Smooth Sailing in a Perfect Storm of Student Debt? Change and Inequality in Borrowing and Returns to Advanced Degrees

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Abstract

Recent efforts to understand aggregate student loan debt have shifted the focus away from undergraduate borrowing and toward dramatically rising debt among graduate and professional students. We suggest educational debt plays a key role in social stratification by deterring bachelor's degree holders from disadvantaged and underrepresented backgrounds from pursuing lucrative careers through advanced degree programs. We speculate that the ongoing personal financing of advanced degrees, changes to funding in higher education, and increasing returns to and demand for post-baccalaureate degrees have created a perfect storm for those seeking degrees beyond college. We find that aggregate increases in borrowing among advanced degree students between 1996 and 2016 can be explained in part by increasing enrollment rates, particularly among master's degree students, and large, secular increases in graduate and professional students' undergraduate and graduate borrowing. In contrast to undergraduate debt alone, the burden of educational debt among graduate borrowers appears to have fallen on students from lower socioeconomic backgrounds and historically discriminated students of color more so than their more advantaged counterparts and women more so than men. Average graduate degree wage premiums over bachelor's degree holders are substantial for many who graduate with advanced degrees, but are particularly high for African American graduates, complicating simple conclusions about the stratification of debt at the post-graduate level.

Keywords: student debt, graduate education, higher education, inequality, returns to education

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Reports of increases in student loan debt have received widespread attention in recent years, with estimates of total student debt in the United States nearing or topping $1.5 trillion in the first quarter of 2018 (Federal Reserve System, 2018; Scally, 2018). Although most public and academic attention to mounting education debt has focused on undergraduate students, some have argued that concerns about undergraduate debt are overstated (e.g., Akers & Chingos, 2016; Elvery, 2016; Looney &Yannelis, 2015). A minority of undergraduate students face significant challenges in resolving their education loans. Contrary to the image conveyed in media accounts, many of these young adults hold modest amounts of debt but failed to complete their degrees, complicating repayment, or chose to attend high-cost, low-aid schools (Baum, 2016; Valentine & Grodsky, 2015). Recent evidence, however, indicates that an increasing share of student loan debt is accruing at the graduate degree level, with graduate degree holders accounting for as much as 40% of the trillion-dollar figure (Delisle, 2014; Looney & Yannelis, 2015).

In this paper, we suggest that the financing of post-baccalaureate education may play a key role in contemporary social stratification. Although bachelor's degree holders have large advantages in the labor market compared to those with less education, we argue that both maximally and effectively maintained inequality come into play at the advanced degree level. Maximally maintained inequality anticipates that when advantaged groups saturate a level of education, competition moves to a higher level of educational attainment (Raftery & Hout, 1993). With virtual saturation at the baccalaureate level among elites, post-baccalaureate credentials will emerge as the new grounds for contesting social and economic status. In fact, research suggests that the reproduction of educational advantage may actually be greatest at the graduate and professional levels (Posselt & Grodsky, 2017; Torche, 2011). Effectively maintained inequality complements maximally maintained inequality by asserting that inequality functions through vertical and horizontal stratification of educational experiences (Lucas, 2001). All graduate degrees are not created equal; field of study matters at the undergraduate level and that distinction carries through at the graduate level (Julian, 2012; Kim, Tamborini, & Sakamoto, 2015; Webber, 2016). Professional degrees in fields like law and medicine carry substantially greater economic and perhaps prestige value than academic doctoral or master's degrees, and are much more expensive with fewer cost defrayments in the way of assistantships and fellowships.

We do not directly test maximally or effectively maintained inequality in this paper, but instead propose a mechanism for both: the financing of graduate education. In contrast to earlier stages of schooling in the American context, there is relatively little public or private initiative for democratizing graduate education through financial subsidies. Few "tuition promise" programs exist at the graduate level, no "free medical school" movement or federally funded needs-based grant programs (like Pell) for less-advantaged graduate and professional degree seekers. We argue that the cost of graduate and professional education acts as a linchpin in the processes of contemporary maximally and effectively maintained inequality at the advanced

degree level, substantially increasing the financial burden to students lacking resources. These processes lead to disproportionately high levels of indebtedness among those less advantaged by socioeconomic origins and to historically underserved racial and ethnic minorities, most notably African American advanced degree students. Such levels of debt may deter less advantaged students from competing with more advantaged students, easing the way for the reproduction of advantage among elites. For the rest who continue in their education, greater demand combined with increasingly regressive levels of debt set the stage for maximally and effectively maintained inequality at the advanced degree level.

Rather than an intentional closure strategy, increasing debt or diversion from graduate school due to costs borne by students are two unintended consequences of strategic choices made by postsecondary institutions and the constraints they confront. Like the constrained entrepreneurs in Dougherty's classic 1994 study of community colleges, universities in the United States are seeking to maximize their revenues in the face of a range of barriers to growth. We suggest that a confluence of features of graduate and professional education influence recent patterns of student debt, creating a perfect storm of post-baccalaureate borrowing. First, the financing of graduate and professional education, unlike undergraduate education, has been and remains funded by students and their families through loans or personal assets. Although post-baccalaureate students benefit from subsidized loans, there is less in the way of grant aid or tuition discounting for graduate and professional education (U.S. Department of Education, 2012; Woo & Shaw, 2015). This lack of assistance leaves students to bear a substantially higher debt burden to complete their graduate training. Second, funding for higher education in most states has declined in recent decades, accompanied by sharp increases in tuition as privatization of public institutions expands (Akers & Chingos, 2016; Ehrenberg, 2005; Goldrick-Rab, 2016; Mitchell, Leachman, & Masterson, 2016). We suggest graduate and professional students play an important role in keeping undergraduate tuition down at public, private nonprofit, and private for-profit colleges and universities. Graduate and professional tuition may have less state regulation and be less subject to public concern, making advanced degree programs some of the few avenues for increasing revenues during times of state retrenchment. Finally, funding, cost, and expansion of post-baccalaureate programs might be legitimized in response to the benefits of earning advanced degrees. While the returns to a baccalaureate degree over a high school diploma remain appreciable, returns to graduate and professional degrees have increased much more over the past 15 years, leading more students to enter such programs (Posselt & Grodsky, 2017; Valletta, 2016). Through educational borrowing, less advantaged individuals appear have greater access to lucrative career prospects than they have in the past, but at increasingly higher costs due to this confluence of forces. Debt thus acts as an exclusionary mechanism of maximally and effectively maintained inequality. These factors of increases in debt serve as the backdrop for the empirical work of this paper. We document changes in graduate students' debt burden in recent years, particularly attending to shifts in debt by student background characteristics. In contrast to the patterns of undergraduate debt we and others observe, we predict that students from less advantaged backgrounds will have higher levels of debt than those from more advantaged backgrounds. The thesis of maximally maintained inequality anticipates that educational expansion will ultimately result in advantaged groups seeking higher levels of

education to differentiate themselves in the labor market (Raftery & Hout, 1993). Although we cannot be certain, the clear advantages of obtaining advanced degrees, coupled with recent trends in delayed life course transitions to adulthood (Mitchell, 2017), might mean advantaged parents are more likely to subsidize their children's graduate school costs at levels they hadn't previously. Concurrently, less-advantaged students primarily use loans for investing in social mobility through education (Dwyer, 2018) and take on ever-higher burdens of debt to keep pace.

Using three nationally representative data sources, we differentiate among graduate students by parents' highest level of education, student's race/ethnicity, gender, degree, and field of study. We find that recent aggregate increases in debt among graduate students is likely attributable to a combination of increasing enrollment, a higher proportion of students borrowing for their education, and large increases in the amount students borrow. Increases in enrollment and aggregate debt are especially pronounced for those earning master's degrees. In contrast to trends in undergraduate debt, educational debt among graduate students has fallen disproportionately on those historically least-advantaged: first-generation college students (i.e., those whose parents do not have a bachelor's degree) and students of color. African American graduate students in particular have been more likely to borrow over time and more likely to borrow much larger amounts than White students in recent years. At the same time the returns to graduate and professional credentials have increased quite dramatically (Autor, 2014; Lemieux, 2008; Valletta, 2016). Using data comparing the returns to bachelor's and advanced degrees by race and ethnicity, we find that the graduate degree wage premium is high among African American advanced degree-holders, making the long-run equity implications of regressive patterns of debt less clear.

In the following sections, we discuss recent trends in student debt at the undergraduate and graduate/professional levels, then turn to racial and socioeconomic inequality in educational debt patterns. Following an outline of our research questions and rationale for directing our attention to graduate student debt, we present empirical results concerning debt increases and inequality at the graduate school level and returns to advanced degrees. We conclude by discussing the implications of these findings and offer recommendations for future research.

Trends in Graduate and Professional Student Debt

The amount of national borrowing for higher education has increased significantly since the late 1990s and a substantial portion of those increases are due to rising shares of debt held by graduate degree seekers. Aggregate increases among graduate and professional enrollees are attributable to overall increases in the number of students who attend graduate school, increases in borrowing at the undergraduate level, and/or increases in the net cost of advanced degree programs. The number of individuals enrolled in advanced degree programs has increased dramatically, from about 2 million graduate students in 1996 to about 3 million enrolled in 2015 (National Center For Education Statistics, 2017b). Even if borrowing patterns remained consistent over this time period, aggregate debt would have increased as a function of the 50% increase in enrollees over the last two decades. Costs have also increased at all levels in recent years (College Board, 2017a), and the combined undergraduate and graduate debt for attendees

has increased accordingly. Delisle (2014) reports dramatic shifts in student loan debt among graduate students at the median, third quartile, and the 90th percentile of borrowing. From 2004 to 2012, median student loan debt among graduate students rose from $40,000 to about $58,000 in real dollars, while debt at the 90th percentile rose from $118,000 to $153,000.

Despite increases in the number of baccalaureate recipients pursuing graduate and professional degrees, we have only recently begun to understand how students fund their graduate studies. We know that rising demand for graduate degrees has driven more students to finance their post-baccalaureate education through loans and to increase the amount of borrowing once they cross into debt (Belasco, Trivette, & Webber, 2014). We also know that the sticker prices of graduate programs have increased sharply over time (College Board, 2017b). Between 1997 and 2012, Integrated Postsecondary Education Data System Delta Cost Project data indicate that published tuition and fees increased from $3,766 to $7,614 (in real 2018 dollars) for public undergraduate education at the median. During this same period, median tuition and fees for master's programs at public institutions increased from $4,848 to $9,431. Increases in the sticker price of professional degrees, mostly law and medical degrees, were even more pronounced. In 1997, median tuition and fees for law and medical schools were $21,792 and $18,260 in real 2018 dollars; by 2012 they were $37,164 and $36,306 (Integrated Postsecondary Education Data System, 2015). Because graduate and professional students have little access to grant and scholarship aid, those enrolled in advanced degree programs are more likely than undergraduates to pay at or near the sticker price for their degrees (Woo & Shaw, 2015).

Increases in sticker prices and costs of attendance have corresponded to increases in returns to advanced degrees. With stagnating returns to bachelor's degrees in recent decades (Valletta, 2016), graduate education has become a more important venue for achieving elite status (Posselt & Grodsky, 2017). As the payoff to these credentials grew, students were likely willing to bear higher costs to earn them. In addition, however, this period saw serious declines in state funding for higher education. Between 1995 and 2015, state and local funding per full-time equivalent undergraduate in the United States declined by 11% (College Board, 2017a). Although sticker prices concurrently increased over this period (Mitchell, Leachman, & Masterson, 2016), typical undergraduates did not take on much more debt at the end of this period than they did in 1996 (Akers & Chingos, 2016; College Board 2017b; Hershbein & Hollenbeck, 2015). We suspect—but cannot be certain—that universities might use increased fees from graduate and professional programs to help cover long-term increases in costs for personnel, benefits, infrastructure, and other expenses they were unable to defer. Regardless of the reasons, increased graduate and professional fees absent an expansion of grants available to professional and graduate students would have contributed to growth in debt burden among students pursuing post-baccalaureate degrees.

