enrolled in an IDR plan after their first application submission. Valid applications are IDR applications that are approved.

Figure 2: Scheduled Payments by Distance to $0 Discretionary Income Threshold, 9 Months After Initial IDR Application



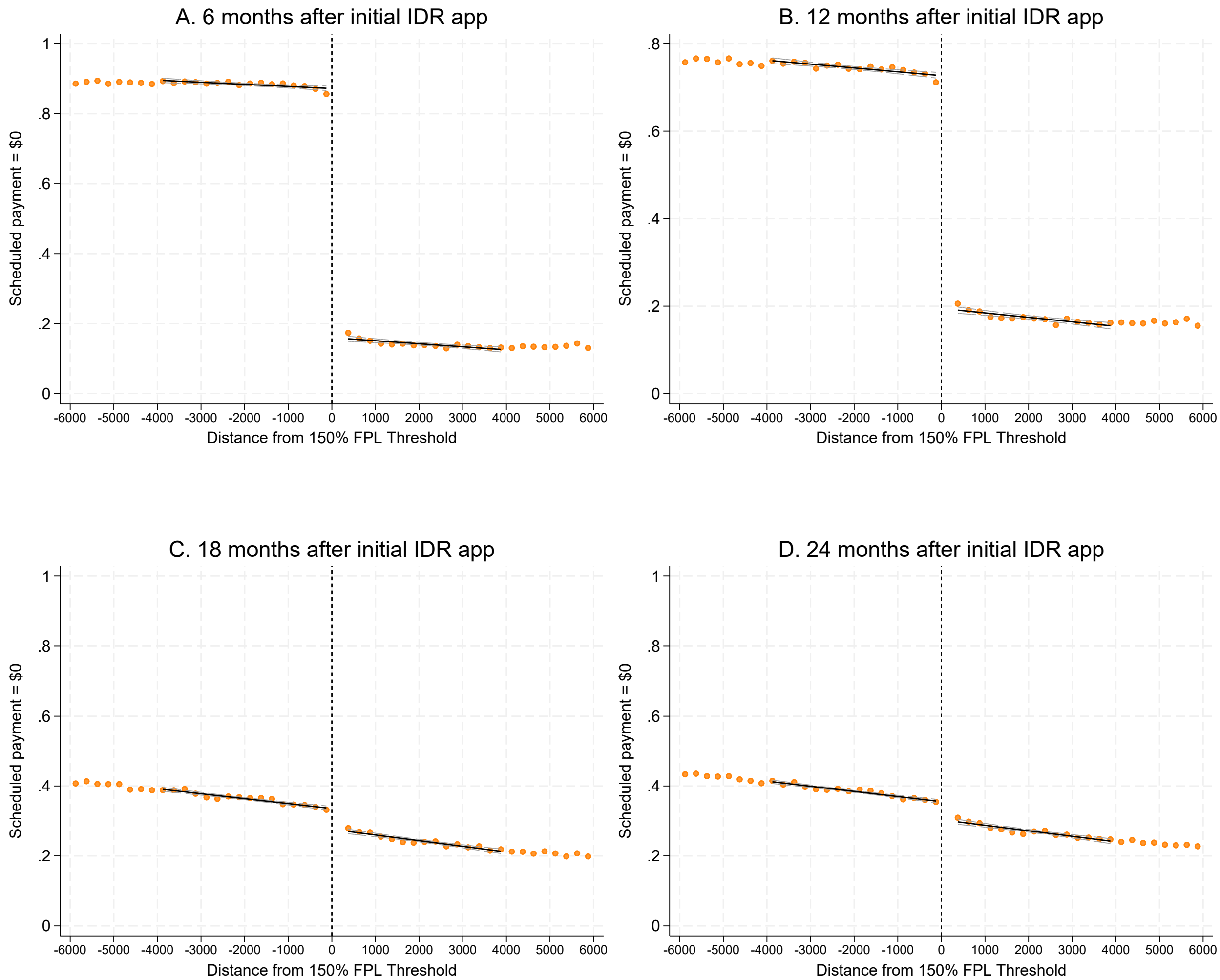

*Notes*: Sample includes first-time IDR applicants in 2015 through 2018 who had income within $6,000 of the $0 discretionary income threshold and a non-missing scheduled payment 9 months after initial application. Scatter plots of the probability of a $0 payment (Panel A) or average scheduled payment (Panel B) within a $250 income bin, by distance to the $0 discretionary income cutoff (150% FPL). Each bin contains between 13,000 and 18,000 IDR applicants, pooling across 2015-2018 application cohorts. A "donut" of applicants with income between $0 and $200 above the 150% FPL cutoff is excluded from the sample; see Section 4 for details. Annualized scheduled payment is measured by summing monthly scheduled payments for all loans held by the applicant and multiplying by 12. Dark lines represent OLS estimates of the outcome by distance to the $0 payment threshold, estimated separately on either side of the threshold for applicants within a $4,350 bandwidth around the cutoff (weighted by the underlying number of individuals in each bin). Dashed gray lines represent 95% confidence intervals for OLS estimates, based on heteroskedasticity robust standard errors.

Figure 3: Number of IDR Applicants by Distance to $0 Discretionary Income Threshold



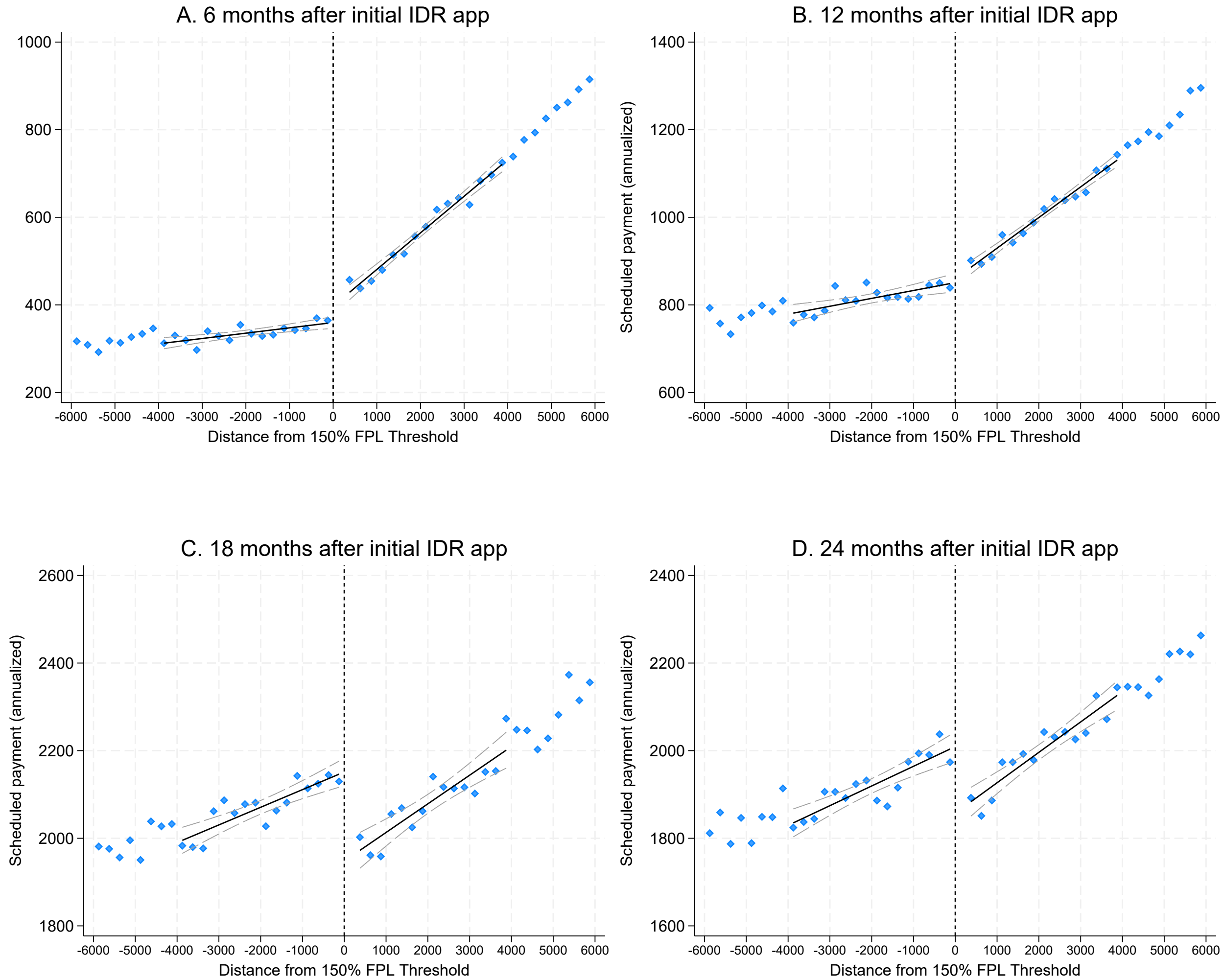

*Notes*: Sample includes first-time IDR applicants in 2015 through 2018 who had income within $6,000 of the $0 discretionary income threshold. Scatter plots of the number of first-time IDR applicants within a $250 income bin, by distance to the $0 discretionary income cutoff (150% FPL). Dark lines represent OLS estimates of the outcome by distance to the $0 discretionary income threshold, estimated separately on either side of the threshold for applicants within a $4,350 bandwidth around the cutoff (weighted by the underlying number of individuals in each bin). Dashed gray lines represent 95% confidence intervals for OLS estimates, based on heteroskedasticity robust standard errors.

Figure 4: Probability of Scheduled $0 Payment, by Distance to $0 Discretionary Income Threshold




*Notes*: Sample includes first-time IDR applicants in 2015 through 2018 who had income within $6,000 of the $0 discretionary income threshold and a nonmissing scheduled payment in the specified time period, measured by months since the date of the first IDR application. Each bin contains between 13,000 and 18,000 IDR applicants, pooling across 2015-2018 application cohorts. Scatter plots of the probability of having a scheduled $0 payment within a $250 income bin, by distance to the $0 discretionary income threshold (150% FPL). Dark lines represent OLS estimates of the outcome by distance to the $0 discretionary income threshold, estimated separately on either side of the threshold for applicants within a $4,350 bandwidth around the cutoff (weighted by the underlying number of individuals in each bin). Dashed gray lines represent 95% confidence intervals for OLS estimates, based on heteroskedasticity robust standard errors.

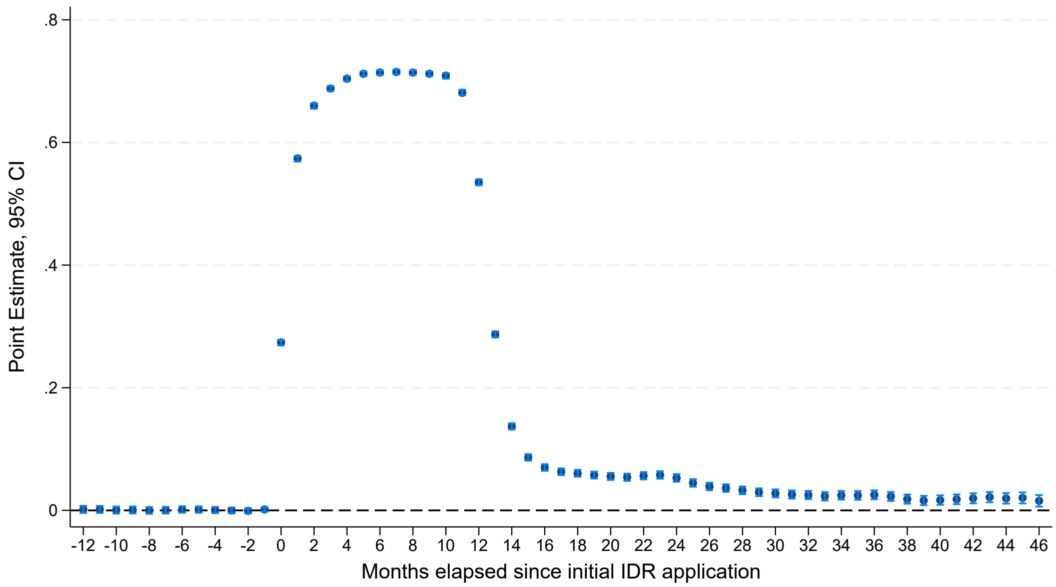
Figure 5: Average Scheduled Payment (Annualized), by Distance to $0 Discretionary Income Threshold



