The Effects of Higher Student Loan Limits on Access to High-Earnings Graduate Programs

By JEFFREY. T DENNING, LESLEY J. TURNER

* Denning: Brigham Young University, IZA, NBER, 2135 WVB, Provo, UT 84604 (jeffdenning@byu.edu). Turner: Vanderbilt University and NBER, VU Station B #351819, 2301 Vanderbilt Place, Nashville, TN 37235-1819 (lesley.j.turner@vanderbilt.edu). The conclusions of this research do not necessarily reflect the opinion or official position of the Texas Higher Education Coordinating Board, the Texas Workforce Commission, or the State of Texas. This work was generously funded by Arnold Ventures.

Government-provided student loans are designed to address a classic market failure—credit constraints on investments in human capital due to limited or missing credit markets. Prospective students who expect positive returns from additional schooling may be unable to secure a private loan because their human capital cannot be offered as collateral. In response, many countries have publicly funded student loan programs.

In 2021, roughly 14 percent of American adults had a postbaccalaureate degree.[1] Workers with advanced degrees have higher earnings and lower unemployment rates than those with only a bachelor's degree, on average. Recent evidence suggests that some portion of this wage premium represents a causal effect of graduate education on earnings and that earnings gains vary substantially across fields of study (Altonji and Zhong 2021; Altonji and Zhu 2021; Minaya, Scott-Clayton, and Yang 2022).

Over the past two decades, over 60 percent of graduate degree completers relied on student loans to finance their education.[2] Student loans for graduate school may be especially important because students have already completed and paid for an undergraduate degree, often incurring substantial debt to do so. This may be especially relevant for Black students who – due to historic discrimination in housing and other markets – have access to much lower family wealth, on average, than white students and accrue higher student loan debt, on average, than other students (e.g., Scott-Clayton and Li 2016).

Furthermore, groups that are underrepresented in graduate school may also require a graduate credential to be on equal footing in the labor market. For example, in 2016, Hispanic workers with a graduate degree only earned slightly more than white workers

[1] https://www.census.gov/data/tables/2021/demo/educational-attainment/cps-detailed-tables.html.

[2] https://nces.ed.gov/programs/digest/d20/tables/dt20_332.45.asp.

with only a bachelor's degree ($55,700 versus $50,000, respectively).[3]

In this paper, we study the effects of increased availability of federal student loans—due to the Grad PLUS Loan Program—on access to graduation programs that typically lead to high earnings. Prior to the creation of Grad PLUS in 2006, graduate students could borrow up to $18,500 annually from the federal Stafford Loan Program.[4]

Grad PLUS essentially uncapped borrowing for postbaccalaureate education by allowing students to cover any difference between the Stafford Loan limit and a program's cost of attendance (COA) with Grad PLUS loans.[5] Since its creation, the Grad PLUS program has disbursed more than $120 billion with $11 billion disbursed in 2020 alone (Ma and Pender 2021). While Black et al. (2020) provide evidence that increases in undergraduate federal loan limits lead to increases in attainment and earnings for most undergraduate borrowers, despite holding almost half of all outstanding debt, little is known about the effects of higher loan limits for graduate students.

To fill this gap, Black, Denning, and Turner (2023) examine whether increases in federal loan limits due to Grad PLUS affected the composition of entering cohorts for programs where students would have experienced higher effective increases in the amount they could borrow from the federal government. Small, precise, and statistically insignificant estimates suggest that Grad PLUS had no more than negligible average effects on enrollment and the composition of new graduate students. In this paper, we examine whether Grad PLUS (and attendant increase in student loan limits) benefited underrepresented groups by facilitating access to programs that were more likely to lead to high earnings.

I. Data and Analysis Sample

We use deidentified administrative data from all public and nonprofit institutions of higher education in Texas.[6] We create a program-by-year level dataset, where a program is a course of study (e.g., social work) at a particular school

[3] https://nces.ed.gov/programs/raceindicators/indicator_RFD.asp.

[4] Medical students could borrow an additional $20,000 per academic year while graduate students in public health, health administration, pharmacy, clinical psychology, and chiropractic programs could borrow an additional $12,500 per academic year. See Hegji (2021), Appendix C for additional details.

[5] COA includes tuition and fees as well as the estimated cost of books, supplies, and living expenses.

