When Nudges Spill Over: Student Loan Use under the CARD Act*

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Abstract

Section 304 of the Credit Card Accountability, Responsibility, and Disclosure Act (2009) limited the marketing and sale of credit cards to college students, nudging them away from these high-rate products. While it reduced card use, we document the nudge raised student loan balances by 8.4%, 15% among the less affluent. To assess the benefits of this substitution, we design a survey that reveals prevalent sub-optimal financial decision-making among students tied to higher card debt. Model-based evidence demonstrates how these results imply the policy raised welfare. A complementary analysis indicates higher grade-point averages and on-time graduation rates resulting from the policy.

JEL: D14, D18, G50, G53

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1 Introduction

Nudges—changes to choice architecture that do not restrict choice—have exploded in popularity as interventions to bring about behavioral change, especially in consumer credit markets (Campbell et al., 2011; Garz et al., 2020). However, analyses of these interventions are often too narrowly focused on the targeted product. Their evaluation requires not just observation on consumers' use of the targeted product, but of the likely alternatives as well. As Beshears and Kosowsky (2020) note in their survey of 174 interventions,

> The dearth of attempts to gauge the effects of nudges on non-targeted outcomes is a glaring omission in the empirical nudge literature, as such unintended consequences can partially offset, entirely eliminate, or even reverse the benefits that nudges deliver on a targeted dimension. (p. 15)

This multi-market approach to analyzing nudge-based policies in credit markets is the focus of our paper. Specifically, we study spillovers from Title 3 of the Credit Card Accountability, Responsibility, and Disclosure (CARD) Act of 2009 on student loans.

Title 3, Section 304 specifically restricted the marketing and sale of credit cards on college campuses, after which card use among students declined substantially (SallieMae, 2009, 2016). A principal justification for the policy was that easy access to cards amplifies financial mistakes, leaving students in a poor financial condition at the start of their adult lives (Warren, 2007). The policy was meant to guide students away from high-interest cards without explicitly prohibiting them from obtaining a credit card, satisfying the basic definition of a nudge.[1]

For students in need of liquidity, the most readily available alternative to cards is a student loan. Though it carries a nominally lower interest rate, it is not obvious that a student loan is always cheaper. Cards provide a flexible line of credit. A student loan is less flexible. For some students, this inflexibility may make a credit card the lower-cost option. Which option is lower cost depends on how aptly students make financial choices, the uncertainty of their expenditures, and the relative cost of student loans. Thus, Title 3 may have unintentionally reduced the use of credit cards among the students who would have benefited from using them.

Our analysis of Title 3 begins by characterizing the trade-off students face when choosing how to finance a liquidity shortfall. Specifically, we model their choice to borrow on a credit card or take out a student loan. This generates predictions of how the policy impacts student loan borrowing and students' welfare. Moreover, given Title 3 was largely justified on the premise that financial mistakes by students abound, we characterize optimal behavior

[1] More specifically, following Beshears and Gino (2015), Title 3 either removed a nudge that engaged System 1, harnessing biases (e.g., availability) to increase student credit card take-up. Alternatively, it provided a nudge to engage System 2, making students jointly evaluate credit cards and student loans.

and four prevailing departures (see Campbell, 2016). Each of the five consumer choice theories we consider predicts that less access to credit cards prompts more student loan borrowing. However, implications for welfare differ. Unsurprisingly, restricting choice only benefits a student who does not choose optimally. The manner by which a student chooses sub-optimally matters as well.

Empirically, we first document Title 3's impact on student loan debt. We use rich administrative data of student financial aid records from a large U.S. public university in a difference-in-difference framework. In our design, the control group consists of incoming freshmen, who make student loan decisions prior to arriving on campus and are therefore never exposed to lenders' activities there. Continuing students are treated. We find Title 3 raised the likelihood of obtaining a student loan by 6.6 percent and average balances by $210 per year, or 8.2 percent. We estimate a larger $454, or 15 percent rise, in balances among those whose application ZIP is at the bottom quartile of the ZIP income distribution, with no effect on balances for students at the top quartile.

We next evaluate mechanisms underlying this substitution towards student loans. To this end, we design a survey which we administer to current students, matching their responses with administrative records. The survey sheds light on how students weigh credit alternatives, the prevalence of financial mistakes, and what form of sub-optimal behavior is most closely associated with credit card borrowing. While not corresponding to the policy period, our matched-survey nonetheless gives novel and rich perspective on how students make financial decisions. The validity of using our survey findings for assessing Title 3 rests on the assumption that sub-optimal behavior—especially among those who use cards—has not substantially worsened in the intervening years. We provide evidence for this assertion by comparing our survey to work from that period.

The survey reveals that students consider both cards and student loans to cover financial shortfalls, in the long term and for short-term emergencies. However, their choices are often inconsistent with optimal behavior set forth in our model. First, students who borrow on their card use it for predictable expenses, such as tuition and fees. Second, students who report a higher chance of emergency expenditure are more likely to say they would use a card to cover it. Third, a majority of students with credit card debt also have unclaimed liquidity on student loans. Moreover, while card use remains most popular among the more affluent, less affluent cardholders are more likely to carry card debt.

Tying specific departures from optimal choice to card debt, we find that borrowing on a credit card is most strongly associated with a low financial literacy. We measure this using the "Big Three" questions from Lusardi and Mitchell (2008). Students who answer two of the questions incorrectly were over twice as likely to owe on their credit card. Using the matched records, we also tie poor knowledge of one's own financial history to credit card borrowing.

In particular, students with unclaimed student loans who report in the survey they have none available are significantly more likely to borrow on their credit card. Knowledge of one's own behavior and the terms of debt, which we measure as the degree of discounting and knowledge of interest rates, were not associated with borrowing on a card.

To assess whether students benefited from Title 3 we derive welfare bounds from our model which we calculate using our survey evidence. We find that the policy raised overall welfare by nudging many students with liquidity needs away from card financing and into student loans. Three factors drive this result: (1) the likelihood of unplanned expenditures is high, (2) the relative price of credit card borrowing is also high, and (3) sub-optimal behavior is prevalent. Together, these factors undo any advantages that the flexibility of using a card brings. Moreover, consistent with our difference-in-difference findings, we calculate that students in the bottom quartile of the ZIP income distribution—for whom the substitution towards student loans is more pronounced—benefited most.

Finally, as a complement to our model based findings we estimate Title 3's effect on students' academic performance. We implement a new difference-in-difference design that leverages the heterogeneous effects on student loan balances described above. Our control group consists of students from the top ZIP income quartile, whose balances were unaffected. Relative to this control, final grade point averages of students from more modest communities rose by 2 percent after the rule. On-time graduation rates rose by nearly 10 percent. Though suggestive, this evidence is more direct and consistent with our previous results.

Our work relates to the literature on choice architecture (Thaler et al., 2014) and consumer financial regulation with heterogeneous consumers (Choi et al., 2003, 2005). Specifically, we contribute to work on spillovers and welfare from nudges (Beshears et al., 2022; Allcott and Kessler, 2019) and on multi-market effects of financial regulation (Melzer and Morgan, 2015; Di Maggio et al., 2020; Mezza et al., 2021). We also add to growing evidence on financial mistakes (Choi et al., 2006; Agarwal et al., 2009), borrowing on the wrong credit product (Agarwal et al., 2015; Ponce et al., 2017), and the underlying mechanisms that cause them (Stango and Zinman, 2009; Lusardi and de Bassa Scheresberg, 2013; Levy and Tasoff, 2016). Lastly, our paper expands on a literature evaluating the CARD Act generally (Agarwal et al., 2015; Keys and Wang, 2019) and Title 3 specifically Debbaut et al. (2016). It also lends insight into the levels of student debt (Avery and Turner, 2012; Goodman et al., 2021).

The remainder of our paper is organized as follows. Section 2 outlines the basis of Title 3, introduces our model, and ends by discussing the potential effects of Title 3 on choices and welfare. Section 3 describes our data. Section 4 presents our difference-in-difference results on student loan balances. Section 5 presents our findings from the matched survey. Section 6 assesses how the policy benefited students. Section 7 concludes.

2 Title 3 and Student Borrowing

2.1 Institutional Background and Motivation

The CARD Act of 2009 was a landmark legislation that had a profound and broad impact on the credit card industry. Title 3 of this law is comprised of 5 sections. Respectively, the sections (1) create new procedures for extending credit to young consumers, (2) shield the young from pre-screened credit offers, (3) control the marketing of cards on campus, (4) put in place privacy protections for college students, and (5) restrict agreements between card issuers and schools.

We focus on the fourth provision controlling marketing activities on campus (i.e., Section 304, see Appendix E for verbatim description). The rule prohibited lenders from offering "to a student at an institution of higher education any tangible item to induce such a student to apply or participate in an open end consumer credit plan" within 1,000 feet of a college campus. It further urged that institutions of higher learning "consider adopting the following policies ... (A) ... any card issuer that markets a credit card...notify the institution of the location at which such marketing will take place ... (B) ... the number of locations at which the marketing ... takes place be limited." These restrictions effectively eliminated the marketing of credit cards in and around any college campus, substantially altering how students considered cards without explicitly removing them as an option.[2] This alteration of choice architecture satisfies the classical definition of a nudge (Thaler and Sunstein, 2008).

Many of the CARD Act's most debated provisions, such as restrictions on upward re-pricing or over-the limit and penalty fees, were justified as a means to alleviate identified market failures (Ausubel, 2008; Nelson, 2017). The justification for Title 3 was less clear (Debbaut et al., 2016). Rather, the policy went into effect on the heels of numerous studies suggesting heavy credit card use among students may be leading to excessive debt for these young individuals (Warren, 2007).

These studies were mainly smaller scale surveys conducted at various small colleges around the country. Broadly, they highlight three themes related to student credit card use in the run up to the policy. First, students obtain cards mostly passively. Moreover, they frequently become indebted on them once obtained (Warwick and Mansfield, 2000). Second, this debt often arose from essential spending, including paying for tuition and fees (Robb and Sharpe, 2009), which can be done more cheaply with student loans. Third, a non-trivial portion of student cardholders were considered as financially-at-risk (Pinto and Mansfield, 2006). These students also reported higher levels of stress related to their credit

[2]Note, this did not per-se eliminate the sale of cards on campus. Banks with branches on campus could still offer cards to students, though its new restrictions still applied. Namely, banks were encouraged to notify the university of their activities, a practice likely already in place given the scope of operating a branch on campus. Branches were also restricted from offering any tangible gift to induce a student to apply for a card.

card debt (Norvilitis et al., 2006). Following these studies, our analysis provides a more comprehensive assessment of Title 3's impact on students borrowing choices and overall well-being.

2.2 The Student Borrower's Basic Trade-Off

We begin by characterizing students' borrowing decisions. Our analysis examines the link between a student's use of credit cards and her choice of student loans. These forms of credit are the two most commonly available to students. Our initial focus will be optimal borrowing behavior. This baseline characterization will be extended to include forms of limited rationality in the next section.

At the start of each year t, a student chooses how much to borrow on her credit card (b_t^c) and student loans (b_t^s) in order to cover necessary expenses during the semester. She is endowed with outside funds (w) and is burdened with existing card and student loan debt, b_0^c and b_0^s, respectively. A portion of her necessary expenditures are known at the year's start. However, some may arise unexpectedly. Denote her period utility of consumption (x) as

$$u_t(x) = \begin{cases} v_t(x - \underline{x}_t), & \text{if} \quad x_t \geq \underline{x}_t, \\ -\infty, & \text{if} \quad x_t < \underline{x}_t. \end{cases} \tag{1}$$

where v is a twice differentiable, increasing concave function. The term $\underline{x}_t$ represents subsistence consumption. Subsistence is stochastic and takes on values

$$\underline{x}_t = \begin{cases} h & \text{w.p.} \quad p, \\ \ell & \text{w.p.} \quad 1-p, \end{cases}$$

with $h > \ell$. A student's optimal choice of how to cover her expenditures can then be written as

$$\max_{b_t^s,\, b_t^c} \; U_t(x_t) = u_t(x_t) + \beta V_t((1+r^s)b_t^s + (1+r^c)b_t^c), \tag{2}$$

such that

$$\begin{aligned} \underline{x}_t \leq x_t &\leq w + (b_t^c - b_0^c) + (b_t^s - b_0^s), \\ 0 \leq b_t^c &\leq \overline{b}^c, \\ 0 \leq b_t^s &\leq b_0^s + \overline{b}_t^s. \end{aligned}$$

The function V_t denotes her expected (dis)utility of carrying debt into the future. It is decreasing in both terms, (weakly) concave and twice differentiable. The interest rate charged

on student loans and credit card debt is denoted by r^s and r^c, respectively. Moreover, $0 \leq r^s < r^c \leq 1$. Parameter $\beta \in (0,1)$ represents the per-period discount factor.

The first constraint in equation 2 is an accounting of consumption, liquidity inflows, and debt. To simplify notation, it incorporates subsistence ($\underline{x}_t$) as a consumption lower bound. The second ensures that the amount of credit card debt outstanding is non-negative and does not exceed the card's predetermined credit line. The third constraint limits student loan debt to be non-negative and within the amount available to the student.

In what follows, we focus on the case where a student has sufficient liquidity to cover her basic expenses. Inability to cover these essentials leads to extreme distress, which often means leaving school altogether. While dropout due to financial hardship is an important aspect of some student's financial experiences, it is not typical and remains outside the scope of our analysis. We further assume that a rational student gains little from borrowing to consume above subsistence, that is, $v_t'(0) \leq -\beta V_t(0)$.

Credit cards differ from student loans in an important way. Student loans are taken out at the start of each period, and interest accrues on the entire loan amount from the moment it is taken out. In other words, student loan borrowing choices are made prior to uncertainty being resolved, whereby some funds may remain unspent. In contrast, cards provide a line of credit. The student can decide how much to borrow on their card after learning about their expenditure needs, albeit at a much higher price.[3]

If all expenses are foreseeable, a rational student always prefers to pay for them with student loans. We can interpret taking out student loans to cover uncertain expenditures similarly to buying "insurance" against the need to borrow on a card at higher interest should the need arise. A student that faces risk over their need to borrow can choose to take out student loans and pay the lower rate with certainty. Alternatively, she may prefer to gamble and possibly not pay interest. She may also choose something in between.

Returning to the student's problem, note that for any initial debt $b_0 = b_0^c + b_0^s$ and endowment w, there are three key ranges to consider: (1) $w - b_0 > h$, (2) $\ell < w - b_0 < h$, (3) $w - b_0 < \ell$. In case 1, the student has sufficient endowment to cover all her debt and possible expenses. It is optimal for her to end the period with no debt accrued and having consumed her endowment less any debts repaid. In case 2, she will be indebted in the high state. In case 3, she will be indebted in either state.

Since student loans are less expensive, it is a dominant strategy for a student in need of debt to move any known expenses—whether previous debts or certain future shortfalls—to student loans. Financing uncertain shortfalls, however, is more complicated. Define such a

[3]We are not necessarily implying a student only uses her credit card for borrowing. She may use it as a method of payment, though never borrow on it. We do not model the value of cards for payments. Later, we will present evidence that students easily substitute towards other electronic payment methods, like debit cards, whereby regulating card use likely did not gravely impact students on this margin.

shortfall Γ as

$$\Gamma \equiv \begin{cases} 0, & \text{if} \quad w - b_0 > h, \\ h - (w - b_0) & \text{if} \quad \ell < w - b_0 < h, \\ h - \ell & \text{if} \quad w - b_0 < \ell. \end{cases} \tag{3}$$

As aforementioned, for each γ dollar of Γ a student can use student loans effectively as a form of insurance against having to borrow on her card. In other words, she can pay $\gamma \times r^s$ in both states h and ℓ in exchange for not paying $(r^c - r^s)(\Gamma - \gamma)$ when the state is h. It is useful to reformulate her problem as a choice over how much of her shortfall to insure against with student loans:

$$\max_{0 \leq \gamma \leq \Gamma} v_t(0) + pV_t((1+r^s)(b_0+h-w)+(r^c-r^s)\cdot(\Gamma-\gamma))+(1-p)V_t((1+r^s)(b_0+\ell-w)+r^s\cdot\gamma) \tag{4}$$

The following characterize conditions under which borrowing on a credit card is optimal:

Proposition 1 *Suppose $w - b_0 < \ell$ (Case 3). There exist two probability thresholds, p_1 and p_2, where $0 < p_1 \leq p_2 \leq \frac{r_s}{r_c}$ such that*

1. *For $p \geq p_2$, the student covers her shortfall only with student loans (she fully insures),*
2. *For $p_1 < p < p_2$, the student partially insures against having to borrow on her card,*
3. *For $p < p_1$, the student covers her entire shortfall with a credit card.*

Proof. See Appendix. ■

Corollary 1 *Suppose $\ell < w - b_0 < h$ (Case 2). Then there exist similar probability thresholds to Case 3, p_1' and p_2' $0 < p_1' \leq p_2' \leq \frac{r_s}{r_c}$.*

Proof. See Appendix. ■

Corollary 2 *The statements $p_1 = p_2$, $p_2 = \frac{r_s}{r_c}$, and V_t is linear are equivalent.*

Proof. See Appendix. ■

The likelihood of a shortfall and the relative price of student loans emerge as principal determinants of whether it is optimal for students to borrow on their card. When shortfalls are sufficiently unlikely, taking out a student loan to cover uncertain expenditures is sub-optimal. Assuming students are not risk-loving, the likelihood of a shortfall that justifies borrowing on a card is never higher than the ratio of r_s and r_c.

The state, or levels of indebtedness and endowment, also influences the choice to borrow on a credit card. If absolute risk aversion is non-increasing in endowment, students with more

debt are less likely to take their chances and rely on their credit card to cover a shortfall. The same applies to students with fewer financial resources. Proposition 2 and Corollary 3 in Mathematical Appendix A provide statements and proofs of these claims.

2.3 Departures from Optimal Behavior

Title 3 was largely justified on grounds that students do not use cards optimally. Having characterized optimal behavior, we now discuss departure from it. Specifically, we outline card use under four types of sub-optimal behavior cataloged in (Campbell, 2016). These types are (1) lack of knowledge on the terms of debt, (2) poor understanding of financial concepts, e.g. financial literacy, (3) poor knowledge of one's own financial history, (4) poor knowledge of one's own behavior.[4]

Knowledge of Financial Concepts and Contract Terms: A student who is not aware of contract terms in credit cards and student loans optimizes under incorrect beliefs about their relative prices. Similarly, students who do not understand how interest compounds over time, or other financial concepts, may underestimate the cost of borrowing on their credit card. In the extreme, they optimize under the assumption that $r_s = r_c$. Under this misperception, the inequalities in Proposition 1 imply that, for any $p \in [0, 1)$, borrowing on credit cards is the better option.

Knowledge of One's Own Financial History: In this case, the student is not fully aware of her own past choices. We consider an individual with incorrect beliefs about available student loans who thinks she has maxed out on her student loans when in reality she is still under the limit. When her beliefs over available liquidity are incorrect, she may simply borrow on her card because she is unaware that she can take out student loans. In the context of Proposition 1, this student will behave as if the cost of student loans were prohibitively high. In this case the student will always choose to cover a shortfall using her credit card rather than taking out more in student loans.

[4]The taxonomy of Campbell (2016) includes five types of "financial ignorance." We left out ignorance of incentives, strategy and equilibrium, which refers to taking into account how the incentives of sellers can influence the information they provide. We also modify the definition of ignorance of financial history. The original definition refers to individuals not using all available historical data to form views about likely returns of alternative investment strategies, and instead relying only on their own personal experiences. In our context, we modify the definition to reflect lack of awareness about own historical experiences, specifically, poor knowledge about previous financial decisions.

Knowledge of One's Own Behavior: This concept can be summarized using the model of naive present-biased behavior (O'Donoghue and Rabin, 1999).[5] Individuals have self-control problems of which they are not aware. Such a student will get a credit card thinking that she will be able to use it optimally, but will overspend. She will choose a form of debt based on the inequality in Proposition 1, but then incur additional borrowing on her card regardless of the state. The behavior of this student will be optimal only if, by chance, the available credit on her card coincides with the her liquidity needs and the likelihood of such a shortfall is sufficiently low—such that relying on her credit card is warranted.

2.4 Restricting Cards: Choices and Welfare

While the policy did not restrict card use, it nudged students away from cards – some of whom may have otherwise benefited from their use. We consider how a student whose option to use a card is "taken away" fares as a result. In actuality, some students stopped using a credit card while others did not. We incorporate this partial compliance into our empirical assessment of welfare in Section 6.

