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# The Effect of Student Loan Debt on Emergency Savings and the Moderating Role of Financial Knowledge: Evidence from the U.S. Survey of Household Economics and Decisionmaking

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**Abstract:** This study examines data from the U.S. 2018 and 2019 Survey of Household Economics and Decision making (SHED) to understand the association between student loan debt and emergency-saving decisions, including the moderating role of financial knowledge. Controlling self-selection bias through a propensity score and coarsened exact matching approach, the findings reveal that individuals with student loan debt are less likely to save for financial emergencies. The findings also show that financial knowledge is positively associated with a higher likelihood of having emergency savings. Furthermore, the results from the moderating analysis indicate a statistically significant interaction effect. Based on the empirical results and the corresponding interaction plots, the findings suggest that targeted financial education may lead to improved financial outcomes for student loan borrowers, rather than assuming that such education occurred prior to a loan application.

**Keywords:** coarsened exact matching; emergency fund; emergency savings; financial literacy; propensity score matching; student loan debt

**JEL Classification:** G51; G53



**Citation:** Korankye, Thomas, Blain Pearson, and Peter Agyemang-Mintah. 2024. The Effect of Student Loan Debt on Emergency Savings and the Moderating Role of Financial Knowledge: Evidence from the U.S. Survey of Household Economics and Decisionmaking. *Journal of Risk and Financial Management* 17: 420. <https://doi.org/10.3390/jrfm17090420>

Academic Editor: Thanasis Stengos

Received: 7 August 2024

Revised: 6 September 2024

Accepted: 19 September 2024

Published: 21 September 2024



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## 1. Introduction

An important lesson from the COVID-19 pandemic is that financial emergencies are inevitable (McDonald 2021). The unexpected occurrence of widespread job losses, health shocks, and mortality of loved ones during the pandemic echoes the belief that some life events are rarely predictable. Consequently, this requires households to have adequate liquid funds available to weather the financial burdens of such events. It is a commonly accepted practice for financial service professionals to recommend having three to six months of fixed expenses held in the form of cash or cash equivalents to allow households to weather financial emergencies. This may help households avoid the risk of predatory loans, incurring transaction costs to convert illiquid assets into liquid funds, or liquidating long-term investments, such as stocks or retirement assets, at inopportune times.

The absence of emergency funds could jeopardize the financial health of affected individuals. Evidence suggests that the lack of emergency savings results in increased vulnerability to short-, medium-, and long-term financial insecurity risks (Adams and West 2015; Hasler et al. 2018). Other studies identify rent or mortgage payment problems, high-cost borrowings, food insecurity, energy insecurity, and psychological distress resulting from sleeplessness and poor health as some of the risks associated with the absence of adequate emergency savings (Brobeck 2008; Gjertson 2016; Lusardi et al. 2011). Conversely, studies have shown that having emergency savings provides financial protection for families. For instance, among low-income households, Gjertson (2016) and Mills and

Amick (2010) report that having emergency savings is associated with a low likelihood of experiencing financial hardships. Studies also show that holding emergency savings is positively associated with financial satisfaction (Korankye and Kalenkoski 2021a; Tharp et al. 2020; Woodyard and Robb 2016). For example, Korankye and Kalenkoski (2021a) show that having emergency savings among U.S. adults is associated positively with higher levels of financial well-being compared with those without such funds.

Despite the benefits of having emergency savings, reports indicate that adequate emergency fund holdings are limited among American adults (Lin et al. 2022; Ratcliffe et al. 2022). The Consumer Financial Protection Bureau's Making Ends Meet survey shows that almost 25% of Americans have no emergency savings, while 49% have emergency funds that may not last for a month (Ratcliffe et al. 2022). When asked whether respondents have emergency funds to cover expenses for three months, the FINRA Foundation National Financial Capability Study found that 47% of Americans responded negatively (Lin et al. 2022). The findings from these survey reports suggest that many American adults are not adequately prepared to handle financial emergencies.

Existing studies identify several factors that could explain emergency-saving behavior. For instance, studies show that people with high financial literacy have a greater propensity to own emergency savings than those with low financial literacy (Babiarz and Robb 2014; Fan and Zhang 2021). Studies also show that seeking financial advice motivates individuals to have emergency funds (Alyousif and Kalenkoski 2017; Marsden et al. 2011). Those who receive financial education from school and work are also more likely to hold emergency savings (Fan and Zhang 2021). Using data from the U.S. National Financial Capability Study, Despard et al. (2020) ascertain that homeownership, the presence of savings accounts, financial confidence, and subjective financial knowledge positively correlate with the likelihood of owning an emergency fund. As important as these studies are, not much is known about the influential role of student debt in shaping individuals' emergency-saving decisions.

The present study aims to expand our understanding of the factors influencing emergency savings, with a specific focus on student loan debt. Generally, the literature suggests that student loans are essential for helping financially constrained individuals obtain post-secondary qualifications and expand opportunities for higher-income occupations. Low federal and state-level funding targeted to colleges, coupled with rising tuition rates (Federal Reserve Bank of New York 2021; Ma et al. 2018), have led to increased student loan usage in the United States, resulting in adverse outcomes for individuals and families, all else being equal (Cho et al. 2015; Korankye and Kalenkoski 2021b; Korankye 2023; Pearson and Lee 2022).

Two research questions are central to the current study. First, the study seeks to answer the question, "How does student loan indebtedness relate to the emergency-saving decisions of individuals?" Second, "Does financial knowledge matter in explaining the relationship between student debt and emergency-saving decisions?" To address the research questions, the current study moves beyond correlational research to account for self-selection bias and endogeneity issues through propensity score and coarsened exact matching. This approach allows inference of a causal relationship between student debt and emergency-saving decisions. In the end, policymakers, financial educators, and financial service professionals will be better positioned to appreciate the empirical relationship between student debt and individuals' emergency-saving behavior for timely intervention.

## 2. Conceptual Framework

The study uses Sherraden's (2013) conceptual framework on financial capability to examine student debt, financial knowledge, and emergency-saving decisions. The framework considers financial knowledge, skills, and access to financial products as inputs that influence financial outcomes, such as emergency savings. Despard et al. (2020) have used Sherraden's (2013) conceptual framework to examine the role of financial capability in explaining the lack of emergency funds among U.S. households. While emphasizing financial

knowledge, the present study incorporates student loan debt into Sherraden's (2013) model to examine the possible role of student debt in explaining the emergency-saving decisions of Americans.