[6] This data is collected by the Texas Higher Education Coordinating Board and provided by the Texas Education Research Center. These data do not include graduate students attending for-profit institutions. Nationally, only 8 percent of graduate students attended for-profit institutions in 2004 (authors' analysis of 2004 National Postsecondary Student Aid Study data, via PowerStats). In Texas, only 2 percent of graduate enrollment was in for-profit institutions in 2004 through 2006 (authors' analysis of IPEDS 12-month enrollment data).

(e.g., Texas Tech University).[7] Outcomes of interest are the number of students enrolling in a given program for a given academic year and entrants' demographic characteristics.

We use earnings data from the Texas Workforce Commission to classify programs into those that lead to higher versus lower earnings.[8] Program earnings equals mean ln(earnings) of students who enrolled in a given field of study in the 2001-02 through 2004-05 academic years (hereafter, AY 2002-2005), measured 8 years after initial enrollment. High earnings programs are those with above median program earnings, remaining programs are classified as low earnings.

Appendix Table A1 displays the fields of study that correspond to programs classified as high- and low-earnings using this approach. The most common high earnings programs offer graduate degrees in business administration, nursing, accounting, and engineering. The most common low earnings programs are academic doctoral degrees, education, clinical psychology, and public administration.

Table 1 displays characteristics and later earnings of students entering high and low earnings programs in AY 2002-2010. Students who enter high earnings programs have annual earnings that are almost 70 percent higher than those who enter low earnings programs (11.34 versus 10.77 log points, which translates into annual earnings of approximately $76,000 and $45,000, respectively).

High earnings programs have smaller entering cohorts than those that lead to lower earnings (122 students versus 158). These programs enroll fewer Black students (7.3 versus 10% of entering cohorts) and fewer Hispanic students (14.9 versus 20.3%) and higher shares of Asian/Pacific Islander (API) and international students (8.6 versus 3.2% and 17.2 versus 7.5% of entering cohorts, respectively).

TABLE 1— PROGRAM SIZE, COMPOSITION, AND EARNINGS

	(1) High earnings programs	(2) Low earnings programs
Entering cohort size	122	158
ln(earnings) 8 years after entry	11.34	10.77
Percent of students in program who are:		
Black	0.073	0.100
Asian/Pacific Islander	0.086	0.032
Hispanic	0.149	0.203
White	0.486	0.556
International	0.172	0.075
Observations	1,148	1,190

Notes: Sample includes graduate programs with an average of at least 20 students in AY 2004-2006 entry cohorts and at least 1 student in AY 2004-2010 entry cohorts (N = 2338). See text for definition of high and low earnings programs.

[7] There are some complications in defining a program which we discuss in more detail in Black, Denning, and Turner (2023). We limit the program-level analysis sample to programs that have at least 20 student entrants, on average, at baseline (2003-04 through 2005-06 academic years) and at least one student entrant in the 2003-04 through 2009-10 academic years. We exclude programs in HBCUs from our main analyses; Black, Denning, and Turner (2023) show that relaxing this restriction does not affect estimates of the main effects of projected increases in graduate loan limits on enrollment or characteristics of entering students.

[8] These data contain quarterly earnings for workers in Unemployment Insurance covered jobs in Texas. Earnings are adjusted for inflation using the CPI-U.

II. Empirical Strategy

The effect of Grad PLUS on federal borrowing limits depended on a program's baseline COA. If a program's COA was less than the Stafford Loan limit, students would not see any increase in their ability to borrow from Grad PLUS. In contrast, students in programs with a COA exceeding the Stafford Loan limit at baseline would be eligible to borrow more from the federal government after the creation of Grad PLUS and the increase in federal borrowing limits would be equal to the difference between the COA and Stafford Loan limits.

Black, Denning, and Turner (2023) use this variation in a generalized difference-in-differences framework to identify effects of loan limit increases on program access. Because the actual increase in federal loan limits after the creation of Grad PLUS may also be affected by endogenous changes in the tuition component of COA, we use the difference between a program's baseline (2006) COA and Stafford Loan limit as a proxy for the realized limit increase after Grad PLUS.[9] In this paper, we build on this strategy to examine the effects on access to programs that lead to high earnings.

