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AN EXPERIMENT ON INFORMATION USE
IN COLLEGE
STUDENT LOAN DECISIONS**

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An Experiment on Information Use in College Student Loan Decisions*

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Abstract

There is ample concern that college students are making ill-informed student loan decisions with potentially negative consequences to themselves and the broader economy. This paper reports the results of a randomized field experiment in which college students are provided salient information about their borrowing choices. The setting is a large flagship public university in the Midwest, and the sample includes all nongraduating students who previously borrowed student loan money (~10,000 students). Half of the students received individually tailored letters with simplified information about future monthly payments, cumulative borrowing, and the typical borrowing of peers; the other half is the control group that received no additional information. There are at most modest effects of the letter overall, which suggests that information alone is not sufficient to drive systematically different borrowing choices among students. However, some key student subgroups changed their borrowing in response to the letter, particularly those with low GPAs. There is also evidence of intended (more contact with financial aid professionals) and unintended (lower Pell Grant receipt) consequences of the letter.

Keywords: student loans, debt letter, financial literacy

JEL codes: D83, H52, I22, I28

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1 Introduction

College student loan borrowing in the United States holds tremendous promise but also poses significant threats. Student loans can promote access to college and therefore increase expected earnings, social mobility, and economic productivity (Avery and Turner, 2012). However, educational debt can diminish the returns students get from education, make going to college less attractive, saddle students and the economy, and disproportionately burden low-income students (Brown and Caldwell, 2013; Elliott and Lewis, 2014). In response to concerns about rising student loan borrowing and default, policymakers are scrambling to design solutions that provide repayment relief to student borrowers and encourage students to make sensible borrowing decisions.¹ These efforts are taking place while we still know little about how college students make judgments related to student debt, even though we have increasing evidence that college students may be making distorted or ill-informed financial decisions (Akers and Chingos, 2014; Bettinger et al., 2012; Bleemer and Zafar, 2015; Cadena and Keys, 2013).

This paper describes a randomized controlled field experiment implemented in conjunction with the financial aid office at a large, public Midwestern university that examines what happens when students are given information about the implications of their borrowing choices. Treatment group students received individually tailored letters that contain information about expected future monthly payments and typical borrowing of peers. Students are also invited to meet with a financial aid officer and given a summary of borrowing to date. I compare students' post-letter borrowing choices, as well as other educational and financial decisions, with those of a control

¹For example, legislators have introduced a series of bills aimed at lowering student loan interest rates, reducing debt burdens, and providing repayment relief. For example, see Senate bills S.897 Bank on Student Loan Fairness Act and S.1066 Federal Student loan Refinancing Act, and House Bill H.R.4170 Student Loan Forgiveness Act of 2012. Additionally, policies that provide information to students, such as the College Scorecard and the "financial aid shopping sheet" fostered by the Department of Education, are being promoted as a means to enhance students' decisions.

group that did not receive the extra information.

The experiment in this study situates itself in the context of initiatives by universities to decrease the borrowing of their students (Kennedy, 2015; Schmeiser et al., 2015), and from which laws have been enacted based on reported findings.² The intervention described in this study distinguishes itself from other similar institutional programs in important ways. First, the experimental design allows us to cleanly identify the effects of the letter by comparing the choices of students who received the letter with those of control group students. This is important to understand year-to-year trends during a period in which aggregate student loan borrowing has been declining since 2011 (Baum et al., 2015). Second, the letter attempted to encourage students to make informed and active student loan decisions, but it did not explicitly attempt to reduce the amount that students borrow. Research does not establish a strong causal link between higher levels of borrowing and default, and not all students will benefit from borrowing less.³ Finally, the intervention described here was arguably the “lowest touch” and lowest cost to implement. Students received an electronic letter,⁴ but there were no additional systematic supports that accompanied the letter since the university in this setting could not incur substantial technology or administrative costs. These resource constraints are common to many institutions that have limited capacity. Therefore, results from the study likely correspond to what we would expect if higher education institutions implemented informational borrowing nudges at scale.

Overall, there are at most modest effects of the letter across all students. This suggests that information alone is not sufficient to drive systematically different borrowing choices among students. However, the letter led to changes in borrow-

²Lawmakers passed state laws in Indiana (Enrolled House Bill 1042) and Nebraska (LB726) based in large part on the reported success of the debt programs in the Indiana University system. See Section 2.2 of this paper.

³Looney and Yannelis (2015) find that those most likely to default on federal student loans have relatively low loan amounts.

⁴ Texts were not permitted in the setting.

ing among some student subgroups that may be at risk for post-college repayment challenges, particularly those with low GPAs. There is also evidence that the letter induced additional contact with financial aid professionals, and this increased information seeking was especially acute among those on the margin of borrowing from sources other than federal loan programs. Therefore, while low-touch informational interventions such as this one are not likely to lead to large-scale changes in the borrowing behavior of college students, they nonetheless have the potential to encourage students to seek additional information that may ultimately help students make better decisions.

2 Background

2.1 Student Loans

College student borrowing has become one of the more prominent education policy issues in the United States, due in part to upswings in outstanding student loan debt and rates of costly student loan default (Federal Reserve Bank of New York, 2016). It is well documented that going to college can lead to substantial personal benefits such as higher earnings and greater economic mobility, and public benefits including increased workforce productivity and stronger community social outcomes (e.g., Goldin and Katz, 2008; Oreopoulos and Salvanes, 2011). Vast amounts of public dollars are used to support students' college enrollment and persistence, with over \$160 billion disbursed through federal financial programs annually. States and higher education institutions also heavily subsidize students' college enrollment. But to afford college, students are increasingly borrowing. Today, about one-third of undergraduate students obtain federal student loans (an increase of about 40% from a decade earlier) and more than half of public four-year college students graduate with debt (Avery and Turner, 2012; Baum et al., 2015).

Over the last 20 years, educational loan disbursements have grown from about \$40 billion to a peak of \$116 billion in 2010; estimated disbursements for the 2014 academic year was \$95 billion (in inflation adjusted dollars, Baum et al., 2015). There are two major broad categories of student loans available to students and their families: from federal programs and from nonfederal lenders. Federal loans comprised more than 90% of the total annual disbursements in recent years, though nonfederal lending was as much as one-third of the market in the mid to late 2000s (Baum et al., 2015). Nonfederal loan programs include loans from states and universities, but about 90% of the loan dollars disbursed in this group come from private lenders.

Federal loan programs typically have more favorable terms than do nonfederal loans. Federal student loans are not underwritten as long as borrowers attend an eligible institution. Similarly, interest rate charged in federal programs do not vary with expected default risk. As a result, federal loan programs are subsidized for most borrowers so credit is offered regardless of default risk and at lower rates than can generally be obtained from private lenders. Some programs have extra benefits, such as the ability to postpone payments and interest accrual during times of enrollment or hardship. The difficulty that many students would face financing human capital investments due to their thin credit files and lack of collateral motivates the public subsidization of federal loan programs. However, the relatively low costs of such credit to the borrower can lead to an overutilization of student loan debt.

Within the federal student loan program umbrella, there are a number of different types of loans available to student loan borrowers. Students can directly obtain either subsidized or unsubsidized loans under the Federal Direct Loan Program.⁵ Subsidized Direct Loan Program loans (hereafter referred to as “subsidized loans”) are available to students based on financial need, and the U.S. Department of

⁵Parents of dependent undergraduate students can also obtain loans from the Direct Loan program (called PLUS) loans. The Direct Loan program also has a loan consolidation program to combine eligible federal student loans into a single loan.

Education pays the interest on the loan while the student is in school, for a grace after the student leaves school and during periods of deferment. Unsubsidized Direct Loan Program loans (“unsubsidized loans”) are also not underwritten and are available at subsidized interest rates, but interest is not paid by the government during periods of enrollment or deferment.⁶ The Perkins Loan Program is a school-based loan program also available to students with demonstrated financial need, but it is a much smaller program and funds per student depend on the availability of funds at the school level.

