Can Self-Control Explain Avoiding Free Money?

Evidence from Interest-Free Student Loans *

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Abstract

This paper uses insights from behavioral economics to explain a particularly surprising borrowing phenomenon: One in six undergraduate students offered interest-free loans turn them down. Models of impulse control predict that students may optimally reject subsidized loans to avoid excessive consumption during school. Using the National Postsecondary Student Aid Study (NPSAS), we investigate students' take-up decisions and identify a group of students for whom the loans create an especially tempting liquidity increase. Students who would receive the loan in cash are significantly more likely to turn it down, suggesting that consumers choose to limit their liquidity in economically meaningful situations.

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> "Although it may be tempting to use student loan money for college football tickets, midnight pizza while cramming for finals, or a Florida spring break trip, try to resist this lure....If you receive a larger loan than you need, the temptation to spend the extra money on "fun" things can be hard or even impossible to resist."

-Dara Duguay, "Spend Student Loans Only on College Expenses" youngmoney.com (a money management website for young adults), 2004

1   Introduction

This paper uses insights from behavioral economics to explain a particularly bizarre borrowing phenomenon: One in six undergraduate students offered interest-free loans turn them down. The students making these choices are not atypical: Our sample consists of full-time students at public or private non-profit four-year institutions. On filling out the application required for all forms of need-based aid, these students demonstrated sufficient financial need to qualify for interest-free loans sponsored by the federal government.

There are three main reasons we should be surprised that one-sixth of eligible students turn down subsidized loans. First, these loans do not accrue interest until six months after students leave school. The uncollected interest payments represent a direct transfer to the student, and the amount is non-trivial. If a student eligible for the annual maximum chose to accept the loan each year, with an interest rate of four percent, the government subsidy would be worth more than $1,500. The "free money" of below-market interest rates on student loans has long been a part of conventional economic wisdom.[1] We are unaware, however, of any work that has tried to systematically understand why students do not take

advantage of this potential "gift" from the government.[2]

Second, government-sponsored loans make increasingly expensive educational costs more affordable. During a period when the return to higher education has dramatically increased, the rising costs of an undergraduate education have far outpaced the increase in the availability of grants and scholarships (Hoxby and Long 1999, Dynarski 2002, Avery and Hoxby 2003). Without these programs, students would find it costly to borrow against their future earnings due to informational asymmetries between students and private lenders. The federal government, recognizing this potential market failure, offers students grants and loans through large-scale programs that provided 90 billion dollars in total aid during the 2004-2005 school year (The College Board 2005).[3] By rejecting their government-sponsored loans, students are effectively choosing to borrow at a significantly higher cost, if at all.

Third, student aid offers presume that eligible students will accept all of their need-based aid: If a student has borrowed before, she needs to do nothing to receive the full amount of any subsidized loan awarded by her financial aid office. First-time borrowers simply need to accept the terms and conditions of the loan, as there is no separate application process. As other research has shown, there is a significant mental barrier to making decisions that deviate from the default (e.g. Choi et al. 2004). In the absence of competing forces, therefore, students should rarely deviate from the default of accepting all of the need-based aid they are offered, including interest-free loans.

Although the benefits of subsidized student loans are seemingly unambiguous, borrowing does increase a student's short-term liquidity. As the quotation at the beginning of this section suggests, interest-free loans are a double-edged sword in the hands of an easily tempted consumer. Despite the fact that these loans make it possible to smooth consumption over time, providing access to additional funds can lead to overspending, i.e. consuming more during school than an agent with perfect willpower would desire.

We formalize this argument by modeling a college student choosing how much to borrow

while in school. We show that a rational agent would not turn down interest-free student loans because doing so requires forgoing a significant government subsidy in addition to limiting liquidity while in school. We then discuss how rejecting the loan is consistent with models of self-control from the theoretical literature that allow rational consumers to prefer a subset of choices to the complete set. The debt-averse behavior we observe, therefore, may be the optimal choice for a forward-thinking student who knows that she will be tempted to overspend.

There are, however, alternative reasons why a potential borrower could make the "wrong" decision. Certainly some students will reject the loan because they do not understand how the subsidy works or do not analyze the decision closely enough.[4] Apart from these information problems, some students may reject their loans because of the hassle borrowing creates, such as having to keep track of the documents associated with a loan or being required to make a payment each month after graduation.[5] Still others may reject the loan because they have acquired an anti-debt ethic such that indebtedness carries a psychological cost.[6] Because any of these factors can potentially explain the significant fraction of students who turn down their interest-free loans, we cannot simply interpret high rejection rates as evidence of a self-control motive.

Instead, we exploit a feature of the financial aid disbursement process that determines the degree of temptation embodied in each student's loan offer. Although the value of the subsidy is equal, needy on-campus students have their loans automatically applied to their educational expenses, while similar off-campus students receive a portion of their aid in cash. A temporarily large cash account creates a daily temptation to overspend through the semester. In section 3, we discuss multiple economic models of impulse control suggesting that the cash disbursement will create a larger temptation to overspend. If self-control concerns are an important factor in the take-up decision, we should find lower take-up rates for students living off-campus.

However, if students who reject their loans for other reasons are disproportionately likely to live in off-campus housing, this comparison may incorrectly attribute differences in take-up rates to differences in how the loans are distributed. To address these omitted variables concerns, we form a difference-in-differences estimator, using differences in take-up among students whose disbursement method is unaffected by their housing location as a counterfactual measure of the on-/off-campus difference. For students in the comparison group, any loan funds are applied directly to their tuition bill regardless of where they live. Importantly, each member of the counterfactual group is also eligible for the maximum subsidized loan. If some students reject their loans to avoid the temptation to overspend using borrowed money, the difference between on- and off-campus rejection rates should be much larger for the group who potentially receive their loans in cash.

Our estimates from the 1999-2000 and 2003-2004 waves of the National Postsecondary Student Aid Study support a self-control explanation: Students who would have received cash from their loans turn down the subsidized loan seven percentage points more frequently than do similarly needy students who live on-campus. Importantly, there is no significant difference in rejection rates across housing locations for students who would not receive cash regardless of where they live. These difference-in-differences results suggest that students are rejecting the loans, in part, to avoid the temptation to overspend out of borrowed money.

Only a framework that accounts for both problems with impulse control and treating financial resources as non-fungible (e.g. mental accounting) can predict the existence of an even smaller take-up rate when the loans are distributed in cash.[7] We conclude, therefore, that self-control concerns comprise an important consideration in the borrowing decision, while leaving open the possibility that any or all of the additional explanations affect the overall level of participation in the subsidized loan program.