Rising Student Debt and Inequality

Expansion of educational loan offerings can increase access to degrees, but cost of attendance can still affect access to higher education. The privatization of financial aid systems in the United States has limited access, overburdening or completely excluding disadvantaged

individuals from advanced degrees through a financing system originally intended to serve their needs (Dwyer, 2018). The prospect of debt can deter prospective students from enrolling; this disincentive is as true at the graduate and professional levels as it is in college (Posselt & Grodsky, 2017). The cost of access to advanced credentials, and to the social mobility they confer, is then debt, instability, and uncertainty (Dwyer, 2018). Excessive or unsustainable borrowing itself can delay marriage, slow wealth accumulation, and direct highly skilled graduates away from less-lucrative but publicly beneficial careers (Addo, 2014; Elliott & Lewis, 2015; Field, 2009; Zhan, Xiang, & Elliott, 2016). Because African American undergraduates and students from low-income families accrue more student debt than their more advantaged counterparts (Huelsman, 2015), we must also pay attention to whether debt burdens at the graduate and professional levels are regressive based on socioeconomic background and race.

Due to increasing costs for access, economic capital weighs heavily in the competition for postgraduate credentials in the United States. If parents are able and willing to subsidize their independent adult children's graduate education, then the added debt burden would be disproportionately borne by those from less economically advantaged families. Family background contributes to differences in debt among students due to the resources parents can provide for students' college education (Carneiro & Heckman, 2002; Long, 2008; Schneider, Hastings, & LaBriola, 2018). Family background also influences students' choices of degree program and institution (Mullen, Goyette, & Soares, 2003; Reay, David, & Ball, 2005). At the undergraduate level, recent evidence is mixed. Using nationally representative data, some studies suggest that parental education and family income are important predictors of who *ends up* borrowing for college, but do not predict *how much* they borrow conditional on borrowing any amount (Houle, 2014). Using administrative data from a public university system, Furquim and colleagues (2017) find that first-generation college students are more likely to borrow and to borrow larger amounts. Whether family background influences student borrowing among graduate students is unclear. There are reasons to believe that parental education and family income do affect the amount graduate students borrow, in part by driving borrowing at the undergraduate level through college selectivity and by influencing the types of graduate programs students choose to enter.

Marked increases in rates of postsecondary and post-baccalaureate attendance for students of color have contributed to their increased risk of educational debt. From 1995 to 2016, the percentage of college-aged African Americans enrolled in degree-granting institutions rose from 28% to 36%, and the percentage of Latinos rose from 21% to 39% (National Center for Education Statistics, 2017a). Rates of enrollment among historically disadvantaged students of color in advanced degree programs have increased as well. From 1960 to 1995, the percentage of African American students enrolling in law and medical schools rose from 1% to 8% and 2% to 8%, respectively, with similar increases for Latino students (Anderson, 2002; Hurtado, 2002). From 1996 to 2012, African American student representation among U.S. graduate and professional students rose from about 6% to 12%, and Latino students rose from 5% to 8%, National Postsecondary Student Aid Study data show.

Racial and ethnic trends in debt are not only shaped by trends in enrollment. Educational loans can increase access to higher education for African American students, but those who borrow are also disproportionately at greater risk of default (Goldrick-Rab, 2016; Seamster & Charron-Chénier, 2017). Goldrick-Rab, Kelchen, and Houle (2014) find that undergraduate racial debt gaps exist largely because African American students are more likely than White students to *enter* borrowing to pay for college and consequently have higher levels of student debt compared to White students earning similar kinds of degrees. A 2016 Brookings Institution report finds that African American bachelor's degree holders average almost $7,500 more student loan debt than White degree holders (Scott-Clayton & Li, 2016).

Although such findings of racial debt gaps might suffer from limitations such as omitted variable bias and measurement error (Hillman, 2015), at least part of this disparity is likely attributable to many African American bachelor's degree holders' borrowing more for graduate school than White and Asian American students (Belasco et al., 2014). African American master's and research doctoral students also borrow considerably more for their undergraduate and graduate education than White graduate students (Baum & Steele, 2018). Black-White disparities in student debt tend to increase through early adulthood, and are partially explained by differences in socioeconomic background and current adult socioeconomic status (Houle & Addo, 2018). Despite these important findings, the literature would benefit from more research describing how debt is distributed among graduate students, how that debt has changed over time, and whether the returns on graduate school investment justify the costs borne by individual students.

Returns to Graduate Degrees

Returns to graduate degrees have been increasing at a faster rate than returns to undergraduate degrees. Although undergraduate degree premia have stagnated since 2000, advanced degree premia have grown steadily since that time (Valletta, 2016). Educational debt, however, may substantially reduce those returns. Repayment burdens are substantial for those in the bottom third of the income distribution among degree holders (Chapman & Lounkaew, 2015). Even with median earnings, graduates often do not see the greatest returns until having worked for many years (Dynarski & Scott-Clayton, 2013), meaning graduates can struggle with repayment even if earnings are typical for their degree type. The amount and proportion of debt that will overburden graduates depends on multiple factors, including age and family responsibilities, other concurrent debts, and cost-of-living (Baum & Schwartz, 2006).

Current Study

We have speculated that rises in graduate student debt in recent decades are driven by the perfect storm summarized above. Graduate and professional education has always been mainly privately funded across the public, private non-profit and private for-profit sectors. However, at public institutions declining state budgets have shifted even more costs to advanced degree seekers to keep undergraduate tuition and fees low. That shift may have incentivized the creation of new graduate programs and the expansion of old ones. These shifts in cost to graduate and professional students might be driven and justified by the ever-increasing returns to advanced degrees.

Together, these explanatory forces are a point of departure as we explore trends and inequalities in advanced degree program debt. We seek to understand levels of and variation in educational debt among graduate students in the late 1990s and early 21st century, whether increases in debt have fallen disproportionately on disadvantaged students, and if attempting to overcome the financial hurdles of earning an advanced degree is worth the cost. We answer the following research questions:

1. To what extent do degree level, field of study, and graduate school sector contribute to trends in graduate borrowing?
2. Has the burden of debt among graduate students changed over time across race, gender, and levels of parental education?
3. Are returns to graduate and professional degrees sufficiently large to justify the costs to obtain them? If so, for whom?

We hypothesize that increases in aggregate advanced degree debt correspond to large increases in enrollment, particularly in master's degree programs. Concurrent with increases in enrollment, we predict that average debt has increased rapidly across advanced degree types. Consistent with recently published work (Baum & Steele, 2018), we predict that African American students have taken on ever greater amounts of debt over time compared to White and Asian American students. By extrapolating from the thesis of maximally maintained inequality, we predict that socioeconomically disadvantaged students are increasingly likely to go into debt and take on higher levels of debt, compared to more advantaged students. Finally, we predict that the majority of advanced degree holders who borrow have sufficient incomes to cover their annual educational debts, even with a standard 10-year loan, and the advanced degree wage premium over a bachelor's degree is sufficiently high to justify the cost of attending graduate or professional school.

Data and Measures

We draw from three nationally representative data sources to study graduate student debt (see Appendix A for details). First, we analyze the 1992 and 2016 panels of the Survey of Consumer Finances data to examine changes in household student loan debt, differentiated by the highest degree held in the household. These household debt data are self-reported, leading us to potentially underestimate actual debt amounts (Brown, Haughwout, Lee, & Van der Klaauw, 2015). However, since our interest is relative rather than absolute debt amounts, we proceed under the assumption that the accuracy of people's reports of their levels of debt is not correlated with year of reporting or degree type. The final samples consist of 19,509 observations for the 1992 cohort and 31,240 observations for the 2016 cohort.

Second, we examine the 1996, 2004, and 2016 cohorts of the National Postsecondary Student Aid Study to look at borrowing patterns among graduate students over cohorts of respondents.[1]

[1] For this study, we also considered 2000, 2008, and 2012 National Postsecondary Student Aid Study cohorts. However, because their inclusion did not substantially add to describing the trends we see in these data, for ease of interpretation we excluded them from this paper. However, we have constructed many of the borrowing figures shown here with all five datasets (available upon request). For borrowing amounts, we draw on the variables boramt1, boramt2, and boramt3, which measure undergraduate, graduate, and total education borrowing. These

We first differentiate between graduate students who do and do not borrow over their postsecondary careers, whether borrowing in undergraduate and/or graduate school. Next, we measure the amount graduate students borrow conditional on borrowing any amount, converting all loan amounts to 2016 dollars using the Consumer Price Index for All Urban Consumers. In some analyses, we distinguish between debt accrued for undergraduate and graduate education. We restrict our sample to graduate students who are U.S. citizens near or past the amount of time in their program required to complete their degree type: second-year students or higher for master's degrees and third-year students or higher for all doctoral and professional degrees. Because we do not know each students' actual graduation year, these figures likely underestimate borrowing amounts for each of the cohorts. The final samples consist of 2,590 observations in the 1996 cohort, 4,290 in the 2004 cohort, and 9,309 in the 2016 cohort. The number of borrowers in each cohort are 1,872 in 1996, 2,966 in 2004, and 7,170 in 2016.

In analyses based on National Postsecondary Student Aid Study data, we consider graduate degree type, parental education, race/ethnicity, gender, and institutional sector. We distinguish among three degree programs in our primary analyses: professional, academic doctoral, and master's degrees. For certain descriptive analyses and figures, we construct a seven-category typology based on level of degree and program type: Medical and health professionals; law professionals; academic doctorates; and master's degrees separated by business administration, science/technology/engineering/math/health, education, and a final category for all other master's degrees. Highest parental education level includes four categories: high school or less, some college, bachelor's degree, and master's degree or higher. Race is a five-category variable, differentiating among White, African American, Latino, Asian American, and all other races and ethnicities. Institutional sectors include public, private nonprofit, and private for-profit colleges and universities.

Third, we use 2013 National Survey of College Graduates data to estimate advanced degree graduates' combined undergraduate and graduate borrowing and earnings at different stages of their careers. To measure student loan borrowing, we use self-reported categorical variables of undergraduate and graduate debt at the time of the interview for those graduating from 2009 to 2013. We take the median value for each category (e.g., $15,000 for the $10,000 to $20,000 range) and sum across undergraduate and graduate borrowing. This crude estimate of borrowing relies on self-reporting, which can underestimate debt amounts (Brown et al., 2015). However, aggregate borrowing amounts in National Survey of College Graduates are consistent with more reliable National Postsecondary Student Aid Study results, except among the highest borrowers (see Results section for details). We measure respondents' salaries using self-report data from the 2013 interview. Baum and Schwartz (2006) recommend a repayment benchmark of 10 percent payment to median incomes to avoid defaulting on loans, pointing out that payments should never exceed 20% of earnings. We use this benchmark when assessing payments and median earnings in these data. Finally, we differentiate graduates' borrowing by their degree (master's, academic doctoral, professional) and their salaries by degree and how long they have had their

amounts are drawn from the U.S. Department of Education's National Student Loan Data System and do not include PLUS or private loans.

highest degree (0–5 years, 6–10 years, 11–15 years, 16–20 years). To measure debt of recent graduates we use data from the 9,557 respondents who graduated with advanced degrees from 2009 to 2013 and borrowed for their education. To measure expected earnings over time we use data from 36,030 respondents in the sample with reported earnings and years since graduation.

Finally, we use 2013 National Survey of College Graduates data to look at the wage premium of an advanced degree over a bachelor's degree in 2013 across levels of postsecondary education by race and ethnicity. We do not impose sample restrictions based on year of degree completion but rather include controls for age and its quadratic. The final sample for wage premium analyses includes 86,823 baccalaureate and advanced degree graduates.

Methods

To answer research question 1, we begin by comparing typical levels of household student debt across levels of the highest degree attained in the household over the last 20 years. We then disaggregate borrowing patterns of graduate students in two ways. First, we examine the distribution of debt among all students enrolled in graduate degree programs, whether they borrowed to pay for higher education or not. Second, we divide each cohort's borrowers into deciles to estimate debt for students across the borrowing distribution and evaluate the ratio of 2004 and 2016 debt levels to 1996 levels of debt. Finally, we differentiate by professional, doctoral, and all master's programs to identify how the share of graduate debt has changed across degree levels.

