Delayed Bachelor's Degree Graduates Have Lower Graduate School Enrollment Rates

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Abstract

Using nationally representative data from the Baccalaureate and Beyond surveys, I establish a new descriptive finding: students who take longer than four years to complete their bachelor's degree have significantly lower graduate school enrollment rates compared to students who complete their bachelor's degree in four years, which is the standard for "on-time" graduation. Importantly, I show that students with a different time to degree report having similar expectations for earning a graduate degree in the future when asked during their final year of their bachelor's degree, suggesting differential graduate school goals do not explain the enrollment gaps. Additional analyses find that these enrollment patterns are driven entirely by differences in full-time enrollment in graduate programs within the first year after completing the bachelor's degree. Delayed graduates are not more or less likely to enroll in part-time graduate degree programs or to initially enroll between one and ten years after completing their bachelor's degree.

JEL Codes: I21, I23, I24, I26

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1 Introduction

The opportunity to pursue a graduate degree is an important source of the private returns to completing a college degree. The median annual earnings for those with a graduate degree in the United States are $18,000 more than the median earnings for those with a bachelor's degree without a graduate degree.[1] Moreover, recent causal estimates of the returns to different graduate degrees on earnings are mostly positive and often large (Altonji and Zhong, 2021; Altonji and Zhu, 2021). There are also important social benefits of building a diverse stock of graduate school-educated labor since those who hold advanced degrees become doctors, lawyers, researchers, or otherwise key leaders and decision-makers (Posselt and Grodsky, 2017).

There are also large disparities in graduate degree attainment rates by race/ethnicity: 16 percent of white adults in the United States hold a graduate degree, versus 11 and 9 percent of Black and Hispanic adults, respectively.[2] Thus, it is critical to understand where students may fall off the path to earning a graduate degree. One point in this pathway is the amount of time students take to complete a bachelor's degree. Nearly half of all bachelor's degree graduates take longer than four years to complete their degree—which is the standard for "on-time" graduation—and a longer time to degree is more common in student populations that are typically underrepresented among those who hold a graduate degree (see Table 1 and Denning et al. (2022)). Moreover, time to degree is closely related to graduation rates, particularly since college-level graduation rates are commonly reported in terms of years between college entry and completion (i.e. graduation within six years). Since these graduation rates are frequently used as key metrics in performance-based funding formulas and by students making college enrollment decisions, it is important to understand how outcomes differ between students who graduate in different amounts of time.

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[1] Author's calculations using data from the 2021 American Community Survey (Ruggles et al., 2023).
[2] Author's calculations using data from the 2021 American Community Survey (Ruggles et al., 2023).

In this paper, I study the question: Are students who take longer to complete a bachelor's degree less likely to later pursue a graduate degree? Taking more time to complete a bachelor's degree could be related to enrollment in graduate school through a possible effect it has on students. For instance, longer time to degree may be associated with higher student loan debt or a greater attachment to the labor force which could diminish interest in enrolling in graduate school. Or spending more time in college could induce greater psychic costs or "educational fatigue" associated with being a full-time student, deterring students from continuing their education (Heckman et al., 2006; Carneiro et al., 2003). A longer time in college could also allow students to learn more about their own aptitude and preferences for graduate school, consistent with the option value of college enrollment (Stange, 2012). Alternatively, if graduate programs admit students most likely to graduate, a longer time to degree could be related to graduate school enrollment if graduate program admissions use time to degree to screen applicants and penalize students who have a longer time to degree with a lower admissions rate (i.e., similar to a signalling theory (Spence, 1974)).

To study the relationship between time to bachelor's degree and graduate school enrollment outcomes, I use nationally representative data from the Baccalaureate and Beyond survey which allows me to follow the long-run outcomes of multiple cohorts of bachelor's degree graduates in the United States. Unconditionally, I find that delayed graduates (those taking more than four years to complete their bachelor's degree) have graduate school enrollment rates that are nearly 20 percentage points (or about 35 percent) lower than on-time graduates (those graduating in four years or less) within ten years after completing their bachelor's degree. These graduate school enrollment rate disparities between on-time and delayed graduates are even larger (in percent terms) at both one and four years after completing their bachelor's degree. The enrollment rate disparities are largest among doctoral programs as well as programs in STEM, humanities, and social science fields.

In an analysis of the potential explanations for the differences in graduate school enrollment by time to degree, I find that about half of the unconditional differences in enrollment rates can be explained by observable student characteristics, including demographics, SAT score, parent's education and income, college GPA and major, and college fixed effects. After accounting for these characteristics, delayed graduates still have about 8.5 percentage points (15 percent) lower graduate school enrollment rates compared to on-time graduates. I also find that the differences in enrollment are not driven by differences in expectations for earning a graduate degree when students are asked during their final year of their bachelor's degree. Yet, the differences again emerge when considering whether students had applied to a graduate degree program before completing their bachelor's degree. Moreover, I find that the differences in graduate school enrollment are entirely concentrated within the first year after bachelor's degree graduation, and completely driven by differences in full-time enrollment. Delayed graduates are no more or less likely to initially enroll in graduate school between one and ten years after their bachelor's degree or enroll in a graduate program part time.

These results are consistent with a phenomenon I describe as educational fatigue. Students who take extra time to complete a bachelor's degree are much less likely to continue immediately into a graduate school program, particularly for full-time programs. Part-time graduate school enrollment appears to be more palatable for these students. Since delayed graduates do not have significantly lower expectations for earning a graduate degree, these students may have goals of eventually returning to graduate school but seek to enter the labor force immediately after graduating to take a break from full-time schooling. Some do eventually return to school, but they do not make up for the initial enrollment disparities generated immediately after graduating.

My primary contribution is documenting several new descriptive facts about how the graduate school enrollment patterns of delayed bachelor's degree graduates differ from on-time graduates. Previous research has more frequently considered time to

degree as an outcome (Denning et al., 2022; Bound et al., 2012; Kurlaender et al., 2014; Aina et al., 2011), or with college graduation in some amount of time as an outcome (Smith, 2013; Cohodes and Goodman, 2014; Goodman et al., 2016; Bettinger and Long, 2018; Jones et al., 2022). I add to a smaller literature that studies the potential post-graduation consequences of a longer time to degree, which has so far focused exclusively on labor market outcomes. A few studies find some evidence for a negative relationship between time to degree and labor market outcomes (Fortin and Ragued, 2017; Aina and Casalone, 2020; Witteveen and Attewell, 2021). Although, Bloem (2023) finds limited signaling value in the labor market of on-time graduation relative to delayed graduation. A related but distinct literature considers the implications of time to high school degrees (e.g., Baert and Picchio (2021); ter Meulen (2023)). To my knowledge, this is the first paper studying the relationship between time to bachelor's degree and graduate school outcomes.

