Does Salient Financial Information Affect Academic Performance and Borrowing Behavior Among College Students?*,†

Maximilian Schmeiser‡, Christiana Stoddard§, Carly Urban¶

Abstract

More students than ever borrow to finance post-secondary education, with average balances rising over time. However, students receive little information when choosing student loan amounts. This paper exploits a natural experiment to understand how information can change student behavior. We study two large public universities: at one institution students received letters with information about their student loan debt, while students at the other institution did not. Using a difference-in-difference-in-differences strategy and administrative data on individual-level academic records and borrowing, we find that the intervention reduced borrowing in the subsequent semester by $1,360 and also increased credits completed and GPAs.

Keywords: student loans; higher education; information; financial cues

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‡Senior Economist, Microeconomic Surveys Section, Federal Reserve Board

§Associate Professor, Montana State University

¶Corresponding Author: Assistant Professor of Economics, Montana State University Phone: (406) 994-2005, E-mail: carly.urban@montana.edu.

1 Introduction

Student loans are typically the first borrowing decision made by young adults and are an increasingly large financial commitment, with aggregate student loan debt totaling $1.19 trillion as of June 2015 (Federal Reserve Bank of New York 2015). However, it is not clear whether students currently have transparent, relevant, and low-cost information about borrowing to finance postsecondary education when making their decisions. High school seniors have relatively limited exposure to formal borrowing when they make the initial decision to attend and finance college.[1] After obtaining a loan, students typically receive no additional information as they make further borrowing decisions.[2] The minimal financial information provided to college students is directed toward those close to graduation and tends to focus on loan repayment options. This paper uses a unique natural experiment to causally determine how targeted provision of timely, salient, and actionable information about student loan debt can change college students' loan choices, majors, credits, and academic performance.

This study analyzes a unique financial counseling and targeted debt information intervention aimed at students whose debt levels–given by a specific debt and year formula based on their standing in school or college major–suggest that they might have difficulty repaying their student debt with their prospective income. At Montana State University, the Allen Yarnell Center for Student Success sent letters to students whose loan amounts exceeded target amounts both informing them of their debt level and warning "If you continue to accept student loans at this rate you will accrue a debt level that may become difficult to repay, which may place you at risk for defaulting on your loan." Letters

[1] One possible way to promote improved decision-making on borrowing for postsecondary education is to provide instruction on student loans in high school financial education courses. While early research on high school financial education has reached differing conclusions about its effectiveness for improving financial behaviors and outcomes (Bernheim, Garrett and Maki 2001; Tennyson and Nguyen 2001; Walstad and Buckles 2008), recent research has shown financial education courses to be effective at improving later life financial outcomes (Brown et al. 2013), particularly when rigorously implemented (Urban et al. 2014).

[2] Federally required entry counseling for those looking to take on student loans is provided online and many students only skim through the material, leaving them with little or no additional information when making future loan decisions (Fernandez et al. 2015).

also contained general academic and financial advice and information, and encouraged student to seek free one-on-one financial counseling, with a modest financial incentive for attending the counseling session.

We rely on a unique administrative dataset on the Montana University System that contains detailed information on students' academic backgrounds, loan packages, and academic outcomes to analyze the effect of this intervention. We utilize a difference-in-difference-in-differences (DDD) strategy to exploit three comparisons. First, we compare students who received the letters at Montana State University to those that also had loans but were below the cutoff for receiving a letter. Second, we compare students who received the letters at Montana State University to those that would have received the letters at the University of Montana had the same policy been in place on that campus. Third, we compare students who received the letters to those who would have received them in the years before the policy was implemented.[3]

Recent research highlights how students' limited understanding of student loan borrowing affects their academic choices and outcomes. Dynarski and Scott-Clayton (2006) and Bettinger et al. (2009) show that the borrowing process and the details of the Federal Student Aid Application (FAFSA) are burdensome for students. Providing students with application assistance increases FAFSA completion, college attendance, and aid received, suggesting that the lack of such information limits prospective students. Academic advising received by most college students is given independently of financial considerations, in spite of the fact that the financial status of students may influence their choice of a major, the time and effort they devote to studying, and their decision to remain enrolled (Deming and Dynarski 2009; Angrist, Lang and Oreopoulos 2009; Castleman and Long 2015; Cohodes and Goodman 2014; DesJardins and McCall 2007). To the best of our knowledge, this paper is the first to link the provision of salient loan information with subsequent borrowing and academic performance.

[3]While the nature of the intervention might initially appear to be a natural setup for a regression discontinuity design, we discuss the issues with that empirical approach in Section 4 and Appendix B.

This paper contributes to a growing body of research that examines how information influences borrowing decisions, showing that borrowers who lack financial knowledge tend to make suboptimal decisions (Lusardi and Tufano 2009; Calvet, Campbell and Sodini 2007, 2009; Agarwal et al. 2009). Furthermore, it contributes to the literature on how cues and decision-making contexts affect a variety of behaviors. This literature shows that cues that make information more salient influence a range of behavioral, consumption, and savings decisions.[4] Currently, little is known about how students respond to either cues or financial information by changing their borrowing behavior. The single paper on information and loan take-up is in the Netherlands, where student loan participation is rare, found little impact of information on borrowing (Booij, Leuven and Oosterbeek 2012). This raises the question of whether an informational intervention would change student behavior in the United States, where student loans are much more common.

This paper makes two contributions to the existing literature. It is the first study to examine the causal effect of an information-based intervention on subsequent loan amounts and academic performance.[5] Second, the administrative data used in this paper are unique, and allow us to examine how students re-calibrate their decisions after receiving salient information; although we cannot determine precisely whether they are behaving optimally.

Not only are student loans a novel context for examining the role of salience, cues, and information, but key aspects of the student loans and borrowing decisions are contested, with a variety of research pointing to evidence of suboptimal decisions. As Avery and Turner (2012) describe, there is an active debate about whether loan amounts are "too large" or "too small." Those on the "too large" side typically make reference to

[4]For example, Stango and Zinman (2014) show that drawing individuals' attention to overdraft fees using survey questions reduces subsequent overdraft usage, Busse et al. (2013) show that the first digit of an odometer reading is influential for car purchases, Chetty, Looney and Kroft (2009) find posting after tax prices makes sales taxes more salient, while Finkelstein (2009) finds electronic toll collection affects driving behavior.

[5]Other strands of literature focus on information-based interventions to promote savings (see e.g. Karlan et al. (2010)) or reduce fees (see e.g. Stango and Zinman (2014)).

high default rates, implying "mistakes" in financing.[6] Furthermore, over the longer term, graduation with a significant amount of student loan debt has been loosely associated with numerous adverse outcomes, such as delays in forming independent households and reduced homeownership (Brown et al. 2015; Dettling and Hsu 2014). There is the possibility that the quality of human capital investment may also be related to its financing, with some evidence indicating that career choices are related to loan packages (Rothstein and Rouse 2011).

However, student loans are clearly essential for human capital investment. While it is well established that individuals from low-income families are less likely to attend college, all else equal, it remains an open question whether this is entirely due to credit constraints or may also be an information problem.[7] Based on existing research, it is unclear whether lack of financial knowledge may also contribute to behaviors that appear to be constrained, or that are otherwise suboptimal in terms of the level of financing or type of loan obtained (Gross and Souleles 2002). Moreover, myopic decision-making could result in students borrowing more than is optimal in order to finance current consumption at the expense of future consumption (Meier and Sprenger 2010; Laibson 1997).

We find that students who receive the financial counseling letters are more likely to switch their major to one in the higher-paying fields of science, technology, engineering, and math (STEM) in the semester following the counseling than those who do not receive the letters. Treated students also reduce their student loan borrowing in the subsequent semester. For freshmen, the intervention increases retention rates for the subsequent semester and year. In addition, receiving a letter increases credits attained that semester, particularly for freshmen, suggesting that students complete courses from which they may have otherwise withdrawn. Students also increase their grade point average (GPA) in the semester of the intervention. These results suggest that early interventions that draw borrowers' attention to their relatively high student loan debt balances and that

[6]See Federal Reserve Bank of New York (2015) for more on the current status of default rates on student loans.

[7]See, for example, Lochner and Monge-Naranjo (2011) and citations therein.

offer information and financial counseling on managing their debt, can improve student academic outcomes and change financial decisions.

2 Background

2.1 Financing Postsecondary Education

Students can finance their postsecondary education through a combination of several different sources: existing savings, parental contributions, employment income, grants, scholarships, subsidized and unsubsidized public student loans, and private student loans. Our research focuses on the federal options for borrowing. The federal government offers subsidized Stafford Loans to undergraduate students based on financial need and unsubsidized Stafford Loans to undergraduate students at all income levels. The borrowing limit for Stafford loans increases with each year of college, reaching a maximum of $7,500 per year for college juniors and seniors who are still financially dependent on their parents and $12,500 per year for financially independent students for the 2014-2015 academic year.[8] As there is no underwriting done on Stafford loans, students are able to borrow for their education without consideration of their ability to repay the loan. Parents can also borrow for their children's education using the Parent PLUS loan program.

Students and their parents also have the option of borrowing from private financial institutions to finance their postsecondary education. Since 2008, the origination of private student loans to undergraduate students has declined substantially due to tighter lending standards and a drop in investor demand for the asset backed securities that funded many private student loans (Consumer Financial Protection Bureau 2012). Private student loans are generally more costly than federal student loans and have repayment terms that are much less flexible than those of federal loans (Lochner and Monge-Naranjo 2015;

[8]The cumulative maximums are $31,000 and $57,500, respectively. Students with exceptional demonstrated financial need can additionally borrow from the government through their college using the Perkins loan program. In our sample, only 7% of individuals have Parent PLUS loans and 11% have Perkins loans. Thus, we omit these loans from our analysis.

Consumer Financial Protection Bureau 2012). Moreover, private student loans are underwritten and therefore require a co-signer for approval unless the student has established a positive credit record. The underwriting requirements and reduced flexibility suggest that students should generally maximize their borrowing through the federal student loan programs before turning to private loans, although some students turn to private loans before exhausting their supply of public loans (Avery and Turner 2012).

2.2 Context for the Intervention

Montana does not have a single state flagship campus; Montana State University and the University of Montana are peer, public institutions that are complementary.[9] This setting allows us to use the University of Montana as a control institution in a natural experiment framework. Montana State University and the University of Montana are ideal for research into the effects of student loans on postsecondary outcomes because these institutions are comparable to many public institutions throughout the United States. Table A.2 provides additional descriptive statistics for the two campuses and for other public four year institutions in the US. Montana State University and the University of Montana have similar student enrollment of about 15,000 and 14,000, respectively; this number is comparable to the average enrollment at public four-year universities in the United States of about 11,000 students. Admission standards are the same at both institutions: both require an ACT score of at least 22, a 2.5 high school GPA, or graduation in the top half of a students high school class. About 60 percent of undergraduate students at both universities come from Montana. In-state tuition at the University of Montana in the 2014-15 school year was $6,330, about 15 percent lower than at Montana State ($6,800); out-of-state tuition is about 5 percent higher at the University of Montana. Although tuition rates at these universities are below the national average, they are comparable as a fraction of state median household income. Graduation rates are also similar, with both

[9]For example, by design, Montana State University has the business school for the state, while the University of Montana has the law school.

colleges graduating about 45 percent of students in six years. The main difference between the two is that Montana State University is the land grant institution, with larger colleges of agriculture and engineering, while the University of Montana has a larger liberal arts program.

Borrowing behavior is also similar at the two schools and approximates the national average. At Montana State, 65 percent of students graduate with student loan debt; at the University of Montana, 62 percent graduate with student loans. The national average is similar, with 69 percent of college students graduating with student loans. In 2013, the average graduate of Montana State University had about $27,000 in debt, which is slightly less than the average debt at the University of Montana ($30,000), and the national average ($28,400) (TICA 2014). About half of in-state students at both institutions receive Pell grants, higher than the US average of about 40 percent. However, when comparing all Montana students to US 4-year public institutions in Table A.2, 32 percent of all Montana State students and 39 percent of University of Montana students receive Pell grants. Table A.2 also shows that while tuition is lower at the Montana schools, average federal loan amounts slightly exceed the national average.