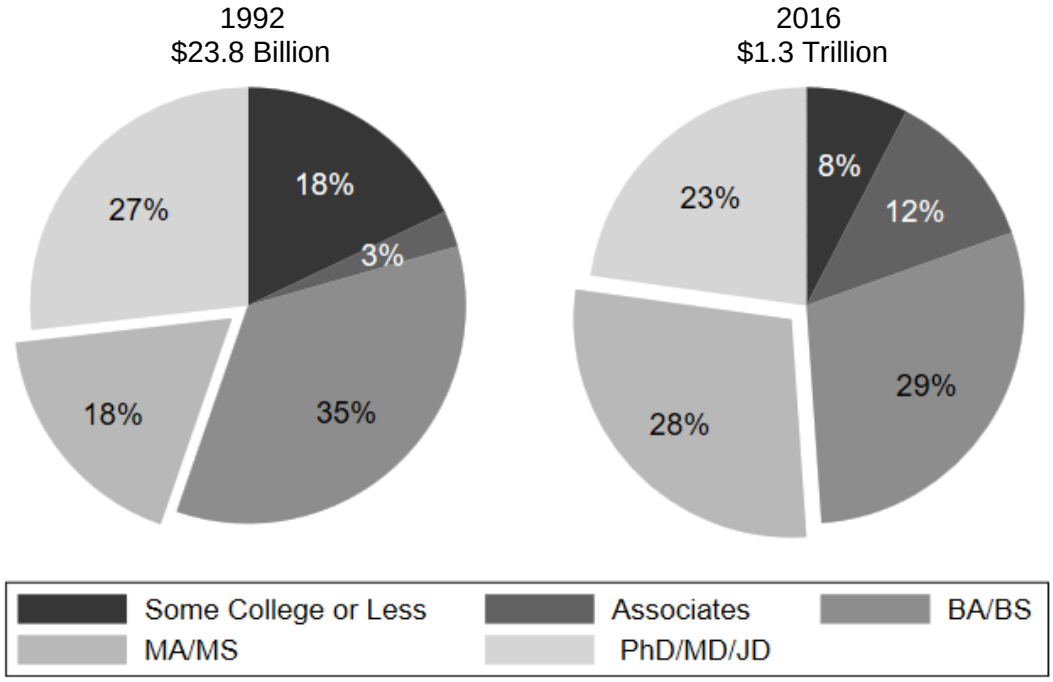
To evaluate the degree to which debt is stratified, we look at the distribution of debt across levels of parental education, race/ethnicity, and gender. We first assess the increases in individual debt over the last 20 years across subgroups of students, differentiating between the probability of borrowing any amount for higher education and the amount students borrow for higher education conditional on borrowing anything. We take the log of total education debt among those incurring debt as the outcome for models of variation in student debt to reduce the influence of outliers in our samples. For regression analyses, we use effects codes for all degree programs, omitting the "other master's programs" category. We report associations of conditional borrowing and each background attribute from a pooled cohort model with year interactions conditioning on race, gender, parental education, and graduate school degree type. We next focus on the most recent cohort of students to understand variation in graduate and professional student debt across levels of parental education, race/ethnicity, gender, and degree type in recent years.

Finally, to explore the relationship between levels of debt and earnings we combine undergraduate and graduate debt at the 50^{th} (median), 75^{th}, and 90^{th} percentiles of debt for master's, academic doctoral, and professional degree holders. Assuming a standard repayment of 10 years at a fixed 6.8% interest rate, we then calculate hypothetical monthly and yearly payment amounts for each degree at the 50^{th} (median), 75^{th}, and 90^{th} percentiles. We next divide the standard yearly payment by estimated earnings to recover the percent of estimated gross income that goes to student loan payments for those at different stages of their career. To estimate the advanced degree wage premium over bachelor's degree holders, we estimate logged annual earnings as a function of degree, age, and its quadratic, differentiated by race and ethnicity.

Results

We examine overall debt trends, compare master's degree holders to others, borrowing by student background, repayment and earnings, and the wage premium advanced degree holders earn.

Figure 1. U.S. 1992 and 2016 household student loan debt, by highest household education attainment



Source: Survey of Consumer Finances, 1992 and 2016. Note: Survey weights applied. Numbers do not add up to 100 due to rounding.

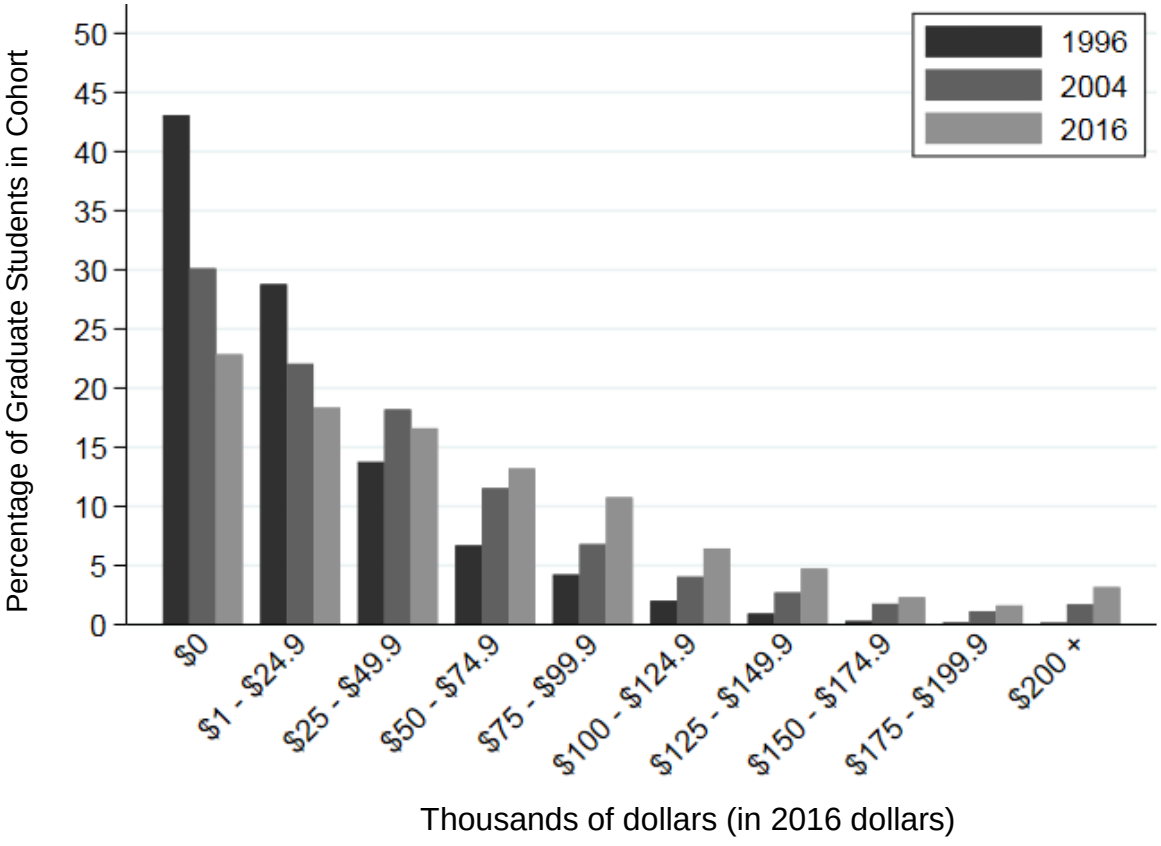
Overall Debt Trends

In 1992, advanced degree households held 45% of the $23.8 billion of student loan debt, while in 2016 advanced degree households held 51% of the $1.3 trillion in debt (Figure 1).[2] The percentage of debt held by master's degree households rose from 18% of all education debt in 1992 to 28% in 2016. Although the number of enrollees increased by about 50% in this time period, the dramatic increase in the total number of graduate students does not fully account for aggregate debt increases. The proportion of graduate students who did not have educational debt declined over time, from 43% in 1996 to 23% in 2016, increasing per-student debt (Figure 2). Federal loan program expansions over this period likely explain this precipitous drop in the proportion of debt-free graduate students by opening advanced degree access to more prospective students who would need loans to enroll in courses. Additionally, the proportion of students who borrowed relatively modest amounts to finance their education declined over the same period, while the proportion borrowing large amounts increased.

[2] These percentages are higher than those presented by Looney and Yannelis (2015), probably because they only counted loan balances for undergraduate education in the percentage of aggregate loan amounts for undergraduates and loan balances for graduate education in the percentage of aggregate loan amounts for graduate students.

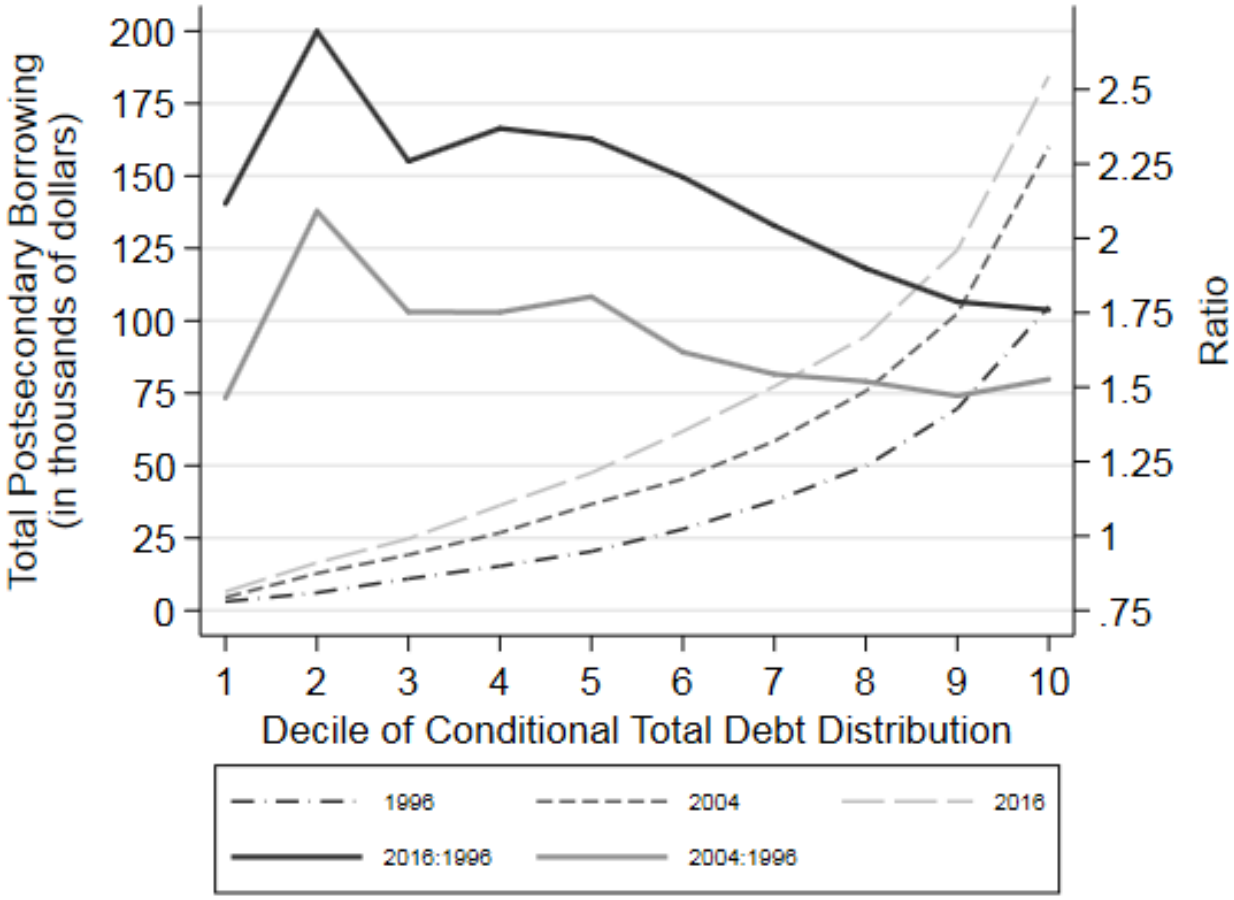
Debt increased across the entire borrowing distribution for 1996–2016. Figure 3 shows the changing distribution of total educational debt (undergraduate and graduate) among graduate students who borrowed. The x-axis represents individuals in each decile of the borrowing distribution. Dashed lines denote real average borrowing at each decile, while the thick, solid lines indicate the ratios of 2016 and 2004 borrowing to 1996 borrowing. The left y-axis corresponds to the dashed lines, and the right y-axis corresponds to the solid lines. So, for example, at the fifth decile, 1996 and 2004 graduate students borrowed about $25,000 and $44,000 for undergraduate and graduate education, meaning the ratio of 2004 to 1996 borrowing was 1.75. In 2016, graduate students at the fifth decile borrowed about $50,000—nearly double the 1996 amounts. In fact, all deciles of graduate students in 2016 borrowed 75% or more compared to borrowers 20 years earlier. Although proportionate increases have been greater at the bottom of the distribution than the top, the top fifth of those borrowing saw the largest real dollar increases (from $50,000 or more in 1996 to about $85,000 or more in 2016. Sharp increases in borrowing rates appear to be driven by graduate students' increased borrowing for undergraduate and graduate education across the borrowing distribution (see Appendix B).

