The Effect of Reduced Student Loan Borrowing on Academic Performance and Default: Evidence from a Loan Counseling Experiment

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Abstract:

Student loan borrowing for higher education has emerged as a top policy concern. We conducted an experiment to evaluate the impact of an outreach campaign that prompted loan applicants at a large community college to make informed and active borrowing decisions. The intervention led students to reduce their unsubsidized loan borrowing by 7 percent. This resulted in worse academic performance and increased the likelihood of loan default during the three years after the intervention occurred. Our results suggest policy makers and higher education leaders should carefully examine the potential unintended consequences of efforts to reduce student borrowing, particularly in light of growing evidence regarding the counter-intuitive positive relationship between reduced borrowing levels and worse student academic and financial outcomes.

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I. Introduction

Student loan borrowing for higher education has emerged as a top policy concern. Total student debt now exceeds one trillion dollars, second only to mortgages in consumer debt. While student loans are designed to help students finance a high-cost, potentially high-return investment, a growing number of researchers and policy makers question whether student debt burden negatively affects future economic decisions, from occupational choice to the timing of when people get married or purchase homes (Rothstein and Rouse, 2011; Brown et al., 2014). Of particular concern is the rising rate of defaults on student loans, particularly among students at community colleges. Thirty-one percent of borrowers at community colleges in 2010 defaulted on their loans, up from 18 percent in 2000 (Dynarski, 2015). The consequences of defaulting for borrowers are substantial, including loss of future eligibility for federal student aid, difficulty accessing credit markets, wage garnishments, and withholding of other government disbursements.

Attention to the negative consequences of overborrowing has resulted in an increasingly common position articulated in the media and by policymakers that students should borrow less, presumably under the assumption that reduced debt would decrease the likelihood of default and improve future financial well-being. At the same time, a number of economists have investigated whether students are borrowing too much (or not enough), concluding in part that the media's depiction of the extent of overborrowing is overstated and reinforcing the valuable role that loans can play in facilitating human capital investments (Avery and Turner 2012). Indeed, recent empirical work suggests that inducing lower levels of borrowing or restricting access to loans may actually result in worse academic performance (Marx and Turner 2019; Dunlop, 2012; Wiederspan, 2015). Together, this work suggests that some students may actually be harmed by

borrowing less. However, existing work on the positive relationship between loan borrowing and academic success is limited, and there are open questions surrounding the extent to which reduced borrowing inhibits human capital accumulation and the extent to which these effects harm student welfare.

We contribute to this discussion by providing the only rigorous evidence we know of on the effects of reduced borrowing on both academic outcomes and a post-college financial outcome, student loan default. Default both provides an indication of post-college financial well-being via ability to repay and has serious negative consequences in its own right.[1]

In collaboration with the Community College of Baltimore County (CCBC), a large, urban community college in Maryland, we implemented a month-long outreach campaign to prompt loan applicants to make active and informed decisions about their student loan borrowing amounts and to offer remote, one-on-one assistance from a financial aid counselor if they had questions or needed help. We designed the messages to address common hurdles that prior research has shown can negatively affect behavior and outcomes in related domains. Specifically, we designed our messages to encourage active choice; increase the salience of the future costs and benefits of borrowing; and mitigate the lack of access to personalized assistance. The standardized intervention content had a modest emphasis on avoiding high levels of borrowing, including message content suggesting that the maximum may not be the best choice for all students and setting a positive norm for keeping borrowing between $3,000-$4,000 annually.[2] Starting in

[1] Once in default, all remaining balance on student debt becomes due. Furthermore, the Department of Education can garnish up to 15 percent of borrowers' wages or withhold their tax returns to collect on defaulted debt. Unlike other forms of debt, student loans cannot be discharged by declaring bankruptcy and defaulted borrowers are not eligible for any future aid. Finally, many states suspend professional and/or driver's licenses for those who default on their student loans (https://www.nytimes.com/2017/11/18/business/student-loans-licenses.html).

[2] While our initial intervention design framed all messages neutrally (with regards to how much students borrow), our partners at CCBC requested we include framing in multiple messages that normed moderate borrowing levels, with the goal of reducing cohort default rates at the institution. For instance, one message read, "Did you know that most CCBC students who keep annual borrowing between $3000-$4000 are able to pay back their loans?" As a result,

December 2014 and continuing until December 2015, we randomly assigned weekly waves of loan applicants to receive these texts, leading to an experimental sample of just under 3,000 loan applicants.

While we designed our intervention to minimize barriers to students accessing personalized loan counseling, subsequent analysis of text message interactions indicates that little additional information was provided by the CCBC loan counselor. Given the small share of individuals asking for advice and the limited advice provided to those who did ask, we conclude that the majority of the intervention's impact was driven by the standardized outgoing message content, which had a modest emphasis on avoiding high levels of borrowing. As we discuss in greater detail below, intervention messaging resulted in decreased student borrowing, and in turn worse academic performance and higher loan default rates.

Our intervention occurred alongside widespread and ongoing discussion of rising student loan debt and rates of default, frequently focused on the negative consequences of overborrowing. Policy makers at the institutional, state, and federal levels have pursued a variety of strategies to inform students about how much a student has cumulatively borrowed and to provide students with greater access to loan counseling.[3] Implicit in these institutional and governmental efforts is the premise that additional information about and assistance with loan borrowing decisions will lead to improved financial well-being (often through reduced debt) without negatively impacting

the overall messaging campaign (the content of which we present in the Appendix) has a modest emphasis on avoiding high levels of borrowing.

[3] For example, several state flagship institutions, including the University of Indiana and Montana State University, send students letters and notifications of their borrowing levels to date, often with encouragement to consider borrowing less and with opportunities to meet financial counselors on campus. In August 2016 the United States Department of Education announced a new initiative to strengthen loan counseling at institutions across the country. The motivating principle for this effort was that "accurate and timely loan information can help students make informed decisions about borrowingSee "https://www.ed.gov/news/press-releases/us-department-education-announces-loan-counseling-experiment-and-new-college-completion-toolkit" for the formal announcement.

students' academic performance. However, the empirical evidence to support this premise, particularly the association between borrowing levels and academic performance, is quite limited and inconclusive. For example, Stoddard, Schmeiser, and Urban (2017) estimate modest (2 percent) reductions in borrowing in response to a letter sent by a flagship university that attempted to reduce borrowing among students with high debt levels. While this effect was accompanied by modest increases in academic performance, this was potentially attributable to the satisfactory academic progress guidance provided in the letters or a result of financial counselor interactions prompted by the letter.[4] This study, like Darolia (2016), focuses on a flagship university with a more traditional student population (younger, whiter, better off) and a likelihood of default that is generally much lower than at community colleges – which suggests that the students at these institutions may have been making borrowing decisions that were relatively close to optimal for their financial and academic circumstances.[5]

Among community college students there is little evidence on the impact of student loan information or counseling on borrowing and academic outcomes; however, there are several studies that investigate the effects of other interventions that altered borrowing levels or loan availability with similar motivations. Multiple studies have suggested a positive effect of federal loan access at an institution on academic performance (Dunlop, 2012; Wiederspan, 2015). Perhaps the closest study to our own is a recent and important paper that explores the effects of changes in how loan offers are presented in students' financial aid award letters to students (Marx and Turner,

[4] There are also several studies that provided information to borrowers, but had no effect on borrowing. For example, research from the Netherlands found that varying the amount of information students received about government loans for higher education had no impact on student borrowing (Booij, Leuven, and Oosterbeek, 2012). In the United States, Darolia (2016) conducted an experiment at a flagship university in the Midwest in which students were sent letters with information about their cumulative borrowing to date and their likely monthly payments after leaving college. He found no significant overall effect on borrowing levels or academic outcomes.

[5] For example, the 3-year cohort default rate at Montana State has hovered around five percent in recent years, less than a third of the default rates at community colleges (and CCBC) over the same period.

forthcoming). The greater borrowing induced by positive offers led to better academic performance.

The results of our experiment extend the evidence base on the effect of loan borrowing among community college students on both academic and post-college financial outcomes. We find that the outreach campaign led to declines in student borrowing. Students who were sent the texts borrowed roughly $200 less (7 percent) in unsubsidized Stafford loans than their control group counterparts during the semester immediately following the intervention. Impacts on borrowing appear to occur in the middle and upper end of the borrowing distribution, with some evidence of an increase in the share of students deciding not to take out unsubsidized loans.

We also find that the intervention led to worse academic outcomes for students in the semester immediately following the intervention (i.e., the semester for which they are applying to receive loans). Students in the treatment group were four percentage points less likely to earn any credits and three percentage points more likely to fail a course in that term. While we see no statistically significant difference in enrollment during the semester immediately following the intervention or the semester after that, students in the treatment group appear slightly (1 percentage point, 1 percent) less likely to be enrolled. A year after the intervention, we find a significant reduction in the likelihood of any enrollment (3.6 percentage points, 6 percent), although this effect disappears three semesters after the intervention. We see no statistically significant effect on degree attainment, although the point estimate is negative (-0.9 percentage points) and meaningful in magnitude (4.4 percent of the control mean). Overall, these findings are quite consistent with Marx and Turner's (forthcoming) evidence that a reduction in borrowing negatively affects academic performance.

We take this line of inquiry one step further by providing the first evidence of the effects of reduced student borrowing on loan default. Likely as a result of the observed worse academic performance, proactive loan counseling also appears to have reduced financial well-being for students, at least in the short term. Treated students were 2.5 percentage more likely to have defaulted on their loans during the three years since the intervention occurred. These effects occur despite similar patterns of half-time or more enrollment following the intervention, indicating that the effects are not a result of differential timing of entry into repayment.[6]

Additional analyses suggest that the reduction in borrowing was most likely driven by an emphasis in the messages on avoiding high levels of borrowing. Specifically, the messages may have resulted in some students paying greater attention in actively choosing a borrowing level other than the maximum, led some students to anchor to the lower recommended range of borrowing, or caused some students to opt out of unsubsidized borrowing altogether as a result of increased loan aversion or cognitive overload. There is little evidence that the intervention led to substantially better information about the appropriate amount to borrow.