Proposition 1 characterizes the conditions under which a student who needs liquidity optimally borrows on their credit card. Without a credit card, she would have to entirely rely on student loans to cover any shortfall. This effectively forces her to "fully insure" against the higher rate when she may optimally prefer not to do so. Here we characterize how a student's well-being changes in the event she no longer has access to a credit card. Denote a change in her welfare by

$$\Delta W^{st} = W^{st}_{(\text{without a credit card})} - W^{st}_{(\text{with a credit card})} \ ,$$

where st refers to a student-type. From above, types include students who makes decisions optimally, lack knowledge of financial concepts or terms on their debt, are unaware of their own financial history, or lack understanding of their own behavior.

When students choose optimally, restricting their choices cannot improve their well-being. For students who do not require additional liquidity, e.g., case 1 above, or for whom the likelihood of h is sufficiently high, restricting card use has no effect on welfare. However, students that would have utilized a credit card, i.e., those for whom the inequality $p > p_2$ in Proposition 1 was not satisfied, now must to take out additional student loans to satisfy subsistence. This is preferred only if the high state occurs. The welfare change for these

[5] A student can also be aware of her self-control problems, or be a sophisticated present-biased type. Such a student will commit to no credit card debt by never carrying a credit card in the first place.

students that make decisions optimally (*opt*) is

$$\begin{aligned}\Delta W^{opt} &= (1-p)\cdot[V_t((1+r^s)\gamma(\ell)+r^s\Gamma)-V_t((1+r^s)\gamma(\ell)+r^s\gamma^*)]+\\ &\quad p\cdot[V_t((1+r^s)\gamma(h))-V_t((1+r^s)\gamma(h)+(r^c-r^s)(\Gamma-\gamma^*))] \qquad (5)\end{aligned}$$

where $\gamma(\ell) = b_0 + \ell - w$ and $\gamma(h) = b_0 + h - w$. As shown in equation 5, a decline in the rate difference between cards and student loans or a lower probability of h occurring would increase the welfare losses associated with the policy.

For students who are ignorant of terms or financial concepts (*br*), taking away the credit card option will also lead to more student loan borrowing. Further, since the model predicts this type will borrow on a card regardless of p, such a policy should raise their demand for student loans. Nevertheless, not all students of this type will be better off without a card.

Students for whom the inequality $p < p_1$ in Proposition 1 is *actually* satisfied will endure welfare losses similar to the optimal case. Students who are mistakenly borrowing on their credit card, or for whom the inequality is not in actuality satisfied, will benefit. The welfare change of this type is

$$\begin{aligned}\Delta W^{br} &= (1-p)\cdot[V_t((1+r^s)\gamma(\ell)+r^s\Gamma)-V_t((1+r^s)\gamma(\ell))]+\\ &\quad p\cdot[V_t((1+r^s)\gamma(h))-V_t((1+r^s)\gamma(h)+(r^c-r^s)\Gamma)]. \qquad (6)\end{aligned}$$

As indicated in Equation 6, the policy necessarily raises welfare when $p > \frac{r^s}{r^c} \geq p_2$, and would reduce it when $p < p_1$. This means that welfare effects for this student type depend on the likelihood of a high state for that student.

Students that are unaware of their financial history and have mistaken beliefs about their available credit options behave similarly to those who are ignorant of financial concepts. Reducing their access to credit cards can nudge them towards finding funds elsewhere. The most obvious next place would be student loans. This would lead to more student loan borrowing among this type. Moreover, since this type always uses a credit card to cover a shortfall, regardless of p, the welfare calculation is similar to that of students who don't know prices or internalize the cost of credit (equation 6). The effect of reducing card access on student loan debt should be larger than under optimal behavior. Using a similar argument to that above, eliminating the credit card option can hurt students of this type for whom $p < p_1$ in Proposition 1. However, if many are mistakenly borrowing on their card, the net effect is likely positive.

Eliminating the card option for a present-biased student (*pb*) also raises their demand for student loans. Such a student makes decisions ex-ante correctly based on the optimal allocation (e.g., γ^*) only to fail to stick to their plan afterwards. Students that would have chosen to take their chances on a card will instead rely on student loans. It follows that the

policy (weakly) raises welfare for the naive present-bias types, many of whom borrow the same total amount but now pay less for this debt. Their gain in welfare will be

$$\Delta W^{pb} = V_t((1+r^s)\gamma(h)) - V_t\left((1+r^s)\gamma(h) + (r^c - r^s)(\Gamma - \gamma^*)\right) \tag{7}$$

or the rate differential scaled by difference in subsistence levels. Note that this value is unaffected by changes in p because these agents consume at the high state level regardless of state realization. The policy directs them to finance this consumption using student loans rather than credit cards, and they are unambiguously better off.

Finally, students who have a high endowment and thereby do not face any liquidity shortfall, e.g., students who fall into case 1 described above, would not need to borrow under any circumstance. For the purposes of a means of debt financing, limiting credit card access has no material effect on these students.[6]

3 Data

Our empirical analysis uses two related sources of data. First, to document spillovers from the CARD Act's Title 3 onto the student loan market, we use administrative data of students' borrowing records from a large public university in the United States spanning the years before and after the policy went into effect. Second, to shed light on the mechanisms underlying a spillover, we administer a survey to current students in this University, which we then match to their student records.

3.1 Administrative Records

The administrative data comprise all students' borrowing records from a large public university in the United States. These data track students' borrowing across several student loan types (e.g. Direct/Perkins/state/private) for each semester in which they are enrolled. Borrowing choices are also matched to demographic and academic variables that include race, gender, semester of first enrollment, and number of credit hours attempted/completed each semester. The data also include the ZIP code for each student's permanent address on file. Using this geographic information, we complement the borrowing data with socioeconomic statistics from the 2011 and 2015 waves of the American Community Survey (ACS).

[6]We acknowledge that cards are also valuable as a method of electronic payment. However, as we show below, our survey responses indicate that students easily substitute into other forms of electronic payment, such as debit cards. It is also the case that cards can be useful for building a credit profile, which can be valuable for obtaining other forms of credit later on in life. To the best of our knowledge, there is not evidence that limiting access to cards for young adults has any effect through this channel (see Section 6.3). Moreover, for students from wealthier backgrounds this likely matters still less.

Our baseline estimation sample is constructed as follows. First, we restrict our attention to students who are first enrolled in the fall semester, eliminating students who join in mid-year or during the summer. Second, we include only students enrolled on or after the Fall of 2005, the first semester of available data. This ensures we have a full borrowing history for each student in our sample. Third, we focus on borrowing decisions of freshmen, sophomores, and juniors. Specifically, we identify a student's class based on the number of semesters since first enrollment.[7] Students are flagged as freshmen if they have been enrolled for at most 3 semesters, students are flagged as sophomores if they have been enrolled for 4 to 6 semesters, and students are flagged as juniors if they are enrolled for 7 to 9 semesters. Finally, we restrict attention to "full-time" students, which we define as students who attemp at least 12 credits (a full time load) in a given semester, excluding summer terms from our sample.

The period of analysis is determined as follows. The pre-reform period spans from Fall 2007 to Spring 2009, inclusive. We start in Fall 2007 to ensure we have freshman, sophomores and juniors in each semester. The end date, Spring 2009, is the last semester prior to the implementation of Title 3, Section 304. The post-reform period spans from Fall 2011 to Spring 2013, inclusive. We drop semesters between Fall 2009 and Spring 2011 because the effects of Setion 304 on student loan balances are unclear; in other words, these students are ambiguously treated (see Section 4 for more detail). The last semester in the post-reform period, Spring of 2013, constitutes the final semester prior to the implementation of the Moving Ahead for Progress in the 21st Century Act (MAP-21) (Public Law 112-141), commonly known as the 150 percent rule.[8]

The 150 percent rule limits the time during which students are eligible for subsidized Direct loans to 150 percent of a borrower's education program (e.g. 6 years for a 4 year degree). Two nuances of the rule interact considerably with our analysis of Title 3. First, the imposition of a time limit also meant that students could not forgo taking out subsidized loans to extend their eligibility period. From a practical standpoint, this led to a change in policy within the financial aid office at the university. After the rule went into effect, the office implemented new standards to ensure all subsidized loans were exhausted prior to any other loans being taken out. This forced change of allocations no doubt led to other changes in student borrowing choices which go beyond Title 3 and the scope of this paper. Second, the rule applied only to first time borrowers, who are disproportionately freshmen. As a result, it likely affected borrowing decisions of freshmen, our control group, differently from those of continuing students, our treatment group.

[7] We explain this further below in our description of the identification strategy.

[8] Note that the law came into effect on July 1, 2013. However, through our conversations with the financial aid office, it became clear that nearly all financial aid decisions for the 2013-2014 academic year were made prior to this date. As a result, the rule was not fully implemented until the 2014-2015 academic year.

Table 1 shows summary statistics for our entire sample, and separately for incoming freshmen and continuing sophomores and juniors. In any given semester, 61 percent of students in our sample file a free application for student aid (FAFSA). About half of those, or 35 percent overall, take out a student loan. The average loan amount for borrowers is about \$3,750 ($\approx \frac{1,280}{0.34}$). Demographically, our sample is well balanced by gender, and

Table 1: Summary Statistics for Administrative Records

	All Students		*Freshmen*		*Returning*	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev
	(1)	(2)	(3)	(4)	(5)	(6)
Total Amt. Borrowed	1,280	2,161	1,113	1,969	1,380	2,262
% Borrowing	34.88		34.21		35.28	
% Filed FAFSA	60.92		71.21		54.78	
% Male	50.04		49.95		50.10	
% Minority	31.30		33.38		30.06	
GPA	3.04	0.57	2.99	0.64	3.07	0.52
Median Income (ZIP Code)	69,167	30,170	68,491	30,104	69,571	30,202
% Below Poverty Line (ZIP Code)	10.10		10.34		9.96	
% No College (ZIP Code)	24.81		25.60		24.34	
Observations	215,913		80,790		135,123	
Unique Students	70,558		41,487		29,071	

***Notes**: This table shows summary statistics for the students in our administrative data. Information about loan amounts, FAFSA, gender, race, class and GPA is taken from administrative records. Information at the ZIP code level (median income, % below poverty line and % without college) is taken from the American Community Survey, based on ZIP code of permanent address for each student, according to university records.*

more weighted toward students who self report as white ($\approx 69\%$). From the matched ACS data, note that the typical student lists a permanent ZIP with median household income of \$69,197, in which one-in-ten households are below the poverty line, and in which one-in-four household heads did not attend college. Further, freshman and returning students, sophomores and juniors, are for the most part quite similar on these characteristics. In all, our final sample consists of 70,349 students who make up a total of 215,277 student-semester observations.

3.2 Survey Matched to Administrative Records

Our survey was administered online during Spring 2021 to all full time sophomores and juniors, our underlying population of interest. Each student that responded received a \$5 gift card for their participation. The survey is broadly divided into three parts. In the first, we ask students about their experiences with credit cards. We begin by asking whether they

have a card. For those that do not, we ask why they do not have one. We then ask them about their knowledge of terms on their card, for what purposes they use their card, and their borrowing activity.

The second part focuses on student loans. Respondents are asked if they took out any loans and if they chose to accept all funds offered to them. Just as for cards, we ask respondents for their knowledge of terms on their student loans. For students that chose not to take out any loans or rejected some, we inquire as to why they made that choice. The match to student records allows us to explore how survey responses compare to students' administrative records. Thus our analysis also examines how accurately students perceive their financial situation, and what this implies for their decision-making.

In the final part, we explore students' experiences with unexpected (emergency) expenditures and the financial tools they use to address them. We also assess respondents' degree of financial literacy and preference for current relative to future consumption. Our financial literacy questions come directly from Lusardi and Mitchell (2008). We also utilize a binary-choice, multiple price list to elicit parameters of exponential discounting (originally from Coller and Williams, 1999). This allows us to tie students' use and knowledge of credit cards and student loans to their perceived liquidity needs, their understanding of financial concepts, and their stated valuation of future consumption.

Out of 18,238 students invited to participate, 1,577 ($\approx 8.6\%$) responded. Of these, 1,506

Table 2: Survey Sample Statistics

	Survey Respondents		*All Students*	
	Mean	Std. Dev.	Mean	Std. Dev.
	(1)	(2)	(3)	(4)
Total Amt. Borrowed	1,006	1,935	951	1,983
% Borrowing	27.42		24.83	
% Filed FAFSA	74.24		60.97	
% Male	39.84		53.37	
% Minority	49.40		42.35	
% Junior	58.50		59.98	
GPA	3.43	0.47	3.30	0.52
Median Income (ZIP Code)	69,167	30,1670	68,491	30,104
% Below Poverty Line (ZIP Code)l	8.50		8.06	
% No College (ZIP Code)	23.06		21.08	
Observations	1,506		18,238	

Notes: *This table shows summary statistics for the students who were invited to participate in our survey. Information about loan amounts, FAFSA, gender, race, class and GPA is taken from administrative records. Information at the ZIP code level (median income, % below poverty line and % without college) is taken from the American Community Survey, based on ZIP code of permanent address for each student, according to university records.*

(95.4%) of students completed the survey. Their responses were matched to administrative school records. Our final sample is comprised of survey responses and school records from 1,506 students. Table 2 presents summary statistics for the survey sample and compares these to the population of interest. As compared to the full population, survey respondents are more likely to apply for financial aid. However, they are only slightly more likely to take out student loans. Respondents are more likely to be female students, with a higher GPA, who identify as a minority (non-White) student. They are also slightly more likely to hail from lower income communities with lower levels of education. Broadly, our survey sample is comprised of students from more modest means who are more likely to identify as female and/or a minority.

4 Title 3 and Student Loan Borrowing

4.1 The Impact of Title 3 on Student Loan Debt

Here we document Title 3's effect on student loan borrowing. We identify Title 3's effects on student loan borrowing by exploiting differences in how Title 3 applied to incoming freshmen vs. continuing sophomores and juniors. As aforementioned, the CARD Act severely limited lenders' presence on campus, and their interaction with students more broadly. This limited access and exposure to cards for continuing students, though much less so for incoming freshmen. Both before and after Title 3, newly incoming freshmen would have not yet been exposed to cards on campus when making their student loan choices.

With this in mind, we use incoming freshmen as our control group. Sophomores and juniors, who are continuing students, are treated. We exclude seniors from our analysis because they are mostly over 21 years old and thus were affected differently by the policy. In addition to Title 3, the CARD act required borrowers under 21 to provide proof of income and/or have an adult cosigner when opening a card, rules not applying to many seniors. Thus, including seniors may confound the effect of Title 3 with these latter provisions of the law. We do not encounter this issue when comparing freshmen to sophomores and juniors, the vast majority of whom are under 21.

Our pre-reform period spans Fall of 2007–Spring 2009, and our post-reform period spans Fall 2011–Spring 2013, inclusive. We drop the two academic years following the reform to eliminate confounding effects from ambiguously treated students. We consider the treatment ambiguous for two main reasons. First, during the 2009–2010 and 2010–2011 academic years, returning sophomores and juniors no longer had access to cards on campus. However, these students did have access to cards during the 2008–2009 academic year, when they were freshmen and/or sophomores. Most surveys of college students (including our own) indicate

among students who acquire a credit card before 21, the first card is disproportionately acquired in the freshman year with much smaller incidence of take-up in sophomore and junior years.

Second, financial aid packages are structured and agreed to months in advance of the relevant college semester. Title 3 was implemented at the start of 2010 and the earliest evidence of the decline in credit card holders under 21 is apparent in Q42010 (Debbaut et al., 2016). Even an instantly-reacting financial aid office who notes this disparity on January 1, 2011 would not have been able to alter financial aid packages for Spring 2011. Thus we refer to these students "ambiguously" treated. While these populations may be gradually adjusting their holdings of credit cards, it is not clear if their financial aid packages are reactive enough to their needs.[9]

Before proceeding, it is important to acknowledge that the policy coincided with the financial crisis that led to the Great Recession. In Section 4.2, we provide evidence in support of the argument that our design in fact distinguishes between effects of the CARD Act and the crisis. Specifically, we address confounding effects from the three most important channels by which the recession might have affected student loan debt: (1) expectations about post-graduation outcomes, (2) changes in home wealth, and (3) differences in the types of students attending college. We further show that our results are likely not driven by changes in student loan limits or length of the observation period.

We estimate effects on the likelihood of taking out a student loan (p) and overall balances (b) at the student-semester level. Our main econometric specification is as follows:

$$y_{i,s}^k = \alpha_{s,q}^k + \alpha_c^k + \sum_{s=F06}^{F08} \beta_s^k \mathbb{1}(cont.)_{i,s} + \sum_{s=F11}^{Sp13} \beta_s^k \mathbb{1}(cont.)_{i,s} + \gamma^k X_{i,s} + \epsilon_{i,s}^k, \tag{8}$$

for student i in semester s, where $k \in \{p, b\}$. The term $\alpha_{s,q}^k$ is a semester (s) by income quartile (q) fixed effect. This accounts for differences in borrowing trends of students from different income backgrounds. The term α_c^k is a fixed effect for each class (c) (e.g. freshman, sophomore, junior). The term $\mathbb{1}(cont.)$ takes the value one for continuing students in semester s, and zero otherwise.[10] As a result, corresponding coefficients β_s^k denote the difference-in-difference effects. Our omitted semester is the Fall of 2009 (F09), the most recent start of academic year term prior to Title 3. Vector X_{is} of control variables includes race, gender, in-state status, and financial aid application status. Allowing treatment coefficients β_s^k to evolve non-parametrically semester-by-semester, we simultaneously test the identification

[9] Our logic is similar to Bailey et al. (2021), who omit children aged 6 in their even study design of on the effects of *HeadStart* on long term outcomes. They argue students of that age are similarly ambiguously treated.

[10] More specifically: $\mathbb{1}(cont.) = \mathbb{1}(c \neq \text{freshman}) \times \mathbb{1}(semester = s)$

assumption and study the timing of response to the treatment. We also report the average effect over the entire post period, β^k.

Figure 1 plots our estimated response coefficients (β^k) from equation 8. The left panel

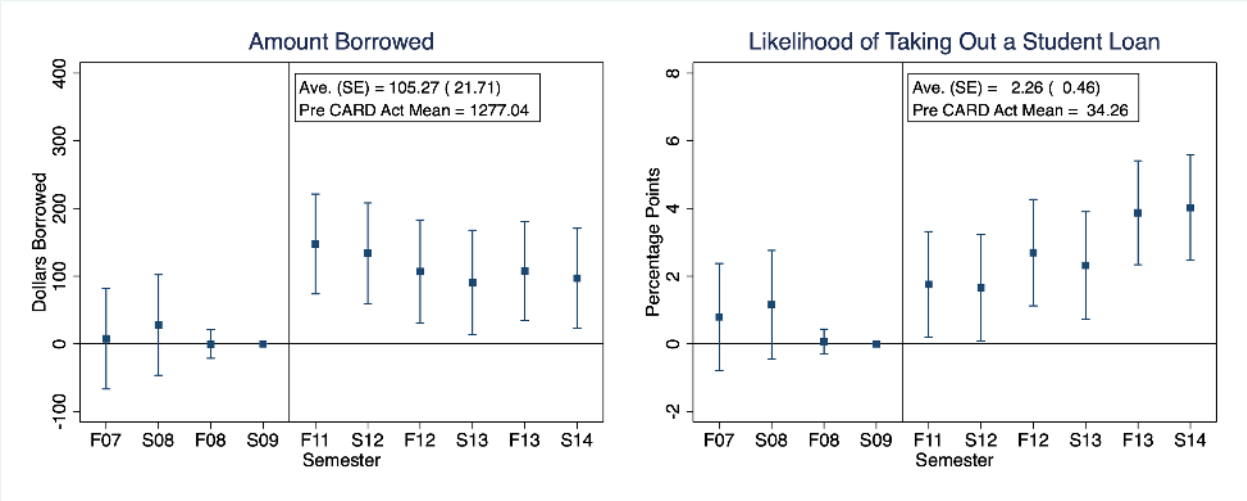

Figure 1: Effects of Title 3 on Student Loan Borrowing

Notes: *The figure plots coefficients (β_s) from equation 8. The left panel shows the amount of student loans borrowed (b). The estimation sample includes all students, even those that did not take out student loan debt. The right panel plots the likelihood of taking out a student loan (p). The estimation controls for gender, class in school, in state status, identified minority, and whether a FAFSA application is filed. It further includes semester by ZIP income quartile fixed effects. Confidence intervals shown are constructed using standard errors clustered by student.*

shows the policy's impact on the amount borrowed, including students who borrow and those who do not. Prior to Title 3, there is no significant difference in borrowing trends between incoming and continuing students. Afterwards, we observe significant rise in borrowing among continuing students. On average, the policy raised student loan borrowing by \$105.27. This amount is just over 8 percent of the pre CARD Act baseline. Title 3 also increased the likelihood of taking out a student loan. As shown in the right panel of Figure 1, the policy raised this likelihood by 2.26 percentage points, or $2.26/34.25 \approx 6.6$ percent. As with the amount borrowed, prior to the policy, we observe no significant difference in propensity trends for incoming and continuing students. Moreover, the effect persists throughout the three year post window.[11]

Our model also predicts substantial heterogeneity in how the policy affects different groups of students. In particular, it suggests students from more vulnerable, less affluent, economic backgrounds are more affected than students with more means. Such students are more likely to have low resources and require liquidity to cover spending shortfalls, $\Gamma > 0$.