Figure 2. Graduate student borrowing trends for undergraduate and graduate education



Sources: 1996, 2004, and 2016 National Postsecondary Student Aid Study. Note: National Postsecondary Student Aid Study weights applied to cohorts.

Figure 3. Distribution of total postsecondary real-dollar borrowing among graduate students, 1996–2016

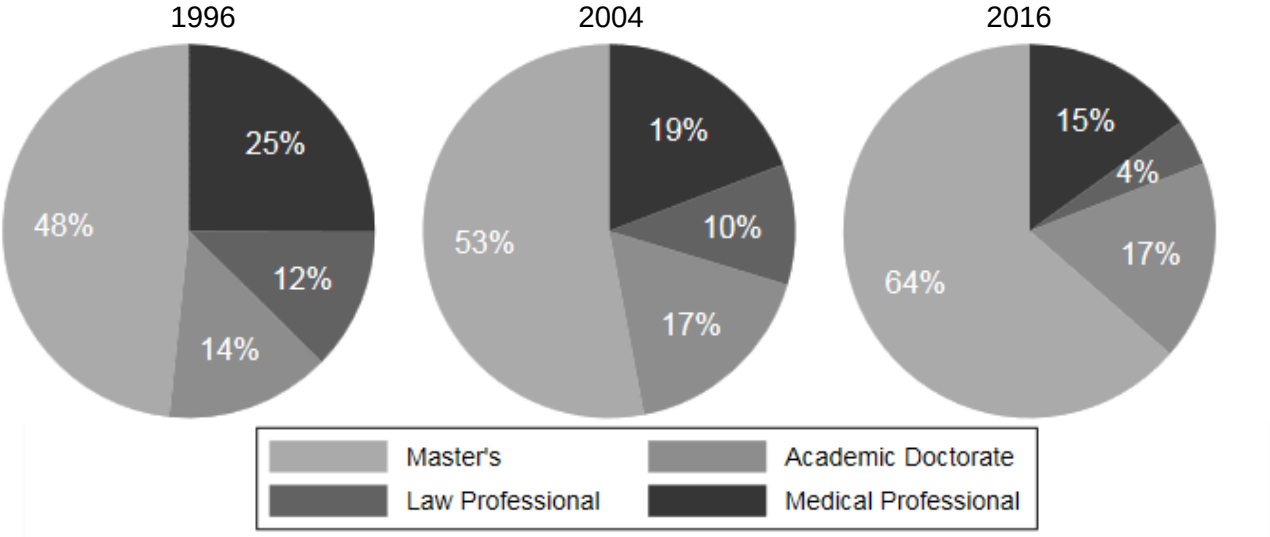


Sources: 1996, 2004, and 2016 National Postsecondary Student Aid Study. Notes: National Postsecondary Student Aid Study weights applied to cohorts. All amounts are in 2016 dollars. Patterned lines represent total borrowing and follow the left y-axis. Solid lines represent ratios and follow the right y-axis.

Borrowing by Degree Type

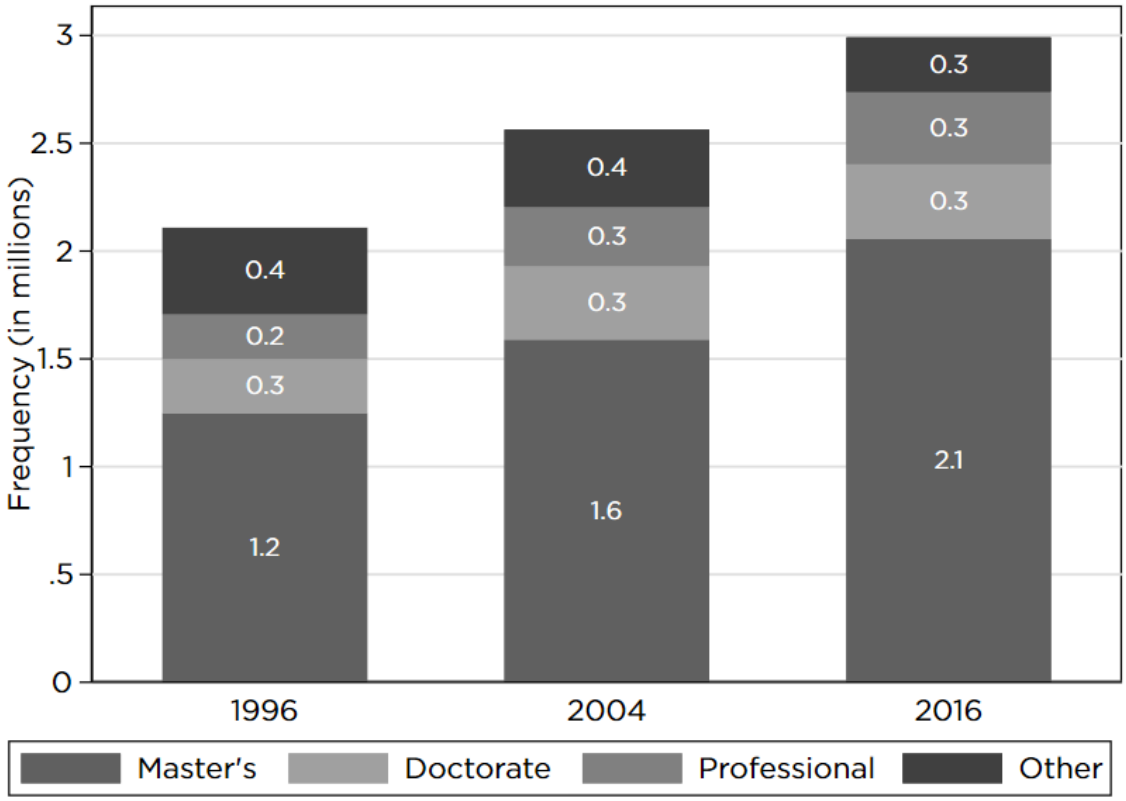
The Survey of Consumer Finances data distributions in Figure 1 revealed that master's degree households held a growing share of student loan debt, from 18% of all household educational debt in 1996 to 28% in 2016. National Postsecondary Student Aid Study cohorts of students enrolled in graduate school show similar trends (Figure 4). While master's degree students carried less than half of educational debt among graduate students in 1996, they carried 53% by 2004 and 64% by 2016. Students enrolled in other degree types had stable or declining shares of total educational debt over time. These trends are due in part to higher relative enrollment in and completion of master's programs. Figure 5 displays National Center for Education Statistics' Digest of Education Statistics yearly enrollment data combined with weighted 1996, 2004, and 2016 National Postsecondary Student Aid Study proportions of students enrolled by degree type. Professional and academic doctoral degree enrollment has remained relatively stable proportionally since 1996, while the proportion of students attending master's degree programs accounted for 82% of the growth in enrollment by 2016.

Figure 4: Share of borrowing for each degree type between 1996 and 2016



Sources: 1996, 2004, and 2016 National Postsecondary Student Aid Study. Notes: National Postsecondary Student Aid Study sample weights used for each sample year.

Figure 5: Total graduate and professional school enrollment from 1996 to 2016



Sources: 1996, 2004, and 2016 National Postsecondary Student Aid Study and National Center for Education Statistics' Digest of Education Statistics. National Postsecondary Student Aid Study weighted proportions applied to 2017 digest population data.

Borrowing by Student Background

Recent aggregate debt increases appear to be a function of large increases in graduate school enrollment and dramatic increases in borrowing for undergraduate and graduate education, particularly among those in master's degree programs. However, some students might be more affected by rising college costs than others regardless of the degree program they enter. Turning to research question 2, we assess increases in graduate student borrowing over time based on parental education level and student race and gender.

Descriptive statistics displayed in Table 1 indicate that from 1996 to 2016 the share of graduate students who grew up in households with a parent with a high school degree or less decreased by half (17 percentage points), while those whose parents had some college education increased by 11 percentage points. Graduate students who were from bachelor's degree households remained relatively stable at 24% of the total, and those from master's degree or higher households increased their share of attendees by six percentage points.[3] The share of White students enrolled in graduate school over the same time period decreased by 11 percentage points, while Latino students' representation doubled and African American students more than doubled their share from 6% to 14% of graduate students. Consistent with findings by DiPrete and Buchmann (2013), we also observe that women increased their representation in the graduate student population from 1996 to 2016, from 52% to 62% of all graduate and professional students.

Table 1. National Postsecondary Student Aid Study Descriptive Statistics

	1996		2004		2016	
	N	%	N	%	*N*	%
Parental Education						
HS or less	571	34%	911	26%	1,828	17%
Some college	166	13%	721	18%	2,385	24%
Bachelor's	301	23%	1,071	24%	2,189	24%
Master's or higher	417	29%	1,563	31%	2,907	35%
Race/Ethnicity						
White	2,033	78%	3,258	76%	5,999	67%
African American	191	6%	385	10%	1,491	14%
Latino	130	5%	298	7%	957	10%
Asian American	201	9%	262	5%	514	6%
Other	35	2%	87	2%	369	3%
Gender						
Male	1,268	48%	1,847	40%	4,113	38%
Female	1,322	52%	2,443	60%	5,217	62%

Note: Table represents unweighted frequencies and weighted percentages.

[3] The reason students from more educated families are increasingly likely to attend graduate school might be because overall educational attainments of parent generations have been on the rise, not that graduate school is getting more exclusive.

Risk of debt. Overall, students in 2016 were seven percentage points more likely to borrow than students in 1996 and five percentage points more likely to borrow compared to students in 2004. In the first three columns of Table 2 we report the risk models for borrowing over time by student characteristics. Debt risk increases by race over this time appear to be driven mostly by increased risk among African American and Latino graduate students. In 1996, African American graduate students were nine percentage points more likely than White students to take out loans for undergraduate and graduate school—this tendency increased to 12 percentage points in 2016, after accounting for parental education, gender, degree type, and institutional sector. Latino graduate students were slightly more likely than White students to take out education loans in 1996, but the difference was not statistically significant. In 2016, Latino students were six percentage points more likely to be indebted with student loans compared to otherwise similar White students. Asian American graduate students in 1996 were as likely as their White peers to borrow for their education but were 13 percentage points less likely than White students to borrow in 2016, all else equal.

By parental education, debt exposure increases by 2016 appear to be driven by increases in the probability of student borrowing among families whose parents have a college education or less. Debt exposure gaps between those from the least educated families and those who had a parent with a bachelor's degree decreased from an eight- percentage point gap in 1996 to no gap in 2016, accounting for student race, gender, degree type and sector of attendance. Conversely, the gap between those from the least and most educated families remained constant at six percentage points over these 20 years. Women also appeared to have an increased risk of going into educational debt over time. While their debt risk was similar to or lower than that of men in 1996, all else equal, they were seven percentage points more likely than men to enter into educational debt in 2016, conditional on race, parent education and degree type.