The top panel of Figure 1 displays the loan disbursements over the past 20 years by program specifically to undergraduate students.⁷ After a peak for total borrowing in 2010, subsidized and unsubsidized Direct Loan borrowing declined, while nonfederal borrowing has increased nearly 30%. Since 2008, the amount of unsubsidized federal borrowing has generally equaled or exceeded the amount of subsidized federal loan borrowing. Perkins Loans represent less than 2% of the total disbursements. The bottom panel of Figure 1 demonstrates the growth in overall borrowing from 2000 to 2012 came from increases in both the percentage of students who borrow and the average award for borrowing students, with the magnitude of growth equaling about 25% in either case.

There are two prominent concerns related to observed increases in student borrowing rates. The first is related to fears that students’ benefits from attending college will be limited by onerous repayment responsibilities. The amount of outstanding student loan debt is currently estimated to exceed \$1 trillion, more than double the level from a decade earlier (Federal Reserve Bank of New York, 2016).

⁶Federal Direct Loan program loan limits vary by year in school, financial dependency status, and financial need. During the year analyzed, the total amount of direct loans first-year dependent students could borrow was \$5,500, of which up to \$3,500 could be in subsidized loans (first-year independent students could borrow up to \$9,500, of which up to \$3,500 could be subsidized loans). Second-year dependent student loan limits were \$6,500, of which up to \$4,500 could be subsidized (\$10,500/\$4,500 for independent students). Dependent students in their third year and beyond could borrow up to \$7,500 in direct federal loans, of which up to \$5,500 could be subsidized (\$12,500/\$5,500). See <https://studentaid.ed.gov/sa/types/loans/subsidized-unsubsidized>.

⁷This figure excludes loans made to parents under PLUS programs.

Higher levels of aggregate debt are in part due to an expansion in college enrollment over time, particularly among students with low incomes and few assets. However, research has demonstrated that borrowing can affect some post-college decisions, such as career choices (Rothstein and Rouse, 2011). Some have raised concern that onerous repayment obligations could lead to lower consumption and delayed investment in assets such as homes (Brown and Caldwell, 2013), though researchers are yet to establish a causal link. And, while college attendance has traditionally been seen as a way to reduce economic disparities among students from different socioeconomic backgrounds, unequal repayment burdens can limit these equity gains (Elliott and Lewis, 2014).

The second group of concerns deal with default. Panel A of Figure 2 displays the percentage of student loan balances (from any type of student loan) that are delinquent, as compared with other types of credit. While delinquency in all types of credit increased as the country emerged from the Great Recession, student loan debt delinquency has continued to rise since 2010, while delinquency in other debt categories has declined. The bottom panel in Figure 2 displays the default rate of students on federal student loan programs (in which taxpayers are responsible for covering losses associated with delinquent debt) as measured by the U.S. Department of Education, which similarly demonstrates an upward trend in default and with default doubling from trough to peak.⁸ In addition to public costs, default can impair a debtor's future access to the credit market and therefore reduce opportunity to build assets. Default in the educational credit context is especially risky since debtors have legal barriers to overcome if they attempt to rebuild economically by filing bankruptcy (Darolia and Ritter, 2015).

⁸This graph displays two-year cohort default rates. Starting with the 2012 cohort, the U.S. Department of Education transitioned to a three-year cohort default rate.

2.2 Student Loan Decisions

Traditional human capital decision-making models assume that students understand and compare the present value of expected benefits of college attendance, such as college earnings premiums, with the present value of costs, such as tuition/fees and forgone earnings.⁹ However, this calculation of costs and benefits is not simple because it is difficult to forecast future benefits and costs, and the returns to education vary depending on college types, majors, careers, student abilities, and preferences (e.g., Brewer et al., 1999). Student loans further complicate this already difficult task. Students who borrow must compare current and future cash flows, understand relatively complex financial concepts such as amortization and interest accrual, and navigate features that vary across loan programs such as deferment options, potential repayment plans, and remedies for hardship.

In limited settings, surveys have demonstrated that substantial proportions of students underestimate or do not know the amount of loans they borrow (Akers and Chingos, 2014; Andruska et al., 2014). Others have found that a large proportion of students do not accurately identify the expected returns to or costs of college (Bleemer and Zafar, 2015). People tend to gain financial knowledge as they get older (e.g., Lusardi and Mitchell, 2014); thus many college students, particularly younger traditionally aged students, are likely not equipped with the knowledge to make prudent student loan decisions without help from others. Informational deficiencies may also be particularly prevalent for students who come from communities without a tradition of college-going that they can draw on to help navigate attendance and borrowing decisions (Dynarski and Scott-Clayton, 2006; Tierney and Venegas, 2009).

⁹Consider, for example, a simple theoretical model of whether to attend or persist in college, such as in Stinebrickner and Stinebrickner (2008). Let $D(t_j)$ be equal one if the student decides to enroll in period j . A student will enroll if the expected present value of lifetime utility, $E_{t_j}(V_S)$, exceeds the expected present value from not enrolling, $E_{t_j}(V_N)$, i.e., $D(t_j) = 1$ iff $D^*(t_j) = E_{t_j}(V_S) - E_{t_j}(V_N) > 0$.

See Lochner and Monge-Naranjo (2011) for a more complete treatment of student loan borrowing decisions.

Online student loan counseling is required to borrow from federal programs; however, it is likely not effective in its current form. For example, Fernandez (2015; 2016) observed that students tended to skim and skip the textual material in the counseling, since students considered it complex, tedious, and unhelpful. These reports also suggested that students were generally interested in finding out more about student loan debt, but they were not sufficiently concerned about the topic at time of college entry to sustain focus on the online counseling task.

Researchers employing experimental designs have shown that providing information, often accompanied by other supports, to college students can aid in decision making. Hoxby and Turner (2013) demonstrate that reducing the complexity and cost of college applications resulted in low-income, high achieving students attending colleges with higher graduation rates using an experiment that provided students with tailored, simplified information about college options, along with application fee waivers. Castleman and Page (2015) show that text messaging and relationships with peer counselors can help low-income high school graduates attend college. Specific to financial aid, Bettinger et al. (2012) establish that targeted assistance for financial aid forms and data about the net costs of college lead to increased attendance and persistence. Students who only received information about aid eligibility were more likely to matriculate in college than the control group students; however, the most positive outcomes were among the group that received additional personalized assistance. Moreover, though students often poorly estimate gains from schooling, Wiswall and Zafar (2015) find that providing students with data about returns to different fields of study leads to actionable knowledge about their earnings potential.

2.3 Related Interventions

An emerging set of interventions implemented by university systems attempt to reduce student borrowing using information and a multitude of other supports. The

highest profile example is the set of programs implemented by Indiana University (IU) starting during the 2012–2013 academic year. These initiatives were associated with a reduction in undergraduate borrowing across the system by about 16% (~\$44 million) over a 2 year period across the 7 campus system (Kennedy, 2015). IU sent out debt letters to all student borrowers, including information about total debt accrued, estimated monthly payment, and remaining borrowing eligibility.

While the letter made the headlines in the media, it is unclear whether the information in the letter was the cause for the reduction in borrowing. In particular, the letter was just one of many services that the IU system implemented to reduce borrowing. For example, IU also started an Office of Financial Literacy that launched a series of programs aimed at reducing borrowing and enrolling in more credits per semester. One of these programs is a “MoneySmarts” website that includes tutorials about financial topics and a series of podcasts, including one titled “How Not to Move Back in With Your Parents” that averages more than 3,000 playbacks monthly (Kennedy, 2015). In addition to these resources, student borrowers were also given access to individual financial mentoring and the option to take advantage of resources IU made available to lower costs among students who are on track to graduate on time.

Based at least in part on the reported success of the IU borrowing intervention, two states passed legislation mandating that information be provided to all college students who borrow (Enrolled House Bill 1042 in Indiana and LB726 in Nebraska). These laws, however, only require that colleges provide information, without recognizing the role that other structural investments may have played in students’ borrowing behavior.