These results have important implications for the behavioral economics literature by providing evidence that consumers choose to limit their available choices in a natural setting,

i.e. one not generated by the researcher. While several laboratory and simulation studies have presented evidence consistent with consumers exercising self-control (Wertenbroch, Soman, and Nunes 2001, Ariely and Wertenbroch 2002, Laibson, Repetto and Tobacman 2003, Fernandez-Villaverde and Mukherji 2006), studies using data and situations not generated by the researcher have tended to find evidence of consumers succumbing to the temptation of immediate gratification (Stephens 2003, Huffman and Barenstein 2005, Shapiro 2005, DellaVigna and Malmendier 2006). In addition, while most field experiments are explicitly designed to hold constant any differences between two choices except for the level of commitment, our results reveal that some consumers are willing to forego a substantial amount of money in order restrict their future decisions.[8]

In the next section, we discuss the mechanics of financial aid and emphasize the case when impatient individuals might be most wary of taking out loans. We present a brief model of the financial aid process in Section 3 and show how rejecting an interest-free loan, while costly, can effectively serve as a mechanism to regulate impulsive consumption. In Section 4, we establish the phenomenon empirically and test the additional predictions suggested by the model. Section 5 concludes.

2   Overview of the Financial Aid Process

This section presents a sketch of the mechanics of financial aid eligibility and receipt.[9] There are two primary components that determine a student's eligibility for federal financial aid: a measure of the student's ability to pay, and the costs of attending school. A student interested in need-based financial aid (including federal, state, and institutional grants and scholarships) must first file a Free Application for Federal Student Aid (FAFSA), which collects information on the student and her parents, including the value of their assets and incomes from the previous year. These data are entered into a federal formula that calculates

the Expected Family Contribution (EFC), the dollar amount a family could reasonably be expected to pay for the student's educational costs in the upcoming school year.

A student's need level is then defined as the difference between her expected educational expenses and her EFC. Students with positive levels of need will, in general, qualify for some form of need-based aid. The definition of educational expenses is quite broad and includes tuition and fees, room and board, books and supplies, and transportation.[10] Based on this level of need, the student may be eligible for grant money from the federal or state government or from the student's institution. The student may also receive merit-based institutional aid or private scholarships.

If these forms of aid do not cover the student's entire need, she will be eligible for subsidized Stafford loans.[11] The federal government pays the interest on these loans as long as the student is enrolled at least half-time, and for a period of six months after the student is no longer enrolled. Students can borrow through this program up to a grade-level specific cap: in 2004, $2,625 for first-year students, $3,500 for second-year students and $5,500 for upper-year students. A student is thus eligible for the maximum loan amount when the difference between her total costs and the sum of the EFC and other grants is greater than the loan limit for her grade level.

After filing a FAFSA, the student receives an award letter from her university containing an itemized list of the amount and types of aid awarded. Although students maintain the right to reject individual types of aid and even to change individual amounts if they desire, the default choice is to accept the amount of the interest-free loan awarded by the financial aid office.[12] Thus, students who choose not to borrow do so despite clear information that they have qualified for a loan that their financial aid office expects them to accept.

We empirically assess the importance of self-control concerns in the borrowing decision by taking advantage of a unique feature of the loan disbursement process. Financial aid funds must first be applied to expenses billed directly by the school, including tuition, fees, and

room and board. Any aid funding in excess of the school's direct charges is then distributed to the student through a refund check. Because aid eligibility is determined based on the entire student budget and not just tuition, these refund checks are not uncommon, especially for students who do not live in university housing.[13]

Figure 1 presents the combination of financial and housing circumstances that result in a refund check. Students whose total aid awards exceed the cost of tuition and fees will have some aid funding applied to room and board expenses. All else equal, students who attend schools with lower tuition or who receive larger grant awards are more likely to fall into this category. Even though the financial benefits of the loan are the same, some students face a large cash payment while other similarly needy students do not. On-campus students never experience an increase in available funds because the borrowed money is automatically applied to the current semester's room and board, which is due at the same time as the loan is disbursed. Those who live off-campus, in contrast, will receive a large refund check, as much as an entire semesters worth of expenses. This cash payment, combined with the pay-as-you-go nature of off-campus room and board expenses, leads to a substantial increase in easily spent resources for off-campus students.[14]

3   A Self-Control Motive?

With these institutional details in mind, we explore a stylized version of the decision facing an enrolled student who is offered a subsidized Stafford loan. We begin by demonstrating that rejecting the loan cannot be the optimal decision for a student with stable preferences and no impulse control problem. We then discuss models from the literature under which rejecting a Stafford loan, and thus foregoing the government subsidy, can be utility improving if doing so serves as a commitment against future over-consumption. We pay particular attention to models under which the loan funds create differential levels of temptation depending on

the type of asset to which they are applied, as these models provide additional testable implications.

Consider a student's intra-personal borrowing and consumption decision taking place over three periods: prior to attendance, during school, and post-graduation. In the initial period, the "Borrower" is offered a subsidized loan in the amount of $\bar{S}$. She decides whether to accept or reject the loan, and once she has chosen, no future actor can alter this decision.[15]

In the next period, during school, the "Student" takes her previous loan-taking decisions as given, receives financial aid and other exogenous income (e.g. parental support), and pays tuition. We denote income available after paying tuition as I_2. The student then decides how much to consume while in school, c_2, and how much to save until the final period. Savings earn a (nominal) interest rate of r per period. We assume that, other than her access to student loans, the student cannot access alternative credit markets.[16] In the final period, post-graduation, the "Graduate" receives income I_3, repays the principal on any loan she has accepted (the government pays the interest), and consumes the remainder of her income.

The decision whether to borrow is equivalent to a choice between two in-school budget sets, shown in Figure 2. If the Borrower chooses to reject the loan, the Student will be faced with the budget set AB. Choosing to borrow provides the Student with budget set CD. Notice that borrowing has two effects on the choice set available to the Student. First, the loan relaxes the Student's credit constraint, allowing her to consume more than I_2 while in school by borrowing against future income, I_3. Second, the government pays the interest that would normally accrue on the loan, $r\bar{S}$. This increase in lifetime income results in a vertical shift upward in the budget set. Proving that a rational student who is not subject to problems of temptation and self-control should strictly prefer to accept the loan requires nothing more than an assumption of locally non-satiated preferences, as the choice set available without borrowing is a proper subset of the choice set induced by accepting the loan.

If, instead, the agent has a self-control problem, she may choose to reject the loan in order to alter her own future consumption. The Borrower can determine through backward induction how much the Student will spend with and without access to the loan funds, hence she chooses between two levels of in-school consumption (or, equivalently, two levels of assets at graduation). Of course, accepting the loan is always optimal if the Borrower's desired consumption level while in school requires spending the entire amount of the loan. The potential conflict between the preferences of the Borrower and the Student only exists, therefore, for people who would prefer to leave school with a level of assets greater than $-\bar{S}$. One can think of these individuals as either having assets to spend down or having access to other in-school resources (earned income, parental support) to provide enough money for basic needs.

Self-control concerns thus provide a natural explanation for the high levels of rejection we find in the data. To further investigate the importance of the self-control motive, we use naturally occurring variation in the degree to which the borrowed funds create a temptation to over-consume. As discussed in the previous section, students who live off-campus and whose loan funds will pay (at least in part) for room and board will receive a loan disbursement in cash. In the next subsection, we discuss multiple economic models of temptation and self-control, each of which implies that receiving the loan as cash will amplify the temptation to overspend the borrowed money. Students facing a cash disbursement should therefore be less likely to accept the loan, a hypothesis we test in Section 4.

