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By

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Rising College Tuition and its Effects on College Finance: New Evidence from the National Longitudinal Survey of Youth 1997

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Abstract

To study students' borrowing behaviors in response to the rising tuition, we construct an OLS regression model to analyze the state tuition effect on multiple college finance approaches. Using the National Longitudinal Survey of Youth 1997 (NLSY97), its Geocode, and the state-level average tuition costs from the National Center for Education Statistics (NCES), we fix the age of the respondents at 17 and match them with the tuition costs based on their birth cohorts and state of residence. The employment of the state-level tuition at the age before college entry eliminates the endogeneity problem of self-reported tuition costs. Our results show that as the tuition rises, students receive higher grants and scholarships, and amass more debts from the government and family or friends. Specifically, on average, with a \$1 increase in the average annual in-state tuition costs for 4-year public institutions, a student receives \$0.666 more in grants or scholarships, an extra \$0.347 in government loans and \$0.128 in loans from family or friends cumulatively.

Keywords: Higher Education, State-level Tuition Costs, College Finance, Students' Borrowing Behaviors

I. Introduction

Entering the 21st century, tuition costs of colleges have been increasing rapidly in the United States. From 2000 to 2018, the average cost for full-time undergraduate students in 4-year public institutions increased by 64.6%, from \$12,517 to \$20,598 in constant 2018 U.S. Dollar (National Center for Education Statistics, 2021). Meanwhile, the average cost for full-time undergraduate students in 4-year private institutions increased by 41.3%, from \$31,614 to \$44,662 in constant 2018 U.S. Dollar (National Center for Education Statistics, 2021). To finance their higher education, more and more students take on loans from the government, family, friends, or private lenders. By the year 2021, the total student federal loan amount has reached \$1.6 trillion (Federal Student Loan Portfolio, 2021). As students amass debts to go to college, people start to wonder about the risks behind student debts and how they would affect students' development and financial well-being.

Economists have extensively studied the tuition and debt effect on students' development, including how it affects marriage rate, job choice, and homeownership (Gicheva, 2016; Rothstein and Rouse, 2011; Brown et al. 2017). The positive effects of student loan credit expansion on educational attainment and financial well-being are also realized by researchers studying students' borrowing behaviors (Black et al., 2020). However, there is little discussion about students' borrowing behaviors across all possible college finance approaches in response to the rising tuition costs.

To provide a comprehensive picture of students' college finance in the United States, our study analyzes various college finance approaches, including grants and scholarships, loans from the government, loans from family or friends, out-of-pocket payment, and work-study, using the

National Longitudinal Survey of Youth 1997 (NLSY97). One advantage of NLSY97 is that it has well-reported college finance data of respondents from 1997 to 2011. The article combines it further with the Geocode to control for the state of residence.

One major challenge of our study is that NLSY97 does not have well-reported tuition costs. Moreover, using self-reported tuition costs will produce biased results due to the endogeneity problem. To deal with this issue, the study relies on the average in-state tuition costs measure for public 4-year institutions in each state from the National Center for Education Statistics (NCES). It is then combined with the Geocode of NLSY97 to correspond each respondent with the average state-level tuition costs in their state of residence at the age of 17.

The study designs an OLS regression model to analyze the change in the amount of college finance approaches in response to the increase in tuition costs. Census region fixed effects and cohort fixed effects are controlled to account for persistent differences across time and locations. Our results indicate that on average, a \$1 increase in the average in-state tuition for 4-year public institutions raises government loans borrowed by \$0.347, grants and scholarships received by \$0.666, and loans taken from family or friends by \$0.128, all else equal. On the other hand, out-of-pocket payments and work-study are not sensitive to the tuition rise. Different races and genders also demonstrate disparate college finance behaviors. Female students tend to receive more grants and scholarships, government loans, and work-study but take fewer loans from family or friends. All minorities receive more grants and scholarships compared to students that are white. Particularly, African American students rely more on government loans and work-study and do less out-of-pocket payment on average compared to white students.

