Working Papers

FEDERAL RESERVE BANK OF BOSTON

No. 23-19

Job Loss, Credit Card Loans, and the College-persistence Decision of US Working Students

Pinghui Wu and Lucy McMillan

Abstract:
This study assesses the impact of involuntary job loss on college persistence by leveraging different job-loss timings relative to a student's college enrollment decision. We find that job loss increases the probability that a working college student leaves college before attaining a degree, but access to short-term credit through credit card loans buffers this liquidity effect. By restricting credit supply to college students, the CARD Act of 2009 has inadvertently inhibited the ability of liquidity-constrained students to remain in college when their earnings unexpectedly fall, resulting in a stronger liquidity effect of job loss on college persistence over the last decade.

JEL Classifications: I22, I23, J64
Keywords: Credit card loans, unemployment, college persistence

Pinghui Wu (Pinghui.Wu@bos.frb.org) is an economist in the Federal Reserve Bank of Boston Research Department. Lucy McMillan (Lucy.McMillan@bos.frb.org) is a senior research assistant in the Federal Reserve Bank of Boston Research Department.

The authors thank Lawrence Bean for editing the manuscript; Darcy Saas, Vanessa Krawczyk, and Teresa Huie for administrative support; and Henry Szeto for technical support. They thank Jeffrey Thompson and participants in the Federal Reserve Bank of Boston internal seminar for helpful comments and feedback.

This version: October 2023 **https://doi.org/10.29412/res.wp.2023.19**

Introduction

A college education is a proven pathway to upward mobility in the United States. However, not all who start down the path reach the end. According to the US Department of Education, in 2020, only 64 percent of first-time, full-time undergraduate students at four-year institutions graduated within six years, and only 48 percent of students who began at two-year institutions graduated or transferred to another institution within three years.[1] While some students dropped out of college for personal reasons or to pursue a different career goal, nearly 40 percent of young adults left college when they could no longer afford to stay.[2] For many students who have limited financial resources, pursuing a college degree requires treading a thin line between attending school and holding a job so that they can pay their day-to-day expenses. Maintaining this balance can be academically and psychologically costly (Johnson et al., 2009). On top of that, unexpected income loss or expenses can disturb the balance, forcing a student to leave college. Timely access to credit is therefore critical for the college persistence of financially constrained students, but it is not always available.

The objective of this study is to gain insight into the relationship between employment, credit constraint, and the college-persistence decision of US 18- to 24-year-old working college students by investigating two interrelated research ques-

[1] US Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System, Winter 2020–2021, Graduation Rates component.

[2] Authors' calculation based on the Panel Study of Income Dynamics (PSID) Transition into Adulthood Supplement, 2005–2019. Affordability-related dropout is defined as college discontinuation because school was too expensive and the student could not obtain financial aid, or because the student needed to have a job for financial reasons and could not work and go to school at the same time.

tions: (1) Does job loss affect whether working students decide to drop out of college, and (2) does access to credit through credit card loans buffer against the liquidity effect of job loss? These working college students represent 57 percent of the 18- to 24-year-old US undergraduate population. On average, compared with their non-working peers, they have lower family income and receive less parental support, and more than half depend on their own earned income to pay for their college education. Furthermore, most working students have no access to commercial loans but hold one or more credit cards, and in many cases, they carry a credit card balance over months.[3] These characteristics suggest that working college students often face a more precarious financial situation and rely on credit card loans for short-term credit when an unexpected liquidity need arises. However, the existing literature offers limited understanding of how a student's own employment, credit access, and the interplay between the two shape their education outcome.

Our first analysis tests job loss's liquidity effect on a working student's college-persistence decision. We leverage the Current Population Survey (CPS) and its short panel design to obtain information on a student's enrollment status and labor market activities over the 16-month CPS survey window across two academic years. We examine whether working students who experienced involuntary job loss in the first academic year showed a different likelihood of re-enrolling in college in the second academic year, conditional on no degree conferral before the second academic year. The short panel design also allows us to exploit the different timing of job-loss events relative to the timing of a student's re-enrollment decision to tease out the treatment effect of job loss from the selection effect. Specifically, we use job-

[3]National Post-secondary Student Aid Study, Undergraduate, 2000 and 2016.

loss events that began after a student's re-enrollment decision—and therefore had no direct liquidity effect on the decision—to assess the extent to which selection on unobservables drives the relationship between job loss and college persistence. Our analysis shows that job loss had minimal effect on working students' college enrollment decision in the period from the 2000–01 to the 2008–09 school years, but it was associated with an 18 percentage point increase in the college dropout rate in the period spanning the 2009–10 through 2018–19 school years. The change indicates that the liquidity effect of job loss on college enrollment was magnified over the last decade, and neither selection nor changes in labor market condition satisfactorily explain the increase.

Coincidentally, during the same period, credit supply to college students through credit card loans plummeted following the passage of the Credit Card Accountability Responsibility and Disclosure (CARD) Act of 2009, which, in addition to other provisions, imposed tight restrictions on credit extension to individuals younger than 21 or older but enrolled in college. The act, while impacting all consumers, disproportionately limited credit supply to young adults (Debbaut, Ghent, and Kudlyak, 2016; Consumer Financial Protection Bureau, 2013) to the extent that it led to a moderate decline in US consumption growth in the post-recession era (Cooper, Gorbachev, and Luengo-Prado, 2022). Unlike government student loans, which follow a fixed application timeline, credit card loans are versatile, allowing students discretion over when and how much credit to use according to their current budget situation. Unlike commercial student loans, which are disproportionately granted to students with a top 10 percent family income, credit card loans

are used more often by students from lower- to middle-income families.[4] These qualities make credit card loans an accessible source of credit to address liquidity-constrained students' unforeseen financial needs, and we posit that the decline in credit card loan supply after 2009 inadvertently limited the ability of these students to remain in college after experiencing temporary earnings losses.

Connecting the two trends, our second analysis finds evidence that the liquidity effect of job loss on college persistence declines with student leverage of credit card loans, which is based on credit card account records retrieved from the Federal Reserve Bank of New York/Equifax Consumer Credit Panel. We find that the decline in credit card use since the 2008–09 school year accounts for 55 to 96 percent of the increase in the liquidity effect of job loss between the two periods, suggesting that many working students rely on credit card loans to make ends meet and remain in college when their earnings fall. As external validation, we find consistent evidence through institution-level records that credit card loans disproportionately increase student retention rates in post-secondary institutions whose enrollment includes a higher share of lower-income students. These analyses reveal coherent evidence across different data sources that credit card loans provide essential liquidity for financially constrained students to smooth their consumption and education investment over temporary liquidity shocks. An important caveat about our findings is that they do not imply credit card loans improve the overall welfare or degree-completion rates of college students. Such an outcome is not observed in the data. Nor do we rule out the possibility that excess credit card debt poses a threat to

[4] Authors' calculation based on National Post-secondary Student Aid Study, Undergraduate, 2016.

college persistence for middle- to higher-income college students.

Our findings contribute to the literature by offering the first evidence that student job loss reduces college persistence, but access to short-term credit through credit card loans moderates this liquidity effect. To our knowledge, Ost, Pan, and Webber (2018) is the only other study on the topic of job loss and working students' college persistence decision. Similarly to our results pertaining to the earlier study period, the authors' findings, based on university-employer-employee-linked administrative data from the state of Ohio, indicate that job loss had a limited effect on college dropout rates over the academic years starting in the 2000–2010 period. Most of the existing research on the relationship between labor market condition and college enrollment focuses on the countercyclical pattern of college enrollment, viewing unemployment risks as a fall in the opportunity cost of college attendance. This historical countercyclical relationship between college enrollment and labor market opportunities has been documented extensively in both the United States and the Scandinavian countries (Sorensen and Hwang, 2021; Sievertsen, 2016; Reiling and Strøm, 2015; Nutting, 2008; Dellas, 2003; Foote and Grosz, 2020; Charles, Hurst, and Notowidigdo, 2018; Barrow and Davis, 2012; Betts and McFarland, 1995; Hillman and Orians, 2013; Schanzenbach, Turner, and Turner, 2023). The relationship is largely due to an increased enrollment in two-year colleges during economic downturns, as workers substitute labor market engagement with career-focused post-secondary education programs with higher market returns (Nutting, 2008; Foote and Grosz, 2020; Betts and McFarland, 1995; Barrow and Davis, 2012; Grosz, 2019; Acton, 2021). Evidence from individual-worker-university-linked records, however, suggests that the enrollment effect has likely

been driven by students not directly affected by the layoffs (Minaya, Scott-Clayton, and Moore, 2020). Our findings complement this literature by revealing a cyclical element of college enrollment due to the liquidity effect of unemployment on working college students.

While there is a sizable literature on credit constraints and higher education decisions, there is scant evidence on the relationship between credit card loans and college enrollment. Past higher education research finds a negative correlation between college persistence and risky credit card use behavior (Robb, Moody, and Abdel-Ghany, 2012) or revolving credit card debt (Andrews, 2021), but the correlation is partially influenced by selection because a student's liquidity condition affects both their card use behavior and education decision. Other studies on student credit constraints and college enrollment report mixed findings. Earlier research based on the 1979–1994 waves of the National Longitudinal Survey of Youth (NLSY79) generally finds limited evidence that credit constraints create meaningful barriers to college enrollment (Keane and Wolpin, 2001; Cameron and Taber, 2004). The lack of evidence reflects the more sufficient supply of government student loans in the 1980s (Lochner and Monge-Naranjo, 2011) as well as data limitations, as credit use is not observed in the NLSY79 and is inferred from instruments of varying strengths. Similarly, using the Health and Retirement Survey, Brown, Karl Scholz, and Seshadri (2012) find that increases in government student aid, instrumented by sibling spacing, has a modest effect on years of schooling for the cohorts that attended college in the 1970s–1990s period. More recent findings based on the NLSY97 show that family resources become a more important determinant of college attendance in the 2000s, and relaxing borrowing constraints leads

to modest to moderate increases in human capital investment and college completion rates (Lochner and Monge-Naranjo, 2011; Johnson, 2013).