Students at these institutions also appear to behave in ways that suggest that information and cues about their student loan borrowing might influence their behavior. First, many students have only a rudimentary understanding of their existing loans. To supplement the administrative data, we polled Fall 2015 students in Economics 101 and Economics 202, entry level courses required for many majors and overpopulated by freshmen. Based on a survey of 756 students, 40 percent took out loans. Of those, 56 percent took out both subsidized and unsubsidized loans and 25 percent took out just subsidized loans. The other 20 percent of borrowers reported either not knowing what kind of loan they took out or reported taking out only the unsubsidized loan. We also polled students on how they determined the amount to borrow. One third of borrowers said they took out the entire amount they were eligible to borrow, while 26 percent said they took out a loan amount to cover tuition. Only 8 percent reported that they "figure out how much I could

afford to repay after graduation and borrowed that amount." Another 24 report calculating the difference between projected spending and their other resources from savings, work, or parents. This suggests that the majority of students are deliberately relating borrowing amounts to factors other than just the maximum eligibility amount.

2.3 Student Debt Intervention at Montana State University

The intervention we study was initiated in fall 2012 by the Office of Financial Education, part of the Center for Student Success at Montana State University. During the fall semester, students with debt levels labeled as high were sent "Know Your Debt" letters. At the time, average debt upon graduation was about $25,000. The "Know Your Debt" letters were sent to students whose debt would have placed them at or above thresholds related to this average: first-semester freshmen with more than $6,250 in loans, sophomores with more than $12,000 in debt, juniors with more than $18,750 in debt, and any student with more than $25,000 in debt.[10] A sample letter is included in Figure A.1. For context, these debt amounts targeted students whose annual borrowing represented about double the amount of in-state tuition. These thresholds exceed the federal subsidized loan limits, but not the unsubsidized loan limits for dependent juniors and seniors, or the federal loan limits for all independent students. For example, freshmen can take up to $3,500 in federal subsidized Stafford loans. Independent students can borrow an additional $6,000 in unsubsidized Stafford loans, for a total of $9,500.[11]

Roughly 2,300 letters were sent in the first year of the intervention.[12] The "Know Your Debt" letters provided students with information about their debt levels, and contained a highlighted statement that the debt levels were high: "If you continue to accept student

[10] This was never indexed for inflation.

[11] A few additional letters were sent to students whose total loan amount exceeded the median annual salary by major or whose expected monthly payments were anticipated to exceed 14 percent of monthly salary. These median salary levels come from Montana State University Career Destinations Survey of recent graduates. However, in practice very few students met this condition who did not also meet the debt threshold conditions. We count these as untreated, as this will bias us against finding an effect.

[12] Appendix Table A.6 predicts loan letter receipt by year for Montana State over time. These results suggest that Pell recipients are the most likely to receive the letter across all years.

loans at this rate, you will accrue a debt level that may become difficult to repay, which may place you at risk for defaulting on your loans." Letters encouraged students to learn more about how to deal with debt. In particular, they encouraged students to take more than 12 credits to take advantage of constant tuition rates above this threshold: "At MSU, tuition doesn't cost a penny more after you've registered for 12 credits in a semester. Please consider registering for more credits to graduate sooner and spend less on tuition!" The letters also offered one-on-one financial counseling appointments with a financial coach. These appointments were incentivized with $10 gift cards in the first year and $20 gift cards in the second year, redeemable at a local grocery store and gas station. The intervention continued into the following year (2013) with the same criteria for letters and recommendations for appointments.

Counseling services were not tracked consistently in connection with the letters, making it difficult to determine the take-up of these services. The number of appointments made represents about 10 percent of the number of unique individuals receiving a letter, but it is not clear how many were repeat visits and when they made the appointment relative to the wave in which they received the letter. As a result, this study does not attempt to distinguish between the effect of receiving a targeted debt letter, the advice in that letter, and the one-on-one counseling sessions.[13] However, even absent take-up of counseling services, the letter itself may have influenced borrowing and academic choices. Specifically targeted letters potentially make debt levels more salient to students: a student receiving a letter indicating that their debt level is considering high by their college may take that as a clear signal to make more informed borrowing decisions. The specific recommendation to take 15 credits instead of 12 credits also provides a mental reference

[13]The counseling services included a one-hour appointment with a certified financial planner who could help with a variety of topics, including formulating a budget, mapping out course schedules for the duration of the students college career, discussing the salary potential in the students major, and talking through some costly registration "mistakes" students can make. These registration mistakes include dropping a course before or after certain dates in the semester (which can cost between 10 and 90 percent of the tuition cost, depending on the date), registering for 12 credits instead of 15 (students pay the same tuition regardless of how many credits they take beyond 12 per semester), and dropping a course in the first week of class (which results in a tuition refund of less than 100 percent).

point, a framing that in many contexts has been shown to influence subsequent choice.

Although the University of Montana also offers financial counseling to all students, there is no parallel effort to target counseling offers and no corresponding initiative to let students know about their debt status other than through the regular process of applying for financial aid.[14] This process is the same federal process all students are required to undergo.[15] We therefore use the University of Montana as a control campus, allowing us to exploit a triple difference strategy, as explained in detail in the Methods Section. We compare outcomes at Montana State for students who received the "Know Your Debt" letters with students who did not, further compare students with similar debt loans in years before and after the intervention, and finally compare similar students in the same time period at the peer institution.

3 Data

The data for this project are administrative panel data from the Montana University System (MUS). These data include students' high school information, demographic information, the Montana postsecondary campus attended, and the degree pursued. The MUS data are novel for the detailed individual-level college funding information provided. These data identify the source of funds (such as federal, institutional, state, or other), the type and amount of award (need-based, merit-based, athletic payments, work study, loans, etc.), and the fraction of tuition covered by the loans. Our data do not include any information on private loans; however, private student loans are only a small fraction of student debt at the undergraduate level. These data also include semester-by-semester enrollment, credits, major, GPA, courses taken, and retention. To our knowledge, we are among the first researchers to use administrative individual student loan data to examine the effects of borrowing on postsecondary education outcomes.

[14] Montana State University received a federal College Access Challenge Grant, which funded the letters and the gift card offers. No such similar grant was awarded to the University of Montana.

[15] See Fernandez et al. (2015) for a discuss of the details of federal counseling.

Our data span the years 2002 through 2014, or 36 semesters of data, allowing us to follow 57,334 undergraduate students with loans for at least some portion of their time in college. The sample yields a total of 229,669 undergraduate student-semester observations with full coverage across all variables. For the purpose of this study, we limit our analysis to the two largest four-year campuses in the state of Montana: the University of Montana and Montana State University. We also limit our analysis to in-state undergraduate students to abstract away from tuition and loan differences due to the choice of an out-of-state institution. We examine the effects of the amount of tuition covered by loans, as relative tuition charges at the University of Montana and Montana State vary from year to year, with a current difference in in-state tuition of about 15 percent ($6,330 at University of Montana compared to $6,800 at Montana State).[16] Finally, we limit our analysis to all students who have some form of public student loan.

Table 1 reports summary statistics on the loan, demographic, and academic characteristics of the students we study. The average loan amount is $4,200, which covers about 94 percent of annual tuition charges. Approximately one-half of students within our sample are Pell grant recipients, meaning they come from a low-income household.[17] The average student enrolls in 12.2 credits per semester, or approximately four classes, which is less than a recommended course load of 15 credits per semester that typically would enable graduation in four years.

Approximately 42 percent of students at these two universities declare a STEM major. The fraction of STEM majors may seem high at first glance, but given that Montana State is a land grant university with many agriculture-based majors, this number is not surprising. The data further contain demographic information: our sample is 87 percent white and 48 percent male. We obtain data from the American Community Survey from the Census Bureau on demographic characteristics for the student's ZIP code of high

[16]For more on the changes in tuition across campuses and over time, see Appendix Table A.3.

[17]According to the US Department of Educations 2012-13 report, about three quarters of Pell Grant recipients have a family income of $30,000 or less (`http://www2.ed.gov/finaid/prof/resources/data/pell-2012-13/pell-eoy-2012-13.html`).

school graduation. These variables include educational attainment, racial composition, median household income, and population density of the ZIP code. Finally, we control for whether or not the student came from a metropolitan area of over 25,000 residents to proxy for urbanicity.

A histogram of loan debt by class for students at Montana State University after the intervention took place is in Figure A.3. The first thin line in the figure represents the maximum subsidized loan amount by class; the second thin line represents the combined subsidized and unsubsidized annual loan amounts by class. The thicker line signifies the threshold for receiving a letter. These limits are only relevant for dependent students: the limits for independent students will exceed the thick blue line in all cases. Beginning at the top left panel, we see that it is common for freshmen to take the full subsidized amount or the full subsidized and unsubsidized amount conditional on taking out loans. After their first year, students deviate from taking out solely the maximum subsidized limit and move to other points.

4 Methods

As described in Section 2.3, beginning in fall 2012, Montana State University extended warning letters and targeted offers of intensive financial counseling to all students who were at risk of graduating with high levels of debt. Letters were sent based on debt as of the fall semester relative to a threshold that depended on the students year in school.[18] The University of Montana offers financial counseling services to the student body at large, as does Montana State.

In our data, we use the information on student loan amounts to determine freshmen, sophomores, juniors, and seniors who would have received the letters based on the debt criteria established by MSU. Table 2 reports the counts of individuals assigned to receive

[18]Letters were also sent to students whose total debt exceeded the median salaries for Montana State graduates in their major field. These salaries were based on responses to MSUs Career Destinations Survey given to graduating seniors. The salary requirement is not binding for most students who receive the letter. Thus, we leave it out of the estimation strategy.

the letter at Montana State and those that would have received the letter using the same criteria at the University of Montana. We only include students with loans at some during college in the analysis, as those without loans are systematically different from those with loans and would never be the target of this type of intervention.

We examine the impact of these letters on academic outcomes by comparing University of Montana and Montana State students who received loans in fall 2012 or fall 2013 to each other and to their counterparts who had similar levels of debt in years prior to the letter program. In these models, it is important to control for some measure of parental income given its role in the determination of eligibility for grants, loans, and financial aid. The best measure we have for parental income in our data is the student's Pell Grant status, a signal for having come from a very low-income family. We also control for ZIP code-level demographics for a student's home ZIP code to capture other dimensions of socio-economic status. These variables include percent non-white, median household income, educational attainment, urbanicity, and population density. We further control for students' race, gender, the number of credits taken up to that semester, the number of semester the student has completed (i.e., their standing in school), the amount of non-loan aid a student receives (e.g., grants, scholarships), a campus dummy ("attends Montana State University"), the type of semester (fall, spring, or summer), and include year fixed effects. We also control for loans as a fraction of tuition. This is to control for within campus changes in loan amounts over time as well as across campus differences. Specifically, we estimate the Equation 1 for students with loans.

$$
\begin{aligned}
Y_{i,t} &= \alpha_0 + \beta_1 \text{Letter}_{i,t} + \beta_2 \text{Montana State}_{i,t} + \beta_3 \text{Letter} \times \text{Montana State}_{i,t} \\
&+ \beta_4 \text{Letter} \times \text{Montana State} \times 2012_{i,t} + \alpha_1 \text{White}_i + \alpha_2 \text{Male}_i + \alpha_3 \text{Pell}_{i,t} \\
&+ \alpha_4 \text{Credits}_{i,t} + \alpha_5 \frac{\text{Loan}}{\text{Tuition}_{i,t}} + \alpha_6 \text{Non Loan Aid}_{i,t} + \boldsymbol{\alpha_7} \text{Zip}_{\boldsymbol{i}} + \alpha_8 \text{Semesters}_{i,t} \\
&+ \gamma_{\text{semester}} + \delta_{\text{year}} + \epsilon_{i,t}
\end{aligned}
$$

Note that the indicator variable "Letter" is equal to 1 for a student at either campus in any year whose debt levels would have qualified them for the "Know Your Debt" letters at Montana State University in 2012 or later. This varies by time because students may be letter eligible one semester and not the next. The primary parameter of interest is β_4, as it captures the difference-in-difference-in-differences (DDD) estimate of the effect of the counseling intervention.[19] This estimate should be thought of as an "intent to treat" measure, as it captures the effect on all students whose borrowing reaches the key thresholds, not just those who attended the one-on-one counseling sessions. The outcome $Y_{i,t}$ represents the outcome of a variety of decisions students can make in the subsequent semester after receiving the letter and, potentially, counseling. We cluster standard errors at the individual student level.