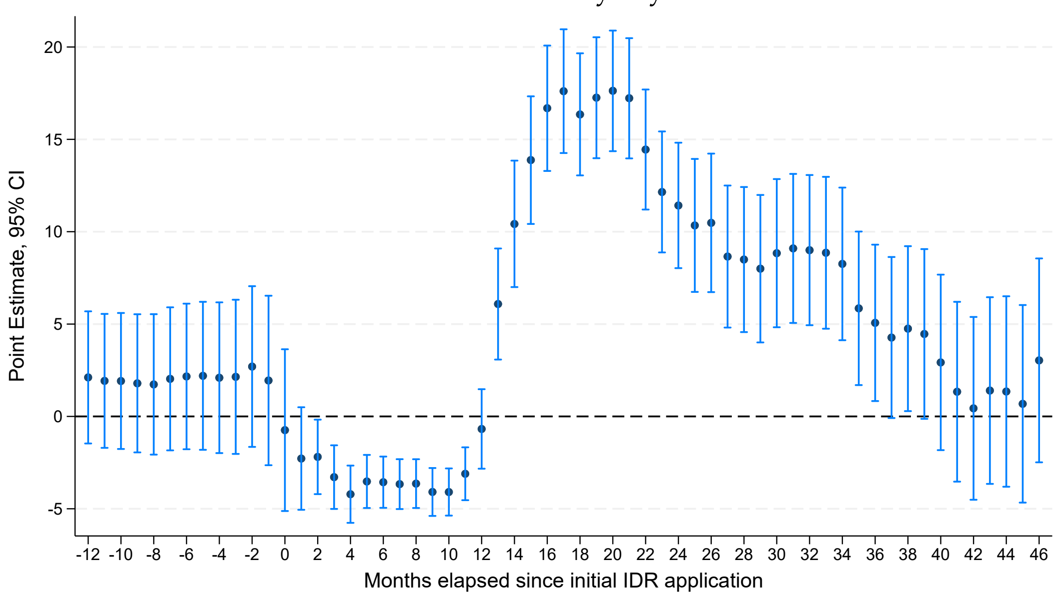

*Notes*: Sample includes first-time IDR applicants in 2015 through 2018 who had income within $6,000 of the $0 discretionary income threshold and a nonmissing scheduled payment in the specified time period, measured by months since the date of the first IDR application. Each bin contains between 13,000 and 18,000 IDR applicants, pooling across 2015-2018 application cohorts. Scatter plots of average scheduled monthly payments (multiplied by 12 to represent an annual amount) within a $250 income bin, by distance to the $0 discretionary income threshold (150% FPL). Dark lines represent OLS estimates of the outcome by distance to the $0 discretionary income threshold, estimated separately on either side of the threshold for applicants within a $4,350 bandwidth around the cutoff (weighted by the underlying number of individuals in each bin). Dashed gray lines represent 95% confidence intervals for OLS estimates, based on heteroskedasticity robust standard errors.

Figure 6: First Stage Estimates by Months Since Initial Application

A. Probability of $0 Payment

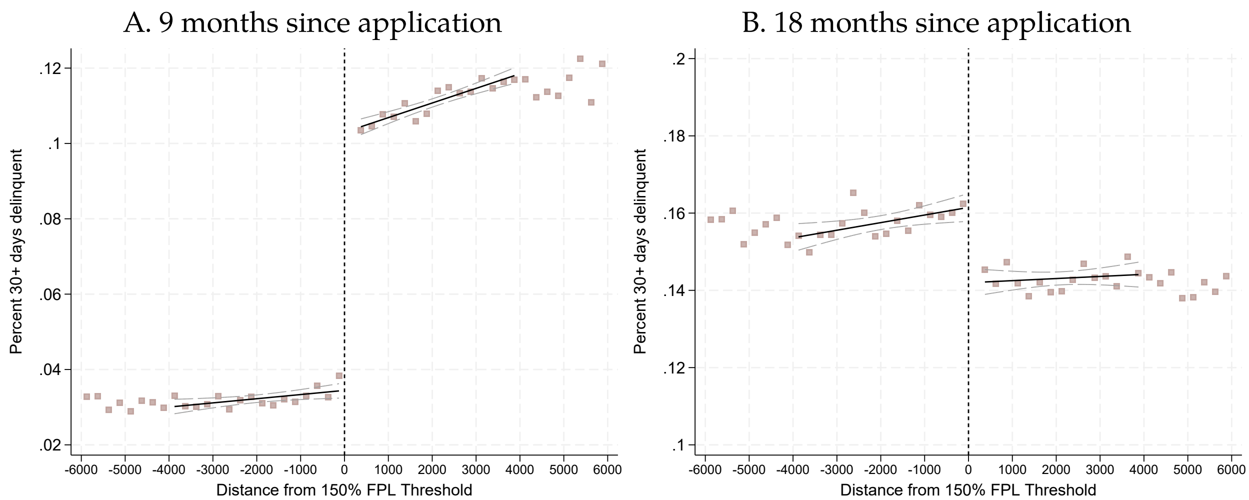


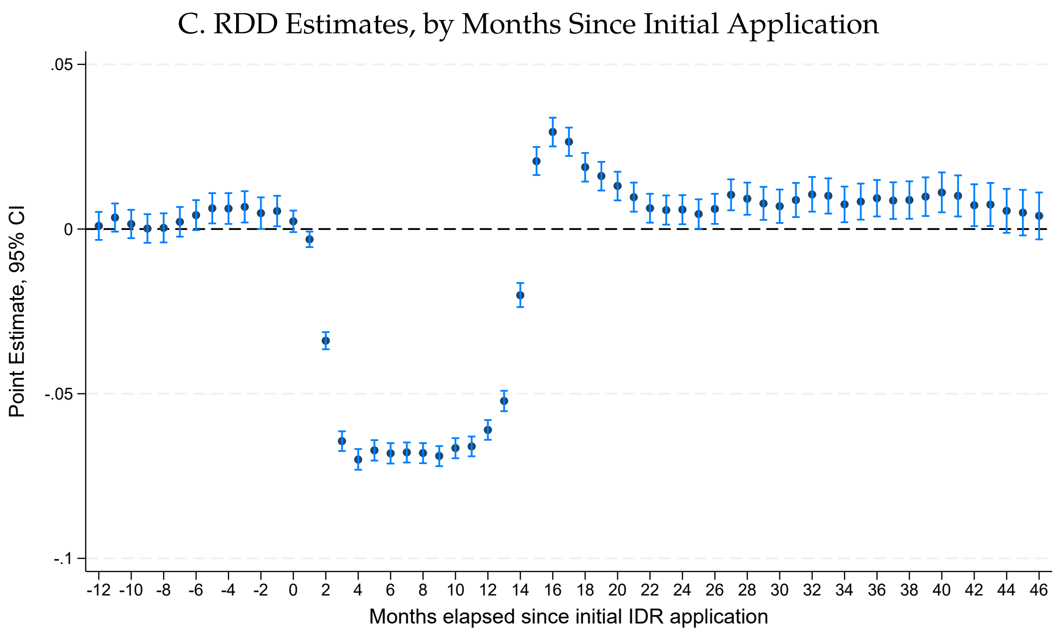

B. Scheduled Monthly Payment




*Notes*: Sample includes first-time IDR applicants in 2015 through 2018 who had income within $4,350 of the $0 discretionary income threshold and a nonmissing scheduled payment in the specified time period, measured by months since the date of the first IDR application, with negative months corresponding to months prior to initial application. OLS estimates of $\beta_1$ from equation (2) and 95% confidence intervals based on heteroskedasticity robust standard errors. In Panel A, the outcome is an indicator for $0 scheduled payment. Panel B uses scheduled monthly payment as the outcome. Outcomes are measured monthly since the date of first IDR application.

Figure 7: Reduced Form Impacts on Borrower Delinquency (30+ Days)

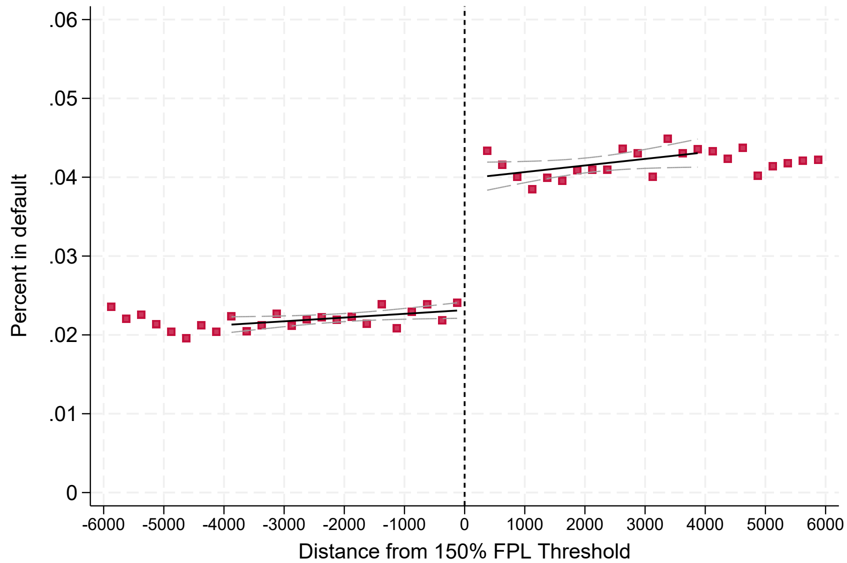


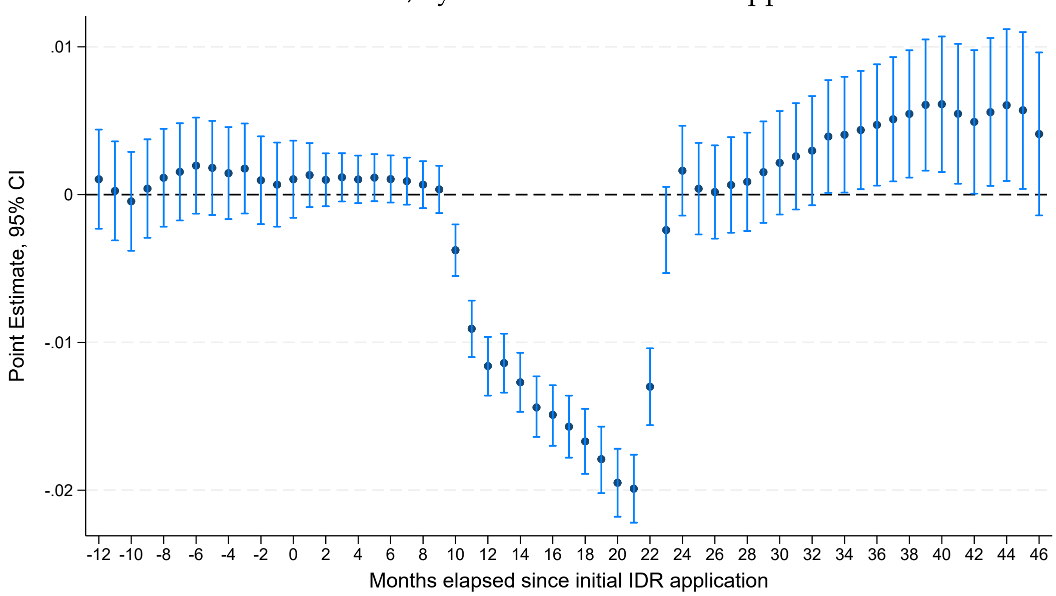

*Notes*: Sample includes first-time IDR applicants in 2015 through 2018 who had income within \$6,000 of the \$0 discretionary income threshold (Panels A and B) or within \$4,350 of the threshold (Panel C). Panels A and B are scatter plots of the probability of being 30 or more days delinquent on a student loan payment in the specified time period within a \$250 income bin, by distance to the \$0 discretionary income threshold (150% FPL). Dark lines represent OLS estimates of the outcome by distance to the \$0 discretionary income threshold, estimated separately on either side of the threshold for applicants within a \$4,350 bandwidth around the cutoff (weighted by the underlying number of individuals in each bin). Dashed gray lines represent 95% confidence intervals for OLS estimates, based on heteroskedasticity robust standard errors. Panel C shows OLS estimates of $\beta_1$ from equation (2) and 95% confidence intervals based on heteroskedasticity robust standard errors; the outcome is the probability of being 30 or more days delinquent with a student loan payment in the indicated number of months before or after the borrower's first IDR application.