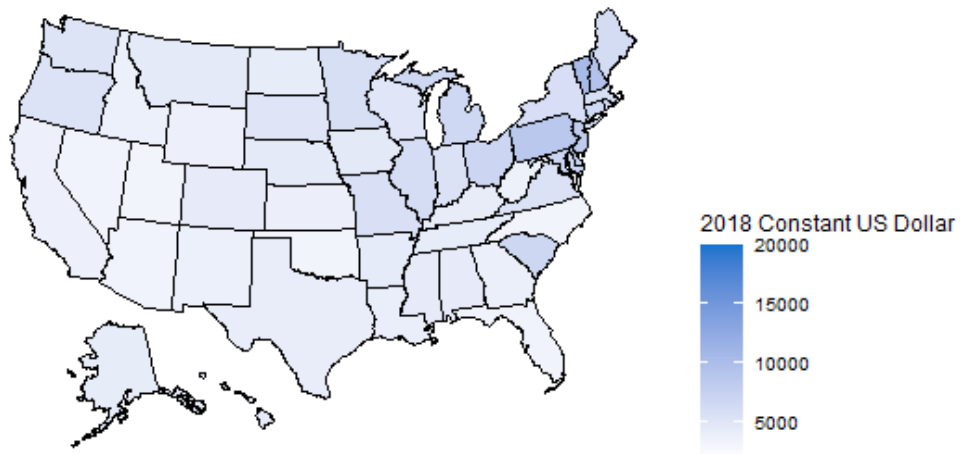
The paper is organized into the following sections: Section II introduces the current trends in college tuition and student loan debt. Section III provides summaries of the datasets and detailed information on the econometric methodology designed. Section IV discusses the results and limitations of our model. Section V concludes the study with derived economic implications and future research directions.

II. Background

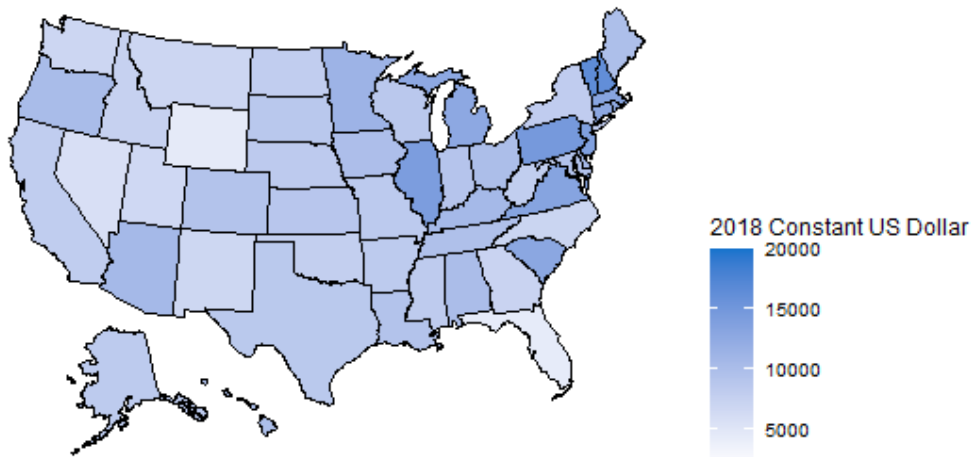
College tuition has been rising rapidly entering the 21st century. Graph 1 shows the average in-state tuition costs for 4-year public institutions weighted by the number of full-time-equivalent undergraduates. The costs are in constant 2018 dollar based on the Consumer Price Index. Among all 50 states, 18 of them have seen their average tuition costs doubled in 18 years. Especially, Arizona's average tuition cost has tripled, from \$3,449 to \$10,666.