Conditional borrowing. The last three columns in Table 2 display the exponentiated coefficients of the association of each attribute with logged debt among borrowers conditional on other attributes. Based on model intercepts, a typical White male borrower who graduated from a public university and whose parents have a high school degree or less could expect to borrow about $18,000 in 1996, $23,000 in 2004, and $28,000 in 2016, in real dollars. Debt inequalities between White and African American students *more than doubled* over time; where African American borrowers took out about 21% more for undergraduate and graduate education in 1996 and 2004, they borrowed nearly 54% more than White students in 2016, conditional on parent education, gender, degree type, and sector of college or university. Latino students borrowed about the same as White students in 1996 and in 2016, all else equal.

Students from more educated families appeared to borrow less than socioeconomically disadvantaged students over time, conditional on borrowing anything. While borrowers from bachelor's and master's degree families took out roughly the same amount in loans as those from high school or less families in 1996, by 2016 those from master's or higher families borrowed 9% less for undergraduate and graduate education compared to students from the least educated families, all else equal. Descriptive trends not shown indicate that near-term differences by parental education are the result of everyone's debt rising, but rising faster for less-advantaged

Table 2. Risk of and Conditional Borrowing by Year

	Risk: Pr(y)=1			Conditional Borrowing: y|y>0		
	1996	2004	2016	1996	2004	2016
	(1)	(2)	(3)	(4)	(5)	(6)
Race (reference category=White)						
African American	0.09*	0.16***	0.12***	1.21	1.22***	1.54***
	(0.04)	(0.02)	(0.01)	(0.99–1.47)	(1.09–1.38)	(1.44–1.64)
Latino	0.03	0.08**	0.06***	0.96	1.15*	1.03
	(0.05)	(0.03)	(0.01)	(0.76–1.22)	(1.00–1.31)	(0.96–1.12)
Asian American	-0.04	-0.04	-0.13***	0.76*	1.06	0.83**
	(0.05)	(0.03)	(0.02)	(0.60–0.98)	(0.91–1.24)	(0.74–0.93)
Other	0.01	0.12*	0.04*	0.82	1.06	1.08
	(0.12)	(0.05)	(0.02)	(0.45–1.50)	(0.84–1.34)	(0.95–1.22)
Parental Education (reference category=high school or less)						
Some College	-0.03	0.02	0.02	0.85	1.22***	1.09*
	(0.03)	(0.02)	(0.01)	(0.71–1.02)	(1.09–1.37)	(1.02–1.17)
Bachelor's	-0.08**	-0.05*	-0.00	1.00	1.15*	0.99
	(0.03)	(0.02)	(0.01)	(0.86–1.15)	(1.03–1.27)	(0.92–1.06)
Master's or Higher	-0.06*	-0.06**	-0.06***	1.14	1.12*	0.91**
	(0.03)	(0.02)	(0.01)	(1.00–1.30)	(1.02–1.24)	(0.85–0.98)
Gender (reference category=female)						
	-0.02	0.03	0.07***	1.05	1.09*	1.24***
	(0.02)	(0.01)	(0.01)	(0.94–1.17)	(1.01–1.17)	(1.18–1.30)
Degree Type (omitted: other master's)						
Medical Doctor/ Health Professional	0.13***	0.25***	0.16***	3.85***	3.46***	3.25***
	(0.03)	(0.03)	(0.02)	(3.26–4.54)	(2.98–4.03)	(2.85–3.71)
Law Professional	0.11**	0.14***	0.09***	2.69***	2.58***	2.74***
	(0.04)	(0.04)	(0.03)	(2.23–3.25)	(2.13–3.12)	(2.38–3.15)
Academic Doctorate	-0.10*	-0.02	0.00	1.41***	1.22***	1.28***
	(0.04)	(0.02)	(0.01)	(1.15–1.73)	(1.09–1.36)	(1.19–1.37)
Master of Business Administration	-0.13**	-0.05	-0.03*	0.92	0.96	0.72***
	(0.04)	(0.03)	(0.02)	(0.74–1.16)	(0.81–1.13)	(0.66–0.79)
Master in Science, Technology, Engineering, Mathematics, or Health	-0.05	-0.01	0.04**	1.18	0.91	0.97
	(0.04)	(0.03)	(0.01)	(0.97–1.45)	(0.78–1.05)	(0.89–1.05)
Master's (Education)	-0.12***	-0.03	0.06***	0.67***	0.86*	0.85***
	(0.03)	(0.03)	(0.02)	(0.55–0.80)	(0.75–0.98)	(0.78–0.93)
Sector (ref=Public)						
Private Nonprofit	0.05*	0.05**	0.03**	1.42***	1.34***	1.18***
	(0.02)	(0.01)	(0.01)	(1.28–1.59)	(1.25–1.44)	(1.11–1.25)
Private For-Profit	0.18*	-0.03	0.09***	1.37	1.58*	1.79***
	(0.08)	(0.07)	(0.01)	(0.95–1.99)	(1.06–2.34)	(1.68–1.91)
Intercept	0.82***	0.66***	0.67***	18,035.38*** (15,328.24–21,220.64)	22,548.46*** (19,821.21–25,650.97)	27,920.00*** (25,578.14–30,476.29)
	(0.03)	(0.03)	(0.02)			
N	1,455	4,266	9,309	1,162	2,948	7,170

Note: Degree types are effects coded. * p<.05, ** p<.01 *** p<.001.

students. Women graduate student borrowers also appeared to borrow more than men over time. While women took out about as much as men for undergraduate and graduate education in 1996, they took out 24% more than men in 2016, all else equal.

In terms of degree type, debt differences appeared to shrink between some doctoral and professional degree seekers and typical borrowers over this time period. Conditional on race, socioeconomic background, and gender, in 1996 health professionals borrowed 285% more than the typical graduate student borrower, but borrowed 225% more than such students in 2016. Debt differences stayed about the same between law professionals and typical borrowers but shrank between academic doctorate and typical borrowers (from 141% in 1996 to 128% in 2016). Borrowers in master of business administration programs borrowed about the same as the typical graduate student in 1996. However, they borrowed 28% less than typical students in 2016, all else equal.

Borrowing by educational sector changed in two ways. First, while 1996 borrowers attending private nonprofit institutions borrowed about 42% more than those from public schools, all else equal, they borrowed only 18% more than public attendees in 2016. Second, while borrowing across sectors increased rapidly, borrowing in the for-profit educational sector increased the most. While the difference between for-profit and public borrowers was 37% and not statistically significant, possibly due to low cell counts for for-profit attendees, those attending for-profits took out almost 80% more than public school advanced degree seekers in 2016, all else equal. The convergence of debt amount among students at public and private nonprofit colleges and universities is due to rising costs at public institutions, not declines at private nonprofit institutions. In results reported in Appendix C, we show how degree type and sector of attendance explain borrowing amounts based on race, socioeconomic background, and gender. In short, we find that socioeconomic and gender debt gaps would be larger if less-advantaged students and women enrolled in more expensive graduate and professional programs. We also find that Black-White debt gaps are partially explained by sector of attendance, since African American students are more likely to attend costlier private institutions.

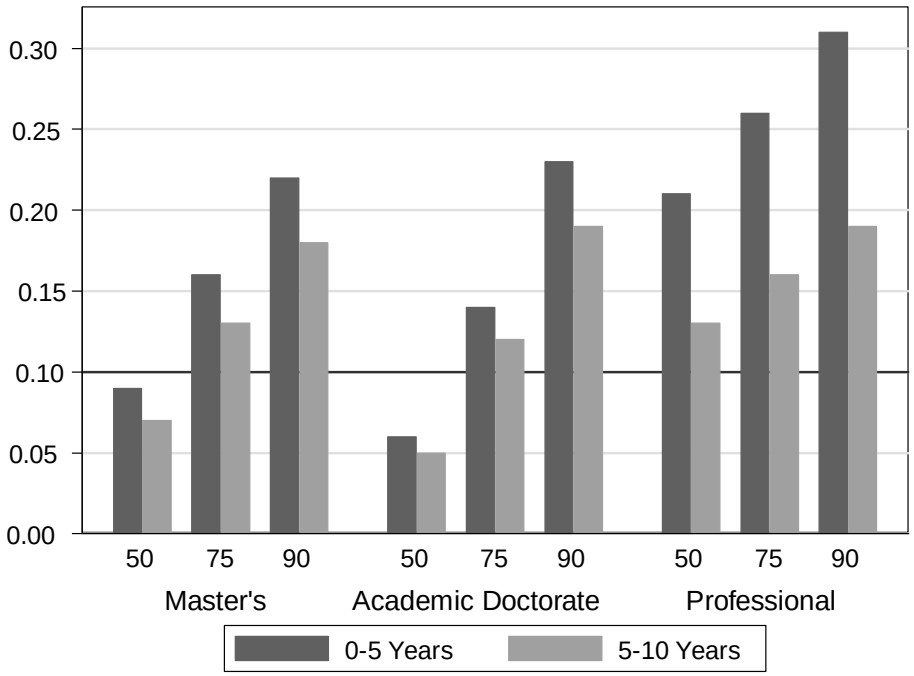
Repayment and Earnings

Are advanced degrees worth the cost in student loan debt? To answer this question, we turn to 2013 National Survey of College Graduates data. Average debt among borrowers for 2009–13 master's ($50,371) and academic doctorate ($51,154) degree earners is quite similar to that of the 2012 National Postsecondary Student Aid Study counterparts. The 2013 survey reports professional degree holder debt of $97,680, while the 2012 study reports $110,000, the difference likely due to the 2013 survey's limited upper bound of reporting categories. Nonetheless, given the concerns raised about the accuracy of self-reports of debt (Brown et al. 2015), we find these results reassuring.

In these data, among advanced degree graduates who recently borrowed, logged salary and logged debt are virtually uncorrelated (r=.01). This lack of relationship suggests the amounts advanced degree holders earn with their degrees is not contingent on how much they borrow, although others have found that earnings are influenced by debt amounts (Chapman &

Lounkaew, 2015). To account for the range of debt-to-earnings ratios graduates might expect, we report the ratio of annual median, 75th percentile, and 90th percentile payment to estimated annual median salary for each degree type throughout the standard payment period of 10 years (Figure 6; see Appendix D for details). The horizontal line at 0.10 on the y-axis refers to the student loan payment to gross earnings ratio Federal Student Aid recommends those in repayment stay at or below (Federal Student Aid, 2018). Half of master's and academic doctoral degree holders who took out student loans would appear to have reasonably low repayment burdens, assuming their salaries in the first 10 years of their career are at the median or higher for their degree type. However, at the 90th percentile, master's degree and academic doctoral degree-holding borrowers would spend over 20% of their annual incomes in the first five years of their careers on student loans if they earn at the median for their degree type. In the next five years of their career, assuming they maintain median earnings, these students would devote 17%–19% of their incomes to student loans. Professional degree-holding borrowers can expect to have greater debt burdens than master's and academic doctoral degree holders in the first 10 years of their careers. Median professional degree-holding borrowers in the first five years of their careers could expect to devote 20% of their salaries to student loans if earning at the median for professional degrees, while those at the 90th percentile of borrowing could expect to devote over 30% of their salaries to student loan debt. Their expected debt burdens are substantially less severe in the next five years of their careers, due to expected salaries nearly doubling over the first five years of their career.