In order for our DDD estimation strategy to produce causal estimates of the effect of the "Know Your Debt" letters on student outcomes several assumptions must hold. The first is the parallel trends assumption that in the absence of the treatment (letters) the trends in the various outcomes across the groups (campuses and debt thresholds) would have remained the same. We plot the trends across our dependent variables of interest in Figure A.2. The second is that there are no spillover effects from the treatment to the control group (e.g. Montana State students who receive the letters do not talk to Montana State students below the debt threshold, or call up University of Montana students and tell them about the letter content). However, if this assumption is violated it would only lead to our estimates being biased downwards since some of the control group would have then received a weak version of the treatment.

Although we use a DDD framework for the analysis, the causal effect of the intervention could also be identified using a regression discontinuity design (RD). Appendix B reports results using this strategy. However, in practice, we do not have sufficient ob-

[19]The DDD estimates with the full set of interaction terms but no individual control variables are presented in Table A.3. Note that tuition varies by campus and time; the interaction term between the Montana State dummy variable and post-2012 is imperfectly collinear with this variable so we omit the interaction term from our baseline results. However, the results including this term are qualitatively similar.

servations within reasonable bandwidths on either side of the threshold for each class of students. Consequently, Appendix B reports results for freshmen and for a pooled sample of upperclassmen. The results for freshmen approximate those in the DDD analysis. Those for upperclassmen are qualitatively similar to the DDD results, but are less stable and are less precisely estimated. None of the RD results rule out the DDD estimates.

5 Results

Table 3 reports outcomes achieved in the subsequent semester (i.e., spring), including the semester loan amount, semester GPA, semester credits, and a declared STEM major. These results are based on the sample of all students with loans in any period. Table 3, Column (1) shows that students subject to the intervention reduced the amount they borrowed in student loans in the semester following receipt of the letter by approximately $1,361. This represents the average decrease, but does not speak to whether the decrease in loans was concentrated among a few students with large changes, or many students with smaller changes in borrowing. The dependent variable in Column (2) instead is a binary variable for whether or not the amount borrowed in the subsequent semester was smaller than in the semester when the letter was sent. It shows that about 18 percent of students had lower loan amounts in the subsequent (spring) semester relative to the control groups, indicating a widespread reduction in borrowing. The targeted letters and offer of one-on-one counseling appear to result in students either reducing their spending or finding alternative ways to finance their subsequent semesters in school.

At the same time, the results suggest that if students are reducing their loan amounts to work more for pay, they are not doing so at the cost of their academic performance. In fact, the intervention increased students semester GPAs by 0.045 points (Column (3)). Students increase their credits by 0.066, but this effect is not statistically different from zero. While these effects are modest, they do suggest some positive effects for students that were exposed to the intervention. The letters increased the likelihood that students would

declare a STEM major by 1.9 percentage points (Column (5)). The explicit information about credit loads or the offer of Career Coaching may have contributed to the positive effects on choice of majors.[20]

We next turn to examining whether these effects are driven by students who are close to graduation, for whom debt levels may be particularly salient, relative to students early in their careers, who may be better able to adjust their borrowing and academic behaviors. To identify the effects of early-targeted financial information, we replicate this exercise in Table 4 for first-semester freshmen only.[21] Freshmen appear to be more responsive in terms of the amount borrowed: freshmen decrease the amount they borrow in the semester following the letter by an average of $1,882, a 30 percent greater effect than the average effect on subsequent borrowing across all students presented in Table 3. Recall that freshmen receiving these letters have already taken out at least $6,250 in loans. Given the magnitude of the effect on their borrowing, freshmen may be particularly appropriate targets for information about student loans. Furthermore, these effects appear to apply to a large fraction of the distribution: Column (2) shows that 28 percent of freshmen reduced their loan amounts in the subsequent semester due to the intervention relative to the freshmen control group.

While we no longer see an effect statistically different from zero on GPA in the freshmen sample, the letter increases the likelihood of declaring a STEM major by 11 percentage points. This represents a 250 percent increase in the probability of declaring a STEM major among targeted students, suggesting that early financial information allows freshmen to change their academic career paths. However, most freshmen initially begin without a declaration of a major, and so the "change" of a major for them typically represents the first official major declaration. This large increase in STEM majors may therefore also be partly driven by earlier declarations for these freshmen; other freshmen who have not

[20]We find no change in work-study participation as a result of the intervention. We do not have any data on external employment while in college.

[21]This analysis no longer controls for standing in school or cumulative credits, as these no longer have much variation.

yet changed their major may declare a STEM major at a later date.

Because the letters were distributed in November, around the time when students make decisions about withdrawing from courses and studying for finals, we also look at performance and credits completed in the semester of the intervention. The letters noted that "you must pass 67% of your classes each semester to meet the Satisfactory Academic Progress requirements to continue to receive student loan financing." The deadline to withdraw from classes at Montana State University is roughly the third week of November. At the University of Montana, students can withdraw without the signature of the dean up until the 45th day of class (roughly the first week of November), but can withdraw with a signature up until finals week. Table 5 shows that the intervention increases current semester GPAs by 0.05 for all students and by 0.12 points for freshmen. Targeted students are also more likely to complete the courses they are enrolled in, finishing the semester with 0.14 more credits for all students and 0.68 more credits for freshmen. This finding suggests that the information increased students attention to their current-semester courses and emphasizes that early interventions for freshmen are particularly effective.

With these data, it is difficult to unambiguously identify financial "mistakes" that students make and potentially correct subsequent to the intervention. The closest approximation to potential "mistakes" we can identify relate to the number of credits taken. Students must enroll in at least 6 credit hours to be eligible for most federal and state aid (with the exception of Pell Grants), and they must be full time (12 credits or more) to receive a full Pell Grant or scholarship. Tuition and fees are constant above 12 credits, implying that the marginal financial cost for enrolling in more than 12 credits is zero. In order to complete the standard graduation credit requirements in four years, students need to enroll in 15 credits each semester. This objective implies that one potential improvement for many students would be to enroll in 15 credits instead of 12 credits, with no marginal financial cost. Students may be especially likely to enroll in more credits in the semester after they receive the letter. A second mistake would be to withdraw from classes in the current semester and jeopardize financial aid in the subsequent semester. To

be eligible for aid in the subsequent semester, students must complete at least 67 percent of credits attempted. For example, a student taking 9 credits could not withdraw from a 3-credit class without losing eligibility for aid the next semester. For students taking more than 9 credits, withdrawing from a single 3-credit class would not affect future financial aid. Indeed, the letter provides explicit information both about the need to pass 67 percent of classes and suggested registering for 15 or more credits a semester.

To investigate whether the effects are driven by uniformly higher credit-taking across the distribution or by larger changes from students at the margin of sub-optimal and optimal choices, we examine the effect of the letter and counseling offer across the distribution of credits. Table 6 reports the effects at two points: the effect of the intervention on the probability of taking at least 9 credits, and the probability of taking at least 15 credits. For both outcomes, we again examine outcomes in the current semester and in the subsequent semester. Columns (1) and (2) show that while the letter and counseling offers increased both probabilities in the current semester, the effect is greater for the probability of taking at least 15 credits. Column (2) of Panel B reports that freshmen who receive the intervention are nearly 5 percentage points more likely to complete at least 15 credits in the current semester.

The specifications that examine future credits in Columns (3) and (4) also condition on the number of credits taken the semester the letter was received. These specifications further help to center the analysis on potential corrections of past "mistakes." Some students likely balance other time or psychological constraints that lead them to consistently enroll in 12 credits even though the financial cost of an additional course to earn 15 credits is zero. If students were behaving optimally, the intervention would then have no effect after conditioning on the typical credit load. However, the specifications in Column (4) indicate that even conditioning on past credits, students who received the intervention were 2.5 percentage points more likely to enroll in 15 or more credits the following semester.[22]

[22]While the magnitude is comparable for freshmen in Panel B, it is no longer statistically different from zero.

Tables 3 through 6 indicate that current and subsequent semester behaviors are affected by the intervention in ways that suggest that students are correcting previous mistakes after receiving additional information. However, it may be that the letters have negative effects on academic outcomes if they cause students to become discouraged and drop out of the university. If subsequent semester outcomes are driven by the fact that some students select out of college completion, the results may overstate the positive effects on academic achievement. This does not appear to be the case. Table 7 examines the effect of the intervention on student retention. This table reports retention two different ways: Columns (1) and (3) report whether the student was still enrolled and taking courses in the subsequent semester, and Columns (2) and (4) report whether the student was still enrolled and taking courses in the subsequent fall semester (one year later). The results indicate that the effects are again greatest for freshmen, for whom the intervention increased the probability of retention by 3.6 percentage points in the next year. This effect is not statistically different from zero when upper-classmen are included in the analysis, showing that the information may not be as relevant for students who have already made decisions about whether to stay in college or drop out.

Since these results suggest that those subject to the intervention are most likely to be retained, causing more treated students to show up in the sample the subsequent semester and year, concern may arise that sample selection affects the estimates on GPA and credit hours taken. However, we argue that the students retained due to the policy are marginal students who might have considered dropping out. The retention of marginal students would downwardly bias on our estimates for GPA and credits in the Spring semester, suggesting that the true magnitude of the effect of this intervention could be greater than what we report.

We provide several robustness tests of our main findings. First, we estimate three difference-in-difference specifications that compare students within Montana State University before and after the intervention above and below the thresholds, across campuses and debt thresholds in just the post years, and across campuses and years for only high

debt students. These results all remain roughly consistent and are presented in Table A.3, though the STEM effect is largely driven by the comparison across campuses and years for only students with high loan amounts. Second, we estimate an additional model that only compares the loans over the threshold to those with loan amounts equal to at least one-half of the threshold. Our results are again in Table A.3 and remain substantively similar, though they have larger standard errors. Third, although there has been a slight increase in tuition over time, Stafford limits have only changed once in our period (see Table A.5 for more on Stafford limits). This may raise concern that our letter receipt variable does not adjust for inflation. We are reluctant to adjust for this, as the Office of Student Success did not change its thresholds over the two years of the policy. Therefore, we account for changing costs by limiting the sample to only two years before and after the intervention. Table A.3 contains these results as well, which again remain comparable to our main effects. Fourth, the final panel of Table A.3 contains a specifications with semester by year fixed effects and the results remain unchanged.[23] Fifth, we falsely assign treatment to the 2008-2009 and 2009-2010 academic years, and look only at the years before the intervention. Using this specification, we find no effect of this falsely placed placebo policy (Table A.4). All of these robustness checks support the validity of our primary estimates.

5.1 Heterogeneity

We next look at potentially heterogeneous effects of the intervention in Table 8. Panel A begins by replicating Table 3 for four different sub-samples: borrowers above the Stafford subsidized limit, Pell recipients, females, and non-white students. Panel B replicates Columns (1) and (2) of Table 5 and Columns (1) and (2) of Table 7 for the same subgroups.

