



Postsecondary Equity & Economics Research Project

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Earnings returns to graduate degrees

*What do we know, and what do we need to know,
for accountability policy?*

Veronica Minaya, Judith Scott-Clayton, and Rachel Yang Zhou

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The views expressed in this report are solely those of the authors.

Graduate education is the fastest growing segment of U.S. higher education. While undergraduate enrollment has increased by 30% over the past two decades, graduate enrollment increased by more than 45% over the same period.¹ Grad school is no longer only for the ultra-elite: a full 44% of bachelor's degree graduates enroll in a graduate program within four years, including 41% of first-generation college graduates, 42% of Pell-recipient college graduates, and 53% of Black college graduates.² While public institutions have always been the most common destination for graduate students (at 44% of graduate enrollments in 2016), for-profit institutions now account for one out of every 10 enrollments, up from less than 2 percent in 2000.³

This rapid growth in enrollment has been accompanied by an even faster increase in federal student loans disbursed annually to graduate students, which nearly quadrupled in real terms between 2000–01 and 2020–21 (from \$10.6 billion to \$39 billion).⁴ Graduate borrowing now represents 47% of annual federal student loan disbursements, and 40% of total student loans outstanding.⁵ Though graduate student borrowers generally have low rates of student loan default (around 5 percent after 5 years in repayment), they are also paying off more slowly in recent years.⁶

The increase in graduate student debt has attracted policy concern and proposals for reform.⁷ But far less attention has been given to the other side of the equation: what financial returns do students earn from their graduate degrees? If and when policymakers aim their sights more squarely on graduate program quality and accountability, they may be surprised at the relatively limited evidence on the earnings premia for graduate degrees. Of course, students may enroll in graduate education for reasons beyond earnings—they may seek greater job satisfaction, flexibility, or benefits. Still, earnings outcomes are particularly important for understanding the implications of rising graduate student debt, as well as rising enrollments in for-profit graduate programs—particularly given the generally poor outcomes of such institutions at the undergraduate level (Cellini & Turner, 2019).⁸

WHAT DATA CAN BE USED TO EXAMINE GRADUATE SCHOOL EARNINGS OUTCOMES?

Even descriptive data on graduate student earnings outcomes are hard to come by: there is no graduate student equivalent of the nationally representative Beginning Postsecondary Student Longitudinal Study, a publicly-accessible survey run by the U.S. Department of Education which tracks a cohort of new undergraduates for six years after entry (a new cohort is tracked every eight years). The Baccalaureate and Beyond survey, also fielded by the U.S. Department of Education, tracks cohorts of bachelor's degree completers (drawing a new cohort every eight years) but recent waves can only capture those enrolling within a few years after graduation. The program-level earnings data provided in College Scorecard and Gainful Employment

databases are largely privacy-suppressed for graduate programs, due to small program size. Institution-level Scorecard data can be used to examine approximately 250 graduate-only institutions, but approximately 95% of graduate students enroll at predominantly undergraduate institutions.⁹

The available research has instead used data from the National Science Foundation's National Survey of College Graduates (NSCG) and National Survey of Recent College Graduates (NSRCG), or more recently, from state administrative data sources. But these sources have their own limitations. The NSCG and NSRCG earnings information comes from self-reported survey data, which can be degraded by survey non-response, misreporting, and attrition. Even combining across multiple waves, samples are sometimes too small to disaggregate results finely. These surveys also do not collect precise information on the timing of graduate enrollment, only the date of the degree earned.

More recently, researchers have begun using state administrative databases—already extensively used to examine returns to undergraduate degrees—to examine graduate education. State databases typically only track students enrolling at public institutions within the state, but include detailed educational records on all such students (as opposed to an occasional sample), and link to administrative state quarterly earnings data (as opposed to relying on survey respondents). Still, the limitation to public-sector enrollees is consequential, as results may not generalize to other institution types.

WHAT HAS RESEARCH FOUND REGARDING EARNINGS PREMIA FOR GRADUATE DEGREES?