Figure 8: Reduced Form Impacts on Borrower Default

A. 18 Months After Initial Application

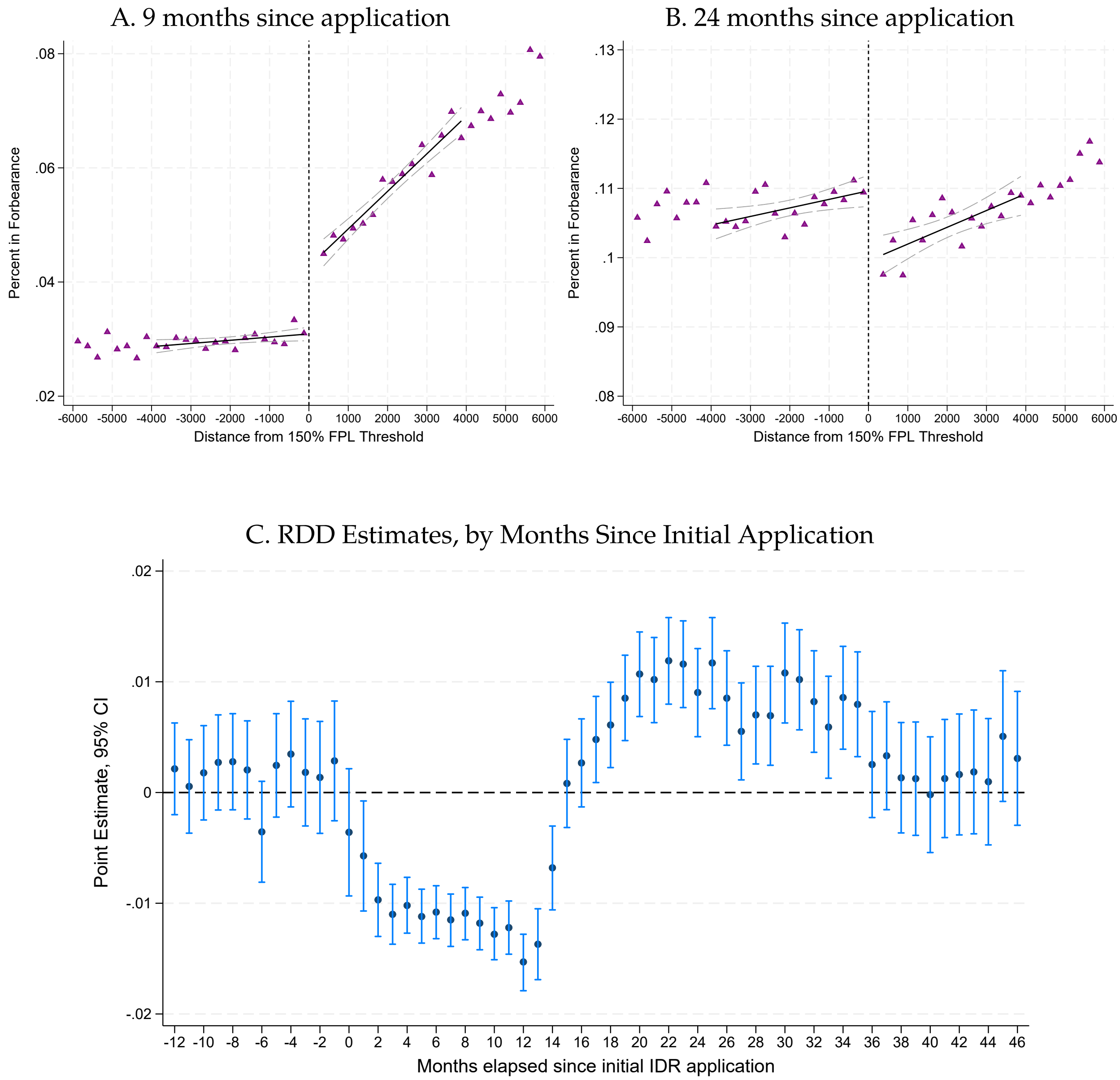



B. RDD Estimates, by Months Since Initial Application



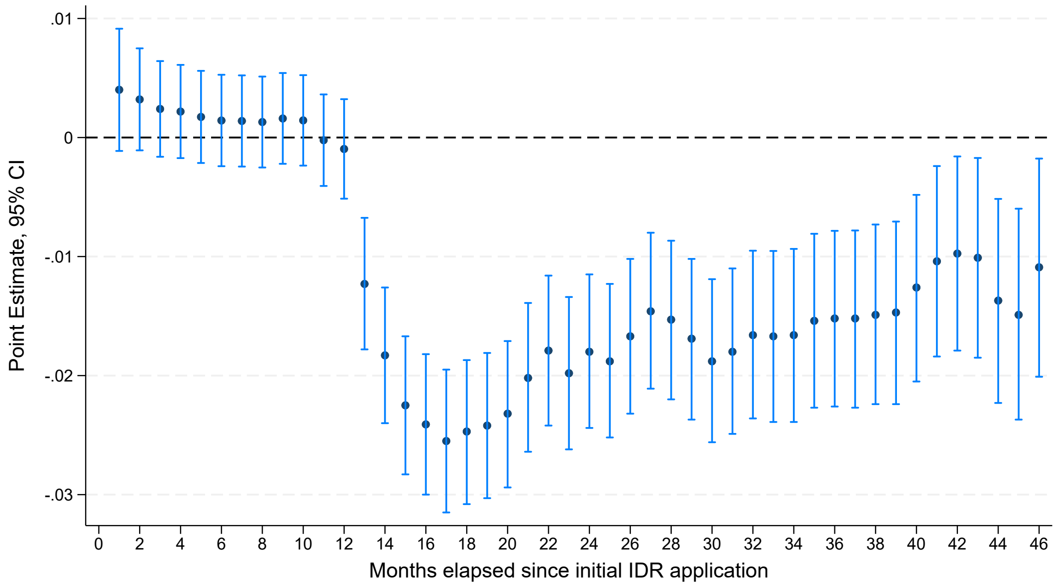

*Notes*: Sample includes first-time IDR applicants in 2015 through 2018 who had income within \$6,000 of the \$0 discretionary income threshold (Panel A) or within \$4,350 of the threshold (Panel B). Panel A is a scatter plot of the probability of being in default on a student loan 18 months after the borrower's first IDR application within a \$250 income bin, by distance to the \$0 discretionary income threshold (150% FPL). Dark lines represent OLS estimates of the outcome by distance to the \$0 discretionary income threshold, estimated separately on either side of the threshold for applicants within a \$4,350 bandwidth around the cutoff (weighted by the underlying number of individuals in each bin). Dashed gray lines represent 95% confidence intervals for OLS estimates, based on heteroskedasticity robust standard errors. Panel B shows OLS estimates of $\beta_1$ from equation (2) and 95% confidence intervals based on heteroskedasticity robust standard errors; the outcome is the probability of being in default on a student student loan in the indicated number of months before or after the borrower's first IDR application.

Figure 9: Reduced Form Impacts on Forbearance



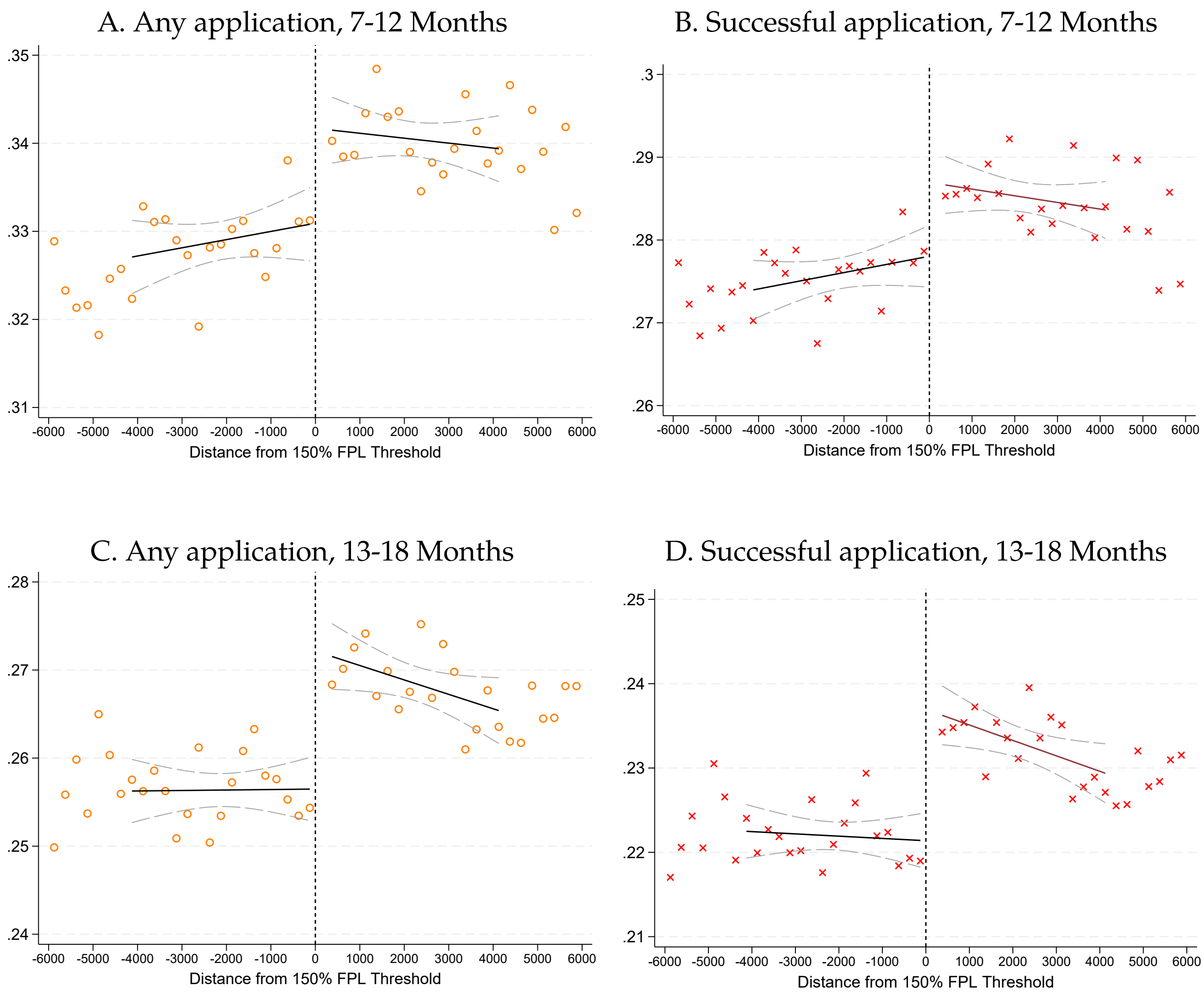

*Notes*: Sample includes first-time IDR applicants in 2015 through 2018 who had income within $6,000 of the $0 discretionary income threshold (Panels A and B) or within $4,350 of the threshold (Panel C). Panels A and B are scatter plots of the probability of having a student loan in forbearance in the specified time period within a $250 income bin, by distance to the $0 discretionary income threshold (150% FPL). Dark lines represent OLS estimates of the outcome by distance to the $0 discretionary income threshold, estimated separately on either side of the threshold for applicants within a $4,350 bandwidth around the cutoff (weighted by the underlying number of individuals in each bin). Dashed gray lines represent 95% confidence intervals for OLS estimates, based on heteroskedasticity robust standard errors. Panel C shows OLS estimates of $\beta_1$ from equation (2) and 95% confidence intervals based on heteroskedasticity robust standard errors; the outcome is the probability of having a student loan in forbearance in the indicated number of months before or after the borrower's first IDR application.

Figure 10: RD Estimates on Persistence in IDR Program by Months Since Initial IDR Application



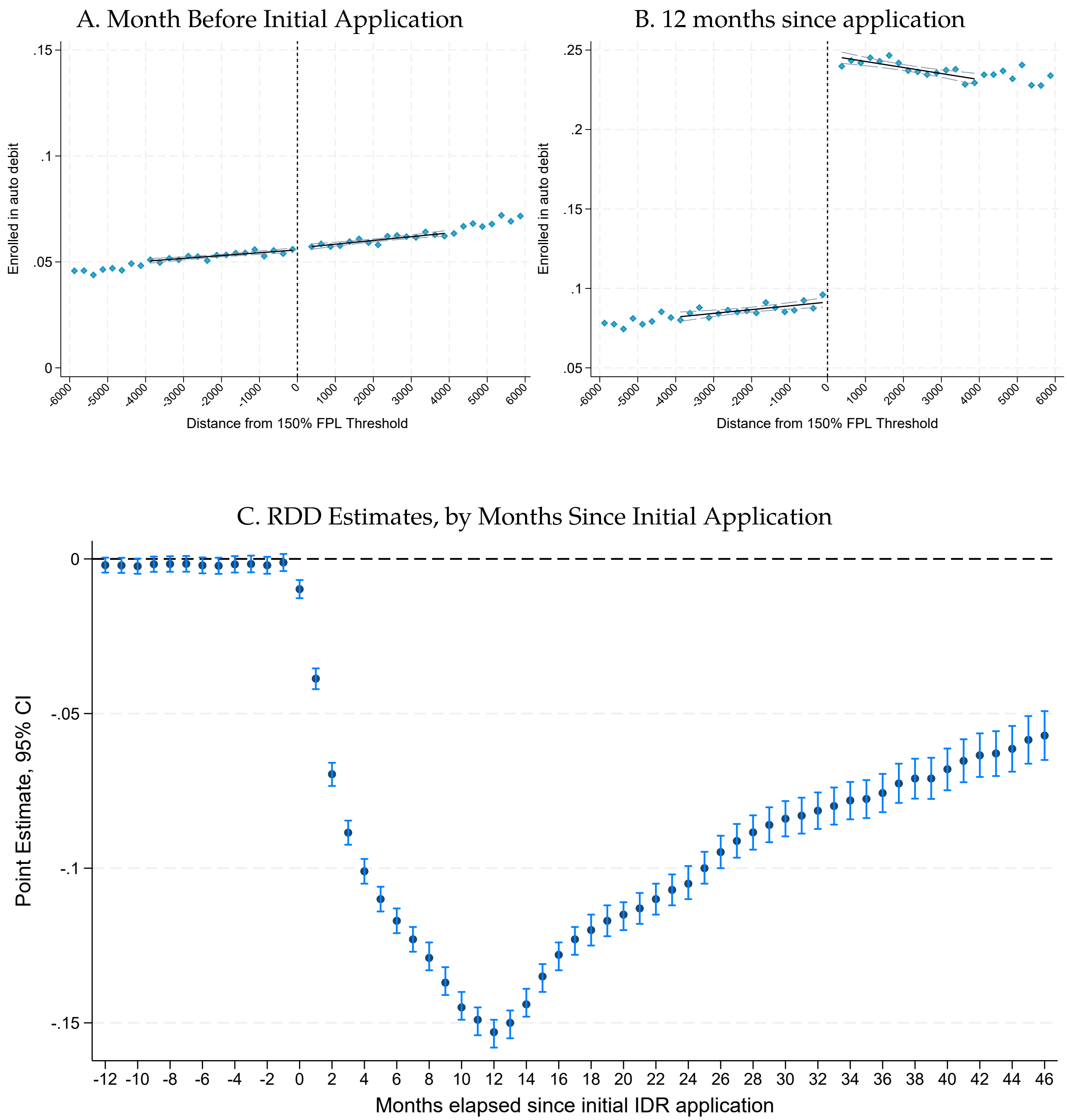

*Notes*: Sample includes first-time IDR applicants in 2015 through 2018 who had income within \$4,350 of the \$0 discretionary income threshold. OLS estimates of $\beta_1$ from equation (2) and 95% confidence intervals based on heteroskedasticity robust standard errors; the outcome is the probability of being in an IDR plan in the indicated number of months after the borrower's first IDR application.