Students that borrowed more than the subsidized Stafford limits in the Fall reduced

[23] If we instead include campus by year fixed effects and letter by year fixed effects, our results remain comparable with slightly larger standard errors.

their loan amounts in the subsequent semester 9 percent more than the average effect (Column (1)) reported in Table 3. These students further responded to the intervention by increasing their average credits by 0.21 in the subsequent semester. These students also respond by improving their GPA by 30 percent more than the average effect: 0.065 points in the subsequent semester. This could be a direct response to the cautions in the letter about maintaining Satisfactory Academic Progress. Further, this group is more likely to respond by declaring a STEM major next semester. In unreported results, we find that the intervention reduced the probability of being over the Stafford subsidized limit in the subsequent semester by 26 percent for those that were above the Stafford subsidized limit in the given semester. This suggests that the letter makes students more cautious about excess borrowing. In the current semester (Panel B), students above the Stafford subsidized limit and exposed to the intervention finish 0.23 credits more, on average, and are 1.7 percentage points more likely to be retained in the next year.

The next group we study is Pell grant recipients, who come from the lowest-income households. On average, the effect sizes for this group are consistent with the average effects in Table 3 in terms of loan amounts. This finding is consistent with Johnson (2013), who suggests that even though low-income individuals are credit constrained, they will not borrow more due to their uncertainty about future earnings and employment. However, like the borrowers above Stafford limits, they are more likely to improve their academic performance, finishing more credits and with a higher GPA in the semester following the intervention than the average effect. These students also seem to respond to the letter by focusing more on the current semester. The effect size for this group is larger for current-semester GPA and current-semester credits, meaning that these students are most likely to complete courses they would have otherwise dropped and to focus on doing well in their final exams. Pell recipients are also most likely to be retained one year after receiving the letters; their probability of being in school next year increases by nearly 3 percentage points. Given that we find no effect of the intervention on this retention measure for the full sample, this significant effect on a group at relatively high-risk of dropping out

emphasizes the range of benefits resulting from this information.

Female students seem to respond to the letters by focusing more closely on academics, achieving higher GPAs in the subsequent semester, with an effect size almost double that of the average result. However, the effect on current semester GPA for females is the same as the average effect. Females do not respond to the intervention by completing more credits in the current or subsequent semesters and are no more likely to be retained. They also do not declare STEM majors at a higher rate because of the intervention. Females do respond by taking out less debt in the next semester, reducing their loan amount by an average of $1,668. This amount is greater than the average effect, $1,361, showing that female students may either be more risk-averse or more influenced by information on their debt amount and future salary.

We find that the intervention produced no changes for non-white students in next-semester GPA, next-semester credits completed, the declaration of a STEM major, current-semester GPA, current-semester credits, or retention. However, these students did reduce their loan amounts by approximately $1,159, though this is lower than the average effect. Note that in our data, only 13 percent of the student body is non-white, and these students are disproportionately American Indian. Caution should be taken in extending these results to other groups.

5.2 Discussion

There are a few components to the experimental design that are worth mentioning. First, while we know the specific rules used to determine who would receive the letters, we do not know who exactly received the letters. In addition, the number of students who should have received letters, according to our counts, is slightly greater than the number of students to whom the Center for Student Success actually sent letters.[24] However, this slight discrepancy would lead to a downward bias in our results relative to the actual

[24]This difference could be due to refunds of student loans or a difference in the loan amounts at the given date in the data versus the loan amount on the given date in the Centers records.

effect size, as we classify students as receiving the intervention when they did not.

Second, we do not know which students who received letters also chose the one-on-one counseling. Counseling was available for all students on both campuses, though it was not incentivized for the general population (no gift card was provided). Although we know that approximately 10 percent of letter recipients made counseling appointments, we do not know who these individuals are and cannot separately identify the effects of the counseling and the letter. It could be the case that the letter, even without the counseling option, is producing the estimated effects by making students cognizant of how much they are borrowing, that their borrowing levels are determined to be risky, and by providing advice about credits, pass rates, and future repayment options. The letter may also be a signal for students to visit with their academic advisor or talk with their parents about their finances. The letter could also result in the students independently deciding to change their borrowing and academic behavior because of the way their debt amount was singled out, while their friends or roommates may have not received a similar letter.

Third, there may be spillover effects from the letter recipients to the non-recipients. For example, at-risk students who received a letter may see the counseling option and tell their roommates about their financial struggles or their experience at a counseling session. Even if the at-risk student does not go to counseling, his roommate can still see a one-on-one financial counselor at no charge. If the roommate attends the counseling, or makes more thoughtful borrowing decisions in the future, this downwardly bias our estimates the true effects of the intervention. Fourth, while we know that the letter provided some relevant information for student borrowers, we do not know if it is the information, the nudges in the letter, or the getting the letter when your peers did not that changed behavior. Fifth, this is a sample of students in Montana, and the results should be extended to other states, private schools, and two-year schools with caution.

6 Conclusion

In June of 2015, the 90 or more day delinquency rate on student loans reached 11.5% (Federal Reserve Bank of New York 2015). This high rate of delinquency on a large amount of consumer debt has prompted widespread concerns about student loan debt. Much of the existing research and policy effort has focused on addressing student loan debt once the borrower has entered repayment. In contrast, we find that providing college students with information when they still have the flexibility to alter their borrowing and career trajectory is a highly effective strategy for improving their outcomes. Furthermore, we focus on effects at public four year institutions. Much of the recent discussion about default has centered on the rising cost of college at high-end private universities, as well as the high default rates for low-quality for-profit and community college students (Looney and Yannelis 2015). However, public four-year institutions educate 72% of all postsecondary students (National Center for Education Statistics 2013) and three year cohort default rates at public institutions are 12 percent.[25] This paper provides insight into this understudied yet large portion of student loan borrowers.

Our study suggests that a relatively low-cost intervention as simple as sending at-risk students a letter about their student loan debt and offering financial counseling could make a substantial difference in students' borrowing behavior and academic outcomes. The MUS data allow us to precisely identify the effects of providing targeted and salient information, as the policy varied both within a given university and across institutions. This emphasizes the importance of high-quality administrative data for understanding student loans at the individual, as opposed to aggregate, level. We find that students who received a letter about their debt levels and were offered financial counseling reduced borrowing levels, increased semester GPAs and credits, and were more likely to switch to a STEM major in the subsequent semester relative to their peers. These estimates rely on comparisons with similar students in pre-intervention periods, other borrowers with

[25]Data accessed at `http://www2.ed.gov/offices/OSFAP/defaultmanagement/cdr.html`.

loans below the thresholds, and similar students in the same time period at a comparable institution. Switching to a STEM major and reducing borrowing were particularly pronounced for freshman receiving the intervention, as their rate of choosing STEM majors increased by 11 percentage points and borrowing fell by about one-third. We also find that females are particularly likely to improve grades because of the intervention, while Pell grant recipients and borrowers above Stafford subsidized limits are more likely to change to a STEM major.

The magnitudes we find in this paper exceed those of some information-based interventions, although others also find economically large effects (Stango and Zinman 2014). The most related study finds modest effects of information on filling out the FAFSA (Bettinger et al. 2009). However, one distinguishing factor is that the students themselves are making decisions in our study at an actionable point in their college careers, whereas Bettinger et al. (2009) focus on parent behavior. Given the complexity of the decision to take out student loans, the amount to take out, which major to declare, how many courses to take each semester, and whether to stay in college, direct information at this stage may be more influential. It may also be the case that targeted information, rather than widespread distribution, makes that information more relevant: a clear signal of at-risk borrowing behavior leads to significant responsiveness.

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7 Tables

Table 1: Summary Statistics

	Observations	Mean	Std. Dev.
Academic Characteristics			
Semester GPA	255,076	2.79	1.03
Semester Credits	255,076	12.23	4.44
STEM Major	255,785	0.42	0.49
Retention next semester	245,271	0.798	0.401
Retention next year	208,262	0.759	0.428
Loan Characteristics			
Loan Amount for Borrowers ($000s)	255,785	4.20	2.75
Non-loan Aid for Borrowers	255,785	1.283	2.040
Student Characteristics			
White	255,785	0.87	0.33
Male	255,785	0.48	0.50
Pell	255,785	0.50	0.50
Census Characteristics			
% Some College	254,614	30.70	3.63
% HS Education	254,614	23.10	7.70
% No HS Education	254,614	5.98	3.34
% Non-White	254,614	7.34	7.02
Median Household Income	254,614	46,218	13,460
Population Density	254,640	1,355	2,106
Urban Area	235,047	0.82	0.39
Unique Students	57,334		

Notes: Separate summary statistics for University of Montana and Montana State University pre- and post-intervention are presented in Appendix Table A1.

Table 2: Letter Descriptive Statistics

	Intended Letter		No Letter	
	Montana State	University Montana	Montana State	University Montana
Number Freshmen	1,584	967	1,863	1,373
Number Sophomores	1,204	1,110	909	882
Number Juniors	1,105	1,155	960	1,048
Number Seniors	1,369	1,473	1,159	1,228
STEM Major	3,142	1,457	2,904	1,461
Cumulative Loan amount Fall	28.9	28.9	8.7	9.0
Cumulative Loan amount Spring	33.1	34.9	11.8	12.8

Notes: Data for Fall 2012 and Fall 2013 only. Cumulative loan amounts in thousands.

Table 3: Effect of Letters on Outcomes in Next Semester

	(1) Loan Amount	(2) Loan Amount Fell	(3) GPA	(4) Semester Credits	(5) STEM Major
Letter	2.315***	0.026***	-0.159***	-0.433***	-0.041***
	(0.034)	(0.004)	(0.011)	(0.048)	(0.006)
Montana State	0.035**	0.048***	-0.050***	0.201***	0.159***
	(0.012)	(0.002)	(0.008)	(0.033)	(0.005)
Montana State × Letter	-0.182***	0.039***	0.075***	0.218***	0.038***
	(0.045)	(0.006)	(0.015)	(0.065)	(0.009)
Montana State × Letter × Post	-1.361***	0.178***	0.045*	0.066	0.019+
	(0.065)	(0.008)	(0.019)	(0.087)	(0.010)
White	-0.094***	0.004+	0.191***	0.851***	0.016**
	(0.016)	(0.002)	(0.009)	(0.038)	(0.005)
Male	-0.010	-0.005***	-0.257***	-0.598***	0.189***
	(0.010)	(0.002)	(0.006)	(0.023)	(0.003)
Pell Dummy	-0.152***	-0.006**	-0.124***	-0.943***	-0.046***
	(0.014)	(0.002)	(0.007)	(0.028)	(0.004)
Cumulative Credits	0.003***	-0.001***	0.009***	0.043***	0.001***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Number Semester	-0.080***	0.006***	-0.066***	-0.462***	-0.004***
	(0.003)	(0.000)	(0.002)	(0.009)	(0.001)
Loan to Tuition Ratio	3.345***	0.278***	-0.128***	-0.394***	-0.030***
	(0.012)	(0.002)	(0.006)	(0.027)	(0.003)
Non-loan Aid	-0.045***	0.009***	0.038***	0.218***	0.006***
	(0.002)	(0.000)	(0.001)	(0.006)	(0.001)
Observations	203,984	203,984	203,237	203,237	203,984
Adjusted R^2	0.530	0.205	0.089	0.083	0.087

Notes: Standard errors are clustered at the individual student level and are reported in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ Dependent variables are all for the subsequent (Spring) semester. Loan Amount Fell is a dummy variable equal to one if the semester loan in the Spring semester was lower than the Fall semester loan amount. Specifications condition on having loans in current semester. All models control for ZIP codelevel characteristics from the American Community Survey, including percent no high school education, percent high school education, percent some college, percent non-white, population density, and median household income. We also control for whether or not the individual is from a metropolitan statistical area (MSA) with over 25,000 residents as a proxy for urbanicity. All models include year fixed effects.