3.1   The Increased Temptation of a Refund Check

Dating back to the pioneering work of Strotz (1955), consumer choice theory has developed models that allow restrictions of future choices to improve lifetime utility.[17] In addition, many modern models of impulse control suggest that a refund check will create a greater temptation than will funds of a similar size applied to a student's university account. In order

to generate this result, a model must allow some degree of non-fungibility across different assets.[18] Each of the models we discuss shares this key feature, although the mechanism by which the cash disbursement increases the temptation to over-consume differs somewhat.[19]

In the mental accounting framework (Thaler 1985), consumers allow themselves different marginal propensities to consume (MPC) out of different forms of wealth as a means of controlling impulsive spending. This framework provides a plausible explanation for the "excess sensitivity" of consumption to current income. As an implication of this model, an increase in assets applied to the "cash" account will be spent almost entirely, while a similarly-sized increase in a less liquid account will lead to a smaller increase in consumption. Thus, consumers' spending behavior responds as if these forms of wealth are not fungible.

A particularly relevant analogue to our context is Thaler's (1990) discussion of the contrast between short-run consumption responses to stock market gains depending on whether funds are sent directly to the investor. Investors receiving their gains as a cash payment spend roughly 59 percent of the increase in wealth (Hatsopoulos, Krugman and Poterba 1989), while the consumption of investors whose gains are applied to their investment account is roughly unchanged (Summers and Carroll 1987). Similarly, we expect that students receiving loan funds directly will tend to increase their spending by more than will students whose loan funds are applied to their university account. Therefore, rejecting the loan becomes a more attractive commitment device when that loan must be received in easy-to-spend cash.

The "dual-self" model of impulse control (Fudenberg and Levine 2006) provides a micro-foundation for behavior consistent with mental accounting.[20] In the dual-self model, the long-run, planning-focused self plays a game with a series of short-run, consuming selves. Because these short-run selves live for only one period, they are infinitely myopic. The long-run self therefore displays some preference for commitment and will take advantage of opportunities to influence the short-run selves' actions. First, at some utility cost, the long-run self can exercise self-control and alter the preferences of the short-run selves. Alternatively, the long-

run self can engage in actions that limit the resources available to the short-run selves for immediate consumption purposes.

As a central example of this type of behavior, Fudenberg and Levine (2006) discuss a system of accounting where the short-run selves are given access to only the most liquid form of a consumer's total wealth: "pocket cash" in their terminology. This application of the model has empirical support in at least two documented applications. First, Wertenbroch, Soman and Nunes (2001) find that consumers are much more likely to pay for hedonic (i.e. short-run consumption) purchases with cash, reserving credit for more durable, utilitarian purchases. Consumers who use cash to pay for nondurable goods behave precisely as predicted by the dual-self model, as only the long-term self may approve spending on credit, and will do so only for goods that provide long-term utility. Second, Huffman and Barenstein (2005) find evidence that even consumers with access to a credit card tend to spend more immediately after receiving a paycheck, and the additional spending is paid for using cash. This finding is consistent with consumers regulating their self-control impulses by treating fungible financial resources of different liquidities differently when making spending decisions.

Applying this framework to the case of interest-free loans provides a straightforward prediction: the temptation costs of an interest-free loan will increase when accepting the loan results in a cash refund because the loan funds are made more accessible to the more myopic self. Relative to a similar student receiving a less liquid disbursement, the long-run self receiving cash must either exercise more self-control or else allow the short-run self a greater degree of over-consumption, both of which lead to a relative reduction in the overall utility of accepting the loan.

With the value of the subsidy the same regardless of the form of disbursement, students facing cash disbursements should therefore be more likely to reject the loan as a means of constraining their future consumption behavior. Further, a recent extension of this model (Fudenberg and Levine 2012) implies that "persistent" temptations, which must be faced

again in the next period if they are overcome in the current period, are more difficult to resist. Students who receive their loans in cash must repeatedly avoid the temptation to spend their highly liquid loan funds on beer, pizza, or football tickets, thus further increasing the difficulty of avoiding this temptation.[21]

Loan funds in cash also likely provide a more "vivid" temptation than do loan funds applied immediately to the semester's living expenses (Loewenstein 1996). Imagining all of the possible ways to spend the loan funds will create a more tempting experience when the funds are actually available for those purposes. Additionally, certain forms of personal rules (Benabou and Tirole 2004) will also lead to increased temptation when the loans arrive as cash. A personal rule saying "I will keep money in a savings account in case of emergencies" can help overcome the temptation to overspend. Under such a rule, a person's bank account balance essentially becomes a consumption good that enters the utility function. If that good displays diminishing marginal returns, then dis-saving from a high bank account balance will have a lower utility cost than will dis-saving from a lower balance. Again, providing the loan in cash will create a greater temptation to increase near-term consumption.

Although none of these models was developed explicitly for our context, they share central characteristics that combine to provide an additional testable hypothesis. In each of these frameworks, consumers' management of their impulse control problems eliminates perfect fungibility across asset types, which allows equally-sized loan funds to create different degrees of temptation depending on how they are distributed. In particular, loan proceeds applied to the most liquid/accessible/salient asset type (cash) represent the highest degree of temptation. Students facing a distribution in cash should therefore be more likely to forego the subsidy and reject the loan as a means of constraining their own future consumption.

4   Empirical Results

4.1   Data

We use the 1999-2000 and 2003-2004 cross-sectional waves of the National Postsecondary Student Aid Study (NPSAS) to investigate the predictions of the self-control model. This unique data source combines administrative financial aid data from the school and from the National Student Loan Data System (NSLDS), information submitted by students and parents on their aid applications, and survey responses from the students during the school year.[22] In addition, the NPSAS contains detailed institution characteristics and individual student information, such as GPA, SAT scores, school location and selectivity, and demographic characteristics.

To focus our analysis on the individuals toward whom the financial aid system is most directly targeted, we restrict our sample to full-time, full-year undergraduate students enrolled at one four-year public or private non-profit institution for a full academic year. The sample includes only those students who applied for financial aid and whose unmet need exceeded the subsidized loan maximum. Recall that a student must submit an aid application to receive any form of need-based aid. Therefore, some students who were not specifically seeking loan funds will nevertheless receive loan offers.

These selection criteria introduce some heterogeneity by admitting needy students as well as more financially able students at high cost schools to our sample. To mitigate this issue, we further restrict our sample to students who, if they accepted their student loan, would owe no more than an additional $10,000 in tuition.[23] Therefore, within a grade level, all students are eligible for the same interest-free loan amount.[24] These students are usually those considered "typical" needy college students, and those most likely to be burdened with loans upon completion of college.

The fact that about one-sixth of our sample of needy students does not accept interest-

free loans is striking. We refer to students who applied for financial aid and who were eligible for subsidized loans according to the federal formula but who do not receive any loan funds as having rejected the loan. Because this measure is all that our data allow, we were concerned that a significant fraction of our observed rejections might be the result of measurement error from incorrectly classifying students' eligibility. However, a senior financial aid administrator at an anonymous large public institution informed us that at her school, 18 percent of Stafford borrowers actively turn down their subsidized loans by logging in to the school's web portal and removing the loan from their package. This communication suggests that measurement error in eligibility does not comprise a large component of this descriptive statistic.[25]

Table 1 provides a descriptive look at the data, emphasizing that a significant fraction of students in each demographic group do not take the loan. The most dramatic differences in take-up rates are by race/ethnicity, where Hispanic and Asian students are nearly twice as likely to turn down the loan as are white and African-American students. These results serve as a reminder that while self-control may be an important determinant of the borrowing decision, it is certainly not the only one. Racial differences in loan rejection are not the emphasis of this paper, though we investigate these racial gaps in more detail below.