[11]How important is this higher propensity on the overall treatment effect? Consider the following decom-

Moreover, to the extent that sub-optimal behavior is more prevalent among students from more modest economic backgrounds, we would expect the rule to have a still greater effect on these lower income groups.

We explore heterogeneous effects of the policy using ZIP level statistics from the matched ACS data and estimate the following triple difference specification:

$$y^b_{i,s} = \alpha^b_{s,q} + \alpha^b_c + \beta^b_1 \mathbb{1}(cont.,\, post)_{i,s} + \sum_{q=2}^{4} \beta^b_q \mathbb{1}(cont.,\, post)_{i,s} \times \mathbb{1}(Qtr_k = q)_i + \gamma^b X_{i,s} + \epsilon^b_{i,s}. \quad (9)$$

The terms $\alpha^b_{s,q}$, α^b_c, and $X_{i,s}$ are as in equation 8. The term $\mathbb{1}(cont.,\, post)_{i,s}$ takes a value of 1 for continuing students in the post period and zero otherwise. The term $\mathbb{1}(Qtr_k = q)_i$ takes a value of 1 for students in quartile $q = \{2, 3, 4\}$ of ZIP median income.

The right hand panel of Figure 2 reports our triple difference results highlighting the heterogeneous response by family income. The figure indicates that Title 3's effects on student loan borrowing are concentrated among students from low income neighborhoods. For students listing their permanent address in a ZIP code at the bottom quartile of the family income distribution, Title 3 led to a $\frac{227.20}{1{,}442.26} \approx 15$ percent rise in student borrowing. As before, to put the magnitudes in perspective, we note that 44% of students take out a positive amount of student loans on any given semester after the CARD Act, and as such, the average effect on those who borrow is in the order of \$499.90. Among those listing their permanent address in a zip code at the top quartile, there is no discernible effect.[12]

Broadly, the above constitutes a significant spillover of Title 3 onto the market for student loans, particularly among students from less affluent backgrounds.

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position: $p_{post} \equiv p_{pre} + \beta^p$ and $\mathbb{E}_{post}[b] \equiv \mathbb{E}_{pre}[b] + \beta^b$. Then,

$$\begin{aligned}
\beta^b &= \mathbb{E}_{post}[b] - \mathbb{E}_{pre}[b] \\
&= p_{post}\mathbb{E}_{post}[b|b>0] - p_{pre}\mathbb{E}_{pre}[b|b>0] \\
&= (p_{pre} + \beta^p)\mathbb{E}_{post}[b|b>0] - p_{pre}\mathbb{E}_{pre}[b|b>0] \\
&= \underbrace{p_{pre}(\mathbb{E}_{post}[b|b>0] - \mathbb{E}_{pre}[b|b>0])}_{\Delta \text{ Amount}} + \underbrace{\beta^p \mathbb{E}_{post}[b|b>0]}_{\Delta \text{ Propensity}}
\end{aligned}$$

If we use $\hat{\beta}^p = 0.0226$, $\hat{\beta}^b = 105.27$, $\hat{p}_0 = 34.26\%$, and $\hat{b}_0 = \$1,277.04$, we calculate that the greater propensity to borrow and the increase in amount borrowed respectively account for about 81 and 19 percent of the overall rise in student loan balances resulting from Title 3. In other words, a majority of the policy's overall effect on balances can be attributed to a higher propensity to take out student loans. Of course, we have taken liberty with some identification restrictions here (namely, the independence of β^b from $\mathbb{E}_{post}[b|b>0]$ which implies that new and existing borrowers reach the same level of debt as a result of the treatment). Thus we cautiously present this calculation for illustrative purposes only.

[12] This pattern is similar when partitioning the sample by parental education. Though correlated, these two measures are by no means collinear. The correlation coefficient between these two is about 70 percent. Though, in this latter case the policy's impact on student borrowing is even more concentrated among students hailing from communities with fewer college educated adults: $\frac{283.94}{1{,}449.82} \approx 20$ percent.

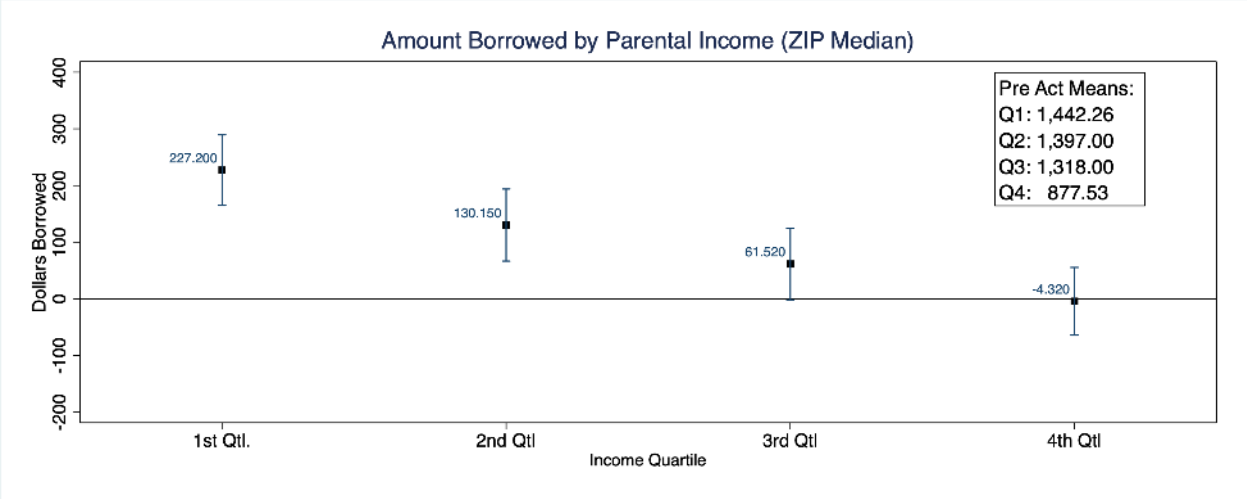

Figure 2: Heterogeneous Effects by Family Income (ZIP Median)

Notes: *The figure plots coefficients (β_q) from equation 9. The estimation controls for gender, class in school, in state status, identified minority, and whether a FAFSA application is filed. It further includes semester by ZIP income quartile fixed effects. Confidence intervals shown are constructed using standard errors clustered by student.*

4.2 Alternative Explanations and Robustness

The Financial Crisis and Labor Market Expectations Enactment of the CARD Act coincides with an unprecedented financial crisis, which likely influenced student loan borrowing decisions. The crisis may have affected student expectations of labor outcomes after graduation, which may align with our difference-in-difference findings. This channel could potentially drive differences in student loan balances for incoming and returning students before and after 2009. We explore this possibility as follows.

As their graduation date approaches, students' form more informed and precise expectations about their job market prospects. To the extent that our results are driven by these expectations, we would expect the treatment effects to be stronger if restricted attention to continuing students who are closer to graduation. In Appendix B.2 we repeat the analysis in equation 8 limiting the treated group to only sophomores or only juniors. We find that in both cases the results are qualitatively the same. If anything, the results seem weaker for students closer to graduation. This suggests that changes in expectations about labor outcomes are unlikely to be driving our results about increases in borrowing.[13]

[13]It is also possible that the financial crisis limited employment opportunities for students during college, which may have influenced their borrowing decisions. Returning students, who are more familiar with the college environment and may be returning to an existing job, would likely be less affected. We would thus expect a decline in employment opportunities during college to attenuate borrowing differences between freshmen and returning students rather than be a driver of our results.

The Financial Crisis and Home Equity Another channel by which the financial crisis may be driving our results is through its effects on home values: it may have reduced the ability of families to use home wealth to finance college education (Amromin et al., 2016). However, a decline in home equity is unlikely to be driving our results since that mechanism would affect incoming and continuing students with the same intensity. Our identification strategy, which controls for secular changes in borrowing choices, relies on differences in trends between these two groups of students. This specification works to mitigate potential confounds affecting the economy as a whole.

The Financial Crisis and the Composition of College Students Increases in student loan balances between continuing and returning students over time could in principle be driven by compositional changes in students choice of major. Those who select majors with higher expected returns could also choose to carry larger student loan balances. However, our results on academic performance do not support this view. While students coming from low income ZIP codes exhibit a significantly large increases in student loan balances (Figure 1), we do not find any evidence that these increases were accompanied by changes in the probability of enrolling in a more lucrative major (see Figure 3 below). We conclude this explanation is an unlikely driver of our spillover results.

It is also possible that the characteristics of students enrolling or dropping-out of college changed before and after 2009. We note that our main analysis uses a rich set of covariates including quartiles of ZIP code level income, gender, in-state status, dummies for minorities and whether or not a FAFSA application was filed. As a result our coefficients are estimated by comparing students in treatment and control groups over time, while keeping their observable characteristics fixed. In addition, we include semester by income quartile fixed effects which control for the differential impact that the financial crisis, and the passing of time, could have on individuals coming from different ZIP codes and socioeconomic backgrounds.

To further rule out compositional effects along unobserved variables when comparing incoming students to returning students, we complement our main results with an alternative specification that includes individual fixed effects. This approach identifies the effect of the regulation by comparing borrowing decisions of the same student as an incoming freshman vs. a returning student. Students with year of first enrollment on or after 2010 experience college during the post-treatment period since they are not exposed to credit cards on campus while in college.[14] Figure B4 reports these results. Consistent with our main specification,

[14]Specifically, we estimate the following equation.

$$y^b_{i,s} = \alpha_i + \alpha_s + \sum_{YFE=07}^{10} \beta_{YFE} \mathbb{1}(cont.)_{i,s} + \epsilon_{i,s}, \tag{10}$$

we find positive and significant increases in student loan borrowing close to $100.[15]

The Financial Crisis and Credit Supply The financial crisis affected the supply of credit as well. Non-parametric time effects included in our design allow us to distinguish between the impact of Title 3 and secular changes in credit supply. Notably, as documented in CFPB (2013) and Agarwal et al. (2015), a great deal of the supply side effect was in the draw down of credit limits for existing users, who are outside the scope of this analysis. One aspect of Title 3, which may have interacted with the crisis, is the establishment of ability to pay (ATP) rules for young users.[16] This may have affected borrowing choices for students who applied but were denied cards based on these new ATP rules.[17] The crisis may have affected ATP for continuing students differently from freshmen in a manner which may account for our results.

We explore the potential impact of this channel by exploiting administrative data on students' adjusted gross income (AGI).[18] These are available for individuals who filed a FAFSA to obtain financial aid. We run a similar specification to Equation 9 with an indicator for a student having positive AGI and also for the AGI amount as dependent variables. The results of this analysis are in Figure B6 of Appendix B. Overall, we find no evidence of relative changes in AGI before and after the policy, on both intensive and extensive margins.

The terms α_i and α_s are fixed effects for each student and semester. YFE stands for the year of first enrollment. The term $\mathbb{1}(cont.)$ takes the value one for continuing students in semester s, and zero otherwise. As a result, corresponding coefficients β_{YFE} denote the difference-in-difference effects across students with different year of first enrollment, as incoming or continuing students.

[15]We note that, while this within student variation is in principle attractive because it avoids the confounding of unobserved student characteristics as they progress through college, it has several drawbacks. First, treatment status, which depends on whether a student is entering or continuing is jointly determined with the year of first enrollment and with the calendar (or semester) dummies. This leads to an under-identification problem similar to the well known age-cohort-time problem. This is because equation 10 includes both individual and calendar time fixed effects. As a result we are only able to identify one pre-treatment coefficient, limiting our ability to evaluate if pre-treatment trends are parallel. In addition, since the same student needs to be observed as a freshman, sophomore and junior, we are left with observations from students who first enrolled on or before 2010. We are forced to throw away substantial amounts of data, limiting statistical power. Finally, while students that enrolled in 2010 are fully treated, in the sense that they were not exposed to credit cards on campus while enrolled in college, it is possible that they may have interacted with more senior students that were exposed to credit cards on campus before the card act, thus biasing downwards the coefficient for that year. For these reasons, we use the fixed effects approach for robustness purposes and not as our preferred specification.

[16]Rule 51(b) (1026.51(a)(2)(ii)(B)(1)).

[17]This is a distinct channel from the nudge. For ATP to become relevant, students would have had to apply for cards. ATP rules are known only to the lender. Moreover, the implementation of these was not highly touted in the media. It was likely not a deterrent to seeking out cards for our population. As we show in Section 5 below, only a minority of students did seek out a credit card because of a belief they would not qualify.

[18]Note, this is what students report as their own earnings. Importantly, ATP rules mandate lenders scrutinize students' independent ability to pay, e.g. their own income. It is important to note that lenders could not then nor can they now, consider future income explicitly for the purpose of satisfying ATP rules.

Continuing students' are more likely to have positive AGI, and higher AGI on average. However, the difference between continuing students and freshmen, on both margins, remains stable over time. This holds across all four Zip income quartiles. We conclude that the supply side channel via enforced ATP rules is likely not driving the results of our analysis.

Changes in Student Loan Limits Student loan limits have been shown to have a significant impact on student loan levels (Black et al., 2020). Table B1 reports student loan limits by class throughout our analysis period. There are no changes in the limits of subsidized loans during this time. In the fall of 2008 limits for un-subsidized loans increased by $2,000. However, this increase applied to all students (freshman, sophomores, juniors, and seniors) equally. Since identification relies on differences in borrowing responses of incoming freshman and returning students before and after 2009, it is unlikely that our results are driven by changes in student loan limits: these affected both treatment and control groups, and took place in the pre-treatment period. We also note that across all periods and classes, 99% of students who take out un-subsidized loans accept amounts corresponding to 86% of their limit, or less.

Definition of Post-treatment Period Our main analysis drops observations between the Fall of 2009 and the Spring of 2011. As aforementioned, there is an ambiguous treatment effect on these individuals (see Section 3). For example, returning students in the Fall of 2009 were not exposed to credit cards on campus during the Fall of 2009, however, the same students were exposed to credit cards on campus during their freshman year. In contrast, returning sophomores in the Fall of 2011 were not exposed to credit card on campus during the Fall of 2011, and were also not exposed to credit cards on campus during their freshman year in 2010. Even if there was a slight decline in credit card holdings among these students, the time frame and logistics of constructing financial aid packages makes is less likely these students would exhibit differential balances. Figure B5 shows the results of estimating equation 8 without dropping observations between 2009 and 2011. We find similar patterns in the dropped years. Though, as expected, estimates in these interim years are imprecise and do not exhibit a clear treatment effect.

5 Mechanisms: Evidence from the Matched-Survey

Our analysis of the matched-survey sheds light on (1) the extent of card use among college students, (2) how they choose among different sources of liquidity, and (3) the form of sub-optimal financial behavior most tied to credit card borrowing. Broadly, we find that fewer students use cards than prior to Title 3, especially among those from lower income areas.

Students consider both cards and student loans in the long and short term. However, they very often do so sub-optimally. A lack of financial literacy is the factor most closely tied to credit card indebtedness.

As we proceed, it is important to note that the survey is administered to current students. Consequently, it does not directly inform on behavior at the time of Title 3's enactment. Its value for assessing the policy is based on the view that students, and those with cards, especially, were not better users of credit at the time of its passing. We provide evidence consistent with this premise.

5.1 Card Use Among Students

About 53 percent of students in our survey have a credit card. This estimate tracks well with other post CARD Act national surveys measuring card use in this population.[19] It also constitutes a more than 30 percentage point decline from pre CARD Act estimates, in line with the policy's objectives.[20] We further find that students from higher income areas (top ZIP quartile) are 22–32 percent more likely to have a card than students from lower income areas (bottom quartiles).[21] Given the nearly universal adoption of cards prior to the CARD Act, this suggest the decline was more precipitous for students from lower income areas. Eliminating the aggressive marketing of cards on campus seems to have raised barriers to adoption more for students with limited ability to gain access though their parents or community. It likely also reduced lenders' ability to influence students predisposed to avoiding debt, whereby adoption became a more active choice.[22]

To better understand this latter mechanism, we ask students why they do not have a

[19]In a 2015 survey sponsored by Sallie Mae, 56 percent of respondents reported having a credit card (SallieMae, 2016). A 2019 national survey from Trellis Research indicates that 48 percent of college students used a credit card in the past 12 months (Klepfer et al., 2020) While the Sallie Mae question is identical to ours, the Trellis survey asks "In the past 12 months, have you used the following borrowing sources?". This ambiguous phrasing makes it unclear whether students who do not borrow on their card but have one would respond affirmatively. Moreover, some students have a card but do not use it. When asked "suppose you could no longer use your card next year, how would this affect your financial situation?" 3.3 percent of our card-holding respondents (1.7 percent overall) said "Not at all (I don't use a credit card)." With this in mind, we interpret the Trellis number as a lower bound for having a credit card.

[20]An earlier 2008 wave of the Sallie Mae survey estimated that about 84 percent of students had a credit card (SallieMae, 2009). This decline is larger than reported in Debbaut et al. (2016) and CFPB (2013). These latter calculations are based on credit reporting data that does not distinguish between those under 21 who are enrolled in college and those who are not. While the ability to repay rules applied to all individuals under 21, Title 3 made no difference to those not enrolled in college—the majority of people between the age of 18 and 21. As a result, it is not surprising that the decline in card use is more pronounced among those attending college.

[21]The top quartile adoption rate is 60.78 percent. The bottom and second quartile adoption rates are 49.75 and 46.10 percent, respectively. See Appendix C for full table and discussion.

[22]This pattern is consistent with Hastings et al. (2017) who show that persuasive sales forces affect price sensitivity and expands demand in financial markets.

credit card. The most common reason students give for not having a credit card is that they are afraid to get into too much debt. About 48 percent give this reason.[23] The next most common reason is "I have other ways of getting cash."[24] This indicates a concern among students for the potential pitfalls of having a credit card and an inclination for using other means to cover their expenses, which may or may not be optimal. Unsurprisingly, the rank order of these responses flips for students from more affluent areas. Those from higher income areas without a credit card are less likely to cite a fear of excessive debt. They stress other ways of obtaining liquidity.[25]

Only 11 percent report they do not have a card because they do not qualify, and 17 percent say it is a "hassle." This response indicates a tepid perception among students that cards are difficult to get or unavailable altogether, which may not be the case for them. In line with our findings on adoption, the perception of unavailability is more pronounced among students from lower income ZIP codes. About 10 percent said they do not have a card because the interest rate is too high, indicating that price does not seem to play a dominant role in students' adoption decisions. They also may not have direct knowledge of rates, which makes them unable to properly compare alternatives.[26]

Students use their cards for a variety of purposes, many of which are predictable. The most commonly cited use (78%) is indirect school expenses, like books and computers. Non-essentials, like entertainment and dining out, are a close second (73%). Only about 58 percent report having a card for emergencies. Notably, 44 percent say they use their card for direct school expenses, like tuition and rent/room and board. Overall about 20 percent of card-using respondents report that they sometimes or hardly ever pay the entire statement balance on their card, a decline from pre CARD Act levels.[27] Nevertheless, borrowing is more concentrated among students from less affluent backgrounds. As compared to the top quartile, card-using students from the lowest quartile of ZIP income are nearly twice as likely

[23]Our estimate is consistent with a similar question from Sallie Mae's 2015 survey. In that survey, 47 percent of students without a card said that they do not have one because "[they] want to avoid as much debt as possible."

[24]Note that these responses are not mutually exclusive. Respondents are instructed to "check all that apply." See Appendix F.

[25]See Table C1 in Appendix C for full results.

[26]These latter responses touch on the broader question of whether the policy constitutes a nudge, and for whom. For some students, it is debatable that Title 3 functioned as an unambiguous nudge, as these responses are more consistent with restricted choice. Specifically, the policy may have also taken away the ability of students to know about and understand their alternatives, making it more difficult to make more informed financial decisions. Another view is that these individuals were nudged harder. There is precedent for this differential framing effect among people from lower socioeconomic status (see Mrkva et al., 2021). Our data does not allow us to provide further clarity on this point. Our reading of the rule and discussions surrounding it lead us to conclude that Title 3 was intended as a nudge. However, we are agnostic about whether it was effectively a nudge for all students. Ultimately, this deeper question is beyond the scope of our analysis.

[27]See SallieMae (2009).

to borrow on their card.[28]

5.2 Choosing Between Cards and Student Loans

A principal objective of our survey is to inform on how students choose between cards and student loans, and the extent to which they do so optimally. Two questions address this choice. In the first, we ask card-holding students how no longer having access to their card next year would affect their financial situation. This reflects on longer term planning. More than three quarters of students say they would "switch to using a debit card or some other form of electronic payment," reaffirming the popularity of a credit card as a method of payment. This response also indicates that for most students there are available substitutes, whereby curbing their access would not burden them on this dimension.