Let $LimInc_p = \min\{COA_{p,2006} - Limit_p), 0\}$ represent the predicted increase in borrowing limits due to Grad PLUS (in \$1000) for program p, based on the program's 2006 COA.[10] $Post_c$ is binary variable indicating whether cohort c entered after the creation of Grad PLUS, H_p is an indicator for whether program earnings are above the overall median, and $L_p = 1 - H_p$. The estimating equation is:

$$(1)\ Y_{pc} = \beta_1(LimInc_p * Post_c) + \beta_2(LimInc_p * Post_c * H_p) + \theta_c^{\boldsymbol{H}} + \theta_c^{\boldsymbol{L}} + \theta_p + \varepsilon_{pc}.$$

Y_{pc} is the outcome for program p and entry cohort c, θ_p is a vector of program fixed effects, and $\theta_c^{\boldsymbol{H}}$ ($\theta_c^{\boldsymbol{L}}$) is a vector of entry cohort fixed effects for high (low) earnings programs. Standard errors are clustered at the program level. Observations are weighted by average baseline entry cohort size.

This strategy leverages variation in baseline COA within programs that are high earnings.[11] Thus, while estimates can provide insight into whether students disproportionately entered high earnings programs where limit increases

[9] Black, Denning, and Turner (2023) provide evidence of graduate program price increases in response to Grad PLUS.

[10] $LimInc_p > 0$ for 56 percent of programs in the analysis sample. Among these programs, the average difference between baseline COA and Stafford limit is approximately \$6,600 (in inflation-adjusted 2019\$) with a standard deviation of 6,600.

[11] Among programs we classify as producing high (low) earnings, 54% (58%) have $LimInc_p > 0$.

were relatively larger but not whether all high return programs grew regardless of price.

III. Results

Table 2 presents estimates of β_1 and β_2 from equation (1). We first consider effects on borrowing limits.[12] The estimate of β_1 indicates that a \$1000 increase in the baseline distance between a program's COA and Stafford Loan limit ("projected limit increase") corresponds with a significant (p<0.01) \$1120 increase in the program's actual limit after Grad PLUS was created. The small, statistically insignificant estimate of β_2 indicates that there is no difference in this relationship for high earnings programs.

Column (2) contains estimated effects on the size of a program's entering cohort. The estimate for β_1 suggests that programs with \$1,000 higher baseline COA saw a (statistically insignificant) 4 student decrease in the size of entering cohorts after Grad PLUS. Compared to the average size of entering cohorts before Grad PLUS was created—139 students—this represents an approximately 3 percent decrease. The estimate of β_2 is positive but not statistically significant; adding β_1 and β_2 together gives the total estimated effect for high earnings programs, approximately -2, which implies there was no change in enrollment in high earnings programs.

We next turn to examine whether higher federal borrowing limits due to Grad PLUS had effects on the composition of students in entering cohorts to test whether students who have been traditionally underrepresented in high return programs gained access after Grad PLUS was created. Specifically, we examine effects on the percentage of entering students by race/ethnicity and nativity.[13]

TABLE 2— ESTIMATED EFFECT OF \$1000 PROJECTED INCREASE IN BORROWING LIMITS

	(1) Annual loan limit	(2) Enrollment
Projected limit increase * Post	1.12	-4.00
	(0.12)	(6.41)
* **1**[High earnings program]	-0.08	2.13
	(0.12)	(6.54)

Notes: Sample includes graduate programs with an average of at least 20 students in AY 2004-2006 entry cohorts and at least 1 student in AY 2004-2010 entry cohorts (N = 2338). Projected limit increase is equal to the larger of the difference between a program's 2006 cost of attendance and the Stafford Loan limit and 0, in \$1000. Estimates and standard errors from a regression of the annual federal borrowing limit (column 1) or number of students in the entry cohort (column 2) on interactions between the projected limit increase and an indicator for belonging to AY 2007-2010 entry cohorts and with an indicator for whether the program is classified as high earnings (see text for details). All regressions also include program fixed effects and separate entry cohort fixed effects for high and low earnings programs. Standard errors clustered at the program-level. Observations are weighted by the mean number of students in AY2004-2006 entry cohorts.

Table 3 contains these estimates. All of the coefficients are quite small in magnitude and

[12] In 2006 and earlier, the borrowing limit for students attending a given program was the smaller of the Stafford Loan limit (\$18,500 for most programs) and the program's COA. In 2007 and later, the borrowing limit was equal to a program's COA.

[13] We do not observe the race/ethnicity of international students. Race/ethnicity categories, including international students, are mutually exclusive. Estimated effects for entering students classified as Native American/Alaskan Native or unknown race/ethnicity are not shown due to small sample sizes.

statistically insignificant. Main effects of a $1000 projected limit increase range from a 0.2 percentage point increase in White entering students to a -0.3 percent point decrease in the share of entering students who are international. Likewise, we find no evidence of statistically significant or economically meaningful heterogeneity for high earnings programs. Taken together, these estimates suggest that after Grad PLUS expanded loan limits, there was no change in the racial/ethnic composition of entering cohorts of students, both on average and for programs that lead to high earnings.