**Graph 1: Average In-state Tuition Cost for Public 4-year Institutions, 2000 and 2018
(Constant 2018 USD)**

Average In-state Tuition Cost for Public 4-year Institutions (2000)



Average In-state Tuition Cost for Public 4-year Institutions (2018)



Source: Digest of Education Statistics, NCES.

Note: the tuition costs are in constant 2018 U.S. dollar, calculated using the CPI calculator from Bureau of Labor Statistics.

The student loan debt hikes simultaneously in the United States. By the year 2010, total student loan debt rose to over \$800 billion, overtaking total credit card debt outstanding for the first time. (Avery and Turner 2014). Just 11 years after that, the total student federal loan amount

reached \$1.57 trillion (Federal Student Loan Portfolio, 2021). This is close to double the total credit card loans in the United States in 2021, which is \$807 billion (Resendiz, 2021). With such a huge growth in student debt, more and more people start to worry about the risks behind the high student debt in the country or to explore potential opportunities behind our student loan system.

The connections between educational attainment and career success have been well-publicized that even disadvantaged students benefit from education no less than the average student group. (Avery and Kane 2004; Rouse 2004; see also Dominitz and Manski 1996). With the rapid cumulation in student debt, more and more economists start to evaluate the opportunities and risks behind students' borrowing behaviors. Rothstein and Rouse (2011) provide evidence that high debt burdens make students less likely to choose a lower-paying career, like becoming a teacher. Gicheva (2016) suggests that additional student debt of \$10,000 decreases the probability of first marriage before 25 by 3 to 4 percent. On the other hand, Black et al. (2020) show that expansion in federal loan limits has improved students' educational attainment and long-run financial well-being.

However, the federal student loan is not the only finance approach for higher education. Most students combine various income sources, such as loans from family/friends and work-study to cover the increase in tuition cost. Therefore, to gain a comprehensive picture of the financial portfolio of college students, it is important to understand how students decide on various finance sources as tuition grows.

Understanding the allocations of students' financial resources for higher education will provide new directions for researchers to explore further. Previous studies have been mainly focusing on the effects of student debts on students' performance and career success.

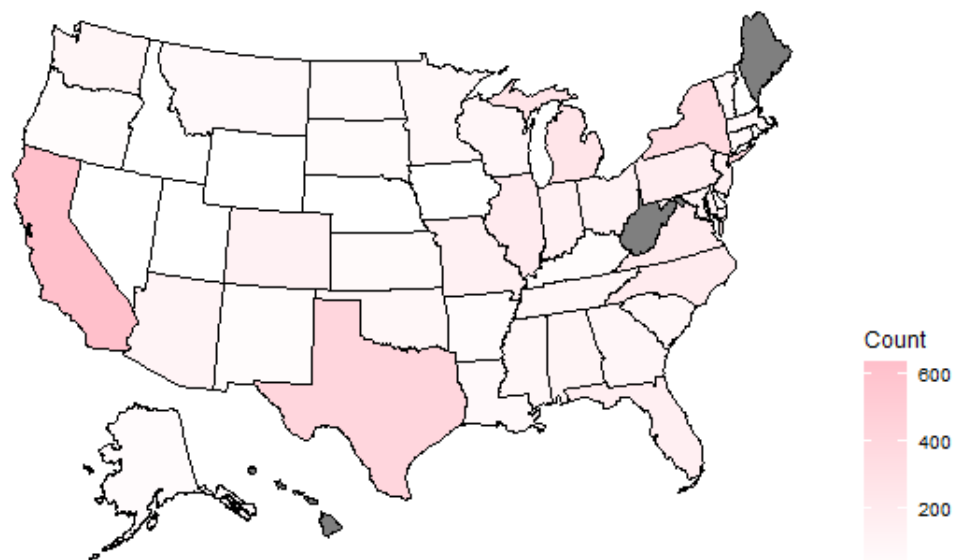
Nevertheless, if there are correlations between various college finance approaches, then their effects should be considered when conducting analyses. Thus, this study is intended to provide a thorough picture of higher education finance and allow studies of student debt to be more inclusive of other potential endogenous effects.