We also explore the potential mechanisms that could contribute to the default impact. These analyses suggest the academic channel as a likely explanation for the observed effects. In contrast, we see little evidence of higher rates of transfer to for-profit institutions (which have higher rates of default) or increased financial stress which could lead students to avoid future loan payments. While we are limited by our data and imprecision to either strongly support or rule out these hypotheses, the evidence suggests worsened academic performance as a likely channel.

Our results build on a growing body of work that suggests that policy makers from the institutional level on up should carefully evaluate whether efforts to reduce student borrowing are

[6] Falling below half-time enrollment triggers the start of the grace period that precedes loan repayment. We discuss the timing of loan repayment further below.

achieving their desired objectives or whether these initiatives have the potential to impair students' academic progression and financial well-being. While it is clear from this work that some students are harmed by reducing borrowing, it is unlikely that *no* students are overborrowing. In the closing sections of the paper, we incorporate a more complete discussion of the potential for over and under borrowing. We separate our discussion of the potential for over or under borrowing into that driven by sub-optimal investments and that driven by sub-optimal borrowing conditional on investment. We link this discussion to the broader policy question of how we might lead students to make more optimal borrowing decisions, concluding that more comprehensive supports for students while in school (Evans et al. 2017; Oreopoulos and Petronijevic 2018) and more comprehensive assistance with initial investment *and* borrowing decisions will result in better investment choices and better success in obtaining the highest possible return on these investments.

II. Background and intervention design

Conceptual framework

We begin with a conceptual framework for the loan origination process, with particular attention to the behavioral biases students may encounter that contribute to sub-optimal borrowing decisions. In a world of perfect information, students would choose an optimal borrowing level that allowed them to pursue a course of study at a particular institution where they maximized the expected benefits, net of the combination of the expected monthly costs of repaying their loan and any additional costs (either direct financial or effort) the student would have to invest to pursue the higher education opportunity that the loan would make possible. To the credit of the Department of Education, it attempts to provide students with high-quality information about loan

origination through an online loan counseling module that students are required to complete before they can access federal loan dollars, in order to encourage students to identify optimal borrowing levels. In practice, however, the information presented in the counseling is highly complex and may lead to more confusion than clarity (Lieber, 2014).[7] In the face of this complexity, students may avoid making an active choice and accept whatever loan amount the institution offers them (Beshears et al., 2012; Madrian and Shea, 2001). Marx and Turner (forthcoming) show that how loans are packaged can exert a strong effect on students' borrowing decisions: Students who were randomly assigned to receive a financial aid award letter that included a positive loan offer were more likely to borrow, and performed better academically, than students who did not automatically receive loans on their award letter.

Present-biasedness may also lead students to make sub-optimal borrowing decisions (Ross et al., 2013; Thaler and Benartzi, 2004). Students may either not be aware of the future monthly payments associated with their level of borrowing, or may underweight these future payments relative to near-term financial constraints that loans help students overcome. This may particularly be the case at community colleges, where students sometimes receive a refund check which can be used to cover personal or familial expenses if the combination of their grants and loans exceed the cost of tuition and fees.

Finally, students—particularly those with lower levels of financial literacy—may struggle to make informed choices about the borrowing amount that maximizes their utility in the absence of access to professional financial advising. Prior experimental evidence demonstrates that providing students with high-quality financial aid advising can increase the probability students follow through on their intentions to pursue college, can improve the quality of institution they

[7] Indeed, a review of the efficacy of student loan counseling suggests that students retain little information from mandatory counseling (Klepfer 2015).

attend, and can substantially increase the probability they receive financial aid for college (Barr and Castleman, 2017; Bettinger et al., 2012; Castleman, Page, and Schooley, 2014; Hoxby and Turner, 2015). Yet most open enrollment and less selective institutions have limited capacity within their financial aid offices to provide students with individual loan counseling (Scott-Clayton, 2015). Assistance may not be available at locations or during times when they are free, or students may not be comfortable asking for help with their aid (Castleman, 2015a; Castleman, 2015b; Scott-Clayton, 2015). Without access to professional assistance, students may struggle to make decisions that best position them for financial success during and after college.

Intervention design

Based on this conceptual framework, we designed an intervention to support students to make more active and informed loan borrowing decisions with three primary principles in mind:

1. **Active choice:** Convey to students that it is their choice whether and how much to borrow in student loans; they are not bound to or limited by what their institution offers (or doesn't offer) them in their financial aid award.
2. **Salience of future costs:** Encourage students to actively consider the future payments associated with their present borrowing decisions.
3. **Personalized financial counseling:** Minimize barriers to students accessing professional financial aid counselors who can help guide students through the loan origination process and answer any questions they have.

We designed an interactive text messaging campaign around these principles to support community college students to make more informed borrowing decisions.

Starting in November 2014, we partnered with the Community College of Baltimore County to modify its loan application to collect students' cell phone numbers and consent to send them text messages about financial aid and loans. Approximately 90 percent of new loan applicants consented to participate. Within roughly one week of applying for a loan, we randomly assigned roughly half of all eligible students to receive a month-long campaign of eight text messages about the loan origination process. The text messages were designed to address the behavioral biases and information frictions described above, and covered the following topics:

- (Active choice): Students get to choose how much to borrow. They can borrow less than the maximum offered. Consistent with similar information campaigns at other colleges, aid counselors felt that students should borrow less. This resulted in messages that were somewhat more suggestive that students should reduce borrowing than we initially intended, although this may be consistent with how similar campaigns would be conducted if implemented more broadly. Specifically, two messages suggested that the maximum may not be the best choice, and a third message set a positive norm for keeping borrowing between $3,000-$4,000 per year.
- (Salience of future costs): Monthly payments can be substantially higher or lower depending on how much students borrow and what repayment plan they select. Students face lifetime limits on how much they can borrow in federal student loans.
- (Personalized assistance): Each of the messages invited students to write back with questions or if they needed help from a CCBC financial aid counselor. The counselor was able to read and respond to student messages on an online portal and respond just as one would with web-based email.

Appendix B contains the complete list of eight text messages sent during the campaign. We did not message individuals in the control group. Over the course of the campaign, 70 percent of students replied to at least one text, indicating that students were reading and engaging with the intervention material. To better understand the nature of student-counselor interactions we randomly selected 200 (19%) of students who sent any messages and reviewed all of the ingoing and outgoing messages for these students. After reading through a substantial set of messages, we generated non-exclusive categories that we could use to code the messages; see Appendix X for a detailed explanation of this analysis. A large fraction of students (47%) sent messages that had no specific purpose other than to answer the yes or no question posed by the outgoing message or say "thank you" for the information. Many (28%) of the students who texted back first expressed some confusion as to why there were receiving text messages about their loans – most of these students who expressed confusion had forgotten that they had signed up for text messages on their loan application. After the CCBC counselor made clear the purpose of the text messages, many students used the texting service to ask general administrative questions. For example, roughly 30% of students sent messages that asked about whether their loan was approved and when and how it would be disbursed. A similar amount (29%) asked a process question related to borrowing, but unrelated to loan approval or disbursement.[8] The counselor typically sent short factual responses to these general questions. Another 30% of students responded to messages about borrowing amounts to confirm that they understood how much they were borrowing, and it was an amount that was appropriate for them. Among this group, students often specifically responded that they needed to take the maximum amount and offered explanations for their choice (e.g. they

[8] Some common questions include how to change the amount of loans requested; how loans are applied across multiple semesters; general questions about repayment; and the maximum amount of loans they are allowed to borrow per semester or lifetime.

needed to cut hours at work in order to attend school or their lab expenses were high that semester). The counselor typically responded with a simple "Ok" or "Sounds good" with no follow up questions or suggestions.[9]

While the counselor generally responded to students' requests for information, there was little in the way of personalized assistance or advice. Roughly 5.5% of students asked for advice on a specific question, typically around the appropriate amount to borrow. Stating that they were following CCBC guidelines, the counselor refrained from recommending specific loan amounts, and instead advised students to "take out enough to cover their expenses and an amount they are ok with having to pay back." A small share of students (13%) engaged with the text messages and seemed willing to discuss their loans with the counselor generally but did not have a specific question. These requests typically weren't directly addressed by the counselor; instead, the counselor instructed the students that they would answer specific questions from the student. A similar share of students (12%) specifically asked to speak to the counselor over the phone or in person. The counselor typically responded that this was a text-only program, but that the student could call the financial aid office or visit the office in person. Only 3 out of 200 students we included in our analysis actually made an appointment to meet with the counselor via the text messaging services.

Our analyses of the text message interaction data suggest three conclusions. First, students were reading and aware of the message content. Second, students seemed to have an existing level of stress about borrowing student loans, as exhibited by the volume of questions about loan processing and disbursement. While the messages may have helped some students with getting up to date information about the status of their loans, it also appears that the text message campaign

[9] As is common in these types of messaging interventions, a non-trivial share of students (19%) requested to opt out of the intervention.

may have increased stress levels around loans, potentially resulting in increased loan aversion or cognitive burden related to the borrowing decision. Third, while the CCBC financial aid counselor was responsive to incoming texts, their responses were limited to general information and answers to process questions. There was little in the way of personalized assistance in helping students to think about their borrowing amounts.[10] Given the small share of individuals asking for advice and the limited advice provided to those who did ask, we conclude that the majority of the intervention's impact was driven by the outgoing messages, as opposed to by students' interactions with the counselor. As we describe above, the scheduled message content conveyed that students need not choose the maximum loan offered, increased the salience of future repayment costs, and set a positive borrowing norm (or anchor) by indicating that students who keep borrowing within a certain range are able to pay back their loans.