Figure 11: IDR Reapplication Rates by Income and Month Since Application




*Notes*: Sample includes first-time IDR applicants in 2015 through 2018 who had income within $6,000 of the $0 discretionary income threshold. Scatter plots of the probability of submitting an IDR application (Panels A and C) or the probability of submitting an IDR application that was approved (Panels B and D) in the specified time period within a $250 income bin, by distance to the $0 discretionary income threshold (150% FPL). Dark lines represent OLS estimates of the outcome by distance to the $0 discretionary income threshold, estimated separately on either side of the threshold for applicants within a $4,350 bandwidth around the cutoff (weighted by the underlying number of individuals in each bin). Dashed gray lines represent 95% confidence intervals for OLS estimates, based on heteroskedasticity robust standard errors.

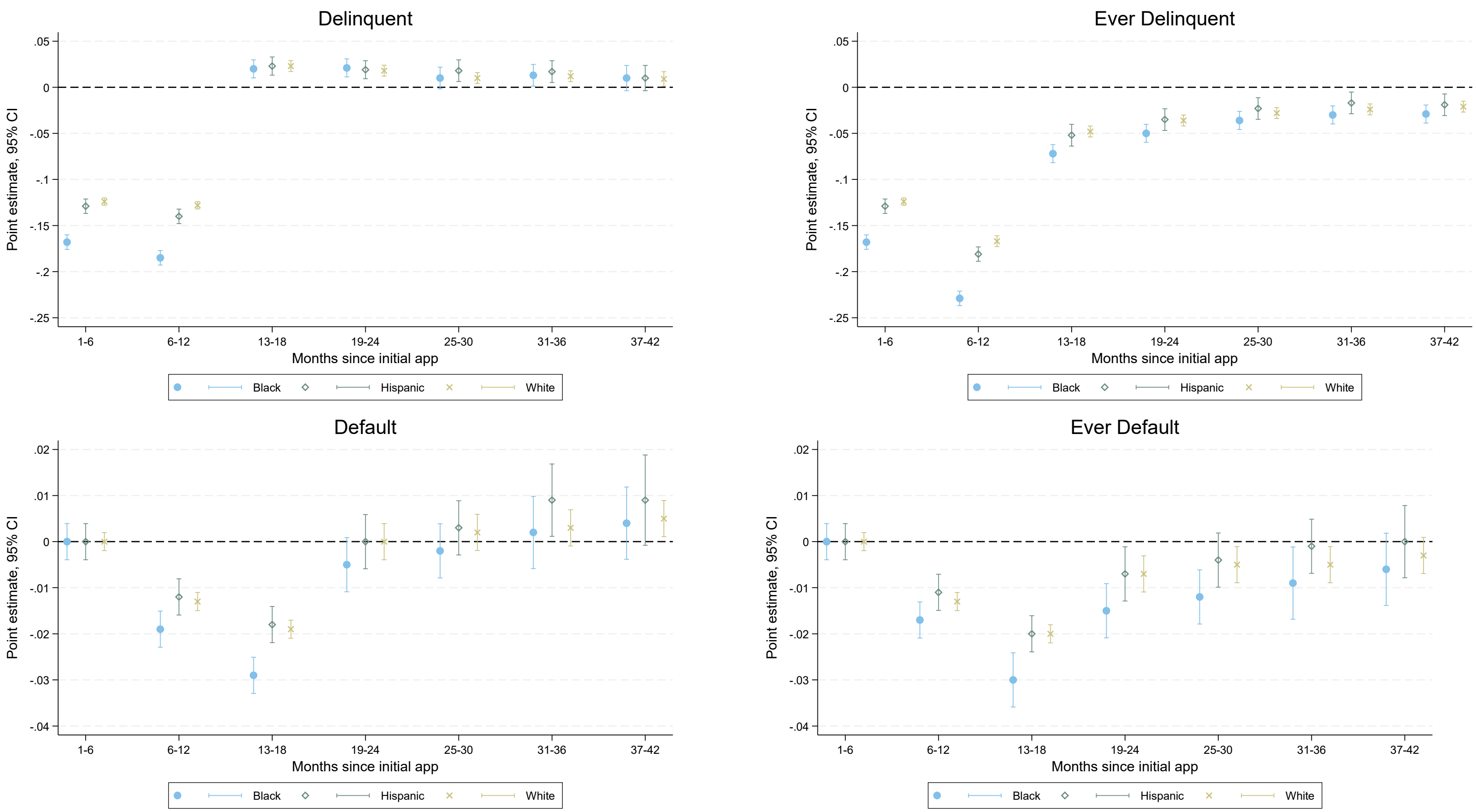
Figure 12: Reduced Form Effects on Use of Auto Debit



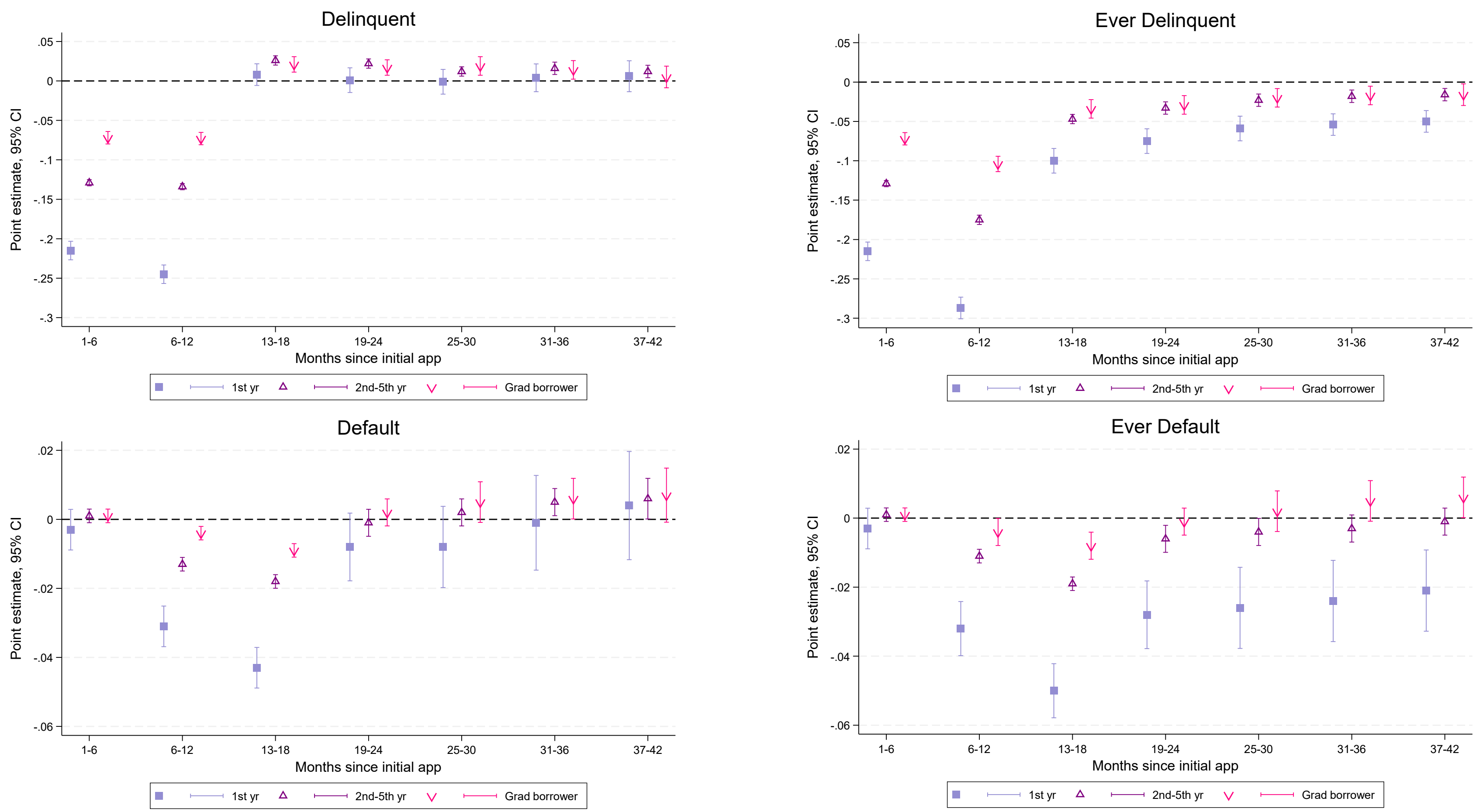

*Notes*: Sample includes first-time IDR applicants in 2015 through 2018 who had income within \$6,000 of the \$0 discretionary income threshold (Panels A and B) or within \$4,350 of the threshold (Panel C). Panels A and B are scatter plots of the probability of using auto debit for student loan payments in the specified time period within a \$250 income bin, by distance to the \$0 discretionary income threshold (150% FPL). Dark lines represent OLS estimates of the outcome by distance to the \$0 discretionary income threshold, estimated separately on either side of the threshold for applicants within a \$4,350 bandwidth around the cutoff (weighted by the underlying number of individuals in each bin). Dashed gray lines represent 95% confidence intervals for OLS estimates, based on heteroskedasticity robust standard errors. Panel C shows OLS estimates of $\beta_1$ from equation (2) and 95% confidence intervals based on heteroskedasticity robust standard errors; the outcome is the probability of using auto debit for student loan payments in the indicated number of months before or after the borrower's first IDR application.

Figure 13: Heterogeneity in Effects on Delinquency and Default by Predicted Race/Ethnicity

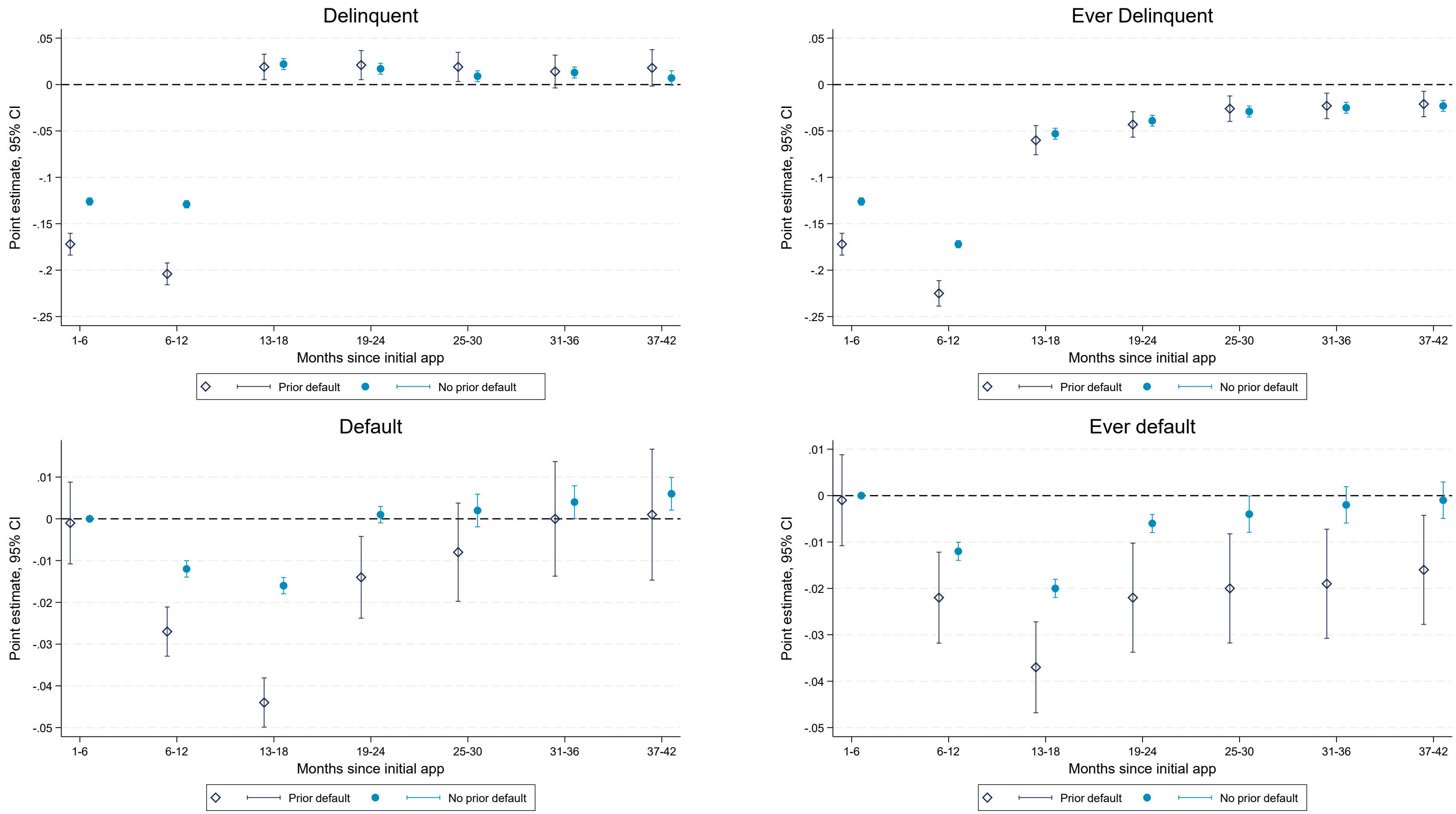
A. Race/ethnicity (predicted probability)