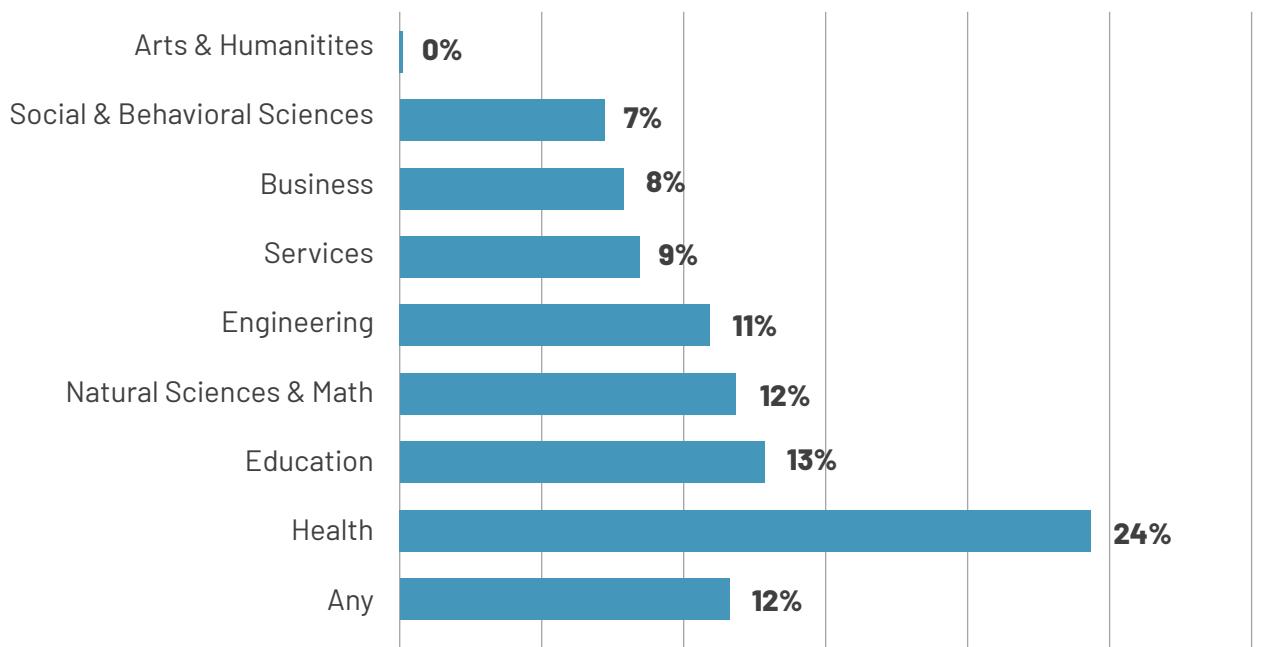
While numerous academic studies have rigorously estimated the causal returns to all kinds of undergraduate education, rigorous research on returns to graduate programs has lagged behind (note: for simplicity we use the term “returns” here to refer to annual earnings gains; we will use the term “net benefits” to refer to aggregate earnings beyond the cost of attendance). Most of the literature is outdated, based only on a single program type (e.g., MBAs), and often lacks a credible strategy for isolating the *causal* returns to graduate degrees, as opposed to simply comparing earnings for those with and without such degrees.¹⁰ While these studies shed light on returns to graduate degrees, they all used data from more than two decades ago. As both graduate education and the labor market have been developing and changing, the results may not generalize well to current conditions.

One important exception is a recent paper by Altonji and Zhong (2021), who use data from the National Survey of College Graduates (1993 to 2015) and the National Survey of Recent College Graduates (1993 to 2010).¹¹ To obtain causal estimates of returns, they compare earnings for students with the same combinations of undergraduate major and graduate field of study, before and after earning a graduate degree.¹² The paper found strong positive earnings returns for most fields of study, ranging from around 15–25%, but with a few fields yielding minimal returns (such as arts and humanities) and others yielding much larger than average returns (such as law and medicine).

Altonji and Zhong also show the importance of having a strategy for addressing selection bias, not just comparing earnings for those with and without graduate degrees. Simplistic comparisons, they find, overstate the earnings premia for fields that attract higher-paid undergraduate majors (e.g. engineering, business) and underestimate the earnings premia for fields attracting lower-paid majors (e.g., social work).