Community College of Baltimore County

The Community College of Baltimore County (CCBC) is a large, urban community college with three primary campuses and several extension centers in Maryland. It serves approximately 23,000 undergraduates, and is similar to many large community college systems in the country in terms of student demographics and academic outcomes. Compared to the overall undergraduate population in the U.S., CCBC students are relatively old; they are also more likely to be black, the first in their family to go to college, and from lower-income backgrounds. Based on data from the United States Department of Education College Scorecard, 14 percent of first-time, full-time

[10] While the advisor did not seem particularly enthusiastic in engaging with students, it is difficult to determine whether students would have received more or better advice from a different individual or at a different community college. CCBC policies on the provision of financial planning generally prevent advisors from providing specific advice on borrowing amounts. More generally, it isn't clear that aid advisors are equipped with the data or training to determine whether certain types of individuals (or in individuals in certain programs) are overborrowing.

students at CCBC earn a degree within four years, and the median financial aid recipient who was working earned $34,200 within ten years of graduating. Most relevant for our study, approximately one in five CCBC students borrows federal loans to finance the cost of their education, slightly higher than the national average for community college students (18 percent).[11] Consistent with the higher default rates often observed at community colleges, three-year cohort default rates at CCBC ranged from 18.5 percent for the 2010 cohort to 15.5 percent for the 2012 cohort. Only 33 percent of borrowers repay at least $1 in loan principle within three years of leaving school, compared to over 40 percent of community college borrowers nationwide.

Potential borrowers at CCBC first need to complete the Free Application for Federal Student Aid (FAFSA). Through the Spring 2015 term, CCBC did not include loans in students' financial aid award letters. Students who wanted to borrow had to complete a supplementary loan application; after processing their application the CCBC financial aid office would then inform students how much they were eligible to borrow. Starting with the Fall 2015 term, CCBC switched to including loan offers in all financial aid applicants' award letters, though students still needed to complete the supplementary loan application to obtain a loan. While CCBC encourages its students to complete the loan application prior to the beginning of the term, it is possible for a student to apply for a loan at any point during the financial aid award year. In the cases when the student applies after already having paid tuition bills out of pocket, CCBC will refund the students tuition payment and apply the loan funds instead.

Federal eligibility for subsidized loans is determined by a student's dependency status, class level, and unmet financial need. Financial need is the difference between a student's cost of attendance (COA) and expected family contribution (EFC), where the EFC is the federal

[11] Authors' calculations from the 2012 NPSAS.

government's formula-driven measure of a student's ability to pay. A student's unmet financial need is their financial need minus all non-loan financial aid provided to the student. The maximum subsidized loan available to a student is the minimum of that student's unmet financial need or the federally mandated maximum of annual subsidized loan borrowing, whichever is lower. Eligibility for unsubsidized loans is similarly determined, but importantly excludes consideration of financial need.[12] Federally mandated maximums vary based on a student's year in school, dependency status, and attendance level. For example, a full-time first-year dependent student can borrow a maximum of $5,500 in Direct loans (with no more than $3,500 in subsidized loans), while a full-time first-year independent student can borrow $9,500 (with no more than $3,500 in subsidized loans). Borrowing levels are also constrained by lifetime borrowing limits.

As is the case at many community colleges across the country (Scott-Clayton, 2015), the CCBC financial aid office has experienced staffing declines over the last several years, and has limited ability to provide one-on-one financial aid advising or loan counseling to students. CCBC administrators were open to investigating scalable strategies to provide students with prompts to make active choices about the loan origination process and to provide a sustainable staffing solution for answering questions students had about their loans. For this study, one adviser at the CCBC financial aid office was primarily responsible for responding to students' text messages.

III. Empirical Strategy

Sample

[12] The maximum unsubsidized loan available to a student is the minimum of the student's net cost (COA minus financial aid, including subsidized loans) and the difference between the federally mandated maximum direct federal loan and the amount of the subsidized loan taken by the student.

Our sample is comprised of 2,876 students who applied for a loan between November 2014 and December 2015. In Table 1 we present summary statistics on students in our experimental sample. Over half (54 percent) of those reporting race were black and roughly two-thirds of students were female. The mean age was 30, and accordingly only one-third of students were classified as dependents for the purposes of financial aid. Just over half of students were the first in their family to go to college, and the average expected family contribution to college was approximately $5,750.[13] Before applying for loans for the Spring or Fall 2015 terms, students with prior loan debt had already accumulated roughly $16,000 in loans, on average. Just under a third of students in the sample were new college students.

Data

The data we use in our analysis come from CCBC administrative data, the National Student Clearinghouse (NSC), and the National Student Loan Data System (NSLDS). We have access to all demographic, socioeconomic, and academic information provided on students' admissions, financial aid, and loan applications to CCBC. Our outcome data on student financial aid disbursements come from CCBC records as well as borrowing data that CCBC obtains from the NSLDS. We also have data on students' subsequent academic outcomes at CCBC, including course enrollment, completion, and grades.

To track longer-term effects of the intervention we leverage enrollment and graduation data from the NSC (obtained in January 2018). Finally, we explore effects on longer-term measures of financial well-being using student loan default information from the NSLDS (obtained June 20, 2018).

[13] The EFC for the median student in our sample was $2,152. For comparison, the maximum EFC for Pell eligibility was $5,198 for the 2015-16 award year.

Finally, we also have access to all text message interactions between students and the financial aid counselor, which we use to describe student engagement with the messaging campaign.

Randomization

We conducted our randomization at the student-level, within weekly waves (36 total) of loan applicants for the Spring and Fall 2015 terms.[14] For example, all students who applied for a student loan between July 31st and August 6th 2015 were randomly assigned to the treatment or control condition on August 7th, and began receiving text messages on August 10th. Because the intervention began in the middle of the 2014-15 academic year, most (2,494 of the 2,910) of the sample participants were applying for loans for the Fall 2015 term. In Table 1, we report baseline equivalence for the experimental sample.[15] Across eighteen baseline measures we only find one statistically significant difference between the treatment and control group at the 5 percent level, which is probabilistically what we would expect given the number of tests we conduct. We therefore conclude that randomization was successful in creating two statistically-equivalent experimental groups at baseline.

Empirical Strategy

To assess overall impacts, we utilize an intent-to-treat model of the following general form:

$$BORROW_{ij} = \alpha_j + \beta_1 TREATMENT_{ij} + \boldsymbol{X\gamma} + \varepsilon_{ij},$$

where for student *i* in wave *j*, $BORROW_{ij}$ is one of several measures of student borrowing during the term for which they applied for a loan, including a binary indicator for whether they borrowed at all and continuous measures of how much they borrowed in different loan types. In our preferred

[14] We did not conduct the intervention with loan applicants for the Summer 2015 term.
[15] Baseline equivalence comparisons are nearly identical with the inclusion of wave fixed effects.

specification, we include a set of wave fixed effects α_j and student-level covariates $\boldsymbol{X}$, including indicator variables for race, gender, age, dependency status for financial aid, and student type (new, returning, transfer), and linear controls for baseline earned credit hours, baseline GPA, EFC, and baseline accumulated loan debt.[16] $TREATMENT_{ij}$ is an indicator for assignment to the treatment condition. The parameter of interest β_1 represents the causal effect of being assigned to the text messaging intervention on students' borrowing outcomes. We also fit this model with a set of academic outcomes, including indicators for whether students earned any credits and whether students failed any courses. We examine impacts of the intervention on academic outcomes in the term in which students received the intervention (i.e. Fall 2015 outcomes for students treated in the Fall 2015 term). Finally, we explore effects of the intervention on longer-term outcomes such as enrollment duration, degree attainment, and student loan default.

IV. Results

We begin by presenting in Table 2 impacts of the intervention on students' borrowing outcomes. All loan outcomes we consider refer to student borrowing that originated during the semester immediately following the intervention; i.e. Spring 2015 for the first 383 participants, and Fall 2015 for the remaining participants. The first column only includes the wave fixed effects as a design control; subsequent columns include additional controls as shown at the bottom of the table.

The bottom row of Panel A shows that the text campaign led to a $220 decline in total borrowing. This effect was driven by a $194 decline in unsubsidized Stafford loans disbursed, which represents a 7 percent decline from the control group mean of $2,792. The first two rows

[16] We set missing values for control variables equal to zero and include indicators for missing values.

show that while the text campaign did not affect the share of students who received a subsidized loan, the text campaign may have decreased the share of students who received an unsubsidized loan by around 3 percentage points, or 4 percent of the control mean of 68 percent.

For the most part, point estimates only change slightly upon inclusion of additional controls. One exception is the impact on total unsubsidized Stafford loan borrowing, which is attenuated upon inclusion of EFC, dependency status, baseline loan debt, and student type. This attenuation is driven by students in the treatment group having a slightly lower EFC on average, and being slightly more likely to be new students. New students borrow lower amounts of unsubsidized Stafford loans on average. Therefore, including controls for student type reduces the treatment effect somewhat. Throughout the paper we focus on impacts from our fully controlled models (column 5 in Table 2).