I also contribute to a broader literature that documents determinants of graduate school enrollment. I add time to degree as a potential important determinant to this literature on graduate school enrollment which includes papers that study its relationship with economic conditions (Bedard and Herman, 2008; Kahn, 2010; Johnson, 2013; Altonji et al., 2016), undergraduate debt and student loan policies (Malcom and Dowd, 2012; Chakrabarti et al., 2020b; Chen and Bahr, 2021; Ortagus and Kramer, 2022; Denning and Turner, 2023), undergraduate admissions policies (Garces, 2012; Bleemer, 2022), college quality and major choices (Eide et al., 1998; Zhang, 2005; Bleemer, 2021; Bleemer and Mehta, 2022; Ge et al., 2022), and funding for higher education (Chakrabarti et al., 2020a). A key insight that my analysis documents is that the first year after completing a bachelor's degree is a critical time for graduate school enrollment, particularly as a period where disparities in enrollment rates emerge between on-time and delayed graduates. Since time to degree is related to graduation rates, this paper is loosely related to a vast literature regarding college-level graduation rate metrics, particularly

papers that study the effect of state performance-based funding policies that include graduation rates as a performance metric (Ward and Ost, 2021; Hillman et al., 2018)

This paper has policy implications related to how college graduation rate metrics are calculated and considered in the higher education landscape. It is common for graduation rates to be computed as the share of students graduating within six years, including in IPEDS (the Integrated Postsecondary Education Data System) with refers to six year graduation as "150 percent of normal time," and in some performance-based funding policies for state appropriations (Ortagus et al., 2020), such as in Tennessee.[3] Graduation rates occasionally have an even longer time horizon, such as the U.S. Department of Education's College Scorecard, which calculates graduation rates within eight years of entry. My findings demonstrate important differences in outcomes between graduates completing their degree in four years versus five years or more, even conditional on what college the degree was earned. This suggests that four-year graduation rates is as an important measure of institutional performance. Four-year graduation rates should be considered as an additional metric wherever graduation rates are used or reported, such as in performance-based funding formulas or tools developed to help students make decisions about college enrollment,

The relationships I document between time to bachelor's degree and graduate school enrollment have potential implications for economic inequality, since earning a graduate degree can be a pathway to reaching the right tail of the income distribution. Black and Hispanic bachelor's degree graduates are (unconditionally) more likely to take five or more years to graduate compared to White graduates. Delayed graduation is also more common among first generation and lower-income graduates. Closing gaps in graduate school enrollment by time to degree may also help to close income- and race/ethnicity-based gaps in graduate school attainment and reduce income inequality

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[3]Ward and Ost (2021) study the impact of performance-based funding policy adoption in Ohio and Tennessee and find no effect of the policy on six-year graduation rates.

more broadly.

The remainder of the paper is organized as follows: In the next section, I describe the data sources I use in the empirical analysis in this paper, discuss summary statistics of the analytic sample, and detail my empirical approaches. The third section presents the unconditional relationships between time to degree and graduate school outcomes. Section four conducts supplemental analyses that assesses the primary mechanisms that explain the unconditional differences in graduate school enrollment by time to degree. Finally, section five concludes.

2 Data and Methodology

2.1 Data sources

I use data from the Baccalaureate and Beyond (B&B) surveys to study the relationship between time to bachelor's degree and long-run graduate school outcomes. These nationally representative surveys are administered by the National Center for Education Statistics of the United States Department of Education. Currently, the B&B data follows four cohorts of students who have received a bachelor's degree and gathers information about their subsequent outcomes after graduation. These four cohorts include students graduating during the 1993, 2000, 2008, and 2016 academic years. All students in the B&B data were initially interviewed as part of the National Postsecondary Student Aid Study (NPSAS).

For the 1993 and 2008 cohorts, the B&B data includes follow-up surveys one, four, and ten years after graduation. Meanwhile, the 2000 and 2016 cohorts have only a follow-up survey one year after graduation in my data. The core analyses of this paper focus on the 1993 and 2008 B&B cohorts due to their ability to observe long-run outcomes. However, results using all four B&B cohorts where possible are included in the appendix (see Table A1). The B&B data also include some records from administrative

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data sources, including the Department of Education's Central Processing System and National Student Loan Data System. Finally, I link colleges in the B&B data to Barron's Admissions Competitiveness Index data files to characterize colleges as more or less selective.

2.2 Analytic sample and summary statistics

I make a few sample restrictions to the B&B data which are similar to those made by other studies of time to bachelor's degree (Bound et al., 2012; Denning et al., 2022). Specifically, I condition the sample to include first-time bachelor's degree graduating students who went to college within two years of graduating high school and who received a bachelor's degree within eight years of graduating high school. My results are robust to relaxing these sample conditions (see Table A2). I calculate time to bachelor's degree (as well as time between high school graduation and college entry or college graduation) in years by converting the variables provided in terms of months.[4] I use the provided B&B survey weights throughout the analyses in this paper to yield nationally representative results.

Table 1 shows summary statistics of the analytic sample from the 1993 and 2008 cohorts of the B&B data. The top panel of the table highlights the wide distribution of time to degree in the United States. In the full sample, 48 percent of bachelor's degree graduates take longer than four years to complete their degree, with 29 percent taking five years, 12 percent taking six years, and 8 percent taking seven years or more. Table 1 also shows summary statistics for demographic and background characteristics, and variables detailing students' college experiences for the full sample as well as separately by time to degree. Unconditionally, students with a longer time to degree are more likely to be male; less likely to be White; and have lower family incomes, SAT scores,

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[4]I calculate time to degree as 4 years or less if the difference between college entry and college graduation is less than or equal to 48 months; 5 years to degree is 49-60 months; 6 years to degree is 61-72 months; and 7 years or more is 73 or more months.

and college grade point averages (GPAs) than students with a shorter time to degree.

Table 1. Summary statistics.

	Full sample	By time to degree 4 years or less	5 years	6 years	7 years or more
Time to degree					
4 years to less	0.515				
5 years	0.289				
6 years	0.119				
7 years or more	0.078				
Demographics					
Female	0.561	0.615	0.509	0.507	0.484
White	0.792	0.820	0.787	0.733	0.717
Black	0.060	0.051	0.063	0.088	0.070
Hispanic	0.067	0.053	0.067	0.092	0.121
Asian	0.061	0.058	0.061	0.072	0.060
Other	0.020	0.019	0.021	0.014	0.032
Background and academics					
Parent has BA	0.594	0.663	0.546	0.487	0.470
Family income ($1,000s)	79.75	95.14	77.77	53.97	21.39
SAT score	1085	1134	1046	1008	997
College GPA	3.168	3.309	3.057	2.973	2.944
College experiences					
Total federal student loans ($1,000s)	7.122	6.442	6.903	8.370	10.566
Worked full-time	0.136	0.082	0.142	0.239	0.322
Took remedial coursework	0.164	0.128	0.181	0.238	0.229
Transferred credits	0.514	0.446	0.524	0.655	0.714
Observations (unweighted)	18,630	9,810	5,220	2,090	1,510

Notes: The table above reports means for key variables in the analytic sample. The sample includes first-time bachelors degree graduates from the 1993 and 2008 B&B graduating cohorts who went to college within two years of graduating high school and who received a bachelors degree within eight years of graduating high school. The summary statistics were computed using the B&B's survey weights.

Table A3 explores the conditional relationships between delayed graduation and student characteristics and college experiences by regressing an indicator for any delayed graduation (5 or more years to degree) on a set of demograhpic, background, and academic variables available in the B&B data. The table shows that several college experiences are strong predictors of delayed graduation, including (among others) working full-time during college, transferring credits between colleges, being placed on

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academic probation, and repeating a course for a higher grade. Meanwhile, SAT scores and family incomes are negatively related to delayed graduation. Finally, while female students are much less likely to be a delayed graduate, contrary to the unconditional summary statistics, race and ethnicity is only weakly correlated with delayed graduation once other background variables are accounted for. Some specifications reveal that Black students are less likely to be a delayed graduate relative to White students when controlling for SAT score and parent's education and income.