Table 4: Effect of Letters on Outcomes in Next Semester, Freshmen Only

	(1) Loan Amount	(2) Loan Amount Fell	(3) GPA	(4) Semester Credits	(5) STEM Major
Letter	5.169***	0.076***	-0.033	0.292*	0.014
	(0.082)	(0.012)	(0.032)	(0.133)	(0.014)
Montana State	0.246***	0.009	0.042	0.221+	0.090***
	(0.036)	(0.009)	(0.027)	(0.116)	(0.011)
Montana State × Letter	-0.695***	0.087***	-0.053	-0.505**	-0.009
	(0.109)	(0.017)	(0.041)	(0.180)	(0.019)
Montana State × Letter × Post	-1.882***	0.280***	0.007	0.303	0.106***
	(0.214)	(0.022)	(0.053)	(0.246)	(0.024)
White	-0.063	-0.000	0.257***	1.084***	0.037***
	(0.052)	(0.008)	(0.024)	(0.109)	(0.010)
Male	0.037	-0.004	-0.270***	-0.879***	0.190***
	(0.029)	(0.005)	(0.014)	(0.063)	(0.007)
Pell Dummy	-0.204***	-0.018**	-0.327***	-1.687***	-0.060***
	(0.033)	(0.006)	(0.017)	(0.075)	(0.008)
Loan to Tuition Ratio	3.904***	0.208***	-0.803***	-4.147***	-0.086***
	(0.075)	(0.017)	(0.039)	(0.166)	(0.019)
Non-loan Aid	-0.072***	0.021***	0.070***	0.347***	0.017***
	(0.010)	(0.002)	(0.005)	(0.021)	(0.002)
Observations	21,562	21,562	21,560	21,560	21,562
Adjusted R^2	0.534	0.460	0.070	0.089	0.071

Notes: Standard errors are clustered at the individual student level and are reported in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ Dependent variables are all for the subsequent (Spring) semester. Loan Amount Fell is a dummy variable equal to one if the semester loan in the Spring semester was lower than the Fall semester loan amount. Specifications condition on having loans in current semester. All models control for ZIP codelevel characteristics from the American Community Survey, including percent no high school education, percent high school education, percent some college, percent non-white, population density, and median household income. We also control for whether or not the individual is from a metropolitan statistical area (MSA) with over 25,000 residents as a proxy for urbanicity. All models include year fixed effects.

Table 5: Effect of Letters on Current Semester Outcomes, All Students and Freshmen Only

	All Students		Freshmen Only	
	(1)	(2)	(3)	(4)
	GPA	Credits	GPA	Credits
Letter	-0.013	0.117**	0.000	0.770***
	(0.010)	(0.043)	(0.028)	(0.120)
Montana State	0.089***	0.681***	0.145***	0.515***
	(0.007)	(0.030)	(0.024)	(0.097)
Montana State × Letter	0.051***	0.434***	-0.090*	-0.856***
	(0.014)	(0.056)	(0.037)	(0.157)
Montana State × Letter × Post	0.051**	0.135+	0.115*	0.680***
	(0.017)	(0.072)	(0.046)	(0.205)
White	0.212***	0.967***	0.230***	1.274***
	(0.008)	(0.034)	(0.022)	(0.092)
Male	-0.264***	-0.579***	-0.251***	-0.603***
	(0.005)	(0.021)	(0.013)	(0.053)
Pell Dummy	0.008	-0.478***	-0.300***	-1.637***
	(0.006)	(0.026)	(0.015)	(0.064)
Cumulative Credits	0.011***	0.065***		
	(0.000)	(0.001)		
Number Semesters	-0.099***	-0.675***		
	(0.002)	(0.008)		
Loan to Tuition Ratio	-0.359***	-1.256***	-1.129***	-6.392***
	(0.006)	(0.026)	(0.032)	(0.130)
Non-loan Aid	0.043***	0.249***	0.075***	0.367***
	(0.001)	(0.005)	(0.004)	(0.018)
Observations	236,200	236,200	23,993	23,993
Adjusted R^2	0.139	0.171	0.099	0.147

Notes: Standard errors are clustered at the individual student level and are reported in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ Dependent variables are all for the current (Fall) semester. Specifications condition on having loans in current semester. All models control for ZIP codelevel characteristics from the American Community Survey, including percent no high school education, percent high school education, percent some college, percent non-white, population density, and median household income. We also control for whether or not the individual is from a metropolitan statistical area (MSA) with over 25,000 residents as a proxy for urbanicity. All models include year fixed effects.

Table 6: Effect of Letters on Distribution of Credits in Current and Next Semester

Panel A: All Students				
	(1)	(2)	(3)	(4)
	Current Semester		Next Semester	
	≥ 9 Credits	≥ 15 Credits	≥ 9 Credits	≥ 15 Credits
Montana State × Letter × Post	0.017*	0.023**	-0.003	0.025**
	(0.007)	(0.009)	(0.007)	(0.009)
Current Credits ≥ 9			0.411***	
			(0.005)	
Current Credits ≥ 15				0.307***
				(0.003)
Observations	122,370	122,370	107,023	107,023
Adjusted R^2	0.119	0.094	0.191	0.156
Panel B: Freshmen Students Only				
	(1)	(2)	(3)	(4)
	Current Semester		Next Semester	
	≥ 9 Credits	≥ 15 Credits	≥ 9 Credits	≥ 15 Credits
Montana State × Letter × Post	-0.013	0.047*	-0.012	0.022
	(0.015)	(0.019)	(0.019)	(0.022)
Current Credits ≥ 9			0.384***	
			(0.013)	
Current Credits ≥ 15				0.241***
				(0.009)
Observations	23,994	23,994	21,562	21,562
Adjusted R^2	0.399	0.253	0.227	0.168

Notes: Standard errors are clustered at the individual student level and are reported in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ Dependent variables are all for the current (Fall) semester. Specifications condition on having loans in current semester. All models control for ZIP codelevel characteristics from the American Community Survey, including percent no high school education, percent high school education, percent some college, percent non-white, population density, and median household income. We also control for whether or not the individual is from a metropolitan statistical area (MSA) with over 25,000 residents as a proxy for urbanicity. All models include year fixed effects.

Table 7: Effect of Letters on Retention, All Students and Freshmen Only

	All Students		Freshmen Only	
	(1)	(2)	(3)	(4)
	Retained 1 Semester	Retained 1 Year	Retained 1 Semester	Retained 1 Year
Letter	0.002	0.002	0.009	0.032***
	(0.006)	(0.004)	(0.012)	(0.007)
Montana State	0.042***	0.032***	0.034**	0.028***
	(0.006)	(0.004)	(0.010)	(0.008)
Montana State × Letter	-0.020*	-0.000	-0.031+	-0.019+
	(0.008)	(0.006)	(0.017)	(0.010)
Montana State × Letter × Post	0.018+	0.011	0.045*	0.036**
	(0.009)	(0.008)	(0.019)	(0.012)
White	0.031***	0.016***	0.040***	0.021***
	(0.006)	(0.004)	(0.009)	(0.006)
Male	-0.013***	0.003	-0.033***	-0.003
	(0.003)	(0.003)	(0.006)	(0.004)
Pell Dummy	-0.049***	-0.030***	-0.077***	-0.037***
	(0.004)	(0.003)	(0.007)	(0.004)
Cumulative Credits	0.007***	0.007***		
	(0.000)	(0.000)		
Number Semesters	-0.051***	-0.063***		
	(0.002)	(0.002)		
Loan to Tuition Ratio	-0.162***	-0.137***	-0.226***	-0.147***
	(0.010)	(0.007)	(0.015)	(0.010)
Non-loan Aid	0.011***	0.011***	0.015***	0.013***
	(0.001)	(0.001)	(0.002)	(0.001)
Observations	55,127	59,914	22,057	23,845
Adjusted R^2	0.240	0.085	0.201	0.052

Notes: Standard errors are clustered at the individual student level and reported in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ Retained 1 semester and Retained 1 year are dummy variables equal to one if the student continued to matriculate in the given timeframe. Specifications condition on having loans in current semester. All models control for ZIP codelevel characteristics from the American Community Survey, including percent no high school education, percent high school education, percent some college, percent non-white, population density, and median household income. We also control for whether or not the individual is from a metropolitan statistical area (MSA) with over 25,000 residents as a proxy for urbanicity. Models include year fixed effects.

Table 8: Heterogeneous Effects

Panel A: Next Semester Outcomes

	(1) Loan Amount	(2) GPA	(3) Credits	(4) STEM Major
Borrowers Above Stafford Subsidized Loan Amounts				
Montana State × Letter × Post	-1.490***	0.065**	0.206*	0.034**
	(0.069)	(0.021)	(0.096)	(0.011)
Observations	95,321	94,995	94,995	95,321
Pell Recipients				
Montana State × Letter × Post	-1.359***	0.061*	0.284*	0.034*
	(0.072)	(0.031)	(0.136)	(0.015)
Observations	54,500	54,341	54,341	54,500
Female				
Montana State × Letter × Post	-1.668***	0.082**	0.139	0.016
	(0.095)	(0.030)	(0.129)	(0.016)
Observations	56,435	56,208	56,208	56,435
Non-White				
Montana State × Letter × Post	-1.159***	-0.005	0.108	0.016
	(0.200)	(0.061)	(0.273)	(0.031)
Observations	13,313	13,275	13,275	13,313

Panel B: Current Semester Outcomes and Retention

	(1) GPA	(2) Credits	(3) Retained 1 Semester	(4) Retained 1 Year
Borrowers Above Stafford Subsidized Loan Amounts				
Montana State × Letter × Post	0.057**	0.231**	0.013	0.017+
	(0.019)	(0.079)	(0.008)	(0.009)
Observations	108,357	108,357	53,010	48,882
Pell Recipients				
Montana State × Letter × Post	0.072**	0.232*	0.007	0.028*
	(0.027)	(0.110)	(0.012)	(0.014)
Observations	63,246	63,246	29,267	26,567
Female				
Montana State × Letter × Post	0.050+	0.082	0.009	0.018
	(0.026)	(0.105)	(0.011)	(0.013)
Observations	64,311	64,311	31,191	28,734
Non-White				
Montana State × Letter × Post	0.006	0.298	0.028	0.030
	(0.055)	(0.229)	(0.023)	(0.028)
Observations	15,568	15,568	7,449	6,683

Notes: Standard errors clustered at the student level and reported in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ Specifications condition on having loans in current semester. All models include the same controls as Table 3.

Appendix A: Descriptive Statistics and Robustness

«First_Name» «Last_Name»
«Address_Line1»
«City», «State» «Zip»

Dear «First_Name»,

At Montana State University, we are serious about your education. We know higher education requires a real investment in time, energy, and financial resources, and we think you made a good choice by investing in yourself. However, we want to be sure the financial choices you make now do not negatively impact your future.

To that end, we want you to *know your debt* and be informed of important programs and options at MSU as well as Federal Student Loan terms and conditions:

- As of September 18, 2014, you have accepted $ in student loan debt at Montana State University.*
- Current federal loans for undergraduate students have interest rates as high as 6.8%.
- In order to remain in good financial aid standing, you must pass 67% of your classes each semester to meet the Satisfactory Academic Progress requirements to continue receiving student loan financing.
- When you are in the repayment period of your loans, there are multiple repayment plans available for you. For example, The Public Service Loan Forgiveness plan allows borrowers who work full-time at a qualifying public service organization to have the balance of their loans forgiven if they have made 120 on-time, full, scheduled monthly payments.
- For more information about your current loan amount, please visit www.NSLDS.ed.gov.
- At MSU, tuition doesn't cost a penny more after you've registered for 12 credits in a semester. Please consider registering for more credits to graduate sooner and spend less on tuition! Check out montana.edu/freshman15 for more information.

Again, we want you to know we think you made an excellent decision to invest in your future. Generally, college graduates earn more, have a lower unemployment rate, and live longer than those who do not have a college degree. We want to be sure you find the right balance so that student loan debt isn't going to negatively affect your financial future.

Schedule an appointment with a Financial Coach to learn more about repayment options, budgeting, and tips for managing your debt. To set up an appointment with a Financial Coach, call the Office of Financial Education at 406.994.4388 or email MakeChange@montana.edu. If you continue to accept student loans at this rate you will accrue a debt level that may become difficult to repay, which may place you at risk for defaulting on your loans.