Johnson (2013) argues that because students have to repay loans, relaxing borrowing constraints is unlikely to change the college enrollment decision for a marginal student whose expected return to college is comparable to the costs of attendance; the only case in which borrowing constraints significantly influence a student's decision is when a student has a binding budget constraint that prevents them from attending school. This observation suggests that credit constraints would exhibit a stronger effect on students who have demonstrated preference and ability for a college education, such as those already enrolled in college. Consistent with this proposition, using a sample of students from low-income backgrounds, Stinebrickner and Stinebrickner (2008) find that student dropout rates doubled for students with self-disclosed credit constraints. Our study supplements this strand of literature by presenting further evidence that student access to credit has a nontrivial positive effect on college persistence, but the effect is confined to students with demonstrated financial needs.[5]

[5]In addition to focusing on students' labor market prospects or credit constraints, the literature devotes much attention to parental income, which has long exhibited a strong positive correlation with college enrollment rates. Evidence from earlier studies suggests that the correlation arises primarily from latent differences in ability and family preferences (Cameron and Heckman, 2001; Shea, 2000; Carneiro and Heckman, 2002). However, the importance of parental income or wealth as a predictor of children's educational attainment has grown over time (Lochner and Monge-Naranjo, 2011; Belley and Lochner, 2007; Bailey and Dynarski, 2011; Pfeffer, 2018). In light of this correlation, a sizable literature studies the causal relationship between parental income and children's educational attainment by leveraging quasi-exogenous changes to parents' short-term or long-run liquidity, such as job loss (Coelli, 2011; Pan and Ost, 2014; Kalil and Wightman, 2011; Hilger, 2016), housing wealth (Lovenheim, 2011; Lovenheim and Reynolds, 2013; Cooper and Luengo-Prado, 2015; Hotz et al., 2023), tax credits (Bastian and Michelmore, 2018; Manoli and Turner, 2018), lottery winnings (Bulman et al., 2021), and casino winnings (Akee et al., 2010). Most studies find that parents' short-term liquidity constraints have modest to moderate effects on college enrollment, and the effects are smaller among students from low-income families (Bulman et al., 2021;

This paper proceeds as follows. Section 1 describes the finances of US working college students and the impact of the CARD Act on credit card loan supply. Section 2 outlines our theoretical framework and empirical estimation strategy. Section 3 summarizes the regression variables and the data sources. Section 4 reports and discusses our estimation results. Section 5 concludes.

1 Background

1.1 The Finances of US Working College Students

This subsection provides context for the significance of work income and credit card loans with respect to the finances of working college students in the United States. According to the US National Postsecondary Student Aid Study (NPSAS), a nationally representative study of students attending Title IV postsecondary institutions, in 2016, 57 percent of the 18- to 24-year-old undergraduate students in the United States worked while enrolled in college.[6] On average, a working student spent 24.7 hours per week on their job at an $11.2 hourly earnings rate, implying an earned income of $8,299 for working 30 weeks during the school year; additional summer earnings are not included. (Table 1 Part B). The value amounts to 43 percent of the total cost of schooling in 2016 (Table 1 Part A) and is comparable to the combined value of grants and federal loans through financial aid (Table

Hilger, 2016), who finance college primarily through financial aid and student work income.

[6]The NPSAS determines student employment status by whether a student worked while enrolled during a school year. The number of working students does not include students on the Federal Work-Study Program.

Table 1: Finances by College Student Employment Status while Enrolled

US 18- to 24-Year-Old Undergraduate Students, 2016

	Working	Not Working
A. Cost of Schooling		
Mean Value of Tuition and Fees ($)	9,171	13,139
Mean Value of Non-tuition Expenses ($)	10,162	11,408
B. Earnings		
Average Hours per Week	24.7	-
Average Hourly Rate ($)	11.2	-
Average Weekly Earnings $\times$ 30 Weeks ($)*	8,299	-
C. Financial Aid		
Received Any Grants (%)	63.2	69.3
Mean Value of Grants $\geq$ 0 ($)	5,004	7,338
Received Any Federal Loans (%)	36.1	39.4
Mean Value of Federal Loans $\geq$ 0 ($)	2,248	2,422
D. Parental Support		
None (%)	32.3	23.9
$1–$1,999 (%)	25.3	25.1
$2,000–$5,000 (%)	11.8	11.4
$5,001–$9,999 (%)	12.0	14.2
$10,000 or More (%)	18.6	25.5
E. Private Loans		
Received Any Private Loans (%)	6.6	7.2
Mean Value of Private Loans $>$ 0 ($)	8,828	9,587
F. Credit Card Loans		
Had Credit Cards under Own Name (%)	54.6	44.4
Carried a Balance over Each Month (%)	23.5	14.3
Mean Value of Balance Carried $>$ 0 ($)	2,100	2,007

Source(s): 2016 National Center for Education Statistics' National Postsecondary Student Aid Study and authors' calculations.

Note(s): The sample consists of undergraduate college students aged 18 to 24 who were enrolled in a Title IV postsecondary institution in the 2015–16 school year and worked while enrolled (excluding work-study). All dollar values are expressed in 2016 dollars.
* According to the 2008 NPSAS, which was the last iteration of the study to include information about weeks worked while enrolled, more than 70 percent of the 18- to 24-year-old working undergraduate students worked all or most weeks during a semester while enrolled.

1 Part C). Most working students received limited, if any, parental support toward their college education (Table 1 Part D).[7] In the 2015–16 academic year, 32 percent of working students reported no parental support, and 25 percent received modest support of less than $2,000. These statistics indicate that for the median working students, wages and salaries serve as their largest funding source toward a college education. Job loss, therefore, has a direct implication for college affordability because for most working college students, there is little cushion to fall back on.

In theory, when a student loses their job and becomes temporarily liquidity constrained, they can borrow to compensate for the lost income and smooth their consumption. In practice, given their low income and short credit history, the supply of commercial credit to college students is limited and largely in the form of credit card loans. During the 2015–16 school year, less than 7 percent of 18- to 24-year-old working students received a private loan through commercial lenders. Those who did obtain loans often received large sums, suggesting that access to commercial loans was restricted to a small subset of college students who had the financial means to acquire large loans (Table 1 Part E). By contrast, 55 percent of working students reported having at least one credit card in their own name (Table 1 Part F). While some students acquired credit cards as a payment tool, nearly one-quarter of working students carried a credit card balance each month, leveraging their credit cards essentially as short-term loans. The high balance-carrying rate indicates that credit card loans functioned as an accessible form of credit for many working stu-

[7]There is also limited evidence that working students received funds through other personal contacts. Based on the 2016 NPSAS, only 14 percent of US working students received any financial support from family members and/or friends aside from their parents and spouse, and that support was often of small value.

dents who lacked alternative credit sources.

1.2 The Decline in Credit Card Loan Use after 2008

While credit card loans have remained popular among college students, their prevalence declined sharply after 2008, when credit supply fell under the combined influence of the 2008 financial crisis and the subsequent passage of the CARD Act. In the decades preceding the crisis, credit card ownership among college students grew steadily through aggressive marketing campaigns targeting this population. By 1998, 67 percent of college students owned at least one credit card, and the share remained high over the next decade (Sallie Mae, 2009). The prevalence of credit cards and, consequentially, credit card debt on college campuses caused considerable worry among educators and scholars (see, for example, Rubin (1998); Manning (1999)). Many were concerned about the detrimental effect of debt on the academic, psychological, and financial well-being of college students, and a large social science literature emerged about the subject (Andrews, 2021, 2017; Joo, Grable, and Bagwell, 2005; Joo, Durband, and Grable, 2008; Norvilitis, Szablicki, and Wilson, 2003; Norvilitis et al., 2006; Robb, Moody, and Abdel-Ghany, 2012; Manning, 2000; Karger, 2005; Manning, 1999).

Due partly to the efforts of these advocates, the CARD Act was signed into law on May 22, 2009.[8] The CARD Act, as a direct response to the 2008 financial crisis,

[8] As noted by Jambulapati and Stavins (2014), additional regulation in the credit card marketplace was imminent before the passage of the CARD Act; in December of 2008, the Federal Reserve Board of Governors announced its approval of new consumer protection rules, but the rules were not slated to go into effect until July 1, 2010, and were thus superseded by the CARD Act.

was intended "to amend the Truth in Lending Act to establish fair and transparent practices relating to the extension of credit under an open end consumer credit plan, and for other purposes."[9] Title III of the act specifically addresses extending credit to individuals under 21 years old and/or college students. Under Title III, credit card issuers cannot accept applications from a consumer who is under the age of 21 unless that individual can demonstrate proof of their ability to repay obligations or can provide a cosigner who is older than 21. In addition, individuals younger than 21 cannot be sent pre-screened credit card offers or have the amount of credit authorized under their account increased without approval from their cosigner. In terms of protections for college students, Title III requires institutions of higher education to publicly disclose any contracts or agreements made with card issuers or creditors for the purpose of marketing credit cards, and students cannot be offered inducements to apply for credit plans on or near campus or at an event sponsored by or related to the school. Title III also encourages schools to set their own guidelines for managing credit card marketing on campus and to provide financial education opportunities for students.

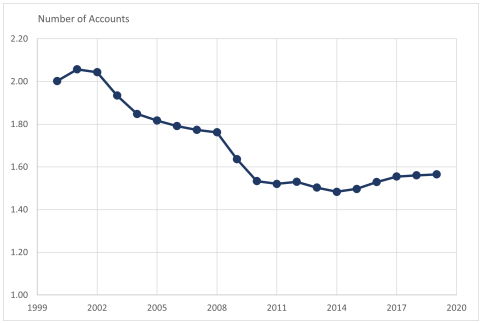
Following the series of regulation changes, the number of credit card accounts and transactions declined across all consumers (Consumer Financial Protection Bureau, 2013; Lux and Greene, 2016; Jambulapati and Stavins, 2014; Jiang and Sánchez, 2016). The decline was particularly pronounced among young adults (Debbaut, Ghent, and Kudlyak, 2016; Consumer Financial Protection Bureau, 2013; Cooper, Gorbachev, and Luengo-Prado, 2022). Based on data from the Credit Card Practices Inquiry (CCPI), a survey of issuers that represents about 80 percent of

[9]Credit CARD Act of 2009, H.R. 627.

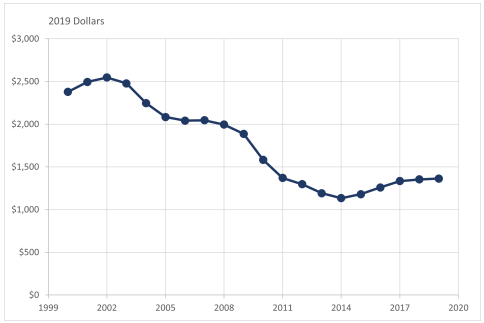
credit card balances in the United States, the share of new accounts issued to cardholders under the age of 21 fell from 5.7 percent in 2007 to 1.7 percent in 2009 (Consumer Financial Protection Bureau, 2013). Relatedly, the share of 18- to 24-year-old US undergraduate students with at least one credit card fell from 66 percent in 2000 to 50 percent in 2016.[10] The leverage of credit card loans among college-age cardholders also fell during this period. Using data from the Federal Reserve Bank of New York/Equifax Consumer Credit Panel (CCP), Figure 1 plots the average number of credit card accounts (Panel 1a), outstanding balances (Panel 1b), total credit limit (Panel 1c), and credit limit per credit card account (Panel 1d) for 18- to 24-year-old US consumers who had one or more credit card accounts. Substantial declines are observed across the four indicators in 2009, the year the CARD Act was signed into law.[11] While part of the decline was tied to supply contraction during the financial crisis, credit card use remained persistently below its pre-2009 levels in the years after the recession, indicating that regulation changes played a leading role in the deleveraging of credit cards after 2008.