2.3 Empirical approach

My goal with the subsequent analyses is to catalog the descriptive relationship between delayed bachelor's degree graduation and graduate school enrollment. To begin, I document the unconditional relationships between time to degree and graduate school outcomes. Later, I assess what factors explain the unconditional differences in graduate school enrollment by time to degree. To do this, using Ordinary Least Squares, I regress several graduate school outcomes on indicators for a student's time to degree, while including a rich set of additional variables, including demographic, background, and academic characteristics that could potentially explain differences in graduate school enrollment by time to degree.[5] Specifically, I estimate the following equation using ordinary least squares:

$$y_{icj} = \sum_{\tau} \beta_\tau \mathbb{1}(TTD_i = \tau) + \alpha X_i + \gamma_c + \delta_j + \epsilon_{icj} \tag{1}$$

Where y is a graduate school outcome for bachelor's degree graduate i. The term inside the summation is a vector of variables indicating student i's time to bachelor's degree in τ years, where $\tau \in \{4, 5, 6, 7\}$. Graduates in less than four years are coded as $\tau = 4$, and graduates in more than seven years are coded as $\tau = 7$. Typically, four-year

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[5]The results are robust to alternative estimators, including propensity score matching and inverse-probability-weighted regression-adjustment.

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graduates are the omitted reference group in the regressions. The vector X includes the set of student and academic characteristics available in the B&B data, including sex, race/ethnicity, parent's education and income, SAT score, college GPA, and fixed effects for college major.[6] Finally, I include college graduation cohort fixed effects (γ_c) and college fixed effects (δ_j), and ϵ_i is the error term. I report robust standard errors of my estimates throughout the paper.

My empirical approach has the following noteworthy limitations. First, the B&B data includes rich information about students and their trajectories during and after college, but I am nevertheless limited somewhat by the variables that are consistently available across survey waves. For instance, the field of graduate school enrollment is available in the surveys four years after graduation but not ten years after graduation. Second, while I am able to include a rich set of control variables that are correlated with both time to degree and graduation school enrollment outcomes, it is unlikely that I am able to fully account for the endogeneity of time to degree with these outcomes. Therefore, I present my results as descriptive and attempt to refrain from making strong causal claims about the relationships I document in my analyses.

3 Time to Bachelor's Degree and Graduate School Enrollment

3.1 Full sample results

Figure 1 shows the unconditional relationship between time to bachelor's degree and graduate school outcomes for the full sample. Overall, about 48 percent of all bachelor's degree graduates later enroll in a graduate degree program within ten years of earning the bachelor's degree. Clear differences in graduate school enrollment emerge by how much time students took to complete their bachelor's degree. Among graduates taking

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[6]The results shown in this paper include parent's income, SAT score, and college GPA as linear predictors in the regressions. Results are robust to more flexible approaches to controlling for these variables.

four years or less, 57 percent enroll in graduate school within 10 years of earning their bachelor's degree. Meanwhile, graduates taking 5, 6, and 7 years or more have graduate school enrollment rates of 39, 36, and 37 percent, respectively.

Figure 1. Graduate school outcomes by time to bachelor's degree.
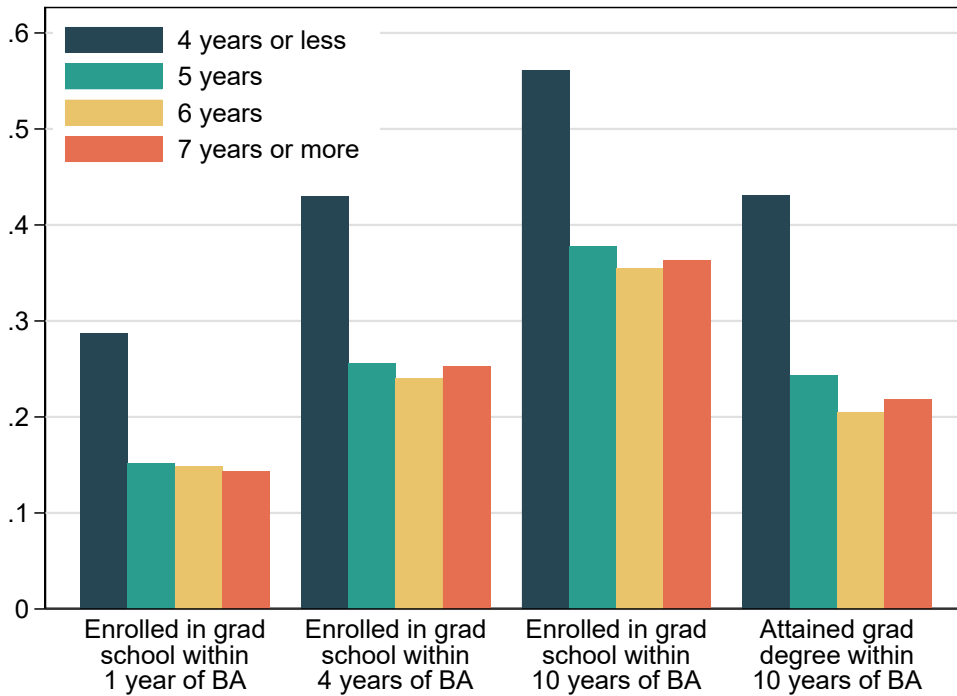
Notes: This figure shows means of graduate school outcomes by time to bachelor's degree. The sample includes first-time bachelor's degree graduates from the 1993 and 2008 B&B graduating cohorts who went to college within two years of graduating high school and who received a bachelor's degree within eight years of graduating high school. The summary statistics were computed using the B&B's survey weights.

Figure 1 also shows that disparities of similar magnitudes exist by time to degree for other graduate school outcomes. Ten years after graduating with a bachelor's degree, delayed degree graduates have roughly 20 percentage points lower graduate degree attainment rates compared to on-time graduates. Disparities of similar magnitudes between on-time and delayed graduates also exist for graduate school enrollment enrollment rates within one and four years after completing their bachelor's degree. This fact that these graduate school enrollment disparities exist and are of similar magni-

tudes at each of the three post-bachelor's degree snapshots in time available in the data is something I will revisit later when exploring the mechanisms behind what explains these enrollment gaps.

3.2 Results by type and field of graduate degree program

Figure 2 splits the graduate school enrollment variable into the type—either master's or doctoral—and field of the highest graduate program enrolled within four years of the bachelor's degree.[7] Compared to on-time graduates, delayed graduates have roughly 10 percentage point lower enrollment rates in both master's and doctoral programs. However, since enrollment rates in doctoral programs are lower overall, the enrollment disparities for doctoral programs are larger in percent terms. Large disparities by time to degree exist for enrollment in STEM (particularly health fields) and humanities and social science fields. However, much smaller disparities exist for enrollment in business or education fields.

3.3 Results by student groups

Among adults between 30–65 years old, 16 percent of the White population in the United States have an advanced degree, while these attainment rates are 11 and 7 percent among the Black and Hispanic populations, respectively (Ruggles et al., 2023).[8] Given these disparities in graduate degree attainment rates in the United States between certain student groups, it is important to examine whether time to degree plays any role in contributing to those disparities. In Figure 3, I examine the relationship between time to degree and graduate school enrollment by student groups including sex, race/ethnicity, and parental income. For parental income, I use information on ad-

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[7]Due to inconsistencies in variable availability across surveys for different B&B cohorts I am unable to produce a similar figure for enrollment within ten years of earning a bachelor's degree.

[8]Advanced degree attainment rates are calculated using the 2021 American Community Survey, including the provided person weights as obtained from IPUMS USA.