### 2.1. Student Loans and Associated Outcomes

Existing studies have shown that student debt influences several household decisions, including stock ownership, homeownership, college savings, and retirement savings (Korankye and Guillemette 2021; Martin et al. 2020; Mountain et al. 2020). Cho et al. (2015) provide a review of several studies on student debt outcomes. Following that review, a longitudinal study of data from 2011 to 2017 using the U.S. Panel Study of Income Dynamics show that households with student debt are less likely to hold stock investments in non-retirement accounts (Korankye 2023; Korankye and Guillemette 2021). Martin et al. (2020) use data from the 2012 National Longitudinal Survey of Youth (NLSY79) to show that parents who hold student debt on their balance sheets have a low probability of saving for their children's education. Focusing on millennials and utilizing data from the 2016 UF/VT Millennial Housing and Student Debt Survey, Mountain et al. (2020) demonstrate that the burden associated with student debt is negatively associated with millennial homeownership.

Given that having emergency savings could help individuals weather financial shocks, expanding the existing literature to examine the link between student debt and the likelihood of holding emergency savings is warranted. As the studies reviewed above indicate, the burden associated with student debt can create financial stressors that limit borrowers' ability to make significant financial decisions that could adversely impact their well-being (Kim et al. 2021). The social stress theory suggests that financially constrained individuals tend to report higher levels of stress, which is associated with lower levels of well-being (Mossakowski 2014).

From a standard economic theory perspective, student debt constitutes an investment in human capital. With all else equal, investment in human capital generates more future earnings, consumption, and wealth (Becker 1962). With this logic, a rational decision maker would only invest in their human capital if the cost of the investment is lower than the expected payoff. Depending on intertemporal preferences, student debt holders may choose to consume more during the current period while paying off higher interest debt rather than having financial assets in emergency savings, holding interest rates constant. The consumption basket of those without student debt excludes student debt repayment obligations. With all else equal, this makes it less financially burdensome for them to allocate resources to other necessities, including holding an emergency fund.

### 2.2. Effect of Financial Knowledge

Financial knowledge and skills, which could be called financial literacy, form part of the inputs in Sherraden's (2013) framework. Financial literacy has been shown to relate positively to emergency savings (Babiarz and Robb 2014; Bhutta et al. 2022). For instance, using the 2016 and 2019 Survey of Consumer Finances and the Big Three financial literacy questions, Bhutta et al. (2022) show that financially literate individuals are more likely to have liquid savings. Through sensitivity analysis, Bhutta et al. (2022) observe that the magnitude of the effect of financial literacy on liquid savings is large for respondents correctly answering all three financial knowledge questions on inflation, diversification, and interest rates.

Although financial knowledge is essential, findings from existing studies have not always been consistent. Using datasets from the 2009 to 2018 National Financial Capability Study, Despard et al. (2020) show that objective financial knowledge is not a statistically significant predictor of emergency savings. Instead, Despard et al. (2020) find subjective financial knowledge to be a statistically significant contributor to the likelihood of having emergency savings. A related study by Babiarz and Robb (2014) observes a positive correlation between subjective financial knowledge and emergency savings. However,

unlike [Despard et al. \(2020\)](#), [Babiarz and Robb \(2014\)](#) observe a statistically significant positive correlation between objective financial knowledge and emergency savings.

While studies, such as [Babiarz and Robb \(2014\)](#), [Bhutta et al. \(2022\)](#), and [Despard et al. \(2020\)](#), examine the direct relationship between financial literacy and emergency savings, other studies examine the moderating role of financial literacy among financial behaviors and decisions. For instance, [Fan and Zhang \(2021\)](#) use data from the 2018 U.S. National Financial Capability Study to examine the mediating role of financial literacy between the sources of financial education and emergency-saving decisions. Their findings show that financial literacy mediates the association between financial education and holding emergency funds.

Adding to the mediation study of [Fan and Zhang \(2021\)](#), the current study considers the moderation role of financial knowledge between student debt and emergency savings. This study believes that it is insufficient to examine the effect of student debt on emergency savings without considering pathways that enhance positive behavior. Including financial knowledge in the moderation analysis could demonstrate the effectiveness of financial knowledge in empowering individuals to make utility-maximizing decisions. By using this approach, the present study illustrates the associated effect of borrowing to pay for college education on a household's ability to meet contingent financial obligations and how financial knowledge could change the dynamics for affected families.

### 2.3. Hypotheses

The current study tests the following hypotheses based on the conceptual framework and existing studies:

**H1.** *Holding student debt negatively relates to the emergency-saving decisions of individuals.*

**H2.** *Financial knowledge moderates the association between holding student debt and emergency-saving decisions.*

## 3. Methods

### 3.1. Data

The study uses pooled cross-sectional data from the 2018 and 2019 Survey of Household Economics and Decisionmaking (SHED). Designed to be nationally representative, the SHED is administered by the U.S. Federal Reserve Board annually to explore the economic well-being of households in the United States. The 2018 and 2019 waves are selected to examine the research topic before the onset of the COVID-19 pandemic. In addition, these are the two waves containing all the variables of interest for the current study. These two waves are part of the National Endowment for Financial Education/Knology's "Financial Education Database", which is streamlined for consistency across multiple years ([Dwyer et al. 2021](#)).

### 3.2. Dependent Variable

The dependent variable for this study is that of emergency savings. The survey asks the question, "Have you set aside emergency or rainy day funds that would cover your expenses for 3 months in the case of sickness, job loss, economic downturn, or other emergencies?" An affirmative response is coded as 1, and otherwise the response would be 0.

### 3.3. Key Explanatory Variable

This study includes two key explanatory variables. The first variable is student loan debt, coded as 1 if an individual reports the presence of student debt on their balance sheet, and otherwise the response would be 0. The second is financial knowledge, obtained from the Big Three financial literacy questions covering inflation, interest rates, and risk diversification ([Lusardi 2008](#); [Lusardi and Mitchell 2017](#)). A correct answer to each question is coded as 1, 0 otherwise. The study sums the correct responses to each question to obtain

the objective financial knowledge score with values ranging from 0 to 3. The 2018 and 2019 SHED do not have information on subjective financial knowledge and the other financial literacy questions.

### 3.4. Other Explanatory Variables

The study includes control variables relating to gender (female), age, race (White), educational attainment, marital status (married), household size, physical health status, homeownership status, household income, employment status, financial risk preference, credit card debt, bank account ownership, and survey year fixed effects. The present study includes these variables based on Sherraden's (2013) conceptual framework and findings from the existing literature (Babiarz and Robb 2014; Bhutta et al. 2022; Despard et al. 2020; Fan and Zhang 2021).

Age, household size, and risk preference are measured as continuous variables. The survey's question for measuring financial risk preference is, "On a scale from zero to ten, where zero is not at all willing to take risks and ten is very willing to take risks, what number would be on the scale?"