We are so certain an appointment with a Financial Coach will be beneficial we are willing to pay you to attend. When you meet with one of the Financial Coaches in the office by DATE, you will receive a $20 gift card to help supplement grocery or gas expenditures.

We also recommend you meet with a Career Coach. Outside of earning a degree, we believe one of the most important steps you can take to secure a solid financial future is to develop an internship and career plan. Your Financial Coach will refer you to a Career Coach during your first meeting to assist with this effort.

Sincerely,

*Please note, Nursing Loans, private education loans, and debt accrued at another institution are not included in this debt total. Loan balance does not reflect any payments or repayments made on the loans. To view your complete federal student loan borrowing history at all schools attended, please visit the National Student Loan Data System (NSLDS.ed.gov).

Figure A.1: Sample "Know Your Debt Letter"

Table A.1: Letter Descriptive Statistics

	Montana State		University Montana	
	Pre	Post	Pre	Post
Academic Characteristics				
Semester GPA	2.777	2.804	2.807	2.812
	(0.986)	(1.018)	(1.080)	(1.039)
Semester Credits	12.202	12.164	12.299	12.119
	(4.254)	(4.580)	(4.528)	(4.771)
STEM Major	0.506	0.558	0.331	0.298
	(0.499)	(0.497)	(0.471)	(0.457)
Retained following semester	0.827	0.636	0.821	0.658
	(0.378)	(0.481)	(0.383)	(0.474)
Retained Following Year	0.785	0.478	0.777	0.537
	(0.411)	(0.500)	(0.416)	(0.499)
Loan Characteristics				
Loan Amount for Borrowers	4.071	5.692	3.885	5.195
	(2.546)	(4.087)	(2.437)	(3.142)
Non-loan aid for borrowers	1.410	2.062	1.446	2.105
	(1.626)	(2.319)	(1.495)	(1.948)
Student Characteristics				
White	0.894	0.860	0.858	0.850
Male	0.506	0.519	0.455	0.444
Pell	0.485	0.490	0.510	0.555
Observations	107,693	19,371	109,307	19,414

Notes: Data for all periods where Pre signifies before the intervention and Post contains all years after the intervention. Means reported with standard deviations in parentheses. Loan amounts in thousands.

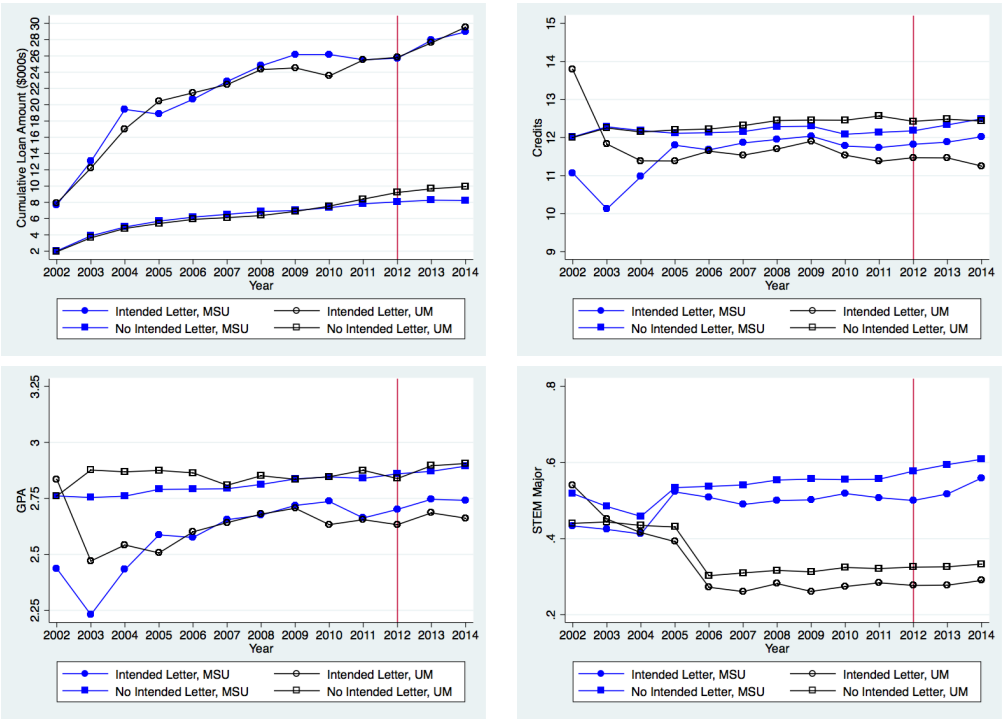

Figure A.2: Difference-in-Difference-in-Difference Plots: Across Campuses, Debt Letters, and Time

Notes: The figures above shows trends in cumulative loan amounts, semester credits, semester GPA, and STEM major declaration, in that order. These averages are reported separately across Montana State and the University of Montana, and students above or below the debt threshold.

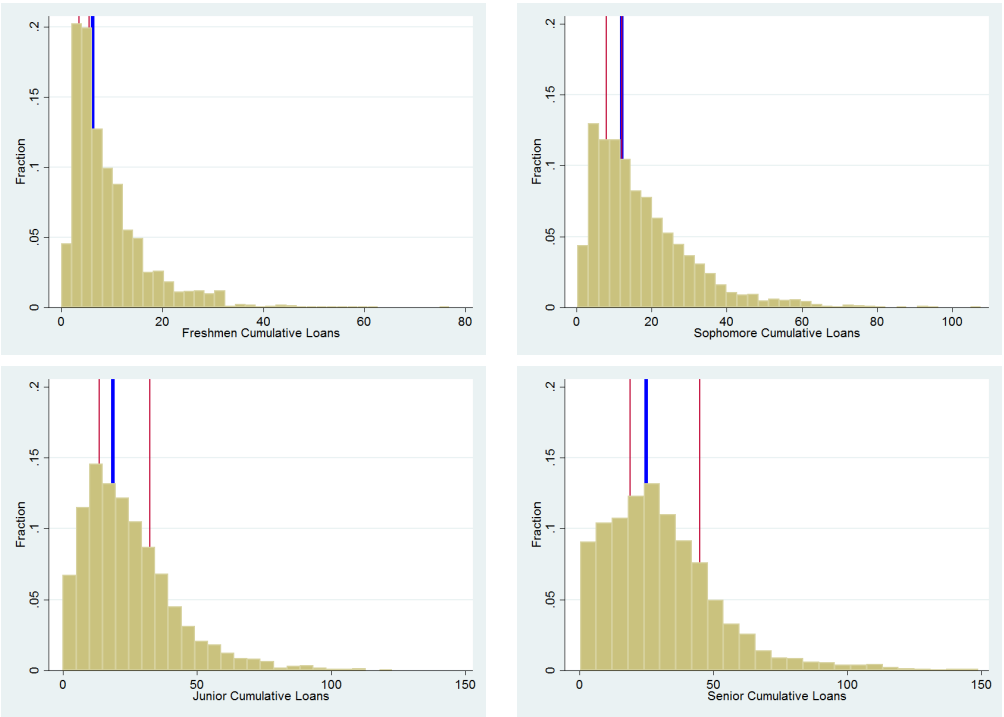

Figure A.3: Histogram of Loan Amounts Across Class Standing

Notes: The figures above shows trends in cumulative loan amounts across classes for Montana State University from Academic years 2012-2013 and 2013-2014 (the two years after the intervention). The thin, red lines, signify the Stafford subsidized amount and Stafford combined subsidized amount that can be borrowed each year, and the thicker, blue line signifies the threshold for the intervention.

Table A.2: Representativeness of Sample

	Montana State	University Montana	US 4-year Public
Undergraduate Enrollment	14,098	14,753	11,028
In-state Tuition and Fees	6,752	6,275	7,756
% White	85	78	69
% Male	54	46	44
% Pell	32	39	39
% Ugrads with Fed Loans	49	56	51
% Avg Fed loan	7,113	7,467	6,873
% In-state	55	74	83

Notes: 4-year public institution data from the 2013 IPEDS. This information differs from Table 1 in that it includes in and out of state students.

Table A.3: Robustness Checks: Alternate Specficiations

Next Semester Outcomes	(1) Loan Amount	(2) GPA	(3) Credits	(4) STEM Major
Symmetric Pre- and Post-Years				
Montana State × Letter × Post	-1.576***	0.016	0.051	0.025*
	(0.071)	(0.021)	(0.097)	(0.011)
Observations	81,505	81,203	81,203	81,505
DD: Within Montana State				
Letter × Post	-1.091***	0.038+	-0.026	-0.002
	(0.066)	(0.021)	(0.092)	(0.011)
Observations	101,967	101,963	101,963	101,967
DD: Across Campuses Post-Years Only				
Letter × Montana State	-1.626***	0.086***	0.407***	0.004
	(0.087)	(0.026)	(0.119)	(0.014)
Observations	32,291	32,188	32,188	32,291
DD: High Loan Amount Students Only				
Post × Montana State	-1.834***	0.061*	0.232+	0.047***
	(0.087)	(0.026)	(0.119)	(0.014)
Observations	32,888	32,774	32,774	32,888
$\frac{1}{2}$ **Threshold**				
Montana State × Letter × Post	-1.349***	0.038+	0.067	0.023*
	(0.070)	(0.021)	(0.096)	(0.011)
Observations	73,284	73,017	73,017	73,284
DDD with Semester by Year Fixed Effects				
Montana State × Letter × Post	-1.358***	0.072***	0.098	0.040***
	(0.065)	(0.018)	(0.082)	(0.010)
Observations	203,984	203,237	203,237	203,984
Raw DDD with Fixed Effects and no Additional Controls				
Montana State × Letter × Post	-1.358***	-0.011	0.191	-0.054***
	(0.104)	(0.030)	(0.139)	(0.015)
Observations	223,615	222,632	222,632	223,615

Notes: Standard errors clustered at the student level and reported in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ Specifications condition on having loans in current semester. All models include the same controls as Table 3, except the last row. The final row only includes DDD interactions (letter, campus, campus by post, campus letter, letter post, and letter-campus-post) as well as semester and year fixed effects.

Table A.4: Robustness Check: Pre-Period Assignment To Treatment

Next Semester Outcomes				
	(1)	(2)	(3)	(4)
	Loan Amount	GPA	Credits	STEM Major
Montana State × Letter × 2008	-0.056	0.019	-0.089	0.017
	(0.076)	(0.029)	(0.125)	(0.013)
Montana State × Letter × 2009	0.076	0.009	-0.118	0.000
	(0.076)	(0.026)	(0.123)	(0.012)
Observations	94,982	94,570	94,570	94,982

Notes: Standard errors clustered at the student level and reported in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ Specifications condition on having loans in current semester. All models include the same controls as Table 3. Falsely assigns treatment to 2008-2009 and 2009-2010 Academic Years.