Figure 2. Type and field of graduate school enrollment by time to bachelor's degree.
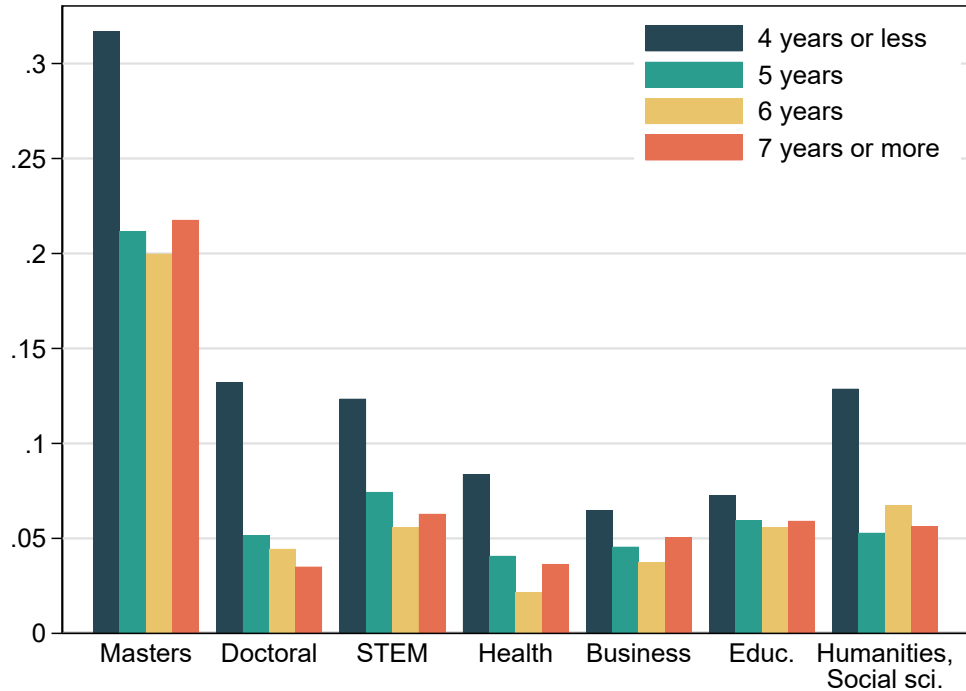
Notes: This figure shows enrollment in various types and fields of graduate degree programs by time to bachelor's degree. Outcomes are observed four years after completing a bachelor's degree. The sample includes first-time bachelor's degree graduates from the 1993 and 2008 B&B graduating cohorts who went to college within two years of graduating high school and who received a bachelor's degree within eight years of graduating high school. The summary statistics were computed using the B&B's survey weights.

justed gross income that is reported in student's filings of the FAFSA (Free Application for Federal Student Aid) that is included in the B&B data.

Overall, the results show that large delayed graduation disparities in graduate school enrollment exist for all student groups shown in the figure. However, the differences across student groups in the delayed graduation disparities are small. Little differences exist between male and female students, as well as between higher and lower income students. Some small differences exist across racial/ethnic groups. In particular, the delayed graduation enrollment disparities appear to be slightly larger for Asian and Black or Hispanic students compared to White students. Finally, Table A4

Figure 3. Graduate school enrollment by time to bachelor's degree and student subgroups.
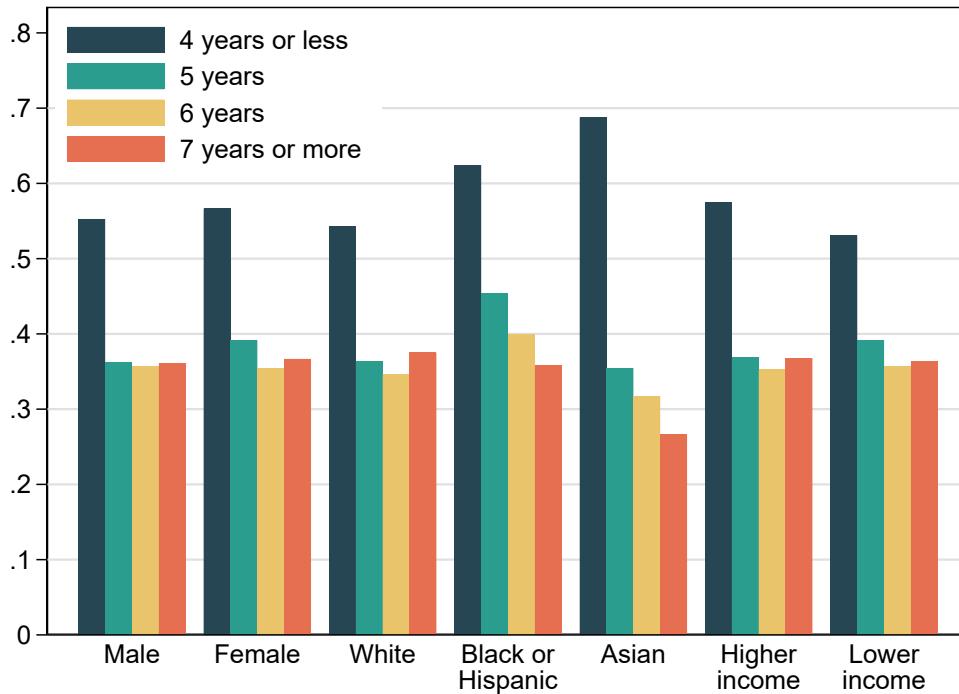
Notes: This figure shows means of graduate school enrollment within 10 years of earning a bachelor's degree by years to complete the bachelor's degree and by student subgroups. The sample includes first-time bachelor's degree graduates from the 1993 and 2008 B&B graduating cohorts who went to college within two years of graduating high school and who received a bachelor's degree within eight years of graduating high school. The summary statistics were computed using the B&B's survey weights.

shows results by students with different college characteristics. While there are similar delayed graduation disparities in graduate school enrollment between students starting at public vs. private schools, larger enrollment disparities exist for students who started at a 2-year (or less) college compared to a 4-year college. Similarly, larger graduate school enrollment disparities exist among graduates of less selective colleges compared to graduates of more selective colleges.[9]

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[9]"More selective" colleges include Barron's categories 1 "Most competitive", 2 "Highly competitive", and 3 "Very competititve", while "less selective" colleges include Barron's categories 4 "Competitive", 5 "Less competitive", and 6 "Noncompetitive".

4 Analysis of Mechanisms

This section aims to provide evidence towards why differences in graduate school enrollment exist between on-time and delayed graduates. At a high level I see three broad potential mechanisms. First, differences in graduate school enrollment by time to degree could be explained by differences in the characteristics of students with different time to degree. Second, differences in graduate school enrollment by time to degree could result from an effect that spending longer in college has on students. For instance, taking more time to complete a degree could increase a student's "educational fatigue," where students become tired of being a student and opt to enter the labor market rather than pursuing further education. For instance, prior research has hypothesized that "psychic costs" of education can explain differences in educational attainment (Heckman et al., 2006; Carneiro et al., 2003). It could also be the case that longer time in college decreases the uncertainty students have about their aptitude or preferences for graduate school, an illustration of the option value of college enrollment (Stange, 2012). There could also be other factors that follow from a longer time to degree, such as larger student loan balances, that could deter students from considering graduate school.

Finally, differences in graduate school enrollment could result from colleges who penalize students with a longer time to degree with lower admissions rates to graduate degree programs. This could be consistent with a signalling theory relating time to degree and graduate school admissions, where graduate school admissions use time to degree to infer applicant quality or which applicants are most likely to graduate. I investigate the data available in the B&B surveys to assess these different mechanisms.

In Table 2, I explore the extent to which observable student characteristics can explain the unconditional differences in graduate school enrollment by time to degree. In column 1, I regress graduate school enrollment within 10 years of earning a bachelor's

Table 2. Time to degree and enrollment in graduate school within 10 years of BA.