In Figure 1, we present a histogram displaying borrowing levels of treatment and control students at different points in the distribution of unsubsidized loan borrowing. The histogram suggests that shifts in student borrowing happened throughout the distribution of unsubsidized loan borrowing rather than impacts being concentrated among one part of the distribution. The most common borrowing outcome for students in both groups was to borrow zero dollars in unsubsidized loans, with a larger number of treated students in this category. The two other most common unsubsidized loan borrowing amounts are at the maximums of unsubsidized Stafford loan borrowing for full-time independent and dependent students who also qualify for the maximum subsidized loans.[17] Figure 1 shows that slightly fewer treatment students borrowed these modal amounts compared to control students, while other treatment gaps exist elsewhere in the

[17] For example, the annual Stafford loan limit for an independent freshman attending full-time is $9,500, up to $3,500 of which may come from subsidized Stafford loans, depending on the student's level of unmet financial need. If the independent freshman is eligible for the full $3,500 in subsidized Stafford loans, then she may also borrow up to $6,000 in unsubsidized Stafford loans for the full year, or $3,000 per semester.

distribution. Overall, Figure 1 suggests that the intervention caused some students to reduce borrowing from the maximum allowable and caused other students to refrain from borrowing unsubsidized loans all together.[18]

In the lower half of Table 2, we present analogous statistics for course outcomes. While not statistically significant, the direction of the point estimates suggest that treated students were less likely to enroll in courses and earned fewer overall credits.[19] Students in the treatment group were 4.2 percentage points less likely to earn any credits (5.4 percent of the control mean) and 3.0 percentage points more likely to fail a course in the term of the intervention (10.2 percent of the control mean).[20]

Table 3 explores effects of the intervention on longer-term outcomes. Treated students are somewhat less likely to be enrolled in the semester after the intervention, but this effect is not statistically significant. A year (two semesters) after the intervention, treated students are significantly (3.6 percentage points) less likely to be enrolled, although this difference in enrollment fades by the following semester (three semesters after the intervention).[21] Perhaps as a result of their worse academic performance during the semester immediately following the intervention and potentially thereafter[22] and reduced enrollment in subsequent semesters, treated

[18] Unfortunately, CCBC does not retain the loan levels offered to students in their award package and we do not have the data necessary to impute individual loan maximums.
[19] Conditioning our loan results on enrollment reduces them by less than a quarter.
[20] With the exception of GPA, which is conditioned on enrollment out of necessity, all regressions are run on the full sample. If we instead examine binary GPA categories, which allows us to include the full sample, we observe a non-significant increase in the fraction of sample participants with a GPA of less than 2.0 (1.5 percentage points) and non-significant decreases in the fraction with GPAs of 2.0-3.0 or 3.0-4.0. Non-enrolled students are included as zeroes in these regressions.
[21] Total borrowing is also reduced by a modestly smaller percentage in the following year (not significantly different from zero), but it is difficult to disentangle changes in enrollment or intensity of enrollment (which we cannot observe in that year) from changes in borrowing conditional on enrollment.
[22] We do not have access to detailed academic outcomes after the semester immediately following the intervention. While we obtained partial data for Spring 2016, we quickly became aware that a number of waves of randomized students were not included. The resulting point estimates, on a subset of the waves, continue to suggest negative academic effects, but we put little weight in them given the missing data and large confidence intervals.

students were also somewhat less likely to have obtained a degree by early 2018 (0.9 percentage points, 4.3 percent). While not statistically significant, this point estimate is statistically indistinguishable from that in Marx in Turner (forthcoming), and quite similar to their estimate when scaled by the effect on borrowing.

In the final column of Table 3, we present estimates of the effect of the intervention on loan default. Students who were sent the messages were 2.5 percentage points more likely to have defaulted on a loan by June 2018, indicating that the intervention had negative effects on financial well-being, at least in the short term.

An immediate question is whether these differences in default rates are generated by treated students entering repayment earlier than control students. If this were the case, the estimates might merely reflect a mechanical shift in the timing of default because default generally occurs after 270 days of missed payments. We can explore effects on the timing of entry into repayment by examining when student enrollment falls below half-time. As the 6-month grace period is triggered by falling below half-time enrollment, we can examine the distribution of dates when student enrollment falls below half-time. Figure 2 plots the cumulative distribution of the end date of the last period of half-time or more enrollment pursued by a student. As seen in the figure, the patterns of entry into 6-month grace periods (and thus repayment) is quite similar across the two groups. In fact, treated students are somewhat slower to drop below half-time enrollment, suggesting that (if anything) they are entering repayment slightly later; this would reduce the likelihood of default, which is the opposite of what we find.[23]

[23] Appendix Table A1 presents the point estimates for half-time or more enrollment by semester. We also present estimates of gaps in half-time or more enrollment in Appendix Table A2. We find no evidence of differential gaps in half-time or more enrollment between treatment and control.

Another way to think about this is to examine default rates by the number of months that have passed since an individual dropped below half-time enrollment. In Figure 3, we plot average default rates by treatment status within bins of number of months since an individual fell below half-time enrollment (i.e. the number of months between falling below half-time enrollment and June 2018). The bins are constructed such that each one contains 20 percent of the individuals in the control or treatment group. The figure provides two main takeaways. First, the bins (dots) for the treatment and control groups align almost exactly, confirming the findings in Figure 2 that the distributions of entry into repayment are quite similar across groups. Second, there is a higher rate of default among treated students at each point in the distribution, confirming that the estimates in Table 3 are not a result of timing. While we find no effect of the intervention on the timing of entry into repayment, we recognize that the intervention may have affected the decision to fall below half-time enrollment, so this figure should be interpreted with that in mind.[24]

V. Exploring Mechanisms

While the intervention clearly affected student behavior, we have yet to address exactly how this messaging campaign affected students' borrowing decisions, academic outcomes, and loan repayment. We begin with a discussion of the various channels through which the intervention may have affected borrowing behavior.

Borrowing Behavior

The intervention encouraged students to make an active choice (to overcome inattention or status quo bias), increased the salience of future costs (to overcome present-biasedness), and

[24] In other words, we recognize that we are splitting the sample on a variable that is potentially affected by the intervention. While we observe no effect of the intervention on this variable, we do not claim that the resulting figure illustrates causal effects of the intervention at different points in the default-timing profile. That said, we think the results are suggestive.

contained a modest emphasis on avoiding overborrowing, both by suggesting that accepting the maximum loan may not be the right choice and by setting a positive norm for keeping borrowing around a certain amount.

Are students making an active choice? Absent the intervention, it seems that many are not. Indeed, the density of students borrowing near or at the federal maximum is consistent with (1) inattention to or lack of awareness of borrowing options other than the maximum and (2) individuals anchoring to the maximum.[25,26] As in Marx and Turner (2019), the CCBC intervention directly targeted both lack of awareness of a borrowing option other than the maximum and provided an alternative anchor; a message indicated that most CCBC students who keep annual borrowing between $3,000-$4,000 are able to pay back their loans. In response to the intervention, we observe a 2.84 percentage point (14 percent) reduction in the share of students borrowing at the maximum (Table 4).[27] We also observe evidence of an increase in borrowing in the $3,000-$4,000 range, consistent with anchoring to the norm provided in the messages. There is a significant and large (3.16 pp, 28 percent) increase in the share of individuals with unsubsidized borrowing in this range.[28] Our results thus suggest that *anchoring* plays some role in the student borrowing decision, at least in the context of providing CCBC borrowers with information on the average borrowing of successful prior CCBC students. The

[25] In the CCBC control group just under 20% individuals (23% of borrowers) are borrowing one of the maximum loan amounts associated with their dependency status. Marx and Turner (2019) find substantially higher rates of borrowing at the maximum among students in their sample.
[26] The excessive density at the maximum is also consistent with borrowing constraints, but these constraints cannot explain the observed drop in borrowing in response to the intervention.
[27] The estimate is significant at the 5% level (se, 0.0142). Because we lack accurate measures of academic level, we classify an individual as borrowing the maximum if they were observed borrowing either level associated with a freshman or sophomore and the individual's dependency status. As in Marx and Turner (2019), we find larger reductions in borrowing (and more movement away from the maximum) among students with lower levels of resources (Appendix Table A3.)
[28] The estimate is significant at the 5% level (se, 0.0124). We focus on unsubsidized borrowing because that is the only margin of adjustment observed. The effect on the likelihood of total borrowing in the $3,000-$4,000 range is suggestive but smaller (0.0170, se 0.0126). This is roughly 14 percent of the control mean.

role of the messages in overcoming existing *inattention* is less clear. While we cannot test the effect of inattention and anchoring separately, Marx and Turner (2019) find no effect on borrowing behavior of simply informing individuals that they have the option to choose something other than the maximum, suggesting that this is not enough to generate active choices. A model of inattention would predict a reduction in borrowing at the offered level and an increase in the density of borrowing throughout the distribution (depending on optimal loan levels for each student). While we lack the statistical power (and knowledge of the optimal borrowing distribution) to make strong statements here, it is possible that the intervention led students to make more *active choices*.

However, it is not clear that individuals are making better choices. Given the limited information and assistance provided by the aid counselor via text message, it seems unlikely that the intervention resulted in more *informed* borrowing decisions. The message content contained no concrete information on how one should weigh the costs and benefits of borrowing or investing in a course of study.[29] Furthermore, the worsening course performance and higher loan default rates suggest that these choices were likely not optimal, even if they were more actively chosen than in the control group. One possibility here is that loan amounts were more actively chosen, but that treatment group students were unaware of the potential impact of reduced resources on school performance or overconfident in their ability to juggle work and school.

Even with full awareness, it is likely that community college students find the optimal borrowing problem a very difficult one to solve. This is supported by students' use of cognitive

[29] While one of the messages was intended to increase the salience of future costs (and thus address concerns that present-biased individuals might be overborrowing), to gain information it required students to click through and interact with a fairly complicated loan calculator set up by the Department of Education. The financial aid counselor did not receive a single text about this tool, suggesting it was likely not used by students.

shortcuts, such as borrowing the maximum, to circumvent a very complicated problem. Another shortcut is to stick with the default, which in this case is accepting any current financial aid they have been offered and paying any remaining costs out of pocket, rather than pursue additional funding through federal student loans. Indeed, as a result of the intervention we observe more students opting to not borrow, particularly in terms of unsubsidized loans. This may be a result of cognitive overload as students forego borrowing in the face of a perceived increase in the complexity of the borrowing decision.[30] Financial scarcity may further hinder the decision-making process, increasing the reliance on heuristics to guide borrowing. Indeed, we find larger negative effects on borrowing (and borrowing less than the maximum) for individuals with fewer resources (Appendix Table A3).[31] We present this result as suggestive given our lack of statistical power. We might also expect that individuals with lower academic performance might be more reliant on heuristics. In Appendix Table A3 we compare individuals with low-GPAs (<2.0) with those with higher GPAs (≥2.0). While we are underpowered to draw strong conclusions, the estimated reduction in borrowing is larger for those with lower GPAs (but the reductions are not statistically different). In contrast, there is mixed evidence that low-GPA students are more likely to shift from the max or shift to the $3,000-$4,000. Our lack of precision limits the conclusions we can draw from this exercise.