Table A.5: Stafford Limits & Tuition Over Time

	Tuition		Freshmen		Sophomores		Juniors +	
Academic Year	Montana State	University Montana	Stafford Subsidized	Stafford Combined	Stafford Subsidized	Stafford Combined	Stafford Subsidized	Stafford Combined
2001	3,079	3,178	2,625	2,625	3,500	3,500	5,500	5,500
2002	3,381	3,648	2,625	2,625	3,500	3,500	5,500	5,500
2003	3,807	4,102	2,625	2,625	3,500	3,500	5,500	5,500
2004	4,145	4,260	2,625	2,625	3,500	3,500	5,500	5,500
2005	4,577	4,546	2,625	2,625	3,500	3,500	5,500	5,500
2006	5,221	4,894	2,625	2,625	3,500	3,500	5,500	5,500
2007	5,673	5,174	3,500	3,500	4,500	4,500	5,500	5,500
2008	5,749	5,338	3,500	5,500	4,500	6,500	5,500	7,500
2009	5,798	5,377	3,500	5,500	4,500	6,500	5,500	7,500
2010	5,988	5,533	3,500	5,500	4,500	6,500	5,500	7,500
2011	6,168	5,722	3,500	5,500	4,500	6,500	5,500	7,500
2012	6,428	5,985	3,500	5,500	4,500	6,500	5,500	7,500
2013	6,705	6,045	3,500	5,500	4,500	6,500	5,500	7,500
2014	6,752	6,099	3,500	5,500	4,500	6,500	5,500	7,500

Table A.6: Predicting Letter Receipt at Montana State from 2011-2014

	(1) 2010	(2) 2011	(3) 2012	(4) 2013
White	-0.003	0.003	-0.008	-0.014
	(0.012)	(0.011)	(0.011)	(0.011)
Male	0.003	0.001	-0.015*	-0.003
	(0.007)	(0.007)	(0.007)	(0.007)
Pell Dummy	0.007	0.019^{+}	0.046***	0.032***
	(0.011)	(0.010)	(0.010)	(0.010)
Cumulative Semesters	0.026***	0.027***	0.023***	0.025***
	(0.002)	(0.002)	(0.002)	(0.002)
$\frac{\text{Loans}}{\text{Tuition}}$	0.465***	0.493***	0.548***	0.462***
	(0.009)	(0.009)	(0.009)	(0.008)
Amount Non-Loan	-0.004**	-0.004***	-0.002	-0.003**
	(0.001)	(0.001)	(0.001)	(0.001)
Observations	9,366	9,576	9,850	10,328
Adjusted R^2	0.311	0.340	0.399	0.344

Notes: Standard errors reported in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ Specifications condition on having loans in currents semester. All models control for total credits, zip code level population density, education, race, and income, as well as urbanicity. Models only include Montana State University, and Columns (1)-(2) predict hypothetical letter receipt given the same rules as were in place in 2012 and 2013. Regressions only include the fall semester.

Appendix B: Regression Discontinuity Results

This Appendix describes the use of a regression discontinuity design (RD) as an alternative to the DDD approach presented in the main paper. The results emerging from the RD estimation are largely consistent with those based on the DDD strategy. The primary obstacle to using RD as the main analytical approach is low power. The RD sample only includes Montana State University, the location of the treatment, and is limited to the two years after the treatment began (2012, 2013). Since the treatment was only administered in the fall semesters, there are only two periods available for use in the analysis. The small number of observations just around the threshold in the two sample periods yield wide bandwidths for the RD model, limiting potential inference.

We construct the RD running variable "distance from threshold" which measures how far away each students' cumulative loan amount is from the designated threshold for receiving a letter based on the student's class standing. For example, freshmen with less than $6,250 in debt accrued by Fall 2012 will appear as negative; those with more than $6,250 will be positive. Since the thresholds vary by class ($6,250 for freshmen, $12,000 for sophomores, $18,750 for juniors, and $25,000 for seniors), we separate our results for freshmen from those for upper classmen.

Ideally, the RD analysis would examine each class separately. Pooling students requires a uniform bandwidth, but this leads to the inclusion of different distributions by class standing. For example, if the bandwidth selected is $6,000, this includes 28 percent of seniors (those with $19,000 to $31,000 in student loan debt). For sophomores, this includes 46 percent of the distribution of students (those with $6,000 to $18,000 in student loan debt). However, due to the low graduation rate at Montana State ($< 50\%$ in six years), sample sizes are too small to estimate this separately for each class with any precision. There are 2,790 sophomores (41% above the threshold), 1,832 juniors (44% above the threshold) , and 1,693 seniors (49% above the threshold) when we separate the analysis by class. This requires large bandwidths of $6,700, $9,600, and $8,200, respectively. In

almost all specifications, we cannot rule out that the true effect of the intervention is zero. In some cases, however, the results are consistent with the DDD findings (e.g. for juniors' future loan amounts). There are no cases for which these results rule out the DDD results. Consequently, we combine sophomores, juniors, and seniors in the same sample.

For all RD results, we use a local polynomial to estimate the effects, as well as a triangular kernel. We use the optimal bandwidth for a "sharp" RD as developed by Imbens and Kalyanaraman (2012). It should be noted that the measure of treatment contains some error because it is based on the assignment rule for the letter and we do not observe who actually received the letter. We find supporting evidence that other bandwidths produce the same results, particularly for the estimates for freshmen (ranging from $2,000 to $6,000). If anything, the Imbens and Kalyanaraman (2012) optimal bandwidth provides conservative estimates that are smaller in magnitude than other estimates.

The results for freshmen are qualitatively comparable to those in Table 4 of the main paper. These are presented in Table B.1. For freshmen, the letter is associated with a loan amount decrease of $1,373 the next semester. Figure B.1 supports this finding, where the students below the threshold appear to follow the 45 degree line, implying that they take out roughly the same amount as in the past semester. However, there is a decrease at the threshold that continues for students with higher initial loan amounts. In addition, freshmen are 6.7 percentage points more likely to declare a STEM major. This is slightly smaller than the estimate in Table 4 (10.6 percentage points). The RD estimates show that freshmen increase their credits next semester by 1.33, which is much larger and more precise than the effect from Table 4 (0.30 credits). In both of these analyses, the intervention did not change subsequent semester GPAs. The effects on current semester outcomes in Table B.1 slightly contrast with those presented in Table 5, though when using the RD, current semester credits increase by 0.453, whereas this increase was a more modest 0.115 credits in the DDD analysis. Similarly, the effect on current semester GPA falls below zero when using the RD in contrast to the DDD estimate. While we do not perform the analysis for just upper classmen in the main portion of the paper, it is

clear that most of the effect is being driven by freshmen. This is quite consistent with the effects we see for upper classmen in this analysis.

Table B.1: Regression Discontinuity Design Results

Freshmen Only	
Next Semester Loan Amounts	-1.373***
	(0.296)
Next Semester Credits	1.331***
	(0.418)
Next Semester GPA	0.127
	(0.0865)
Next Semester STEM	0.0672^{+}
	(0.0402)
Current Semester Credits	0.453^{+}
	(0.268)
Current Semester GPA	-0.0197
	(0.0643)
Observations	3,206
Upper Classmen Only	
Next Semester Loan Amounts	-0.212
	(0.176)
Next Semester Credits	-0.215
	(0.266)
Next Semester GPA	-0.071
	(0.0708)
Next Semester STEM	-0.0045
	(0.0435)
Current Semester Credits	0.0403
	(0.200)
Current Semester GPA	0.0417
	(0.0603)
Observations	4,018

Notes: Coefficients presented with standard errors in parentheses. Each RD estimate uses the distance from the threshold of obtaining the letter as the running variable (centered at zero). We use a local polynomial with a triangular kernel to estimate the effects, and the presented results use the optimal bandwidths of Imbens and Kalyanaraman (2012).

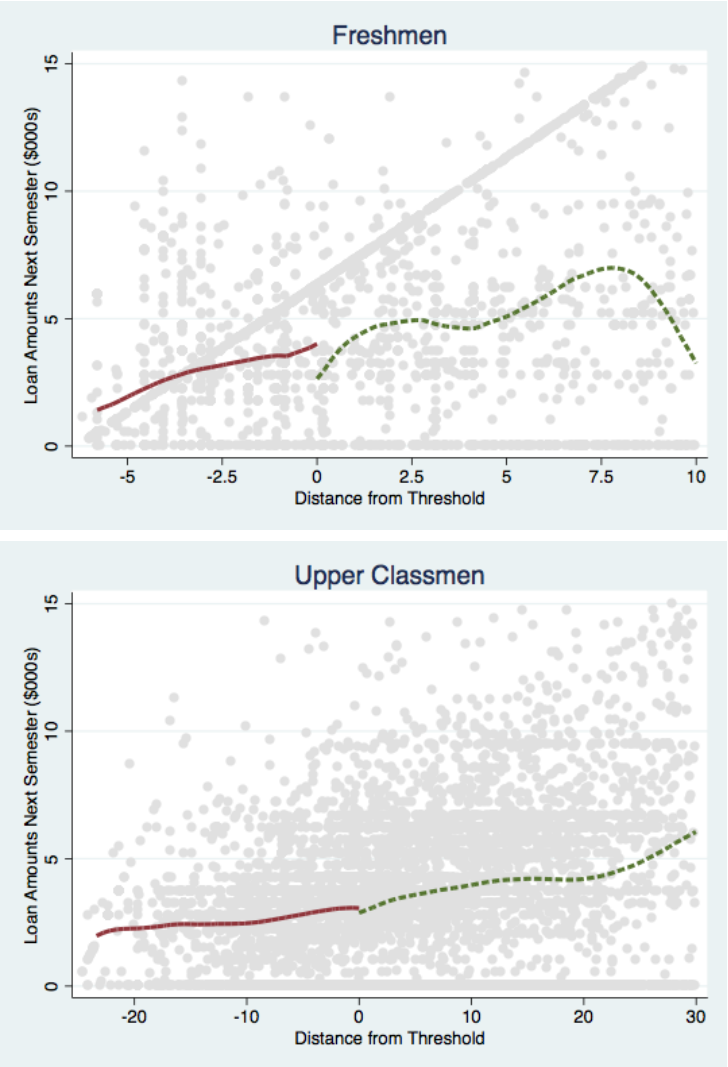

Figure B.1: RD Estimates for Freshmen and Upper Classmen on Future Loan Amounts
Notes: The top panel looks only at freshmen (30 or fewer credits), and the bottom panel looks only at upper classmen (more than 30 credits). The running variable is the distance to the threshold for receiving a letter. The y-variable is the loan amount in the subsequent semester. Estimates are provided in Table B.1.

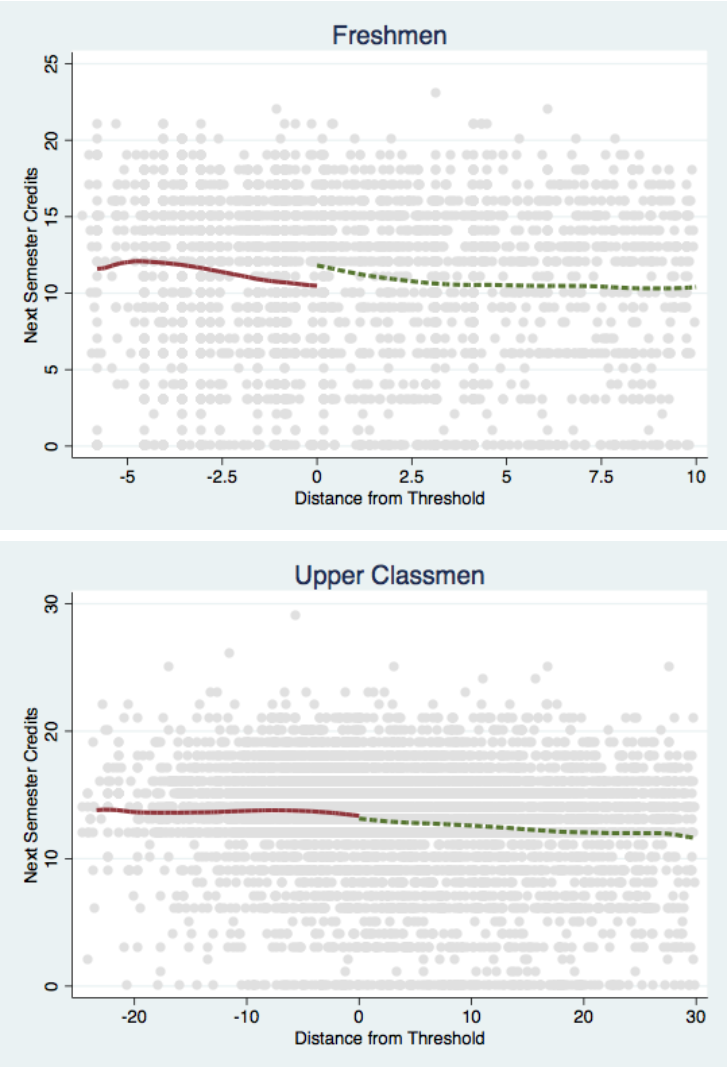

Figure B.2: RD Estimates for Freshmen and Upper Classmen on Future Credits

Notes: The top panel looks only at freshmen (30 or fewer credits), and the bottom panel looks only at upper classmen (more than 30 credits). The running variable is the distance to the threshold for receiving a letter. The y-variable is the credits completed in the subsequent semester. Estimates are provided in Table B.1.