Students with high unmet need are much more likely to take the loan. This difference confirms that, on average, the loans are being used by those who need them most. Students from families that earn less than $50,000, roughly the median in our sample, are actually more likely to turn down the loan than are students from wealthier families. Recall, however, that these families are also likely to be eligible for larger grant awards and scholarships. Because family income and need are negatively related as a result of the federal aid formula, it is difficult to determine whether either factor independently drives this result. More generally, this table reveals that students of all types reject the interest-free loans at non-trivial rates.

4.2   Evidence for a Self-Control Explanation

Less than full participation in the interest-free loan program is consistent with a number of hypotheses, including taste-based debt aversion, non-pecuniary "hassle" costs of borrowing, or a lack of information. The self-control discussion presented in section 3 provides a behavioral reason for rejecting subsidized loans. Unlike the other candidate explanations, this potential motivation provides an additional testable hypothesis: Students should be particularly unwilling to accept their loans when their loan funds will be applied to their most easily spent asset.

The simplest test of the self-control hypothesis is to compare the take-up rates between on-campus and off-campus students whose loan funds would pay for room and board. The results of this comparison are shown in the first column of Table 2. Students who live off-campus are 8.0 percentage points less likely to accept their loans than are students in the same financial situation living on campus. As the overall take-up rate is 83 percent, this is nearly a 10 percent difference between students who would receive a refund check and those who would have the funds applied directly to on-campus housing expenses.

However, living off-campus may be associated with greater loan rejection for reasons other than the "refund check" effect. To address this issue, we use a difference-in-differences methodology to compare this on-/off-campus difference in loan acceptance rates to the difference for a set of students whose loan disbursement method is unchanged across housing locations. To do so, we add students who are also eligible for the maximum subsidized loan amount, but whose financial aid benefits (including the loan if accepted) do not exceed tuition to the regression sample (see Figure 1).

We estimate linear probability models of the form

$$y_i = \alpha_1(OFFCAMPUS)_i + \alpha_2(ROOMBOARD)_i + \alpha_3(OFF * ROOM)_i + X_i\beta + \nu_i,$$

and the results are presented in the second column of Table 2. The dependent variable is a dummy variable for whether a student accepted his/her interest-free loan (1=accept). The independent variables are indicators for residence (1=off-campus) and for whether loan funds, if accepted, would pay for room and board (1=yes).[26] The interaction of these two variables creates an indicator for whether the loans are distributed in cash (1=refund check).[27]

Each coefficient from this specification provides insight into students' take-up decisions. All reasonable explanations for loan rejection suggest that α_2 will be negative. When students have enough scholarship and grant aid to cover tuition, the non-subsidy benefits of the loan are lower, and the costs of borrowing - be they increased temptation, higher direct disutility, or the cost of learning about the program - are more likely to compel the student to reject the loan. A negative sign for this coefficient, therefore, cannot help distinguish among the potential explanations.

In contrast, the various explanations provide different predictions for the coefficient on the interaction term, α_3. For students in this "refund check" category, accepting the loan would present the largest temptation, and finding that these students are especially likely to reject the loan would provide support for a self-control explanation. The strongest results in favor of a self-control motivation would also find α_1 indistinguishable from zero. This coefficient measures the on-/off-campus difference in take-up when the disbursement method is identical across housing locations. A non-zero result would suggest that students living on- and off-campus have different tastes for debt and/or access to information about the loan program.

The results in the second column of Table 2 bear out the predictions of a model combining impulse control and mental accounting: Faced with additional short-run liquidity, students are especially likely to turn down the loan when the loan funds would be disbursed in cash. The estimated on/off-campus difference for students who will not receive a refund check in either location is essentially zero (less than half of one percentage point). The resulting

interaction coefficient remains strongly negative at 7.3 percentage points (column 2).[28]

Figure 3 presents an important specification check for the difference-in-differences methodology. The graph plots loan acceptance rates against the amount of aid in excess of tuition (including the loan). The continuous lines represent the results of local linear regression smoothing, while the individual points give unweighted averages of bins with a $1000 half-width. The darker lines and points represent the off-campus sample; the lighter plots represent the on-campus sample.

The divergence of the acceptance rates between on- and off-campus students begins close to the zero-dollar cutoff and increases rapidly as the amount of money borrowed for room and board increases. The gap continues to increase for refund checks up to roughly $2,500. These differential trends arise even though the local linear regression does not impose any structure on the shape of the estimated relationship. This result supports the hypothesis that off-campus students are differentially rejecting the loans to avoid receiving large easy-to-spend refund checks. In contrast, for students whose loans pay only tuition (to the left of zero), the relationship between aid and acceptance is quite similar across housing situations. Furthermore, while an alternative explanation that students rely on a rule of thumb to "borrow only if necessary," combined with lower off-campus housing expenses, could create a divergence in take-up rates, only self-control concerns provide a rationale for the divergence to accelerate precisely when off-campus students begin to receive refund checks.[29]

Neither the linear probability regressions nor the nonparametric analysis presented so far has accounted for the influence of additional covariates. Although the difference-in-differences results are entirely consistent with the self-control explanation, these differential take-up rates may instead reflect an unequal distribution of other characteristics that influence borrowing decisions across the four categories. Adding controls for race, gender, and year in school (and thus indirectly for the amount of loan eligibility) in column 3 of Table 2 reduces the magnitude of the "refund check" coefficient only slightly. Importantly, the

addition of these controls leaves the measured differential take-up across housing locations indistinguishable from zero.

While we have described the student's self-control dilemma in the context of a within-person principal/agent game rather than as a parent/child problem, the latter problem would have much the same flavor. To address parental influences, we include indicators for whether parents help pay tuition or provide additional financial support including housing expenses in column 4, our preferred specification. While students whose parents help pay tuition are less likely to take the loan, the "refund check" result remains even after including measures of parental assistance. All else equal, students who would receive their loans in easy-to-spend cash are 7.1 percentage points less likely to take the loan.

Table 3 presents a series of additional robustness checks on our main result. One alternative explanation for these results is that housing decisions and neediness are serving as proxies for other characteristics of the school the student attends. The NPSAS provides a broad range of school-level characteristics, which we add to our preferred specification from Table 2. We include a selectivity index constructed by the NCES based on admission standards and average standardized test scores, the school's Carnegie classification (e.g. research university, liberal arts college, etc.), and a measure of the urbanicity of the school's location. The results are largely unchanged; the point estimate on the "refund check" effect falls by only 0.5 percentage points and remains statistically significant.