III. Methodology

To study the interactions between college tuition and various finance sources, we employ the tuition data of the Yearly Digest of Education Statistics from the National Center for Educational Statistics (NCES) and the college finance data of the National Longitudinal Survey of Youth 1997 (NLSY97) from the Bureau of Labor.

The NLSY97 with its Geocode is a suitable collection of data for our borrowing analysis as it contains the state of residence of each respondent and the reported value of college finance from 5 sources: Grants and Scholarships, Government Loan, Loans from Family/Friends, Out-of-pocket Payment, and Work-study. All the college finance measures are cumulative from 1997 to 2011, which covers the years when all cohorts born from 1980 to 1984 were in college. We drop individuals who refuse to answer the college finance questions when surveyed or report invalid information for the college finance variables. After filtering invalid data, we produce a sample of 4973 respondents with well-reported college finance information. Graph 2 shows the state-level distribution of the surveyed individuals when they were 17 years old. Most individuals surveyed lived in Texas, California, and the Northeast of the United States. No respondent lived in Hawaii, West Virginia, or Maine at the age of 17.

Graph 2: Distribution of NLSY97 State of Residence, at the age of 17



One major challenge of our study is that NLSY97 does not have well-reported tuition costs. There are only around 300 observations with valid tuition information after filtering the missing data in NLSY97. Furthermore, using self-reported tuition costs will result in endogeneity problems. **Students' decisions** about which college to attend are closely related to their ability, household background, and scholarship availability. Therefore, using self-reported tuition costs will produce biased results. To deal with this issue, we employ the average in-state tuition costs for public 4-year institutions in each state from the National Center for Education Statistics (NCES). This dataset is combined with the Geocode of NLSY97 so that we can correspond each respondent with the average tuition costs in their state of residence at the age of 17. The tuition costs from the NCES are weighted by the number of full-time-equivalent undergraduates.

Table 1 is the summary statistics of the NLSY97 dataset used for our study. One thing to note here is that the “Other Race” variable includes American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and races other than those listed in the summary statistics.

The means of the race/ethnicity variables show the percentage of that race group. For example, 23.8 percent of the respondents in our dataset are African American and 12.9 percent are Hispanic. We observe that in our sample the average cumulative loan taken from the government for higher education is \$6,149.7 and the average cumulative grants or scholarships received by college students is \$9,023.4. The average cumulative out-of-pocket payment, work-study, and loans from family or friends are relatively small. The coefficients of census regions show the percentages of the respondents in each region. 17.4% of the respondents live in the Northeast of the United States at the age of 17. 24% live in the North Central, 35.4% live in the South and 23.2% live in the West.

Table 1: Summary Statistics

	(1)
Birth Year	1982.0 (1.406)
Female	0.546 (0.498)
White	0.575 (0.494)
Black	0.238 (0.426)
Hispanic	0.129 (0.336)
Asian	0.0195 (0.138)
Other	0.0302 (0.171)
Northeast	0.174 (0.379)
North Central	0.240 (0.427)
South	0.354 (0.478)

West	0.232 (0.422)
Loan From Family/Friends	864.0 (3764.0)
Government Loan	6149.7 (10114.0)
Work-study	340.5 (1231.0)
Grants/Scholarships	9023.4 (14367.9)
Out-of-pocket Payment	1897.9 (3619.9)
Observations	4973

mean coefficients; sd in parentheses

To study how students manage various college finance approaches to respond to the rising tuition, we construct an econometrics model as the following:

$$Y_{ics} = \alpha_{ics} + X_i\beta + T_{cs}\gamma + \eta_r + \delta_c + \epsilon_{ics}$$

Y_{ics} represents the amount taken from a certain finance approach of individual i in birth cohort c living in state s at the age of 17. Further, X_i represents a vector of individual-level covariates, including *gender, race, family income, ability measure, and parents' education levels*. T_{cs} represents the average college tuition of the state of residence of individual i , weighted by the number of full-time-equivalent enrollment as described above. We control for the census region fixed effect, η_r , and the cohort fixed effect, δ_c , to account for persistent differences across regions and common changes over time in these college finance measures. The coefficient of interest is γ . Since each observation represents one student with the information drawn from his

or her family background, late high school years, and full college experiences, we estimate without individual effects or clustering.