Female, White, married, homeownership, credit card debt, and bank account ownership are measured dichotomously, with 1 indicating a yes response and 0 otherwise. The categorical variables from the SHED are educational attainment, physical health status, household income, and employment status.

### 3.5. Model

The paper estimates four logistic hierarchical regression models based on the study's objectives. The first is a restricted model that includes the key explanatory variable of student loan debt. The second model estimates the relationship between student debt and the emergency-saving decisions of individuals, including all the control variables except financial knowledge. The third model adds financial knowledge to the second model. The fourth is the interaction model that examines the moderating role of financial knowledge between student debt and emergency-saving decisions. The four models just described are stated as follows:

$$\Pr(Y = 1) = \Phi(\beta_0 + \beta_1 Sdebt) \quad (1)$$

$$\Pr(Y = 1) = \Phi(\beta_0 + \beta_1 Sdebt + \beta_X X) \quad (2)$$

$$\Pr(Y = 1) = \Phi(\beta_0 + \beta_1 Sdebt + \beta_2 FinKnow + \beta_X X) \quad (3)$$

$$\Pr(Y = 1) = \Phi(\beta_0 + \beta_1 Sdebt + \beta_2 FinKnow + \beta_3 Sdebt \times FinKnow + \beta_X X) \quad (4)$$

where  $Y$  is the dependent variable representing the emergency-saving decisions of individuals.  $Sdebt$  and  $FinKnow$  connote student debt and objective financial knowledge, respectively. The matrix,  $X$ , represents the control variables, including gender, age, race, education, marital status, household size, health status, homeownership, income, employment status, financial risk, credit card debt, bank account ownership, and survey year. The  $\beta$ 's are the odds ratios to be estimated.

### 3.6. Accounting for Self-Selection Bias

The uptake of student loans is considered non-random (Cho et al. 2015). This suggests that standard regression estimates could be biased due to the presence of self-selection bias associated with student loans. For instance, it has been shown that holders and non-holders of student loan debt could differ regarding financial knowledge, personality traits, gender, and race/ethnicity (Korankye 2024; Li 2021; Liu et al. 2023). Therefore, using controlled experimental data to establish a causal relationship between student debt and emergency savings will be ideal. However, the current study uses survey data for empirical analyses. Another strategy is to utilize an instrumental variable technique, but finding a suitable instrument in this particular case is compelling.



To address the endogeneity issues associated with student debt, the current study initially performs a propensity score matching analysis (and later coarsened exact matching), utilizing one-to-one matching with replacement. This analysis method contrasts the treatment sample (student debt holders) from the control sample (those without student debt) by conditioning on covariates. The estimators use propensity scores to match each respondent to comparable observations, thereby eliminating the self-selection effect and allowing causal inferences (Lanza et al. 2013). The current study estimates the average effect of the treatment (holding student debt) on emergency-saving decisions in the population. Studies, such as Korankye et al. (2023), Kim et al. (2018), and Marsden et al. (2011), estimate a similar model to handle similar perceived self-selection problems. Abadi and Imbens (2016) provide more information about propensity score matching.

#### 4. Results

##### 4.1. Descriptive Statistics

Table 1 contains the summary statistics for the full sample and the *t*-test results for those with and without emergency savings. The statistics here pertain to the raw data that have not been exposed to any of the matching techniques. Almost 55% of the respondents hold emergency funds that could cover three months of expenses when financial emergencies occur. About 21% of the respondents have student debt on their balance sheets. There are more student debtholders without emergency savings than those with emergency funds (29% versus 14%), suggesting that student debtholders have a lower likelihood of owning emergency funds. The average score for financial knowledge is 1.9 out of 3 for the full sample. However, those with emergency savings have an average score of 2.18 compared to 1.5 for respondents without emergency savings. The average score for financial risk is 4 out of 10. The *t*-test results show that those with emergency savings have higher risk tolerance than those without emergency funds (4.61 versus 3.52). The average age for the full sample is 52, and there are approximately 50% females, 70% White, 39% college-educated respondents, and 31% respondents with a household income of \$100,000 or more.

**Table 1.** Summary Statistics for the Dependent and Explanatory Variables.

	Full Sample <sup>a</sup>	Have Emergency Savings <sup>a</sup>	No Emergency Savings <sup>a</sup>	
Dependent variable: Emergency savings	0.5437			
Main explanatory variable:				
Student loan debt (1 = Yes)	0.2076	0.1372	0.2915	***
Other explanatory variables:				
Gender (1 = Female)	0.4971	0.4590	0.5425	***
White (Yes = 1)	0.6986	0.7567	0.6293	***
Married (Yes = 1)	0.5547	0.6442	0.4482	***
Age (continuous)	52.2750	56.3383	47.4341	***
Education				
Less than high school	0.0468	0.0203	0.0784	***
High school	0.2409	0.1939	0.2969	***
Some college	0.3223	0.2929	0.3573	***
Bachelor’s degree or higher	0.3900	0.4929	0.2675	***
Household Size (1 to 12)	2.4983	2.3287	2.7003	***
Health status				
Poor	0.0277	0.0130	0.0452	***
Fair	0.1237	0.0850	0.1697	***
Good	0.3414	0.3115	0.3770	***
Very good	0.3511	0.4198	0.2692	***
Excellent	0.1033	0.1239	0.0787	***
Household income				

**Table 1.** Cont.

	Full Sample <sup>a</sup>	Have Emergency Savings <sup>a</sup>	No Emergency Savings <sup>a</sup>	
Less than \$50,000	0.4034	0.2742	0.5574	***
\$50,000 to less than \$100,000	0.2881	0.3010	0.2728	***
\$100,000 to less than \$150,000	0.1635	0.2091	0.1091	***
\$150,000 or more	0.1450	0.2157	0.0607	***
Employment status				
Unemployed	0.0440	0.0150	0.0818	***
Not working—Disabled	0.0455	0.0150	0.0818	***
Self-employed	0.0772	0.0804	0.0734	*
Paid employee	0.5236	0.5028	0.5484	***
Retired	0.2570	0.3362	0.1627	***
Other	0.0527	0.0422	0.0652	***
Homeownership (Yes = 1)	0.6664	0.8070	0.4989	***
Health insurance ownership (Yes = 1)	0.5365	0.6007	0.4601	***
Bank account ownership	0.9482	0.9869	0.9020	***
Credit card debt	0.3780	0.2931	0.4791	***
Financial risk preference (0 to 10)	4.1111	4.6094	3.5175	***
Financial knowledge (0 to 3)	1.8730	2.1822	1.5047	***
N	34,354	18,677	15,677	

Notes: The data source is the 2018 and 2019 SHED. The *t*-tests are performed for households with emergency savings versus those without college savings. \* *p* < 0.05; \*\*\* *p* < 0.001. The mean values are shown, but not the standard errors. Year dummies are included but not shown. <sup>a</sup> All values are percentages, except where indicated otherwise.