Nearly half indicate that this change would prompt them to increase their income (30%) or cut their essential expenditures (18%), including those for school. About 9 percent said they would take out more in student loans. Consistent with our difference-in-difference results, students from low income communities are nearly twice as likely to consider this option. Moreover, students that regularly borrow on their card are two-and-a-half times more likely to indicate they would take out more student loans if they could no longer use their card.

The second question, concerning more immediate liquidity needs, asks: "if in the next month you had to cover an emergency expenditure of $500 or more, how would you do it?" A majority of students holding cards said they would use them in that case. About 5 percent of respondents said they would use their student loans. Students who provided this latter answer are more likely to (1) be from the lowest ZIP-income quartile, (2) have been offered financial aid in the form of student loans, and a student who regularly revolves a balance on their card. This result suggests that those who access liquidity with their card are more likely to lean on this option, perhaps even when less costly options are available. Moreover, student loans are a source of emergency funding when available.[29]

In Table 3, we report how students weigh the choice between cards and student loans while controlling for financial aid status, previous card use, financial circumstances, and students' demographics. Column (1) relates these factors to the probability a student indicates they would take out more in student loans if they could no longer use their card in the future. Students offered loans are nearly 60 percent more likely to consider student loans as an alternative financing option. Students using their card to cover liquidity needs (i.e., "make ends meet"), and not just for payments, are over twice as likely. The same applies for those

[28]The rates are 14.29% vs. 26.13% for the top and bottom ZIP income quartiles, respectively. See Table C3 in Appendix C for more details.

[29]See Table C2 in Appendix C for details.

Table 3: Determinants of the Student Loan / Credit Card Tradeoff

	(1)	(2)	(3)	(4)	(5)
	No Card	*Cover $500 Emergency*			
Depvar =	More SL	Use Card	Use card	Use SL	Use SL
Offered SL	0.057**				
	(0.019)				
Took Out SL		-0.097*	-0.097*	0.123**	0.120**
		(0.042)	(0.042)	(0.025)	(0.024)
Revolve	0.139**	0.032	0.027	0.032	0.030
	(0.034)	(0.050)	(0.051)	(0.033)	(0.033)
Use to Make Ends Meet	0.119**				
	(0.023)				
Available Family/Savings		-0.354**	-0.354**	-0.002	-0.001
		(0.039)	(0.039)	(0.024)	(0.024)
$\mathbb{E}(Emergencies > 1)$			0.031		-0.020
			(0.033)		(0.017)
Controls	✓	✓	✓	✓	✓
Mean Dep. Var	0.091	0.565	0.565	0.062	0.062
R-Squared	0.116	0.104	0.106	0.092	0.098
N	784	579	579	579	579

Notes: *Data for these regressions are from students with a credit card in the matched-survey. Controls include reported number of $500 or more emergency expenditures in the past year, class in school, minority status, how often a student reported thinking about their finances, and whether they are responsible for paying their credit card bill. From their student records, it also includes fixed effects for ZIP median income quartile. Robust standard errors are in parentheses.* $^{*}p < 0.05$, $^{**}p < 0.01$.

who report they would need to increase their income or cut back on essential expenditures (not shown). While existing access to student loans is an important factor, the consideration of additional student loan debt seems strongest among those who are in greatest need of this liquidity.

The remaining columns of Table 3 pertain to financing emergency needs in the short term. In Columns (2) and (3) of the table, the dependent variable takes on a value of one if a student declared they would use their card to cover an emergency expenditure of $500 or more in the next month. In Columns (4) and (5), the dependent variable takes on a value of one if they would use their student loans. Consistent with the rational model, students who have taken out loans in the semester are significantly less likely to use their card. They are also over three times as likely to use their student loans. Students who also said they would ask their parents or use other savings are almost half as likely to use their credit card, suggesting a strong preference for the less risky (costly) option whenever available. Unlike when considering their long term needs, revolving behavior does not seem to factor into their short term decision.

Optimal Use While students consider both cards and student loans for liquidity needs, their choices are often inconsistent with our model defined optimal behavior. Specifically, we document four departures. First, the (self-reported) likelihood of an emergency is neither negatively correlated with card use, nor is it positively associated with student loan balances. Second, known expenses are not covered by student loans, even when these are available. Third, students with unclaimed subsidized loans, which do not accrue interest during school, borrow on their credit cards.[30] Fourth, credit card debt should not be long lasting, more than one year, for those who have student loans available to liquidate that debt.

Our model highlights card use for unforeseen expenses. As unforeseen expenses become more likely, it becomes optimal to "insure" against higher card rates by taking out more student loans. The survey directly asks students how often they experienced emergencies over the past year and their expectations for the next year. About 44 percent reported having experienced an emergency; the number increases to more than 48 percent among those with card debt. While suggestive of financial mistakes, this relationship might also result from past hardship driving current debt.

Table 3 also helps us tie expectations of emergencies to planned behavior to test the predictions of our model. It shows that students' own expectation of future emergency expenditures is not significantly associated with their choice to use a credit card or student loans. Among students who would use a card to cover an emergency, this term is in fact positive. If anything, students are *more* likely to plan to use a credit card for emergencies when emergencies are (perceived to be) more likely. Moreover, the coefficient does not change accounting for past emergencies, suggesting the association is not complicated by differences in individuals who have suffered more or less emergencies over the past year and are perhaps running out of liquidity sources (or, alternatively, due to differences in idiosyncratic ways of characterizing "emergencies").

Recall, a majority of students reported using their card for indirect expenses or non-essentials. Moreover, nearly half reported using their card for direct school expenses, like tuition and room and board. Direct school costs are seldom unexpected. Charging tuition to one's card may just be for convenience, i.e., these balances are promptly paid off with no interest paid. In fact, the likelihood of using a card for direct school expenditures increases in ZIP income quartile. Nevertheless, over a third (35%) of students from the bottom ZIP income quartile report using their card for this purpose. This quartile of students are also most likely to borrow on their card.[31] Moreover, we find similar use patterns among students

[30] We identify these types as students who have applied for financial aid, been offered subsidized loans, but have not claimed them. We do not count students who have not applied for financial aid.

[31] This proportion also tracks well with a similar question in the national survey of students' financial well-being administered by Trellis Research (Klepfer et al., 2020). In that study, about 29 percent of respondents report using their credit card to pay for college. About 23 percent ($\approx 44\% \times 52\%$) report doing so in our survey. Similarly, in Sallie Mae's 2015 survey, 21 percent of all students sampled reported using a credit

with card debt who have not experienced an emergency. About 50% of these students report using their credit card to pay for direct educational expenses.

Since the responses to our survey are matched to administrative records, we can identify students who have been offered and do not claim subsidized student loans, but who nevertheless borrow on their credit card. About 37 percent of students who do not always pay their balance in full had liquidity available in the form of subsidized student loans. Since these loans do not accrue interest during school, they are a cheaper form of debt over credit cards in almost any situation. Additionally, 56 percent of students who revolve on their credit card have at least one type of available student loans, including subsidized, un-subsidized, and alternative. All have substantially lower interest rates than credit cards.

Finally, of the 20 percent who do not regularly pay their balance in full, over a third report they "hardly ever" pay their balance in full. This response suggests that borrowing on the credit card is not constrained to short periods for a large portion of borrowers. In other words, card debt is not paid off with student loans after students have had the opportunity to revisit their financial aid allocation. This relation is inconsistent with optimal card use in our model, which views carried debt a known expense that will be financed with student loans.

5.3 Financial Mistakes and Card Borrowing

Given these notable departures from optimal use, we next examine the underlying forms of financial mistakes, or financial ignorance, most associated with students taking on credit card debt. Our analysis focuses on the four types categorized in Campbell (2016): (1) knowledge of contract terms, (2) understanding of financial concepts (literacy), (3) knowledge of own history and available options, (4) awareness of own preferences.

A large portion of students do not know the interest rate on their credit card. Among cardholders about 42 percent report not knowing the interest rate. An additional 22 percent report a rate below 10 percent. While some card contracts carry a rate below 10 percent, this is rare.[32] Many students also display a low level of financial literacy, which we measure using two of the "Big Three" questions from Lusardi and Mitchell (2008) most relevant

card to cover tuition and fees. This proportion is lower than in Sallie Mae's 2008 survey. However, while this type of use is more common among students from higher income areas, students who take out student loans are not less likely to cover direct school expenses with their card. This further suggests many may not be optimally handling their financial obligations.

[32]According to the CFPB's most recent card act report, in 2019, the average rate on general purpose cards was nearly 19 percent, and three quarters of all accounts carried a rate greater than 15 percent. Given the way our question is phrased, it is possible that some of these reporting rates below 10 percent are in a promotional period. However, this would imply that $22\%/58\% \approx 38\%$ of our respondents were currently in a promotion, which is also inconsistent with the population rate. Moreover, those from low income areas, who are likely higher risk borrowers, are over-represented among those reporting curiously low rates.

to our setting.[33] Fewer than half card-holding students answer both questions correctly.[34] Unsurprisingly, students from lower income areas are substantially less likely to answer these correctly.

Students also display a lack of knowledge about their available options, e.g. their financial history. About 8 percent of card-holding students underestimate how much student loan liquidity is readily available to them. Among students with a credit card who took out student loans in that semester, nearly 20 percent are unaware of unclaimed loans still available to them.[35] To assess knowledge of preferences, we use the un-incentivized multiple price list method (Coller and Williams, 1999). The price list is designed so that even one "early" response translates to an internal monthly interest rate of 10 percent.[36] On average, card-holding students are heavy discounters.[37]

Table 4 weighs the importance of each type of financial mistake in students' choice to borrow on their credit card. As before, we isolate the importance of these factors using a broad set of controls.[38] Column (1), which reports the factors most associated with having a card, indicates a positive selection. Students who answer both financial literacy questions correctly are 13 percent more likely to be cardholders. Moreover, students with more than one immediate answer on our exponential-discounting multiple price list, or heavy discounters, are 11 percent less likely to have a card.[39]

In Columns (2)–(5), we look at borrowing among those students with cards. Low finan-

[33]The questions are: (1) how interest payments accumulate over time, (2) effects of inflation and nominal rates on purchasing power.

[34]All survey participants are asked the Lusardi and Mitchell (2008) questions. Participants who do not have a credit card answer correctly at a lower rate, 36 vs. 44 percent.

[35]Students may be eligible for student loans and not be aware of this fact. Our measure is not about eligibility, rather actual availability. We flag students who have applied for financial aid, were offered student loans, and left some portion of these unclaimed. In the survey, these students claimed they had no additional loans available or did not qualify for student loans altogether.

[36]This method is subject to a number of concerns. Most importantly, students may misunderstand the question. However, we note that only 24 of 1,506 responses (1.5%) violated the implied single crossing. This method may also significantly overstate the degree of discounting. However, many studies find that this value, while not identical to exponential discounting factors elicited over longer-term horizons, is highly correlated with such values (e.g., Eckel et al., 2005). It is also shown to be correlated with credit card indebtedness (Meier and Sprenger, 2010). That is, we may reasonably expect these elicited discount factors are predictive of the underlying time preferences of our respondents.

[37]They are also highly likely to perceive having too much credit card debt. While about 10 percent of card-holding students strongly agree with the statement "I have too much credit card debt," this accounts for nearly half (10%/20%) of students who regularly revolve a balance on their card. See Table C4 in Appendix C for details.

[38]We include ZIP income quartile fixed effects, whether or not they applied for financial aid (e.g. filed a FAFSA), their class in school, race/ethnicity, whether or not a student reports being responsible for paying the bill, and how often they think about their finances." We control for past financial shocks using the number of emergencies they reported in the past year and for the continuing volatility of their financial situation by including their own expectation of how many emergencies they will face in the coming year.

[39]This single result is consistent with sophisticated hyperbolic behavior. However, the totality of our results are not.

Table 4: Credit Card Debt and Financial Ignorance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
OLS Depvar =	Has Card	Regularly Revolves a Balance				Regularly Revolves and has Unclaimed SL				
Concepts:	0.070**	-0.107**			-0.104**	-0.084**				-0.085**
Both Correct	(0.027)	(0.028)			(0.029)	(0.030)				(0.030)
History:							0.139*			0.136*
Unknown SL							(0.060)			(0.059)
Behavior:	-0.059*		0.043		0.031			0.030		0.017
Discount > 1	(0.026)		(0.030)		(0.030)			(0.031)		(0.031)
Terms:				-0.019	-0.019				-0.046	-0.044
DK Rate				(0.028)	(0.028)				(0.030)	(0.029)
Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Mean Dep. Var	0.527	0.196	0.196	0.196	0.196	0.150	0.150	0.150	0.150	0.150
R-Squared	0.035	0.066	0.052	0.050	0.068	0.059	0.059	0.048	0.050	0.076
N	1,489	784	784	784	784	579	579	579	579	579

Notes: *Data for these regressions are from students with a credit card in the matched-survey. Controls include reported number of $500 or more emergency expenditures in the past year, class in school, minority status, how often a student reported thinking about their finances, and whether they are responsible for paying their credit card bill. It also includes whether they filed a FAFSA and fixed effects for ZIP median income quartile determined from their student records. Robust standard errors are in parentheses.* $^{*}p < 0.05$, $^{*}\check{p} < 0.01$.

cial literacy is strongly associated with regularly revolving balances. As shown in Column (2), students who answer both questions correctly are less than half as likely to revolve. Further, while discounting is positively associated with revolving, this relation is much weaker (Column (3)). The coefficient is both small and imprecisely estimated. Finally, knowledge of credit terms, measured as whether a student knows the rate on their card, does not seem to factor significantly into the borrowing decision (Column (4)). Combining these factors in Column (5) more clearly illustrates the distinct association between financial literacy and credit card indebtedness.

In columns (5)–(10) we focus on card borrowing behavior of card-holding students who have been offered student loans. The dependent variable takes on a value of one if a student revolves on their card *and* has unused student loans. Because we focus on students for whom student loans are readily available, we can extend our analysis to include awareness of one's own financial history.[40] Financial literacy continues to factor heavily in the decision to borrow among this population. Further, discounting and knowledge of the interest rate on the card do not meaningfully associate with this choice.[41] However, we also find that a lack of awareness about available student loans is strongly associated with card borrow-

[40]These regressions also control for whether any student loans were taken out during the semester. In addition, because all of these students applied for financial aid, we observe their parent and own AGI. Our results do not materially change when we include these more precise income controls.

[41]We note that the coefficient, though imprecisely estimated, is slightly larger for this population. Lack of familiarity with contract terms is one of the reasons why students borrow on the wrong financial instrument. Our estimate suggests a slightly different timing: those who pay interest are more likely to become aware of the rate on their credit card. Nevertheless, optimal behavior implies ex-ante knowledge of prices.

ing. Combining all four factors in Column (10) highlights the distinct contribution of these elements of literacy and awareness to students' borrowing decisions.

In columns (5)–(10) we focus on card borrowing behavior of card-holding students who have been offered student loans. The dependent variable takes on a value of one if a student revolves on their card *and* has unused student loans. Because we focus on students for whom student loans are readily available, we can extend our analysis to include awareness of one's own financial history.[42] Financial literacy continues to factor heavily in the decision to borrow among this population. Further, discounting and knowledge of the interest rate on the card do not meaningfully associate with this choice.[43] However, we also find that a lack of awareness about available student loans is strongly associated with card borrowing. Combining all four factors in Column (10) highlights the distinct contribution of these elements of literacy and awareness to students' borrowing decisions.

The association in the survey between lack of financial knowledge and credit card indebtedness is consistent with results in Carvalho et al. (2019) who find that demand for high-interest loans is correlated with limited financial sophistication. Our finding that students carry credit card balances while having unused student loans touches on the discussion of the credit card debt puzzle: individuals simultaneously hold high interest card debt and substantial liquid savings (Gross and Souleles, 2002; Zinman, 2007; Bertaut et al., 2009; Gathergood and Weber, 2014). Just as in that literature, we highlight the importance of individuals' specific situation and the frictions inherent in certain types of debt and or savings. In our context, borrowing on a card may be more optimal than taking out student loans if it is used very short term debt, like emergency expenditures, and flexibility is especially valuable. However, taken together, our findings suggest that on average students do not make borrowing choices optimally.

6 Assessing the Benefits of Title 3

We now evaluate whether Title 3 benefited students. Recall from Section 2 that limiting card access can harm students who are in need of liquidity to cover uncertain expenditure shortfalls, but for whom the likelihood of a shortfall may be (relatively) small. In contrast, the policy most likely benefits students prone to financial mistakes who have a somewhat higher chance of an expenditure shortfall. These students may use a credit card to cover their

[42]These regressions also control for whether any student loans were taken out during the semester. In addition, because all of these students applied for financial aid, we observe their parent and own AGI. Our results do not materially change when we include these more precise income controls.

[43]We note that the coefficient, though imprecisely estimated, is slightly larger for this population. Lack of familiarity with contract terms is one of the reasons why students borrow on the wrong financial instrument. Our estimate suggests a slightly different timing: those who pay interest are more likely to become aware of the rate on their credit card. Nevertheless, optimal behavior implies ex-ante knowledge of prices.

expenses when it is optimal for them to use student loans. Section 5 provides evidence of the existence of these types of students and quantifies both their proportion of the population as well as their type of mistakes. Restricting card access to these individual nudges them towards the optimal choice. While it is unlikely Title 3 constituted a Pareto improvement, we assess empirically the extent to which Title 3 may have benefited students on average: did it constitute a net good?

We leverage our model to generate bounds on welfare changes, which we then quantify using results from the survey. Returning to the administrative data, we apply a new identification strategy to estimate Title 3's impact on students' academic performance. This latter view complements our model-based assessment, providing more direct, albeit suggestive, evidence of Title 3's benefits.

6.1 Welfare Bounds

A full estimation of our model requires substantial functional form restrictions on students' preferences for which theory provides little guidance. Instead, we derive bounds to welfare using linear forms that are easily calculated using available data. Before proceeding further, it is helpful to envision a worst case scenario for the policy.

Example 1 *Suppose all students choose optimally. Further suppose parameter p is infinitesimally small, s.t., $p \approx 0$. Since the high state can still occur ($p \neq 0$), subsistence utility requires that students have liquidity available in case of the high state. The credit card is the ideal tool. A switch to student loans is particularly harmful.*

$$\Delta W = V_t((1+r^s)\gamma(\ell) + r^s\Gamma) - V_t((1+r^s)\gamma(\ell)) \equiv -\Delta V_t.$$

For any utility specification satisfying our assumptions, we will define a value ΔV_t, that represents the absolute worst case for a policy that nudges students to use student loans for unplanned expenses. Proposition 3 shows that a utility function scaled by this value will provide a lower bound on all welfare analysis.

Proposition 3 *Consider the following linearly scaled utility function L_t,*

$$L_t(d) = \frac{V_t((1+r^s)\gamma(\ell) + r^s\Gamma) - V_t((1+r^s)\gamma(\ell))}{r^s\Gamma} \cdot d = \frac{-\Delta V_t}{r^s\Gamma} \cdot d \tag{11}$$

For the welfare calculations ΔW^{opt} and ΔW^{br} defined in equations (5), (6), the linear function L_t provides a lower bound on changes in welfare.

Proof. See Appendix. ■

Now we can re-write Equations 5 and 6 using the linear form in equation 11. Dividing by $-\Delta V_t > 0$ preserves the inequality. Respectively,

$$\frac{\Delta W^{opt}_{linear}}{-\Delta V} = \begin{cases} p \cdot \frac{r^c}{r^s} - 1 & \text{if } p < \frac{r^s}{r^c}, \\ 0 & \text{if } p \geq \frac{r^s}{r^c} \end{cases} \tag{12}$$

$$\frac{\Delta W^{br}_{linear}}{-\Delta V} = p \cdot \frac{r^c}{r^s} - 1. \tag{13}$$

Equations 12 and 13 constitute a lower bound on the (relative) welfare effects, expressed as a proportion of the worst case scenario described in Example 1. Clearly, if $p \approx 0$ equation 12 is -1 (i.e., full harm); it is 0 (i.e., no harm) should p be sufficiently high. Equation 13 represents the welfare changes under bounded rationality where the student chooses to use the credit card unconditional of parameters. Welfare ranges from -1 (i.e., full harm) when $p \approx 0$ to values higher than 1 (i.e., net benefit) depending on the ratio of r_c to r_s. It is important to note this is a lower bound; in the event $p \approx 0.5$ and $r_c >> r_s$ utility curvature likely increases the nominal welfare value of the true (unknown) utility function as student loans are the less risky option. Conveniently, this value is solely a function of the likelihood (p) of the high consumption state and the relative price of card debt (r_c) and student loans (r_s).