	(1)	(2)	(3)	(4)
Time to degree				
4 years or less (reference)	*Outcome mean for 4-year-grads = 0.561*			
5 years	-0.178***	-0.137***	-0.117***	-0.085***
	(0.013)	(0.013)	(0.013)	(0.013)
6 years	-0.205***	-0.147***	-0.140***	-0.094***
	(0.018)	(0.018)	(0.019)	(0.019)
7 years or more	-0.200***	-0.137***	-0.120***	-0.068***
	(0.021)	(0.023)	(0.022)	(0.022)
Demographics				
Female	0.012	0.038***	-0.002	-0.019*
	(0.011)	(0.011)	(0.012)	(0.012)
Black	0.078***	0.152***	0.099***	0.127***
	(0.023)	(0.023)	(0.027)	(0.027)
Hispanic	0.046**	0.081***	0.062**	0.066***
	(0.023)	(0.024)	(0.025)	(0.025)
Asian	0.050**	0.031	0.023	0.029
	(0.025)	(0.025)	(0.024)	(0.023)
Background				
Parent with BA		0.027**	0.031***	0.031***
		(0.012)	(0.011)	(0.011)
Family income ($10,000s)		0.000	0.001	0.001
		(0.001)	(0.001)	(0.001)
Academics				
SAT score (100s)		0.047***	0.035***	0.019***
		(0.003)	(0.004)	(0.004)
College GPA (0.1s)				0.018***
				(0.001)
Observations	16,320	16,320	16,320	16,320
Additional controls:				
B&B cohort fixed effects	✓	✓	✓	✓
College major fixed effects			✓	✓
College fixed effects			✓	✓

Notes: The outcome in the regression results in the above table is whether the graduate ever enrolled in a graduate school program within ten years of earning a bachelors degree. The sample includes first-time bachelors degree graduates from the 1993 and 2008 B&B graduating cohorts who went to college within two years of graduating high school and who received a bachelors degree within eight years of graduating high school. The regressions include survey weights. Robust standard errors are reported in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

degree on time to degree, graduating cohort fixed effects, and demographic character-istics. The coefficients on time to degree show graduate school enrollment disparities for delayed graduates that are similar in magnitude to the unconditional relationships, suggesting that differences in demographics do not explain these disparities. Column

2 adds students' family income, whether they have a parent with a bachelor's degree, and their SAT score to the regression. The coefficients on the time to degree indicators decrease by about 25 percent relative to the unconditional differences.

Column 3 includes college and college major fixed effects to the regression, effectively comparing the graduate school enrollment outcomes between students graduating from the same college and major. The coefficients on time to degree decrease in magnitude again with these additional explanatory variables, by about 10 percent relative to the unconditional differences. Finally, column 4 includes students' college GPA in the regression, which presumably is a strong signal of a students' admissibility into graduate school. The coefficients on time to degree decrease in magnitude another 15 percent. In Table A5 and Table A6 I report very similar results from the same regressions but which instead use as the outcome graduate school enrollment within four years and one year since earning the bachelor's degree, respectively.

Overall, while these observable student characteristics account for a large share of the unconditional differences in graduate school enrollment by time to degree, about 50 percent of the unconditional differences still remain. Even after accounting for these student characteristics, delayed graduates have about 15 percent lower graduate school enrollment rates compared to on-time graduates. In Table A7, I include in the regressions many additional variables that describe students' experiences during college, including (among several others) the amount of loans students finished their degree with and their employment status during their last year of their degree. Including these additional variables have little effect on changing the estimated difference in graduate school enrollment rates by time to degree. These results suggest that the lower enrollment rates for delayed graduates are seemingly not explained by a larger amount of student debt or a greater attachment to the labor force among delayed graduates. While it is possible that unobserved differences between on-time and delayed graduates could explain more of the unconditional differences in enrollment, the results in

Table A8 using the methods of Oster (2019) shows that it is unlikely that unobserved factors can *fully* explain the differences in graduate school enrollment that I observe by time to degree.

Next, I present results in Table 3 that largely use other outcome variables related to graduate school enrollment that are available in the B&B data using the same specification and full set of student controls from the final column in Table 2. Column 1 shows that upon graduating with their bachelor's degree, delayed graduates do not have large differences in their expectations for later earning a graduate degree compared to on-time graduates.[10] This result suggests that less uncertainty about graduate school preferences does not explain the lower graduate school enrollment rates of those who take longer to complete their bachelor's degree. Yet, column 2 shows that delayed graduates are less likely to have applied to a graduate degree program during their last year of their bachelor's degree. The magnitude of these differences (17 to 25 percent) is similar to, although slightly larger than, the differences in graduate school enrollment. To reemphasize the takeaway from column 1, column 3 conditions the sample on students who indicated that they expected to someday earn a graduate degree. I still find lower application rates for delayed graduates, suggesting again that the unconditional differences in graduate school enrollment do not appear to be explained by differential expectations or motivation to earn a graduate degree.

The final column of Table 3 conditions the sample on students who applied to a graduate degree program during their final year of their bachelor's degree to assess whether lower chances of admission to graduate school programs may be a leading mechanism driving the results in section 3. In this specification I combine the "six years to degree" and "seven years or more" groups to compensate for the loss in statistical power for this smaller sample size. Among these students, I still find that delayed

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[10]The specific question wording is: "What is the highest level of education you ever expect to complete?" The response options are: bachelor's degree, post-BA or post-master certificate, master's degree, first-professional degree, or doctoral degree. The question is asked during the baseline NPSAS survey.

Table 3. Analysis of mechanisms.

Outcome variable:	Expect to earn grad degree	Applied to grad school	Applied to grad school	Enrolled in grad school
Sample condition:	None	None	Expect to earn grad degree	Applied to grad school
	(1)	(2)	(3)	(4)
Time to degree				
4 years or less (reference)				
5 years	-0.020*	-0.064***	-0.080***	-0.064**
	(0.012)	(0.012)	(0.015)	(0.025)
6 years	-0.021	-0.081***	-0.111***	-0.047
	(0.016)	(0.016)	(0.020)	(0.034)
7 years or more	0.032	-0.054***	-0.086***	
	(0.020)	(0.019)	(0.023)	
Observations	17,110	17,900	13,690	5,660
Outcome mean for 4-year-grads	0.807	0.326	0.381	0.660

Notes: The above table uses alternative outcomes and samples to explore potential mechanisms. In all columns, regressions include the full set of controls from column 4 of Table 2, including demographics, parent's education and income, SAT score, college GPA, and fixed effects for the student's college, college major, and B&B graduating cohort. The outcome in column 1 is whether the student expected to earn a graduate degree when asked during the last year of their bachelor's degree. The outcome in columns 2 and 3 is whether the student had applied to a graduate degree program before completing their BA. Column 3 conditions the sample on those who expected to earn a graduate degree. The outcome in column 4 is whether the graduate ever enrolled in a graduate degree program within one year of earning the BA degree, while conditioning the sample on those who had applied to a program before completing their BA. The sample includes first-time bachelors degree graduates from the 1993 and 2008 B&B graduating cohorts who went to college within two years of graduating high school and who received a bachelors degree within eight years of graduating high school. The regressions include survey weights. Robust standard errors are reported in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

graduates have lower graduate school enrollment rates within one year of earning their bachelor's degree. This may indicate that delayed graduates are admitted to graduate programs at lower rates than on-time graduates even conditional on applying, which would offer some support for the role of graduate program admissions as a mechanism for the main results. However, the magnitude of the differences (7 to 10 percent) is smaller than for other results, suggesting this is likely not a primary channel. Another angle to consider the admissions margin is to explore the relationship between time to degree and the "quality" of the graduate school students attend. Table A9 shows that delayed graduates do not have lower advanced degree attainment rates at elite graduate schools, suggesting again that the admissions margin is not a major mechanism.