IV. Results

Table 2 shows the regression results on all 5 college finance approaches. In our regression, control variables include *gender*, *race*, *household income*, and *parents' educational levels*. The reference group for the race variable is White. The parent's educational level is coded as 1, 2, 3 with 1 representing "lower than high school", 2 representing "high school", and 3 representing "college". The reference group is parents whose highest degree completed is lower than high school. The coefficients of the census region dummy variables are relative to the Northeast. The birth cohort dummy variables are included to control for the cohort fixed effect and all the coefficients are relative to the 1980 cohort. To include all meaningful observations, we create a dummy variable for respondents with missing household income. The "income reported" variable is coded as 0 for no household income reported and 1 for having reported household income.

Based on the regression results in table 2, we observe statistically significant positive coefficients of state tuition costs on grants and scholarships received, loans taken from the government, and the loans taken from the family and friends. The regression in Column 2 indicates that on average, a \$1 increase in the average in-state tuition for 4-year public institutions raises government loans borrowed by \$0.347, all else equal. Similarly, Columns 1 and 3 demonstrates that on average, a \$1 increase in the average in-state tuition for 4-year public institutions raises grants and scholarships received by \$0.666 and loans taken from family or

friends by \$0.128, all else equal. On the other hand, out-of-pocket payments and work-study are not sensitive to the tuition rise.

One thing to note here is that the sum of the tuition coefficients in the first three Columns does not cover the total increase in tuition costs. If we assume students generally complete college in 4 years, a \$1 increase in the tuition means that students need to pay \$4 more throughout their college lives. However, the sum of the coefficients is \$1.141, which only covers around 28.5% of the total increase in tuition. One reason behind this is that the tuition is in 2000 real dollar value while many students report their college finance in current dollar value before 2000. Thus, we expect the coefficients in Column 1 to 3 to be larger if using constant dollar value. The other reason is that as the tuition hikes, students may alter their college choices to maintain their financial well-being. Since tuition variable is in state-level average annual value, it is possible that students choose colleges with lower tuition costs in their states.

Meanwhile, we observe that different genders and racial groups make disparate decisions across all the college finance approaches. The coefficients of the *Female* variable in Columns 1 to 5 demonstrate that on average, women receive an extra \$1,966.8 in grants and scholarships, take \$1129.3 more in government loans, and gain \$63.43 more from work-study throughout their college lives compared to men, all else equal. However, male students generally take more loans from their family or friends and do more out-of-pocket payments. If we look at the race variables, Column 1 shows that all races and ethnicities other than the white finance their higher education with more grants and scholarships compared to white students. Additionally, African American students take more government loans, do less out-of-pocket payment, and rely more on work-study on average compared to white students, holding other factors constant. This is not generally observed in other racial groups based on our results.