To calculate this lower bound of Title 3's impact on welfare, we obtain student loan rates ($\overline{r}^s$) from the Department of Education's website. The vast majority of student debt is through the Direct/Stafford program, prices for which are posted regularly and do not vary across students.[44] In 2010, the subsidized loan rate was 4.5 percent and the un-subsidized loan rate was 6.8 percent.[45] We obtain average credit card interest rates (r^c) from the CFPB's CARD Act report (CFPB, 2013).[46] In 2010, the average rate was 19.5 percent for a prime credit card user and 21.5 percent for a subprime user.[47] Estimates on the probability of being in the high consumption state p are obtained from our survey responses. Specifically, p is calculated as the likelihood of having an emergency expenditure of \$500 or more in the

[44]See `https://studentaid.gov/understand-aid/types/loans/interest-rates`. Another popular program is the PLUS loans program. Rates on these loans are markedly higher, about 7.9% in the 2010-2011 school year. However, these loans are made to parents rather than students directly.

[45]Subsidized loans, in addition to carrying lower rates, do not accrue interest during college. In our model, this implies an "expected" interest rate that is below the posted 4.5 percent. We have no way of determining what the "expected" rate might be and thereby use the posted rate. Crucially, this generates a more conservative view of any benefits stemming from the policy.

[46]See Figure 8 on page 31 of the report.

[47]According to the report, the prime group contains users with a credit score between 660 and 720. The subprime group is comprised of users with a credit score below 620. Students typically obtain cards that are as least as high as the average rate for prime users.

past year.[48]

We must account for the following: (1) not all students stop using a credit card, (2) not all students need liquidity, and (3) some students make optimal decisions and some do not. For these distributions, we again look to our survey responses. First, we calculate the drop in the likelihood of having a card (%Δ CC) by comparing our results to the Sallie Mae survey (SallieMae, 2009).[49] Second, we categorize a student as in need of liquidity (%NL) if they do not report they would ask their parents (or someone else) for funds in case of an emergency expenditure.

Third, to determine the manner of suboptimal behavior in applying the welfare equations from Section 2.4, we use our results from Table 4 in Section 5.3. The survey findings indicate that ignorance and misunderstanding, or bounded rationality, is the dominant mechanism underlying students' suboptimal behavior. As a result, we apply Equation 6 to best describe welfare change for this type of student. We categorize a student as making sub-optimal financial choices, $\hat{p}^{bd}$, if they respond incorrectly to a financial literacy question or if they make an incorrect statement about their available student loans.

Given the above, denote an average change in welfare as

$$\Delta\overline{W}^{opt} = (\%\Delta CC) \cdot (\%NL) \cdot \Big[min\{0, \hat{p} \cdot \frac{\overline{r}^c}{\overline{r}^s} - 1\} \,|\, NL = 1\Big], \tag{14}$$

$$\Delta\overline{W}^{bd} = (\%\Delta CC) \cdot (\%NL) \cdot \Big[\hat{p} \cdot \frac{\overline{r}^c}{\overline{r}^s} - 1 \,|\, NL = 1\Big], \tag{15}$$

$$\Delta\overline{W} = (1 - \hat{p}^{bd}) \cdot \Delta\overline{W}^{opt} + \hat{p}^{bd} \cdot \Delta\overline{W}^{bd}. \tag{16}$$

Equation 14 refers to the average effect for students who make optimal choices, and equation 15 refers to the average effect for students that make suboptimal ones consistent with our models of bounded rationality. Equation 16 denotes the overall average effect. As our values are tied to a specific worst case, it should be noted that this case would require $(\%\Delta CC) = (\%NL) = 100$.

Table 5 reports ranges for the policy's effects on student's well-being. Column (1) shows the overall impact of the policy, while Columns 2-5 break down the effect by ZIP income quartile. Our calculations indicate that, on average, students benefited from the policy, which raised welfare for the typical student by at least 3 to 11 percent of the utility loss of the worst case scenario.

For the representative optimal-decision-making student, there is no change in welfare under the policy. The high likelihood of an unplanned shortfall exceeds the ratio of student

[48] We also ask students' how many emergencies they expect in the coming year. The correlation between those distributions is nearly 0.8, with the expected number being just slightly higher than the one recalled.

[49] In our calculations by income quartile, we assume that prior to Title 3 the rate of card use was the same among all students.

Table 5: Bounds Approach for the Net Benefits of the Regulation

	(1) All	(2)	(3)	(4)	(5)
		By Parental Income (ZIP Median)			
		0-25 ptcl.	25-50 pctl.	50-75 pctl.	75-100 pctl.
% Δ CC Adoption (%Δ CC)	30.35	33.25	36.90	27.06	22.22
% Needing Liquidity (% NL)	46.61	52.50	43.17	45.80	44.61
Prob. high state h ($\hat{p}$)	47.12	56.19	49.72	43.04	35.57
$\overline{r}^c$	19.50 - 21.50	19.50 - 21.50	19.50 - 21.50	19.50 - 21.50	19.50 - 21.50
$\overline{r}^s$	4.50 - 6.80	4.50 - 6.80	4.50 - 6.80	4.50 - 6.80	4.50 - 6.80
$100 \times \Delta\overline{W}^{opt}$	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
$100 \times \Delta\overline{W}^{bd}$	4.97 - 17.70	10.67 - 29.41	6.78 - 21.91	2.90 - 13.09	0.20 - 6.93
Prob. boundedly rational ($\hat{p}^{bd}$)	62.06	69.25	62.93	62.03	52.40
$100 \times \Delta\overline{W}$	3.08 - 10.98	7.39 - 20.37	4.27 - 13.79	1.80 - 8.12	0.10 - 3.63

Notes: *This table shows calculations of welfare effects using Equations 14, 15, and 16. Interest rates on student loans and credit cards are taken from the Department of Education's website and CFPB (2013). Estimates of changes in credit card use (%Δ CC), the proportion requiring liquidity (% NL), the probability of an emergency expenditure ($\hat{p}$), and the proportion of students choosing sub-optimally ($\hat{p}^{bd}$), are calculated using responses in the matched-survey.*

loan and credit card interest rates, so that the optimal strategy is to take out additional student loans precautionarily. Formally, $p \geq \frac{r^s}{r^c}$ and welfare changes are 0, because the policy does not change behavior. Among students that did not choose optimally, welfare rose by at least 5 to 18 percent of the worst case magnitude. Recall from Equations 12 and 13 that the key ingredients in this calculation are the relative price of student loans and credit card debt and the likelihood of having an unexpected emergency expenditure. As we see from the table, this likelihood is large. About 47 percent of students in need of liquidity indicate having experienced at least one such emergency. The corresponding value of p is larger than the ratio of student loan to credit card debt.[50] Any $p > \frac{6.8}{19.5} \approx 34.87$ would imply the policy improved students' welfare, on average.[51]

Table 5 also shows that gains are larger among students hailing from more modest communities (ZIP codes). This result is consistent with our difference-in-difference findings from Section 4.1, which indicate a larger substitution towards student loans among these students. We calculate an average rise in welfare of at least 7 to 20 percent of the worst case magnitude

[50]We acknowledge the likelihood of an emergency may have been different for students in 2010. A higher likelihood would imply a greater benefit of the rule.

[51]Our calculations in Table 5 are based on the retrospective question "how many emergencies did you have in the last year?". We also ask students about their prospective beliefs, "how many emergencies do you expect to have next year?". Their responses are highly correlated, whereby our results do not materially change using either definition of p.

among students at the bottom quartile of ZIP income. Among those at the top quartile, the impact is smaller at 0.10 to 4 percent of the worst case magnitude. Three factors contribute to these differences. First, and most crucial to our calculation, the likelihood of an emergency expenditure $\hat{p}$ for those requiring liquidity is highest in the low income group. Second, a larger proportion of top quartile students are categorized as in need of liquidity. Third, the decline in credit card use is larger among bottom quartile students.

Taken together, our welfare analysis suggests the policy had no effect on optimizing students and a positive increase in welfare among the boundedly rational. The welfare increase was more pronounced among students originating from the lowest quartile of ZIP income. Appendix D provides an alternative welfare analysis specification, using dollars in a risk-neutral framework rather than generalized utility. The main results do not differ between the two welfare specifications.

6.2 Academic Performance

As complementary evidence to our model-derived welfare bounds, we estimate the impact of the policy on students' academic performance. This estimate provides more direct, albeit limited, evidence of benefits stemming from the policy. Much of the value generated from optimal financial choices is realized over time, as the debt is repaid. However, a lighter debt burden can also benefit students during their time in school. Though not explicitly part of our model, analysis of these academic outcomes lends insight into whether or not the policy provided positive net benefits. For example, Marx and Turner (2015) show that nudging students to take out more in student loans—presumably to offset the cost other more expensive forms of liquidity—improves their academic performance.

We focus on two measures of academic achievement available to us: (1) on-time graduation, and (2) final grade point average (GPA). In addition, we measure Title 3's effect on the choice of engineering or business major. These courses of study lead to higher paying jobs post graduation. They are also academically more challenging. Unlike our analysis of borrowing, these outcomes are at the student level. We must therefore adjust how we incorporate the policy's timing in our identification strategy.

For academic outcomes, each observation incorporates a student's entire experience in college (4+ years). As a result, we restrict our comparison to students who began college right around Title 3. Specifically, we compare students who began their studies in the fall of 2007 or 2008, just before Title 3, to those who began in the fall of 2010, just after Title 3.[52] As we can no longer use new students as our control group, we exploit heterogeneity in the policy's effects across income quartiles. Our triple difference analysis (Figure 1) indicates

[52]Like before, we eliminate from our analysis students who began in the fall of 2009. These students would have started in a transition period.

almost no effect on students from the highest income quartile ZIP codes. We thereby identify post-CARD Act achievement differences relative to this high-income group.

Estimated effects of Title 3 on academic performance are based on the following specification

$$y_i^k = \alpha_q + \alpha_s + \sum_{q=1}^{3} \beta_q^k \mathbb{1}(s \geq 2010)_i \times \mathbb{1}(Qtr = q)_i + \gamma^k X_i + \epsilon_i^k, \tag{17}$$

$k \in \{\text{GPA, On-time Graduation, Major}\}$, for student i, from income ZIP quartile q, who began their university studies in semester s. The terms α_q and α_s are fixed effects for each income quartile and starting semester, respectively. The variable $\mathbb{1}(s \geq 2010)_i$ takes the value of 1 for students who began their studies after the fall of 2010. Coefficients β_q^k then give differences in achievement after Title 3 for students in quartiles, $q = 1, 2, 3$, relative to those in the top quartile, $q = 4$. The vector X_{is} of control variables includes race, gender, and in-state status.[53] Estimated coefficients of equation 17 are illustrated in Figure 3.

The left panel of the figure plots the effect of Title 3 on on-time graduation rates. Relative

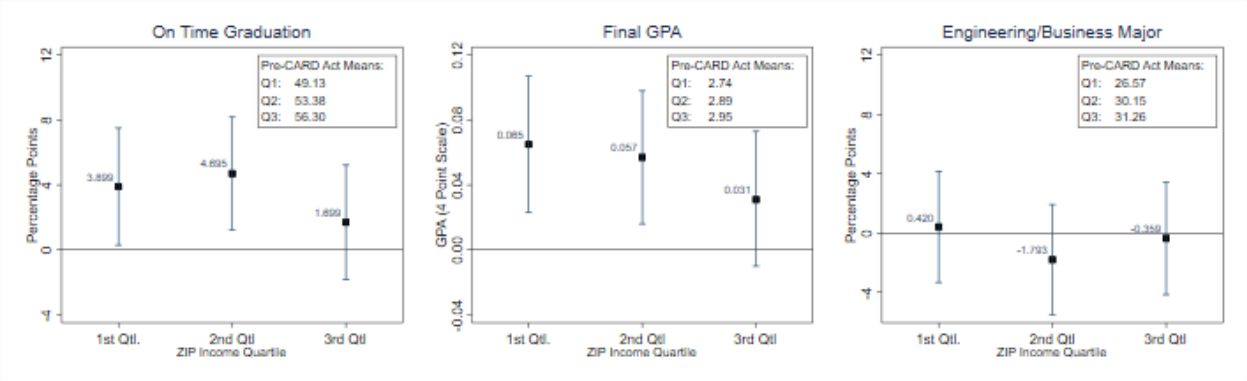

Figure 3: Effects of Title 3 on Academic Performance

Notes: *The figure plots coefficients (β_k) from equation 17. The dependent variables are one-time graduation (left panel), final grade point average (GPA) (middle), and whether or not the student majored in engineering or business (right). On-time graduation is defined as graduating in 4 years or less. Final GPA is based on a 4 point scale. The right panel plots coefficients (β_s) from Equation 8. The left panel plots coefficients (β_q) from equation 9. The estimation controls for gender, in state status, and identified minority. It further includes enrollment year and ZIP income quartile fixed effects. Confidence intervals shown are constructed using robust standard errors.*

to students in the high income group, on-time graduation rose among those beginning their studies after Title 3. Moreover, this effect was concentrated in the lower income quartiles. For those at the bottom quartile, on-time graduation increased by nearly 4 percentage points, or 8 percent. Those in the second quartile experience a similar rise. While we see some rise among students in the third quartile, it is much smaller and no longer statistically significant.

[53]For the GPA outcome, the vector also includes whether or not a student graduated on-time.

The middle panel of Figure 3 plots effects of Title 3 on students' final GPA. Not only did the likelihood of graduating on time rise, but the final GPA among students rose as well. Like before, our results indicate that these effects are largely concentrated among students from lower income areas. For those at the bottom quartile, the final GPA rose by 0.065 points on a 4 point scale, about 2 percent.

The right panel of Figure 3 shows the effect of Title 3 on course of study. Unlike for on-time graduation and GPA, we find no significant effect of Title 3 on the likelihood of choosing these majors. Relative to those from high income ZIP codes, students from less affluent communities did not experience significant changes in the probability of enrolling into an engineering or business major. While the probability of selecting such majors before the CARD Act ranged between 27 and 31 percent across income groups, the point estimates for the treatment effects range between -1.8 and 0.42 percentage points.[54] Together, these three results on academic performance suggest Title 3 helped those students most affected by the legislation.

6.3 Alternative Mechanisms

There may be alternative reasons why individuals may prefer to use credit cards over student loans that are not captured in the model, which we discuss below.

Incorrect Expectations About Future Emergencies As the model makes clear, much of a student's decision to finance is highly dependent on the probability of the high expense state. So far this analysis has assumed that such expectations are correctly determined. A possible departure from this analysis would be if individuals exhibited systematic biases in determining probabilities of future states (e.g., Kahneman and Tversky, 1979; Prelec, 1998). We do not believe distortions of expected probability are reflected in our data and compromising the general theme of our results. First, most probability distortions occur at very high or very low values, those below 0.05 or above 0.95. Neither surveyed responses on expectations nor estimates of r^s/r^c correspond to those levels. Further, surveyed responses of expected unplanned expenses do not generally deviate from past recollections of expenses and results do not meaningfully change whether either value is used to make welfare calculations. Thus, we do not see this departure from optimality as prevalent behavior in our data.

[54] Majors are categorized using codes given by the university. The codes are mapped to 2 digit Classification of Instructional Programs (CIP) codes for engineering (14) and business, management, marketing and related support services (52). We have also carried out this analysis using $\mathbb{1}$[STEM Major] and obtained a similar null result. We identify STEM major by mapping the four digit major code to the university's official list of OPT eligible majors.

Bankruptcy While credit cards carry higher interest rates than student loans, credit card debt is dischargeable in bankruptcy and student loans are not. As a result, students use of credit card debt could be rationalized as students valuing the option to discharge their debt in the future. To investigate this possibility, we include one question in our survey asking students who did not take student loans what were their reasons for doing so. One of the options was the non-dischargeability of student loans in bankruptcy (question 12 of the Survey). Only 5.1% of students selected that option. This suggests that the differential treatment of credit card debt and student loans in bankruptcy is not a dominant factor behind students' financial choices.

Impact of Early Access to Credit Cards on Credit Scores Another way in which access to a credit card can affect students' welfare is through its impact on students' credit profile, and thereby future credit scores. While credit card use is reported to national credit reporting agencies (NRC) nearly instantaneously, student loans are only reported after the post-graduation deferment period. Moreover, young borrowers could also benefit from having a mix of installment and revolving lines on their profile. However, Debbaut et al. (2016) show that borrowers who obtain a card early are less likely to have a higher credit score later in life. Their results suggest that this channel is an unlikely explanation for our findings.

7 Conclusion

This paper argues for taking into account multi-market spillovers in the discussion of nudge design, specifically, in the domain of consumer protection policies. We contend that a complete analysis of the impact of these policies requires an understanding of how they influence consumers' use of the targeted products as well as the non-targeted alternatives. We highlight insights gleaned from this multi-market approach in the context of the CARD Act's Title 3. Specifically, we document effects of this policy, which reduced credit card use by college students, on student loan borrowing. We then estimate the welfare changes to students before and after the rule.

Our empirical analysis combines administrative data with a survey. This combination helps us connect borrowing and school outcomes to the mechanisms underlying financial choices. With the administrative data, we show that Title 3 raised student loan balances, nudging students in need of liquidity away from card debt. With our survey, we document the prevalence and form of sub-optimal financial decision-making among students and tie this to their decision to borrow on their credit card. Combining these findings allows us to calculate bounds on the welfare effects of the policy, which indicate that students benefited from it overall. Finally, we corroborate this assertion with more direct evidence showing

increases in students' grade-point-averages and on time graduation rates due to Title 3.

More generally, empirical work on consumer financial policies has slowly begun to incorporate these multi-market effects (Medina and Pagel, 2021; Medina, 2021; Beshears et al., 2022; Allcott and Kessler, 2019). Given the increasing regularity with which interventions in consumer financial markets resemble a nudge design and are justified on the premise of sub-optimal behavior, we hope this approach can provide a template for assessing other such policies going forward.

References

Agarwal, S., S. Chomsisengphet, C. Liu, and N. S. Souleles (2015). Do consumers choose the right credit contracts? *The Review of Corporate Finance Studies 4*(2), 239–257.

Agarwal, S., S. Chomsisengphet, N. Mahoney, and J. Stroebel (2015). Regulating consumer financial products: Evidence from credit cards. *The Quarterly Journal of Economics 130*(1), 111–164.

Agarwal, S., J. C. Driscoll, X. Gabaix, and D. Laibson (2009). The age of reason: Financial decisions over the life cycle and implications for regulation. *Brookings Papers on Economic Activity 2009*(2), 51–117.

Allcott, H. and J. B. Kessler (2019). The welfare effects of nudges: A case study of energy use social comparisons. *American Economic Journal: Applied Economics 11*(1), 236–76.

Amromin, G., J. Eberly, and J. Mondragon (2016). The housing crisis and the rise in student loans. *Unpublished Mimeo*.

Ausubel, L. (2008, March). Testimony before the subcommittee on financial institutions and consumer credit of the committee on financial services of the united states house of representatives hearing on "the credit cardholders bill of rights: Providing new protections for consumers.".

Avery, C. and S. Turner (2012). Student loans: Do college students borrow too much–or not enough? *Journal of Economic Perspectives 26*(1), 165–92.

Bailey, M. J., S. Sun, and B. Timpe (2021). Prep school for poor kids: The long-run impacts of head start on human capital and economic self-sufficiency. *American Economic Review 111*(12), 3963–4001.

Bertaut, C. C., M. Haliassos, and M. Reiter (2009). Credit card debt puzzles and debt revolvers for self control. *Review of Finance 13*(4), 657–692.

Beshears, J., J. J. Choi, D. Laibson, B. C. Madrian, and W. L. Skimmyhorn (2022). Borrowing to save? the impact of automatic enrollment on debt. *The Journal of Finance 77*(1), 403–447.

Beshears, J. and F. Gino (2015). Leaders as decision architects. (cover story). *Harvard Business Review 93*(5), 51 – 62.

Beshears, J. and H. Kosowsky (2020). Nudging: Progress to date and future directions. *Organizational behavior and human decision processes 161*, 3–19.

Black, S. E., J. T. Denning, L. J. Dettling, S. Goodman, and L. J. Turner (2020). Taking it to the limit: Effects of increased student loan availability on attainment, earnings, and financial well-being. Technical report, National Bureau of Economic Research.

Campbell, J. Y. (2016). Restoring rational choice: The challenge of consumer financial regulation. *American Economic Review 106*(5), 1–30.

Campbell, J. Y., H. E. Jackson, B. C. Madrian, and P. Tufano (2011). Consumer financial protection. *Journal of Economic Perspectives 25*(1), 91–114.

Carvalho, L., A. Olafsson, and D. Silverman (2019). Misfortune and mistake: The financial conditions and decision-making ability of high-cost loan borrowers. Technical report, National Bureau of Economic Research.