The second column of this table further addresses the question of whether the "refund check" effect can best be interpreted as evidence for a self-control or a parental control explanation. We exclude school attributes but include parents' education levels and measures of how involved the student's parents are in financing their educational and living expenses. The additional parental assistance measures are insignificant, and whether at least one parent has some college experience is insignificant as well. That our result still holds suggests that self-control concerns are independent of the role of parents, though a student's parents may

still influence her take-up decision. As a further test, we estimated our preferred specification separately on the sample of students who received parental assistance, and then using only those who did not, and generated nearly identical results.[30]

The stability of the point estimates when controlling for a host of potentially confounding factors suggests that the distribution of these covariates is roughly equal across the four housing location/financial situation categories. Table 4 investigates this balance directly. Students from all demographic types can be found in each category, usually in roughly the same proportions. Most of the demographic variation across these categories can be attributed exclusively to housing location or to financial situation, rather than to the "refund check" interaction. Additionally, the table reveals that our comparison group (those whose loans pay only tuition) are only somewhat better off financially than the group potentially eligible for a refund check. The difference in Estimated Family Contribution is only about $4,500.

There are a few cases, however, where demographic variables differ systematically by refund check status. This imbalance presents a potential challenge to the difference-in-differences specification. In additional regressions (not shown), we included the interaction of unbalanced covariates with both the off-campus and "loan pays room and board" dummies.[31] The results continued to show point estimates for the "refund check" effect of similar magnitude and significance, providing further evidence that variation in take-up across these groups is driven by exposure to different levels of short-term liquidity.

Each of the previous specifications used both between-school and within-school variation in where students fall in the four categories listed in Figure 1. The third column of Table 3 adds college-specific fixed effects, eliminating the influence of between-school variation on the estimated coefficients. One might prefer this specification because it has the potential to remove unobserved institutional characteristics that affect loan take-up decisions and that are potentially correlated with students' housing and financial aid situations. The resulting

point estimate of the coefficient of interest remains negative, but is no longer statistically different from zero, nor statistically different from the results of previous columns.

One interpretation of this specification is that there are unobserved factors (beyond those we directly include as controls) at the school level that are falsely creating the pattern of results supporting the self-control explanation. Under this interpretation, the regressions including school fixed effects are preferable, and they certainly appear to suggest a more limited influence of self-control. Yet, these results do not necessarily eliminate self-control as a candidate explanation. After removing the influence of school-level variables, the remaining within-school variation in housing location largely represents endogenous choices made by students. This endogeneity could easily generate the smaller point estimates observed in the third column of Table 3. If, for example, students who are aware of their self-control problems choose to live on campus as a commitment device to ensure that aid funds go toward appropriate expenses, this compensating behavior will tend to minimize differences in on- and off-campus take-up rates, especially within schools. Alternatively, the inclusion of the school fixed effects exacerbates the attenuation bias from any measurement error in our characterization of the student's potential refund check status. These additional explanations prevent this specification from providing a clean test of the self-control interpretation of the main results.

Table 5 presents an additional test to determine whether students are indeed planning ahead to reject these loans. When filing a FAFSA in the spring, aid applicants must report whether they would like loans included in their financial aid package for the following school year, as well as where they expect to live in the fall. The residential choice and the preference for loans do not directly determine the aid package offered to students in most cases. Using the student's stated desire for loans as a part of next year's aid package as the dependent variable in the difference-in-differences specification, we find that students who would get a refund are more likely to report that they are not interested in loans than are other groups.

Thus their desire to avoid borrowing reveals itself not only in their eventual behavior but also in their stated intentions months before their loans are disbursed. These results provide further support for the hypothesis that students' failure to receive interest-free loans reflects the type of forward-thinking decisions made by "sophisticated" consumers aware of their self-control problems.

5 Implications for policy and further research

Our analysis suggests that self-control motives play a significant role in students' decisions to reject interest-free loans.[32] One-sixth of traditional undergraduate students actively reject loans with an implied government subsidy of up to $1,500 over the student's career. Furthermore, they are particularly less likely to borrow when doing so provides them with a large amount of easy-to-spend cash. This behavior is consistent with the optimal choices of sophisticated economic actors with self-control concerns who treat similar financial resources as non-fungible. Alternative frameworks can explain the incomplete take-up, but only a model allowing for impulse control motives and some form of mental accounting can reconcile the entirety of the results including the additional aversion to borrowing when the loan funds are distributed in cash. These empirical results provide some of the first non-laboratory evidence of consumers choosing to limit their own borrowing and consumption despite the financial costs [see also Huffman and Barenstein (2005)]. In doing so, these results suggest that behavior previously thought to be "irrationally" debt-averse may, in fact, result from consumers trying to constrain their own impulses.

The results also have important implications for the efficiency of the design of the current loan system. Recent work on the optimal choice of default rules reveals that accentuating the difference between the optimum and the default can cause a greater fraction of decision-makers to reject the default and choose their personal optimum (Choi, Laibson, Madrian

and Metrick 2003). This consideration must be balanced with a desire to set the default close to the modal optimum to minimize the total costs of switching that agents must incur. In the case of subsidized loans, setting the default to the maximum accomplishes both goals of optimal default rules by making the default the modal decision and by maximizing the difference between the default and the optimum for those who wish to deviate.

Potential policy solutions can directly reduce the temptation to overspend and increase student participation in this need-based program. For example, aid administrators could offer students access to educational spending accounts similar to flexible spending accounts currently used for medical expenses. Schools could place any aid in excess of tuition into these accounts, and students would need to provide evidence of approved education-related expenses in order to spend these funds. Account balances would earn interest. Upon leaving school, any remaining funds could be applied directly to the student's outstanding loan balances. In this way, all students could receive the benefits of the subsidized loans without needing to manage large cash payments.

By interacting a model of impulse control with the particular features of this credit market, we have shown that the resulting taste for commitment can induce debt-averse behavior. Although the "rational" choice is less clearly defined in other contexts, we expect that this insight could help explain unresolved questions in similar economic situations, such as repaying car loans or home mortgages ahead of schedule. Further research is needed to determine whether self-control similarly influences other credit markets.

Notes

[1]One classic undergraduate textbook explains the benefits of a $1,000 interest-free loan as follows: "You could at least take the money and put it in a savings bank, where you will earn at least 4 percent per year. Each year you can draw out the $40 interest and throw a big party. Finally...you can draw out the $1,000, plus the last year's interest; repay the $1,000; and have $40 for a last party"(Alchian and Allen 1964).

[2]Note that a student need not plan on "gaming the system" when she borrows for accepting the loan to be a good idea. If there is some uncertainty about the costs she will face over the school year, she may wish to borrow the money as a precautionary measure.

[3]Previous work on the the financial aid system has focused on the characteristics of students who default on their loans (Knapp and Seaks 1992, Dynarski 1994) or whether the size and type of student loans affect enrollment (McPherson and Schapiro 1991, van der Klaauw 2002, Kane 2003, Epple, Romano and Sieg 2003). Field (2004) investigates an NYU law school experiment and finds that the decision to enter public-interest law in exchange for a lower debt burden is sensitive to the timing of incurring debt.

[4]See Dynarski and Scott-Clayton (2006) for a discussion of the complexity of the financial aid system.