Schmeiser et al. (2015) evaluated a related initiative at Montana State University (MSU). Students whose cumulative borrowing exceeded certain loan thresholds (\$6,250 for freshmen, \$12,000 for sophomores, \$18,750 for juniors, and \$25,000 for

seniors) received a debt letter that included a reminder about total cumulative borrowing, strategies to reduce borrowing, and encouragement to graduate. The intervention was focused on reducing borrowing, with statements such as “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.” These students were also provided access to meetings with certified financial planners and a financial incentive to do so (a \$20 gift card) as well as access to personal meetings with career coaches. The evaluators of the study compared the students at MSU with students with similar characteristics at the University of Montana and those at MSU with loan amounts below the thresholds and found substantial reductions (nearly one-third) in borrowing by students with high loan amounts.

The study presented in this paper contributes to our understanding of this promising line of programs but has a number of key differences. Because of the randomized experimental design, we can identify effects of the letter distinctly from borrowing trends common across students. This is important because during the period in which undergraduate borrowing was reported to decline in the IU system, national aggregate student loan borrowing declined about 15% (Baum et al., 2015). In addition, the intervention in this study allows us to isolate the effect of the information letter, since the university in this study’s setting did not have the resources to implement additional systematic supports such as hiring certified financial planners or career coaches.

Furthermore, the IU and MSU programs were also explicitly focused on *reducing* student borrowing, but it is not clear that this is the right goal for all students. Research has not established a causal link between higher levels of borrowing and default, and evidence demonstrates that students who are most likely to default have relatively low loan amounts (Looney and Yannelis, 2015). Student loans can improve efficiency in the economy by enabling students to borrow against post-college incomes

when earnings are expected to be higher, and in the absence of other aid, access to educational credit markets have the potential to equalize college access among disparate groups (Avery and Turner, 2012; Ellwood and Kane, 2000).¹⁰ There is also evidence that college students are making poor financial decisions in an attempt to avoid borrowing (Cadena and Keys, 2013). Such debt aversion that leads to reduced college consumption could put students’ ability to graduate and reap the full benefits of college at risk. Therefore, information that is presented neutrally may result in some students making better decisions by borrowing more rather than less. Relatedly, students with borrowing levels of any amount are included in the study rather than restricting to students with borrowing that is considered high.

Finally, this study set at a 4-year research university complements work by researchers who are conducting experiments to further understand the role of information in borrowing decisions among community college students. Barr et al. (2016) sent text messages to mostly adult students at a large community college system, encouraging them to make active decisions related to loans and found substantial reductions in borrowing, particularly among minority, new, and low-income students. Marx and Turner (2016) alter the default student loan offering assigned to students at two community colleges in the Midwest and find that students are biased toward borrowing the amount listed in their financial aid offers.

3 Experimental Design

3.1 Setting and Sample

The experiment in this study is set at a large flagship public land-grant research university in the Midwest, the University of Missouri (MU). In recent years, MU en-

¹⁰Prior empirical research is mixed on the link between the availability of credit and higher education attainment (see Dynarski and Scott-Clayton, 2013 for a review of related literature).

rolled approximately 27,000 undergraduate students, of which approximately 12,000 borrowed federal student loans. The average total federal loan borrowing among recent graduates is about \$22,000. All aid-eligible students at MU are offered the maximum amount of federal loans for which they are eligible, and this is not necessarily directly tied to calculated financial need.¹¹ Therefore, students have the option to accept or decline all or a portion of the maximum amount of loans for which they are eligible, and this decision is not necessarily contingent on need.

Using financial aid office records, the experiment includes all nongraduating undergraduate students who obtained student loans in their tenures at MU ($N = 9,802$). Half of the students are randomly assigned to receive the loan notice; the other half is the control group. Table 1 includes summary statistics for the treatment and control groups. About 55% of the sample identifies as female. About 80% of students identify as white, 17% identify as black, 4% identify as Hispanic, 3% identify as Asian, and 3% identify as another minority race/ethnicity (students can identify as multiple races/ethnicities). More than one-third of students are the first in their families to go to college, and more than 90% are considered financially dependent on their parents. About three-quarters of students are charged in-state tuition, and about 14% transferred to MU from another postsecondary institution. Before implementing the intervention, we ensured that the treatment and control groups are balanced based on observable characteristics, including race/ethnicity, gender, number of credits, financial resources, and prior borrowing levels. No observable characteristics are statistically different between the treatment and control groups at the 95% confidence level.

The bottom half of the table includes financial measures based on the academic year (2013–2014) prior to receiving the loan notice. About 90% of students borrowed in the prior academic year, with an average total borrowing amount of about \$6,800.

¹¹Maximum eligibility varies by number of credits completed, and the mix of loans is determined by financial need. See footnote 5 and <https://studentaid.ed.gov/types/loans/subsidized-unsubsidized>.

The remaining 11% of students did not borrow in the immediate prior year but borrowed in an earlier year at MU. Average subsidized and unsubsidized borrowing were about \$2,700 and \$3,000 respectively. The incidence of Perkins and private loans was relatively low, while the per-student private loans are notably high.¹² Average expected family contribution to college expenses (EFC) is nearly \$20,000, while about 17% of the students have EFCs equal to zero. About one-third of students receive a Pell Grant, with an average amount of about \$1,400.

3.2 Intervention

In the experiment, students received a “loan notice” that included individually tailored information about student borrowing to date. These data were not intended to increase nor decrease the borrowing of students but rather to have them make informed and active decisions. The letter provides a summary of annual and cumulative borrowing in total and by type of loan (e.g., subsidized, unsubsidized, private).¹³ In addition, the letter included components that have the potential to address informational problems that lead to poor borrowing decisions. First, because research demonstrates that individuals do poorly with basic computations of future costs and benefits (e.g., Frederick et al., 2002), students received an estimate of their future monthly payment responsibilities. The expected monthly payment is based on the formula used in the U.S. Department of Education’s repayment plan estimator for the standard 10-year period.¹⁴ Future payments may not be as salient to the student as the access to current funds, which may lead to suboptimal decisions (Karlan et al., 2010). Second, we provided students with information about their peers’ borrowing, specifically the average total loan debt of recent spring graduates at the university.

¹²The average in the table includes those who did not have any private loans, so the average among private student loan borrowers is substantially higher.

¹³The letter included data on loans originated to the student, but not parents (e.g., parent PLUS loans).

¹⁴See <https://studentloans.gov/myDirectLoan/mobile/repayment/repaymentEstimator.action>.

These data are potentially beneficial because behavioral research suggests that when navigating situations with limited knowledge, individuals will be influenced by the behavior of others (e.g., Cialdini, 2008).

Beyond curing information deficiencies, the intervention has other potential benefits. It promotes active borrowing decisions by prompting the student to think and seek information about current and future borrowing. To that end, the letters included hyperlinks to various resources to find out more about their own loans and about student loans in general. Additionally, students were encouraged to meet with a financial aid advisor and given contact information to facilitate such outreach.

The notice came in the form of a letter that was e-mailed to the student from professionals in the financial aid office. The letter was also available on the students' online portal, which is the primary interface through which students register and interact with administrative components of the university. The financial aid office emailed loan notices to the treatment group at two different points. The first notice was sent in January 2015, after students have made borrowing and course-taking decisions for the 2014–2015 academic year and contained personalized data and messages related to each student's borrowing up to and including that academic year. The second notice was sent in March 2015, around the time when students received financial aid offers for the 2015–2016 academic year. The timing of this second letter is important; research suggests that information can be particularly powerful when it draws attention to an important at a salient time (Stango and Zinman, 2014). The control group received the traditional financial aid award letter with no additional mailings or information at either time point.¹⁵

¹⁵It would have been possible for treatment group students to reveal to control group peers that they received a letter, and we could not measure the extent of such discussions.

4 Empirical Framework

The primary outcome of interest is the amount of student loan debt the student chooses to borrow in the year after receiving the loan letter. I estimate borrowing, Y , for student i as a function of notice receipt,¹⁶

$$Y_i = N_i\gamma + X_i\beta + \epsilon_i \tag{1}$$

N_i is the treatment variable equal to one if the student received the loan notice and equal to zero for control group members ($N_i = 1 [\textit{Received Letter}]_i$). The coefficient of interest is the estimated parameter on the treatment indicator, γ , which represents the causal effect of receiving the informational treatment on outcomes.