CFPB (2013). Card act report: A review of the impact of the card act on the consumer credit card market. Technical report, Consumer Financial Protection Bureau.

Choi, J. J., D. Laibson, and B. C. Madrian (2006). 100 bills on the sidewalk: Suboptimal saving in 401 (k) plans.

Choi, J. J., D. Laibson, B. C. Madrian, and A. Metrick (2003). Optimal defaults. *American Economic Review 93*(2), 180–185.

Choi, J. J., D. Laibson, B. C. Madrian, A. Metrick, et al. (2005). Saving for retirement on the path of least resistance. *RODNEY L WHITE CENTER FOR FINANCIAL RESEARCH-WORKING PAPERS- 9*.

Coller, M. and M. B. Williams (1999). Eliciting individual discount rates. *Experimental Economics 2*(2), 107–127.

Debbaut, P., A. Ghent, and M. Kudlyak (2016). The card act and young borrowers: The effects and the affected. *Journal of Money, Credit and Banking 48*(7), 1495–1513.

Di Maggio, M., A. T. Ma, and E. Williams (2020). In the red: Overdrafts, payday lending and the underbanked. Technical report, National Bureau of Economic Research.

Eckel, C., C. Johnson, and C. Montmarquette (2005). Saving decisions of the working poor: Short-and long-term horizons. In *Field experiments in economics*. Emerald Group Publishing Limited.

Garz, S., X. Giné, D. Karlan, R. Mazer, C. Sanford, and J. Zinman (2020). Consumer protection for financial inclusion in low and middle income countries: Bridging regulator and academic perspectives. Technical report, National Bureau of Economic Research.

Gathergood, J. and J. Weber (2014). Self-control, financial literacy & the co-holding puzzle. *Journal of Economic Behavior & Organization 107*, 455–469.

Goodman, S., A. Isen, and C. Yannelis (2021). A day late and a dollar short: Liquidity and household formation among student borrowers. *Journal of Financial Economics*.

Gross, D. B. and N. S. Souleles (2002). Do Liquidity Constraints and Interest Rates Matter for Consumer Behavior? Evidence from Credit Card Data. *The Quarterly Journal of Economics 117*(1), 149–185.

Hastings, J., A. Hortaçsu, and C. Syverson (2017). Sales force and competition in financial product markets: the case of mexico's social security privatization. *Econometrica 85*(6), 1723–1761.

Kahneman, D. and A. Tversky (1979). Prospect theory: An analysis of decision under risk. *Econometrica 47 (2)*, 263–292.

Keys, B. J. and J. Wang (2019). Minimum payments and debt paydown in consumer credit cards. *Journal of Financial Economics 131*(3), 528–548.

Klepfer, K., A. Cornett, C. Fletcher, and J. Webster (2020, July). Student financial wellness survey: National aggregate report. Technical report.

Levy, M. and J. Tasoff (2016). Exponential-growth bias and lifecycle consumption. *Journal of the European Economic Association 14*(3), 545–583.

Lusardi, A. and C. de Bassa Scheresberg (2013). Financial literacy and high-cost borrowing in the united states. Technical report, National Bureau of Economic Research.

Lusardi, A. and O. S. Mitchell (2008). Planning and financial literacy: How do women fare? *American economic review 98*(2), 413–17.

Marx, B. M. and L. J. Turner (2015). Borrowing trouble? student loans, the cost of borrowing, and implications for the effectiveness of need-based grant aid. Technical report, National Bureau of Economic Research.

Medina, P. C. (2021). Side effects of nudging: Evidence from a randomized intervention in the credit card market. *The Review of Financial Studies 34*(5), 2580–2607.

Medina, P. C. and M. Pagel (2021). Do saving nudges cause borrowing? evidence from a mega study. Technical report.

Meier, S. and C. Sprenger (2010). Present-biased preferences and credit card borrowing. *American Economic Journal: Applied Economics 2*(1), 193–210.

Melzer, B. T. and D. P. Morgan (2015). Competition in a consumer loan market: Payday loans and overdraft credit. *Journal of Financial Intermediation 24*(1), 25–44.

Mezza, A., D. Ringo, and K. Sommer (2021). Student loans, access to credit and consumer financial behavior.

Mrkva, K., N. A. Posner, C. Reeck, and E. J. Johnson (2021). Do nudges reduce disparities? choice architecture compensates for low consumer knowledge. *Journal of Marketing 85*(4), 67–84.

Nelson, S. T. (2017). *Private information and price regulation In the US credit card market*. Ph. D. thesis, Massachusetts Institute of Technology.

Norvilitis, J. M., M. M. Merwin, T. M. Osberg, P. V. Roehling, P. Young, and M. M. Kamas (2006). Personality factors, money attitudes, financial knowledge, and credit-card debt in college students 1. *Journal of applied social psychology 36*(6), 1395–1413.

O'Donoghue, T. and M. Rabin (1999). Doing it now or later. *American economic review 89*(1), 103–124.

Pinto, M. B. and P. M. Mansfield (2006). Financially at-risk college students: An exploratory investigation of student loan debt and prioritization of debt repayment. *Journal of Student Financial Aid 36*(2), 2.

Ponce, A., E. Seira, and G. Zamarripa (2017). Borrowing on the wrong credit card? evidence from mexico. *American Economic Review 107*(4), 1335–61.

Prelec, D. (1998). The probability weighting function. *Econometrica*, 497–527.

Robb, C. A. and D. L. Sharpe (2009). Effect of personal financial knowledge on college students' credit card behavior. *Journal of Financial Counseling and Planning 20*(1).

SallieMae (2009). How undergraduate students use credit cards - sallie mae's national study of usage rates and trends. Technical report, Sallie Mae.

SallieMae (2016). Majoring in money: How american college students manage their finances - sallie mae's national study of college students ages 18-24. Technical report, Sallie Mae.

Stango, V. and J. Zinman (2009). Exponential growth bias and household finance. *The Journal of Finance 64*(6), 2807–2849.

Thaler, R. H. and C. R. Sunstein (2008). *Nudge: Improving decisions about health, wealth, and happiness*. Yale University Press.

Thaler, R. H., C. R. Sunstein, and J. P. Balz (2014). Choice architecture. *The behavioral foundations of public policy*.

Warren, E. (2007, January). Testimony before the committee on banking, housing, and urban affairs of the united states senate hearing: Examining the billing, marketing, and disclosure practices of the credit card industry, and their impact on consumers.

Warwick, J. and P. Mansfield (2000). Credit card consumers: College students' knowledge and attitude. *Journal of Consumer Marketing*.

Zinman, J. (2007). Household borrowing high and lending low under no-arbitrage. *Dartmouth University*.

A Mathematical Appendix

Proposition 1 *Suppose $w - b_0 < \ell$ (Case 3). There exist two probability thresholds, p_1 and p_2, where $0 < p_1 \leq p_2 \leq \frac{r_s}{r_c}$ such that*

1. *For $p \geq p_2$, the student covers her shortfall only with student loans (she fully insures),*
2. *For $p_1 < p < p_2$, the student partially insures against having to borrow on her card,*
3. *For $p < p_1$, the student covers her entire shortfall with a credit card.*

Proof of Proposition 1. Let

$$a = \frac{r^s}{r^c - r^s} \cdot \frac{V_t'((1+r^s)(b_0+\ell-w) + r^s \cdot \Gamma)}{V_t'((1+r^s)(b_0+h-w))}$$

and

$$b = \frac{r^s}{r^c - r^s} \cdot \frac{V_t'((1+r^s)(b_0+\ell-w))}{V_t'((1+r^s)(b_0+h-w) + (r^c-r^s)\cdot\Gamma)}.$$

Since V_t is strictly decreasing and $r_c > r_s$ by assumption, $0 < a \leq b$. Consider $f(p) = \frac{p}{1-p}$. For any non-negative value c, $\exists p \in [0,1)$ s.t., $f(p) = c$. Define p_1 and p_2 s.t. $f(p_1) = a, f(p_2) = b$. Clearly, $p_1 \leq p_2$. Note that $\frac{p_2}{1-p_2}\frac{r^c-r^s}{r^s} \leq \frac{V_t'((1+r^s)(b_0+\ell-w))}{V_t'((1+r^s)(b_0+h-w)+(r^c-r^s)\Gamma)} \leq 1 \Rightarrow p_2 \leq \frac{r^s}{r^c}$.

Consider any $p \geq p_2$, for any $\gamma \in [0, \Gamma]$ we have

$$\frac{V_t'((1+r^s)(b_0+\ell-w)+r^s\gamma)}{V_t'((1+r^s)(b_0+h-w)+(r^c-r^s)(\Gamma-\gamma))} \leq \frac{V_t'((1+r^s)(b_0+\ell-w)+r^s\Gamma)}{V_t'((1+r^s)(b_0+h-w))} \leq \frac{r^c-r^s}{r^s}\frac{p}{1-p}.$$

with equality possible only where $\gamma = \Gamma$. Then for any $0 \leq \gamma < \Gamma$,

$$(1-p)r^s V_t'((1+r^s)(b_0+\ell-w)+r^s\gamma) - p(r^c-r^s)V_t'((1+r^s)(b_0+h-w)+(r^c-r^s)(\Gamma-\gamma)) < 0.$$

This indicates the expression to be maximized in (4) is increasing on the interval $[0, \Gamma)$. Thus $\gamma = \Gamma$ is the maximum on the interval and the student fully insures.
Alternatively if $p < p_1$ then

$$\frac{V_t'((1+r^s)(b_0+\ell-w)+r^s\gamma)}{V_t'((1+r^s)(b_0+h-w)+(r^c-r^s)(\Gamma-\gamma))} \geq \frac{V_t'((1+r^s)(b_0+\ell-w))}{V_t'((1+r^s)(b_0+h-w)+(r^c-r^s)\Gamma)} \geq \frac{(r^c-r^s)\cdot p}{r^s\cdot(1-p)}.$$

with equality possible only where $\gamma = 0$. Then for any $0 < \gamma \leq \Gamma$,

$$(1-p)r^s V_t'((1+r^s)(b_0+\ell-w)+r^s\gamma) - p(r^c-r^s)V_t'((1+r^s)(b_0+h-w)+(r^c-r^s)(\Gamma-\gamma)) > 0.$$

This indicates the expression to be maximized in (4) is decreasing on the interval $[0, \Gamma)$. Thus $\gamma = 0$ is the maximum on the interval and the student does not insure.
Now consider any $p \in (p_1, p_2)$. We know that any interior solution of (4) where $0 < \gamma^* < \Gamma$, it follows that

$$\frac{p}{1-p} \cdot \frac{r^c - r^s}{r^s} = \frac{V_t'((1+r^s)(b_0+\ell-w) + r^s \cdot \gamma^*)}{V_t'((1+r^s)(b_0+h-w) + (r^c - r^s) \cdot (\Gamma - \gamma^*))} \,. \tag{A1}$$

From the previous reasoning we know that where $\gamma = \Gamma$, $\frac{V_t'((1+r^s)(b_0+\ell-w)+r^s\Gamma)}{V_t'((1+r^s)(b_0+h-w))} > \frac{r^c-r^s}{r^s}\frac{p}{1-p}$ and where $\gamma = 0$, $\frac{V_t'((1+r^s)(b_0+\ell-w))}{V_t'((1+r^s)(b_0+h-w)+(r^c-r^s)\Gamma)} < \frac{r^c-r^s}{r^s}\frac{p}{1-p}$. By the intermediate value theorem, there exists a $\gamma \in (0, \Gamma)$ satisfying equation (A1). Thus this student will insure up to $0 < \gamma < \Gamma$ and rely on credit card liquidity to cover the remainder $(\Gamma - \gamma)$ should the high state be realized. ■

Corollary 1 *Suppose $\ell < w - b_0 < h$ (Case 2). Then there exist similar probability thresholds to Case 3, p_1' and p_2' $0 < p_1' \leq p_2' \leq \frac{r_s}{r_c}$.*

Proof of Corollary 1. Let

$$a = \frac{r^s}{r^c - r^s} \cdot \frac{V_t'(max\{(1+r^s)(b_0+\ell-w) + r^s \cdot \Gamma, 0\})}{V_t'((1+r^s)(b_0+h-w))}$$

and

$$b = \frac{r^s}{r^c - r^s} \cdot \frac{V_t'(0)}{V_t'((1+r^s)(b_0+h-w) + (r^c - r^s) \cdot \Gamma)}.$$

Similar arguments as in the Proof of Proposition (1) show the existence and relation of p_1' and p_2'. ■

Corollary 2 *The statements $p_1 = p_2$, $p_2 = \frac{r_s}{r_c}$, and V_t is linear are equivalent.*

Proof of Corollary 2. If $p_1 = p_2$, then $\frac{V_t'((1+r^s)(b_0+\ell-w)+r^s\cdot\Gamma)}{V_t'((1+r^s)(b_0+h-w))} = \frac{V_t'((1+r^s)(b_0+\ell-w))}{V_t'((1+r^s)(b_0+h-w)+(r^c-r^s)\cdot\Gamma)}$. Since V_t is assumed to be decreasing and (weakly) concave, the can only occur if V is linear. Then $\frac{p_2}{1-p_2} = \frac{r^s}{r^c-r^s} \Rightarrow p_2 = \frac{r^s}{r^c}$.
If $p_2 = \frac{r^s}{r^c}$, then $\frac{V_t'((1+r^s)(b_0+\ell-w))}{V_t'((1+r^s)(b_0+h-w)+(r^c-r^s)\cdot\Gamma)} = 1$ and V_t must be linear. Then $p_1 = \frac{r^s}{r^c} = p_2$.
The preceding arguments have already showed that $p_1 = p_2 = \frac{r^s}{r^c}$ if V_t is linear. A similar line of reasoning will hold for Case 2. ■

Proposition 2 *Suppose $-\frac{V_\infty''(x)}{V_\infty'(x)}$ is non-decreasing in x. Then for any two levels of aggregate debt, $b_0 < b_0'$ the corresponding probability thresholds follow $p_1' \leq p_1$ and $p_2' \leq p_2$. In other words, higher levels of initial debt make students more predisposed to precautionarily borrow on student loans.*

Proof of Proposition 2. The condition $-\frac{V''_\infty(x)}{V'_\infty(x)}$ is more commonly defined as the Arrow-Pratt coefficient of risk aversion. If it were non-decreasing in x, it implies that more risky gambles (in this case credit liquidity) are less likely to be selected over safer gambles (in this case student loans) as x increases. Formally, this means that $\frac{V'_t((1+r^s)(b_0+\ell-w)+r^s\cdot\gamma^*)}{V'_t((1+r^s)(b_0+h-w)+(r^c-r^s)\cdot(\Gamma-\gamma^*))} \leq \frac{V'_t((1+r^s)(b'_0+\ell-w)+r^s\cdot\gamma^*)}{V'_t((1+r^s)(b'_0+h-w)+(r^c-r^s)\cdot(\Gamma-\gamma^*))}$ $\forall 0 \leq \gamma \leq \Gamma$. Following the reasoning of the proof of Proposition (1), it follows that $p'_1 \leq p_1$ and $p'_2 \leq p_2$. ■

Corollary 3 *Suppose $-\frac{V''_\infty(x)}{V'_\infty(x)}$ is non-decreasing in x. Consider two students i and i' with identical debt levels but with different wealth so that one is categorized as Case 2 and the other Case 3. Formally, $w < w'$ and $w < b_0 + \ell$ but $b_0 + \ell < w' < b_0 + h$. Then the corresponding probability thresholds follow $p'_1 \leq p_1$ and $p'_2 \leq p_2$.*

Proof of Corollary 3. Clearly, $\frac{V'_t((1+r^s)(b_0+\ell-w)+r^s\cdot\gamma^*)}{V'_t((1+r^s)(b_0+h-w)+(r^c-r^s)\cdot(\Gamma-\gamma^*))} \leq \frac{V'_t(min\{(1+r^s)(b_0+\ell-w)+r^s\cdot\gamma^*,0\})}{V'_t((1+r^s)(b'_0+h-w)+(r^c-r^s)\cdot(\Gamma-\gamma^*))}$ $\forall 0 \leq \gamma \leq \Gamma$. The result $p'_1 \leq p_1$ and $p'_2 \leq p_2$ follows directly from this relation. ■

Proposition 3 *Consider the following linearly scaled utility function L_t,*

$$L_t(d) = \frac{V_t((1+r^s)\gamma(\ell) + r^s\Gamma) - V_t((1+r^s)\gamma(\ell))}{r^s\Gamma} \cdot d = \frac{-\Delta V_t}{r^s\Gamma} \cdot d \tag{11}$$

For the welfare calculations ΔW^{opt} and ΔW^{br} defined in equations (5), (6), the linear function L_t provides a lower bound on changes in welfare.

Proof of Proposition 3. Consider the optimal consumer in item 1. Define $\gamma^* \in [0, \Gamma]$, as before as the level of insurance the consumer selects under no restrictions. If the probability of the high state, $p \geq p_2$, then $\gamma = \Gamma$, the student fully insures with student loans, there is no change in behavior. It follows then that $\Delta W^{opt} = 0$ under any utility specification, trivially satisfying our claim.

If $p < p_2$, then behavior changes under the policy as $\gamma^* < \Gamma$. Let us first define a particular risk premium $\epsilon \geq 0$ that represents the utility gain to the consumer from full insurance at even odds. Recall from Proposition 1 that $p_2 \leq \frac{r^s}{r^c}$. Then,

$$\begin{aligned} \epsilon \equiv\ & (1-p^*)\cdot[V_t((1+r^s)\gamma(\ell) + r^s\Gamma) - V_t((1+r^s)\gamma(\ell) + r^s\gamma^*)] + \\ & p^*\cdot[V_t((1+r^s)\gamma(h)) - V_t((1+r^s)\gamma(h) + (r^c-r^s)(\Gamma-\gamma^*))] \end{aligned} \tag{A2}$$

where $p^* = \frac{r^s}{r^c}$.

There exists a p' such that if we were to replace p^* with p' in equation (A2), ϵ would equal 0. Further $p' \leq p^*$. Multiplying both sides of equation (A2) by $\frac{p'}{p^*}$ and combining like terms yields

$$\epsilon = \left(\frac{p^*-p'}{p'}\right)[V_t((1+r^s)\gamma(\ell)) - V_t((1+r^s)\gamma(\ell) + r^s\gamma^*)]. \tag{A3}$$

Now multiply both sides of equation (A2) by $\frac{p}{p'}$ and apply the same technique. This allows us to come up with a new expression for ΔW^{opt}.

$$\begin{aligned}
\Delta W^{opt} &= \frac{p}{p^*}\epsilon - \left(1 - \frac{p}{p^*}\right)\left[V_t((1+r^s)\gamma(\ell) + r^s\gamma^*) - V_t((1+r^s)\gamma(\ell) + r^s\Gamma)\right] \qquad \text{(A4)} \\
&= \left(\frac{p(p^* - p')}{p^*p'} - \frac{p^* - p}{p^*}\right)\left[V_t((1+r^s)\gamma(\ell) + r^s\gamma^*) - V_t((1+r^s)\gamma(\ell) + r^s\Gamma)\right] \\
&\geq -\frac{p^* - p}{p^*}[L_t((1+r^s)\gamma(\ell)) - L_t((1+r^s)\gamma(\ell) + r^s\Gamma)]
\end{aligned}$$

where the last expression is the welfare loss under the linear, risk-neutral specification L_t.

Now consider item 2, for the boundedly rational consumer. Let us define $p_3 \in [p_1, p_2]$ as the probability where the utilities from full insurance and no insurance (i.e., full liquidity) are equal. This is also the point where $\Delta W^{br} = 0$, and our claim is trivially satisfied. Using similar techniques as before, we can set up equation (A4) as

$$\begin{aligned}
\Delta W^{br} &= \left(\frac{p(p^* - p_3)}{p^*p_3} - \frac{p^* - p}{p^*}\right)\left[V_t((1+r^s)\gamma(\ell)) - V_t((1+r^s)\gamma(\ell) + r^s\Gamma)\right] \\
&\geq -\frac{p^* - p}{p^*}[L_t((1+r^s)\gamma(\ell)) - L_t((1+r^s)\gamma(\ell) + r^s\Gamma)].
\end{aligned}$$

which importantly holds whether $p > p^*$ and welfare changes are positive in the linear case or $p < p^*$.

■

B Additional Results and Alternative Specifications

B.1 Heterogeneity by Parental Education

In Section 4.1 we study heterogeneous effects of the intervention by parental income. Here, we present heterogeneous treatment effects by parental education. Specifically, for each student we pull information on the prevalence of college education at the ZIP code level using data from the ACS, and split them into quartile groups. Though correlated, parental income and education are by no means collinear. The correlation coefficient between these two variables is about 70 percent. We estimate equation 9 calculating triple interactions with quartiles of parental education. Figure B1 presents the results when the dependent variables are student loan balances (left panel), and a binary variable that takes the value of one when a student accepts a positive loan amount (right panel).