B. Educational Attainment



C. Prior default




*Notes*: Sample includes first-time IDR applicants in 2015 through 2018 who had income within \$4,350 of the \$0 discretionary income threshold. Each plot shows OLS estimates $\beta_1$ from equation (2). In Panel A, observations are weighted using the predicted probability of belonging to the specified racial/ethnic group. Predicted racial probabilities are based on logit fitted values from a model of self-reported race on individual characteristics (first and last name, zip code, etc.) using the NPSAS16 survey and extrapolated to the borrower population. In Panels B and C, models are estimated separately for each subgroup. Outcomes are indicators for the probability of being 30+ days delinquent or in default on a student loan payment within the specified 6-month period (left panels) or since applying for IDR (right panels). 95% confidence intervals are based on heteroskedasticity robust standard errors.

Table 1: Characteristics of IDR Applicants

| | All first-time IDR applicants | $4350 bandwidth |
|---|---|---|
| Outstanding balance | $52,118 | $44,082 |
| Scheduled monthly payment | $385 | $349 |
| **IDR application information** | | |
| Income | $23,371 | $27,717 |
| Household Size | 2.0 | 1.9 |
| Married | 9% | 7% |
| **Borrower Characteristics** | | |
| Graduate loans | 23% | 17% |
| Years since repayment entry >= 2 | 33% | 32% |
| Prior default | 18% | 17% |
| **First FAFSA Characteristics** | | |
| Dependent | 54% | 61% |
| Family AGI | $54,398 | $55,292 |
| Female | 69% | 69% |
| Observations | 5,646,325 | 636,332 |

*Notes*: 2015-2018 applicants. Balance is measured at month of initial IDR application. Scheduled payment is measured 3 months before initial application and is only reported for borrowers in repayment. All dollar amounts adjusted for inflation using the CPI-U (2022 dollars) (Bureau of Labor Statistics, 2023).

Table 2: Placebo Estimates - Applicant Characteristics at the 150% FPL $0 Payment Cutoff

| | A. Borrower characteristics and attainment | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | Predicted probability race/ethnicity = | | | Highest attainment[§] | |
| | (1) Age | (2) Gender = female | (3) Family income[‡] | (4) Black | (5) Hispanic | (6) White | (7) 1st yr | (8) Grad |
| $\mathbf{1}[DI \leq 0]$ | 0.010 | -0.006 | 371 | -0.0004 | -0.002 | 0.003 | 0.0001 | 0.003 |
| | (0.055) | (0.003)* | (399) | (0.002) | (0.001) | (0.002) | (0.002) | (0.002) |
| Dep var mean | 31.2 | 0.687 | $56,406 | 0.198 | 0.144 | 0.577 | 0.148 | 0.189 |
| Observations | 472,154 | 469,820 | 471,689 | 481,095 | 481,095 | 481,095 | 484,571 | 484,571 |
| | B. Initial IDR application, debt, repayment | | | | | | | |
| | | | Application income source | | | | | |
| | (9) HH size | (10) Married | (11) Taxes | (12) ADOI | (13) Outst. debt | (14) Any prior default | (15) Auto debit | (16) Index |
| $\mathbf{1}[DI \leq 0]$ | 0.007 | 0.0001 | 0.0005 | -0.0005 | 658 | 0.002 | -0.002 | 0.001 |
| | (0.007) | (0.001) | (0.003) | (0.003) | (281)* | (0.002) | (0.001) | (0.001) |
| Dep var mean | 1.90 | 0.064 | 0.728 | 0.272 | $45,874 | 0.174 | 0.067 | 0.084 |
| Observations | 484,571 | 484,571 | 484,571 | 484,571 | 484,571 | 484,571 | 484,571 | 484,571 |

*Notes*: Point estimates from regressions of the baseline characteristic indicated in the column heading on discretionary income ($DI$, defined as AGI minus 150% FPL), an indicator for AGI less than or equal to 150% FPL, and an interaction between these variables. Household size, marital status, and application income source based on initial IDR application. Highest and attainment years since entering repayment measured as of the month before initial application submission. Auto debit measured over the 6 months prior to initial application submission. Age, gender, and family income from first FAFSA. Index is the predicted probability of defaulting in the 2 years after initial application, based on all observable baseline characteristics; $4,350 bandwidth. Robust standard errors in parentheses; ** $p < 0.01$, ** $p < 0.05$, + $p < 0.1$. § Highest attainment is highest level as borrower. ‡ From first FAFSA, adjusted for inflation (2022 dollars).

Table 3: Summary of First Stage Effects on Payments

| | (1) Scheduled monthly payment | (2) Any scheduled $0 payment |
|---|---|---|
| $\mathbf{1}[DI \leq 0]$ | -2.96 | 0.643 |
| | (0.69)** | (0.002)** |
| Mean \| DI > 0 | $59.41 | 0.232 |
| Observations | 488,937 | 488,937 |

*Notes*: Point estimates from regressions of the scheduled monthly payments or the probability of having a $0 scheduled payment over the 12 months after initial application on discretionary income (defined as AGI – 150% FPL), an indicator for AGI less than or equal to 150% FPL, an interaction between these variables, and application year fixed effects. Limited to borrowers with initial application AGI within $4,350 of the 150% FPL threshold. Robust standard errors in parentheses; ** $p < 0.01$, ** $p < 0.05$, + $p < 0.1$.

Table 4: Reduced Form Estimates, Effects on Risk of Delinquency, Default, and Forbearance

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | Any in 12 month period | | | Any since initial IDR app | |
| *Years since initial IDR application =* | *1* | *2* | *3* | *2* | *3* |
| *A. Delinquency* | | | | | |
| $\mathbf{1}[DI \leq 0]$ | -0.180 | 0.028 | 0.015 | -0.035 | -0.013 |
| | (0.0023)** | (0.0029)** | (0.0034)** | (0.0031)** | (0.0036)** |
| Mean \| $DI$ > 0 | 0.272 | 0.307 | 0.306 | 0.400 | 0.467 |
| Observations | 488,937 | 444,490 | 334,001 | 444,490 | 334,001 |
| *B. Default* | | | | | |
| $\mathbf{1}[DI \leq 0]$ | -0.024 | 0.0001 | 0.006 | -0.005 | 0.004 |
| | (0.0010)** | (0.002) | (0.0021)** | (0.0018)** | (0.002) |
| Mean \| $DI$ > 0 | 0.041 | 0.067 | 0.088 | 0.091 | 0.122 |
| Observations | 488,937 | 444,490 | 334,001 | 444,490 | 334,001 |
| *C. Forbearance* | | | | | |
| $\mathbf{1}[DI \leq 0]$ | -0.052 | 0.013 | 0.009 | -0.015 | -0.007 |
| | (0.0021)** | (0.0027)** | (0.0031)** | (0.0029)** | (0.0036)* |
| Mean \| $DI$ > 0 | 0.183 | 0.257 | 0.244 | 0.353 | 0.452 |
| Observations | 488,937 | 444,490 | 334,001 | 444,490 | 334,001 |

*Notes*: Point estimates from regressions of the probability of delinquency (30+ days late), default, or forbearance in the 12-month period (columns 1-3) or since initial application on discretionary income, an indicator for AGI less than or equal to 150% FPL, an interaction between these variables, and application year fixed effects. Defaults are lagged by 6 months (e.g., year 1 = 6-18 months after initial application). Limited to borrowers with initial application AGI within $4,350 of the 150% FPL threshold. Robust standard errors in parentheses; ** $p < 0.01$, ** $p < 0.05$, + $p < 0.1$.

Table 5: Reduced Form Estimates, Effects on IDR Persistence

| *Years since initial IDR application =* | *2* | *3* |
|---|---|---|
| *A. In an IDR plan* | | |
| $\mathbf{1}[DI \leq 0]$ | -0.021 | -0.021 |
| | (0.003)** | (0.004)** |
| Mean \| $DI$ > 0 | 0.561 | 0.556 |
| Observations | 451,183 | 338,848 |
| *B. Any (re)application to date* | | |
| $\mathbf{1}[DI \leq 0]$ | -0.021 | -0.019 |
| | (0.003)** | (0.003)** |
| Mean \| $DI$ > 0 | 0.676 | 0.741 |
| Observations | 451,183 | 338,848 |
| *C. Successful (re)application to date* | | |
| $\mathbf{1}[DI \leq 0]$ | -0.021 | -0.021 |
| | (0.003)** | (0.003)** |
| Mean \| $DI$ > 0 | 0.591 | 0.682 |
| Observations | 451,183 | 338,848 |

*Notess*: Point estimates from regressions of the probability of being on an IDR plan, any IDR application submitted since the initial application, and any successful application submitted since the initial application, measured over the period indicated in column headings, an indicator for AGI less than or equal to 150% FPL, an interaction between these variables, and application year fixed effects. Limited to borrowers with initial application AGI within $4,350 of the 150% FPL threshold. Robust standard errors in parentheses; ** $p < 0.01$, ** $p < 0.05$, + $p < 0.1$.

Table 6: IV-RD and IV-RK Estimates of the Contemporaneous and Longer-Run Effects of a $10 Decrease in First-Year Monthly Payments

| | (1) Delinquent | (2) Default | (3) Forbearance | (4) Any IDR app TD | (5) In IDR |
|---|---|---|---|---|---|
| *A. Contemporaneous (year of app)* | | | | | |
| IV-RD | -0.641 | -0.085 | -0.183 | -0.038 | -- |
| | (0.224)** | (0.030)** | (0.064)** | (0.017)* | -- |
| IV-RK | -0.008 | -0.002 | -0.025 | 0.002 | -- |
| | (0.002)** | (0.001)* | (0.002)** | (0.002) | -- |
| Test of eq (*p* -val) | 0.005 | 0.005 | 0.013 | 0.021 | -- |
| Observations | 488,937 | 488,937 | 488,937 | 488,937 | -- |
| *B. In the 2nd year after initial application submission* | | | | | |
| IV-RD | 0.099 | 0.0003 | 0.047 | -0.076 | -0.077 |
| | (0.037)** | (0.006) | (0.020)* | (0.029)** | (0.030)** |
| IV-RK | 0.005 | 0.001 | -0.009 | 0.006 | 0.007 |
| | (0.002)* | (0.0011) | (0.002)** | (0.002)** | (0.002)** |
| Test of eq (*p* -val) | 0.011 | 0.893 | 0.005 | 0.005 | 0.005 |
| Observations | 444,490 | 444,490 | 444,490 | 444,490 | 444,490 |
| *C. In the 3rd year after initial application submission* | | | | | |
| IV-RD | 0.054 | 0.020 | 0.033 | -0.069 | -0.075 |
| | (0.023)* | (0.010)+ | (0.016)* | (0.027)* | (0.029)* |
| IV-RK | 0.004 | 0.002 | -0.001 | 0.004 | 0.006 |
| | (0.002) | (0.001) | (0.002) | (0.002)+ | (0.003)* |
| Test of eq (*p* -val) | 0.028 | 0.078 | 0.039 | 0.007 | 0.007 |
| Observations | 334,001 | 334,001 | 334,001 | 334,001 | 334,001 |

*Notess*: Point estimates from instrumental variables regressions of the outcome indicated in the column heading over the period indicated in the panel heading on year 1 average scheduled payments (multiplied by -10 so that estimates reflect the effect of a $10 decrease in payments), application year fixed effects, and an indicator for AGI less than or equal to 150% FPL (IV-RK) or the interaction between this indicator and the continuous measure of distance from the threshold (IV-RD). Limited to borrowers with initial application AGI within $4,350 of the 150% FPL threshold. Robust standard errors in parentheses; ** $p < 0.01$, ** $p < 0.05$, + $p < 0.1$.