Our own recent work examines labor market returns to Master's degrees using administrative data from Ohio.¹³ To obtain causal estimates, we use an individual fixed effects model that compares individual earnings trajectories, before and after graduate degree completion (for those who work in between).¹⁴ We find that across fields, obtaining a Master's degree from a public institution in Ohio increased quarterly earnings by about 12% on average, or about \$1,400. Consistent with prior work, the returns varied across fields. Our results suggest that while Master's degrees in Health increased earnings by approximately 25%, students saw nearly zero earnings gains from completing a Master's degree in Arts and Humanities. The magnitudes of the returns to obtaining a Master's degree in other fields are around 10%. These results for Ohio echo similar patterns found by Altonji & Zhu (2021), using administrative data from Texas.¹⁵

EARNINGS PREMIA FOR MASTER'S DEGREES (LOG REAL QUARTERLY EARNINGS GAINS)



Note: Each bar represents a separate regression showing individual fixed effects estimates. Log real quarterly earnings gains roughly correspond to percentage earnings gains.

We also find higher average returns to public Master's degrees for women than for men – though not enough to close the pre-existing gender wage gap. Finally, we estimate larger earnings gains for White and Hispanic graduate completers than for Black or Asian graduate completers in Ohio (about 15% versus about 10%, respectively).¹⁶ Differences in fields of graduate study across race/ethnicity and gender appear to explain some, but not all of the heterogeneity we find in returns at public institutions. Note that these results only apply to those who work in between undergraduate and graduate school, though Altonji and Zhong (2021) find that only about 15% of graduate enrollees go directly after graduating from college.

Overall, the emerging evidence on returns to graduate education may be seen as broadly reassuring: at public institutions, graduate degrees in many fields do appear to yield a substantial causal earnings premium above and beyond a bachelor's degree. While our estimates do not account for tuition, fees, and foregone earnings, Altonji & Zhong (2021) show that internal rates of return are still positive in most fields even after taking costs into account.¹⁷ So it looks like graduate completers are doing all right, on average, at least those from public institutions.

But only 45% of graduate students enroll at public institutions, and when it comes to accountability policy, averages aren't enough.¹⁸ And while the existing research also documents substantial heterogeneity across fields of graduate study (and to a lesser extent, across demographics), so far it has not been able to offer any insight regarding variation in earnings returns across graduate sectors (public, versus private non-profit, versus for-profit graduate programs). Since data on undergraduate institutions shows that poor performing programs are often concentrated in the for-profit sector, relying on state administrative databases that cover only public institutions is a substantial limitation for broader policymaking.

The existing evidence on earnings returns thus may miss the biggest areas of concern—expensive private and for-profit programs for which students take on large amounts of debt, and which may have different patterns of returns. Research indicates that undergraduates who attend for-profit colleges have lower earnings and employment gains than those attending public colleges. Yet one in ten graduate students, and *one in four* Black graduate students, enrolls in a for-profit graduate program, and default rates are about twice as high for graduate students in this sector.¹⁹

To build out the evidence base, we need better data. Existing federal data on employment, earnings, and student loan repayment could be made more accessible for research. Federal policymakers might also consider expanding federal survey data collections to include a “Beginning Graduate Student” longitudinal survey, which could be linked to federal data on employment, earnings, and student loan repayment. State policymakers could use existing administrative data and research partnerships to examine graduate program outcomes.

Today, 14% of the US population over age 25 holds a graduate degree. If this seems small, it’s worth noting that this is still more than the percentage who held a bachelor’s degree in 1975, 10 years after the first Higher Education Act was enacted.²⁰ This fraction is likely only to grow in the future, and is already having an outsize effect on federal student loan volume. Now is the time to start laying the groundwork for research that can inform accountability efforts on this next frontier.