Overall, the analyses in Table 3 suggest an important role for how longer time to degree affects students in explaining the lower graduate school enrollment rates for delayed graduates. In particular, the results seem to fit with a story where longer time to degree generates greater educational fatigue or psychic costs associated with being a student (Heckman et al., 2006; Carneiro et al., 2003). Despite not having significantly lower expectations for earning a graduate degree in the future, delayed graduates end up enrolling in graduate school at much lower rates. It appears that after spending extra time completing a bachelor's degree, delayed graduates are less willing to continue being a full-time student and instead are more likely to enter the labor market perhaps with goals of eventually returning to graduate school.

Further analyses in Table 4 support this story. Columns 1 through 3 show that the differences in enrollment come entirely within the first year after completing the bachelor's degree. Delayed graduates are about 28 percent less likely to initially enroll in graduate school within one year of their bachelor's degree even after accounting for the full set of student characteristics, but are not more or less likely to initially enroll between one and ten years after graduation. Narrowing in on the graduate school enrollment within one year of earning a bachelor's degree, columns 4 and 5 show that the differences in enrollment are entirely driven by differences in full-time enrollment in graduate programs. Delayed graduates are about 37 percent less likely to enroll in a full-time program, but are not more or less likely to enroll in a part-time program. These results show that the main results are explained by an abrupt divergence in full-time enrollment in graduate school between on-time and delayed graduates immediately after finishing their bachelor's degrees. This could also be an explanation for the heterogeneity in the relationship between time to degree and graduate school enrollment by the field of the graduate program documented in Figure 2. These results found smaller delayed graduate disparities in enrollment in business and education programs, which are perhaps more likely to have part-time

programs available.

Table 4. Timing and intensity of graduate school enrollment.

	Timing of first graduate school enrollment			Enrollment intensity within 1 year of BA	
	Within 1 year after BA (1)	Between 1 and 4 years after BA (2)	Between 4 and 10 years after BA (3)	Full time (4)	Part time (5)
Time to degree					
4 years or less (reference)					
5 years	-0.084***	-0.001	0.005	-0.076***	-0.007
	(0.010)	(0.009)	(0.010)	(0.009)	(0.006)
6 years	-0.079***	-0.006	-0.012	-0.075***	-0.003
	(0.014)	(0.012)	(0.013)	(0.012)	(0.009)
7 years or more	-0.064***	0.014	-0.008	-0.086***	0.023**
	(0.016)	(0.017)	(0.016)	(0.013)	(0.011)
Observations	17,890	15,790	15,640	17,890	17,890
Outcome mean for 4-year-grads	0.287	0.157	0.133	0.221	0.065

Notes: In all columns, regressions include the full set of controls from column 4 of Table 2, including demographics, parent's education and income, SAT score, college GPA, and fixed effects for the student's college, college major, and B&B graduating cohort. The outcome in column 1 is whether the student first enrolled in graduate school within one year of earning a bachelors degree. The outcome in column 2 is whether the student first enrolled in graduate school between one and four years of earning a bachelors degree. The outcome in column 2 is whether the student first enrolled in graduate school between four and ten years of earning a bachelors degree. The outcome in columns 4 and 5 is full-time or part-time enrollment in a graduate degree program within one year of earning a bachelors degree. The sample includes first-time bachelors degree graduates from the 1993 and 2008 B&B graduating cohorts who went to college within two years of graduating high school and who received a bachelors degree within eight years of graduating high school. The regressions include survey weights. Robust standard errors are reported in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

5   Conclusion

I study the relationship between time to bachelor's degree and long-run graduate school outcomes using nationally representative data from the Baccalaureate and Beyond surveys which allows me to follow the outcomes of multiple cohorts of bachelor's degree graduates up to ten years after completing their bachelor's degrees. I establish a new descriptive finding: delayed bachelor's degree graduates have lower graduate school enrollment rates compared to on-time graduates. Unconditionally, the difference

is roughly 20 percent points (or about 35 percent). Observable student characteristics including demographics, SAT score, parent's education and income, college GPA and major, and college fixed effects, can explain about half of this enrollment gap, but delayed graduates still have about 15 percent lower graduate school enrollment rates once these characteristics are accounted for.

The pattern of the results suggests an important role for how time to degree generates an educational fatigue where students with a longer time to degree are much less likely to continue being a full-time student immediately after finishing a bachelor's degree. In additional analyses, I show that while delayed graduates do not have large differences in their expectations for earning a graduate degree at the time of finishing their bachelor's degree, I do find large differences in application rates to graduate school programs in students' final year of their bachelor's degree. Moreover, I find that the differences in graduate school enrollment are entirely driven by differences in full-time enrollment within one year of earning their bachelor's degrees. Delayed graduates are not more or less likely to initially enroll in graduate school between one and ten years after earning the bachelor's degree, or to enroll part-time in a graduate program.

This paper uncovers a potential consequence of delayed graduation that has received little attention in the literature. Since nearly half of all bachelor's degree graduates in the United States are delayed graduates, my results highlight an important area for closer attention from policymakers and researchers. The results have implications for how graduation rates are calculated and used in the higher education landscape, since many college graduation rates are reported as the share of students who graduate within six years of entry, but I document important differences in outcomes between on-time and delayed bachelor's degree graduates. Four-year graduation rates should be considered as an additional metric wherever graduation rates are used or reported, such as in performance-based funding formulas for state appropriations or in data tools used to help students compare colleges and make enrollment decisions (e.g., the

College Scorecard).

There is still much to learn about who enrolls in graduate school and why. Future research could endeavor to 1) further explore the mechanisms driving these descriptive findings, 2) estimate causal effects of time to bachelor's degree on graduate school enrollment and other post-graduation outcomes. Moreover, there is scope for policy interventions to support delayed graduates who would like to eventually enroll in graduate school, such as individualized counselling to promote seamless enrollment between undergraduate and graduate education, and active recruitment or tuition discounts in graduate admissions.

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A Appendix Tables

Table A1. Results using all four B&B graduating cohorts.

Outcome variable:	Expect to earn grad degree	Applied to grad school	Enrolled in grad school (1 yr post BA)	Enrolled in grad school (1 yr post BA)
Sample condition:	None	None	None	Applied to grad school
	(1)	(2)	(3)	(4)
Time to degree				
4 years or less (reference)				
5 years	-0.018**	-0.054***	-0.065***	-0.070***
	(0.008)	(0.008)	(0.007)	(0.019)
6 years	-0.005	-0.067***	-0.081***	-0.078***
	(0.012)	(0.011)	(0.009)	(0.025)
7 years or more	0.006	-0.054***	-0.060***	
	(0.014)	(0.013)	(0.010)	
Observations	34,250	34,890	35,980	9,680
Outcome mean for 4-year-grads	0.795	0.301	0.250	0.626

Notes: The above table shows results for which it is possible to use all four of the B&B's graduating cohorts: 1993, 2000, 2008, and 2016. In all columns, regressions include the full set of controls from column 4 of Table 2, including demographics, parent's education and income, SAT score, college GPA, and fixed effects for the student's college, college major, and B&B graduating cohort. The outcome in column 1 is whether the student expected to earn a graduate degree when asked during the last year of their bachelor's degree. The outcome in columns 2 is whether the student had applied to a graduate degree program before completing their BA. The outcome in columns 3 and 4 is whether the graduate ever enrolled in a graduate degree program within one year of earning the BA degree. Column 4 conditions the sample on those who had applied to a program before completing their BA. The analysis sample includes first-time bachelors degree graduates from the 1993 and 2008 B&B graduating cohorts who went to college within two years of graduating high school and who received a bachelors degree within eight years of graduating high school. The regressions include survey weights. Robust standard errors are reported in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Table A2. Core results with relaxed sample conditions.