We explore the robustness of these findings to different definitions of programs that lead to high earnings, results can be found in Appendix Table A.2). First, we classify programs based on average student earnings—instead of ln(earnings)—in the field of study, measured 8 years after entry. Second, we calculate average student earnings and average ln(earnings) for each program—instead of field of study—measured 8 years after entry. Finally, we classify programs using our main approach but based on ln(earnings) measured 10 years after entry. In all cases, estimated effects on enrollment and cohort composition are small and statistically insignificant.

[Table 3 approximately here]

IV. Conclusion

We study the effect of the largest expansion in loans for graduate school in recent history on access to programs where students have higher than typical earnings. We find that no effect on enrollment overall. Nor did the increase in federal borrowing limits increase access for Black and Hispanic students, who are underrepresented in high earnings programs. Despite increasing the debt burden of graduate students (Black, Denning, and Turner 2023), Grad PLUS did not improve access to high returns graduate programs.

REFERENCES

Altonji, Joseph G., and Ling Zhong. 2021. "The Labor Market Returns to Advanced Degrees." *Journal of Labor Economics* 39 (2): 303-60.

Altonji, Joseph. G., and Zhengren Zhu. 2021. "Returns to Specific Graduate Degrees: Estimates Using Texas Administrative Records." https://www.dropbox.com/s/urgnlpm1a3d68bl/ja_zz_returns_to_graduate_programs_v24.pdf. Accessed 1/13/2023.

Black, Sandra E., Jeffrey T. Denning, Lisa Dettling, Sarena F. Goodman, and Lesley J. Turner. 2020. "Taking it to the Limit: Effects of Increased Student Loan Availability on

Attainment, Earnings, and Financial Well-being." NBER working paper number 27658.

Black, Sandra E., Jeffrey T. Denning, J. T., and Lesley J. Turner. 2023. “PLUS or Minus? The Effect of Grad PLUS Loans on Graduate School Outcomes, Earnings, and Programs.” Unpublished.

Hegji, Alexandra. 2020. "Federal Student Loan Debt Relief in the Context of COVID-19. CRS Report R46314, Version 3." *Congressional Research Service*.

Ma, Jennifer, and Matea Pender. 2021. “Trends in College Pricing and Student Aid 2021.” New York: College Board.

Minaya, Veronica, Judith Scott-Clayton, and Rachel Yang. 2022. “Heterogeneity in Labor Market Returns to Master’s Degrees: Evidence from Ohio.” EdWorkingPaper No. 22-629. https://doi.org/10.26300/akgd-9911. Accessed on 1/13/2023.

Scott-Clayton, Judith, and Jing Li. 2016. “Black-White Disparity in Student Loan Debt More than Triples after Graduation.” *Brookings Institution Evidence Speaks Reports* 2 (3).

TABLE 3: ESTIMATED EFFECT OF $1000 PROJECTED INCREASE IN BORROWING LIMITS ON DEMOGRAPHIC COMPOSITION OF ENTERING COHORTS

	Percent of entering students who are:				
	(1) Asian/Pacific Islander	(2) Black	(3) Hispanic	(4) White	(6) International
Projected limit increase ($1k) * Post	0.001	-0.001	-0.0004	0.002	-0.003
	(0.0003)	(0.001)	(0.0005)	(0.003)	(0.002)
* **1[**High earnings program]	-0.001	0.001	-0.00002	-0.006	0.004
	(0.0004)	(0.001)	(0.0005)	(0.003)	(0.002)

Notes: Sample includes graduate programs with an average of at least 20 students in AY 2004-2006 entry cohorts and at least 1 student in AY 2004-2010 entry cohorts (N = 2338). Projected limit increase is equal to the larger of the difference between a program's 2006 cost of attendance and the Stafford Loan limit and 0, in $1000. Estimates and standard errors from a regression of the percent of students in the entering cohort in the specified race/ethnicity/nativity group on interactions between the projected limit increase and an indicator for belonging to AY 2007-2010 entry cohorts and with an indicator for whether the program is classified as high earnings (see text for details). All regressions also include program fixed effects and separate entry cohort fixed effects for high and low earnings programs. Standard errors clustered at the program-level. Observations are weighted by the mean number of students in AY2004-2006 entry cohorts. Race/ethnicity/nativity groups are mutually exclusive.