We can see that the treatment effect of Title 3 on student loan outcomes is significantly larger among students coming from neighborhoods where college education is less prevalent.

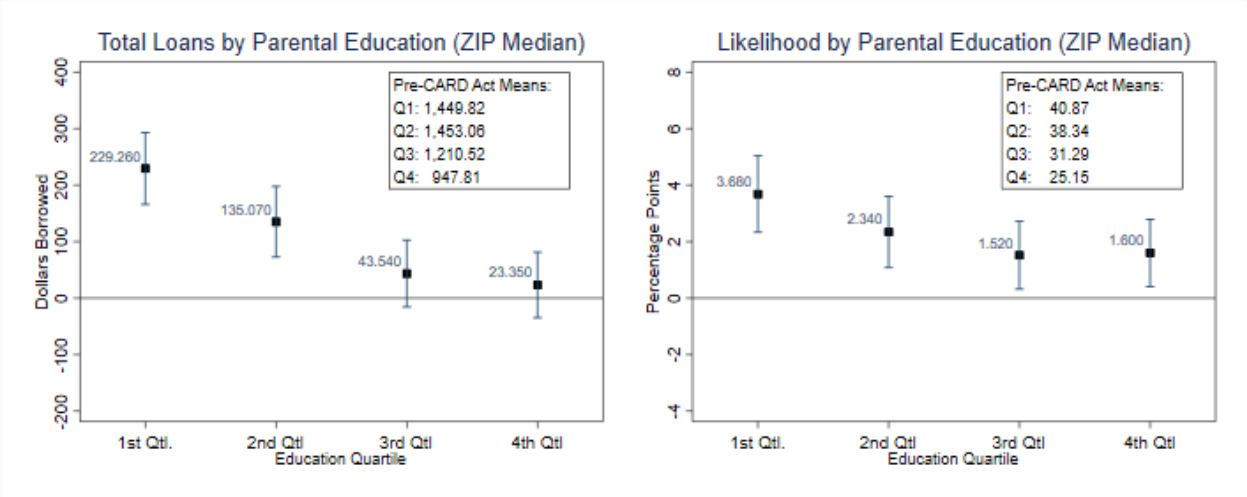

Figure B1: Heterogeneity by Parental Education

Note: *This figure plots coefficients (β_q) from equation 9 where the triple interaction is defined over quartiles of parental education. The dependent variables are student loan balances (left panel) and a binary value that takes the value of one when a student accepts a positive amount of student loans on any given semester (right panel). The estimation controls for gender, class in school, in state status, identified minority, and whether a FAFSA application is filed. It further includes semester by ZIP income quartile fixed effects. Confidence intervals shown are constructed using standard errors clustered by student.*

For them, student loan balances increase by $\frac{229.26}{1{,}449.82} \approx 16$ percent, and the probability of taking out student loans increases by $\frac{3.68}{40.87} \approx 9$ percent.

B.2 Expectations about Post-Graduation Outcomes

It is possible that the financial crisis affected students expectations about post graduation outcomes, and it is these changes that are driving student borrowing decisions. We note that expectations about post-graduation outcomes are likely to be more relevant for students closer to graduation. For robustness, we redefine our treatment group to be composed only of sophomores or only of juniors. Figures B2 and B3 shows the results of estimating equations 8 and 9 with these alternative definitions. We find that the results are qualitatively the same in both cases, and if anything, the effect is weaker for students close to graduation.

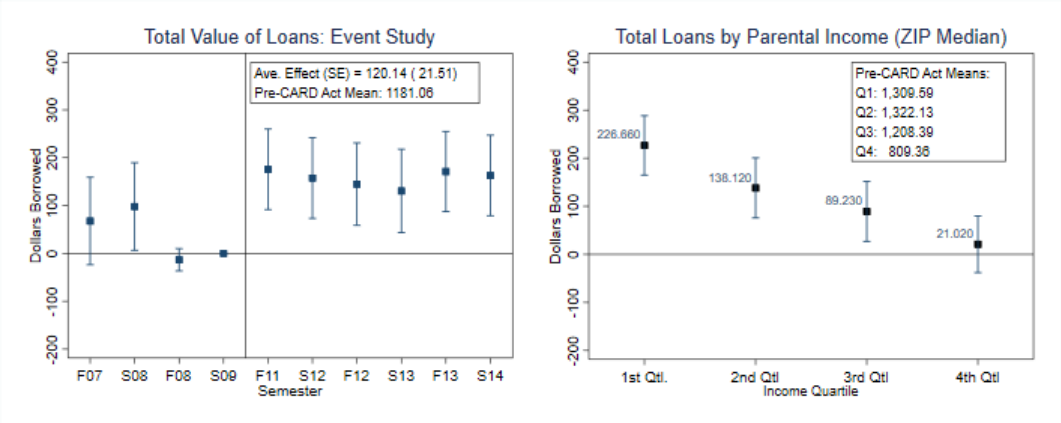

Figure B2: Treatment Effect on Student Loan Borrowing: Freshmen vs Sophomore Students

Note: *The left panel of the figure plots coefficients (β_s) from equation 8. The right panel plots coefficients (β_q) from equation 9. In both cases, the treatment group consists of sophomores. The outcome of interest is the dollar value of student loans borrowed on any given semester. The estimation controls for gender, class in school, in state status, identified minority, and whether a FAFSA application is filed. It further includes semester by ZIP income quartile fixed effects. Confidence intervals shown are constructed using standard errors clustered by student.*

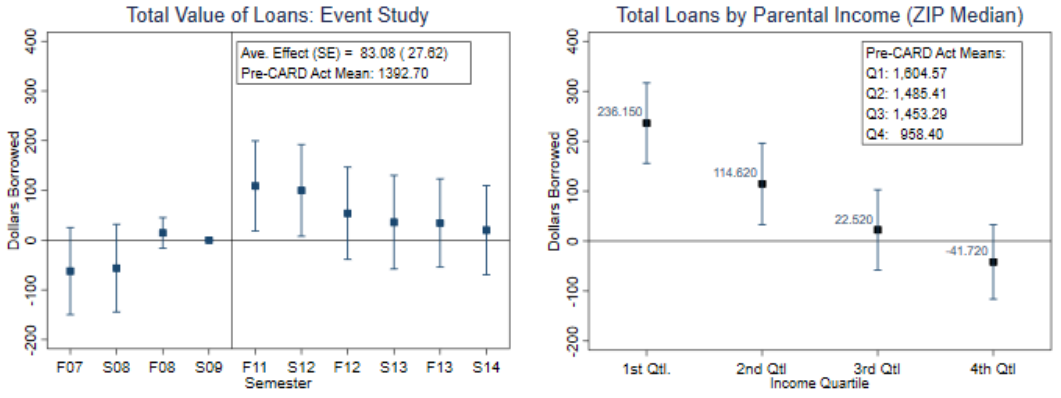

Figure B3: Treatment Effect on Student Loan Borrowing: Freshmen vs Junior Students

Note: *The left panel of the figure plots coefficients (β_s) from equation 8. The right panel plots coefficients (β_q) from equation 9. In both cases, the treatment group consists of juniors. The outcome of interest is the dollar value of student loans borrowed on any given semester. The estimation controls for gender, class in school, in state status, identified minority, and whether a FAFSA application is filed. It further includes semester by ZIP income quartile fixed effects. Confidence intervals shown are constructed using standard errors clustered by student.*

B.3 Student Loan Limits

Table B1 shows the limits for subsidized, unsubsidized and total federal student loans for each grade and academic year between 2007 and 2014. The limit for subsidized loans remains unchanged during the observation period. The limit for unsubsidized loans increases at the beginning of the 2008 academic year. It increases by $2,000 for all classes.

Table B1: Federal Student Loan Limits by Year, Grade and Type: 2007-2014

School year	Grade	Max Subsidized	Max Unsubsidized	Max Total
2007	Freshman	3500	3500	3500
2008	Freshman	3500	5500	5500
2009	Freshman	3500	5500	5500
2010	Freshman	3500	5500	5500
2011	Freshman	3500	5500	5500
2012	Freshman	3500	5500	5500
2013	Freshman	3500	5500	5500
2014	Freshman	3500	5500	5500
2007	Sophomore	4500	4500	4500
2008	Sophomore	4500	6500	6500
2009	Sophomore	4500	6500	6500
2010	Sophomore	4500	6500	6500
2011	Sophomore	4500	6500	6500
2012	Sophomore	4500	6500	6500
2013	Sophomore	4500	6500	6500
2014	Sophomore	4500	6500	6500
2007	Junior/Senior	5500	5500	5500
2008	Junior/Senior	5500	7500	7500
2009	Junior/Senior	5500	7500	7500
2010	Junior/Senior	5500	7500	7500
2011	Junior/Senior	5500	7500	7500
2012	Junior/Senior	5500	7500	7500
2013	Junior/Senior	5500	7500	7500
2014	Junior/Senior	5500	7500	7500

B.4 Composition Effects

Figure B4 presents the result of estimating equation 10, to identify the causal effect of the regulation using variation within students as they progress from incoming freshman to continuing sophomore and junior, for students with different years of first enrollment. Students with years of first enrollment on or after 2010 experience college during the post-treatment period.

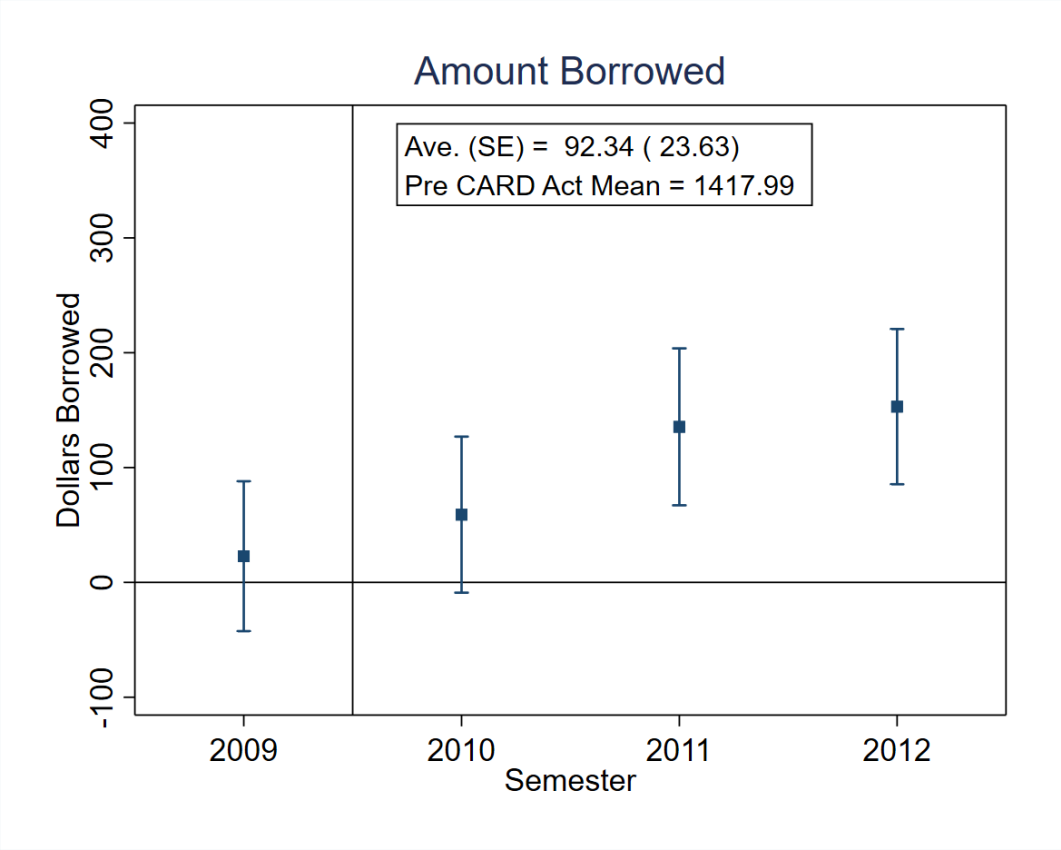

Figure B4: Treatment Effect on Student Loan Borrowing: Individual Fixed Effects

Note: *This figure plots coefficients (β_{YFE}) from equation 10 which includes individual fixed effects. Confidence intervals shown are constructed using standard errors clustered by student.*

B.5 Definition of Post-Treatment Period

Figure B5 shows treatment effect estimates of Title 3 extending the post-treatment period to also include Fall 2009 to Spring 2011. In the main specification, this period is excluded since sophomore and juniors enrolled during those years as the treatment effect of Title 3 was ambiguous on these students' financial aid packages.

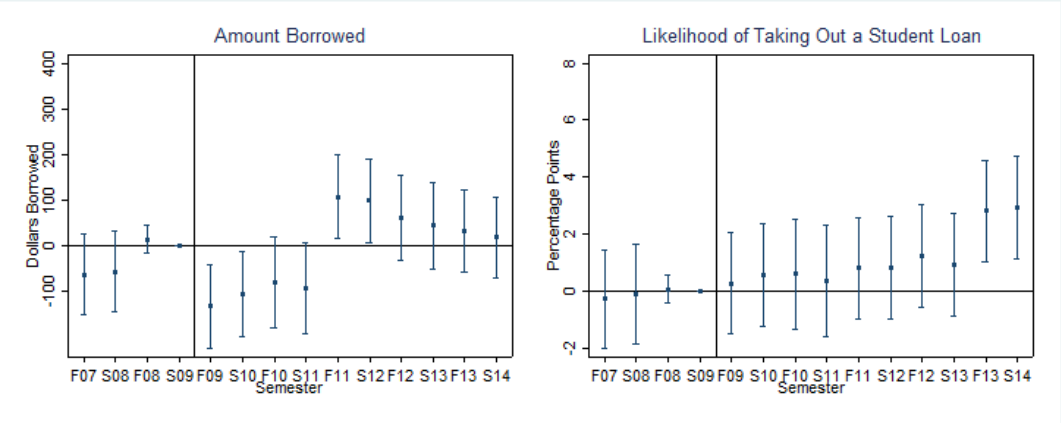

Figure B5: Treatment Effect on Student Loan Borrowing: Extended Post-Treatment Period

Notes: *The figure plots coefficients (β_s) from equation 8. The left panel shows the amount of student loans borrowed (b). The estimation sample includes all students, even those that did not take out student loan debt. The right panel plots the likelihood of taking out a student loan (p). The estimation controls for gender, class in school, in state status, identified minority, and whether a FAFSA application is filed. It further includes semester by ZIP income quartile fixed effects. Confidence intervals shown are constructed using standard errors clustered by student. The post-treatment period starts in the Fall of 2009 and as a result, it includes partially treated students who where enrolled between Fall 2009 and Spring 2011.*

B.6 Ability to Pay Rules and the Supply Side

Figure B6 shows relative changes before and after implementation of Title 3 of students' AGI. The graphs is based on estimation of Equation 9 with an indicator for positive AGI (left panel) and the amount of AGI reported (right panel) as dependent variables. It is run on students who have filed a FAFSA, for whom AGI is reported.

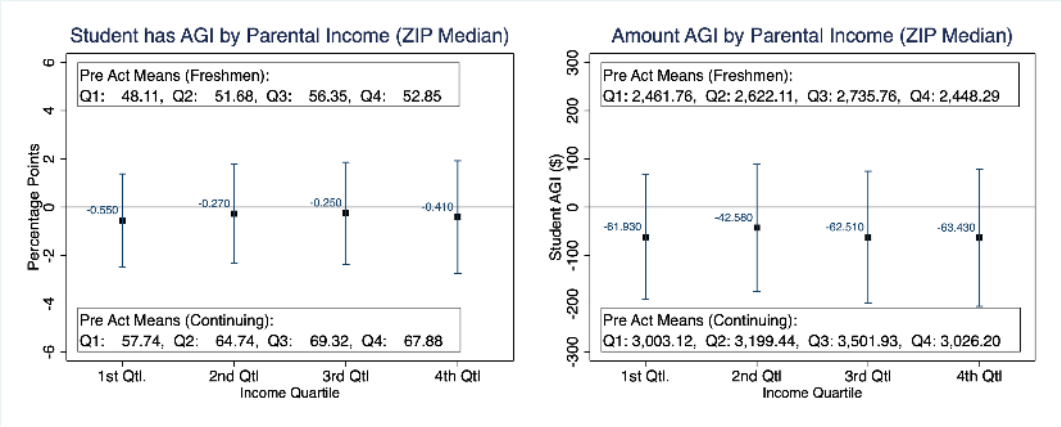

Figure B6: Relative Changes in

Note: *The figure plots coefficients from Equation 9 with an indicator for whether a student has AGI (left panel) and the amount of AGI (right panel) as dependent variables. The estimation controls for gender, class in school, in state status, and identified minority. It further includes semester by ZIP income quartile fixed effects. Confidence intervals shown are constructed using standard errors clustered by student.*

B.7 Academic Outcomes: Dynamic Specification

In Section 6.2 we estimate the treatment effect of the intervention on academic outcomes using the difference-in-difference specification described in equation 17. To asses the validity of the parallel trends assumption we also estimate a dynamic specification with semester-specific coefficients, as described in equation B1:

$$y_i^k = \alpha_q^k + \alpha_s^k + \sum_{s \neq F09} \beta_s^k \times \mathbb{1}(Qtr \leq 3)_i + \gamma^k X_i + \epsilon_i. \tag{B1}$$

As before, we estimate treatment effects on the following outcomes:

$$k \in \{\text{GPA, On-time Graduation, Major}\}.$$

In this case, the treatment group is defined as all students in the bottom three quartiles of the parental income distribution. The results are presented in Figure B7.

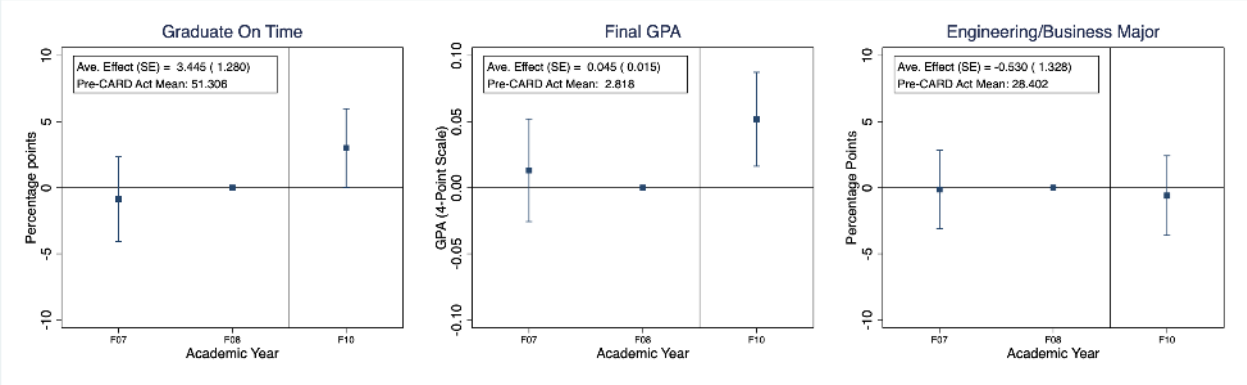

Figure B7: Treatment Effect on Academic Outcomes: Event Study Design

Note: *The figure plots coefficients (β_k) from equation 17. The dependent variables are on-time graduation (left panel), final grade point average (GPA) (middle), and whether or not the student majored in engineering or business (right). On-time graduation is defined as graduating in 4 years or less. Final GPA is based on a 4 point scale. The estimation controls for gender, in state status, and identified minority. It further includes enrollment year and ZIP income quartile fixed effects. Confidence intervals shown are constructed using robust standard errors.*

In all three cases we can see that there are no significant differences in trends in the pre-treatment period. We can also see a clear positive increase in the probability of graduating on time, and on grade point averages after Title 3 took place. In contrast, there is no treatment effect of the regulation on the probability of selecting a business or engineering major.

C Full Tables From Survey

This section provides the full tables discussed in Section 5. These include tables regarding card adoption and use.