Given that this study utilizes propensity score matching, Table 2 shows the summary statistics for the matched and unmatched samples. The means for the treated and control groups in the matched sample are similar, a situation that is not observed for the unmatched sample shown in Table 2. For instance, the average age for those with student debt (treatment group) is 41, and that of those without student debt (control group) is approximately 41. The average scores for financial risk and knowledge are about 4 and 2, respectively, for each treatment and control group.

**Table 2.** Summary Statistics of Matched and Unmatched Samples—Propensity Score Matching.

	Unmatched Sample <sup>a</sup>			Propensity Score Logit Coefficients	Matched Sample <sup>a</sup>		
	Has Student Debt	No Student Debt	% Bias		Has Student Debt	No Student Debt	% Bias
P score	0.3669	0.1659	116.0		0.3666	0.3666	0.0
Gender (1 = Female)	0.5550	0.4820	14.6	0.2208 ***	0.5547	0.5406	2.8
White (Yes = 1)	0.5968	0.7252	−27.4	−0.3001 ***	0.5972	0.5879	2.0
Married (Yes = 1)	0.5109	0.5662	−11.1	0.2252 ***	0.5110	0.5322	−4.3
Age (continuous)	41.159	55.187	−91.3	−0.0422 ***	41.171	41.044	0.8
Education							
Less than high school							
High school	0.1071	0.2759	−43.9	0.1173	0.1072	0.1086	−0.4
Some college	0.3574	0.3131	9.4	1.2311 ***	0.3577	0.3749	−3.7
Bachelor’s degree or higher	0.5146	0.3574	32.1	1.6282 ***	0.5142	0.4912	4.7
Household Size (1 to 12)	2.862	2.403	30.2	0.0605 ***	2.8619	2.9036	2.7

Table 2. Cont.

	Unmatched Sample <sup>a</sup>			Propensity Score Logit Coefficients	Matched Sample <sup>a</sup>		
	Has Student Debt	No Student Debt	% Bias		Has Student Debt	No Student Debt	% Bias
Health status							
Poor							
Fair	0.1082	0.1277	−6.0	−0.0815	0.1083	0.1094	−0.3
Good	0.3424	0.3412	0.3	−0.1241 *	0.3425	0.3309	2.4
Very good	0.3379	0.3546	−3.5	−0.2670 ***	0.3382	0.3309	1.5
Excellent	0.1082	0.1020	2.0	−0.3171 ***	0.1083	0.1047	1.2
Household income							
Less than \$50,000							
\$50,000 to less than \$100,000	0.3092	0.2826	5.8	−0.1140 **	0.3091	0.2952	3.0
\$100,000 to less than \$150,000	0.1844	0.1580	7.0	−0.1185 *	0.1845	0.1862	−0.4
\$150,000 or more	0.1317	0.1485	−4.8	−0.3211 *	0.1318	0.1360	−1.2
Employment status							
Unemployed							
Not working—Disabled	0.0327	0.0489	−8.2	−0.2656 **	0.0327	0.0348	−1.1
Self-employed	0.0648	0.0804	−6.0	−0.1726 *	0.0648	0.0678	−1.1
Paid employee	0.7286	0.4699	54.7	0.0765	0.7284	0.7171	2.4
Retired	0.0618	0.3082	−66.9	−0.6283 ***	0.0619	0.0630	−0.3
Other	0.0543	0.0523	0.9	−0.3525 ***	0.0543	0.0596	−2.4
Homeownership (Yes = 1)	0.5164	0.7057	−39.6	−0.4082 ***	0.5168	0.5203	−0.7
Health insurance ownership (Yes = 1)	0.6451	0.5081	28.0	0.1099 **	0.6450	0.6372	1.6
Bank account ownership	0.9478	0.9483	−0.2	−0.1585 *	0.9478	0.9537	−2.7
Credit card debt	0.5202	0.3407	36.9	0.8603 ***	0.5199	0.5179	0.4
Financial risk preference (0 to 10)	4.2227	4.0819	5.5	−0.0218 **	4.2223	4.2656	−1.7
Financial knowledge (0 to 3)	1.7877	1.8954	−9.9	−0.0434 **	1.7887	1.7689	−1.8
N	7132	27,222		34,354	7127	3253	

Notes: <sup>a</sup> All values are percentages, except where indicated otherwise. \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ . One-to-one matching with replacement is used. This could explain why the treated group (has student debt) is larger than the control group (no student debt), as control units can be matched to multiple treated units, leading to more treated units than unique control units in the final sample.

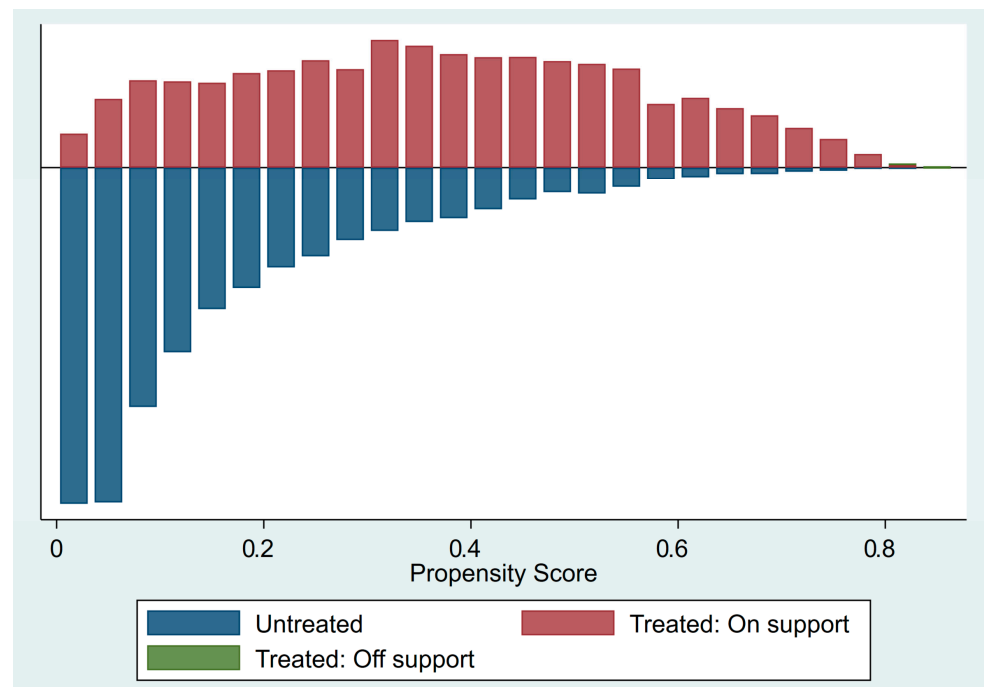
In addition to the summary statistics, Table 2 contains the propensity score logistic coefficient estimates for student loan indebtedness. The coefficient estimates support the notion that student debtholders differ from those without such debt. These debt holders are more likely to be females, non-White, and college degree holders, for instance. They also are less likely to have high risk tolerance, financial knowledge, and household income.