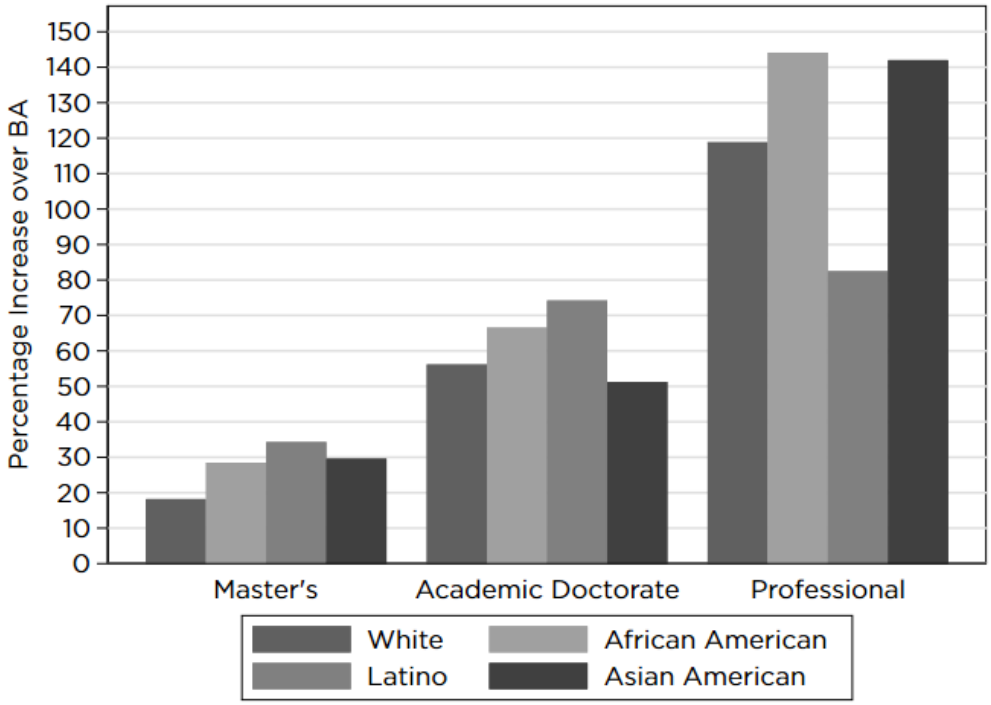
Figure 6. Payment to Salary Ratio at the 50th, 75th, and 90th percentiles of borrowing and median salary, by degree type



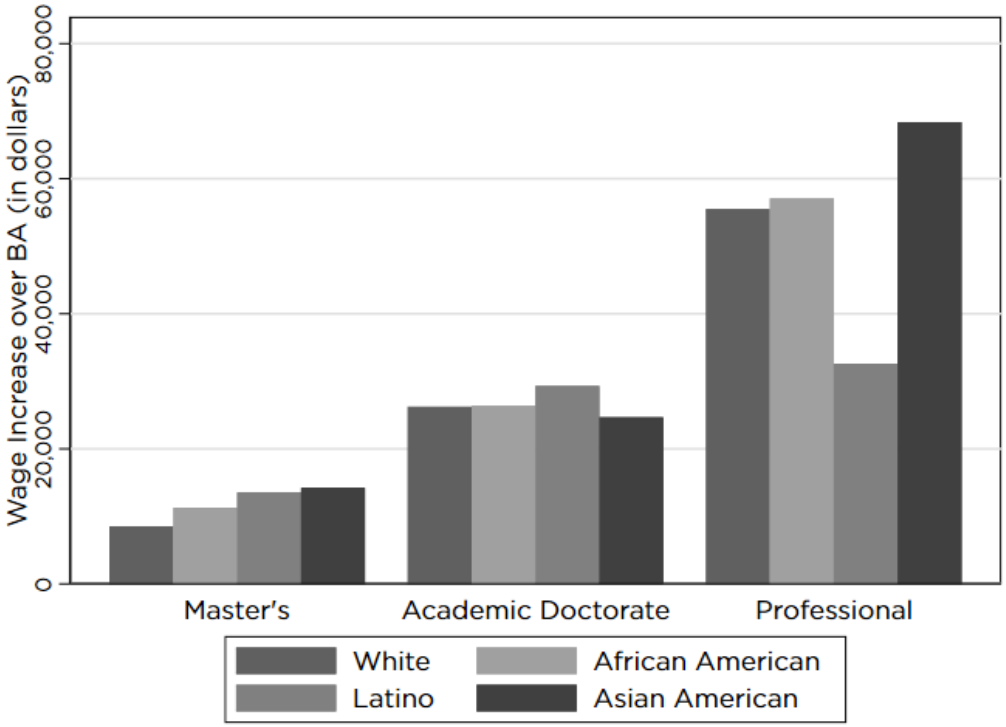
Source: National Survey of College Graduates: 2013. Survey weights applied to results. Assumes a standard repayment plan with fixed interest rate of 6.8%

Figure 7. Advanced degree wage premium by race and ethnicity

Panel A: Relative Wage Premium



Panel B: Real Wage Premium



Source: National Survey of College Graduates: 2013.
Survey weights applied to results.

The Advanced Degree Wage Premium

Finally, given the large amount of debt held by African American students, we examine returns to graduate education by race. Recall that in general the graduate degree wage premium has risen faster than the college-only wage premium over the past few decades (Valletta, 2016). African American and Latino students may enjoy a greater return to advanced credentials than non-Hispanic White students, thus justifying their greater willingness to take on debt. To investigate this possibility, we used National Survey of College Graduates data from 2013 to regress logged wages on age and its quadratic, gender, and a series of race by degree-type interactions.

Model results indicate that across degree level and type, typical White and Asian American degree holders earn more than their African American and Latino counterparts. Even so, the graduate degree wage premium appears to be higher for African American than students than it is for White or Asian American students. Figure 7 displays differences within race between average bachelor's and advanced degree holder wages using the recovered marginal associations of the above model. Compared to African American bachelor's degree graduates, African American master's degree graduates earned 29% more per year on average, about two-thirds more than the relative premium for White master's degree holders (Panel A). African American academic doctoral students earned 66% more on average, and African American professional degree holders earned 142% more on average, than African American bachelor's degree holders. In each case, relative advanced degree wage premiums are greater than for White students. In real dollar terms, African American master's degree graduates earned $11,500 more per year, and African American doctorate and professional graduates earned $25,000 and $57,000 more per year, on average, compared to their counterparts with bachelor's degrees (Panel B). The average master's degree wage premium for Latino students was about $12,000.

Discussion

Anyone pursuing an advanced degree is privileged with a college education. Yet those from advantaged families are usually the first to seek better quality or higher levels of education to distinguish themselves from others in the labor market (Lucas, 2001; Raftery & Hout, 1993). To maintain inequality in such systems, it helps that there is a mechanism for exclusion to those higher or better-quality credentials so they remain scarce resources. Several likely social closure mechanisms affect access to advanced degree programs, including the prerequisite of a bachelor's degree, undergraduate institutional prestige, and standardized testing requirements (e.g., GRE, MCAT, LSAT). However, even for those from disadvantaged families who meet these standards, we speculate educational cost also excludes individuals by diverting them either into the labor market or to less-expensive and less-lucrative advanced degree programs. Absent prohibitive costs, these students might have otherwise pursued more lucrative careers through the completion of graduate or professional programs.

Theories of maximally and effectively maintained inequality do not typically reveal overt exclusionary mechanisms, but instead explain why imperfect information or fewer resources based on social disadvantage lead to a lower likelihood of making an educational transition. Although individual or family-level competition for scarce resources is the driving force for

each, the qualities of the social environment that nurture them can vary. For example, Raftery and Hout (1993) demonstrate that the structural change leading to maximally and maintained inequality in Ireland was the egalitarian expansion of, and fee removal for, secondary education. In the seminal work of Lucas (2001), high schools enabled effectively maintained inequality by offering both vocational and college-prep courses. At the undergraduate level, Alon (2009) shows that effectively maintained inequality resulted from colleges changing admissions standards simply for efficiency: An influx of applications required a greater reliance on test scores as a criterion for admission. In each example, institutional or structural mechanisms were incidental or even well-intended rather than deliberately exclusionary.

At the graduate degree level, we have argued that cost is one such mechanism of exclusion leading to maximally and effectively maintained inequality. In-demand advanced degrees serve as increasingly lucrative sources to sustain institutional expansion and funding compared to heavily scrutinized undergraduate programs. Institutions may promote advanced degree programs without considering the dearth of needs-based public or private financial grants for graduate or professional students that ease access. Educational debt, both that held for undergraduate education and the prospective debt anticipated for an advanced degree, thus likely serves as an unintended mechanism for exclusion at the post-baccalaureate level.

Although we do not directly test maximally or effectively maintained inequality in this paper, we demonstrate that stratification in graduate debt burden sets the stage for both at the postgraduate level. Aggregate student loan debt has surpassed $1.5 trillion, and a large portion of that debt is attributable to those pursuing graduate and professional degrees. Increases in graduate student borrowing since the late 1990s could be due to a perfect storm of continued reliance on private financing for graduate and professional programs, declining funding for higher education accompanied by shifts in cost burden to advanced degree programs, and increased returns to and demand for advanced degrees. Using these factors as a point of departure, we divide our discussion into four areas: Trends in graduate student debt, inequality in borrowing for advanced degree programs, costs and benefits of advanced degrees, and study limitations.

Trends in Graduate Student Debt

This study finds that rises in aggregate student debt over the last two decades are explained in part by increases in graduate school attendance rates and greater incidences and levels of borrowing across the conditional debt distribution. Consistent with maximally maintained inequality, the rapidly increasing graduate school enrollments we observe since the late 1990s correspond to virtual saturation of undergraduate enrollment by the most advantaged students. Levels of debt among those who borrowed more than doubled across all but the top deciles of graduate student borrowing. This trend was largely consistent regardless of degree type. Concurrently, master's degree students increased their share of borrowing among graduate students by 16 percentage points, accompanied by large increases in the number of students enrolling in master's degree programs (82% of all enrollment increases from 1996 to 2016). Taken together, these factors help explain why master's degree holders also increased their share of household and student debt dramatically in the time period even though their debt rates increased at a consistent pace with other advanced degree program enrollees.

Graduate student borrowing for undergraduate education has risen dramatically across the borrowing distribution. Since borrowing for undergraduate education in general has risen fairly slowly since about 2005 (Akers & Chingos, 2016; Hershbein & Hollenbeck, 2015), this pattern of undergraduate debt places graduate students at the top end of all students in terms of undergraduate borrowing. Consistent with effectively maintained inequality, we believe aspiring graduate students are likely to use college prestige to distinguish themselves from other undergraduates when applying for graduate and professional programs, which usually comes at a higher cost for college attendance.[4] Prior research finds that advantaged students are more likely than others to enroll in selective and elite four-year colleges, more likely to enter advanced degree programs, and more likely to enter doctoral and professional programs than master's programs (Mullen et al., 2003). Even so, average undergraduate debt among graduate students is still much lower than their average graduate school debt.

Graduate student debt and inequality. Increases in borrowing over time have corresponded to expansion at the baccalaureate level and increasing returns to advanced degrees (Valletta, 2016). Maximally maintained inequality anticipates that the expansion of enrollments in college eventually leads young adults from advantaged backgrounds to distinguish themselves from their peers by acquiring higher degrees. We have speculated that due to increasing competition for advanced credentials and changes in early life course trajectories, advantaged parents of advanced degree students are more likely to both help their children secure funding resources for graduate school and to directly subsidize their children's graduate or professional degrees than they would have in years past. Similar to findings by Houle (2014), and Goldrick-Rab et al. (2014), who only examine undergraduate students, we conclude that graduate students from less-educated families and African American graduate students are more likely to borrow for undergraduate and graduate school than their White peers or those whose parents achieved higher levels of education. Unlike previous undergraduate findings, we show that these members of underrepresented groups end up borrowing more for their undergraduate and graduate education than their counterparts once they take on debt. Consistent with Baum and Steele (2018), and Scott-Clayton and Li (2016), we find that this inequity is especially pronounced for African American graduate student borrowers, who average 66% more educational debt than White borrowers in recent years, accounting for other demographics, and 54% more after also accounting for degree type and sector of attendance (public, non-profit private, for-profit private).

Disparities in educational debt are understated by differences in the types of degrees students tend to pursue (see Appendix C). African American graduate students borrow more than White students, but this gap narrows when conditioning on sector of attendance. In fact, sector of attendance explains about 14% of the Black-White debt gap, conditional on parental education and gender. This suggests that African American borrowers tend to enroll in more costly private nonprofit and for-profit institutions at a greater rate than White students.