Outcome variable:	Enrolled in grad school	Enrolled in grad school	Enrolled in grad school	Applied to grad school	Earned grad degree
When outcome is observed:	10 years after BA	4 years after BA	1 year after BA	Last year of BA	10 years after BA
	(1)	(2)	(3)	(4)	(5)
Time to degree					
4 years or less (reference)					
5 years	-0.088***	-0.090***	-0.083***	-0.067***	-0.087***
	(0.012)	(0.012)	(0.010)	(0.011)	(0.011)
6 years	-0.102***	-0.086***	-0.079***	-0.086***	-0.113***
	(0.017)	(0.016)	(0.013)	(0.014)	(0.015)
7 years or more	-0.110***	-0.103***	-0.088***	-0.088***	-0.088***
	(0.015)	(0.014)	(0.011)	(0.013)	(0.013)
Observations	21,140	21,480	23,400	23,410	21,930
Outcome mean for 4-year-grads	0.557	0.428	0.286	0.325	0.400

Notes: The above table repeats the core results while eliminating the main sample conditions. The sample now includes all first-time bachelors degree graduates from the 1993 and 2008 B&B graduating cohorts. In all columns, regressions include the full set of controls from column 4 of Table 2, including demographics, parent's education and income, SAT score, college GPA, and fixed effects for the student's college, college major, and B&B graduating cohort. The regressions include survey weights. Robust standard errors are reported in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Table A3. Predictors of delayed graduation.

	(1)	(2)	(3)	(4)	(5)	(6)
Demographics						
Female	-0.114***		-0.143***	-0.140***	-0.138***	-0.119***
	(0.007)		(0.007)	(0.007)	(0.009)	(0.009)
Black	0.121***		-0.034**	0.003	-0.043**	-0.076***
	(0.016)		(0.015)	(0.016)	(0.020)	(0.020)
Hispanic	0.149***		0.043***	0.020	0.003	-0.017
	(0.015)		(0.014)	(0.015)	(0.018)	(0.018)
Asian	0.044***		0.037**	0.030**	0.030	0.011
	(0.016)		(0.015)	(0.015)	(0.018)	(0.018)
Background						
Parent with BA		-0.046***	-0.050***	-0.021***	-0.014	-0.017*
		(0.008)	(0.007)	(0.007)	(0.010)	(0.009)
Family income ($10,000s$)		-0.011***	-0.010***	-0.006***	-0.008***	-0.007***
		(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
SAT score (100s)		-0.063***	-0.068***	-0.044***	-0.046***	-0.040***
		(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
College experiences						
Had a part-time job in last year of BA				0.014*	-0.000	0.001
				(0.008)	(0.011)	(0.011)
Had a full-time job in last year of BA				0.142***	0.137***	0.113***
				(0.012)	(0.015)	(0.015)
Took remedial courses				0.050***	0.046***	0.031**
				(0.011)	(0.013)	(0.013)
Transferred any credits				0.120***	0.110***	0.094***
				(0.007)	(0.009)	(0.009)
Changed major						0.021**
						(0.009)
Stopped out						0.193***
						(0.013)
Placed on academic probation						0.126***
						(0.016)
Withdrew from course or incomplete grade						0.083***
						(0.010)
Repeated a course for higher grade						0.109***
						(0.011)
College fixed effects				✓	✓	✓
B&B cohort fixed effects	✓	✓	✓	✓	n/a	n/a
Included B&B cohorts	1993, 2008	1993, 2008	1993, 2008	1993, 2008	2008 only	2008 only
Observations	17,900	17,900	17,900	17,900	10,790	10,790

Notes: The table above regresses an indicator variable for whether students were a delayed graduate (5 years to degree or more) on student demographic, background, and college experience predictor variables. Robust standard errors are reported in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Table A4. Results by college characteristics.

	Sector of initial college				Selectivity of BA college	
	Public college (1)	Private college (2)	4-year college (3)	2-year college (4)	More selective (5)	Less selective (6)
Time to degree						
4 years or less (reference)						
5 years	-0.094***	-0.066**	-0.088***	-0.145***	-0.079***	-0.091***
	(0.016)	(0.027)	(0.014)	(0.052)	(0.021)	(0.018)
6 years	-0.090***	-0.135***	-0.107***	-0.100*	-0.065**	-0.126***
	(0.022)	(0.040)	(0.021)	(0.060)	(0.031)	(0.024)
7 years or more	-0.088***	-0.052	-0.068**	-0.135**	-0.062	-0.083***
	(0.027)	(0.058)	(0.028)	(0.063)	(0.041)	(0.028)
Observations	10,020	5,870	13,800	2,050	7,110	8,210
Outcome mean for 4-year-grads	0.554	0.568	0.564	0.513	0.613	0.504

Notes: The outcome in the regression results in the above table is whether the graduate ever enrolled in a graduate school program within ten years of earning a bachelors degree. The sample includes first-time bachelors degree graduates from the 1993 and 2008 B&B graduating cohorts who went to college within two years of graduating high school and who received a bachelors degree within eight years of graduating high school. Columns 1-4 split the sample by characteristics of students' initial college. Columns 5 and 6 split the sample by the selectivity of the college the student earned their bachelor's degree, defined by Barron's selectivity classifications. Column 5 includes Barron's categories 1 "Most competitive", 2 "Highly competitive", and 3 "Very competitive". Column 6 includes Barron's categories 4 "Competitive", 5 "Less competitive", 6 "Noncompetitive". In all columns, regressions include the full set of controls from column 4 of Table 2, including demographics, parent's education and income, SAT score, college GPA, and fixed effects for the student's college, college major, and B&B graduating cohort. The regressions include survey weights. Robust standard errors are reported in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Table A5. Time to degree and enrollment in graduate school within 4 years of BA.

	(1)	(2)	(3)	(4)
Time to degree				
4 years or less (reference)	*Outcome mean for 4-year-grads = 0.434*			
5 years	-0.171***	-0.132***	-0.120***	-0.087***
	(0.012)	(0.012)	(0.012)	(0.012)
6 years	-0.189***	-0.134***	-0.138***	-0.090***
	(0.016)	(0.016)	(0.017)	(0.017)
7 years or more	-0.180***	-0.117***	-0.108***	-0.055***
	(0.019)	(0.020)	(0.021)	(0.021)
Demographics				
Female	0.005	0.029***	-0.003	-0.020*
	(0.011)	(0.010)	(0.011)	(0.011)
Black	0.070***	0.136***	0.076***	0.105***
	(0.022)	(0.022)	(0.025)	(0.025)
Hispanic	0.040*	0.075***	0.065***	0.068***
	(0.022)	(0.021)	(0.023)	(0.023)
Asian	0.043*	0.028	0.018	0.021
	(0.024)	(0.023)	(0.023)	(0.023)
Background				
Parent with BA		0.030***	0.029***	0.029***
		(0.011)	(0.011)	(0.011)
Family income ($10,000s)		0.001	0.002**	0.002***
		(0.001)	(0.001)	(0.001)
Academics				
SAT score (100s)		0.041***	0.034***	0.017***
		(0.003)	(0.004)	(0.004)
College GPA (0.1s)				0.018***
				(0.001)
Observations	16,520	16,520	16,520	16,520
Additional controls:				
B&B cohort fixed effects	✓	✓	✓	✓
College major fixed effects			✓	✓
College fixed effects			✓	✓

Notes: The outcome in the regression results in the above table is whether the graduate ever enrolled in a graduate school program within four years of earning a bachelors degree. The sample includes first-time bachelors degree graduates from the 1993 and 2008 B&B graduating cohorts who went to college within two years of graduating high school and who received a bachelors degree within eight years of graduating high school. The regressions include survey weights. Robust standard errors are reported in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Table A6. Time to degree and enrollment in graduate school within 1 year of BA.