ENDNOTES

- 1 We use the term "graduate education" to refer to post-baccalaureate programs in degree-granting institutions. Statistics represent authors' calculations based on IPEDS enrollment figures as reported in the NCES Digest of Education Statistics, 1999–2019, Tables 303.70 and 303.80.
- 2 PowerStats calculations using B&B 2008–2012 data (most recent cohort available with 4 years of follow up), limited to US citizens. The table number to retrieve results is ascrav.
- 3 Enrollment statistics are authors' tabulations using NPSAS:2000 and NPSAS:2016 data via NCES PowerStats, The table numbers to retrieve results are bwrrpp and naxqks for the 2000 and 2016 statistics, respectively.
- 4 College Board, *Trends in Student Aid 2021*, Table 2_GRAD.
- 5 Annual disbursement figures come from College Board, *Trends in Student Aid 2021*. Figures on total student loans outstanding are from Congressional Budget Office (2020), *The Volume and Repayment of Federal Student Loans, 1995–2017*, Figure 1, <https://www.cbo.gov/system/files/2020-11/56706-student-loans.pdf>.
- 6 Vivian Lee and Adam Looney (2018), "Headwinds for graduate student borrowers: Rising balances and slowing repayment rates," Washington, DC: Brookings Institution, <https://www.brookings.edu/research/headwinds-for-graduate-student-borrowers-rising-balances-and-slowing-repayment-rates/>.
- 7 See, e.g. Douglas-Gabriel, D. 2020. This is the student loan problem that no one talks about: Graduate school debt. *The Washington Post*. Retrieved from <https://www.washingtonpost.com/education/2020/01/13/this-is-student-loan-problem-that-no-one-talks-about-graduate-school-debt/>. Also Miller, B. 2020. *Graduate School Debt – Ideas for Reducing the \$37 Billion in Annual Student Loans That No One Is Talking About*. The Center for American Progress. Retrieved from <https://www.americanprogress.org/article/graduate-school-debt/>.
- 8 Cellini, S. R., & Turner, N. (2019). Gainfully employed? Assessing the employment and earnings of for-profit college students using administrative data. *Journal of Human Resources*, 54(2), 342–370.
- 9 Authors' calculations using institution-level College Scorecard data, as included in the July 2022 release of the Accreditor Data File, prepared by the U.S. Department of Education's National Advisory Committee on Institutional Quality and Integrity (NACIQI). See: <https://sites.ed.gov/naciqi/>.
- 10 See, for example, Arcidiacono, P., Cooley, J., & Hussey, A. (2008). The Economic Returns to an MBA. *International Economic Review*, 49(3), 873–899; Song, M., Orazem, P. F., & Wohlgemuth, D. (2008). The role of mathematical and verbal skills on the returns to graduate and professional education. *Economics of Education Review*, 27(6), 664–75; Stevenson, A. (2016). The returns to quality in graduate education. *Education Economics*, 24(5), 445–464; and Titus, M. A. (2007). Detecting selection bias, using propensity score matching, and estimating treatment effects: an application to the private returns to a master's degree. *Research in Higher Education*, 48, 487–521.
- 11 See Altonji, J. G., & Zhong, L. (2021). The labor market returns to advanced degrees. *Journal of Labor Economics*, 39(2), 303–360.
- 12 The logic is akin to an individual fixed-effects empirical design, but allows the authors to make use of observations in the data for which only pre-degree or only post-degree earnings data are available. The results are only directly generalizable, however, to those who worked in between undergraduate and graduate study.
- 13 See Minaya, Veronica, Judith Scott-Clayton, and Rachel Yang Zhou. (2022). *Heterogeneity in Labor Market Returns to Master's Degrees: Evidence from Ohio*. (EdWorkingPaper: 22-629). Retrieved from Annenberg Institute at Brown University: <https://doi.org/10.26300/akgd-9911>
- 14 To avoid including quarters while students may still be enrolled in college, we restrict our analysis to quarters in which individuals were older than 22 and earning at least the equivalent of full-time work at the state minimum wage. Students must have at least six quarters of earnings meeting these criteria prior to graduate enrollment in order to be included in the sample.
- 15 See Altonji, J. G. & Zhu, Z. (2021). *Returns to Specific Graduate Degrees: Estimates Using Texas Administrative Records*. Retrieved from https://www.dropbox.com/s/urgnlpmla3d68bl/ja_zz_returns_to_graduate_programs_v24.pdf?dl=0. Although we use a different approach to categorize Master's degree fields than Altonji & Zhu's study based on Texas administrative data, our results are largely similar across several graduate fields such as Engineering, Health and Social & Behavioral Sciences. However, our estimates are lower for Master's degrees in Business and higher for Education than results in Altonji & Zhu's estimates. The difference in returns to Business could be due to different labor market conditions at graduation or different quality of MBA programs offered in the two states. And the difference in Education may be explained by differences in teacher's salary schedule between the two states.
- 16 Our results for Hispanic and Asian students are estimated on a small sample and thus should be interpreted with caution.
- 17 Once again, arts and humanities are notable exceptions, with negative internal rates of return.
- 18 Authors' tabulations using NPSAS:2008.
- 19 Enrollment statistics are authors' tabulations using NPSAS: 2016 data via NCES PowerStats, The table number to retrieve results is naxqks. Default rates by sector are from CBO (2020), Figure 4, based on three-year default rates for the 2015 cohort entering repayment.
- 20 CPS Historical Time Series Tables: <https://www.census.gov/data/tables/time-series/demo/educational-attainment/cps-historical-time-series.html>