[10]National Post-secondary Student Aid Study, Undergraduate, 2000 and 2016.

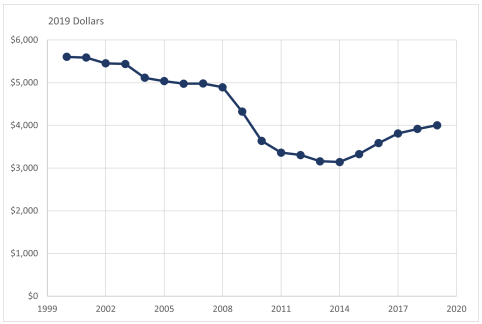
[11]Prior to 2009, credit card use fell modestly from 2003 to 2005, reflecting the recovery of the economy from the 2001 recession.



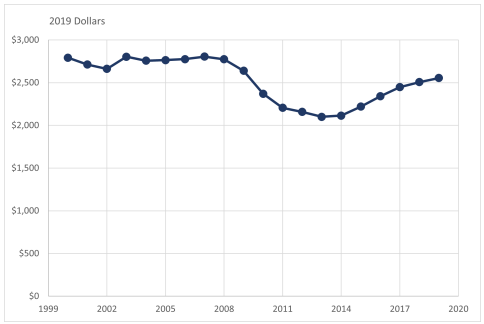
(a) Number of Accounts per Cardholder



(b) Outstanding Balance per Cardholder



(c) Credit Limit per Cardholder



(d) Credit Limit per Account

Figure 1: Credit Card Use among Cardholders

US 18- to 24-Year-Old Consumers, 2000–2019

Source(s): 2000–2019 FRBNY/Equifax Consumer Credit Panel and authors' calculations.

Note(s): The sample consists of 18- to 24-year-old US consumers with at least one open credit card account and a valid Social Security number. All dollar values are inflation-adjusted to 2019 dollars using the Consumer Price Index for All Urban Consumers (CPI-U).

2 Method

2.1 Conceptual Framework

This section offers a conceptual framework for the return to college and its relationship with student work income and borrowing costs. The objective is to gain insight into how individual job loss and credit constraint affect a student's college-persistence decision. While a structural estimation of the model is beyond the scope of this study, we apply the intuition derived from the framework to develop reduced-form models for our empirical analysis, as outlined in Section 2.2 and 2.3.

Consider an environment in which student i enters college at $t-1$ and decides whether to continue enrolling in college at t. If they stay in college, they expect a labor market return of present value $Y_{i,\tau}^{1}$ in any future period $t < \tau \leq L$ after completing the degree. If they drop out of college, the expected return becomes $Y_{i,\tau}^{0}$, where $Y_{i,\tau}^{0} \leq Y_{i,\tau}^{1}$. The fixed cost of college attendance is $T_{i,t}$. The student may devote a fraction of their time, $\rho_{i,t} \in (0,1)$, to paid work while in college to defray the costs. Working while studying, however, comes with a price such that the psychological cost of college attendance, $\psi(\rho_{i,t})$, increases with the amount of time a student spends at paid work. Lastly, the student can borrow at a personal rate, $r_{i,t}$, to cover any remaining portion of the expenses above the value of their current labor income.

Define $R_{i,t}$ as the expected present value of lifetime return to college enrollment

at t:

$$R_{i,t} = \max_{\rho_i \in (0,1)} \sum_{k=1}^{L-t} (Y^1_{i,t+k} - Y^0_{i,t+k}) - (1-\rho_{i,t})Y^0_{i,t} - \psi(\rho_{i,t}) - T_{i,t}$$
$$- r_{i,t}(T_{i,t} - \rho_{i,t}Y^0_{i,t})\mathbb{1}(T_{i,t} - \rho_{i,t}Y^0_{i,t} > 0).$$

The return comprises five terms: (1) the future earnings premium from completing a college degree, $\sum_{k=1}^{L-t}(Y^1_{i,t+k} - Y^0_{i,t+k})$; (2) the opportunity cost of college enrollment, $(1-\rho_{i,t})Y^0_{i,t}$; (3) the psychological cost of college enrollment, $\psi(\rho_{i,t})$; (4) the direct cost of college enrollment, $T_{i,t}$; and (5) the borrowing cost of college enrollment, $r_{i,t}(T_{i,t} - \rho_{i,t}Y^0_{i,t})$.

After evaluating the costs and returns associated with re-enrollment, a student chooses to re-enroll in college at t if enrollment produces positive lifetime returns. Denote Persistence$_{i,t}$ by an indicator variable that is equal to 1 if the student decides to remain in college at t, then

$$\text{Enrollment}_{i,t} = 1 \text{ iff } R_{i,t} > 0.$$

According to the model, when a student experiences job loss and is temporarily out of work, their expected current-period labor market return, $Y^0_{i,t}$, drops. This produces three distinct effects on the expected return to college enrollment. First, the student bears additional borrowing cost if, following the job loss, their expected earnings fall short of the cost of schooling; that is, $T_{i,t} - \rho_{i,t}Y^0_{i,t} > 0$. The additional borrowing cost rises with the size of the earnings loss and the personal borrowing rate, $r_{i,t}$, which reflects a student's credit constraint. When credit access

is limited, the effective borrowing rate, $r_{i,t}$, rises and increases the borrowing cost. This liquidity effect decreases the student's expected return to college and reduces their likelihood of persisting in college. Second, the opportunity cost of college enrollment falls as the student's outside options become less desirable, raising the return to college. Third, the psychological cost of college enrollment, $\psi(\rho_{i,t})$, may either increase or decrease depending on whether the student adjusts their time allocated to paid work in response to the lower labor market return. The net effect of individual job loss on college enrollment is therefore theoretically ambiguous.

The ambiguity of the effect stands in contrast to the effect of an increase in the aggregate job-loss risk. Similarly to personal job loss, an increase in the aggregate job-loss risk reduces the opportunity cost of college enrollment. However, unlike personal job loss, which is accompanied by substantial income loss, an increase in the aggregate job-loss risk marginally reduces a student's expected labor income. As a result, aggregate job-loss risk influences student behavior primarily by altering the opportunity cost of college enrollment such that an increase in aggregate job-loss risk is predicted to increase college enrollment. Consistent with this prediction, previous studies find that aggregate college enrollment rises when local employment opportunity deteriorates (Sorensen and Hwang, 2021; Sievertsen, 2016; Reiling and Strøm, 2015; Nutting, 2008; Dellas, 2003; Foote and Grosz, 2020; Charles, Hurst, and Notowidigdo, 2018; Barrow and Davis, 2012; Betts and McFarland, 1995; Hillman and Orians, 2013). Yet, this countercyclical relationship between aggregate college enrollment and aggregate labor market conditions may obscure a more localized liquidity effect of job loss on students who rely on employment to afford a college education. The next section tests this hypothesis em-

pirically by outlining the reduced-form models we developed to assess the liquidity effect of job loss on working college students and whether credit access moderates the strength of this liquidity effect.

2.2 Analysis 1: Job Loss and College Persistence Rates

We retrieved our analysis sample from the US Census Bureau's Current Population Survey (CPS) through the Integrated Public Use Microdata Series (IPUMS) (Flood et al., 2022) for the period spanning the school years starting in 1999 to 2019. The CPS is a nationally representative household survey that gathers information on labor market activities from members of about 70,000 households each month across the United States. Individual respondents who reside in the same housing unit during the survey period are interviewed monthly for four months (survey months one through four, or S1 through S4), followed by an eight-month break, and interviewed again for four months (S5 through S8). The short panel design allows us to observe a respondent's short-term labor market transitions as well as changes in their school enrollment status over the 16-month survey period.

Leveraging this data structure, our first analysis tests whether having experienced involuntary job loss in an academic year ($t-1$) decreases a working college student's probability of re-enrolling in college in the next academic year (t), conditional on no degree attainment before t. Figure 3 illustrates the relationship between the data structure and our research design, which can be summarized using the fol-

lowing regression model:

$$\text{Enrollment}_{i,z,t} = \alpha_0 + \alpha_1 \text{Job Loss}_{i,z,t} + X'_{i,t} + T'_{z,t} + \eta_z + \zeta_t + \epsilon_{i,z,t}. \quad (1)$$

The analysis sample consists of 18- to 24-year-old college students who were enrolled in college and employed in the first CPS survey month in school year $t-1$. The outcome variable is a respondent's college-persistence decision in school year t, measured by their enrollment status in the fifth CPS survey month, 12 months after the first CPS survey month. The treatment variable, $\text{Job Loss}_{i,z,t}$, is an indicator variable that equals 1 if a respondent reported a new spell of unemployment due to involuntary job loss from the second through the fourth CPS survey months in school year $t-1$. $X_{i,t}$ is a vector of controls for worker i's demographic and employment characteristics in the first CPS survey month prior to the treatment window. $T_{z,t}$ is a vector of state-level controls on state labor market condition and schooling costs in school year t. η_z is the state fixed effects, and ζ_t is the school-year fixed effects.

CPS Survey Month	S1	S2	S3	S4	No interview	S5	S6	S7	S8
Calendar Month	1	2	3	4	5—12	13	14	15	16
	School Year t-1					School Year t			
Research Design	**[Sample]** Students enrolled and employed in S1	**[Treatment]** New job loss in S2—S4				**[Outcome]** College enrollment status in S5	**[Placebo]** New job loss in S6—S8		

Figure 3: CPS Data Structure and Research Design

Because a student who experiences job loss may have other personal characteristics that independently influence their college-persistence decision, the identification of job loss's treatment effect in Equation 1 relies on addressing this selection effect. For example, job loss may partially reflect a student's productivity, which is positively correlated with their expected return to education. In this case, students with lower productivity are selected into job loss and the selection generates a downward bias for job loss's estimated treatment effect. In an ideal world, we would use an instrumental variable (IV) to correct the bias. Existing research on personal job loss often leverages aggregate job-loss risk, such as mass layoff events, as quasi-exogenous instruments for personal job loss. However, as discussed in Section 2.1, an increase in aggregate job-loss risk independently influences student's expected return to college by lowering their perceived opportunity cost of college attendance. Using aggregate job-loss risk as IV therefore violates the exclusion restriction and generates a positive bias for job loss's treatment effect on college persistence.