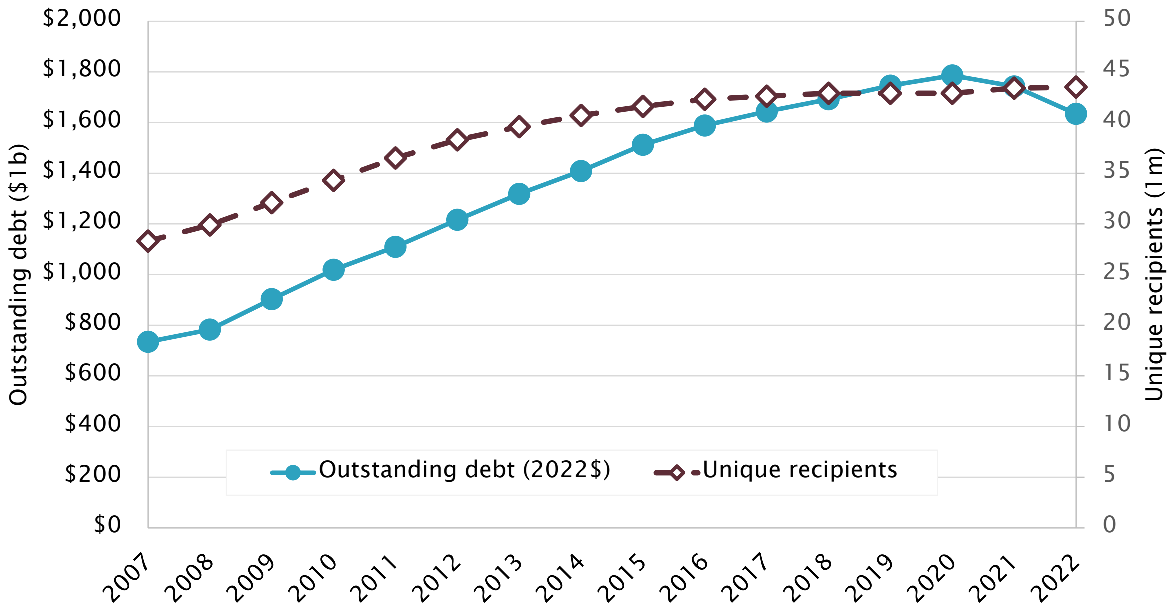
Table 7: Contemporaneous and Longer-Run Effects of Waiving Requirement to Make Payments

| | (1) Delinquent | (2) Default | (3) Forbearance | (4) Any IDR app TD | (5) In IDR |
|---|---|---|---|---|---|
| *A. Contemporaneous (year of app)* | | | | | -- |
| $\tau_0$ | -0.264 | -0.034 | -0.066 | -0.017 | -- |
| | (0.004)** | (0.002)** | (0.005)** | (0.004)** | -- |
| Observations | 487,779 | 487,779 | 487,779 | 487,779 | -- |
| *B. One year later* | | | | | |
| $\tau_0$ | 0.040 | 0.0001 | 0.022 | -0.034 | -0.035 |
| | (0.005)** | (0.002) | (0.004)** | (0.005)** | (0.005)** |
| Observations | 443,409 | 443,409 | 443,409 | 443,409 | 443,409 |
| *C. 2 years later* | | | | | |
| $\tau_0$ | 0.021 | 0.008 | 0.014 | -0.030 | -0.033 |
| | (0.005)** | (0.003)* | (0.005)** | (0.005)** | (0.006)** |
| Observations | 333,050 | 333,050 | 333,050 | 333,050 | 333,050 |

*Notess*: Estimates of the effect of not having to make payments ($\tau_0$) on repayment outcomes, IDR recertification, and persistence in IDR. See Section 6 for additional details.

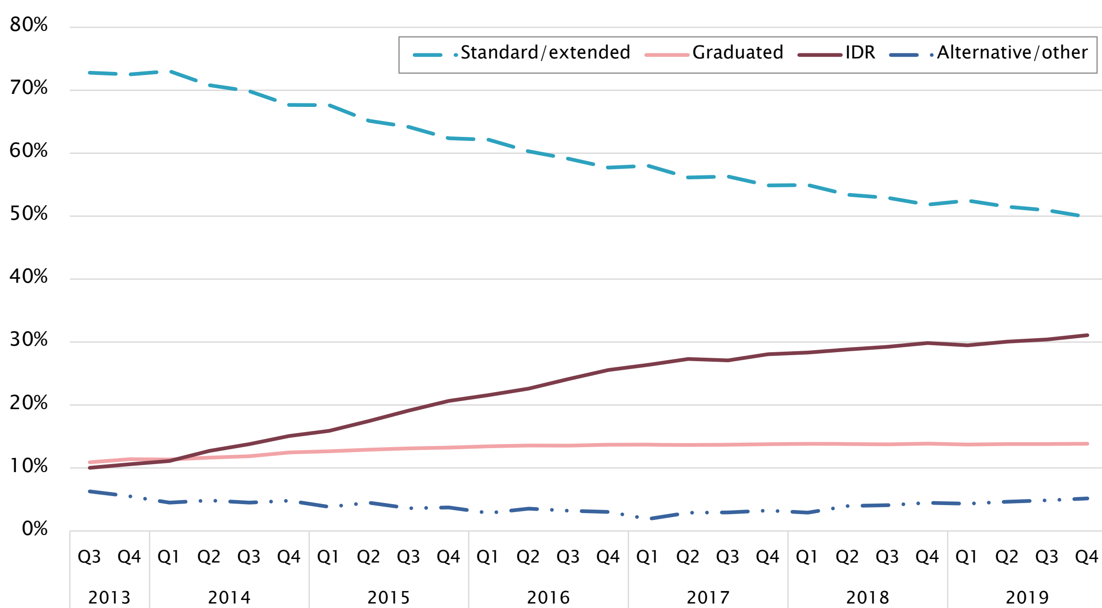
# Appendix A Additional Figures and Tables

Figure A.1: Outstanding debt and unique borrowers by Federal Fiscal Year



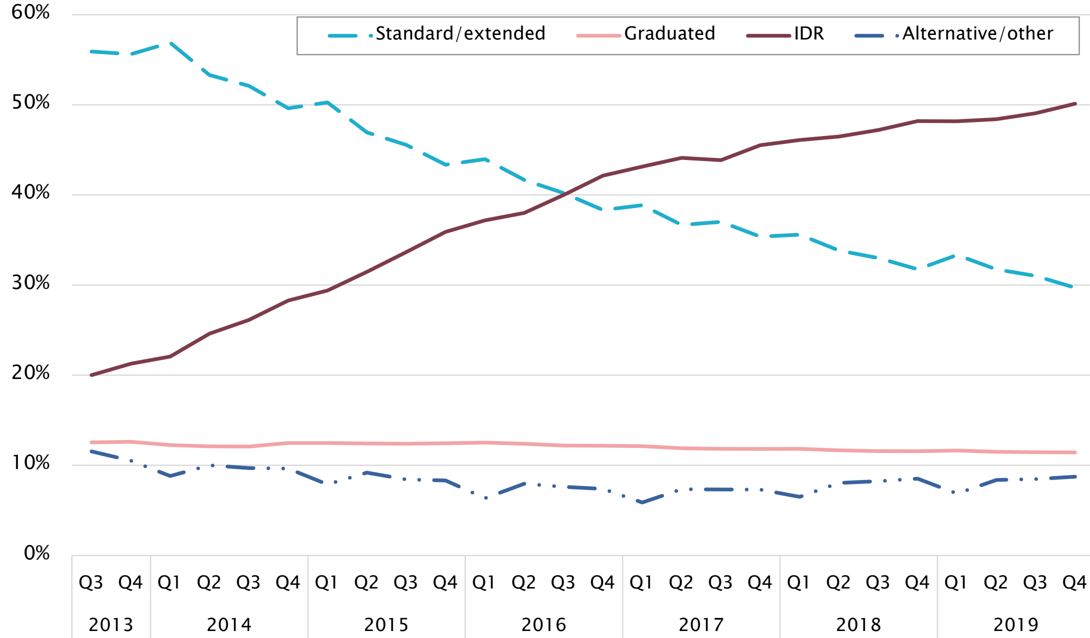

*Sources*: Federal Student Aid Portfolio Summary (https://studentaid.gov/data-center/student/portfolio, accessed 7/15/2023).

Figure A.2: Percent of Direct Loan Borrowers by Repayment Plan



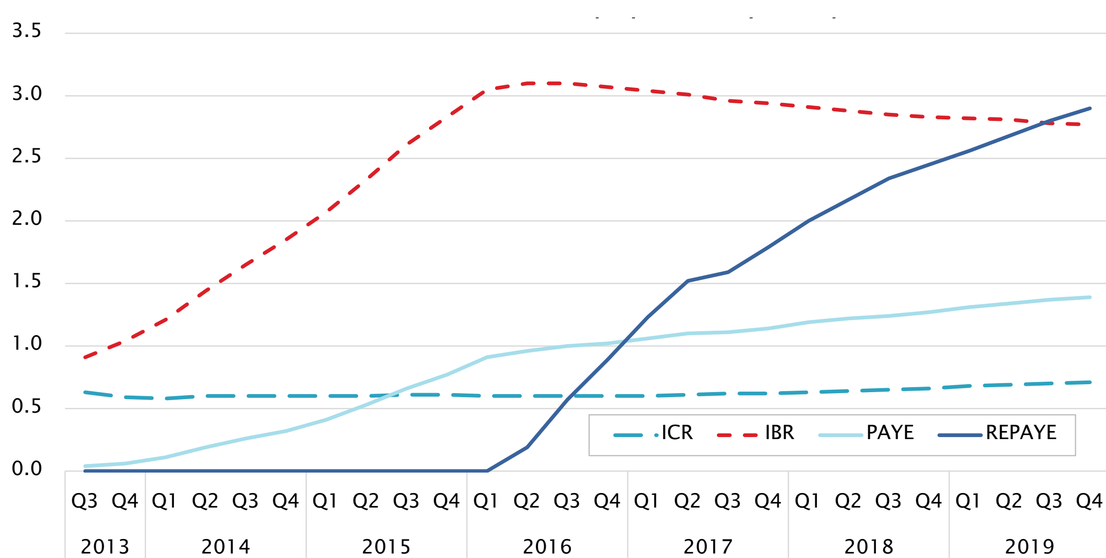

*Notes*: Publicly available data on borrowers with Direct Loans in repayment, forbearance, or deferment, from FSA Data Center.

Figure A.3: Percent of Student Loan Debt by Repayment Plan



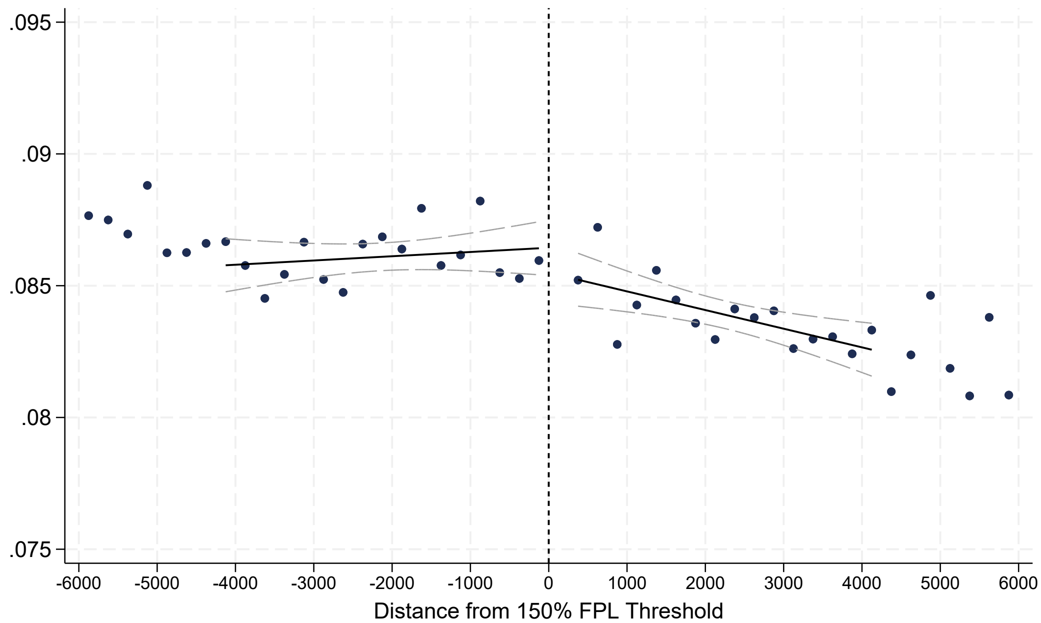

*Notes*: Publicly available data on outstanding balances by repayment plan for Direct Loans in repayment, forbearance, or deferment from FSA Data Center.