Table C1: Having and Using Credit Cards

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Card?	*Why Do You Not Have a Card?*					
		Afraid of Debt	Other Cash	Hassle	Do Not Qualify	High Rate	Other
All	52.72	47.75	35.81	17.13	11.38	9.55	18.68
By ZIP level Income Quartile							
1^{st}	49.75	53.73	31.84	15.42	11.44	9.45	18.41
2^{nd}	46.10	52.04	36.20	16.74	12.67	9.95	14.93
3^{rd}	55.94	45.39	37.50	16.45	11.18	7.89	20.39
4^{th}	60.78	33.59	39.69	21.37	9.16	9.92	23.66
By Financial Aid Status							
Filed FAFSA	52.86	50.66	34.54	15.18	11.01	10.44	17.84
Offered SL	53.05	50.39	35.08	15.12	10.66	10.66	18.02
Took Out SL	51.82	53.77	33.17	13.57	12.56	11.56	16.08

Notes: *This table shows survey responses describing the reasons why students do not have credit cards or, among those who have them, how they use them. Column 1 of panel (a) shows the fraction of students who responded "Yes" to the question "Do you have a credit card". Students who responded "No" to this question were further asked: "You do not have a credit card because? (Check all that apply)". Columns 2 to 7 of the same panel show the fraction of students who selected the corresponding answer.*

Table C2: Response to Changes in Students' Financial Environment

	(1)	(2)	(3)	(4)	(5)	(6)
	Panel (a): *How Would Not Using a Card Affect Your Financial Situation?*					
	Switch To Debit	Cut Back On Non-Essentials	More Paid Work	Funds From Parents	Cut Back Essentials	More SL
All	76.45	38.41	29.72	23.17	18.26	8.94
By Income Quartile						
1^{st}	73.87	43.72	33.67	28.64	22.11	12.56
2^{nd}	72.49	37.57	30.69	21.16	18.52	11.11
3^{rd}	80.31	40.41	27.98	22.28	14.51	6.22
4^{th}	78.82	32.02	27.59	21.18	17.73	6.40
By Financial Status						
Offered SL	76.50	38.59	29.33	22.47	19.04	10.81
Revolve on Card	54.78	47.13	43.95	30.57	29.30	22.29
	Panel (b): *How Would You Cover A $500 Emergency?*					
	Use Card	Use Other Savings	Funds From Parents	Unable to Cover	Use SL	Other
All	59.07	48.74	46.22	6.05	4.91	3.53
By Income Quartile						
1^{st}	53.27	49.75	41.71	10.55	9.05	6.03
2^{nd}	58.73	54.50	46.56	6.35	4.23	3.70
3^{rd}	61.66	49.74	45.08	3.63	3.11	1.04
4^{th}	61.58	41.87	51.23	3.94	2.96	3.45
By Financial Status						
Took Out SL	52.34	43.46	42.06	12.15	14.49	3.74
Revolve on Card	59.24	38.22	45.86	15.29	9.55	5.10

Notes: *This table presents students' responses to the following two survey questions: "Imagine that you could no longer use your credit card(s) next year. How would this affect your financial situation? (check all that apply)", and "Imagine that tomorrow you had to cover an emergency expenditure of $500 or more. How would you do it? (check all that apply)". In both cases, respondents are split by income quartile or financial status. Each cell shows the fraction of students that selected the corresponding answer. We consider only students who reported having a credit card on the same survey.*

Table C3: How Students Use a Credit Card

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Card?	*Revolver?*	*What Do You Use Your Card For?*				
			Indirect Expenses	Non-Essentials	Emergency	Direct Expenses	Other
(a) All Students with Credit Cards							
All	52.72	19.77	77.71	72.54	58.06	43.95	26.45
By ZIP level Income Quartile							
1^{st}	49.75	26.13	74.87	68.34	57.29	35.18	27.14
2^{nd}	46.10	19.58	75.66	73.02	59.79	47.09	26.98
3^{rd}	55.94	18.65	81.87	73.58	59.07	47.15	22.80
4^{th}	60.78	14.29	79.31	74.38	56.16	46.80	28.08
By Financial Aid Status							
Filed FAFSA	52.86	21.66	76.48	71.91	56.68	44.50	25.72
Offered SL	53.05	21.10	75.99	71.53	56.43	43.74	25.90
Took out SL	51.82	29.44	72.90	65.42	59.35	44.86	25.70
(b) Revolvers Who Had No Emergencies							
All			70.06	67.52	57.96	50.32	26.11
By ZIP level Income Quartile							
1^{st}			67.31	67.31	69.23	46.15	26.92
2^{nd}			72.97	78.38	62.16	51.35	35.14
3^{rd}			80.56	69.44	52.78	50	19.44
4^{th}			65.52	51.72	34.48	58.62	24.14
By Financial Aid Status							
Filed FAFSA			72.66	67.97	60.16	53.91	25.78
Offered SL			72.36	66.67	59.35	53.66	24.39
Took out SL			76.19	60.32	63.49	58.73	23.81

Notes: *Column 1 of this table shows survey responses to the questions: "Do you have a credit card?" Among those who responded yes, Column 2 shows the fraction of students who responded "sometimes" or "hardly ever" to the following question: "Think about all your credit cards together. When you receive a bill, do you almost always, sometimes, or hardly ever pay the statement balance (the amount owed) in full?. Students were further asked: "What do you use your credit card(s) for? (check all that apply)". Columns 3 to 7 show the fraction of students who selected the corresponding answer. Indirect expenses include "Other school supplies (textbooks and computers)" and "Commuting". Non-Essentials include "Entertainment and dining out" and "Clothing and personal items". Direct Expenses include "Direct school expenses (including tuition, rent, or room and board)". Emergencies and other expenses are directly included as separate options.*

Table C4: Financial Ignorance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Terms / Concepts / History / Own Behavior						
	Contract Terms			*Concepts*	*History*	*Own Behavior*	
	DK Rate	Rate $< 10\%$	DK Limit	Both Correct	Unaware of SL	Discount # Early	Too Much Debt
All	42.32	21.79	13.73	43.95	8.06	1.18	9.70
By ZIP level Income Quartile							
1^{st}	34.17	27.14	10.05	40.20	7.54	1.35	14.07
2^{nd}	42.86	23.28	14.81	37.04	10.05	1.17	10.58
3^{rd}	43.01	18.65	11.92	44.56	9.33	1.02	8.81
4^{th}	48.77	18.72	18.72	52.71	5.91	1.14	5.91
By Financial Aid Status							
Filed FAFSA	39.42	23.18	12.35	41.29	10.83	1.21	11.17
Offered SL	39.62	23.16	12.69	40.99	10.98	1.23	10.98
Took Out SL	35.51	23.83	11.21	34.11	19.16	1.23	15.42

Notes: *This table presents the answers to several survey questions designed to measure ignorance of contract terms, financial concepts, financial history or own behavior. DK stands for Don't Know. SL stands for Student Loans.*

D (Dollarized) Welfare with Risk Neutral Students

Here we consider the dollarized version of the model based welfare analysis. Specifically, we calculate dollar gains (losses) for the average student as a result of Title 3. Consider the following linear versions of Equations 5 and 6:

$$\Delta W^{opt}_{linear} = \begin{cases} \Gamma \cdot (pr^c - r^s) & \text{if } p < \frac{r^s}{r^c}, \\ 0 & \text{if } p \geq \frac{r^s}{r^c} \end{cases} \tag{D1}$$

$$\Delta W^{br}_{linear} = \Gamma \cdot (pr^c - r^s). \tag{D2}$$

Equations D1 and D2 then constitute welfare effects of removing cards for risk-neutral students. They are a function of the likelihood (p) of the high consumption state and the relative price of card debt and student loans (r^c, r^s), and the shortfall Γ. Here, we provide empirical analogues for these objects, which we then use to calculate dollar values for the welfare effects of the policy.

For the first three objects, p, r^c, r^s, we use the same empirical analogues described in Section 6.1. For the latter object, the shortfall Γ, we calculate the average size of the expenditure in the high state, conditional on being in the high state. More specifically, $\hat{\Gamma} = \sum_{j=1}^{J} p(j|j > 0) \times j \times \$500$, where j is the number of emergencies reported by students in the survey. The accounting for the propensity of complying (no longer having a card), the need for liquidity, and making optimal financial choices is the same as in Section 6.1, whereby

$$\Delta \overline{W}^{opt} = (\%\Delta CC) \cdot (\%NL) \cdot \big[min\{0, \hat{\Gamma}(\hat{p}\overline{r}^c - \overline{r}^s)\} \,|\, NL = 1\big], \tag{D3}$$

$$\Delta \overline{W}^{bd} = (\%\Delta CC) \cdot (\%NL) \cdot \big[\hat{\Gamma}(\hat{p}\overline{r}^c - \overline{r}^s) \,|\, NL = 1\big], \tag{D4}$$

$$\Delta \overline{W} = (1 - \hat{p}^{bd}) \cdot \Delta \overline{W}^{opt} + \hat{p}^{bd} \cdot \Delta \overline{W}^{bd}. \tag{D5}$$

Table D1 reports the average per student dollar value effects of Title 3. Welfare for the average student rises by at least \$2.33 per year. However, there is no effect for students who make optimal decisions—these students would not use their credit card in the first place. Among those that did not choose optimally, welfare rose by at least \$3.76. Table D1 also shows that gains are larger among students hailing from more modest communities (zip codes). This is consistent with our difference-in-difference results, which indicate a larger substitution towards student loans among this group. We calculate an average rise in welfare of at least \$6 among students at the bottom quartile of ZIP income, and up to \$11. For students at the top quartile, the impact is almost negligible, approximately \$0.08, similar

Table D1: Bounds Approach for the Net Benefits of the Regulation

	(1) All	(2) 0-25 ptcl.	(3) 25-50 pctl.	(4) 50-75 pctl.	(5) 75-100 pctl.
% Δ CC Adoption (%Δ CC)	30.35	33.25	36.90	27.06	22.22
% Needing Liquidity (% NL)	46.61	52.50	43.17	45.80	44.61
Prob. high state h ($\hat{p}$)	47.12	56.19	49.72	43.04	35.57
Avg. Shortfall ($\hat{\Gamma}$)	1,111.62	1,199.15	1,011.36	1,058.82	1,150.94
$\overline{r}^c$	19.50 - 21.50	19.50 - 21.50	19.50 - 21.50	19.50 - 21.50	19.50 - 21.50
$\overline{r}^s$	4.50 - 6.80	4.50 - 6.80	4.50 - 6.80	4.50 - 6.80	4.50 - 6.80
$\Delta\overline{W}^{opt}$	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00	0.00 - 0.00
$\Delta\overline{W}^{bd}$	3.76 - 8.85	8.70 - 15.87	4.66 - 9.97	2.09 - 6.24	0.16 - 3.59
Prob. boundedly rational ($\hat{p}^{bd}$)	62.06	69.25	62.93	62.03	52.40
$\Delta\overline{W}$	2.33 - 5.49	6.02 - 10.99	2.93 - 6.27	1.30 - 3.87	0.08 - 1.88

Notes: *This table shows calculations of welfare effects using Equations 14, 15, and 16. Interest rates on student loans and credit cards are taken from the Deparment of Education's website and CFPB (2013). Estimates of changes in credit card use (%Δ CC), the proportion requiring liquidity (% NL), the probability of an emergency expenditure ($\hat{p}$), and the proportion of students choosing sub-optimally ($\hat{p}^{bd}$), are calculated using responses in the matched-survey.*

to our main welfare calculation. Students from this group may still hold a credit card, make optimal decisions anyways, and may not be subject to a shortfall. Among behavioral compliers at the bottom quartile subject to a shortfall, this benefit rises to $\$11/(.33 \times .53 \times .56) \approx \$113$, or about 10% of the expected shortfall.

E CARD Act, Section 304

SEC. 304. PRIVACY PROTECTIONS FOR COLLEGE STUDENTS.

Section 140 of the Truth in Lending Act (15 U.S.C. 1650) is amended by adding at the end the following:

"(f) CREDIT CARD PROTECTIONS FOR COLLEGE STUDENTS.—

"(1) DISCLOSURE REQUIRED.—An institution of higher education shall publicly disclose any contract or other agreement made with a card issuer or creditor for the purpose of marketing a credit card.

"(2) INDUCEMENTS PROHIBITED.—No card issuer or creditor may offer to a student at an institution of higher education any tangible item to induce such student to apply for or participate in an open end consumer credit plan offered by such card issuer or creditor, if such offer is made—

"(A) on the campus of an institution of higher education;

"(B) near the campus of an institution of higher education, as determined by rule of the Board; or

"(C) at an event sponsored by or related to an institution of higher education.

"(3) SENSE OF THE CONGRESS.—It is the sense of the Congress that each institution of higher education should consider adopting the following policies relating to credit cards:

"(A) That any card issuer that markets a credit card on the campus of such institution notify the institution of the location at which such marketing will take place.

"(B) That the number of locations on the campus of such institution at which the marketing of credit cards takes place be limited.

"(C) That credit card and debt education and counseling sessions be offered as a regular part of any orientation program for new students of such institution.".

F Survey Details

We distributed the survey via Qualtrics to 18,238 students. These correspond to the University population of full time sophomores and juniors, excluding international students who reported a foreign ZIP code for their permanent address. All students who completed the survey received a $5 Amazon gift card. We first sent a pilot to a random sample to 100 students on April 26, 2021. The remaining 18,138 received the invitation to respond on May 4th. We sent reminders on a weekly basis to students who have not taken the survey by that time. The last reminder was sent on May 25th. The survey was closed on Friday June 4th. Out of 18,238 students invited to participate, 1,577 ($\approx 8.6\%$) responded. Of these, 1,506 (95.4%) of students completed the survey. Below we include the full survey, as exported from Qualtrics.

Survey

Start of Block: Block 1

Intro
This survey studies how TAMU students finance their education. As a student over 18, you may participate. The focus is how you pay for college and deal with money issues. Your answers help us and your school inform policies to help Aggies succeed in their studies.

Your participation is voluntary. The survey will take about 5 minutes.

You will receive a $5 Amazon gift card for completing the survey. It will be emailed to you within 2 weeks.

There are no sensitive questions in this survey that will cause discomfort. The research team will not collect any information that could identify you. Your identity will remain confidential to the extent allowed by law. All published results will be grouped together.

You may skip any question you do not wish to answer. You may also exit the survey at any point. The host's confidentiality policy is available here.

You may ask questions about this study to the Money Education Center or Professor Alex Brown. You may call TAMU's Human Research Protection Program (irb@tamu.edu) at 979-458-4067 or 1-855-795-8636 (toll free). Please reference IRB #2018-1178D. You may print this screen to keep a copy of this consent for your records.

To participate, please select **"I agree"**. You will begin the survey.

Please select **"I Disagree"** if you do not wish yo participate. You may also select **X** in the corner of your browser.

- ○ **I Agree**
- ○ **I Disagree**

Skip To: End of Survey If This survey studies how TAMU students finance their education. As a student over 18, you may part... = I Disagree

Page Break

Q0 How frequently do you think about your finances?

- ○ Rarely
- ○ Every once in a while
- ○ Regularly
- ○ All the time

Page Break

Q1 Do you have a credit card?

- ○ Yes
- ○ No

Skip To: Q3 If Do you have a credit card? = Yes

Page Break

Q2
You do not have a credit card because? (Check all that apply)

- [ ] It is a real hassle to get one
- [ ] Interest rates are too high
- [ ] I am afraid I will get into debt and financial problems
- [ ] I have other ways of getting cash
- [ ] I do not qualify for one
- [ ] Other

Skip To: Q11 If Condition: Selected Count Is Less Than or Equal to 6. Skip To: DID YOU TAKE OUT STUDENT LOANS THIS S....

Page Break

Q3 Think about the credit card you use the most. What is the interest rate on that credit card right now?

- Less than 5%
- 5% to 10%
- 10% to 15%
- 15% to 20%
- More than 20%
- I don't know

Q4 Think about the credit card you use the most. What is the credit limit on that credit card right now?

- less than $1,000
- $1,000 - $2,000
- $2,000 - $5,000
- More than $5,000
- I don't know

Page Break

Q5
Think about all your credit cards together. When you receive a bill, do you almost always, sometimes, or hardly ever pay the statement balance (the amount owed) in full?

- ○ Always or almost always
- ○ Sometimes
- ○ Hardly ever

Page Break

Q6 Think about the credit card you use the most. On your most recent bill, did you pay your statement balance in full or did you leave a balance?

- ○ Paid in full
- ○ Left a balance

Skip To: Q8 If Think about the credit card you use the most. On your most recent bill, did you pay your statemen... = Paid in full

Q7 After the last payment was made, what was the balance still owed on that credit card?

- ○ Less than $100
- ○ Between $100 and $250
- ○ Between $250 and $500
- ○ Between $500 and $1000
- ○ Between $1,000 and $2,000
- ○ More than $2,000
- ○ I don't know

Page Break

Q8 Who is responsible for paying your credit card bill(s)?

- ○ I am
- ○ Mostly me and sometimes my parents or someone else
- ○ Mostly my parents or someone else
- ○ My parents or someone else

Page Break

Q9 What do you use your credit card(s) for? (check all that apply)

- [ ] Emergencies
- [ ] Direct school expenses (including tuition, rent, or room & board)
- [ ] Other school supplies (textbooks & computers)
- [ ] Entertainment and dining out
- [ ] Commuting
- [ ] Clothing and personal items
- [ ] Other

Page Break

Q10 Imagine that you could no longer use your credit card(s) next year. How would this affect your financial situation? (check all that apply)

- [ ] Not at all (I don't use a credit card)
- [ ] I would switch to using a debit card, other electronic payment method, and/or cash
- [ ] I would take out more in student loans
- [ ] I would ask my parents or someone else for additional funds
- [ ] I would get a job or increase hours at my current job to make ends meet
- [ ] I would cut back on essential expenditures (including those for school)
- [ ] I would cut back on non-essential expenditures

Page Break

Q11 Did you take out student loans this semester?

- ○ Yes
- ○ No

Skip To: Q15 If Did you take out student loans this semester? = Yes

Page Break

Q12 Why did you not take out student loans this semester? (check all that apply)

- [ ] The decision was primarily made by my parents or someone else
- [ ] I did not qualify for student loans
- [ ] It was too much of a hassle
- [ ] The interest rate was too high
- [ ] I was afraid I would not spend the money wisely
- [ ] I have other ways of covering my expenses
- [ ] If I face financial troubles in the future, I cannot discharge my student loans in bankruptcy
- [ ] Other

Skip To: Q16 If Condition: Selected Count Is Less Than or Equal to 8. Skip To: In the past year, how many times did ....

Page Break

Q15 What is the highest interest rate on any of these student loans right now?

- ○ Less than 5%
- ○ 5% to 10%
- ○ 10% to 15%
- ○ 15% to 20%
- ○ More than 20%
- ○ I don't know

Page Break

Q13 Did you take out the maximum amount in student loans available to you this semester?

- Yes
- No
- I don't know

Skip To: Q16 If Did you take out the maximum amount in student loans available to you this semester? = Yes

Skip To: Q16 If Did you take out the maximum amount in student loans available to you this semester? = I don't know

Page Break

Q14 Why did you not take out the maximum amount in student loans available to you this semester? (check all that apply)

- [ ] I was afraid I would not spend the money wisely
- [ ] The interest rate on additional student loans was too high
- [ ] It would have been a real hassle to take out additional loans
- [ ] I was afraid of reaching a lifetime loan limit
- [ ] If I face financial troubles in the future I cannot discharge my student loans in bankruptcy
- [ ] Other

Page Break

Q16 In the past year, how many times did you have an emergency expenditure of $500 or more?

_____

Q17 In the coming year, how many times do you expect you will have an emergency expenditure of $500 or more?

_____

Page Break

Q18 Imagine that tomorrow you had to cover an emergency expenditure of $500 or more. How would you do it (check all that apply)?

- [ ] I would use my credit card
- [ ] I would use my student loan money
- [ ] I would ask my parents (or someone else) for help
- [ ] I would use other savings
- [ ] I would not be able to cover this amount
- [ ] Other

Page Break

Display This Question:

If Do you have a credit card? = Yes

Q19 I have more credit card debt than I expected at this point.

- ○ Strongly disagree
- ○ Disagree
- ○ Neutral
- ○ Agree
- ○ Strongly agree

Page Break

Display This Question:

If Did you take out student loans this semester? = Yes

Q20 I have more student loan debt than I expected at this point.

- ○ Strongly disagree
- ○ Disagree
- ○ Neutral
- ○ Agree
- ○ Strongly agree

Page Break

Q21 Imagine you had $100 in a savings account and the interest rate was 5% per year. After 2 years, how much do you think you would have in the account if you left the money to grow?

- ○ More than $110
- ○ Exactly $110
- ○ I don't know
- ○ I refuse to answer

Q22 Imagine that the interest rate on your savings account was 1% per year and inflation was 2% per year. After 1 year, how much would you be able to buy with the money in this account?

- ○ More than today
- ○ Exactly the same as today
- ○ Less than today
- ○ I don't know
- ○ I refuse to answer

Page Break

Q23 Imagine you did some work for pay. When it came to be paid, you were given the following choice: you can get $100 today, or if you waited one month, you would get more. For each of the following choices, please record which you would prefer. Please choose your preferred option in each row.

	1	2	
$100 today	○	○	$110 in one month
$100 today	○	○	$125 in one month
$100 today	○	○	$150 in one month
$100 today	○	○	$175 in one month
$100 today	○	○	$200 in one month
$100 today	○	○	$225 in one month

End of Block: Block 1