[5]Another potential reason to turn down student loans is that they are not dischargeable under current bankruptcy law.

[6]Survey research in the United Kingdom finds that students who are uncomfortable with debt are less likely to pursue a college education, although the authors do not attempt to determine the source of this discomfort (Callender and Jackson 2005).

[7]For instance, a hyperbolic discounting model combined with a mental accounting component would similarly reconcile our findings.

[8]For example, Ashraf, Karlan and Yin (2006) are careful to note the equal interest rates

paid in the experimental restricted bank account and the unrestricted account.

[9]Our discussion draws heavily from the 2003 Federal Student Aid Handbook published by the Department of Education.

[10]The costs of attending school include room and board and are explicitly included in the financial aid award process for both on- and off-campus students. Although some students may reject loans for room and board because they do not want to spend "education" dollars on "non-education" expenses, the aid award's framing of these expenses as part of the necessary costs of investment likely minimizes any on-/off-campus difference in students' perceptions of whether these are legitimate expenses for education funds.

[11]Students with exceptional need are also given access to interest-free Perkins loans. The student may also receive a work-study award which is a promise from the government to pay a portion of the student's wages if she obtains employment. Because both of these awards are also need-based, we subtract Perkins and work-study awards from need before categorizing a student as eligible or ineligible for the Stafford program.

[12]In order to receive their loans, first-time borrowers must sign a Master Promissory Note and receive loan counselling related to borrowing through student loans, both of which can be fulfilled online. In subsequent years, no additional action beyond the normal FAFSA application process must be taken to receive the entire amount of offered loan funds.

[13]Recent statistics based on administrative data from an anonymous large public university reveals that 36 percent of aid recipients were issued refund checks.

[14]A numerical example of the difference in these two disbursements is provided in the online supplemental material.

[15]We discuss the choice as binary, despite the fact that students can choose to borrow only a fraction of the amount they are offered. Data limitations do not allow us to distinguish between volitional partial borrowers and students who failed to receive the full amount because they dropped out or graduated early. In addition, the structure of the award letter

often frames the choice as an all-or-none decision, with the reduction option buried in the fine print.

[16]While allowing for students to borrow from higher-cost private lenders would add a degree of realism, the intuition underlying this section would be unchanged. We maintain the assumption for expositional simplicity.

[17]Many further theoretical advances have been developed in response to specific documented empirical anomalies (Thaler and Shefrin 1981, Loewenstein and Thaler 1989, Prelec and Loewenstein 1998). Gul and Pesendorfer (2001) provide a more general discussion of how self-control concerns cause consumers to prefer a subset of choices to the entire set.

[18]Hastings and Shapiro (2011) provide strong empirical evidence of this type of non-fungibility in consumers' gasoline consumption behavior.

[19]For completeness, we note that in a standard hyperbolic discounting model with perfect fungibility (e.g. Laibson (1997), O'Donoghue and Rabin (1999) or Frederick, Loewenstein and O'Donoghue (2002), the loan creates an equally tempting increase in liquidity regardless of the form of the disbursement. Although one could certainly augment this standard model with a form of mental accounting, we prefer the models discussed here because they can explain a number of otherwise puzzling empirical findings in addition to providing an explanation for why some consumers choose to "tie themselves to the mast." We thank an anonymous referee for clarifying the central importance of non-fungibility in generating the additional empirical prediction.

[20]This work also builds on a related model of a long-run "planner" and myopic "doer" (Thaler and Shefrin 1981).

[21]The numerical example contained in the online supplemental material further elaborates this point.

[22]One additional advantage of the NPSAS is that students make their financial aid decisions prior to being selected into the survey. Thus, there is no additional pressure to make

the "correct" decision as a result of being in the study. We use the restricted version of the data (which requires an agreement with NCES) for our analysis.

[23]In addition, due to concerns regarding the quality of some responses in the NPSAS, we restrict our dataset further to exclude individuals whose values of student budget and Stafford loan amount were imputed. For similar accuracy concerns with the same variables, we also excluded individuals who were independent or lived with their parents, and students who were not born in the United States.

[24]Note that this sampling frame requires greater unmet need for upperclassmen to be included in the sample than for freshmen and sophomores. We have rerun our analysis using only students who have $5,500 in unmet need regardless of grade level, and the results are qualitatively unchanged.

[25]The same financial aid administrator noted that some students also passively reject their loans by failing to return this required paperwork. Although some students may fail to get the loan because the paperwork is too cumbersome, a substantial fraction are observed directly choosing not to receive the interest-free money, which suggests that some of those rejecting the loan passively have also intentionally decided not to borrow.

[26]We limit the sample to students who live either in on-campus housing or off-campus, but not with their parents. Students who live with their parents are typically given a much smaller housing allowance than students living off-campus independently, and thus it is more difficult to determine their eligibility. Additional controls include a dummy for whether the student is observed in 1999 or 2003.

[27]We have run linear probability models because our primary parameter of interest is the interaction term, which can be difficult to interpret in probit and other MLE models. Most of the variables we include are categorical, and, as a result, none of the predicted values are greater than one or below zero.

[28]All of the reported standard errors are clustered to allow for arbitrary correlation at the

school level.

[29]In addition, this non-parametric analysis suggests that whether the loan results in a refund is more important than the potential refund amount in determining take-up. Consequently, we continue to report categorical difference-in-differences results rather than results that include the size of the refund as a continuous variable.

[30]We have also estimated similar specifications including a cubic in parental income, which does not substantively affect the point estimate. All results not reported in the tables are available from the authors upon request.

[31]These additional specifications are available in the online supplemental materials.

[32]It is likely that we have identified only a portion of the behavior induced by self-control problems. Our estimates omit any effect resulting from students choosing not to apply for aid at all to avoid being faced with the temptation of loan funds.

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Figure 1: Student circumstances and refund eligibility

Accepted loan funds:

Housing location:	Do not pay room and board	Pay room and board
On-campus	Not eligible	Not eligible
Off-campus	Not eligible	Eligible for refund check