With no suitable IV candidate, we take two alternative steps in the empirical analysis to reduce the selection bias. First, to control for any selection based on the observable, in addition to the ordinary least squares (OLS) estimates of Equation 1, we report a second set of estimates using the Mahalanobis distance matching (MDM) estimator. We match students who reported involuntary job loss to other students in the control group based on the Mahalanobis distance between their individual characteristics, $X'_{i,t}$, to obtain treated and control groups with comparable observable personal qualities.[12] Each student in the treated group is matched, with

[12]The vector of individual characteristics in the pre-treatment period includes a student's age, sex, race/ethnicity, whether they had children under age 5 in their household, whether they had received some college education prior to entering the sample, their full- or part-time employment

replacement, to at least four students in the control group with whom they maintained the closest Mahalanobis distance.[13] We then implement the bias-corrected matching estimator as proposed by Abadie and Imbens (2011) to estimate the treatment effect of individual job loss on the treated sample.

Second, to assess the extent of selection bias from unobserved differences in personal characteristics between the treated and the control groups, we conduct a placebo test in which the placebo is defined as a spell of new unemployment from involuntary job loss in the sixth to eighth CPS survey month.[14] Because of the later timing, these placebo job-loss events had no direct liquidity effect on a student's college-persistence decision, defined by their enrollment status in the fifth survey month. However, if selection drives the correlation between job loss and college persistence, we expect these later job-loss events to have a statistical relationship with college-persistence rates that is similar to the statistical relationship between the treatment and the persistence rates. The placebo test regression model can be written as follows:

$$\begin{aligned}\text{Enrollment}_{i,z,t} =& \alpha_0 + \alpha_1 \text{Job Loss}_{i,z,t} + \alpha_2 \text{Placebo Job Loss}_{i,z,t} \\ &+ X'_{i,t} + T'_{z,t} + \eta_z + \zeta_t + \epsilon_{i,z,t}.\end{aligned} \tag{2}$$

We view the difference between the estimated treatment and the placebo effect, $\hat{\alpha_1} - \hat{\alpha_2}$, as a proxy of the selection-adjusted treatment effect of involuntary job

status, whether they worked multiple jobs, and their sector and occupation of employment.

[13]Following Abadie and Imbens (2011), we choose four nearest neighbors to achieve the best balance between low bias and low root mean squared error (RMSE).

[14]To ensure that the unemployment spell reflects a new job loss that postdated a student's re-enrollment decision, we exclude students who were already unemployed in the fifth CPS survey month from the placebo test sample.

loss on college-persistence rates. Section 4.1 presents the estimation results from Analysis 1 using the OLS, MDM, and placebo test specifications.

2.3 Analysis 2: Credit Card Loans as a Liquidity Buffer

Our second analysis assesses whether credit supply to college students through credit card loans moderates the liquidity effect of job loss on college-persistence rates. We augment Equation 1 with an interaction term between job loss and credit card loan use among college-age consumers in a student's residence state. We expect the interaction term to have a positive sign if credit card loans improve college persistence among the unemployed students. The modified equation is as follows:

$$\begin{aligned} \text{Enrollment}_{i,z,t} =& \beta_0 + \beta_1 \text{Job Loss}_{i,z,t} + \beta_2 \text{Credit}_{z,t} \text{Job Loss}_{i,z,t} \\ &+ \beta_3 \text{Credit}_{z,t} + X'_{i,t} + T'_{z,t} + \eta_z + \zeta_t + \epsilon_{i,z,t}. \end{aligned} \tag{3}$$

The variable $\text{Credit}_{z,t}$ is one of the four indicators of credit card use among the 18- to 24-year-old credit card holders in state z from school year $t-1$ to t. Those measures are (1) the average number of credit card accounts per cardholder, (2) the average credit limit of each credit card account, (3) the average total credit limit per cardholder, and (4) the average total outstanding credit card balance per cardholder. While we do not observe a consumer's total credit card debt, measured by the amount of credit card balance carried over from month to month, we choose the four indicators as an approximation of the actual debt level because a consumer's borrowing capacity is jointly influenced by their ability to acquire new credit card accounts (1), which often offer low promotional annual percentage rates (APRs),

and their ability to obtain high credit limits (2, 3). The amount of debt is also partially reflected by a consumer's total outstanding balance (4), which includes both their current and carried-over balances.[15]

A critical question arising from our research design is whether supply- or demand-side factors drive consumer leverage of credit card loans. While regulation changes played a leading role in the deleveraging of credit card loans over the last decade (see Section 1.2), our estimates can be biased if demand-side factors also influence consumers' use of credit card loans. Specifically, if strong consumer demand generates high credit card use, then an observed high credit-card-use rate partially reflects favorable underlying economic conditions, which independently strengthen a student's liquidity situation. In this case, the estimated interaction term between job loss and credit card loans will be biased away from zero. While the concern is theoretically valid, there is scant empirical evidence supporting this proposition. Existing research shows that demand for credit card loans and other forms of unsecured debt is countercyclical and increases when households become more liquidity constrained (Drozd and Kowalik, 2018; Collins, Edwards, and Schmeiser, 2015; Sullivan, 2008; Bird, Hagstrom, and Wild, 1999). Instead of a bias away from zero, the countercyclical relationship creates a bias toward zero for the interaction between job loss and credit card loans, and we view our estimate of β_2 in Equation 3 as a conservative lower bound of credit card loans' moderating effect on college-persistence rates.

[15]These indicators reflect credit card use among the cardholders, or the intensive margin of credit use, instead of the extensive margin because consumers with no credit account do not appear in our credit data.

External Validation: Credit Card Loans and College Retention Rates

Due to the smaller size of the CPS working-student sample, we take additional steps to rule out the possibility of a spurious correlation. Specifically, we seek external validation for our hypothesis that credit card loans provide liquidity for financially constrained students to smooth their consumption and education investment over temporary liquidity shocks. If the hypothesis holds, we expect that access to credit card loans also improves college persistence for lower-income students, who have a higher likelihood of being at the margin of their budget constraint and in need of short-term credit to remain in college.

The hypothesis motivates us to develop a supplementary analysis leveraging a large sample of US postsecondary institutions and their administrative records on student financial status and retention rates. Specifically, the model uses a modified version of Equation 3 to test whether access to credit card loans disproportionately improves student-retention rates at institutions with a higher share of liquidity-constrained students, as indicated by students' Federal Pell Grant award status:[16]

$$\begin{aligned}\text{Retention Rate}_{i,z,t} =& \gamma_0 + \gamma_1 \text{Pell}_{i,z,t-1} + \gamma_2 \text{Credit}_{z,t} \text{Pell}_{i,z,t-1} + \gamma_3 \text{Credit}_{z,t} \\ &+ K'_{i,t} + M'_{z,t} + \eta_i + \zeta_t + \epsilon_{i,z,t}.\end{aligned} \tag{4}$$

The analysis sample was retrieved from the US National Center for Education Statistics Integrated Post-secondary Education Data System (NCES-IPEDS) and consists of all US Title IV two- to four-year degree-granting institutions over the

[16]The Federal Pell Grant is a form of federal student aid to undergraduate students who demonstrate exceptional financial need.

academic years from 2003–04 to 2019–20. The outcome variable of the model is the full-time student retention rate in institution i in academic year t. The variable of interest is the interaction between the share of students who received a Federal Pell Grant, $\text{Pell}_{i,z,t-1}$, and the credit card use indicators. As with the previous model, a positive interaction term indicates that access to credit card loans weakens the link between a student's family income and their college-persistence decision. The regression model also includes a vector of institution-level controls, $K'_{i,t}$; a vector of state-level controls, $M'_{z,t}$, to account for changes in the direct and opportunity costs of college attendance; and institution and state fixed effects. A complete description of the variables used in the supplementary analysis can be found in Appendix C.

3 Data

This section describes the construction of our primary analysis sample and the data sources. For information on data used for the supplementary analysis, refer to Appendix C.

3.1 Sample

Our sample consists of CPS respondents aged 18 to 24 who had at least a high school diploma/GED but no college degree throughout the 16-month survey window. We match each respondent over time from the first (S1) through the fifth (S5) survey months over the course of 13 calendar months to obtain information on their

employment transitions and college enrollment from one school year to the next.[17] We restrict the sample to respondents who were enrolled in a two- or four-year college, employed at the time of their first survey month, and consistently in the labor force in both the first and the fifth survey months. To reduce the influence of seasonality in enrollment or job search, we include only respondents whose first survey month fell in the fall or spring semester in the following calendar months: September, October, November, December, January, or February. We exclude respondents whose first survey month fell in March or April because the job-loss treatment window (S2 through S4) of these students would coincide with school vacation months.

3.2 Key Variables

Enrollment

The outcome variable $\text{Enrollment}_{i,z,t}$ of Equations 1 and 3 is an indicator variable that equals 1 if a sample respondent continued to enroll in college in the fifth survey month (S5) in school year t 12 months after their initial reported college enrollment in the first survey month (S1) in school year $t-1$, conditional on no degree conferral before t.

[17] The matching is based on a unique personal identifier assigned by IPUMS-CPS; to ensure accurate matching, we drop any matches that show different biological sexes, self-reported race/ethnicity, or an age gap larger than three years between the two survey months. We also exclude any respondents who had any incomplete interview records in the first through fifth survey months to retrieve the full month-to-month work history that was available in the intervening period.

Job Loss

The treatment variable Job Loss$_{i,z,t}$ in Equations 1 and 3 is an indicator that equals 1 if a sample respondent, following their initial reported employment in the first survey month (S1), reported a spell of unemployment due to temporary layoff, involuntary job loss, or ending of a temporary job during the period from the second through the fourth survey months (S2 through S4) in school year $t-1$.

Credit Card Loan Leverage

We retrieve individual credit card use records from the CCP, which is a nationally representative anonymous 5 percent random sample of all US consumers who have a valid Social Security number and a credit file with Equifax. Each quarter, the CCP reports a snapshot of individual credit card account records for its 12 million primary sample members along with each member's birth year and geographic location.[18] Based on these individual records, we estimate the aforementioned four credit card leverage indicators for consumers aged 18 to 24 residing in state z from school year $t-1$ through t. All dollar values are inflation-adjusted to 2019 dollars using the CPI-U and measured in thousands of dollars.

[18] Interested readers should refer to Lee and van der Klaauw (2010) for a detailed documentation of the history, sample design, and content of the CPP.