#### 4.2. Overlap Test and Covariate Balance

Based on recommendations from studies, such as Drukker (2016), Garrido et al. (2014), and Stuart (2010), this study performs overlap and balance tests to check the unbiasedness of the propensity score estimates. The overlap test results, which assume that every respondent could receive any of the two treatment levels, are presented in Figure 1. The



figure shows a good overlap because a comparison group has a similar propensity score for every individual receiving treatment.



**Figure 1.** Distribution of propensity scores across treatment and control groups.

The results of the covariate balance test in the form of standardized mean differences (% bias) are also shown in Table 2. An imbalance may exist if the standardized mean differences exceed 10% (Benedetto et al. 2018). From Table 2, an imbalance exists in the unmatched sample. However, the matched sample of interest does not appear imbalanced because all the standardized mean differences fall below 10%. These findings provide evidence of random assignment of the treatment, allowing a causal inference from the empirical estimates.

#### 4.3. Regression Results

Table 3 contains the logistic regression estimates of emergency savings on student loan debt using propensity score matching. The results for Model 1, the restricted model with only student debt as the explanatory variable, indicate that student debtholders have 0.5579 ( $p < 0.001$ ) times the odds of having emergency savings as compared to those without student debt. The results for Model 2, the model with student debt and other predictor variables except for financial knowledge, show that student debtholders have 0.4826 ( $p < 0.001$ ) times the odds of having emergency savings when compared to non-student debtholders. The results for the full model without interaction terms (Model 3) show that the odds of having emergency savings for student-debt holders is estimated to be 0.4808 ( $p < 0.001$ ) times the odds of holding emergency savings for those without student debt. Table 3 (Model 3) also shows that the odds ratio for financial knowledge is 1.1176 ( $p < 0.001$ ), suggesting that each additional increase in financial knowledge score is associated with an 11.76% increase in the odds of having emergency savings.

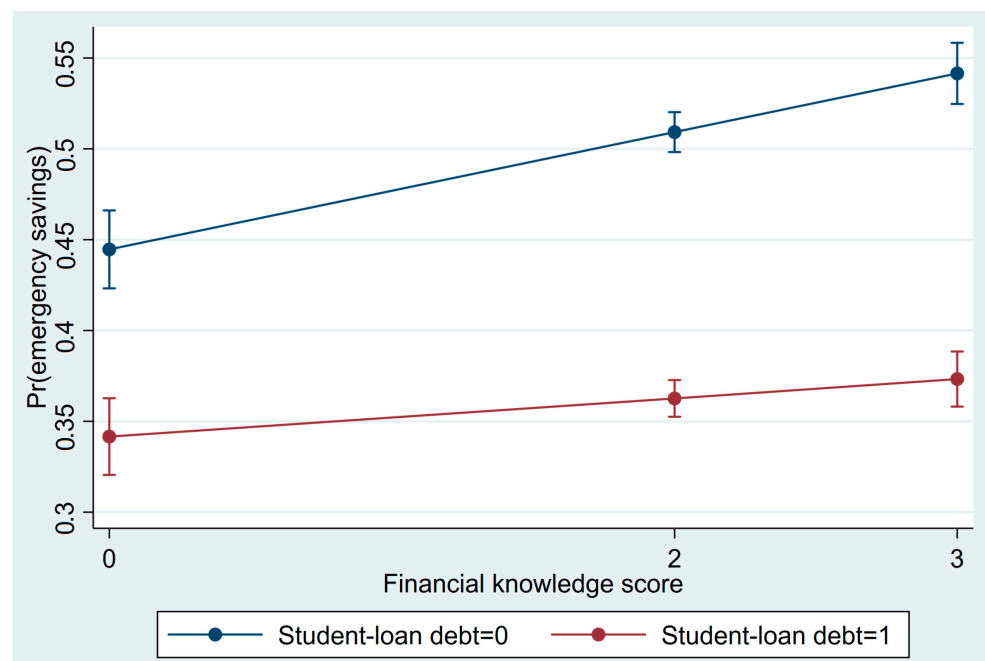
**Table 3.** Logistic Regression Estimates of Emergency Savings on Student Loan Debt—Propensity Score Matching.

	Model 1	Model 2	Model 3	Model 4
Explanatory Variables:				
Treatment: Student loan debt (1 = Yes)	0.5579 *** (0.0191)	0.4826 *** (0.0190)	0.4808 *** (0.0189)	0.5834 *** (0.0449)
Financial knowledge (0 to 3)	-	-	1.1176 *** (0.0227)	1.1757 *** (0.0315)
Interaction: Student debt × Financial knowledge	-	-	-	0.9004 ** (0.0324)
Gender (1 = Female)	-	0.9803 (0.0391)	1.0278 (0.0421)	1.0266 (0.0420)
White (Yes = 1)	-	0.8783 ** (0.0354)	0.8569 *** (0.0348)	0.8590 *** (0.0349)
Married (Yes = 1)	-	0.9897 (0.0455)	0.9902 (0.0456)	0.9926 (0.0457)
Age (continuous)	-	1.0041 * (0.0017)	1.0031 (0.0017)	1.0029 (0.0017)
Education (versus less than high school)				
High school	-	1.5304 * (0.2597)	1.5194 ** (0.2578)	1.5157 ** (0.2572)
Some college	-	1.6670 ** (0.2702)	1.6099 ** (0.2612)	1.5995 ** (0.2595)
Bachelor’s degree or higher	-	2.5927 *** (0.4221)	2.4126 *** (0.3939)	2.3957 *** (0.3911)
Household Size (1 to 12)	-	0.8688 *** (0.0116)	0.8700 *** (0.0116)	0.8705 *** (0.0116)
Health status (versus poor)				
Fair	-	0.7089 *** (0.0616)	0.7131 *** (0.0621)	0.7088 *** (0.0618)
Good	-	0.9979 (0.0684)	1.0045 (0.0690)	1.0035 (0.0690)
Very good	-	1.3490 *** (0.0927)	1.3502 *** (0.0930)	1.3501 *** (0.0931)
Excellent	-	1.5586 *** (0.1312)	1.5672 *** (0.1321)	1.5640 *** (0.1319)
Household income (versus less than \$50,000)				
\$50,000 to less than \$100,000	-	1.4439 *** (0.0738)	1.4221 *** (0.0729)	1.4199 *** (0.0727)
\$100,000 to less than \$150,000	-	1.9143 *** (0.1186)	1.8627 *** (0.1160)	1.8650 *** (0.1162)
\$150,000 or more	-	3.2195 *** (0.2358)	3.0891 *** (0.2277)	3.0992 *** (0.2287)
Employment status (versus unemployed)				
Not working–Disable	-	0.8765 (0.1384)	0.8823 (0.1396)	0.8770 (0.1387)
Self-employed	-	1.2568 (0.1466)	1.2467 (0.1457)	1.2356 (0.1446)
Paid employee	-	1.2065 * (0.1119)	1.2193 * (0.1135)	1.2137 * (0.1131)
Retired	-	2.8925 *** (0.3648)	2.9069 *** (0.3672)	2.9087 *** (0.3676)
Other	-	1.1024 (0.1354)	1.1112 (0.1368)	1.1053 (0.1362)
Homeownership (Yes = 1)	-	1.7884 *** (0.0834)	1.7696 *** (0.0827)	1.7680 *** (0.0826)
Health-insurance ownership (Yes = 1)	-	1.1774 ** (0.0570)	1.1636 ** (0.0564)	1.1629 ** (0.0564)
Bank account ownership	-	3.3621 *** (0.4254)	3.1602 *** (0.4010)	3.1286 *** (0.3966)
Credit card debt	-	0.4125 *** (0.0167)	0.4125 *** (0.0168)	0.4141 *** (0.0168)
Financial risk preference (0 to 10)	-	1.1223 *** (0.0092)	1.1148 *** (0.0093)	1.1143 *** (0.0093)
N	10,380	10,380	10,380	10,380