Table 2: Regression Results of College Finance on State-level Tuition

	(1) Grants/Scholarships	(2) Government Loans	(3) Loans From Family/Friends	(4) Out-of-pocket Payments	(5) Work-study
Average State Tuition	0.666** (0.283)	0.347* (0.204)	0.128* (0.0760)	0.0884 (0.0728)	0.0366 (0.0249)
ASVAB	-0.103*** (0.0216)	0.0432*** (0.0155)	0.000671 (0.00580)	-0.0161*** (0.00555)	-0.00329* (0.00190)
ASVAB^2	0.00000202*** (0.000000229)	-0.000000133 (0.000000165)	2.82e-08 (6.14e-08)	0.000000291*** (5.88e-08)	7.32e-08*** (2.01e-08)
Black	4640.6*** (544.9)	1264.3*** (392.0)	-229.7 (146.2)	-466.2*** (140.0)	165.7*** (47.98)
Hispanic	1964.2*** (668.3)	-214.8 (480.7)	204.2 (179.3)	-57.21 (171.7)	53.06 (58.85)
Asian	5296.3*** (1439.2)	1451.3 (1035.3)	159.8 (386.2)	-381.0 (369.9)	38.75 (126.7)
Other	2328.7** (1174.0)	-2099.4** (844.5)	-424.9 (315.1)	-355.4 (301.7)	98.76 (103.4)
Female	1966.8*** (397.1)	1129.3*** (285.7)	-222.7** (106.6)	-190.1* (102.1)	63.43* (34.97)
Birth Year = 1981	448.8 (627.2)	-792.4* (451.2)	-19.64 (168.3)	96.36 (161.2)	-10.24 (55.23)
Birth Year = 1982	450.7 (629.9)	-684.1 (453.1)	-129.4 (169.0)	50.95 (161.9)	2.767 (55.47)
Birth Year = 1983	2010.0*** (634.6)	-580.7 (456.5)	217.7 (170.3)	214.7 (163.1)	-59.97 (55.88)
Birth Year = 1984	894.7 (633.6)	-450.1 (455.8)	116.6 (170.0)	-73.94 (162.8)	-114.5** (55.80)
Mom Highest Degree = High School	-1347.8* (705.2)	279.6 (507.3)	104.9 (189.2)	24.34 (181.2)	-58.14 (62.10)
Mom Highest Degree = College and Higher	-230.3 (707.4)	928.4* (508.9)	120.6 (189.8)	275.4 (181.8)	67.49 (62.30)
Mom Highest Degree = Not Reported	-1741.8* (893.2)	-291.9 (642.5)	-105.3 (239.7)	149.7 (229.5)	-108.8 (78.65)
Dad Highest Degree = High School	-941.4	659.5	231.4	374.1* (229.5)	-189.3*** (78.65)

	(821.2)	(590.7)	(220.4)	(211.0)	(72.32)
Dad Highest Degree = College and Higher	-220.6 (806.9)	532.3 (580.4)	637.4*** (216.5)	343.0* (207.4)	-137.9* (71.06)
Dad Highest Degree = Not Reported	-92.68 (774.7)	515.4 (557.3)	36.63 (207.9)	241.2 (199.1)	-54.15 (68.22)
Household Income	-0.0121** (0.00500)	-0.0114*** (0.00359)	0.00267** (0.00134)	0.00126 (0.00128)	-0.00149*** (0.000440)
Income Reported = 1	2524.0*** (510.0)	1806.0*** (366.8)	72.21 (136.9)	124.7 (131.0)	238.2*** (44.91)
North Central	-1825.4*** (672.6)	-1446.0*** (483.8)	-878.1*** (180.5)	339.6** (172.8)	-88.93 (59.23)
South	-1373.6* (802.2)	-1851.7*** (577.1)	-909.4*** (215.3)	-168.3 (206.2)	-64.26 (70.64)
West	-1859.6** (865.3)	-1792.6*** (622.4)	-905.1*** (232.2)	64.41 (222.4)	-55.05 (76.20)
Constant	3154.4* (1741.1)	2941.8** (1252.5)	672.4 (467.3)	1016.6** (447.4)	180.8 (153.3)
Observations	4973	4973	4973	4973	4973
R^2	0.078	0.037	0.033	0.041	0.026
Adjusted R^2	0.074	0.033	0.028	0.036	0.022

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

V. Conclusion

The well-studied connection between collegiate attainment and career success encourages more and more students to pursue post-secondary education entering the 21st century. However, as the tuition costs hiked in the past 20 years, student debts also piled up. How to balance between the benefits of college and an individual's financial well-being becomes an important question.