Figure A.4: Number of Direct Loan Borrowers (1m) in IDR by Plan



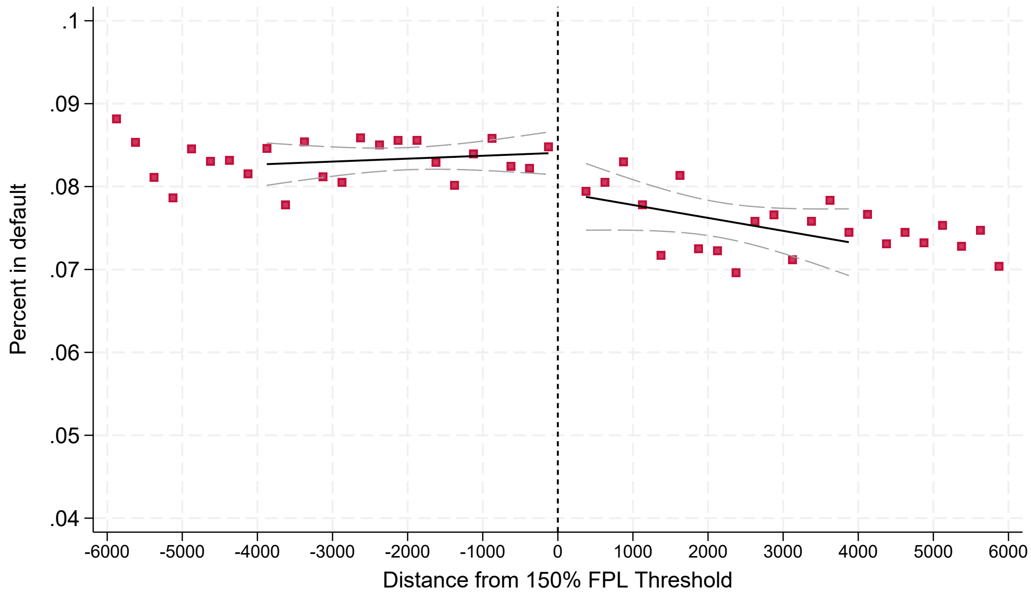

*Notes*: Publicly available data on the number of borrowers with Direct Loans (DL) in repayment in one of the listed IDR plans, from FSA Data Center.

Figure A.5: Index of Baseline Characteristics by Income Relative to 150% of Federal Poverty Line




*Notes*: Sample includes first-time IDR applicants in 2015 through 2018 who had income within \$6000 of the \$0 discretionary income threshold and a non-missing scheduled payment 9 months after initial application. A ”donut” of applicants with income between \$0 and \$200 above the 150% FPL cutoff is excluded from the sample, see Section 4 for details. Linear OLS estimates on either side of the threshold are estimated for applicants within a \$4,350 bandwidth around the cutoff (weighted by the underlying number of individuals in each bin). 95% confidence intervals for OLS estimates are based on heteroskedasticity robust standard errors.

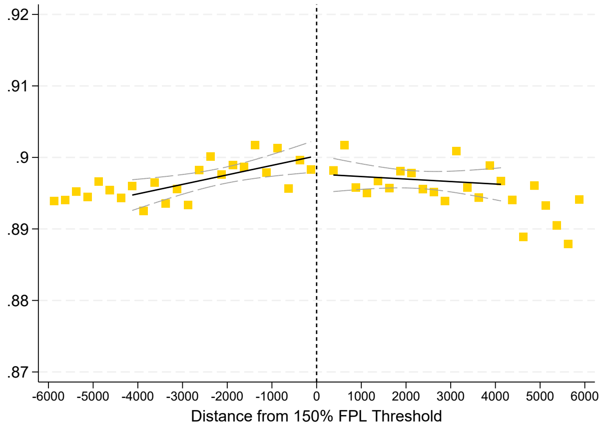
Figure A.6: Reduced Form Impacts on Borrower Default, 36 Months Since Application



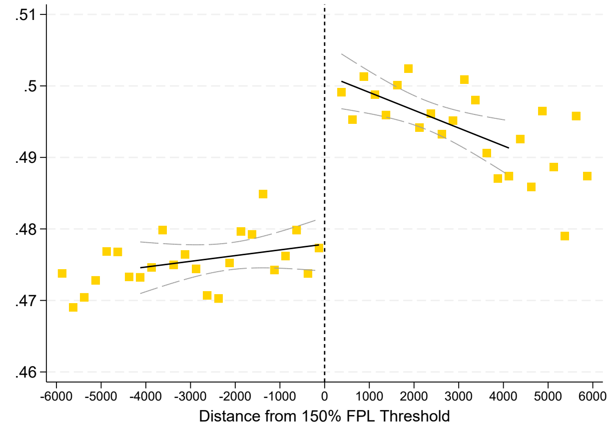

*Notes*: Means of default indicator 36 months after initial IDR application, by income bin. Linear OLS estimates on either side of the threshold are estimated for applicants within a $4,350 bandwidth around the cutoff (weighted by the underlying number of individuals in each bin); 95% confidence intervals for OLS estimates are based on heteroskedasticity robust standard errors.

Figure A.7: RD Scatters for Probability of IDR Participation, by Months Since Application

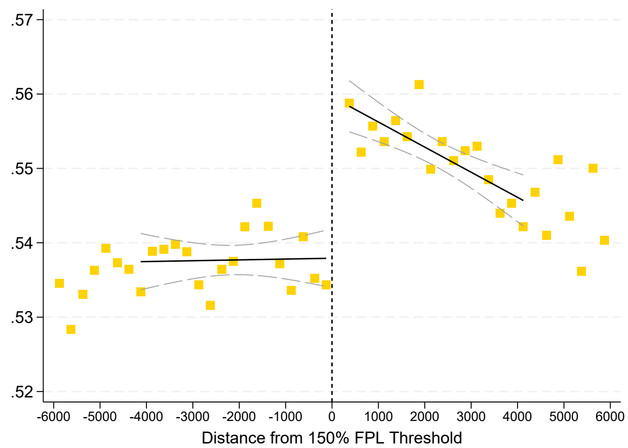
A. 7-12 months since initial application




B. 13-18 months since initial application

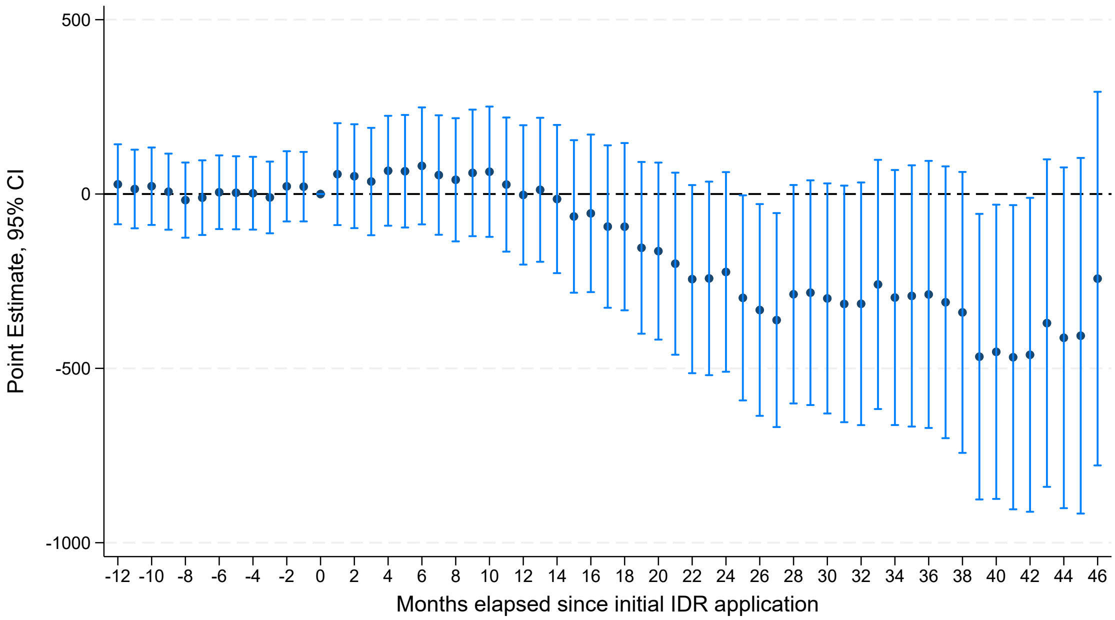



C. 19-24 months since initial application




*Notes*: Binned scatter plots showing means of indicator for having an IDR repayment plan, by income bins of width $250 around the 150% FPL cutoff. IDR participation is measured monthly since the date of first IDR application. Each bin contains between 13,000 and 18,000 IDR applicants, pooling across 2015-2018 application cohorts. Linear OLS estimate on either side of the threshold estimated for applicants within a $4,350 income window around the cutoff; 95% confidence bands for OLS estimates are based on heteroskedasticity robust standard errors.

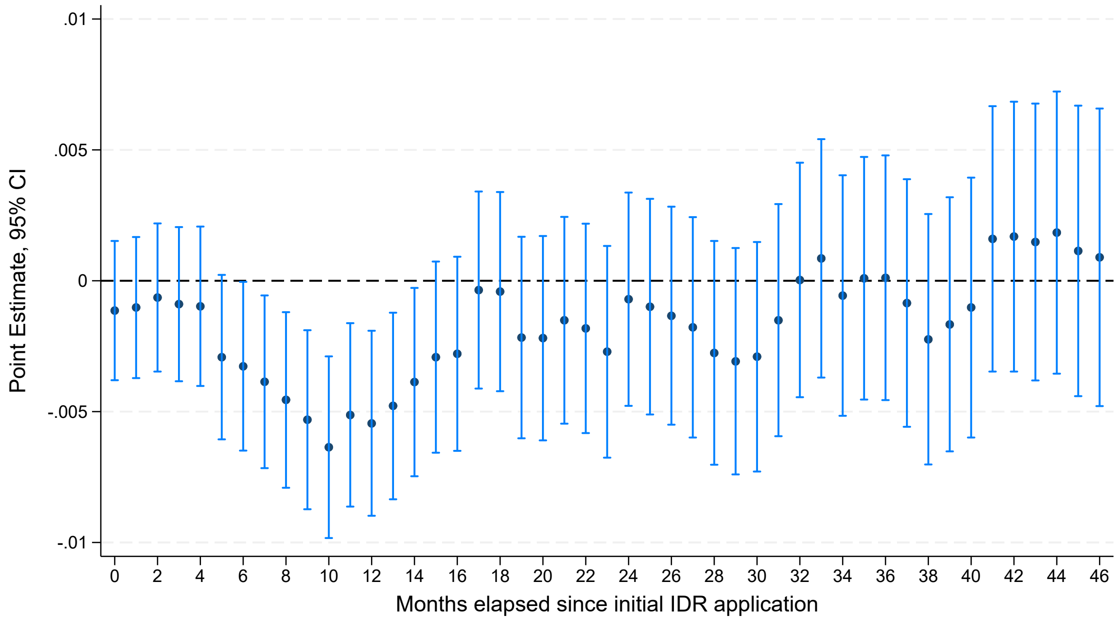
Figure A.8: Impacts on Outstanding Balances



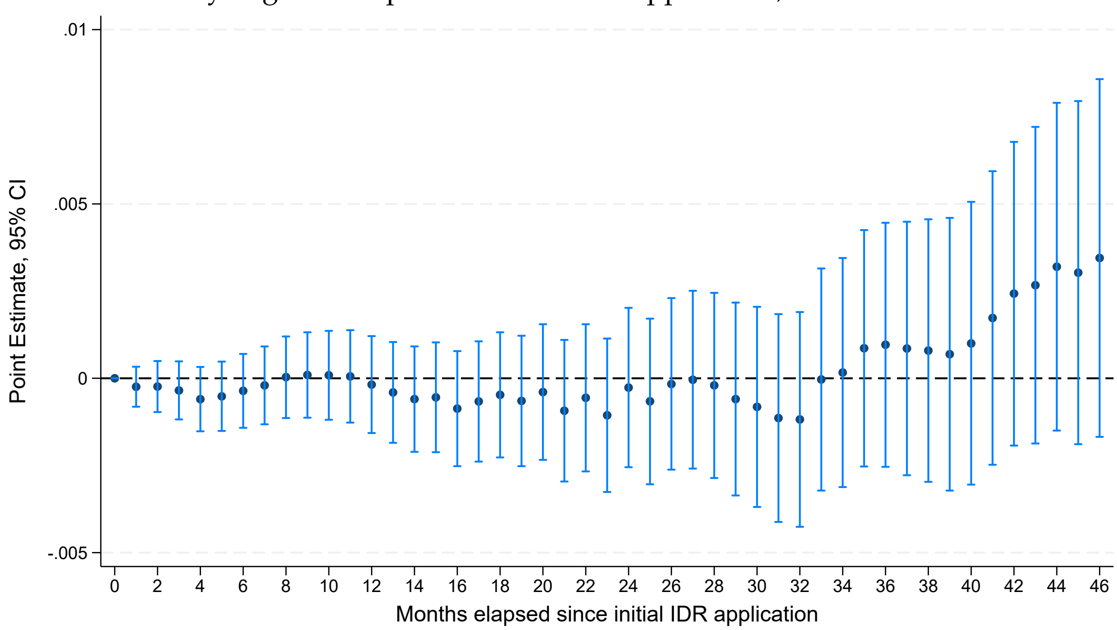

*Notes*: Plot shows OLS estimates of the RDD coefficient $\beta_1$ from equation (2) in the main text, using total outstanding balance as the outcome. Estimates based on pooled sample of first-time IDR applicants from 2015-2018, controlling for application year fixed effects. Outcomes are measured monthly since the date of first IDR application, with negative months corresponding to months prior to initial application; 95% confidence bands are based on heteroskedasticity robust standard errors.