An alternative explanation for the observed shift out of borrowing is that the intervention generated an increase in debt or loan aversion as a result of its modest emphasis on avoiding high levels of borrowing. This aversion may have been induced by the text message content or a lack

[30] This is the explanation concluded by Marx and Turner (2019), who do not observe a shift in borrowing towards their anchors when providing similar information. We note, however, that the anchor provided in the intervention conducted in Marx and Turner (2019) lacked the positive norm that we associated with the range provided in our messages. They merely provided information about the average borrowing level of prior graduates, whereas the CCBC messages indicated that students with a certain level of borrowing were generally able to pay it back.
[31] In contrast, we see no difference in the likelihood of choosing a borrowing amount in the $3,000-$4,000 range in comparing those above or below-median EFCs.

of meaningful support from the CCBC financial aid counselor. However, we are unable to provide concrete evidence as to whether our intervention increased loan aversion. Furthermore, the lack of an effect on subsidized borrowing is inconsistent with a general shift in loan aversion.[32]

We conclude that the intervention reduced borrowing mainly by nudging students away from particularly high levels of borrowing, primarily the maximum. This occurred largely by shifting students towards a new lower anchor or out of borrowing altogether.[33] The latter effect may be a result of cognitive overload or an increase in loan aversion in response to the intervention. Given this, we view the primary direct effect of the intervention as a reduction in borrowing.

Understanding effect on academic outcomes

While much of the media attention focuses on the downsides of borrowing, recent research suggests that changes in access to or packaging of loans that generates increased borrowing leads to improved outcomes, at least in regards to enrollment, credit completion, and transfer to four-year colleges (Dunlop, 2012; Marx and Turner, forthcoming; Wiederspan 2015). We find a similar positive relationship between borrowing levels and academic outcomes: the text intervention reduced borrowing among students who had applied for loans, and this borrowing reduction preceded reductions in course completion and performance. The worsened course performance

[32] Of course it is possible that subsidized loans are viewed differently because they accrue no interest while a student is in college. However, for the students in our sample the amount of accumulated interest would be small relative to the loan amount.

[33] Further supporting this point, we see no reduction in the share of individuals borrowing positive amounts under $3,000.

may have resulted from a shift in student in effort from school to work; indeed, this is consistent with the effects of constraining borrowing in a human capital model with student effort. The reduction in available time and resources may have exacerbated an environment of "scarcity" that further hampered student decision-making.

Understanding effect on loan default

There are several channels through which the near-term reductions in academic performance could potentially affect loan default rates. First, the higher withdrawal and course failure rates we observe in the semester immediately following the intervention could lead to lower rates of enrollment and degree attainment in subsequent years. Indeed, we find evidence of reduced rates of enrollment a year after the intervention and the point estimates are negative across semesters. While we don't find a significant difference in degree attainment between the treatment and control groups, our point estimate is negative (-0.9 percentage points) and meaningful in magnitude (4.3 percent).

The effects of the intervention on academic outcomes are even stronger when we restrict the sample to individuals with an above-median risk of default at baseline (Table 5).[34] Among this high-risk group, the intervention generated significant reductions in credit accumulation (0.37 fewer credits) and course performance (0.162 lower GPA), alongside large increases in course failure and withdrawal. This is despite similar patterns of semester course enrollment and GPAs at baseline.[35] While there are no significant reductions in enrollment or degree attainment, the point estimates continue to be negative and the magnitudes of the implied percentage effects on

[34] Specifically, we predict default using the baseline observables from our main specification in the control group (following a leave one out procedure to avoid bias for control group observations). We then estimate our basic specification for individuals with a predicted risk of default above the median (0.114).

[35] More generally, treatment and control students are balanced on this predicted index, with students assigned to treatment actually predicted to have a slightly lower default risk (-.0031, se .0036).

degree attainment are nearly twice as large (due primarily to lower rates of graduation in the high-risk group). Perhaps unsurprisingly, the estimated effect on default is substantially larger among this high-risk group. In contrast, we observe no effect on default or academic outcomes among students with below median default risk. Given the preponderance of negative point estimates on course performance, enrollment, and degree attainment, we believe it is likely that the intervention decreased educational attainment for the treatment group. It is likely that this in turn negatively affected students' labor market opportunities and made it harder for them to pay back their loans.

Indeed, if we examine the predictive effect of these near-term outcomes on default, we find that GPA and credits earned are both negatively associated with default, while failing a course is strongly positively associated; this is true even if we condition on eventual associate degree attainment, suggesting that the short-term academic effects of the intervention are likely at least partially responsible for the observed increase in the likelihood of default (Table A4). Those who fail a course during the semester are 7 percentage points more likely to default, which is larger in magnitude than the association between associate degree receipt and default (4.3 percentage points).

While we think that the human capital channel is the most likely explanation for the default results, another possible avenue is that the intervention resulted in more students transferring to for-profit institutions where default rates are typically higher (Dynarski, 2015). On the margin, changes in the decision to enroll in a for-profit institution could have been driven by worse academic outcomes or the impression that CCBC was less supportive of student borrowing. We do not find evidence of higher transfer rates to for-profits and can rule out effects of the size necessary to generate the default result (Appendix Table A5).

It is also possible that the student loan default we observe reflects a shifting of repayment priorities from student loans to other debts such as credit card debt, but we think this is unlikely given the relatively low levels of credit card debt held by those likely to default (Blagg 2018).[36] Also, it is unclear why a shift in the source of debt (as opposed to a reduction in available resources) would influence student course performance.

VII. Implications for Policy

The results of the experiment return us to the broader question of whether students are borrowing too much or not enough. It seems fairly clear that the reduction in borrowing induced by the intervention was not optimal. The pattern of results suggests then that, at least on average, the students affected by the intervention were not overborrowing. This is consistent with a typical human capital model with complete information, in which overborrowing is impossible from an individual perspective and underborrowing can only happen in the presence of an exogenous reduction in borrowing. Within this context, any exogenous effect on borrowing moves borrowing away from the optimum and necessarily harms individuals.

It is worth noting that the sub-optimality of exogenously altered borrowing under the standard model may not be true from a societal perspective if there are significant externalities associated with student investment decisions. While there is a tendency to focus on the positive externalities associated with education (see, Oreopolous and Salvanes (2011) for a review), recent attention has been on the potential negative externalities associated with individuals who accrued

[36] The available evidence on student loan default suggests that those likely to default are substantially less likely to have credit card debt at the point of repayment (24 versus 62 percent) and have much lower median levels conditional on borrowing ($1,500 versus $7,400), perhaps because of their lower credit scores (Blagg 2018). This suggests that those at high risk of default may be unable or unwilling to increase credit card debt substantially.

substantial debt or entered a field that resulted in weak labor market opportunities. For example, research has demonstrated that higher debt burdens reduce the likelihood that students choose lower-paying, but potentially socially beneficial, career paths such as teaching (Rothstein and Rouse 2011). Recent evidence also suggests that higher debt levels may decrease the probability of marriage and home buying (Gicheva 2011; Brown et al., 2014). To the extent that these effects are associated with spillovers to society, the depressive effects of debt may suggest that current borrowing levels are socially excessive. The role of externalities may be further influenced by income contingent repayment programs in the form of debt forgiveness, although it is not clear in what direction.[37]

Putting the CCBC results aside, there is still a more general question as to whether and how students may be borrowing sub-optimally, and how they might be helped to make better decisions. Broadly, the evidence suggests that students lack complete information and that their decisions are influenced by what seem to be theoretically trivial aspects of the borrowing process, inconsistent with a standard human capital investment model. Following the models best supported by the evidence, non-optimal borrowing then is most likely to come about as a result of (1) under or over estimates of the costs or returns of investing in human capital, (2) a lack of awareness of the availability of loans, (3) responses to behavioral factors such as default effects, anchoring, inattention, cognitive overload, or loan-aversion in the borrowing decision, (4) present-biasedness, or (5) credit constraints.

[37] Debt forgiveness generates a direct negative externality by raising the taxes of others (and potentially incentivizing poor investments via moral hazard). However, this direct effect may be outweighed by the insurance effect which potentially curbs against the worst types of outcomes experienced by those with crushing levels of debt and few job prospects. IBR programs also allow risk-averse individuals to take on investments with positive expected value that they may have otherwise foregone due to risk aversion. These investments might generate spillovers for society. Given evidence of recent increases in labor market uncertainty and the variance of returns to higher education investments, IBR programs may take on an increasingly vital role (Avery and Turner 2011).

We give limited attention to structural reasons for underborrowing such as credit constraints. While important, these constraints are discussed at length elsewhere (for example, Lochner and Monge-Naranjo 2011, 2012), and the solution to under borrowing generated by the presence of credit constraints is simple: provide students with borrowing options. Relevant to our context, credit constraints may be meaningful for the more than one million students who attend a community college that has opted out of the federal loan program entirely (Cochrane and Szabo-Kubitz 2014). Indeed, multiple studies suggest that students at colleges that lack access to these programs perform worse academically (Dunlop, 2012; Wiederspan, 2015).

As in our intervention, underborrowing may also be generated by behavioral aspects of the borrowing set up. For example, a substantial amount of sub-optimal non-borrowing is likely generated by setting the default loan level at zero. This underborrowing is compounded by a lack of awareness of the availability of loans, particularly among students at community colleges that do not offer loans in financial award letters (Marx and Turner, forthcoming). There may also be fixed hassle costs, such as submitting loan applications or students' anticipation of the time required for mandatory loan counseling, associated with borrowing that leads students to avoid borrowing smaller amounts (Marx and Turner 2018). Loan aversion or cognitive overload may also lead some students to opt out of borrowing, even if borrowing would result in better outcomes. By and large, college remains a good investment for most individuals and factors that limit borrowing may be particularly detrimental to those students with the fewest resources (Avery and Turner 2012; Lochner and Monge-Naranjo 2011). At minimum, this would suggest that students should be made aware of loans.