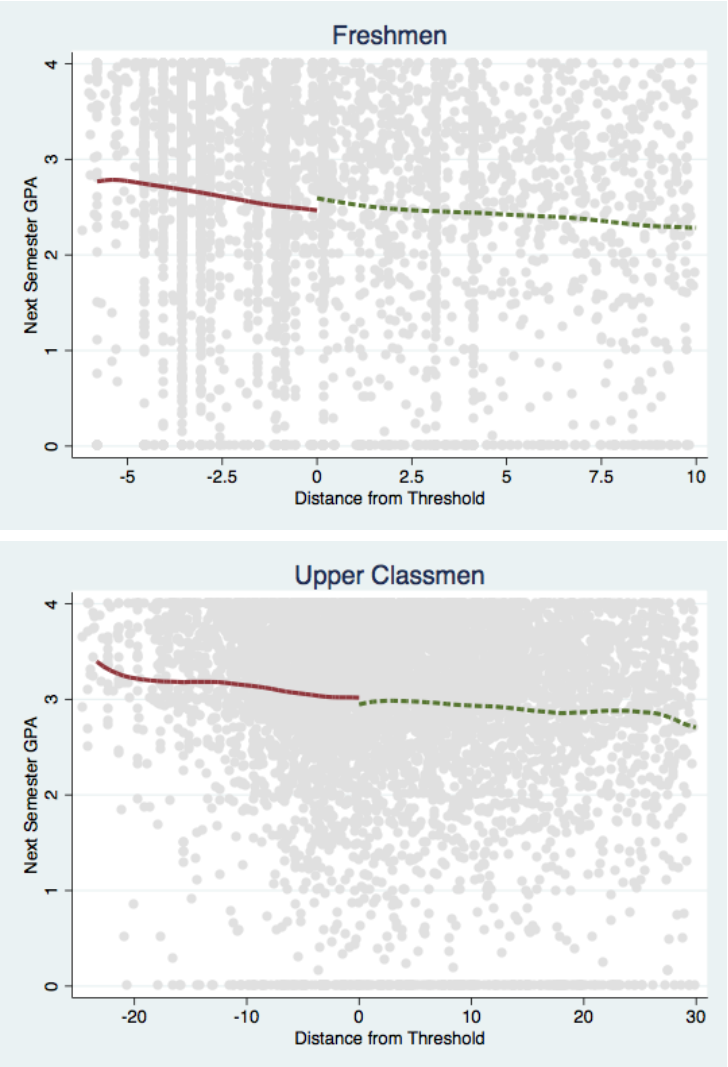

Figure B.3: RD Estimates for Freshmen and Upper Classmen on Future GPA

Notes: The top panel looks only at freshmen (30 or fewer credits), and the bottom panel looks only at upper classmen (more than 30 credits). The running variable is the distance to the threshold for receiving a letter. The y-variable is the student GPA at the end of the subsequent semester. Estimates are provided in Table B.1.

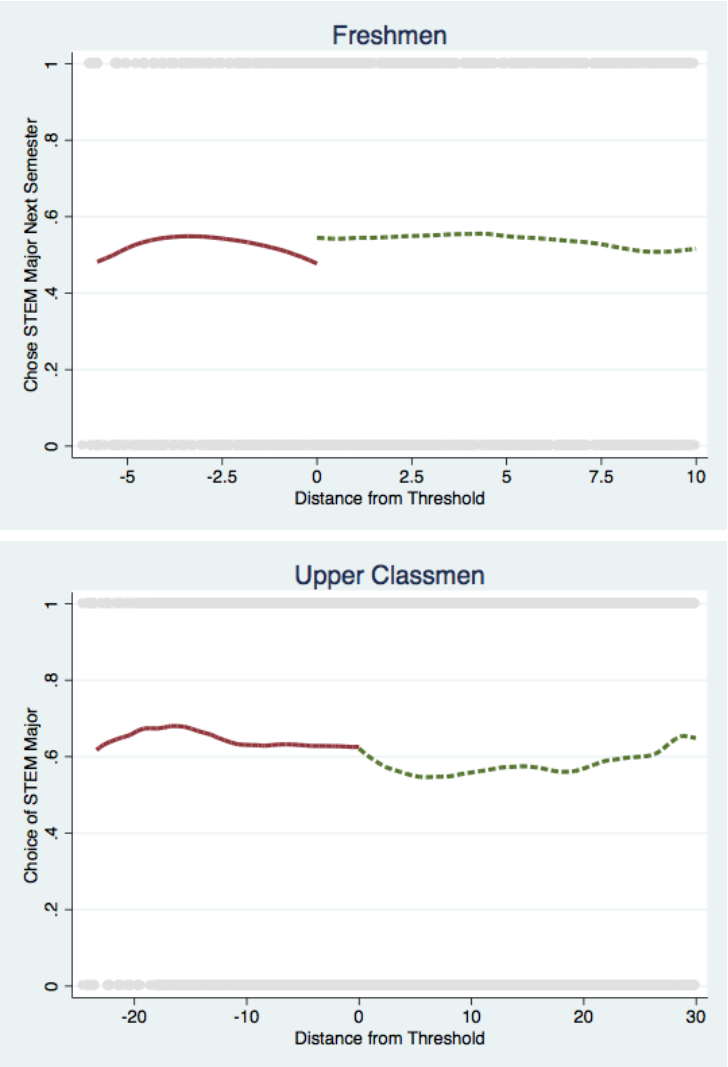

Figure B.4: RD Estimates for Freshmen and Upper Classmen on Future STEM

Notes: The top panel looks only at freshmen (30 or fewer credits), and the bottom panel looks only at upper classmen (more than 30 credits). The running variable is the distance to the threshold for receiving a letter. The y-variable is equal to one if the student declares a STEM major in the subsequent semester. Estimates are provided in Table B.1.

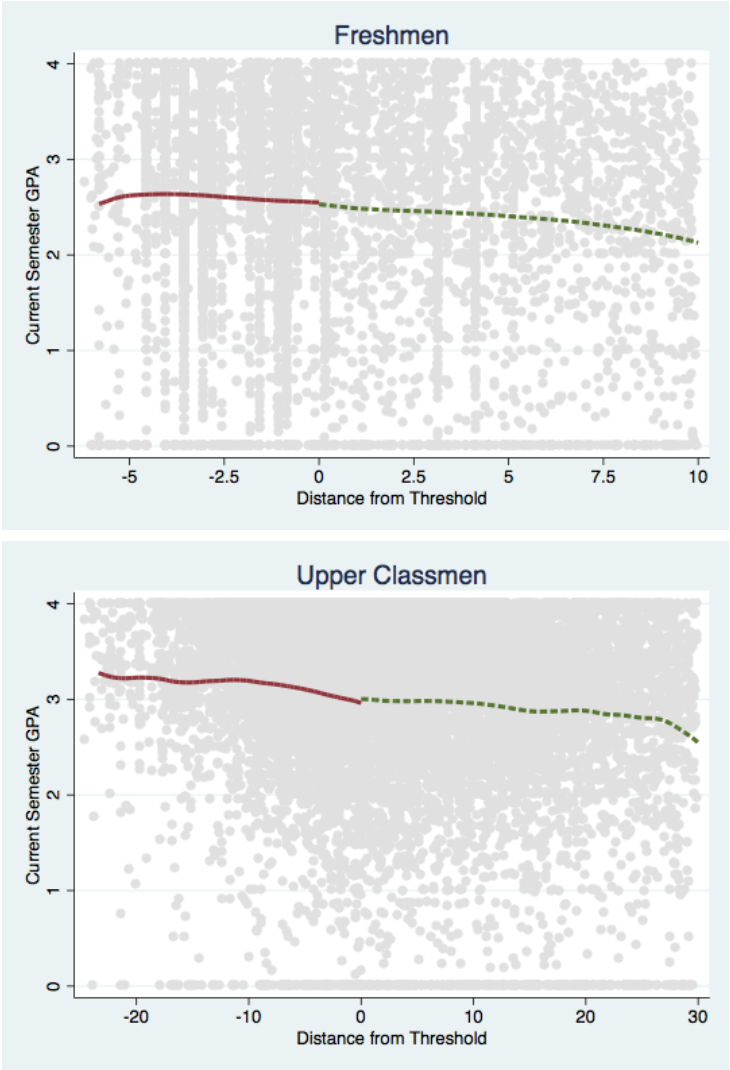

Figure B.5: RD Estimates for Freshmen and Upper Classmen on Current Semester GPA
Notes: The top panel looks only at freshmen (30 or fewer credits), and the bottom panel looks only at upper classmen (more than 30 credits). The running variable is the distance to the threshold for receiving a letter. The y-variable is the student's GPA at the completion of the current semester. Estimates are provided in Table B.1.

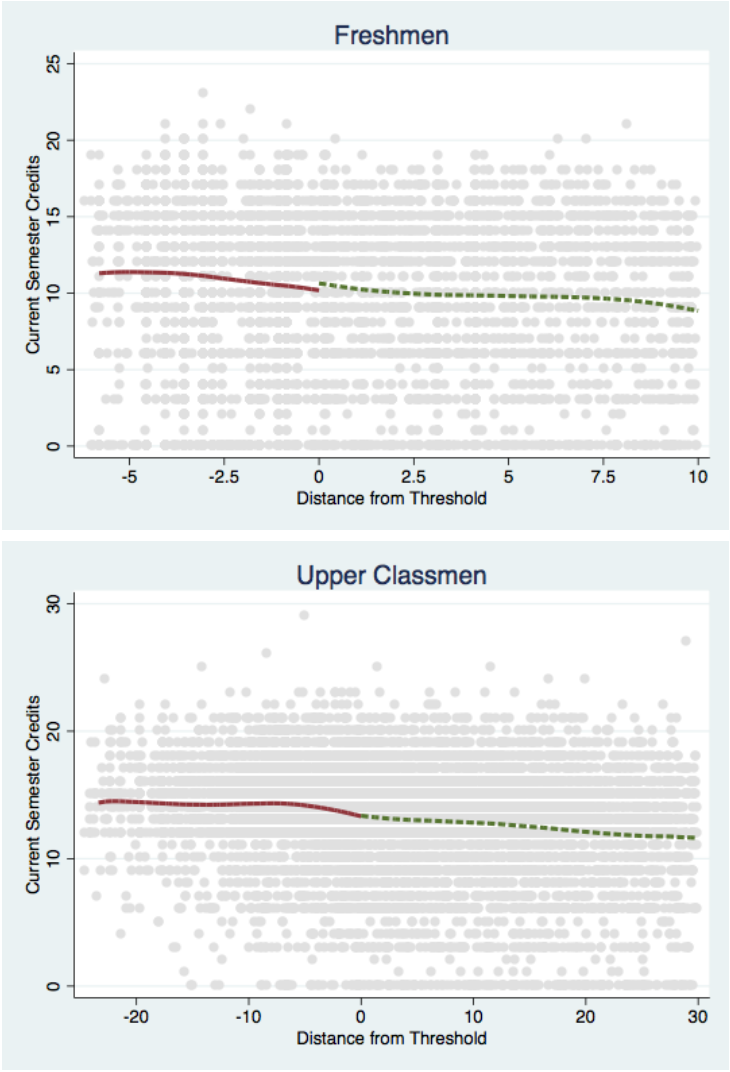

Figure B.6: RD Estimates for Freshmen and Upper Classmen on Current Semester Credits
Notes: The top panel looks only at freshmen (30 or fewer credits), and the bottom panel looks only at upper classmen (more than 30 credits). The running variable is the distance to the threshold for receiving a letter. The y-variable is the number of credits completed in the current semester. Estimates are provided in Table B.1.