Notes: The data source is the 2018 and 2019 SHED. Odds ratios are shown alongside standard errors, which are in parentheses. \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ . Year dummies are included but not shown.

The results for Model 4, which contains the interaction term, show that the interaction between student debt and financial knowledge is statistically significant. However, the

odds ratio for the interaction term is less than one. Considering the interaction slopes, the odds of having emergency savings increases by a factor of 1.1757 for each additional financial knowledge score if the individual does not hold student debt and by a factor of 1.0586 (that is,  $1.1757 \times 0.9004$ ) for every level of financial knowledge if the individual has student debt. Figure 2 displays the interaction plot, which shows the predictive margins at 95% confidence intervals. The figure shows that the likelihood of holding emergency savings is higher for those without student debt at each level of financial knowledge compared to those with student debt. Figure 2 also suggests that the difference in the likelihood of holding emergency savings between student debtholders and non-student debtholders widens as the financial knowledge score increases.



**Figure 2.** Interaction plot—propensity score matching, predictive margins with 95% confidence intervals.

Considering the control variables, factors, such as household size, educational attainment, health status, household income, retirement status, homeownership, health insurance, bank account ownership, credit card debt, and financial risk preference, are statistically significant predictors of emergency savings across Models 2, 3, and 4. For instance, in Model 4, college-educated individuals have 139.57% higher odds of holding emergency savings than those with less than high school education. Increasing household size by one person is associated with 12.95% lower odds of having emergency savings. Homeownership and bank account ownership are associated with 76.80% and 212.86% higher odds of having emergency savings, respectively, compared to individuals without homeownership or bank account ownership. A one-unit increase in risk preference is associated with an 11.43% higher likelihood of having emergency savings.

#### 4.4. Sensitivity Analysis with Coarsened Exact Matching

This study performs sensitivity analysis using coarsened exact matching as an alternative statistical technique to support the findings from the propensity score matching. Coarsened exact matching is a matching method for making causal inferences from observational data. It is noted for estimating improved causal effects through an imbalance reduction in covariates between the treated and untreated samples (Blackwell et al. 2009; King and Nielsen 2019). Baseline covariates are coarsened based on recommendations by Iacus et al. (2009). The study directly matched on gender (female), race (White), marital status (married), educational attainment, household income, retirement status, homeownership, health insurance, bank account ownership, and credit card debt. Age is split into adult

(18 to 39), middle-aged adult (40 to 59), and senior adult (>60). Household size is divided into small ( $\leq 2$ ) and high ( $\geq 3$ ) based on the median. Financial knowledge is composed of low ( $< 3$ ) and high ( $= 3$ ), and risk preference is divided into low ( $\leq 3$ ), medium (4 to 6), and high ( $\geq 7$ ).

In carrying out the analysis, the study employed the “CEM” algorithm in Stata and  $k-2-k$  matching leading to an equal number of 2402 matched observations for the treated and untreated samples. An examination of the differences in means and the quantiles of the distributions of the treated and untreated groups shows a balance for the marginal and joint distributions of the covariates, as suggested by Blackwell et al. (2009).

Table 4 shows the logistic regression estimates of emergency savings on student loan debt using coarsened exact matching for Models 1 to 4. The odds of having emergency savings for student debtholders relative to those without student debt is estimated to be 0.5896 ( $p < 0.001$ ) for Model 1, 0.5154 ( $p < 0.001$ ) for Model 2, and 0.5140 ( $p < 0.001$ ) for Model 3. Table 4 (Model 3) also shows that the odds ratio for financial knowledge is 1.1327 ( $p < 0.001$ ), suggesting that each additional increase in financial knowledge score is associated with a 13.27% increase in the odds of having emergency savings. The interaction term in Model 4 is statistically significant (odds ratio of 0.8606 with  $p < 0.01$ ). More specifically, the interaction results indicate that the odds of having emergency savings increase by a factor of 1.2194 per every one-unit increase in financial knowledge score if the individual does not have student debt, and by a factor of 1.0494 (that is,  $1.2194 \times 0.8606$ ) for every level of financial knowledge if the individual has student debt.

Comparatively, the results obtained through coarsened exact matching are similar to those of the propensity score matching. That is, student debt negatively impacts the emergency-saving decisions of individuals, although increases in financial knowledge provide some gains to emergency-saving decisions among individuals with student debt. Figure 3, which contains the interaction plot for the coarsened exact matching, amplifies these results.