Individual-level Controls

The vector of individual-level controls in Equations 1 and 3 includes the following variables: the CPS respondent's age, sex, race and ethnicity, whether they reside with one or more child aged 4 or younger, whether they had acquired some college credits prior to the first survey month, whether the respondent works a full-time schedule (35 hours or more per week), whether the respondent works multiple jobs, and their sector and occupation of employment. All individual controls are estimated using information retrieved from the first survey month (S1) prior to the job-loss treatment window.

State-level Controls

Equations 1 and 3 control for the direct and opportunity costs of college attendance in state z in academic year t using the following variables: the average tuition and fees charged to first-time full-time students, the average financial aid received by first-time full-time students, the prime-age (25 to 54) college and non-college unemployment rates, and the prime-age college and non-college weekly earnings rates. We retrieve the tuition and financial aid data from NCES-IPEDS and calculate the measures separately for two- and four-year degree-granting institutions in a state. The labor market indicators are estimated using the CPS Basic Monthly survey and the CPS Earner Study. All dollar values are log-transformed and inflation-adjusted to 2019 dollars using the CPI-U.

3.3 Summary Statistics

Table 2 reports the summary statistics of our regression sample, of which 228 observations are in the treated group and 9,638 observations are in the control group. The average age of the working students in our sample is 21. Overall, there are more female working college students than male working college students in the sample. The vast majority of the working students were employed by three sectors, trade/transportation/utilities, education/health services, and leisure/hospitality, and were in sales, administrative, and service occupations. Twenty-four percent of the students worked full-time while enrolled in college, and 8 percent worked multiple jobs. Most students reported having earned some college credits at the time of the interview and were not first-time students. Despite their different sizes, the treated and control sample groups are similar in the observable personal characteristics, indicated by the small standardized mean differences across the demographic and employment characteristics, but some selection remains. For example, compared with the control group, the students in the treated group are slightly more likely to be male, Black or Hispanic, with no earlier college experience, and work in the manufacturing or construction sector before losing their jobs. Using the MDM estimator, we further remove these differences by matching the treated and control groups based on the observable personal characteristics. We find limited evidence that the observable differences significantly bias the OLS estimates, as evidenced by the comparability between the OLS and MDM results.

Table 2: Summary Statistics

US 18- to 24-Year-Old Working College Students, 1999–2020

	Control (N=9,638)		Treated (N=228)		Std. Diff.
	Mean	S.D.	Mean	S.D.	
Sex					
Male	0.45	0.50	0.51	0.50	0.13
Female	0.55	0.50	0.49	0.50	-0.13
Age	21.02	1.50	21.09	1.46	0.05
Education Attainment					
High School Diploma or GED	0.19	0.39	0.24	0.43	0.12
Some College	0.81	0.39	0.76	0.43	-0.12
Race					
Non-Hispanic Whites	0.74	0.44	0.69	0.46	-0.10
Non-Hispanic Blacks	0.08	0.26	0.10	0.30	0.08
Hispanics	0.11	0.32	0.14	0.35	0.09
Others	0.07	0.26	0.07	0.25	-0.02
Parent of Young Child	0.04	0.20	0.06	0.23	0.07
Worked Full-Time	0.24	0.43	0.21	0.41	-0.06
Worked Multiple Jobs	0.08	0.27	0.06	0.23	-0.10
Sector of Employment					
Natural Resources and Mining	0.01	0.09	0.02	0.13	0.09
Construction	0.02	0.14	0.05	0.21	0.16
Manufacturing	0.03	0.18	0.06	0.23	0.11
Trade, Transportation, and Utilities	0.31	0.46	0.27	0.44	-0.09
Information	0.02	0.13	0.02	0.13	0.01
Financial Activities	0.04	0.20	0.03	0.16	-0.08
Professional and Business Services	0.05	0.21	0.08	0.27	0.13
Education and Health Services	0.22	0.42	0.21	0.41	-0.02
Leisure and Hospitality	0.25	0.43	0.23	0.42	-0.04
Other Services	0.04	0.20	0.03	0.16	-0.08
Government	0.01	0.10	0.01	0.11	0.03
Occupation of Employment					
Management and Professional	0.12	0.33	0.11	0.31	-0.04
Healthcare	0.05	0.22	0.07	0.25	0.07
Sales and Administrative	0.42	0.49	0.35	0.48	-0.13
Production	0.04	0.21	0.05	0.21	0.02
Transportation and Construction	0.08	0.27	0.11	0.31	0.11
Food, Building, and Personal Care Service	0.29	0.45	0.32	0.47	0.06

Source(s): 1999–2020 IPUMS-CPS.

Note(s): The sample consists of working college students aged 18 to 24 over the study period spanning the academic years from 2000–01 to 2019–20.

4 Empirical Results

4.1 Result 1: Job Loss and College-persistence Rates

Table 3 presents the results of our first analysis on job loss and college-persistence rates for the 2000–01 through 2019–20 academic years. Column 1 reports the OLS result, column 2 reports the MDM estimation result, and column 3 reports the placebo test result. Over this period, involuntary job loss is associated with a 14 percentage point reduction in a working college student's college-persistence rate (column 1). Job loss's estimated treatment effect falls from 14 to 12 percentage points after we account for selection on the observable using the MDM method (column 2). The placebo test further suggests that adjusting for selection on the unobservable reduces job loss's treatment effect to 10 percentage points, and the point estimate is not statistically significantly different from zero at the 0.05 level.

A closer look into the data reveals that the findings in Table 1 conceal significant time variation in job loss's treatment effect. Table 4 reports the regression estimates separately for the sample periods covering the 2000–01 through 2008–09 and 2009–10 through 2019–20 academic years to demonstrate the time variation. Prior to 2009, a spell of unemployment from job loss was associated with a 4 to 5 percentage point decrease in the college-persistence rate (columns 1 and 2) that selection on the unobservable can fully account for (column 3). Contrary to the absence of an effect in the earlier period, student job loss is associated with a 21 percentage point decline in the college-persistence rate in the 2009–10 through 2019–20 academic years (column 4). While selection drives part of the associa-

Table 3: Job Loss and College-persistence Rates (in %pt)

US 18- to 24-Year-Old Working College Students, 2000–2019 SY

	(1)	(2)	(3)
Job Loss: Treatment	-0.14***	-0.12***	-0.14**
	(0.03)	(0.03)	(0.04)
Job Loss: Placebo			-0.04
			(0.03)
Treatment - Placebo			*-0.10*
			(0.06)
Individual-level Controls	✓	✓	✓
State-level Controls	✓	✓	✓
State Fixed Effects	✓	✓	✓
School-Year Fixed Effects	✓	✓	✓
Method	OLS	MDM	OLS
R^2	0.10	–	0.10
Observations	9,866	3,448	7,994

Source(s): 1999–2020 IPUMS-CPS and authors' calculations.
Note(s): The samples consist of working college students aged 18 to 24 over the study periods (t) from the 2000–01 through 2019–20 academic years. The OLS results are weighted by the CPS 12-month linking person weight for each sample observation. Standard errors are clustered at the state level.
* for P $<$ 0.05, ** for P $<$ 0.01, *** for P $<$ 0.001.

tion, after we adjust for selection, job loss is predicted to have led to a 17 to 18 percentage point decline in the college-persistence rate (columns 5 and 6). In other words, nearly one in five students who experienced job loss discontinued college due to employment disruption. The difference between the two periods suggests that US working students' ability to withstand the impact of job loss significantly deteriorated after the 2008–09 academic year.

Table 4: Job Loss and College-persistence Rates: Period-Specific Results

US 18- to 24-Year-Old Working College Students, 2000–2019 SY

	2000–2008 SY			2009–2019 SY		
	(1)	(2)	(3)	(4)	(5)	(6)
Job Loss: Treatment	-0.05	-0.04	-0.04	-0.21***	-0.18***	-0.21***
	(0.05)	(0.05)	(0.06)	(0.04)	(0.05)	(0.05)
Job Loss: Placebo			-0.04			-0.04
			(0.06)			(0.04)
Treatment - Placebo			*0.00*			-0.17**
			(0.09)			(0.06)
Individual-level Controls	✓	✓	✓	✓	✓	✓
State-level Controls	✓	✓	✓	✓	✓	✓
State Fixed Effects	✓	✓	✓	✓	✓	✓
School-Year Fixed Effects	✓	✓	✓	✓	✓	✓
Method	OLS	MDM	OLS	OLS	MDM	OLS
R^2	0.10	–	0.10	0.12	–	0.12
Observations	4,924	1,217	4,029	4,942	1,311	3,965

Source(s): 1999–2020 IPUMS-CPS and authors' calculations.

Note(s): The analysis samples consist of working college students aged 18 to 24 over the study periods from the 2000–01 through 2008–09 and 2009–10 through 2019–20 academic years. The OLS results are weighted by the CPS 12-month linking person weight for each sample observation. Standard errors are clustered at the state level.

* for P $<$ 0.05, ** for P $<$ 0.01, *** for P $<$ 0.001.

4.2 Result 2: Credit Card Loans as a Liquidity Buffer

The stark difference between the results before and after the 2008–2009 academic year prompted our search for an explanation. According to the theoretical framework outlined in Section 2.1, two scenarios can magnify the liquidity effect of job loss: when job loss induces more substantial earnings loss or when the borrowing rate increases. Both scenarios could hypothetically contribute to the heightened liquidity effect in the aftermath of the 2007–2009 recession, when working college students faced longer unemployment spells if they lost their jobs, lower earnings, and more restricted access to credit through credit card loans. Nevertheless, we find limited evidence that changes in labor market conditions led to more college dropouts among unemployed working students (see Appendix A for the supplementary analysis), suggesting that credit access played a larger role in the increased liquidity effect of job loss over this period.

Supporting this presupposition, our second analysis finds that working college students had a higher likelihood of persisting in college after involuntary job loss when they had more leverage from credit card loans (Table 5). The relationship is observed consistently across the four credit card loan indicators. Specifically, for a student who experienced job loss, their college-persistence rate is estimated to have increased by 46 percentage points for each additional credit card account (column 1), by 21 percentage points for an additional $1,000 in credit limit per credit card account (column 2), by 9 percentage points for an additional $1,000 in total credit limit (column 3), and by 15 percentage points for an additional $1,000 in their total outstanding credit card balance (column 4). Applying these coefficients to the ob-

served differences in credit card use between the first and second study period, we estimate that the deleveraging of credit card loans after 2008 is associated with a 9 to 16 percentage point decline in the college-persistence rate among unemployed working students, accounting for 55 to 96 percent of the increase in the estimated liquidity effect of job loss from the pre-2009 period to the post-2009 period. However, for the 98 percent of the working students in the control group who did not experience involuntary job loss, we do not find that credit card loans significantly altered their college-persistence behavior.