Information about students' financial resources and about the student herself is included in the X -vector, with parameter vector β . Because of random assignment, these controls are not necessary to identify the effect of the letter on outcomes, but I include them to improve precision. Specifically, I include demographic characteristics including race/ethnicity and gender, EFC, cumulative GPA, credits earned, financial dependency status, and indicators for being a first-generation student, a transfer student, and in-state resident. All of these factors are measured in the pretreatment period. The idiosyncratic error term is ϵ .

I also have a record of borrowing in the pretreatment year. Thus, in certain specifications, I add a lagged dependent variable. This changes the interpretation of the coefficient of interest in these models to the year-to-year change in the outcome for those who received the letter compared with the students in the control group.

I am interested in understanding whether responses to the letter vary with the intensity with which students borrowed in the pretreatment year. Students with loan

¹⁶I estimate this model using ordinary least squares for the continuous outcomes (e.g., amount of borrowing) and the dichotomous outcomes (e.g., whether or not the student borrowed). For this latter group of outcomes, this linear probability model yields results that are similar to a logit specification (available upon request).

amounts of various levels could have differential responses to additional information about their debt. Uninformed students who needlessly borrowed may be likely to reduce borrowing once they learn more about their future repayment responsibilities. Alternatively, students who borrowed relatively low amounts may feel empowered to increase borrowing once provided with more information, either because their expected future payment is low or because their debt lags that of their peers.

Loan limits for various loan programs may also influence changes to students' debt choices. Some students may not want to exceed the subsidized student loan limit (such that they would have to start borrowing unsubsidized loan funds), while others may not want to exceed the total federal loan program limit (in which case, they would have to start borrowing from nonfederal sources that would be expected to have inferior loan terms). Thus, I group all students into one of four mutually exclusive categories based on their applicable federal direct loan limits:¹⁷

- No loans in the prior year (~11% of students)
- Low prior year borrowing (~12% of students): Positive loan borrowing, up to and including the subsidized loan limit
- Moderate prior year borrowing (~58% of students): Loan borrowing greater than the subsidized loan limit, up to and including the total annual federal direct loan limit
- High prior year borrowing (~20% of students): Borrowing greater than the annual federal direct loan limit

To examine responses by students with different loan amounts, I add a vector of indicators for each student's borrowing group, L , and interact this vector with the

¹⁷I cannot observe calculated financial need in the data. Therefore, I set these thresholds based on the maximum loan allowed for the student based on their year in school and financial dependency status. See footnote 5.

loan notice indicator:

$$Y_i = N_i\delta_1 + (N_i \times L_i)\delta_2 + L_i\alpha + X_i\beta + \epsilon_i \quad (2)$$

From this model, δ_1 is the estimate of the effect of the loan notice on the omitted base group, which, in this case, is students with no loans in the prior year. δ_2 is a vector of coefficients representing the marginal difference between the effect for the base group and each respective other group. To capture the total effect of the notice on students from the various borrowing groups, I report in the tables the linear combination of $\delta_1 + \delta_2[1, j]$ for each j in prior year low, moderate, and high borrowing.

In addition, to test for heterogeneous responses among various groups, I separately present estimates for the following student subgroups: first-generation students (i.e., students who are the first in their family to attend college), students who identify as a minority race/ethnicity (defined as non-White race and/or Hispanic ethnicity), those with EFC equal to zero, and those with low GPAs (less than 2.5).¹⁸ Of the sample, 36% are first-generation students, 19% are minorities, 17% have an EFC equal to zero (this indicates that they have few personal or family resources to contribute to college expenses), and 25% of the students have a pretreatment GPA less than 2.5 on a 4.0 scale.

I also consider whether the loan notice changes students' other educational and financial choices. First, I examine whether the letter leads to lower Pell Grant receipt. The federal Pell Grant program provides money to undergraduate students based on financial need. Pell Grant money does not need to be repaid and is not tied to achievement, so it should be a more attractive financing option than loans or

¹⁸The estimating equation is thus:

$$Y_i^g = N_i\delta_1^g + (N_i \times L_i)\delta_2^g + L_i\alpha^g + X_i\beta^g + \epsilon_i$$

where, $g \in \{\text{First-generation student, Minority student, EFC} = 0, \text{ GPA} < 2.5\}$

merit-based aid. The maximum Pell Grant award for the 2015-2016 academic year was \$5,775. I also examine whether students who receive the letter change the amount that they accept in federal work study funds. Work-Study is a federally funded program that helps students finance their education through part-time employment. Some students may prefer to work instead of borrow (or vice versa), such that Work-Study funds could substitute for student loans. Work-Study funds can also vary with financial need and are typically constrained by the amount of funding available at the school level. Thus, some students may find non Work-Study employment to be more flexible. In these data, however, I cannot observe working behavior outside of the federal Work-Study program.

The second group of outcomes relates to educational decisions. Students may change their course-taking pattern in response to the letter. I therefore examine whether the student drops out of school, and I observe students' cost of attendance, which would change if students decide to take fewer classes.¹⁹ Furthermore, students who underestimated their future debt repayment obligations might switch their educational major to one with higher expected earnings. Two measures of a course of study are available. The first is the academic program, which is defined as the general group of fields in which one studies and is organized according to the colleges within the university. For example, a student may have an academic program in Arts & Sciences, Engineering, or Business.²⁰ The second measure is the academic plan, which incorporates more detail on the type of degree sought and specific fields. For example, within Arts & Sciences, an undergraduate student could be pursuing a bachelor's degree in in anthropology, economics, political science, or one of the other

¹⁹Tuition and fees are capped, such that if a student pays to go to college full-time (which is at least 12 hours for undergraduates in the setting) they can take as many credits for the same price. Undergraduate students infrequently attend college part-time in this setting. At the end of the academic year, I will also be able to formally examine credits accrued and GPA.

²⁰The full list of programs is: Agriculture, Food, & Natural Resources; Arts & Sciences; Business; Education; Engineering; Health Professions; Human & Environmental Sciences; Journalism, Natural Sciences; Nursing; and Social Work.

disciplines included in the program.²¹

The last outcome I observe is whether students in the treatment group are more likely to solicit further information from or meet with financial aid counselors. Information-seeking behavior is important because this mechanism could help students obtain the knowledge they need to make prudent decisions. Not only does contact with the financial aid office offer support for making current borrowing decisions, but it also facilitates a relationship that could benefit students when making later educational and financial decisions such as choosing a post-college student loan repayment plan.

5 Results

5.1 Borrowing

I report effects of the letter on total borrowing using equation (1) in Table 2. First, consider the first three columns that display results from estimates of the total amount that students borrow in the academic year after receiving the loan notice. The first column includes unadjusted results, the second column adds the vector of controls previously described, and the third column adds a control for total borrowing in the prior academic year. Results do not provide evidence that the information letter affected the average amount that students borrowed overall. While point estimates are negative, they are not statistically different than zero. Based on results and standard errors from the preferred estimates in column 3, I can rule out overall effects as large as those reported in the IU or MSU settings. Coefficients on covariates generally take on expected signs based on other literature. Black students on average borrow higher loan amounts than do white students. We also observe that borrowing is negatively related to EFC and that first-generation college students borrow more than their

²¹There are 110 unique values of academic plans pursued by students in the sample.

peers whose parents attended college.

Columns 4–6 display corollary results, but this time with having a loan in the 2015–2016 academic year as the dependent variable. Point estimates continue to be negative but not precisely estimated. When adding the lagged outcome variable in column 6, we observe a 1.4 percentage point decline in the probability of having a loan (this translates to an effect size of about 2%), with this effect statistically significant at only the 10% level. Coefficients on covariates are generally directionally similar in these models, although we now observe that female students are less likely to borrow than male students.