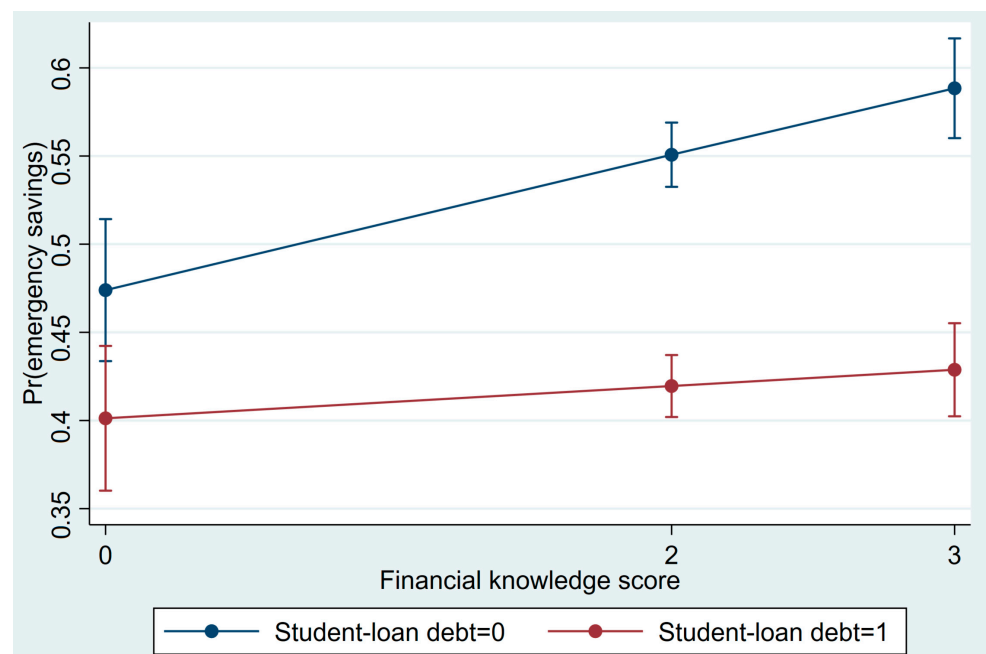


Figure 3. Interaction plot—coarsened exact matching, predictive margins with 95% confidence intervals.

**Table 4.** Logistic Regression Estimates of Emergency Savings on Student Loan Debt—Coarsened Exact Matching.

	Model 1	Model 2	Model 3	Model 4
Explanatory Variables:				
Treatment: Student loan debt (1 = Yes)	0.5896 *** (0.0343)	0.5154 *** (0.0348)	0.5140 *** (0.0347)	0.6845 ** (0.0944)
Financial knowledge (0 to 3)	-	-	1.1327 ** (0.0448)	1.2194 *** (0.0615)
Interaction: Student debt × Financial knowledge	-	-	-	0.8606 * (0.0544)
Gender (1 = Female)	-	0.9394 (0.0675)	0.9951 (0.0739)	0.9951 (0.0740)
White (Yes = 1)	-	0.9891 (0.0773)	0.9499 (0.0753)	0.9481 (0.0751)
Married (Yes = 1)	-	1.1727 (0.1207)	1.1822 (0.1219)	1.1810 (0.1218)
Age (continuous)	-	1.0109 ** (0.0034)	1.0095 ** (0.0034)	1.0095 ** (0.0034)
Education (versus Less than high school)				
High school	-	4.0060 * (2.2624)	3.8626 * (2.1795)	3.8205 * (2.1571)
Some college	-	4.8146 * (2.6943)	4.5045 * (2.5198)	4.4257 * (2.4776)
Bachelor’s degree or higher	-	7.0977 *** (3.9941)	6.2752 ** (3.5360)	6.1977 ** (3.4948)
Household Size (1 to 12)	-	0.8236 *** (0.0214)	0.8237 *** (0.0214)	0.8250 *** (0.0214)
Health status (versus poor)				
Fair	-	0.6904 (0.1571)	0.6778 (0.1547)	0.6740 (0.1539)
Good	-	0.8369 (0.1128)	0.8362 (0.1128)	0.8365 (0.1126)
Very good	-	1.2317 (0.1658)	1.2232 (0.1648)	1.2276 (0.1652)
Excellent	-	1.4863 * (0.2353)	1.4780 * (0.2341)	1.4754 * (0.2334)
Household income (versus Less than \$50,000)				
\$50,000 to less than \$100,000	-	1.4484 *** (0.1525)	1.3947 ** (0.1480)	1.3902 ** (0.1475)
\$100,000 to less than \$150,000	-	1.5241 ** (0.2009)	1.4475 ** (0.1927)	1.4464 ** (0.1927)
\$150,000 or more	-	2.8165 *** (0.4151)	2.6311 *** (0.3921)	2.6487 *** (0.3953)
Employment status (versus unemployed)				
Not working–Disabled	-	0.4015 ** (0.1284)	0.3986 ** (0.1278)	0.3995 ** (0.1281)
Self-employed	-	1.0184 (0.2168)	1.0065 (0.2148)	1.0013 (0.2136)
Paid employee	-	0.8908 (0.1572)	0.8936 (0.1582)	0.8894 (0.1573)
Retired	-	2.0200 ** (0.4737)	1.9998 (0.4697)	1.9981 ** (0.4688)
Other	-	1.0104 (0.2215)	1.0155 (0.2234)	1.0112 (0.2221)
Homeownership (Yes = 1)	-	1.6915 *** (0.1714)	1.6897 *** (0.1716)	1.6867 *** (0.1713)
Health-insurance ownership (Yes = 1)	-	1.4626 *** (0.1492)	1.4403 *** (0.1473)	1.4380 *** (0.1469)
Bank account ownership	-	4.4484 *** (1.4650)	4.3714 *** (1.4397)	4.3167 *** (1.4200)
Credit card debt	-	0.3682 *** (0.0273)	0.3687 *** (0.0274)	0.3675 *** (0.0274)
Financial risk preference (0 to 10)	-	1.1226 *** (0.0180)	1.1132 ** (0.0181)	1.1140 *** (0.0181)
N	4804	4804	4804	4804

Notes: The data source is the 2018 and 2019 SHED. Odds ratios are shown alongside standard errors which are in parentheses. \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$ . Year dummies are included but not shown.



## 5. Discussion, Limitations, and Implications

### 5.1. Discussion

The life cycle theory of savings and consumption suggests that individuals smooth consumption over time to maximize their financial well-being. Emergency savings can help individuals smooth consumption because it makes liquid funds available to meet short-term financial needs that may arise unexpectedly. Thus, an individual's ability to hold emergency funds equal to at least three times their monthly expenses is generally accepted as necessary for minimizing the negative impacts of idiosyncratic and systematic financial shocks on their well-being. This study utilized SHED data to examine the impact of student debt on holding emergency savings, including the moderating role of financial knowledge.