Table 5: Job Loss and College Persistence: Credit Card Loans as a Moderator

US 18- to 24-Year-Old Working College Students, 2000–2019 SY

	(1)	(2)	(3)	(4)
Job Loss	-0.93**	-0.67**	-0.53***	-0.40**
	(0.28)	(0.24)	(0.14)	(0.13)
Credit Card Leverage	-0.24	-0.06	-0.05	-0.04
	(0.16)	(0.05)	(0.02)	(0.06)
Job Loss × Credit Card Leverage	0.46**	0.21*	0.09**	0.14
	(0.17)	(0.09)	(0.03)	(0.08)
Individual-level Controls	✓	✓	✓	✓
State-level Controls	✓	✓	✓	✓
State Fixed Effects	✓	✓	✓	✓
School-Year Fixed Effects	✓	✓	✓	✓
Credit Card Leverage Indicator	No. Cards	Acct Limit	Total Limit	Total Balance
R^2	0.10	0.10	0.10	0.10
Observations	9,866	9,866	9,866	9,866

Source(s): 1999–2020 IPUMS-CPS and CCP. All calculations, findings, and assertions are the authors'.
Note(s): The sample consists of working college students aged 18 to 24 over the period from the 2000–01 academic year through the 2019–20 academic year. The results are weighted by the CPS 12-month linking person weight for each sample observation. Standard errors are clustered at the state level.
* for $P < 0.05$, ** for $P < 0.01$, *** for $P < 0.001$.

External Validation: Credit Card Loans and College-retention Rate

To corroborate the findings reported in Table 5, we conduct an external validation test assessing whether credit card access disproportionately improves student retention in institutions with a larger share of financially constrained students, who are more likely to encounter a binding budget constraint and in need of credit to stay in college. The results lend support to this proposition. A larger share of financially constrained students, as indicated by Pell Grant eligibility, is associated with a lower retention rate, but access to credit card loans weakens the relationship (Table 6). For example, column 1 of Table 6 shows that a 10 percentage point increase in the share of students receiving Pell Grants is associated with a 2.3 percentage point decrease in the student-retention rate, but the magnitude of the decline falls by 1.2 percentage points for each additional credit card account available to the college-age cardholders. This moderating effect on student-retention rates is observed consistently across the four credit card indicators.

Based on the estimates, the decline in credit card loans after 2008 led to a stronger connection between student financial status and retention outcomes. On average, for each additional 10 percentage point increase in the share of students receiving Pell Grants, the student retention rate is predicted to fall 0.16 to 0.34 percentage points (45 to 138 percent) further due to the deleveraging of credit card loans over this period. In other words, for every 100 Pell Grant–eligible students, one to three more students would drop out of college prematurely due to the reduced access to credit card loans. Consistent with the results in Table 5, we find that the positive effect of credit card loans on college persistence is concentrated in a small

Table 6: Credit Card Loans and College Retention Rates

US Title IV Two- to Four-year Degree-granting Institutions, 2003–2019

	(1)	(2)	(3)	(4)
Pell Grant Share (in 10 %pt)	-2.34***	-1.37***	-1.09***	-1.19***
	(0.61)	(0.32)	(0.24)	(0.28)
Credit Card Leverage	-4.21	-3.55**	-1.57*	-3.75*
	(3.58)	(1.26)	(0.59)	(1.63)
Pell Grant Share × Credit Card Leverage	1.17**	0.37**	0.16**	0.45*
	(0.39)	(0.14)	(0.06)	(0.17)
Institution-level Controls	✓	✓	✓	✓
State-level Controls	✓	✓	✓	✓
Institution Fixed Effects	✓	✓	✓	✓
School-Year Fixed Effects	✓	✓	✓	✓
Credit Card Leverage Indicator	No. Cards	Acct Limit	Total Limit	Total Balance
R^2	0.87	0.87	0.87	0.87
Observations	45,101	45,101	45,101	45,101

Source(s): 2003–2019 NCES-IPEDS and CCP. All calculations, findings, and assertions are the authors'.
Note(s): The samples consist of US Title IV two- to four-year degree-granting institutions over the study period (t), the 2003–04 through 2019–20 academic years. The results are weighted by the first-time full-time entering cohort in academic year $t-1$ for each cell. Standard errors are clustered at the state level.
* for P $<$ 0.05, ** for P $<$ 0.01, *** for P $<$ 0.001.

subset of college students who are presumably the most liquidity-constrained and encounter a binding budget constraint to remaining in college. For the majority of students who are not financially constrained, the test reveals that credit card loans are associated with a net decline in their college-persistence outcome, as indicated by the negative coefficients in row 2 of Table 6. The negative correlation partially reflects that students are selected into credit card debt (see Section 2.3), but we cannot rule out the possibility that access to credit card loans has an adverse effect on college persistence for middle- to higher-income students, who are better represented in the NCES-IPEDS sample than in the CPS working-student sample.[19]

The findings in Tables 5 and 6 demonstrate that access to credit card loans enables financially constrained students to remain in college despite temporary employment disruptions or liquidity shocks. A plausible explanation is that credit card loans provide necessary liquidity for unemployed students to maintain their basic consumption levels without having to take time off from college to make ends meet. Supporting this consumption-smoothing theory, we find that, in the robustness test detailed in Appendix B, credit card loans exhibit a comparable moderating effect on the basic food consumption of unemployed college-age workers, who are similarly affected by the credit supply regulation changes. These results offer coherent evidence that credit card loans enable liquidity-constrained students to better smooth their consumption and education investment over transient liquidity shocks, but the retention benefit does not extend beyond these students.

[19]Unlike the CPS sample, which consists of working college students who, on average, have lower family income, the NCES-IPEDS sample contains the universe of undergraduate students in US Title IV two- to four-year degree-granting institutions.

5 Conclusion

This study finds that involuntary job loss increases the probability that an 18- to 24-year-old working student will drop out of college before attaining a degree, but student access to short-term credit through credit card loans buffers this liquidity effect. However, the benefit of credit card loans to student retention is confined to liquidity-constrained students, who represent a modest share of the US undergraduate population.[20] For the vast majority of students with no demonstrated financial needs, we cannot rule out the possibility that credit card loans are detrimental to their academic progress. The double-edged results indicate that expanding student access to credit card loans is unlikely to be the optimal solution to improving student retention. Instead, the significance of credit card loans in the personal finance of unemployed working students reflects a dearth of resources to support college students when they experience temporary earnings losses. Most student aid programs have limited capacity to respond to students' emergency financial needs due to the timing of the application process.[21] College students also have more restricted access to government unemployment assistance programs due to their short earnings history, reduced work availability, and the seasonality of student employment.[22]

[20] In our CPS sample, students who experienced job loss account for 2 percent of the working students in the sample; in the NCES-IPEDS sample, the average share of students who receive Federal Pell Grants in a Title IV institution is 32 percent.

[21] Each year, before the start of the academic year, students submit the Free Application for Federal Student Aid (FAFSA) form to their institutions. Colleges use the information from FAFSA to determine a student's federal aid eligibility and, often, to award their own financial aid packages. The amount of aid a student receives is based on their financial records from the preceding year and will not reflect changes in their current financial circumstances.

[22] According to the authors' calculations based on IPUMS-CPS Annual Social and Economic Supplement (ASEC), from 2000 through 2019, the probability that a worker who reported a spell of unemployment in a year received unemployment assistance in that year was 8.5 percent for workers aged 18 to 24 compared with 32.7 percent for workers aged 25 to 54 and 41.8 percent for workers

Our findings therefore highlight that employment stability plays a pivotal role in the retention of working college students and suggests that credit card loans can become a critical liquidity source for students when there is insufficient insurance against job loss and other unforeseen financial disruptions.

References

Abadie, Alberto, and Guido W. Imbens. 2011. "Bias-Corrected Matching Estimators for Average Treatment Effects." *Journal of Business & Economic Statistics* 29(1): 1–11. ISSN 0735-0015, 1537-2707. doi:10.1198/jbes.2009.07333.

Acton, Riley K. 2021. "Community College Program Choices in the Wake of Local Job Losses." *Journal of Labor Economics* 39(4): 1129–1154. ISSN 0734-306X, 1537-5307. doi:10.1086/712555.

Akee, Randall K. Q., William E. Copeland, Gordon Keeler, Adrian Angold, and E. Jane Costello. 2010. "Parents' Incomes and Children's Outcomes: A Quasi-Experiment Using Transfer Payments from Casino Profits." *American Economic Journal: Applied Economics* 2(1): 86–115. ISSN 1945-7782, 1945-7790. doi:10.1257/app.2.1.86.

Andrews, Benjamin D. 2017. *What's in Your Financial Package? Student Credit Card Use and Economic Insecurity in College*. Ph.D. thesis, Ohio State University.

aged 55 to 64.

Andrews, Benjamin D. 2021. "College Costs and Credit Cards: How Student Credit Card Use Influences College Degree Attainment." *Research in Higher Education* 62(6): 885–913. ISSN 0361-0365, 1573-188X. doi:10.1007/s11162-020-09622-8.

Bailey, Martha, and Susan Dynarski. 2011. "Gains and Gaps: Changing Inequality in U.S. College Entry and Completion." Technical Report w17633. Cambridge, MA: National Bureau of Economic Research. doi:10.3386/w17633.

Barrow, Lisa, and Jonathan Davis. 2012. "The Upside of Down: Postsecondary Enrollment in the Great Recession." *Economic Perspectives* 36(4).

Bastian, Jacob, and Katherine Michelmore. 2018. "The Long-Term Impact of the Earned Income Tax Credit on Children's Education and Employment Outcomes." *Journal of Labor Economics* 36(4). doi:10.1086/697477.

Belley, Philippe, and Lance Lochner. 2007. "The Changing Role of Family Income and Ability in Determining Educational Achievement." *Journal of Human Capital* 1(1): 37–89. ISSN 1932-8575, 1932-8664. doi:10.1086/524674.

Betts, Julian R., and Laurel L. McFarland. 1995. "Safe Port in a Storm: The Impact of Labor Market Conditions on Community College Enrollments." *The Journal of Human Resources* 30(4): 741. ISSN 0022166X. doi:10.2307/146230.

Bird, Edward J., Paul A. Hagstrom, and Robert Wild. 1999. "Credit Card Debts of the Poor: High and Rising." *Journal of Policy Analysis and Management* 18(1): 125–133. ISSN 0276-8739, 1520-6688. doi:10.1002/(SICI)1520-6688(199924)18:1⟨125::AID-PAM8⟩3.0.CO;2-7.