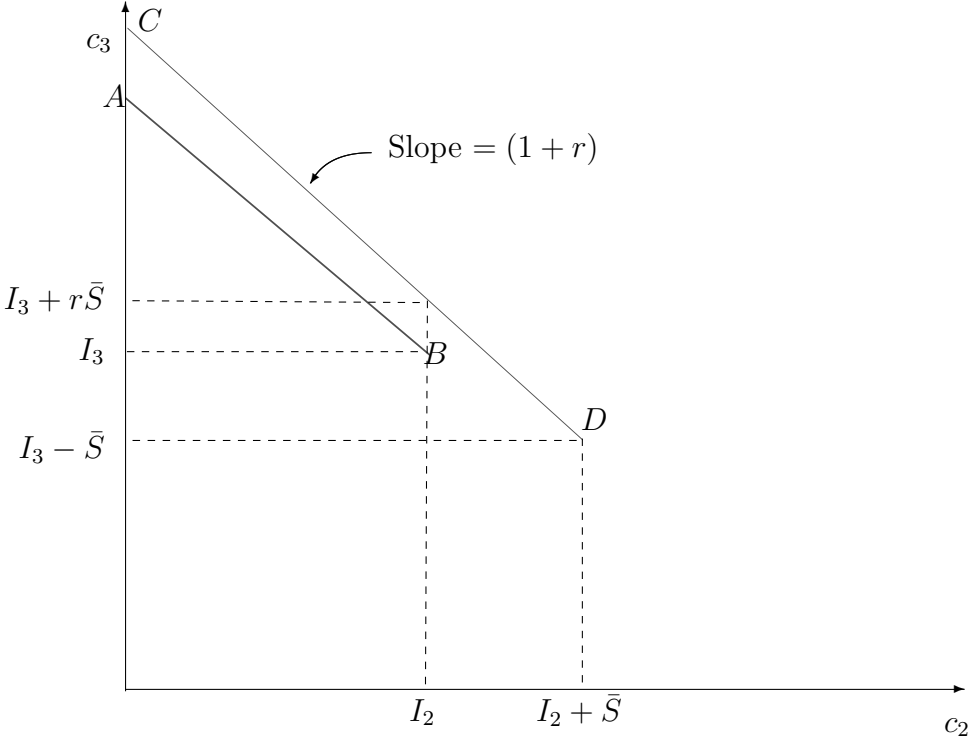Figure 2: Choosing to borrow results in a larger choice set.

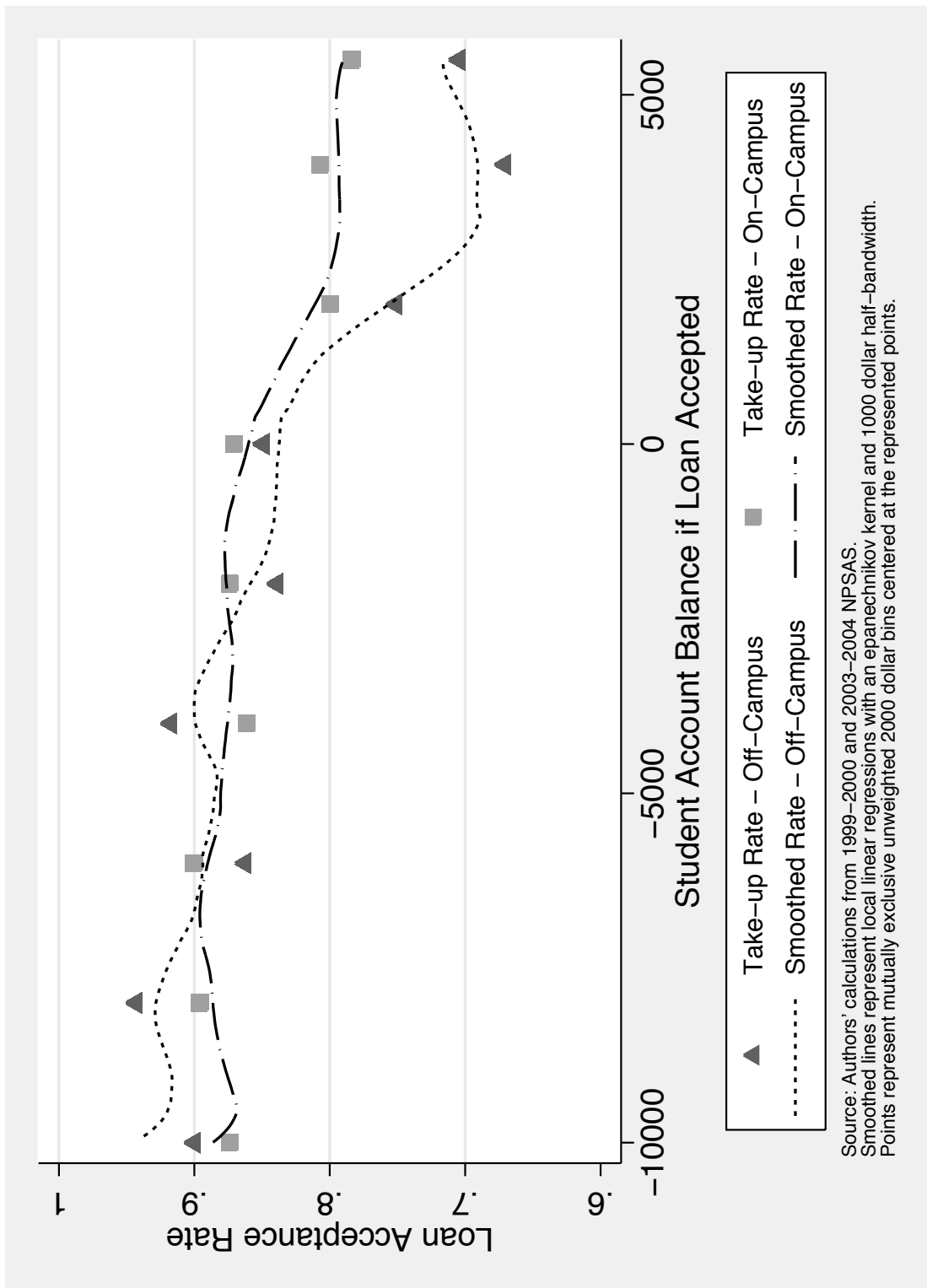Figure 3: Loan Acceptance Rates by Aid in Excess of Tuition.

Table 1: Descriptive Statistics of Subsidized Stafford Loan Take-up

	% Reject loan	N
Full sample	16.9%	5530
Grade level		
Freshmen	16.0%	2470
Sophmores	20.5%	1050
Juniors	14.5%	830
Seniors	17.0%	1190
Race		
White	15.8%	3940
African-American	15.2%	830
Hispanic	27.1%	400
Asian	27.4%	180
Other (incl. multiple)	14.0%	180
Gender		
Male	17.5%	2420
Female	16.4%	3120

Table 1: (Continued) Descriptive Statistics of Subsidized Stafford Loan Take-up

Parental support

Parents do not pay tuition	16.6%	2310
Parents pay tuition	17.4%	2660

Parental income

Below $50,000/year	18.5%	3390
Above $50,000/year	14.3%	2150

Cost of attendance after grants/scholarships

Below median	20.1%	3100
Above median	12.7%	2440

Parental education

HS degree or less	17.0%	1520
Some college or higher	16.6%	3860

Standardized test scores

Below median SAT / ACT	14.6%	980
Above median SAT / ACT	19.4%	1010

Table 1: (Continued) Descriptive Statistics of Subsidized Stafford Loan Take-up

Survey Year

1999-2000	16.2%	2170
2003-2004	17.3%	3360

Source: Authors' calculations using the NPSAS 99/00 and 03/04.

Note: We restrict the sample to full-year, full-time, US-born, dependent, undergraduate students at four-year public or private non-profit institutions who do not live with their parents, applied for financial aid, and demonstrated financial need exceeding their grade-level specific loan maximum. We additionally exclude students whose values of student budget and Stafford loan amount are imputed. Number of observations rounded to nearest 10 per Dept. of Education guidelines.