[4] National Postsecondary Student Aid Study graduate student data do include Carnegie classifications for undergraduate institutions. However, these data are missing for over half of the students in the sample. Taking weighted descriptive statistics from this highly selected group and comparing them to National Postsecondary Student Aid Study undergraduate students, it appears those advanced degree students attend slightly more selective institutions as undergrads than undergrads as a whole.

Conversely, students from less-educated families tend to borrow as much as those from the most educated families, but this is because disadvantaged students are enrolled in less expensive graduate degree programs, regardless of sector of attendance. The same is true by gender—women tend to borrow slightly more than men regardless of degree type, but this debt gap would likely be larger if women entered more costly programs at the same rate as men. These two findings lend support to effectively maintained inequality, suggesting advantaged students extract better credentials from debt burdens similar to their less-advantaged peers.

Costs and Benefits of Advanced Degrees

Does the decision to assume substantial debt burdens to support graduate school enrollment harm students? National Survey of College Graduates data show that recent indebted advanced degree holders' earnings are virtually uncorrelated with their educational borrowing, suggesting graduates can expect to face a range of possible debt-to-earnings ratios upon graduating. Chapman and Lounkaew (2015) find that U.S. graduates in the bottom third of the income distribution face substantial repayment burdens, which are a function of debt, interest rates, and earnings. We instead focus on the *debt* distribution and find that students in the top 25% (and particularly the top 10%) of borrowing for their degree type might struggle to repay their loans based on a median salary. Advanced degree-holding borrowers earning near or above the median have reasonable repayment burdens for their undergraduate and graduate school debt based on federal guidelines. After 10 years, these individuals' earning power increases, with substantial salary gains one and two decades after receiving their degrees. Professional degree holders can expect to have the greatest challenges with repayment in the first 10 years of earning their degree. However, the sizable gains in returns over time for professional degree holders are likely worth the early lean years after graduation.

Finally, the wage premium that advanced degree holders enjoy over those with bachelor's degrees is substantial. African American graduates enjoy particularly high absolute and relative wage premiums over their bachelor degree counterparts, on average. Given the average Black-White graduate student debt difference of $22,000 in 2012, typical African American borrowers leaving with a master's degree would recoup that additional spending through increased earnings in under two years of employment. Typical African American borrowers leaving with academic doctoral or professional degrees would recoup spending in under a year of employment.

Of course, the substantial return on the human capital investments African American students enjoy cannot justify the greater debt burdens they assume. Our results raise serious equity concerns with respect to financing graduate education. Furthermore, the African American advantage in relative returns to graduate and professional education are due not to an earnings advantage African Americans with advanced credentials enjoy over their White peers, but instead to inequalities in the earnings of baccalaureate recipients that favor White students. Our results do, however, suggest that the added debt borne by African American graduate students has the potential to pay off in the labor market.

Limitations and future directions. This study has several limitations that future studies can address. First, we do not observe parental income, which could account for parental education

and racial differences in the risk and rate of borrowing. Second, since we limit our sample to master's students who are second-year students and all other students who are third-year or higher, we likely underestimate the borrowing amounts of many students who remain enrolled and overestimate amounts of those who leave their programs early. Third, National Survey of College Graduates data limitations allow us only a crude estimation of the debt burdens of advanced degree holders. Although average amounts mostly map onto the more reliable National Postsecondary Student Aid Study borrowing reports, National Survey of College Graduates student loan data come in categorical dollar ranges, which are capped at $90,000 for undergraduate and graduate borrowing, leading to an underestimation of the upper limit to combined educational debt. Furthermore, our calculations of monthly payments do not take into account alternative payment structures, such as income-driven or extended repayment plans. The absence of this factor affects evaluations of the debt burdens of medical professional degree students who typically complete relatively low-paying residencies in the first years of their careers and have alternative repayment or deferment plans available at that time. Furthermore, the debt-to-earnings ratio we use is a simple estimate to assess debt burden, as a multitude of factors influence how much debt is too much (Baum & Schwartz, 2006).

Finally, we initially framed our empirical work based in part on the extent to which institutions have expanded graduate program offerings to increase graduate school enrollment and revenue. Colleges and universities across the country are likely expanding graduate offerings (for example, see Karam et al., 2017), but we have little empirical data with which to test this claim. To our knowledge, information on the number of advanced degree offerings at institutions across the country and over time is not readily available. We offer some preliminary evidence regarding advanced degree credential proliferation based on our analyses of archived graduate course catalogs at a dozen flagship public universities across the country (See Appendix E). These preliminary results show no evidence of overall increasing program offerings at the universities studied. Such general increases may exist, but they might be more apparent across a wider range of flagships, in private nonprofit or for-profit institutions, or among less-competitive public institutions. Future studies might clarify whether such an expansion has been occurring by conducting more detailed surveys of course catalogs or coordinating/discovering comprehensive collection of these data from institutes of higher education.

Conclusion

Individual borrowers, policy makers, and the broader public are understandably concerned about increases in the educational debt burden assumed by young adults in the United States. Deciding to enroll in college means weighing the increasing costs of college and foregone earnings in the labor market against the promise of careers that increases workers' chances of enjoying higher economic and social status. This study extends findings on changes in the distribution of undergraduate debt by looking for increasing debt at the advanced degree level. We find that those earning graduate or professional degrees are largely able to handle rising student loan payments due to the high returns to their credentials. However, graduate students of color and those from less educated families assume substantially higher debt burdens at the undergraduate and graduate levels and complete less-lucrative degrees than their advantaged counterparts. The substantial wage premium offered by advanced degrees over bachelor's degrees make the long-run implications of those inequalities unclear. In the perfect storm of

circumstances driving advanced degree student costs, educational debt appears to be either one of the barriers that deters the disadvantaged from achieving elite status or the high cost of entry.

Research Ethics

An institutional review board approved the research conducted on human subjects used for this manuscript, and this research was carried out in a way that is consistent with the ethical standards articulated in the 1964 Declaration of Helsinki and Section 12 of the American Sociological Association Code of Ethics. Adequate steps have been taken to protect participants' confidentiality.

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Appendix A. Datasets

The Survey of Consumer Finances is a triennial nationally representative survey of income and demographic characteristics of families in the United States, conducted by the National Opinion Research Center.

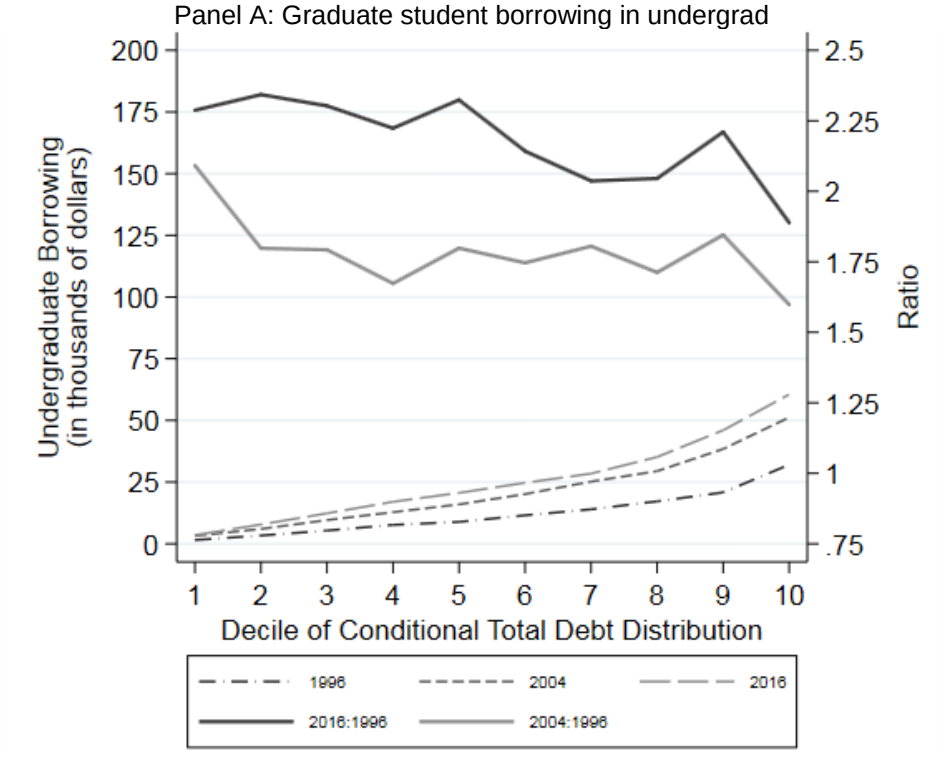
The National Postsecondary Student Aid Study is a nationally representative sample of U.S. college students conducted by the National Center for Education Statistics every four years. It contains a wide range of academic, demographic, and financial aid variables for those sampled.

The National Survey of College Graduates is a longitudinal survey administered biennially by the National Science Foundation to a nationally representative sample of college graduates younger than 76 who have completed at least a bachelor's degree. The survey asks for characteristics such as occupation, highest degree earned, field of study, annual salary, and demographics.

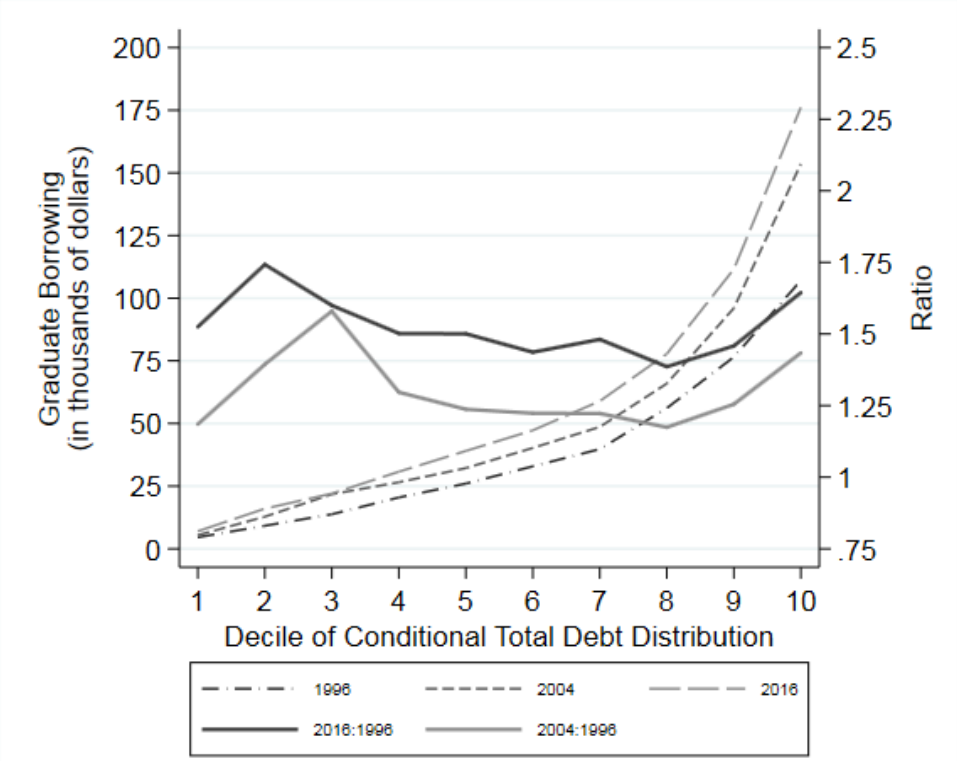
Appendix B. Graduate versus Undergraduate Debt among Advanced Degree Seekers

Figure B1 disaggregates total educational debt into distributions of undergraduate and graduate debt among graduate students. As in Figure 3, the x-axis represents individuals in each decile of the borrowing distribution. Dashed lines denote real average borrowing at each decile, while the thick, solid lines indicate the ratios of 2016 and 2004 borrowing to 1996 borrowing. The left y-axis corresponds to the dashed lines and the right y-axis corresponds to the solid lines. Panel A reveals that undergraduate borrowing among graduate students increased steadily from 1996 to 2016, where 2016 borrowers were taking on over double the educational debt of 1996 students at all but the top decile of the undergraduate borrowing distribution among graduate students. Note that these results differ from trends in borrowing among undergraduate students as a whole; Akers and Chingos (2016) show that increases in undergraduate borrowing are explained mainly by the top 20% of borrowers. The rate of graduate student borrowing for graduate and professional school increased more modestly compared to their borrowing as an undergraduate (Panel B). The middle half of 2016 graduate students took out about 50% more for graduate school than their counterparts in 1996, with higher rates of increase at the tails of the distribution. Although the rates of graduate school borrowing growth are smaller in relative terms, the actual dollar increases in graduate school borrowing were mostly larger than undergraduate increases. Figure B2 clarifies differences in graduate and undergraduate debt across the conditional borrowing distribution. It appears that undergraduate borrowing by graduate students has driven increases in debt among those in the bottom eight deciles, while graduate school debt increases are less prominent in all but the top two deciles of borrowing.