I next examine the effect of the loan notice on the borrowing of key groups of interest and of students with varying prior-year borrowing intensity. I display results in Table 3. In this table, I display only the coefficient on the treatment variable, i.e., the effect of receiving a loan notice (full output for any displayed model is available upon request). First, consider the results listed in the first row of Panel A for total borrowing dollars. The first column includes estimates on all students, and then the four subsequent columns list results from separate estimates on each subgroup. The first row in Panel A displays results from an estimate of equation (1), and the next four rows display total effect of the loan notice on each prior year loan amount subgroup from equation (2).²²

Taken together, findings from the first row of columns 1 and 6 suggest that the loan notice does not lead to large scale systematic changes in student borrowing behavior across prior year borrowing levels. However, we observe differences for some student subgroups when examining results in other columns and rows. Among all students, we observe evidence that students with the highest loan amounts in the prior year borrowed \$379 less on average and were 3.2 percentage points less likely to have a loan because of the letter, though these results are statistically significant at

²²Average borrowing for these subgroups are included in Appendix Table A.1.

only the 90% confidence level (last row of Panel A, columns 1 and 6).

We see a stronger incidence effect for students with low incomes and assets (as reflected in EFC equal to zero) and for students with relatively low GPAs. Low GPA students were 4.3 percentage points less likely to have a loan because of the letter, which translates to an effect size of nearly 5% (column 10). The effect among students with low GPAs could be because these students received negative feedback from the university on their academic performance and thus may expect relatively low returns to their education or may view themselves at relatively high risk of not completing their degree. Among this group, point estimates of effects for different prior year borrowing intensities are all negative, but the strongest effect is among students who did not borrow in the prior year. This indicates that students in this group who did not receive the letter were more likely to start borrowing again as compared with treatment group students. Among students with zero EFCs, both students in the zero and high prior year borrowing groups were less likely to have a loan because of the letter, although the effect for this latter group was only on the margin of statistical significance.

Panels B and C are structured similarly to Panel A, but they include estimates for federal subsidized and unsubsidized borrowing.²³ Starting with Panel B, we observe a negative point estimate of a \$72 letter effect on subsidized borrowing overall (an effect size of about 3% in column 1), and a 3.2 percentage point decrease in having a student loan among high borrowing students (an effect size of nearly 5% in column 6), with these results statistically significant at only the 90% confidence level. When examining effects across the heterogeneous groups, we observe the strongest effects among the low GPA students. Treatment group students with low GPAs borrow \$291 less in subsidized student loans (effect size of nearly 11% of the average subsidized borrowing for that group in the prior year in column 5) and are 5.3 percentage points

²³Results for Perkins loans and private loans are available upon request and generally do not indicate changes in these loan programs because of the letter.

less likely to borrow (an effect of 8% in column 10) than the the control group on average. Results also indicate that the letter had the effect of lowering both the level and incidence of borrowing for all but the high borrowing students among those with low GPAs (the high borrowing group has directionally consistent point estimates that are not statistically significant).

The low GPA group is also the most likely to change student loan behavior for unsubsidized loans, as displayed in Panel C. Overall, low GPA students are 4.3 percentage points less likely to take out an unsubsidized loan (a 5% effect in column 10), with larger relative decreases for the no- and low-prior year borrowing students. Among minority students, there are also declines in both the level and incidence of unsubsidized borrowing among minority students (columns 3 and 8), but these are statistically significant at only the 10% level.

5.2 Other Financial and Educational Outcomes

Results from estimates of Pell Grant and federal Work-Study awards are included in Table 4. Panel A displays results for Pell Grants. Treatment group students get \$47 less in Pell Grants compared with control group students (statistically significant at the 10% level) and are 1.6 percentage points less likely to obtain any Pell Grant funds. Relative Pell Grant decreases for the treatment group students appear concentrated among students with low amounts of loans in a prior year and is particularly large among first-generation and minority students. Minority students (2.7 percentage points, statistically significant with 90% confidence) and low GPA students (5.3 percentage points, statistically significant at the 95% confidence level) are both less likely to get Pell Grants after receiving the letter. Zero EFC and low GPA students with high loan amounts are particularly likely to have a relative decline in Pell Grants. This effect is not driven by students dropping out of school. As discussed later, there is no discernible difference in dropouts among the treatment and control groups. I

also estimate the effect of the letter on Pell Grants on the sample of students who persist in college and find similar results (displayed in Appendix A.2). The effect is also not driven by differential changes in EFC among treatment and control students since I control for EFC in the model. Therefore, this effect is likely because students who learned about their debt burdens through the letter did not apply for aid in the following year. This is likely a suboptimal outcome for students since Pell Grants do not have to be repaid.

There are no observable differences in federal Work-Study awards accepted overall, although students with high borrowing, especially first-generation and low-EFC students, obtain fewer Work-Study funds and are less likely to accept Work-Study. A plausible explanation for this result is that these students are increasing their non Work-Study employment as a means to afford college expenses and are therefore reducing their Work-Study participation.²⁴

In Table 5, I display changes in students' cost of attendance or in the likelihood that a student drops out, changes program or plan, or contacts the financial aid office. There are no meaningful changes in enrollment pattern or academic program/plan decisions, but the letter leads to increased contact with the financial aid office. Treatment group students are two percentage points more likely to get in touch with a financial aid officer, either by phone or in person.²⁵ While the increase in contact with the financial aid office does not appear to manifest itself in large-scale systematic changes in borrowing (as evidenced in results from prior tables), this information seeking should nonetheless be considered a positive outcome since it creates a stronger connection with financial aid professionals that may lead to better postgraduation repayment outcomes.

I display the effect of the letter on contact with the financial aid office by

²⁴There is some evidence that suggests that on-campus work is less harmful to students' academic progress than off-campus work (e.g., Ehrenberg and Sherman, 1987).

²⁵The extra contact by treatment group students comes primarily through increased in-person visits rather than by phone.

subgroup in Table 6. Here, we observe that much of the effect is driven by increased visits from students in the moderate prior year student loan subgroup. These students are at or near their federal loan limits. Therefore, this is a relatively important group to target with information since these students are at the margin of borrowing nonfederal loan money which is likely to have less favorable terms. The magnitudes are large; overall, for this subgroup, students who received the letter are 3.4 percentage points more likely to contact a financial aid professional at the university, which translates to an effect size of about 8%. Treatment group first-generation students and those with EFCs equal to zero are even more likely to contact the financial aid office, with point estimates of 5.1 and 12.2 percentage points translating to effect sizes of about 10% and 24%, respectively. Nonetheless, while students in this group are more likely to meet with financial aid professionals at the university, they don't appear to actually be changing decisions in systematic ways.

6 Discussion

This paper includes results from a randomized field experiment that evaluates a low-intensity informational intervention aimed at helping college students make informed and active student loan decisions. While there are some modest behavior changes among some student subgroups, there are substantially smaller borrowing effects across all students in comparison with other more intensive institution-based initiatives related to student borrowing (Kennedy, 2015; Schmeiser et al., 2015). This suggests that information alone is not sufficient to drive systematically different borrowing choices among students and that other supports are likely necessary to affect behavior. For many students, especially those on the margin of making poor decisions, access to more intensive, yet more costly, personalized counseling services are likely needed to help students fully process the implications of borrowing (for exam-

ple, as in Carrell and Sacerdote, 2013). There are a number of design improvements to informational letters that could better capture students' attention, enhance motivation, and further ease the comprehension of complicated topics (e.g., Lamberton and Castleman, 2016). However, these improvements are unlikely to be easily implemented across a multitude of school contexts, and may still be insufficient to drive wholesale behavioral changes without additional help.

While there are no observable overall changes in year-to-year borrowing due to the letter in these data, there is evidence that the letter induced a positive outcome, namely information seeking among students. There is value to encouraging a more informed student body, even if average short-term borrowing behavior does not demonstrably change. For example, informed students are more likely to actively choose an appropriate repayment plan and engage with their loan servicer, both of which may help students stay current on their educational debt post-college. Long-term follow-up studies examining degree attainment and repayment are therefore also needed in this context.