Figure A.9: Impacts on Educational Attainment

A. Enrolled in month, RDD estimates




B. Any degree receipt since initial IDR application, RDD estimates




*Notes*: Plot shows OLS estimates of the RDD coefficient $\beta_1$ from equation (2) in the main text. Estimates based on pooled sample of first-time IDR applicants from 2015-2018, controlling for application year fixed effects. Outcomes are measured monthly since the date of first IDR application, with negative months corresponding to months prior to initial application. In Panel A, the outcome is an indicator being enrolled in a post-secondary education program, according to NSLDS enrollment reporting records from colleges. Panel B uses an indicator of graduation from any postsecondary program; 95% confidence bands are based on heteroskedasticity robust standard errors.

Table A.1: Placebo RK Estimates - Applicant Characteristics at the 150% FPL \$0 Payment Cutoff

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | *A. Borrower characteristics and attainment* | | | | | | | |
| | | | | Predicted probability race/ethnicity = | | | Highest attainment[§] | |
| | (1) Age | (2) Gender = female | (3) Family income[‡] | (4) Black | (5) Hispanic | (6) White | (7) 1st yr | (8) Grad |
| $\mathbf{1}[DI \leq 0] * DI$ | 0.005 | 0.0001 | -325 | 0.0005 | 0.001 | -0.002 | 0.001 | -0.001 |
| | (0.022) | (0.001) | (163)* | (0.001) | (0.001)* | (0.001)* | (0.001)+ | (0.001) |
| Dep var mean | 31.2 | 0.687 | \$56,406 | 0.198 | 0.144 | 0.577 | 0.148 | 0.189 |
| Observations | 472,154 | 469,820 | 471,689 | 481,095 | 481,095 | 481,095 | 484,571 | 484,571 |
| | *B. Initial IDR application, debt, repayment* | | | | | | | |
| | | | Application income source | | | | | |
| | (9) HH size | (10) Married | (11) Taxes | (12) ADOI | (13) Outst. debt | (14) Any prior default | (15) Auto debit | (16) Index |
| $\mathbf{1}[DI \leq 0] * DI$ | 0.003 | -0.0003 | -0.001 | 0.001 | -60 | 0.003 | 0.0001 | 0.001 |
| | (0.003) | (0.001) | (0.001) | (0.001) | (111) | (0.001)** | (0.001) | (0.0003)** |
| Dep var mean | 1.90 | 0.064 | 0.728 | 0.272 | \$45,874 | 0.174 | 0.067 | 0.084 |
| Observations | 484,571 | 484,571 | 484,571 | 484,571 | 484,571 | 484,571 | 484,571 | 484,571 |

*Notes*: Point estimates from regressions of the baseline characteristic indicated in the column heading on discretionary income ($DI$, defined as AGI minus 150% FPL), an indicator for AGI less than or equal to 150% FPL, and an interaction between these variables. Household size, marital status, and application income source based on initial IDR application. Highest and attainment years since entering repayment measured as of the month before initial application submission. Auto debit measured over the 6 months prior to initial application submission. Age, gender, and family income from first FAFSA. Index is the predicted probability of defaulting in the 2 years after initial application, based on all observable baseline characteristics; \$4,350 bandwidth. Robust standard errors in parentheses; ** $p < 0.01$, ** $p < 0.05$, + $p < 0.1$. § Highest attainment is highest level as borrower. ‡ From first FAFSA, adjusted for inflation (2022 dollars).

Table A.2: Reduced Form RK Estimates, Effects on Repayment Outcomes, IDR Recertification, and IDR Persistence

| | (1) Delinquent | (2) Default | (3) Forbearance | (4) Any IDR app TD | (5) In IDR |
|---|---|---|---|---|---|
| *A. Contemporaneous (year of app)* | | | | | |
| $\mathbf{1}[DI \leq 0] * DI$ | -0.004 | -0.024 | -0.052 | 0.001 | -- |
| | (0.001)** | (0.001)** | (0.002)** | (0.001) | -- |
| Observations | 488,937 | 488,937 | 488,937 | 496,391 | -- |
| *B. In the 2nd year after initial application submission* | | | | | |
| $\mathbf{1}[DI \leq 0] * DI$ | 0.003 | 0.0001 | 0.013 | 0.003 | 0.004 |
| | (0.001)* | (0.002) | (0.003)** | (0.001)* | (0.001)** |
| Observations | 444,490 | 444,490 | 444,490 | 451,183 | 451,183 |
| *C. In the 3rd year after initial application submission* | | | | | |
| $\mathbf{1}[DI \leq 0] * DI$ | 0.002 | 0.006 | 0.009 | 0.002 | 0.003 |
| | (0.001) | (0.002)** | (0.003)** | (0.001) | (0.001)* |
| Observations | 334,001 | 334,001 | 334,001 | 338,848 | 338,848 |

*Notes*: Point estimates from regressions of the outcome indicated in the column heading on discretionary income, an indicator for AGI less than or equal to 150% FPL, an interaction between these variables, and application year fixed effects. Defaults are lagged by 6 months (e.g., year 1 = 6-18 months after initial application). Limited to borrowers with initial application AGI within $4,350 of the 150% FPL threshold. Robust standard errors in parentheses; ** $p < 0.01$, ** $p < 0.05$, + $p < 0.1$.

## Appendix B Additional Information on IDR

The first IDR plan — Income Contingent Repayment or ICR — was established in 1994. It was followed by four additional plans: ”old” Income Based Repayment (IBR), established in 2007; ”new” IBR, established in 2010; Pay As You Earn (PAYE), established in 2012; and Revised Pay As You Earn (REPAYE), established in 2015. Eligibility for each IDR plan depends on the types of federal loans a borrower holds, when they first borrowed and/or when they last had student loan debt, and (for PAYE and IBR), their income relative to debt. See the top panel of Table B.1 for details.

As shown in the bottom panel of Table B.1, payment rates range from 10% in REPAYE, PAYE, and new IBR, to 15% in old IBR, and 20% in ICR. Outside of ICR, which defines discretionary income relative to 100% FPL, all plans in effect before 2023 used the 150% FPL threshold. There is no cap on REPAYE payments, but the other plans cap payments at the amount a borrower would pay on the 10-year standard plan (PAYE and IBR) or on a fixed-payment 12-year plan with adjustments for income (ICR). All plans outside of ICR provide subsidies for unpaid interest for at least the first 3 years of repayment; REPAYE is the most generous providing a 50% subsidy on unpaid interest for the entirety of repayment. Remaining debt is forgiven after 20 to 25 years of payments.

Before 2023, borrowers were required to recertify their income on an annual basis to remain in IDR. This process was similar to the process of submitting an initial application: Borrowers had to either provide information to their servicer on their prior year income and family size via an income tax return (either electronically or via paper tax transcript) or provide ”alternative documentation of income.” The latter method is most commonly used when a borrower's current income is not reflected in their prior year tax return, such as following job loss or a large drop in earnings.

When a borrower fails to recertify but does not actively choose another repayment plan, their scheduled payments will depend on the specific IDR plan they were previously participating in. Monthly payments for borrowers previously in REPAYE equal the amount required to repay the loan by the earlier of 10 years from the date the borrower began repayment under the alternative repayment plan or the ending date of the 20- or 25-year IDR repayment period. Payments for borrowers the other IDR plans who fail to recertify equal the amount paid under a 10-year standard repayment plan based on the loan amount owed when the borrower initially entered IDR. Failing to recertify or actively switching to a different repayment plan results in the borrower's unpaid interest being capitalized into their principal balance. Additionally, when a borrower in PAYE or IBR no longer qualifies for a ”partial financial hardship,” their unpaid interest is capitalized.[1]

In 2023, REPAYE was supplanted by SAVE (Saving on a Valuable Education), which increased the discretionary income threshold to 225% FPL and eliminated 100% of unpaid interest immediately.

[1] A borrower qualifies for partial financial hardship based on their discretionary income and debt, specifically, when the annual amount due on eligible loans, as calculated under a 10-year Standard Repayment Plan, is lower than the amount that would be paid in PAYE or IBR.

In 2024, additional changes will be implemented, including a reduction of the payment rate for undergraduate loans from 10% to 5% and a reduction in the number of payments required for forgiveness for borrowers with small balances. Additionally, beginning in 2024, borrowers can now consent to have their federal income tax automatically retrieved for recertification for up to 5 years.

Table B.1: Features of Available IDR Plans

| | Revised Pay As You Earn (REPAYE) | Pay As You Earn (PAYE) | New Income Based Repayment (IBR) | Old IBR | Income Contingent Repayment (ICR) |
|---|---|---|---|---|---|
| *Eligibility criteria* | | | | | |
| Types of loans | Direct Stafford and Grad PLUS* | Direct Stafford and Grad PLUS* | Direct Stafford and Grad PLUS** | Direct and FFEL Stafford and Grad PLUS** | Direct Stafford, Grad PLUS, and Parent PLUS*** |
| Income restrictions | None | PFH | PFH | PFH | None |
| Additional criteria | None | Borrowers who received their first federal student loan after 10/1/2007 and received a Direct Loan after 10/1/2011. | Borrowers who had no outstanding Direct or FFEL Loan balance as of 7/1/2014 and who received a Direct Loan on or after 7/1/2014. | Borrowers who had a Direct or FFEL loan balance on July 1, 2014. | None |
| *Other parameters* | | | | | |
| Discretionary income threshold | 150% FPL | 150% FPL | 150% FPL | 150% FPL | 100% FPL |
| Payment rate | 10% | 10% | 10% | 15% | 20% |
| Payment cap | None | 10-year Standard | 10-year Standard | 10-year Standard | Amount based on fixed payment 12-year plan, adjusted for income |
| Interest subsidies | Subsidized loans: 100% of unpaid interest for 3 years, 50% thereafter. Unsubsidized loans: 50% of unpaid interest. | Subsidized loans: 100% of unpaid interest for 3 years. No benefit for unsubsidized loans. | Subsidized loans: 100% of unpaid interest for 3 years. No benefit for unsubsidized loans. | Subsidized loans: 100% of unpaid interest for 3 years. No benefit for unsubsidized loans. | None |
| Forgiveness | 240 payments (UG), 360 payments (grad) | 240 payments | 240 payments | 360 payments | 360 payments |

*Notes*: PFH = partial financial hardship, when the annual amount due on eligible loans, as calculated under a 10-year Standard Repayment Plan, your payment on the specified IDR plan.

* Including Direct Consolidation loans, comprised of Stafford (DL or FFEL), and/or Grad PLUS (DL or FFEL)

** Including Direct/FFEL Consolidation loans, comprised of Stafford and/or Grad PLUS

*** Including Direct Consolidation loans, comprised of Stafford (DL) and/or PLUS (DL)

## Appendix C Data Appendix

We leverage administrative files from Federal Student Aid's Enterprise Data Warehouse (EDWA), a federal student aid (FSA) database housing detailed records on Title IV aid recipients. EDWA tracks all disbursements of grant and loan aid, as well as loan balance records from the National Student Loan Data System (NSLDS), which are provided by loan servicers. Additionally, EDWA includes individual FAFSA application data, IDR plan applications, and the enrollment verification reports that colleges submit to NSLDS as part of the requirements for Title-IV aid eligibility. EDWA was first launched in 2014. The quality of the data is highest for this year and onward. Because older records were retroactively populated by FSA, they are more likely to be incomplete and can be less reliable. For example, digitized IDR application records are only available starting in 2014.

We first construct a data set of borrowers applying for IDR between 2015 and 2018. In order to identify applicants who have been in IDR before application data was stored in EDWA, we link the sample of IDR applicants to loan servicing data and exclude borrowers who are listed as being in an IDR repayment plan at any point prior to their first observed IDR application.

In principle, repayment plan, scheduled payments, and loan status data are updated in every monthly draw from servicing data. In practice, however, servicers vary in the amount of time it takes them to update their loan status reports, generating measurement error on the effective timing of repayment plan changes in our data. When examining patterns of repayment plan and scheduled payment by servicer, we discovered a several month lag between IDR application and changes in scheduled payments for many borrowers, which could have either been caused by delays in processing time or reporting delays. We exclude borrowers from this servicer from our main analysis sample. Borrowers essentially are randomly assigned to servicers, thus it is not surprising that the exclusion of these borrowers has no affect any of the estimated effects on outcomes measured after month 6 or before month 0, but this does reduce the size of the analysis sample.

Borrowers who initially enroll in new IBR and PAYE and who fail to recertify still are listed in EDWA as having the same status as borrowers in these plans who do recertify but have sufficiently high income that their IDR payment would exceed their payment on the standard 10-year plan (i.e., in IBR/PAYE with no partial financial hardship). To distinguish between borrowers who fail to recertify and those who recertify but have high income, we use subsequent IDR application data and classify a borrower as remaining on IDR if they submitted a successful reapplication in the prior 12 months. We classify borrowers who did not reapply in the last 12 months or reapplied but were not approved for an IDR plan.