One interpretation of our results then is that, despite the popular belief that students are over borrowing, policy makers and educators should be encouraging students to borrow more (at least for those who are not borrowing at all). However, we caution against this interpretation. First, it is important to keep in mind that students in our sample had already made the active choice to apply for a loan, presumably because they determined they needed some financial assistance in order to successfully do their coursework. It is not clear whether the relationship between borrowing and academic performance (and relatedly, loan default) would be the same for those nudged into borrowing, although Marx and Turner (forthcoming) suggest that it may be.[38] In addition, even if we focus on our sample of loan applicants, it is not necessarily the case that encouraging increased rather than decreased borrowing would generate a symmetric effect on academic performance. Some of these individuals may already be borrowing at a nearly optimal level. While we cannot speak to whether students should be borrowing more, our results indicate that it can be detrimental to students to nudge them towards reduced borrowing.

A natural question that arises, then, is whether there are any conditions under which students should be encouraged to reduce borrowing? High default rates in recent years certainly suggest that some students are overborrowing. One legitimate concern is that students have inflated impressions of the returns to their chosen programs. To the extent that individuals have overestimated the net return to their investment, they may overborrow to finance it. However, it is not clear whether a nudge that results in reduced borrowing is optimal conditional on a particular level of investment. For example, a student may have an unrealistically high

[38] At least for those nudged to increase borrowing by a non-zero loan offer.

expectation for their post-schooling labor market opportunities from majoring in the romance languages. Without telling the student that the return to this major is less than expected, they will continue to make a non-optimal investment decision whether or not borrowing is reduced.[39] The policy concern in this case is not really one of overborrowing but rather of students overinvesting in a low-return investment.[40] The same could be said of individuals who are performing poorly in their courses and more likely to drop out of school. It is not necessarily the case that these students are over borrowing, but rather that they have overestimated their level of preparation for college conditional on the level of academic support or guidance provided in their program of choice.[41]

Of course, on the individual level, students are largely protected from these individual mistakes given currently available loan repayment options that limit downside risk (i.e., income-based repayment). That said, low returns to government-financed schooling are suboptimal from a societal perspective, since these resources could have potentially been used for a more productive purpose.

Policy makers and educators might hope to identify the types of individuals most likely to overinvest (and thus overborrow). For example, given recently released data from the Department of Education on debt and earnings, it seems clear that individuals enrolling at certain

[39] While it is indeed better for the individual to reduce borrowing under standard models of human capital investment, this is still a second-best option.
[40] As in standard models of human capital investment, this ignores the potential for non-pecuniary returns to investments. In that case, majoring in romance languages may be optimal, but the individual should take on less debt to finance it as they will have a lower lifetime PDV of income. In practice, students borrow relatively similar amounts across majors.
[41] This isn't to say that these students could not succeed in college with better preparation or support, just that they have overestimated the returns conditional those things.

for-profit institutions are susceptible to overinvesting. Similarly, the high debt to income ratios in certain fields are highly suggestive of overborrowing. While we cannot, without better information, precisely determine which groups are most likely to have incorrect estimates of the costs and returns to different programs, one potential solution is to provide everyone with better and simpler information. Indeed, the Department of Education has taken steps to make this information available, but it remains difficult to access and incomplete.[42] In addition to making this information more completely and readily available, ideally it would be personalized to an individual's academic and financial characteristics. If this information is readily available and students are helped to understand it, then students will make better investment (and thus borrowing) decisions.[43] Helping students to understand would likely require well-informed and impartial financial aid counselors who have the time to work with students individually; without this, students are likely to resort to the same cognitive shortcuts on which they currently rely. However, it is not clear that even a well-trained individual would be able to help students choose an optimal loan amount conditional on the students' academic and financial background and intended institution and program. As a complement or alternative, the Department of Education might provide students and counselors with better heuristics generated from the data.[44]

While a general set of heuristics might nudge students away from investments that do not warrant their costs, individual returns may vary substantially and be too difficult to identify in advance of enrolling. For example, most of the student loan borrowers who default on their loans

[42] For the majority of programs, the information is suppressed due to privacy considerations.
[43] One possibility is to include this information in a student's financial aid award letter or the online loan borrowing portal.
[44] For example, one rule might be to advise against borrowing that would result in an expected repayment to gross income ratio that exceeded a certain level. These ratios are used in the mortgage industry.

drop out of college before completing their degree. One might suggest that students with the highest risk of dropping out be discouraged from borrowing. However, even if it were possible to identify such students prior to enrolling, the students with the highest risks also likely come from the most disadvantaged backgrounds and therefore may be even less likely to succeed without borrowing. Further, IBR programs allow these students to more comfortably invest in a program with a high expected return under a reasonably high level of uncertainty. That said, we might still discourage students from borrowing additionally if they have struggled academically in early semesters (e.g. are close to missing Satisfactory Academic Progress benchmarks).[45]

So far we have discussed potential overborrowing generated by overinvesting. Stepping beyond the human capital investment decision, there is a concern that students are overborrowing conditional on program choice. Under a behavioral model of present-biased individuals, it is possible for a student to overborrow even given an optimal level of investment. Once the money from loans is in hand, often reimbursed to students in a check or deposited into their bank account, it may be beyond students' self-control to avoid spending it. The overborrowing of present-biased individuals might be exacerbated by aspects of the borrowing setup (such as overborrowing as a result of anchoring or inattention), which might overcome individuals self-preserving aversion to debt.[46]

[45] Indeed, if we focus on those individuals with very low GPAs (below 2.0), we see no effects on default (Appendix Table A3). This perhaps reflects the limited productive human capital investment occurring for these types of students, although we are underpowered to draw strong conclusions here.

[46] Without present-biasedness, overborrowing in response to these aspects of the borrowing setup seems less problematic on its face. Theoretically, individuals nudged to overborrow by anchoring or inattention could save this money in the bank and pay it back upon graduating, with a relatively small amount of interest.

Present-biased individuals may then benefit from a nudge to borrow less (as in the CCBC intervention) because it would constrain them.[47] While it is beyond the scope of this paper to determine the types of individuals likely to benefit from such a constraint, a potential solution is to require individuals to choose their borrowing levels well in advance. For example, a student might be asked to commit to a borrowing schedule for the full period of enrollment prior to initial enrollment. An alternative approach might be to provide students with more comprehensive supports and assistance while in school (Evans et al. 2017; Oreopoulos and Petronijevic 2018). More comprehensive assistance from a trained individual may help students follow through on their initial plans.

In summary then, the existing evidence suggests combining data-driven assistance with initial investment *and* borrowing decisions with comprehensive assistance from individuals trained to help students follow through on their initial plans. Data-driven assistance with initial decisions will help students to identify investments with expected returns that warrant borrowing.[48] Comprehensive supports for students while in school will help students follow through on their initial investment and borrowing plans.

VII. Conclusion

While much of the media attention focuses on the downsides of borrowing, our results are more consistent with recent evidence that suggests borrowing leads to improved outcomes, at least

[47] This is similar to the way that Cadena and Keys (2013) suggest students constrain themselves by foregoing subsidized loans altogether. Reductions in this type of overborrowing in the experiment are inconsistent with the observed effects on credit accumulation and default.

[48] Of course, some students are enrolling for reasons other than financial gain. These individuals should at least be made aware when they are considering investment and borrowing combinations unlikely to result in a manageable repayment to income ratio.

in regards to enrollment, credit completion, and transfer (Marx and Turner, forthcoming). In our intervention, those who borrowed less did worse academically. We also show that reduced borrowing counter-intuitively leads to higher rates of default within three years of the intervention, likely as a result of reducing students' human capital accumulation.

Our results are particularly relevant in the context of growing media and policy rhetoric about a student debt and default crisis, and descriptive research suggesting that higher borrowing levels are correlated with worse economic outcomes. In light of a growing number of institutions proactively sending students information about cumulative debt levels, an increasingly important question is whether rhetoric about the debt crisis will translate into explicit direction to students to reduce their borrowing levels. It is not clear, based on the evidence from our paper as well as results from other studies (Dunlop, 2012; Marx and Turner, forthcoming; Wiederspan, 2015) that encouraging students to borrow less would actually improve their academic outcomes. Further, and perhaps counterintuitively, our findings suggest that encouraging students to borrow less (when they likely do not have access to other financial resources) may actually make the default problem worse and negatively affect students' financial well-being.

This is not to suggest that there is not a default problem. Our findings and other recent work suggest a more nuanced answer to the question of whether students are borrowing too much. Many students are investing in human capital that likely does not generate the return that they anticipate. Others may be overborrowing due to present-biasedness, although restricting borrowing for these individuals likely won't help with refocusing attention on their investments. Rather, we suggest that more comprehensive supports for students while in school (Evans et al. 2017; Oreopoulos and Petronijevic 2018) and more comprehensive assistance with initial investment *and*

borrowing decisions will result in better investment choices and better success in obtaining the highest possible return on these investments.