Brown, M., J. Karl Scholz, and A. Seshadri. 2012. "A New Test of Borrowing Constraints for Education." *The Review of Economic Studies* 79(2): 511–538. ISSN 0034-6527, 1467-937X. doi:10.1093/restud/rdr032.

Bulman, George, Robert Fairlie, Sarena Goodman, and Adam Isen. 2021. "Parental Resources and College Attendance: Evidence from Lottery Wins." *American Economic Review* 111(4): 1201–1240. ISSN 0002-8282. doi:10.1257/aer.20171272.

Cameron, Stephen V., and James J. Heckman. 2001. "The Dynamics of Educational Attainment for Black, Hispanic, and White Males." *Journal of Political Economy* 109(3): 455–499. ISSN 0022-3808, 1537-534X. doi:10.1086/321014.

Cameron, Stephen V., and Christopher Taber. 2004. "Estimation of Educational Borrowing Constraints Using Returns to Schooling." *Journal of Political Economy* 112(1): 132–182. ISSN 0022-3808, 1537-534X. doi:10.1086/379937.

Carneiro, Pedro, and James J Heckman. 2002. "The Evidence on Credit Constraints in Post-Secondary Schooling." *The Economic Journal* 112(482): 705–734. doi:10.1111/1468-0297.00075.

Charles, Kerwin Kofi, Erik Hurst, and Matthew J. Notowidigdo. 2018. "Housing Booms and Busts, Labor Market Opportunities, and College Attendance." *American Economic Review* 108(10): 2947–2994. ISSN 0002-8282. doi:10.1257/aer.20151604.

Coelli, Michael B. 2011. "Parental Job Loss and the Education Enrollment of

Youth." *Labour Economics* 18(1): 25–35. ISSN 09275371. doi:10.1016/j.labeco.2010.04.015.

Collins, J Michael, Kathryn Edwards, and Maximilian Schmeiser. 2015. "The Role of Credit Cards for Unemployed Households in the Great Recession." *FDIC*.

Consumer Financial Protection Bureau. 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.

Cooper, Daniel, Olga Gorbachev, and María José Luengo-Prado. 2022. "Consumption, Credit, and the Missing Young." *Journal of Money, Credit and Banking* 55(2-3): 379–405. ISSN 0022-2879, 1538-4616. doi:10.1111/jmcb.12973.

Cooper, Daniel, and María José Luengo-Prado. 2015. "House Price Growth when Children are Teenagers: A Path to Higher Earnings?" *Journal of Urban Economics* 86: 54–72. ISSN 00941190. doi:10.1016/j.jue.2014.12.003.

Debbaut, Peter, Andra Ghent, and Marianna Kudlyak. 2016. "The CARD Act and Young Borrowers: The Effects and the Affected." *Journal of Money, Credit and Banking* 48(7): 1495–1513. ISSN 00222879. doi:10.1111/jmcb.12340.

Dellas, H. 2003. "On the Cyclicality of Schooling: Theory and Evidence." *Oxford Economic Papers* 55(1): 148–172. ISSN 14643812. doi:10.1093/oep/55.1.148.

Drozd, Lukasz A, and Michal Kowalik. 2018. "Credit Cards and the Great Recession: The Collapse of Teasers." *Federal Reserve Bank of Philadelphia Working Paper*.

Flood, Sarah, Miriam King, Renae Rodgers, Steven Ruggles, J. Robert Warren, and Michael Westberry. 2022. "Integrated Public Use Microdata Series, Current Population Survey: Version 10.0 [dataset]." *Minneapolis, MN: IPUMS* doi:10.18128/D030.V10.0.

Foote, Andrew, and Michel Grosz. 2020. "The Effect of Local Labor Market Downturns on Postsecondary Enrollment and Program Choice." *Education Finance and Policy* 15(4): 593–622. ISSN 1557-3060, 1557-3079. doi:10.1162/edfp_a_00288.

Grosz, Michel. 2019. "Do Postsecondary Training Programs Respond to Changes in the Labor Market?" *Federal Trade Commission Working Paper*.

Hilger, Nathaniel G. 2016. "Parental Job Loss and Children's Long-Term Outcomes: Evidence from 7 Million Fathers' Layoffs." *American Economic Journal: Applied Economics* 8(3): 247–283. ISSN 1945-7782, 1945-7790. doi:10.1257/app.20150295.

Hillman, Nicholas W., and Erica Lee Orians. 2013. "Community Colleges and Labor Market Conditions: How Does Enrollment Demand Change Relative to Local Unemployment Rates?" *Research in Higher Education* 54(7): 765–780. ISSN 0361-0365, 1573-188X. doi:10.1007/s11162-013-9294-7.

Hotz, V Joseph, Emily Wiemers, Joshua Rasmussen, and Kate Maxwell Koegel. 2023. "The Role of Parental Wealth and Income in Financing Children's College Attendance and Its Consequences." *Journal of Human Resources* 58(3). doi:10.3368/jhr.1018-9828R2.

Jambulapati, Vikram, and Joanna Stavins. 2014. "Credit CARD Act of 2009: What did banks do?" *Journal of Banking & Finance* 46: 21–30. ISSN 03784266. doi:10.1016/j.jbankfin.2014.04.025.

Jiang, Helu, and Juan M. Sánchez. 2016. "The Deleveraging of U.S. Households: Credit Card Debt over the Lifecycle." *Economic Synopses* 2016(11). doi:10.20955/es.2016.11.

Johnson, Jean, Jon Rochkind, Amber N. Ott, and Samantha DuPont. 2009. "With Their Whole Lives Ahead of Them." Technical Report. Public Agenda.

Johnson, Matthew T. 2013. "Borrowing Constraints, College Enrollment, and Delayed Entry." *Journal of Labor Economics* 31(4): 669–725. ISSN 0734-306X, 1537-5307. doi:10.1086/669964.

Joo, So-Hyun, Dorothy Bagwell Durband, and John Grable. 2008. "The Academic Impact of Financial Stress on College Students." *Journal of College Student Retention: Research, Theory & Practice* 10(3): 287–305. ISSN 1521-0251, 1541-4167. doi:10.2190/CS.10.3.c.

Joo, So-Hyun, John Grable, and Dorothy C Bagwell. 2005. "Credit Card Attitudes and Behaviors of College Students." *Journal of American College Health* 53(5): 224.

Kalil, Ariel, and Patrick Wightman. 2011. "Parental Job Loss and Children's Educational Attainment in Black and White Middle-Class Families." *Social Science Quarterly* 92(1): 57–78. ISSN 00384941. doi:10.1111/j.1540-6237.2011.00757.x.

Karger, Howard. 2005. *Shortchanged: Life and Debt in the Fringe Economy*. San Francisco, CA: Berkeley, CA: Berrett-Koehler Publishers.

Keane, Michael P, and Kenneth I Wolpin. 2001. "The Effect of Parental Transfers and Borrowing Constraints on Educational Attainment." *International Economic Review* 42(4): 1051–1103. doi:10.1111/1468-2354.00146.

Lee, Donghoon, and Wilbert van der Klaauw. 2010. "An Introduction to the FRBNY Consumer Credit Panel." *Federal Reserve Bank of New York Staff Reports* ISSN 1556-5068. doi:10.2139/ssrn.1719116.

Lochner, Lance J, and Alexander Monge-Naranjo. 2011. "The Nature of Credit Constraints and Human Capital." *American Economic Review* 101(6): 2487–2529. ISSN 0002-8282. doi:10.1257/aer.101.6.2487.

Lovenheim, Michael F. 2011. "The Effect of Liquid Housing Wealth on College Enrollment." *Journal of Labor Economics* 29(4): 741–771. ISSN 0734-306X, 1537-5307. doi:10.1086/660775.

Lovenheim, Michael F, and C Lockwood Reynolds. 2013. "The Effect of Housing Wealth on College Choice: Evidence from the Housing Boom." *Journal of Human Resources* 48(1): 1–35. doi:10.3368/jhr.48.1.1.

Lux, Marshall, and Robert Greene. 2016. "Out of Reach: Regressive Trends in Credit Card Access." *M-RCBG Associate Working Paper Series* ISSN 1556-5068. doi:10.2139/ssrn.3597180.

Manning, Robert D. 1999. "Credit Cards on Campus: The Social Costs and Con-

sequences of Student Debt." Technical Report. Washington, DC: Consumer Federation of America.

Manning, Robert D. 2000. *Credit Card Nation: The Consequences of America's Addiction to Credit*. Basic Books.

Manoli, Day, and Nicholas Turner. 2018. "Cash-on-Hand and College Enrollment: Evidence from Population Tax Data and the Earned Income Tax Credit." *American Economic Journal: Economic Policy* 10(2): 242–271. ISSN 1945-7731, 1945-774X. doi:10.1257/pol.20160298.

Minaya, Veronica, Judith Scott-Clayton, and Brendan Moore. 2020. "The Effect of Job Displacement on College Enrollment: Evidence from Ohio." *NBER Working Paper Series* doi:10.3386/w27694.

Norvilitis, Jill M., Michelle M. Merwin, Timothy M. Osberg, Patricia V. Roehling, Paul Young, and Michele M. Kamas. 2006. "Personality Factors, Money Attitudes, Financial Knowledge, and Credit-Card Debt in College Students." *Journal of Applied Social Psychology* 36(6): 1395–1413. ISSN 0021-9029, 1559-1816. doi:10.1111/j.0021-9029.2006.00065.x.

Norvilitis, Jill M., P. Bernard Szablicki, and Sandy D. Wilson. 2003. "Factors Influencing Levels of Credit-Card Debt in College Students." *Journal of Applied Social Psychology* 33(5): 935–947. ISSN 0021-9029, 1559-1816. doi:10.1111/j.1559-1816.2003.tb01932.x.

Nutting, Andrew W. 2008. "Costs of Attendance and the Educational Programs

of First-Time Community College Students." *Economics of Education Review* 27(4): 450–459. ISSN 02727757. doi:10.1016/j.econedurev.2007.05.001.

Ost, Ben, Weixiang Pan, and Doug Webber. 2018. "The Impact of Mass Layoffs on the Educational Investments of Working College Students." *Labour Economics* 51: 1–12. doi:10.1016/j.labeco.2017.11.008.

Pan, Weixiang, and Ben Ost. 2014. "The Impact of Parental Layoff on Higher Education Investment." *Economics of Education Review* 42: 53–63. ISSN 02727757. doi:10.1016/j.econedurev.2014.06.006.

Pfeffer, Fabian T. 2018. "Growing Wealth Gaps in Education." *Demography* 55(3): 1033–1068. ISSN 0070-3370, 1533-7790. doi:10.1007/s13524-018-0666-7.