SELF-CONTROL INDUCED DEBT AVERSION Table 2: Linear Probability Models for Subsidized Stafford Take-up Rates by Direct Access

Dependent variable:	Eligible[a]	Full Sample		
Accept/reject interest-free loans	(1)	(2)	(3)	(4)
Loan funds distributed in cash (offcampus*room and board)[b]	-0.080**	-0.073**	-0.070**	-0.071**
	(0.017)	(0.022)	(0.022)	(0.022)
Lives off-campus, not with parents		-0.004	-0.005	-0.011
		(0.015)	(0.016)	(0.016)
Accepted loan funds pay room and board		-0.066**	-0.065**	-0.072**
		(0.012)	(0.012)	(0.012)
Female			0.013	0.013
			(0.010)	(0.010)
African-American			0.017	0.013
			(0.014)	(0.014)
Asian-American			-0.107**	-0.105**
			(0.033)	(0.033)

Table 2: (Continued) Linear Probability Models for Subsidized Stafford Take-up Rates by Direct Access

	(1)	(2)	(3)	(4)
Hispanic			-0.089**	-0.093**
			(0.022)	(0.022)
Other race			0.027	0.028
			(0.026)	(0.027)
Parents help pay tuition				-0.043**
				(0.012)
Financial support other than tuition				0.009
				(0.012)
Constant	0.840**	0.888**	0.888**	0.907**
	(0.014)	(0.010)	(0.012)	(0.014)
Controls for grade level (4 categories)	No	No	Yes	Yes
Observations	2770	5530	5530	5530
R^2	0.01	0.02	0.03	0.03

Table 2: (Continued) Linear Probability Models for Subsidized Stafford Take-up Rates by Direct Access

Source: Authors' calculations using the NPSAS 99/00 and 03/04.

Note: Robust standard errors in parentheses.

+ significant at 10%; * significant at 5%; ** significant at 1%.

All models include a dummy for survey year.

a. The sample for the first column includes only students who would receive a refund check if they

lived off-campus and accepted their loans. We maintain the sample restrictions from Table 1.

b. Loan funds are distributed in cash when the student BOTH lives off-campus and accepted loan

funds pay room and board. See Figure 1.

Number of observations rounded to nearest 10 per Dept. of Education guidelines.

Table 3: Subsidized Stafford Take-up Rates by Direct Access - Robustness Checks

Dependent variable:			
Accept/reject interest-free loans	(1)	(2)	(3)
Loan funds distributed in cash (offcampus*room and board)[a]	-0.066**	-0.073**	-0.038
	(0.022)	(0.023)	(0.025)
Lives off-campus, not with parents	-0.000	-0.010	0.020
	(0.016)	(0.016)	(0.018)
Accepted loan funds pay room and board	-0.065**	-0.073**	-0.044**
	(0.012)	(0.012)	(0.014)
Constant	0.934**	0.914**	0.863**
	(0.035)	(0.016)	(0.019)
Controls for grade level (4 categories)	Yes	Yes	Yes
Controls for race, gender, and parental assistance	Yes	Yes	Yes
Controls for Carnegie Classification, urbanicity[b]	Yes	No	No
Additional parental controls[c]	No	Yes	No
Institution-level fixed effects	No	No	Yes

Table 3: (Continued) Subsidized Stafford Take-up Rates by Direct Access - Robustness Checks

Observations	5500	5380	5530
R^2	0.04	0.04	0.24

Source: Authors' calculations using the NPSAS 99/00 and 03/04.

Note: Robust standard errors in parentheses. + significant at 10%;
* significant at 5%; ** significant at 1%. All models include a dummy for survey year.

a. Loan funds are distributed in cash when the student BOTH lives off-campus and accepted loan funds
pay room and board. See Figure 1. We maintain the sample restrictions from Table 1.

b. Includes 3 selectivity dummies, 5 categories of Carnegie classification, and 7
categories for degree of urbanicity.

c. Parents' education, whether parents help pay educational expenses, whether parents
pay non-housing living expenses.

Number of observations rounded to nearest 10 per Dept. of Education guidelines.

Table 4: Balance of Control Variables

On-campus/off-campus?	On	On	Off	Off
Does loan cover some room&board expenses?	No	Yes	No	Yes
Borrower gets a refund check?[a]	No	No	No	Yes
Female	55.0%	56.8%	56.3%	58.4%
African-American	12.0%	22.7%	8.9%	12.1%
Hispanic	4.8%	7.4%	6.3%	13.0%
Asian-American	2.5%	3.7%	3.6%	3.7%
Other race	2.9%	3.6%	2.8%	3.3%
Masters U.	20.5%	22.4%	18.9%	17.8%
BA U.	20.0%	13.7%	7.6%	4.6%
Oth U.	40.3%	39.7%	55.3%	50.1%
Research U.	19.2%	24.2%	17.6%	27.2%
Highly selective	24.7%	21.1%	23.5%	19.2%
Moderately selective	71.4%	74.2%	68.5%	75.5%
Not selective	4.0%	4.7%	8.1%	5.3%

Table 4: (Continued) Balance of Control Variables

High parental education	77.5%	67.2%	71.6%	67.8%
Tuition above median	69.8%	36.4%	61.7%	11.3%
Any parental help with expenses	76.7%	67.2%	62.3%	52.8%
After grant cost of attendance above median	75.2%	10.1%	81.1%	14.4%
Parental income above median	58.6%	19.4%	55.6%	20.3%
Test scores above median	52.9%	49.1%	51.9%	48.4%
Demonstrated need above median	62.4%	28.9%	67.1%	31.6%
Has a credit card	44.2%	44.3%	56.6%	59.3%
Carries credit card balance	21.7%	26.6%	43.4%	42.6%
Average year in school	1.85	1.91	2.75	2.75
Expected Family Contribution (EFC) ($)	5790	1976	5702	2310
Number of Observations	2150	1760	610	1020

Source: Authors' calculations using the NPSAS 99/00 and 03/04.

a. Loan funds are distributed in cash when the student BOTH lives off-campus and accepted loan funds pay room and board. See Figure 1. We maintain the sample restrictions from Table 1.

Average year in school is coded as 1= Freshman, 2=Sophomore, etc.

Number of observations rounded to nearest 10 per Dept. of Education guidelines.

Table 5: Linear Probability Models of Stated Desire for Loans

Dependent variable:

Want loans in financial aid package?	(1)	(2)
Expected loan funds distributed in cash[a]	-0.035+	-0.043*
	(0.021)	(0.021)
Expects to live off-campus, not with parents	0.012	-0.008
	(0.013)	(0.014)
Accepted loan funds pay room and board	-0.057**	-0.039**
	(0.011)	(0.011)
Constant	0.946**	0.980**
	(0.008)	(0.012)

Table 5: (Continued) Linear Probability Models of Stated Desire for Loans

Controls for grade level, gender, ethnicity, and parental help	No	Yes
Observations	4510	4510
R^2	0.02	0.06

Source: Authors' calculations using the NPSAS 99/00 and 03/04.

Robust standard errors in parentheses.

+ significant at 10%; * significant at 5%; ** significant at 1%.

a. Loan funds are distributed in cash when the student BOTH lives off-campus and accepted loan funds pay room and board. See Figure 1. We maintain the sample restrictions from Table 1.

Number of observations rounded to nearest 10 per Dept. of Education guidelines.