Finally, the results presented here do not reflect important changes students may have made in response to the letter, such as reducing spending or obtaining an off-campus job. To address this knowledge gap, in-person interviews are underway that will shed further light on the nuance of college student borrowing decisions.

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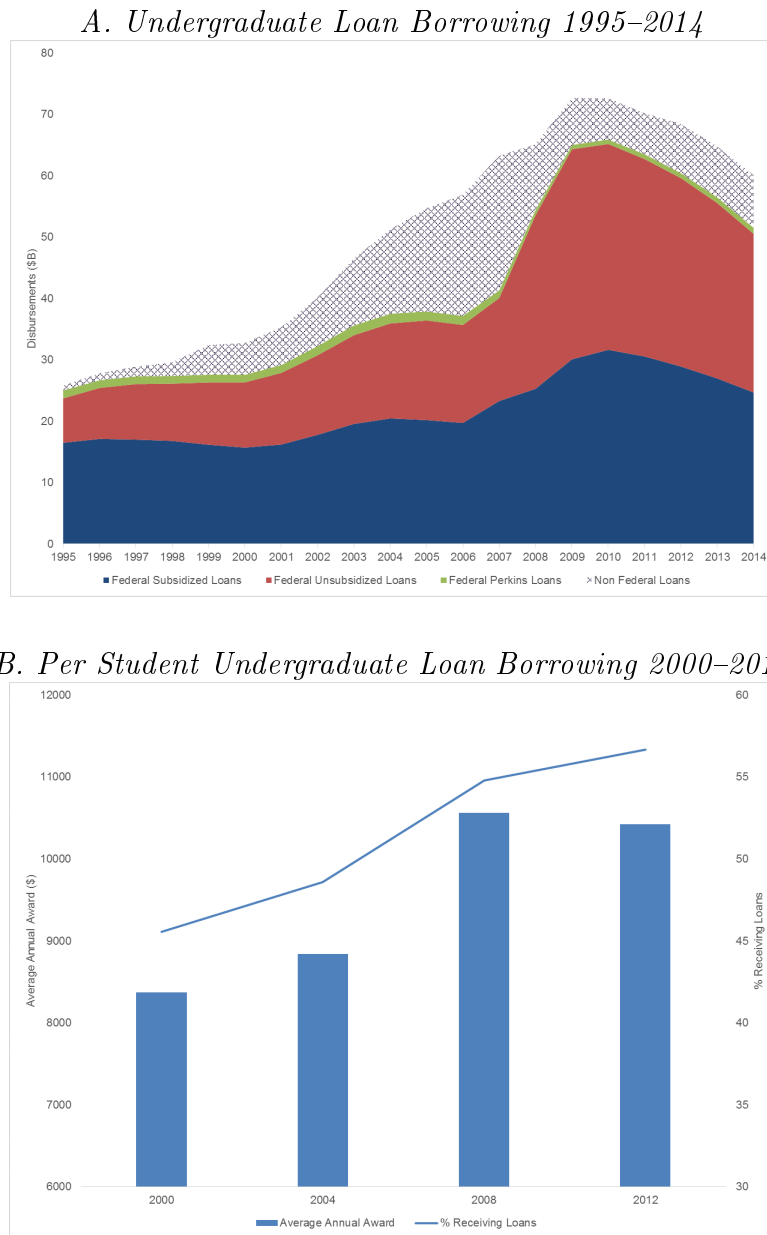
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Figures and Tables

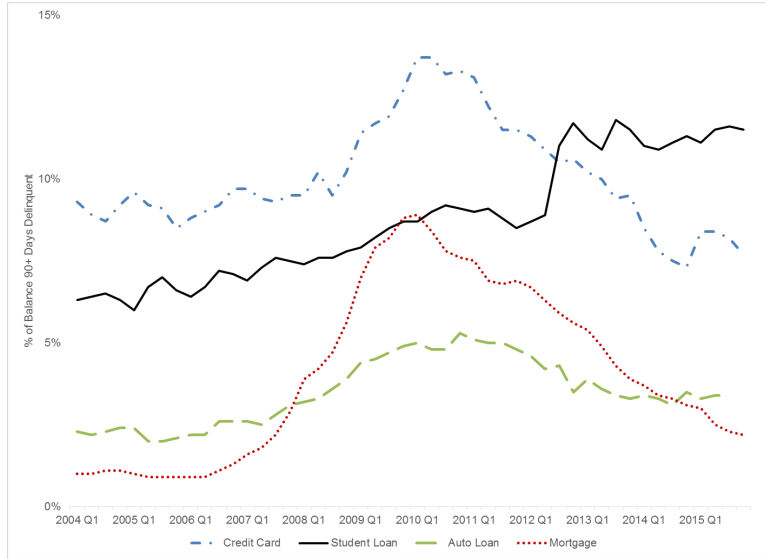
Figure 1: Loan Borrowing Trends



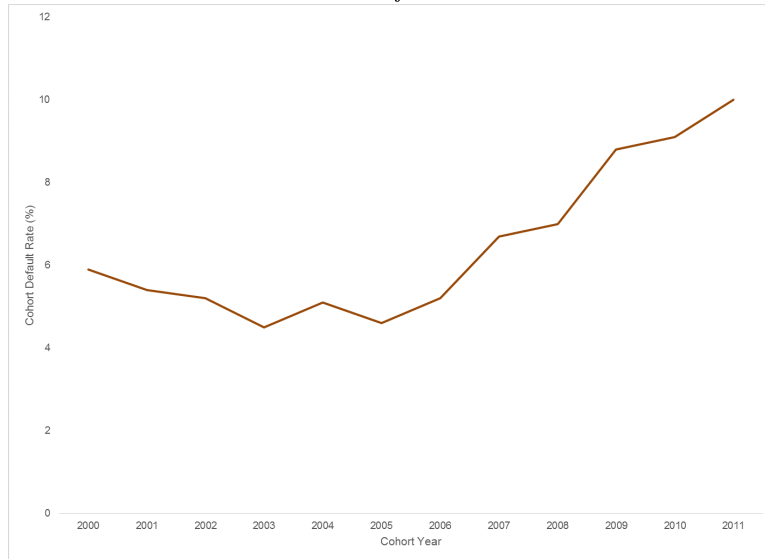
Source: Baum et al. (2015). *Notes:* Panel A — Total annual undergraduate loan borrowing in constant 2014 dollars, with each color representing a different type of loan. The y-axis is the total amount borrowed in billions of dollars. Panel B — The bars represent average annual award per borrowing undergraduate student in constant 2014 dollars for selected years (on the left y-axis). The line represents the percentage of undergraduate students who borrow in each of the years (on the right y-axis).

Figure 2: Delinquency Trends

A. National Percent of Balance 90+ Days Delinquent 2004Q1–2015Q1



B. National Cohort Default Rates 2000–2011



Source: Panel A — Federal Reserve Bank of New York Quarterly Report on Household Debt and Credit (February 2016, available at <https://www.newyorkfed.org/microeconomics/hhdc.html>). Panel B — U.S. Department of Education available at <http://ifap.ed.gov/eannouncements/attachments/2013OfficialFY112YRCDRBriefing.pdf>). *Notes:* Panel A — lines are the percentage that are at least 90 days delinquent for different segments of consumer credit. Panel B — Two-year national student loan default rates. The U.S. Department of Education transitioned to a three-year cohort default rate starting with the 2012 cohort.