Therefore, it is vitally important to understand students' borrowing behaviors in higher education and its effects on students' development.

Our study employs college finance measures in NLSY97 and demonstrates that there are strong positive correlations between the rising tuition and the increase in the amounts taken grants/scholarships, government loans, and loans from family/friends. As the tuition costs for higher education increase, students finance their colleges with more loans and grants or scholarships. Work-study and out-of-pocket payments do not vary significantly as the tuition costs rise. Analyses based on race and gender also show interesting disparities in higher education finance across students. Female students tend to receive more grants and scholarships, government loans, and work-study but take fewer loans from family or friends. All minorities receive more grants and scholarships compared to students that are white. Particularly, African American students rely more on government loans and work-study and do less out-of-pocket payment on average compared to white students.

Future studies should focus on the trade-offs between various higher education finance approaches. How student makes decisions between government loans and loans from family or friends if one becomes more attainable would be an interesting question to ask. Furthermore, as other loans and incomes for college finance increase simultaneously with government loans, it would be beneficial to study their effects on students' future career success and financial well-

being. Researching the government loan is mainstream but studying the topics mentioned above will help students' evaluations of the cost-benefits of each college finance approach.

Reference

- Avery, C. & Turner, S. 2012. "Student Loans: Do College Students Borrow Too Much - Or Not Enough?" *Journal of Economic Perspectives* 26(1): 165–192.
- Avery, Christopher, and Thomas J. Kane. 2004. "Student Perceptions of College Opportunities. The Boston COACH Program." Chap. 9 in *College Choices: The Economics of Where to Go, When to Go, and How to Pay For It*, edited by Caroline M. Hoxby. University of Chicago Press.
- Black, S., Denning, J., Dettling, L., & Turner, L. 2020. Taking it to the Limit: Effects of Increased Student Loan Availability on Attainment, Earnings, and Financial Well-being. NBER Working Paper 27678. <http://www.nber.org/papers/w27658>
- Bleemer, Z., Brown, M., Lee, D., Strair, K., & Klaauw, W. 2017. "Echoes of Rising Tuition in Students' Borrowing, Educational Attainment, and Homeownership in Post-Recession America". Federal Reserve Bank of New York Staff Reports, no.820. [sr820.pdf \(newyorkfed.org\)](http://www.newyorkfed.org/publications/staff_reports/papers/2017/sr820.pdf)
- Dominitz Jeffrey, and Charles Manski. 1996. "Eliciting Student Expectations of the Returns to Schooling." *Journal of Human Resources* 31(1): 1–26.
- Federal Student Aid. 2021. "Federal Student Loan Portfolio". U.S. Department of Education. Retrieved from [Federal Student Loan Portfolio | Federal Student Aid](https://www.federalstudentaid.gov/federal-student-loan-portfolio)
- Gicheva, Dora. 2016. "Student Loans or Marriage? A Look at the Highly Educated. *Economics of Education Review*. <http://www.sciencedirect.com/science/article/pii/S0272775716302035>
- Resendiz, Joe. July 9, 2021. "Average Credit Card Debt in America: 2021". ValuePenguin. Retrieved from [Average Credit Card Debt in America: 2021 - ValuePenguin](https://valuepenguin.com/average-credit-card-debt-in-america-2021/)

Rothstein, Jesse, and Cecilia Rouse. 2011. "Constrained after College: Student Loans and Early Career Occupational Choices." *Journal of Public Economics* 95(1–2): 149–63.

Rouse, Cecelia Elena. 2004. "Low-Income Students and College Attendance: An Exploration of Income Expectations." *Social Science Quarterly* 85(5): 1299–1317.

The Institute for College Access & Success. 2019. "Quick Facts about Student Debt". Retrieved from <http://bit.ly/1lxjskr>