The results from the current study concur with prior findings (i.e., [Lin et al. 2022](#); [Ratcliffe et al. 2022](#)), demonstrating that many individuals do not have emergency savings that are sufficient to cover their regular expenses for at least three months in the event of a financial emergency. Using propensity score and coarsened exact matching to account for self-selection bias, the findings also show that student debt may negatively impact the emergency-saving capacity of individuals. This finding confirms the hypothesis of the current study. Additional analysis for the interaction effect of financial knowledge and student debt is significant statistically, with an overall positive slope for student debtholders. However, the relationship is not as strong as expected when considering only the main effects.

These results indicate that individuals with student debt have a lower likelihood of saving for financial emergencies than those without student debt. The finding that student debt decreases the possibility of having emergency savings to cover three months of expenses in the case of emergencies lends support to the growing body of research highlighting the consequences of student debt on financial well-being ([Cho et al. 2015](#)). The findings also indicate that incorporating student debt into [Sherraden's \(2013\)](#) model could provide further insights into the emergency-saving behavior of individuals. From these results, one can infer that student debt may create a stressor to the detriment of borrowers' financial security and wellness during economic shocks. [Mossakowski \(2014\)](#) has suggested that this stressor can be detrimental to mental health.

[Gjertson \(2016\)](#) found that those with emergency savings have a low likelihood of experiencing overall and specific hardships like food and energy insecurity. This study demonstrates that carrying student debt increases the likelihood of lower levels of emergency savings, and therefore a higher likelihood of the financial insecurities studied by [Gjertson](#) and two other studies ([Korankye and Kalenkoski 2021a, 2021b](#)).

### 5.2. Limitations

The SHED dataset lacks information on the dollar values of emergency savings and student loan debt for further analysis. Additionally, the question of whether an individual has emergency savings or not uses three months as the generally accepted threshold. Although this minimum threshold is prevalent among some financial educators/advisors, it ignores those smaller amounts of emergency savings that could cushion individuals (particularly those in low-income brackets) against mild financial emergencies; a more nuanced understanding of the tipping point between financial security and a cascade of negative effects was used by [Gjertson \(2016\)](#). Furthermore, the Big Three financial knowledge questions are the only information available in the database, limiting the ability of this study to explore the causal relationships between loan debt, risk, and stress. Other questions relating to asset pricing, mortgage payment, and subjective financial knowledge are unavailable in the SHED for analysis and could enhance the understanding of the reported effects. Finally, the study lacks data on certain variables, such as household wealth and other forms of debt. Nonetheless, studies have shown that the propensity score methods utilized in this study can be used to control for confounding ([Yang et al. 2019](#)).

### 5.3. Implications

The findings from the current study suggest that it is essential for student loan debtholders to develop positive financial skills associated with saving for emergencies. Although student debt service can impose financial restrictions on holders, it is necessary to contextualize debt as part of an individual's overall financial landscape. Doing so can reduce the risk of narrow framing, where individuals focus on one aspect of their finances to the detriment of the larger picture of which student debt is just one component of all debt.

Financial educators who consider emphasizing the importance of consumption smoothing across the life cycle in their interactions with student debtholders may aid in their students' financial outcomes. For instance, financial educators who show how a financial budget encompassing the relevant aspects of cashflows and future debt accumulation could help student debtholders consider emergency savings as a necessity. Whether in the classroom, workplace, or another community setting, providing financial education is likely one of the most viable solutions to help build emergency savings.

Financial stress and lower mental well-being could create default risks for both student debtholders and the institutions that seek to reduce defaults on their loans. These findings suggest that financial education programs should include direct instructions on how debtholders can participate in income-driven repayment plans. Furthermore, private student loan lenders could consider the value of reducing the chances of a default by adopting income-driven repayment plans that can reduce the stress on borrowers, thereby ensuring a lower likelihood of a default occurring due to a financial emergency in that borrower's life. Ultimately, measures such as these could motivate student debtholders to gradually build sufficient emergency funds to cover at least three months of their monthly expenses during financial emergencies, which leads to a long-term lower risk of default occurrence.

The results on financial knowledge and bank account ownership, for instance, emphasize their usefulness in motivating individuals to save for financial emergencies. The findings on these factors, which lend support to the literature ([Babiarz and Robb 2014](#); [Despard et al. 2020](#); [Fan and Zhang 2021](#)), suggest that individuals may be more likely to save for financial emergencies when they have more financial knowledge and are included in the financial system through account ownership. Thus, financial education efforts geared towards enhancing financial acumen and inclusiveness represent steps in the right direction.

The interaction effect results suggest that financial knowledge could play a role in helping student debtholders to hold emergency savings that would be sufficient to meet at least three months of expenses during economic shocks. However, the large gap in the likelihood of holding emergency savings between student debtholders and those without such debt suggests the need for policy and curriculum interventions during the period leading up to application, during loan terms, when accepting a loan, and early in a student's educational career as they are growing their debt burden through student loans. This policy suggestion is recommended for borrowers of both private and federal loans. The existence of such intervention warrants intensification.

The federal government may consider a threshold that allows student debt holders to build emergency savings before they start paying off their student loans. For instance, a program that allows student loan holders an exemption for their student loan interest requirements while building their emergency savings would allow borrowers to build emergency savings with lessened financial stress. Additionally, a delayed interest accumulation stage upon graduation, such as 6-month or 1-year, would provide borrowers the time to build their emergency funds before being subject to interest charges. Initiatives such as these could improve the financial resilience of affected individuals and families as they save for unforeseen future financial circumstances. Having a financially resilient populace is more likely beneficial for stakeholders, including the federal government, compared with a non-financially resilient populace.

**Author Contributions:** Conceptualization, T.K.; methodology, T.K., B.P. and P.A.-M.; software, T.K.; validation, T.K., B.P. and P.A.-M.; formal analysis, T.K. and B.P.; investigation, T.K., B.P. and P.A.-M.; resources, T.K., B.P. and P.A.-M.; data curation, T.K.; writing—original draft preparation, T.K. and B.P.; writing—review and editing, T.K., B.P. and P.A.-M.; visualization, T.K., B.P. and P.A.-M.; funding acquisition, T.K. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research was funded by the National Endowment for Financial Education and Knology through the Financial Education Database Training Fellowship awarded to Thomas Korankye.

**Data Availability Statement:** Publicly available datasets were analyzed in this study. This data can be found here: [<https://gitlab.com/knologyresearch/KnologyFinEdStateSpending>], accessed on 20 June 2022.

**Acknowledgments:** Thomas Korankye is grateful to John Fraser, Joseph Dwyer, and Shaun Field from Knology and the 2022 Fellowship cohort for their support. The authors also thank the participants of the 2023 Academy of Financial Services conference in Phoenix, Arizona (USA), for their insightful feedback.

**Conflicts of Interest:** The authors declare no conflict of interest.

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