Figure B1. Distribution of graduate student borrowing, disaggregated by undergraduate and graduate borrowing

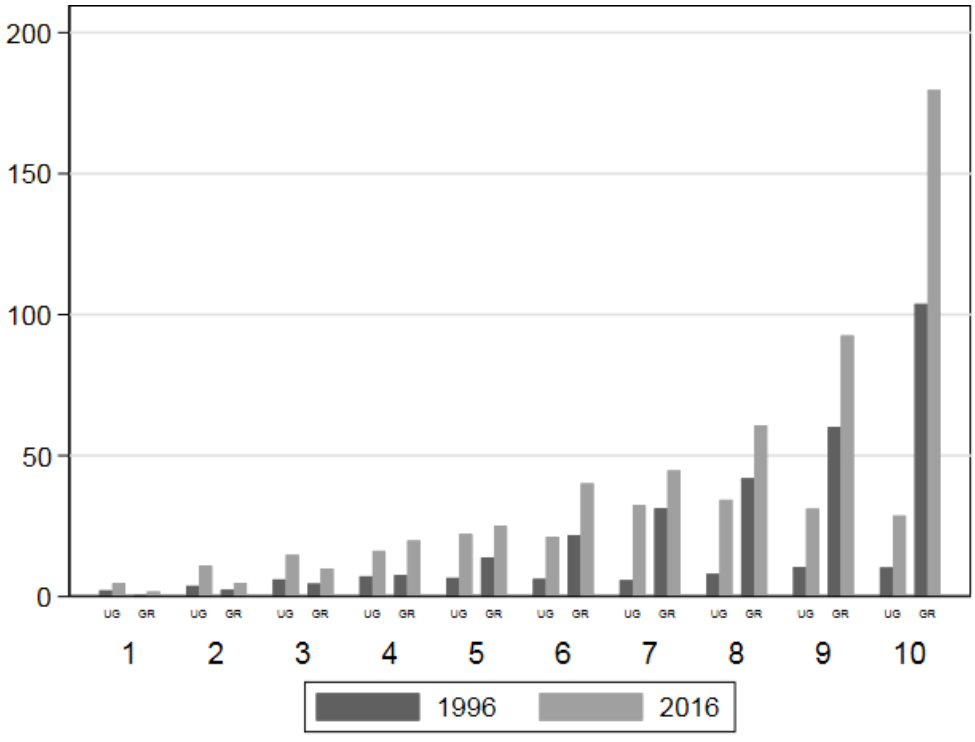


Panel B: Graduate student borrowing in graduate or professional school



Sources: 1996, 2004, and 2016 National Postsecondary Student Aid Study. National Postsecondary Student Aid Study weights applied to each cohort. All amounts are in 2016 dollars.

Figure B2. Graduate vs. Undergraduate Borrowing at Each Decile of Total Borrowing



Appendix C. Relationships among Degree Type, Sector of Attendance, and Student Background

Table C1 displays models of 2016 logged debt differences among students borrowing any amount at all. Note that model 4 in Table C1 is equivalent to model 6 in Table 2; however, among the four models in Table C1 we are observing changes in the associations between conditional logged debt and all other independent variables when degree type and institutional sector are and are not accounted for. Comparing results across models in Table C1, racial gaps in borrowing are present whether taking degree type and sector into account or not. However, racial debt gaps shrink when accounting for sector of attendance, which implies that Black-White debt gaps are driven partially by Blacks being more likely to enroll at private institutions. Regarding socioeconomic gaps, students whose parents have a master's degree or higher have similar average borrowing amounts compared to students from the least educated families, conditional on race and gender. However, when conditioning on degree type, students from master's degree or higher households borrow less than those from the least educated households. Conditioning on sector of attendance does little to change these patterns, which suggests that socioeconomic gaps in debt burden would be larger if students from the least-educated households enrolled in more expensive degree programs. Gender debt gaps also expand slightly as a function of the types of degree programs men and women enter. If women entered expensive degree programs at the same rate as men, gender debt gaps would likely be somewhat larger than they are.

Table C1. Logged 2016 Debt for Graduate Student Borrowing, Conditional on Borrowing Anything

	(1)	(2)	(3)	(4)
Race (reference category=White)				
African American	1.66***	1.64***	1.57***	1.54***
	(1.55–1.77)	(1.54–1.74)	(1.47–1.68)	(1.44–1.64)
Latino	1.06	1.06	1.06	1.03
	(0.98–1.15)	(0.99–1.14)	(0.98–1.15)	(0.96–1.12)
Asian American	1.15**	0.95	1.12*	0.83**
	(1.03–1.28)	(0.86–1.05)	(1.01–1.24)	(0.74–1.12)
Other	1.36***	1.29***	1.34***	1.08
	(1.20–1.56)	(1.14–1.46)	(1.18–1.53)	(0.95–1.22)
Parent Education (reference category=High School or Less)				
Some College	1.15***	1.10**	1.15***	1.09*
	(1.07–1.23)	(1.03–1.18)	(1.07–1.24)	(1.02–1.17)
Bachelor's	1.10*	1.03	1.11**	0.99
	(1.02–1.18)	(0.96–1.11)	(1.04–1.20)	(0.92–1.06)
Master's or Higher	0.96	0.87***	0.99	0.91**
	(0.90–1.03)	(0.82–0.93)	(0.92–1.06)	(0.85–0.98)
Gender (reference category=Male)				
Female	1.17***	1.21***	1.16***	1.24***
	(1.11–1.22)	(1.15–1.27)	(1.10–1.21)	(1.18–1.30)
Degree Program (reference category=Other Master's Degree)				
Medical Doctor/Health Professional		2.92***		3.25***
		(2.65–3.21)		(2.85–3.71)
Law Professional		2.74***		2.74***
		(2.34–3.20)		(2.38–3.15)
Academic Doctorate		1.32***		1.28***
		(1.23–1.42)		(1.19–1.37)
Master of Business Administration		0.86***		0.72***
		(0.80–0.93)		(0.66–0.79)
Master's (Science, Technology, Engineering, Mathematics, Health)		1.00		0.97
		(0.94–1.06)		(0.89–1.05)
Master's (Education)		0.72***		0.85***
		(0.68–0.77)		(0.78–0.93)
Sector (reference category=Public)				
Private Nonprofit			1.26***	1.18***
			(1.20–1.33)	(1.11–1.25)
Private For-profit			1.51***	1.79***
			(1.39–1.63)	(1.68–1.91)
Intercept	36,711.74***	36,390.11***	31,584.09***	27,920.00***
	(34,310.18–39,281.40)	(33,841.72–39,130.40)	(29,391.32–33,940.46)	(25,578.14–30,476.29)
N	7,170	7,170	7,170	7,170
R-Squared	0.05	0.16	0.07	0.18

Note: Degree types are effects coded. * p<.05, ** p<.01 *** p<.001.

Appendix D. National Survey of College Graduates Debt and Estimated Salaries

Table D1 reports real debt and estimated salaries of students graduating with advanced degrees between 2009 and 2013. Estimated salaries are the median reported salaries of 2013 National Survey of College Graduates respondents who graduated with their highest degrees 0–5, 6–10, 11–15, and 16–20 years prior to the 2013 survey. For example, among master's degree holders, a borrower at the median amount of debt took out $40,000 for undergraduate and graduate school education. With a standard repayment of 10 years at a fixed interest rate of 6.8%, that would equate to a monthly payment of $460 and a yearly payment of $5,520. A master's degree borrower at the 75th percentile of borrowing took out $70,000 for undergraduate and graduate school education, which amounts to an $806 monthly payment and a $9,672 yearly payment. At the 90th percentile, master's degree borrowers took out $100,000 of educational debt, resulting in monthly payments of $1,151 and yearly payments of $13,812. In terms of estimated earnings, master's degree graduates would see those 0–5 years out of their programs making a median of $67,000 per year. Master's degree holders' median estimated earnings increase linearly, with those 16–20 years out of their programs earning a median of $92,500 per year in 2013. Academic doctorate degree-holding borrowers took out amounts for undergraduate and graduate school that were very similar to master's degree-holding borrowers. However, their estimated earnings were also greater than master's degree holders at each career stage reported. Professional degree holders at the median borrowed over double the amount for undergraduate and graduate school compared to master's and academic doctoral degree-holding borrowers, 70% more at the 75th percentile, and about 40% more at the 90th percentile.

Table D1. Real Debt and Estimated Salaries of 2009–13 Borrowers

	Master's	Academic Doctorate	Professional
Student Loans among Borrowers			
50th Percentile (Median)			
Total Undergrad and Grad Debt	$40,000	$30,000	$95,000
Monthly Payment*	$460	$345	$1,093
Yearly Payment	$5,520	$4,140	$13,116
75th Percentile			
Total Undergrad and Grad Debt	$70,000	$70,000	$120,000
Monthly Payment*	$806	$806	$1,381
Yearly Payment	$9,672	$9,672	$16,572
90th Percentile			
Total Undergrad and Grad Debt	$100,000	$110,000	$140,000
Monthly Payment*	$1,151	$1,266	$1,611
Yearly Payment	$13,812	$15,192	$19,332
Estimated Salaries+			
0-5 Years Out	$62,000	$67,000	$62,900
5-10 Years Out	$75,000	$82,000	$100,500
11-15 Years Out	$85,000	$90,000	$120,000
16-20 Years Out	$92,500	$103,000	$135,500

* Monthly payment is based on a standard 10-year payoff at 6.8% interest rate. Calculated using finaid.org/calculator

+ Estimated salaries based on median salaries of National Survey of College Graduates respondents in 2013 who had graduated from their program the designated range of years.

Average student debt for that survey's 2009-2013 graduates was: master's $50,371; academic doctorate $51,154; professional $97,680.

Appendix E. Trends in Graduate Program Offerings

We speculate that in response to declines in per-student public funding of higher education, systems have sought to expand the range of graduate degrees they offer to increase revenue by enticing more individuals to enroll in graduate studies. Although evidence for this is scant, we do know that some states have sought to expand graduate education offerings so their public institutions remain competitive nationally (Karam, Goldman, Basco, & Carew, 2017). Additionally, since part of the cost-saving regime of institutes of higher education is to curb rapidly rising faculty salaries (Whalen, 2004), universities might cross-subsidize undergraduate education by increasing graduate student enrollments to replace faculty instructors with graduate students (Winston, 1996).

Given a dearth of information on graduate program offerings at institutions over time, we conducted a preliminary study to better understand these trends. We explored archived 1998, 2006, and 2013 course catalogs from 11 flagship universities across the country to determine whether advanced degree offerings at institutions have increased over time. We select flagship universities based on two practical factors: (a) the university's online archives need to date back to 1998, and (b) archived catalogs must provide the names of each graduate or professional degree field and type. These requirements disqualify all but the 11 public flagship universities used in this study.

Figure E1 displays the number of graduate or professional degree offerings at the flagship public universities from 1998 to 2013. In short, we find no clear upward trend in the number of advanced degree offerings across the institutions surveyed; while some universities saw increases in the number of graduate programs, others remained fairly stable, and others still reduced their advanced degree offerings.

Figure E1. Advanced Degree Offerings across Institutions