Table 1: Pretreatment Descriptive Statistics

	Treatment		Control	
	Mean	SD	Mean	SD
Male	0.45	0.50	0.45	0.50
Female	0.55	0.50	0.55	0.50
Non-Hispanic White	0.81	0.39	0.81	0.39
Asian	0.03	0.16	0.03	0.16
Black	0.17	0.37	0.16	0.37
Hispanic	0.04	0.20	0.04	0.20
Other minority	0.03	0.17	0.03	0.16
First generation	0.36	0.48	0.34	0.48
Financially dependent	0.93	0.26	0.92	0.27
Financially independent	0.03	0.18	0.04	0.19
Financial dependency unknown	0.04	0.20	0.04	0.20
State resident	0.72	0.45	0.73	0.44
Transfer student	0.14	0.34	0.14	0.35
GPA	2.85	0.78	2.85	0.78
Credits earned	53	27	53	27
Total loans (\$)	6841	4974	6872	5152
Has a loan	0.89	0.31	0.89	0.32
Subsidized loans (\$)	2708	2120	2639	2137
Has subsidized loan	0.67	0.47	0.65	0.48
Unsubsidized loans (\$)	2986	2494	2997	2508
Has unsubsidized loan	0.79	0.41	0.78	0.41
Perkins loans (\$)	89	365	94	365
Has Perkins loan	0.06	0.24	0.07	0.26
Private loans (\$)	1053	4103	1136	4353
Has private loan	0.08	0.27	0.08	0.28
Expected family contribution (\$)	19341	42291	19517	36671
Cost of attendance (\$)	27367	6675	27130	6569
Federal Work-Study (\$)	113	456	114	454
Has Federal Work-Study	0.07	0.25	0.07	0.26
Count	4900		4902	

Source: Administrative data from the 2014–2015 academic year. *Notes:* All time-invariant measures are as of the 2014–2015 academic year (the pretreatment period).

Table 2: Effects of the Loan Notice on Total Borrowing

	Total Borrowing (\$)			Has A Loan		
	(1)	(2)	(3)	(4)	(5)	(6)
Loan notice	-84 (108)	-118 (104)	-82 (90)	-0.010 (0.009)	-0.014 (0.009)	-0.014* (0.008)
Female		-29 (107)	-147 (93)		-0.029*** (0.009)	-0.031*** (0.008)
Asian		-217 (326)	-82 (283)		-0.033 (0.027)	-0.029 (0.026)
Black		581*** (152)	591*** (132)		0.103*** (0.013)	0.081*** (0.012)
Hispanic		-393 (264)	-190 (228)		-0.017 (0.022)	-0.019 (0.021)
Other minority		-3 (317)	44 (274)		-0.050* (0.026)	-0.045* (0.025)
First-generation		341*** (114)	38 (99)		0.026*** (0.009)	0.019** (0.009)
EFC (\$000)		-5*** (2)	-5*** (2)		-0.001*** (0.000)	-0.001*** (0.000)
GPA		1,418*** (74)	1,442*** (64)		0.182*** (0.006)	0.171*** (0.006)
Credits earned		2 (2)	-3* (2)		-0.000 (0.000)	0.000** (0.000)
Transfer student		559*** (161)	-216 (140)		0.015 (0.013)	0.003 (0.013)
State resident		-860*** (126)	-87 (110)		0.021** (0.010)	0.017* (0.010)
Financially independent		765** (298)	48 (258)		-0.055** (0.025)	-0.042* (0.024)
Financial dependency unknown		-3,221*** (268)	-295 (238)		-0.446*** (0.022)	-0.103*** (0.024)
Constant	5,677*** (76)	2,104*** (249)	-1,755*** (226)	0.708*** (0.007)	0.212*** (0.021)	-0.202*** (0.024)
N	9,802	9,802	9,802	9,802	9,802	9,802
R-squared	0.000	0.066	0.300	0.000	0.136	0.207
Lagged DV?			X			X

Source: Administrative data from the 2014–2015 and 2015–2016 academic years. *Notes:* Standard errors are included in parentheses. Estimates are from equation 1 and are described in Section 4. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 3: Effect of Loan Notice on Heterogeneous Groups and Prior Year (PY) Loan Amount

	Loan \$					Has a Loan				
	All Students (1)	First Generation (2)	Minority Race/Ethnicity (3)	EFC = 0 (4)	GPA < 2.5 (5)	All Students (6)	First Generation (7)	Minority Race/Ethnicity (8)	EFC = 0 (9)	GPA < 2.5 (10)
A. Total Loans										
All	-82 (90)	-23 (153)	-142 (184)	-116 (209)	-218 (192)	-0.014* (0.008)	-0.008 (0.014)	-0.021 (0.016)	-0.023 (0.020)	-0.043** (0.017)
PY loans: 0	-114 (272)	-240 (539)	-610 (665)	-601 (402)	-929 (575)	-0.006 (0.025)	-0.002 (0.047)	-0.072 (0.058)	-0.079** (0.039)	-0.137*** (0.052)
PY loans: low	-175 (264)	-516 (436)	72 (551)	639 (633)	-368 (576)	-0.016 (0.024)	-0.007 (0.038)	-0.026 (0.048)	0.069 (0.061)	-0.056 (0.052)
PY loans: moderate	43 (119)	167 (211)	-196 (256)	350 (383)	-203 (261)	-0.008 (0.011)	-0.005 (0.019)	-0.024 (0.022)	0.045 (0.037)	-0.02 (0.024)
PY loans: high	-379* (204)	-103 (292)	5 (339)	-384 (365)	129 (392)	-0.032* (0.018)	-0.02 (0.026)	-0.004 (0.030)	-0.061* (0.035)	-0.046 (0.035)
B. Subsidized Federal Loans										
All	-72* (40)	-29 (70)	-54 (81)	-15 (93)	-291*** (76)	-0.013 (0.008)	-0.006 (0.014)	-0.009 (0.017)	-0.02 (0.019)	-0.053*** (0.017)
PY loans: 0	39 (121)	69 (245)	-357 (291)	-205 (180)	-428* (229)	0.008 (0.025)	0.007 (0.050)	-0.053 (0.061)	-0.056 (0.037)	-0.115** (0.051)
PY loans: low	-104 (117)	-55 (198)	48 (241)	318 (283)	-391* (229)	-0.015 (0.025)	-0.002 (0.041)	0.015 (0.050)	0.046 (0.058)	-0.057 (0.051)
PY loans: moderate	-63 (53)	-38 (96)	-38 (112)	186 (171)	-276*** (104)	-0.011 (0.011)	-0.008 (0.020)	-0.008 (0.023)	0.027 (0.035)	-0.046** (0.023)
PY loans: high	-134 (91)	-43 (133)	-63 (148)	-121 (164)	-218 (156)	-0.032* (0.019)	-0.014 (0.027)	-0.013 (0.031)	-0.045 (0.034)	-0.04 (0.035)
C. Unsubsidized Federal Loans										
All	-60 (48)	-40 (73)	-157* (92)	9 (96)	-41 (84)	-0.011 (0.009)	-0.012 (0.014)	-0.033* (0.017)	-0.021 (0.021)	-0.043** (0.018)
PY loans: 0	-99 (146)	-80 (256)	-27 (331)	-278 (186)	-276 (250)	-0.015 (0.026)	-0.022 (0.051)	-0.092 (0.061)	-0.083** (0.040)	-0.119** (0.052)
PY loans: low	-140 (141)	-161 (207)	-338 (275)	358 (293)	-321 (251)	-0.016 (0.025)	-0.042 (0.041)	-0.039 (0.051)	0.059 (0.063)	-0.107** (0.053)
PY loans: moderate	4 (64)	106 (100)	-120 (128)	279 (177)	78 (114)	-0.004 (0.011)	0 (0.020)	-0.04* (0.024)	0.044 (0.038)	-0.017 (0.024)
PY loans: high	-178 (109)	-243* (139)	-149 (169)	-89 (169)	-55 (171)	-0.021 (0.019)	-0.022 (0.027)	-0.004 (0.031)	-0.036 (0.036)	-0.035 (0.036)
Count	9802	3464	2412	1644	2408	9802	3464	2412	1644	2408

Source: Administrative data from the 2014–2015 and 2015–2016 academic years. *Notes:* Standard errors are included in parentheses. Coefficients and standard errors displayed in the first row for each panel (all students) are from equation 1, while estimates and standard errors for the remaining rows in each panel are from equation 2. Controls for gender, race/ethnicity, first-generation status, EFC, GPA, credits earned, transfer student status, resident status, financial dependency, and the lagged dependent variable are included but not displayed. *** p < 0.01, ** p < 0.05, * p < 0.10.