Reiling, Rune Borgan, and Bjarne Strøm. 2015. "Upper Secondary School Completion and the Business Cycle." *The Scandinavian Journal of Economics* 117(1): 195–219. ISSN 03470520. doi:10.1111/sjoe.12088.

Robb, Cliff A., Beth Moody, and Mohamed Abdel-Ghany. 2012. "College Student Persistence to Degree: The Burden of Debt." *Journal of College Student Retention: Research, Theory & Practice* 13(4): 431–456. ISSN 1521-0251, 1541-4167. doi:10.2190/CS.13.4.b.

Rubin, Bonnie Miller. 1998. "College Students Charge Right into Valley of Debt." *Chicago Tribune*.

Sallie Mae. 2009. "How Undergraduate Students Use Credit Cards: Sallie Mae's National Study of Usage Rates and Trends 2009." Technical Report. Sallie Mae.

Schanzenbach, Diane Whitmore, Julia A. Turner, and Sarah Turner. 2023. "Raising State Minimum Wages, Lowering Community College Enrollment." *NBER Working Paper Series*.

Shea, John. 2000. "Does Parents' Money Matter?" *Journal of Public Economics* doi:10.1016/S0047-2727(99)00087-0.

Sievertsen, Hans Henrik. 2016. "Local Unemployment and the Timing of Post-Secondary Schooling." *Economics of Education Review* 50: 17–28. ISSN 02727757. doi:10.1016/j.econedurev.2015.11.002.

Sorensen, Lucy C., and Moontae Hwang. 2021. "The Importance of Place: Effects of Community Job Loss on College Enrollment and Attainment Across Rural and Metropolitan Regions." *AERA Open* 7(1): 233285842199717. ISSN 2332-8584, 2332-8584. doi:10.1177/2332858421997170.

Stinebrickner, Ralph, and Todd Stinebrickner. 2008. "The Effect of Credit Constraints on the College Drop-Out Decision: A Direct Approach Using a New Panel Study." *American Economic Review* 98(5): 2163–2184. ISSN 0002-8282. doi:10.1257/aer.98.5.2163.

Sullivan, James X. 2008. "Borrowing During Unemployment: Unsecured Debt as a Safety Net." *Journal of Human Resources*.

Appendix A Job Loss and Local Labor Market Conditions

Table A1 reports the estimation results from a modified Equation 3, where, instead of credit card use rates, the moderators are the unemployment rate, unemployment duration, and weekly earnings rate of 18- to 24-year-old non-college workers. The objective of the supplementary exercise is to test whether the increased liquidity effect of job loss after the 2008–09 school year reflects deteriorated labor market conditions in the aftermath of the Great Recession. We find limited evidence that local labor market conditions significantly alter the liquidity effect of job loss on college persistence. The college-age unemployment rate and unemployment duration have no detectable interaction with student job loss, and the college-age median earnings level is estimated to modestly reduce job loss's treatment effect. A possible explanation for the findings is that, while high unemployment and low earnings magnify the liquidity effect of job loss, they also reduce the opportunity cost of college attendance. The two opposing effects offset each other, resulting in a small net interaction between labor market conditions and job loss.

Table A1: Job Loss and College Persistence: Labor Market Conditions as a Moderator

US 18- to 24-Year-Old Working College Students, 2000–2019 SY

	(1)	(2)	(3)
Job Loss	-0.19	-0.02	2.79*
	(0.12)	(0.11)	(1.33)
Labor Market Condition	-0.78	0.00	-0.05
	(0.44)	(0.00)	(0.07)
Job Loss × Labor Market Condition	0.54	-0.01	0.45
	(1.21)	(0.01)	(0.23)
Individual-level Controls	✓	✓	✓
State-level Controls	✓	✓	✓
State Fixed Effects	✓	✓	✓
School-Year Fixed Effects	✓	✓	✓
Labor Market Condition Indicator	Unemp. Rate	Unemp. Duration	Median Earnings
R^2	0.10	0.10	0.10
Observations	9,866	9,866	9,866

Source(s): 1999–2020 IPUMS-CPS and authors' calculations.

Note(s): The samples consist of working college students aged 18 to 24 over the study period (t) from the 2000-01 through the 2019-20 school years. The results are weighted by the CPS 12-month linking person weight for each sample observation. Standard errors are clustered at the state level. The labor market condition indicators reflect the (1) unemployment rate (in %), (2) average unemployment duration (in weeks), and (3) log median weekly earnings of the 18- to 24-year-old workers with education attainment that is less than a two- or four-year college degree in state z in academic year $t-1$.

* for P $<$ 0.05, ** for P $<$ 0.01, *** for P $<$ 0.001.

Appendix B Food Consumption Robustness Test

Following the same research design as the primary analysis and using a modified version of Equation 3, this robustness test evaluates whether job loss leads to a lower incidence of inadequate food consumption when a college-age worker has better access to credit card loans:

$$\begin{aligned}\text{Food Security}_{i,z,t} =& \delta_0 + \delta_1 \text{Job Loss}_{i,z,t} + \delta_2 \text{Credit}_{z,t} \text{Job Loss}_{i,z,t} \\ &+ \delta_3 \text{Credit}_{z,t} + X'_{i,t} + T'_{z,t} + \eta_z + \zeta_t + \epsilon_{i,z,t}.\end{aligned} \tag{5}$$

The outcome variable is an indicator of having adequate basic food consumption in the preceding 30 days. Job Loss$_{i,z,t}$ is an indicator variable that is equal to 1 if a respondent reported a spell of unemployment due to involuntary job loss during the October–December period of school year t. As with the case of college-persistence rate as the outcome variable, we are interested in the interaction between job loss and the credit card use indicator and expect to see a negative interaction term if the leverage of credit card loans weakens the liquidity effect of job loss on basic food consumption. The model includes the same individual-level controls as specified in Equation 1 based on information obtained in September of school year t and state-level controls on prime-age unemployment rates and weekly earnings rates, separately for workers with a college degree and those without a college degree.

The analysis sample consists of 18- to 24-year-old CPS respondents who had complete four-month interview records from September through December in the CPS Basic Monthly and December Food Security Supplement. Each December,

in addition to the basic monthly survey questions, CPS respondents receive questions about the food security situation in their households in the preceding 30 days. The questions cover subjects including the ability to afford balanced meals, worries about running out of food, and the frequency with which meals were skipped or respondents were hungry due to food affordability. The CPS then assigns a household's food security status based jointly on the number of affirmative answers to the food security screening questions, the household income-to-poverty ratio, and the presence of children in the household. The analysis has a shorter study period (the 2005–06 through 2019–20 school years) to accommodate the availability of the 30-day food security questions in the CPS.

Consistent with our hypothesis, job loss is estimated to decrease the likelihood of having adequate basic food consumption, but access to credit card loans mitigates this liquidity effect. For a college-age worker who experienced a recent spell of unemployment from job loss, their probability of having adequate food consumption increases by 29 percentage points for each additional credit card account, 10 percentage points for each additional $1,000 in the account credit limit, 5 percentage points for each additional $1,000 in the total credit limit, and 9 percentage points for each additional $1,000 in the total outstanding balance. The results closely mirror the findings in Table 5 in terms of both the numerical signs and the magnitudes of the interaction terms as a fraction of job loss's main effects. The consistency between the two sets of results lend support to the proposition that credit card loans act as a liquidity buffer against the impact of unanticipated earnings loss.

Table B1: Job Loss and Food Security: Credit Card Leverage as a Moderator

US 18- to 24-Year-Old Civilian Population, 2005–2019

	(1)	(2)	(3)	(4)
Job Loss	-0.53***	-0.31***	-0.25***	-0.20***
	(0.13)	(0.08)	(0.05)	(0.04)
Credit Card Leverage	0.16	0.01	0.02	0.03
	(0.11)	(0.03)	(0.02)	(0.03)
Job Loss × Credit Card Leverage	0.29***	0.10**	0.05***	0.09**
	(0.08)	(0.03)	(0.01)	(0.03)
Individual-level Controls	✓	✓	✓	✓
State-level Controls	✓	✓	✓	✓
State Fixed Effects	✓	✓	✓	✓
School-year Fixed Effects	✓	✓	✓	✓
Credit Card Leverage Indicator	No. Accounts	Acct Limit	Total Limit	Total Balance
R^2	0.04	0.04	0.04	0.04
Observations	23,651	23,651	23,651	23,651

Source(s): 2005–2019 IPUMS-CPS and CCP. All calculations, findings, assertions are the authors.
Note(s): The sample consists of the civilian population aged 18 to 24 over the 2005–06 through 2019–20 school years to accommodate the availability of the CPS 30-day food security data. The results are weighted by the CPS food security supplement person weight for each sample observation. Standard errors are clustered at the state level.
* for P $<$ 0.05, ** for P $<$ 0.01, *** for P $<$ 0.001.

Appendix C Data for the External Validation

We retrieved the sample for the supplementary analysis on credit access and college-retention rates from the National Center for Education Statistics (NCES) Integrated Post-secondary Education Data System (IPEDS) for the 2003–04 through 2019–20 academic years. NCES-IPEDS is a collection of surveys that all postsecondary institutions participating in federal student financial aid programs (Title IV) must answer each year. We limit our analysis to two- and four-year degree-granting postsecondary institutions from NCES-IPEDS for the 2003–04 through 2019–20 academic years. Full-time retention rates, the outcome variable of the model, is reported for first-time full-time students in the fall of each academic year by participating schools. For four-year institutions, NCES-IPEDS defines the retention rate as the percentage of full-time first-time undergraduates seeking a bachelor's (or equivalent) from the previous fall who are enrolled in the current fall. For all other types of institutions, the retention rate is defined as the percentage of first-time degree- or certificate-seeking students from the previous fall who are either re-enrolled or have completed their program by the current fall. While this question was added to the fall enrollment surveys starting in fall 2003, reporting the value became mandatory starting in fall 2004. In the analysis, we use the share of undergraduate students receiving Federal Pell Grants in the previous academic year as an instrument for the strength of credit card loans' treatment effect on the institution. Institutions with a higher share of Pell Grant students are expected to see a higher retention rate when credit card loans are more accessible to their students. Because information on the share of students receiving Pell Grants is available only

for the 2007–2019 period, we assign the average share of students receiving Pell Grants during that time frame to the earlier years, when the variable is not available from NCES-IPEDS. The step enhances that we have sufficient observations in the pre-CARD-Act period but does not significantly alter the estimation results. The model also includes institution-level controls on the average tuition rate and value of financial aid for first-time full-time students, retrieved from NCES-IPEDS, and state-level controls on prime-age unemployment rates and weekly earnings rates, separately for workers with a college degree and those without a college degree, estimated using the CPS.