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Table 1: Baseline Equivalence

	Control	Treatment	Difference	T-statistic	
Black	54.6%	53.7%	0.9 pp	0.282	
White	31.2%	30.0%	1.2 pp	0.423	
Hispanic	11.7%	11.1%	0.6 pp	0.303	
Other Race	3.1%	5.0%	-1.9 pp	-1.569	
Missing Race	63.4%	63.9%	-0.5 pp	-0.271	
Female	66.2%	64.8%	1.4 pp	0.762	
Age	30.3	29.8	-0.5	1.144	
Dependent	33.3%	34.4%	-1.1 pp	0.652	
First Generation	51.6%	52.6%	-1 pp	-0.508	
New Student	**27.0%**	**31.2%**	**-4.2 pp**	**-2.447**	**
Returning Student	54.2%	51.8%	2.4 pp	1.332	
Transfer Student	18.7%	17.0%	1.7 pp	1.165	
Previous credits earned	24.8	24.2	-0.6	0.687	
Term Hours	8.8	9	0.2	1.239	
Prior GPA	2.66	2.65	-0.01	0.214	
EFC	**$6,153**	**$5,357**	**-796**	**1.823**	*
Parents' AGI	$75,145	$72,782	-2363	0.811	
Student's AGI	$27,581	$27,520	-61	0.056	
Previous student loan debt	$11,655	$10,741	914	1.626	
Any previous loan debt	67.6%	65.4%	2.2 pp	1.250	
N	1427	1449			

Notes: based on a sample of 2,876 students who applied for Title IV loans at CCBC between December 2014 and December 2015, and consented to receive text messages. Significance levels indicated by: * (p<0.1), ** (p<0.05), *** (p<0.01)

Table 2: Treatment effects on borrowing and course outcomes

Panel A: Student Borrowing (NSLDS)

	Control Mean	(1)	(2)	(3)	(4)	(5)
Any Subsidized Loans	74.7%	0.00631	0.00929	0.000184	-0.000967	-0.00149
		(0.0160)	(0.0159)	(0.0145)	(0.0145)	(0.0144)
Any Unsubsidized Loans	68.2%	-0.0385**	-0.0365**	-0.0311*	-0.0291*	-0.0275
		(0.0173)	(0.0172)	(0.0171)	(0.0169)	(0.0169)
Any Loans	87.5%	-0.0142	-0.0134	-0.0114	-0.0115	-0.0119
		(0.0124)	(0.0124)	(0.0124)	(0.0124)	(0.0124)
Subsidized Stafford Loans ($)	$2,222	-38.29	-27.93	-54.71	-60.00	-63.37
		(60.05)	(59.36)	(55.25)	(54.93)	(54.73)
Unsubsidized Stafford Loans ($)	$2,792	-261.1***	-240.2***	-208.3**	-199.4**	-194.4**
		(93.52)	(91.14)	(89.36)	(88.73)	(88.84)
Total Loans ($)	$5,031	-267.1**	-233.4*	-228.7*	-224.6*	-222.3*
		(125.5)	(121.7)	(120.0)	(119.8)	(119.8)

Panel B: Course Outcomes During Intervention Semester

		(1)	(2)	(3)	(4)	(5)
Enrolled (NSC)	94.9%	-0.0107	-0.0109	-0.0108	-0.0110	-0.0111
		(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Enrolled in CCBC (NSC)	94.8%	-0.0126	-0.0128	-0.0128	-0.0130	-0.0131
		(0.00870)	(0.00869)	(0.00868)	(0.00869)	(0.00871)
Enrolled in Courses (CCBC)	92.4%	-0.0131	-0.0127	-0.0134	-0.0141	-0.0148
		(0.0102)	(0.0102)	(0.0101)	(0.0101)	(0.0101)
Credits Earned	6.2	-0.190	-0.219	-0.189	-0.202	-0.225
		(0.171)	(0.168)	(0.167)	(0.167)	(0.161)
Earned Any Credits	78.1%	-0.0413***	-0.0418***	-0.0385**	-0.0393**	-0.0418***
		(0.0158)	(0.0158)	(0.0157)	(0.0157)	(0.0154)
Failed Any Classes	29.5%	0.0368**	0.0359**	0.0295*	0.0288*	0.0302*
		(0.0171)	(0.0171)	(0.0170)	(0.0170)	(0.0166)
GPA*	2.06	-0.0863*	-0.0840*	-0.0634	-0.0644	-0.0640
		(0.0504)	(0.0500)	(0.0497)	(0.0497)	(0.0474)
Wave Fixed Effects		X	X	X	X	X
Gender, Race, Age			X	X	X	X
EFC, Dependency Status				X	X	X
Baseline Loan Debt					X	X
Student Type (New, Returning, Transfer)					X	X
Baseline credits earned and GPA						X

Notes: based on sample of 2,876 students who applied for Title IV loans at CCBC between December 2014 and December 2015, and consented to receive text messages. All outcomes variables refer to semester of the intervention (for NSLDS outcomes, this includes loans where the academic period overlapped with the semester of the intervention. *The sample size for estimating the treatment effects on GPA is 2,639, as GPAs cannot be calculated for students who did not enroll. The full sample is used for all other outcomes.

Table 3: Treatment effects on educational attainment and default

	Enrolled (t+1) (1)	Enrolled (t+2) (2)	Enrolled (t+3) (3)	Any Degree (4)	Associate Degree (5)	Any Default (6)
Treatment	-0.00994	-0.0361**	-0.00283	-0.0075	-0.0087	0.0246**
	(0.0158)	(0.0180)	(0.0184)	(0.0127)	(0.0126)	(0.0125)
Control Mean	75.9%	61.6%	49.7%	20.4%	20.0%	13.4%

Notes: based on sample of 2,876 students who applied for Title IV loans at CCBC between December 2014 and December 2015, and consented to receive text messages. Degree outcomes from the NSC are as of January 2018. Default outcomes from the NSLDS are as of June 20, 2018.

Table 4: Understanding Effects on Borrowing Behavior

	Max Loans (1)	3-4K Loans (2)	3-4K Unsub Loans (3)
Treatment	-0.0284**	0.0170	0.0316**
	(0.0142)	(0.0126)	(0.0124)
Control Mean	19.9%	12.4%	11.3%

Notes: based on sample of 2,876 students who applied for Title IV loans at CCBC between December 2014 and December 2015, and consented to receive text messages.

Table 5: Treatment effects by Predicted Default Risk

Panel A: Short-term

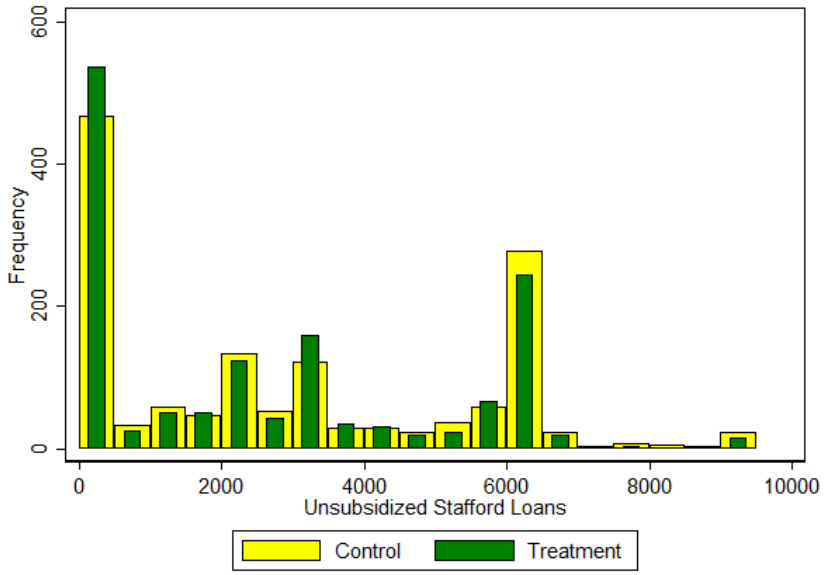
	Total Loans (1)	Enrolled (2)	Credits Earned (2)	Earned Any Credits (1)	Failed Any Classes	GPA*
High Risk	-211.2	-0.00408	-0.367*	-0.0571**	0.0644***	-0.162**
	(179.3)	(0.0148)	(0.218)	(0.0236)	(0.0247)	(0.0711)
Low Risk	-250.6	-0.0240*	-0.103	-0.0253	0.001	0.0249
	(161.5)	(0.0137)	(0.239)	(0.0200)	(0.0224)	(0.0631)
p-value (High versus Low):	0.858	0.504	0.113	0.004	0.035	0.032
Control Mean High Risk	5339	91.4%	5.2	73.2%	32.2%	1.88
Control Mean Low Risk	4715	93.5%	7.2	82.9%	26.7%	2.21

Panel B: Long-term

	Enrolled (t+1) (2)	Enrolled (t+2) (2)	Enrolled (t+3) (3)	Any Degree (4)	Associate Degree (5)	Any Default (6)
High Risk	-0.0129	-0.0358	-0.0001	-0.0097	-0.0086	0.0470**
	(0.0225)	(0.0254)	(0.0255)	(0.0148)	(0.0145)	(0.0211)
Low Risk	-0.00846	-0.0409	-0.0178	-0.00568	-0.0102	0.0089
	(0.0221)	(0.0258)	(0.0268)	(0.0210)	(0.0209)	(0.0131)
p-value (High versus Low):	0.860	0.883	0.635	0.862	0.939	0.036
Control Mean High Risk	73.5%	58.2%	45.6%	12.3%	11.9%	20.0%
Control Mean Low Risk	78.6%	65.5%	54.4%	29.7%	29.3%	6.5%

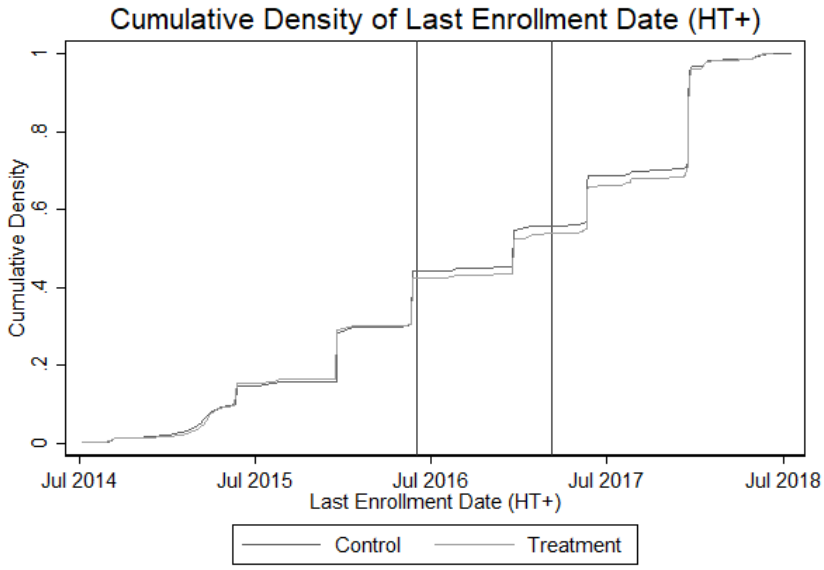
Notes: based on sample of 2,876 students who applied for Title IV loans at CCBC between December 2014 and December 2015 and consented to receive text messages. We predict default using the baseline observables from our main specification in the control group (following a leave one out procedure to avoid bias for control group observations). We then estimate our basic specification for individuals with a predicted risk of default above and below the median (0.114) separately; each cell represents a separate regression. Treatment and control students are balanced on this predicted index, with students assigned to treatment actually predicted to have a slightly lower default risk (-.0031, se .0036). Degree outcomes from the NSC are as of January 2018. Default outcomes from the NSLDS are as of June 20, 2018.