	(1)	(2)	(3)	(4)
Time to degree				
4 years or less (reference)	*Outcome mean for 4-year-grads = 0.287*			
5 years	-0.127***	-0.102***	-0.108***	-0.084***
	(0.010)	(0.010)	(0.010)	(0.010)
6 years	-0.135***	-0.099***	-0.114***	-0.079***
	(0.013)	(0.013)	(0.014)	(0.014)
7 years or more	-0.143***	-0.101***	-0.106***	-0.064***
	(0.015)	(0.016)	(0.016)	(0.016)
Demographics				
Female	-0.007	0.008	-0.018**	-0.032***
	(0.009)	(0.009)	(0.009)	(0.009)
Black	0.026	0.071***	0.033	0.053***
	(0.018)	(0.019)	(0.020)	(0.020)
Hispanic	0.006	0.031*	0.036*	0.042**
	(0.018)	(0.018)	(0.020)	(0.020)
Asian	0.041**	0.036*	0.044**	0.045**
	(0.021)	(0.020)	(0.022)	(0.021)
Background				
Parent with BA		0.021**	0.026***	0.026***
		(0.009)	(0.009)	(0.009)
Family income ($10,000s)		0.001	0.001*	0.002**
		(0.001)	(0.001)	(0.001)
Academics				
SAT score (100s)		0.026***	0.026***	0.014***
		(0.003)	(0.003)	(0.003)
College GPA (0.1s)				0.014***
				(0.001)
Observations	17,890	17,890	17,890	17,890
Additional controls:				
B&B cohort fixed effects	✓	✓	✓	✓
College major fixed effects			✓	✓
College fixed effects			✓	✓

Notes: The outcome in the regression results in the above table is whether the graduate ever enrolled in a graduate school program within one year of earning a bachelors degree. The sample includes first-time bachelors degree graduates from the 1993 and 2008 B&B graduating cohorts who went to college within two years of graduating high school and who received a bachelors degree within eight years of graduating high school. The regressions include survey weights. Robust standard errors are reported in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Table A7. Including additional college experience variables.

	(1)	(2)	(3)	(4)	(5)
Time to degree					
4 years or less (reference)					
5 years	-0.085***	-0.093***	-0.078***	-0.097***	-0.098***
	(0.013)	(0.013)	(0.019)	(0.018)	(0.018)
6 years	-0.094***	-0.108***	-0.116***	-0.095***	-0.096***
	(0.019)	(0.019)	(0.026)	(0.027)	(0.027)
7 years or more	-0.068***	-0.086***	-0.089***	-0.084***	-0.083***
	(0.022)	(0.023)	(0.032)	(0.031)	(0.032)
College experiences					
Cumulative federal student loans ($10,000s)		0.016**	0.047***	0.009	0.008
		(0.007)	(0.014)	(0.007)	(0.007)
Had a part-time job in last year of BA		0.027**	0.005	0.043**	0.042**
		(0.013)	(0.018)	(0.018)	(0.018)
Had a full-time job in last year of BA		0.006	-0.044	0.037	0.036
		(0.018)	(0.028)	(0.024)	(0.024)
Took remedial courses		0.028*	0.008	0.030	0.030
		(0.016)	(0.028)	(0.021)	(0.021)
Transferred any credits		0.041***	0.040**	0.034**	0.034**
		(0.011)	(0.016)	(0.015)	(0.015)
Changed major					0.014
					(0.016)
Stopped out					-0.004
					(0.023)
Placed on academic probation					-0.020
					(0.030)
Withdrew from course or incomplete grade					0.015
					(0.017)
Repeated a course for higher grade					0.011
					(0.019)
Observations	16,320	16,320	6,010	10,310	10,310
Outcome mean for 4-year-grads	0.570	0.570	0.527	0.591	0.591
B&B cohorts included	1993,	1993,	1993	2008	2008
	2008	2008	only	only	only

Notes: The outcome in the regression results in the above table is whether the graduate ever enrolled in a graduate school program within ten years of earning a bachelors degree. In all columns, regressions include the full set of controls from column 4 of Table 2, including demographics, parent's education and income, SAT score, college GPA, and fixed effects for the student's college, college major, and B&B graduating cohort. The sample includes first-time bachelors degree graduates from the 1993 and/or the 2008 B&B graduating cohorts who went to college within two years of graduating high school and who received a bachelors degree within eight years of graduating high school. The regressions include survey weights. Robust standard errors are reported in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Table A8. Unobservable selection and coefficient stability.

	Short (1)	Long (2)	Oster's δ (3)
Enrolled in graduate school within 10 years of BA	-0.186***	-0.085***	1.30
	(0.011)	(0.012)	
R^2	0.040	0.258	
Observations	16,320	16,320	
Enrolled in graduate school within 4 years of BA	-0.174***	-0.084***	1.41
	(0.010)	(0.012)	
R^2	0.038	0.249	
Observations	16,520	16,520	
Enrolled in graduate school within 1 year of BA	-0.130***	-0.081***	2.01
	(0.009)	(0.010)	
R^2	0.037	0.220	
Observations	17,890	17,890	
Applied to graduate school before completing BA	-0.118***	-0.067***	2.06
	(0.009)	(0.011)	
R^2	0.019	0.200	
Observations	17,900	17,900	
Attained graduate degree within 10 years of BA	-0.185***	-0.092***	1.48
	(0.010)	(0.011)	
R^2	0.043	0.242	
Observations	16,840	16,840	

Notes: The above table conducts an analysis of coefficient stability using the psacalc Stata command created by Oster (2019). The analysis calculates the proportional selection coefficient (Oster's δ in column 3) which represents how much more meaningful unobservable and omitted covariates would need to be, relative to the observable and included covariates, to explain away the results. Specifically, Oster's δ is calculated by comparing the results between the short regression in column 1 with no controls to the results in the long regression in column 2 with the full set of controls. The method requires an assumption about the maximum possible R^2 in each specification. I follow Oster (2019)'s recommendation and set the theoretical maximum R^2 as 1.3 times the R^2 of the long regression. For simplicity, I use a single indicator for any delayed graduation (5 or more years to degree) as the independent variable of interest instead of separate indicators for 5, 6, and 7 years to degree. The sample includes first-time bachelors degree graduates from the 1993 and 2008 B&B graduating cohorts who went to college within two years of graduating high school and who received a bachelors degree within eight years of graduating high school. The regressions include survey weights. Robust standard errors are reported in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Table A9. Graduate degree attainment at elite vs. non-elite graduate schools.

	Elite grad schools (1)	Non-elite grad schools (2)
Time to degree		
4 years or less (reference)		
5 years	-0.005	-0.098***
	(0.006)	(0.017)
6 years	0.005	-0.123***
	(0.008)	(0.023)
7 years or more	0.006	-0.089***
	(0.006)	(0.028)
Observations	10,310	10,310
Outcome mean for 4-year-grads	0.040	0.426

Notes: The outcome in the regression results in the above table is graduate degree attainment at elite or non-elite graduate schools within ten years of earning a bachelor's degree. Following Chetty et al. (2023) I define elite graduate schools as the Ivy League schools, plus the University of Chicago, Duke University, MIT, Stanford, UC-Berkeley, UCLA, UCSF, University of Michigan, and the University of Virginia. In all columns, regressions include the full set of controls from column 4 of Table 2, including demographics, parent's education and income, SAT score, college GPA, and fixed effects for the student's college, college major, and B&B graduating cohort. The sample includes first-time bachelors degree graduates from the 2008 B&B graduating cohort who went to college within two years of graduating high school and who received a bachelors degree within eight years of graduating high school. The regressions include survey weights. Robust standard errors are reported in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).