Table 4: Effect of Loan Notice on Other Financial Choices

		\$					Incidence				
		All Students (1)	First Generation (2)	Minority Race/Ethnicity (3)	EFC = 0 (4)	GPA < 2.5 (5)	All Students (6)	First Generation (7)	Minority Race/Ethnicity (8)	EFC = 0 (9)	GPA < 2.5 (10)
A. Pell Grants											
All		-47* (26)	-90* (53)	-45 (63)	-16 (88)	-144 (56)	-0.016** (0.006)	-0.018 (0.012)	-0.027* (0.014)	-0.019 (0.017)	-0.053*** (0.014)
PY loans: 0		58 (78)	184 (186)	322 (229)	36 (169)	-44 (167)	0.011 (0.019)	0.053 (0.043)	0.05 (0.051)	-0.014 (0.032)	-0.041 (0.041)
PY loans: low		-304*** (76)	-514*** (150)	-517*** (190)	-338 (267)	-447 (168)	-0.038** (0.018)	-0.051 (0.035)	-0.082* (0.042)	-0.02 (0.050)	-0.076* (0.042)
PY loans: moderate		2 (34)	-69 (73)	0 (88)	330** (162)	-87 (76)	-0.012 (0.008)	-0.026 (0.017)	-0.028 (0.020)	0.032 (0.030)	-0.046** (0.019)
PY loans: high		-97* (58)	-20 (101)	-51 (117)	-255* (154)	-188 (114)	-0.027* (0.014)	-0.009 (0.023)	-0.028 (0.026)	-0.063** (0.029)	-0.065** (0.028)
B. Federal Work-Study											
All		-8 (6)	-26* (13)	-34* (18)	-51** (24)	-12 (10)	-0.003 (0.003)	-0.009 (0.006)	-0.008 (0.008)	-0.018* (0.010)	-0.004 (0.005)
PY loans: 0		-19 (19)	-28 (47)	-29 (67)	-32 (45)	5 (31)	-0.005 (0.009)	0 (0.021)	0.011 (0.029)	-0.005 (0.020)	0 (0.016)
PY loans: low		-14 (19)	-21 (38)	39 (55)	-16 (71)	8 (31)	-0.005 (0.008)	-0.001 (0.017)	0.022 (0.024)	0.009 (0.032)	0.006 (0.016)
PY loans: moderate		6 (8)	-8 (19)	-33 (26)	-9 (43)	-12 (14)	0.002 (0.004)	-0.005 (0.008)	-0.015 (0.011)	-0.012 (0.019)	-0.004 (0.007)
PY loans: high		-39*** (14)	-61** (26)	-61* (34)	-119*** (41)	-30 (21)	-0.014** (0.006)	-0.023** (0.011)	-0.01 (0.015)	-0.046** (0.018)	-0.013 (0.011)
Count		9802	3464	2412	1644	2408	9802	3464	2412	1644	2408

Source: Administrative data from the 2014–2015 and 2015–2016 academic years. Notes: Standard errors are included in parentheses. Coefficients and standard errors displayed in the first row for each panel (all students) are from equation 1, while estimates and standard errors for the remaining rows in each panel are from equation 2. Controls for gender, race/ethnicity, first generation status, EFC, GPA, credits earned, transfer student status, resident status, financial dependency, and the lagged dependent variable are included but not displayed. *** p < 0.01, ** p < 0.05, * p < 0.10.

Table 5: Effect of Loan Notice on Educational Choices

	Dropout	Cost of Attendance	Change Program	Change Plan	Contacts the Financial Aid Office
	(1)	(2)	(3)	(4)	(5)
Loan Notice	0.000 (0.004)	-0.052 (0.156)	0.005 (0.008)	0.002 (0.009)	0.020** (0.010)
R-squared	0.214	0.309	0.086	0.029	0.088

Source: Administrative data from the 2014–2015 and 2015–2016 academic years. *Notes:* Standard errors are included in parentheses. Coefficients and standard errors displayed in the front row for each panel are from equation 1. Controls for gender, race/ethnicity, first generation status, EFC, GPA, credits earned, transfer student status, resident status, financial dependency, and the lagged dependent variable are included but not displayed. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table 6: Effect of Loan Notice on Contact with the Financial Aid Office, by Subgroup

	All Students	First Generation	Minority Race/Ethnicity	EFC = 0	GPA < 2.5
	(1)	(2)	(3)	(4)	(5)
All	0.02** (0.010)	0.021 (0.016)	-0.003 (0.019)	0.034 (0.022)	0.02 (0.019)
PY loans: 0	-0.014 (0.029)	-0.048 (0.057)	-0.056 (0.069)	0.028 (0.043)	-0.021 (0.058)
PY loans: low	-0.001 (0.028)	-0.018 (0.046)	-0.09 (0.057)	0.099 (0.067)	-0.015 (0.058)
PY loans: moderate	0.034*** (0.012)	0.051** (0.022)	0.024 (0.026)	0.122*** (0.041)	0.041 (0.026)
PY loans: high	0.012 (0.021)	0. (0.031)	-0.009 (0.035)	-0.048 (0.039)	0.005 (0.039)
Count	9802	3464	2412	1644	2408

Source: Administrative data from the 2014–2015 and 2015–2016 academic years. *Notes:* Standard errors are included in parentheses. Coefficients and standard errors displayed in the first row for each panel (all students) are from equation 1, while estimates and standard errors for the remaining rows in each panel are from equation 2. Controls for gender, race/ethnicity, first generation status, EFC, GPA, credits earned, transfer student status, resident status, financial dependency, and the lagged dependent variable are included but not displayed. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

A Appendix Tables

A.1 Subgroup Descriptive Statistics

Table A.1: Descriptive Statistics, Subgroups

	First Generation (1)	Minority Race/Ethnicity (2)	EFC = 0 (3)	GPA < 2.5 (4)
Total loans (\$)	7347	7156	5925	7011
Has a loan	0.92	0.92	0.73	0.89
Subsidized loans (\$)	3309	3137	2879	2733
Has subsidized loan	0.80	0.78	0.70	0.70
Unsubsidized loans (\$)	2722	3108	2143	2889
Has unsubsidized loan	0.80	0.83	0.60	0.81
Count	3464	2412	1644	2408

Source: Administrative data from the 2014–2015 and 2015–2016 academic years.

A.2 Effect of Loan Notice on Pell Grant Receipt, Excluding Dropouts

Table A.2: Effect of Loan Notice on Pell Grant Receipt, Excluding Dropouts

	All Students	First Generation	Minority Race/Ethnicity	EFC = 0	GPA < 2.5
	(1)	(2)	(3)	(4)	(5)
A. Pell Grants (\$)					
All	-47*	-109**	-32	-62	-112*
	(27)	(55)	(65)	(92)	(65)
PY loans: 0	85	263	434*	124	59
	(81)	(197)	(245)	(177)	(204)
PY loans: low	-355***	-576***	-559***	-570**	-514**
	(79)	(159)	(201)	(289)	(215)
PY loans: moderate	2	-89	14	266	-71
	(35)	(75)	(90)	(168)	(86)
PY loans: high	-86	-45	-43	-328**	-140
	(60)	(104)	(119)	(157)	(128)
B. Pell Grants (%)					
All	-0.014**	-0.016	-0.022	-0.023	-0.042***
	(0.006)	(0.012)	(0.014)	(0.016)	(0.016)
PY loans: 0	0.02	0.073	0.064	0.008	-0.019
	(0.019)	(0.045)	(0.053)	(0.031)	(0.049)
PY loans: low	-0.046**	-0.051	-0.078*	-0.054	-0.096*
	(0.019)	(0.036)	(0.043)	(0.051)	(0.052)
PY loans: moderate	-0.011	-0.025	-0.021	0.022	-0.038*
	(0.008)	(0.017)	(0.019)	(0.030)	(0.021)
PY loans: high	-0.02	-0.007	-0.027	-0.073***	-0.043
	(0.014)	(0.023)	(0.026)	(0.028)	(0.031)
Count	9227	3232	2224	1493	2007

Source: Administrative data from the 2014–2015 and 2015–2016 academic years.