Figure 1: Histogram of Unsubsidized Loan Borrowing, by Experimental Status



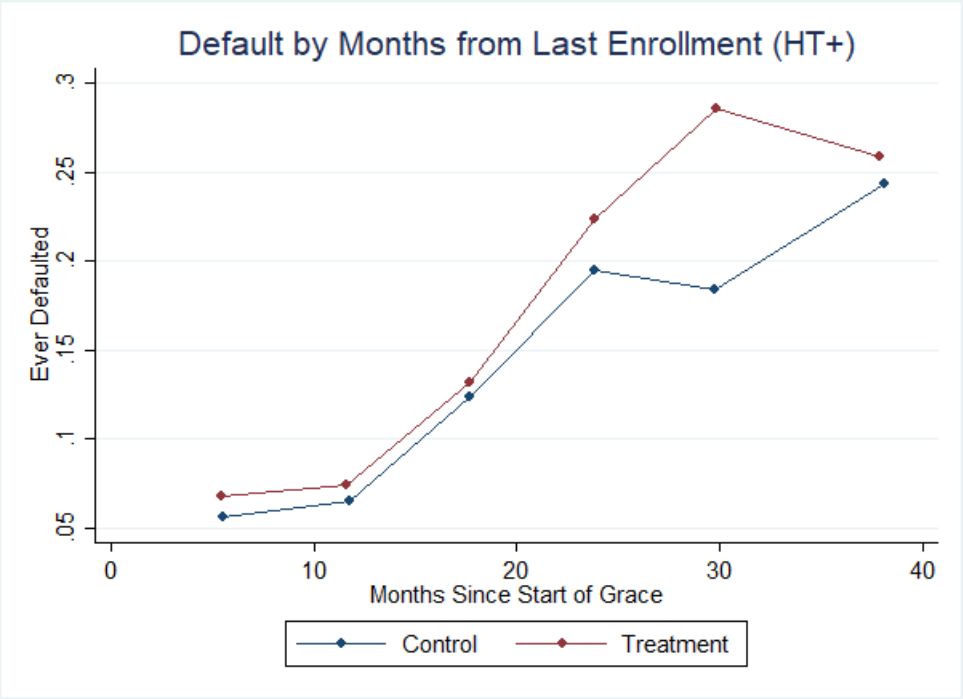
Note: Based on sample of 2,876 students who applied for Title IV loans at CCBC between December 2014 and December 2015, and consented to receive text messages. This includes loans where the academic period overlapped with the semester of the intervention.

Figure 2: Distribution of Estimated Start of Grace Period, by Experimental Status



Note: Based on sample of 2,876 students who applied for Title IV loans at CCBC between December 2014 and December 2015, and consented to receive text messages. Last enrollment date (HT+) indicates the end date of the last period of half-time or more enrollment in the NSC data.

Figure 3: Default Rate Patterns, by Experimental Status



Note: Based on sample of 2,876 students who applied for Title IV loans at CCBC between December 2014 and December 2015, and consented to receive text messages. "Months Since Start of Grace" is calculated as the number of months between the last period of half-time or more enrollment in the NSC data and June 20, 2018 (the date at which default status is observed). Each dot is generated from a separate subsample, which explains why the share having defaulted goes down slightly between 23 and 30 months since start of grace.

Table A1: Treatment effects on Half-time or More (HT+) Enrollment

	Enrolled HT+ (t+1) (1)	Enrolled HT+ (t+2) (2)	Enrolled HT+ (t+3) (3)
Treatment	-0.0074	0.000310	0.0194
	(0.0184)	(0.0180)	(0.0172)
Control Mean	50.1%	37.1%	30.2%

Notes: based on sample of 2,876 students who applied for Title IV loans at CCBC between December 2014 and December 2015, and consented to receive text messages. Enrollment outcomes are from the NSC.

Table A2: Treatment effects on Gaps in HT or More Enrollment

	6 Month Gap	6 Month Gap (After)	12 Month Gap	12 Month Gap (After)	18 Month Gap	18 Month Gap (After)
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	0.008	-0.003	0.007	0.004	0.007	0.005
	(0.009)	(0.011)	(0.013)	(0.016)	(0.014)	(0.017)
Control Mean	93.4%	89.8%	85.4%	73.6%	82.9%	68.6%

Notes: based on sample of 2,876 students who applied for Title IV loans at CCBC between December 2014 and December 2015, and consented to receive text messages. Enrollment andd degree outcomes from the NSC are as of January 2018. Default outcomes from the NSLDS are as of June 20, 2018.

Table A3: Treatment effects by Subgroup

	Total Loans (1)	Unsub Loans (2)	Max Loans (3)	3-4K Loans (4)	3-4K Usb Lns (5)	Any Degree (6)	Any Default (7)
Panel A: Financial Resources							
Below Median EFC	-300.3	-302.0**	-0.0622***	-0.000693	0.0302	-0.0177	0.0372*
	(184)	(122.0)	(0.0213)	(0.0177)	(0.0186)	(0.0174)	(0.0204)
Above Median EFC	-180.4	-114.7	0.00902	0.0286	0.0382**	-0.000632	0.0120
	(155.8)	(130.6)	(0.0164)	(0.0182)	(0.0162)	(0.0189)	(0.0149)
p-value (High versus Low):	0.662	0.341	0.023	0.189	0.76	0.772	0.23
Control Mean Below	5351	2776	27.4%	12.7%	13.8%	19.0%	17.8%
Control Mean Above	4716	2809	12.5%	12.1%	8.8%	21.8%	9.1%
Panel B: Academic Progress							
Below 2.0 GPA	-326.6	-425.5*	0.00972	0.122***	0.0226	0.000744	-0.00637
	(348.0)	(252.4)	(0.0403)	(0.0369)	(0.0486)	(0.0225)	(0.0473)
Above 2.0 GPA	-250.1*	-186.4*	-0.0315**	0.00374	0.0326***	-0.00746	0.0287**
	(128.1)	(96.02)	(0.0143)	(0.0135)	(0.0126)	(0.0140)	(0.0129)
p-value (High versus Low):	0.772	0.269	0.221	0.001	0.857	0.772	0.537
Control Mean Low GPA	4400	2570	14.3%	6.8%	20.5%	3.1%	24.8%
Control Mean High GPA	5112	2821	20.6%	13.1%	10.1%	22.6%	11.9%

Notes: based on sample of 2,876 students who applied for Title IV loans at CCBC between December 2014 and December 2015 and consented to receive text messages. Degree outcomes from the NSC are as of January 2018. Default outcomes from the NSLDS are as of June 20, 2018.

Table A4: Factors Correlated with Loan Default

	Any Default (1)
Baseline GPA	-0.0278***
	(0.0088)
Credits Earned	-0.0078***
	(0.0023)
Earned Any Credits	-0.0323
	(0.0226)
Failed Any Classes	0.0707***
	(0.0155)
Associate Degree	-0.0430**
	(0.0181)
Control Mean	13.4%

Notes: based on sample of 2,876 students who applied for Title IV loans at CCBC between December 2014 and December 2015, and consented to receive text messages. Degree outcomes from the NSC are as of January 2018. Default outcomes from the NSLDS are as of June 20, 2018.

Table A5: Treatment effects on subsequent for-profit enrollment

	All	Fall
	(1)	(1)
Treatment	0.000	0.001
	(0.006)	(0.006)
Control Mean	2.4%	2.4%

Notes: based on sample of 2,876 students who applied for Title IV loans at CCBC between December 2014 and December 2015, and consented to receive text messages. Enrollment andd degree outcomes from the NSC are as of January 2018. Default outcomes from the NSLDS are as of June 20, 2018.

Appendix B: Text Messages

Fields in green would be customized to the student.

1. Purpose: Introductory Message
Part 1: Hi [student name], this is [fin aid counselor] from CCBC. We know loans can be confusing so we're here to help you decide the loan amount that is right for you!
Part 2: You can text me back at this # & I'll write back as soon as I can. Want to confirm this is from CCBC? Stop by the aid office or call us XXX-XXX-XXXX

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2. Purpose: Inform students that they choose how much to borrow
Did u know that how much to borrow is YOUR choice? Accepting the maximum loan may not be right for everyone. Want to chat about the loan amount best for you?

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3. Purpose: Inform students about what their monthly payments will be
Part 1: [Student name], your loan payments can be $100s higher or lower each month depending on how much you borrow and which repayment plan you choose.
Part 2: Visit
https://studentloans.gov/myDirectLoan/mobile/repayment/repaymentEstimator.action
to see examples of payment amounts. Text me back to discuss how your borrowing choices will affect the payments you owe.

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4. Purpose: Set a positive norm for keeping borrowing around a certain amount
Part 1: Hi [Student name]. Did u know that most CCBC students who keep annual borrowing between $3000-$4000 are able to pay back their loans?
Part 2: Paying back loans keeps future choices open, like getting financial aid again or qualifying for auto loans or credit cards. Text me if u want to discuss

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5. Purpose: Encourage students to complete loan entrance counseling
[Student name], have you completed loan counseling @ www.studentloans.gov? This step is required for CCBC to process your loans & pay your bill.

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6. Purpose: Inform students about lifetime limits on how much they borrow
Part 1: Do you plan to transfer? There are government limits on borrowing for college over ur lifetime. Taking the max. loan now may not leave you enough down the road
Part 2: Text me to discuss how what you borrow now can impact your future college plans.

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7. Purpose: Message for students who have requested private loans
Hi [Student name], did you know that private loans can have higher interest rates & less flexible repayment plans than government loans? Text back if you'd like to discuss your options.

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8. Purpose: Encourage students to complete promissory notes

[Student name], have you completed your promissory note @ www.studentloans.gov? This step is required to disburse your loans & credit to your CCBC bill.