Time to Baccalaureate Degree in the Labor Market: Evidence from a Field Experiment

December 2024

Abstract

I study whether the amount of time students take to complete their bachelor's degree affects labor outcomes after graduation using a resume-based field experiment. I randomly assign a time to degree of either four or six years to over 7,000 fictitious resumes of recent graduates and submit them to entry-level business jobs. Resumes listing degree completion in six years received 1-2 percent fewer employer responses than resumes indicating graduation in four years, which is not a statistically significant difference. There is also no difference in the effect of longer time to degree between resumes listing a more or less selective college. However, among jobs with relatively large applicant pools, resumes listing six years to degree receive 16 percent fewer responses.

JEL Codes: I23, I26, J24, J63, M51

1 Introduction

The time between initial postsecondary enrollment and completion of a bachelor's degree is considered a key indicator of student success. While earning a college degree is associated with substantial labor market benefits, the diverse paths students take towards completing their degrees may be important determinants of labor market outcomes after graduation. Bachelor's degree graduates often take longer than four years to graduate, which is the standard "on-time" number of years. While 58 percent of graduates finish in four years, 26 percent finish in five years, and 16 percent finish in six or more years (Denning, Eide, Mumford and Sabey, 2022). Thus, nearly half of all bachelor's degree graduates in the U.S. are "delayed" graduates.

Conditional on students' college major and the college they graduated from, delayed graduates are more likely to have repeated or withdrawn from a course, received an incomplete grade, or have been placed on academic probation, in addition to having lower college GPAs and SAT scores (See Table A1). Thus, taking more time to complete a bachelor's degree may send a negative signal to potential employers even conditional on what they can observe from a resume. Since employers routinely make inferences about a worker's productivity based on observable characteristics such as on a resume (Altonji and Pierret, 2001), time to degree could be meaningful in the labor market if employers associate it with differing cognitive or non-cognitive skills. Alternatively, conditional on college and major, students graduating in a different number of years have taken a similar set of courses and should not have large human capital differences.

Does time to bachelor's degree affect labor market outcomes after graduation? I study this question by conducting a resume audit experiment that is designed to examine employer preferences for job applicants who completed a bachelor's degree in a different number of years. I include two educational treatments on the resumes: 1) time to degree, either four or six years, indicated by the range of years listed next to the college the applicant graduated from, and 2) college selectivity, indicated by listing names of public colleges with distinct average SAT scores. This generates four resume types defined by the interaction of the two educational treatments. Including college selectivity as a secondary treatment provides a benchmark to compare estimates of the effect of time to degree. It also provides the ability to test for differences in how employers value time to degree

between graduates of more or less selective colleges and test the extent to which time to degree may be a mechanism for the labor market returns to college selectivity. All other information listed on the resumes is designed to be independent of the treatments.

To carry out the experiment, I submit about 7,000 resumes to about 2,000 entry-level business jobs posted on a large online job board in seven major US metropolitan areas beginning in January 2022. I apply to jobs in occupations such as accounting, finance, marketing, and sales that require (or at least prefer) a bachelor's degree with at most three years of experience. All applicants list bachelor's degree completion in 2022. I track employer responses to each resume from emails, phone calls, and text messages and compare response rates across the different educational treatment characteristics.

In the full sample of jobs, I find little evidence that employers place a high value on time to degree, on average, as a signal of an applicants' quality. Overall, resumes listing bachelor's degree completion in six years have a 1 percent (0.2 percentage points) lower response rate than resumes listing four years to degree, though this difference is not statistically significant. Moreover, the difference in the estimated effect of time to degree between more and less selective colleges is negligible.

There is evidence, however, that among jobs with larger applicant pools, there is a large penalty for delayed graduation. Listing six years to degree on resumes decreases response rates by about 16 percent (2.5 percentage points) relative to listing four years to degree. I interpret these results to suggest that on-time bachelor's degree graduation is often no more valuable to employers than delayed graduation. But time to degree does seem to be more important in some situations. Specifically, it appears the competitive environment of the job vacancy is important. This is consistent with time to degree being relatively low on employers' list of important resume characteristics. When an employer has many applicants, it has the luxury to be more selective in its pursuit of potential employees and screen applicants based on less important characteristics like time to degree. Thus, on-time graduation becomes more important for applicants looking to stand out in a larger, more competitive applicant pool.

My results provide evidence that employers generally do not have significantly lower initial interest in delayed bachelor's degree graduates relative to on-time graduates. Although, I cannot rule out larger penalties for delayed graduates further into the hiring process beyond the outcomes I can observe. While employers

appear to value time to degree on the margin when job openings are competitive, perhaps as a "tie-breaker," the skills and employment experiences graduates list on resumes are likely to be more valuable than time to degree itself. Moreover, the tuition costs and opportunity costs associated with longer time to degree remain important issues worth considering and addressing with policy. An important caveat of this paper is that my analysis is conditional on college graduation. The true cost of extending enrollment beyond the standard on-time number of years may be on the graduation margin itself. Given the large labor market returns to having a degree relative to not having a degree (Zimmerman, 2014; Smith et al., 2020; Kozakowski, 2023), policy efforts should continue to focus on helping students graduate, regardless of how long it takes.

The first contribution of this paper is providing causal evidence on the labor market returns to time to bachelor's degree. A few papers have studied the heterogeneous labor market outcomes of graduates with different time to degree with observational data (Fortin and Ragued, 2017; Aina and Casalone, 2020; Witteveen and Attewell, 2021). Generally, these papers find a negative relationship between longer time to degree and labor market outcomes, at least in some capacity. However, research on this question is limited by a lack of credibly causal research designs. Observational studies are challenging since exogenous sources of variation in time to degree are scarce, and there are likely important differences between graduates with different time to degree that are also correlated with labor market outcomes that cannot be fully accounted for.

My research design avoids these problems by experimentally varying the information observed by employers. Since I randomly assign time to degree and college names to otherwise identical resumes, on average, differences in response rates represent a causal difference in how employers perceive applicants with a different educational history. My study follows a long tradition of resume audit experiments that study how employers respond to job seekers' characteristics.[1] This includes a set of papers that experimentally vary educational characteristics including the sector and selectivity of postsecondary institutions (Darolia et al., 2015; Deming et al., 2016), internships during college (Nunley et al., 2016; Baert et al., 2021), online degrees (Lennon, 2021), and college grades (Quadlin, 2018; Piopiunik et al., 2020).

Another primary contribution of this paper is providing evidence on time to

[1]See for example, Riach and Rich (2002); Bertrand and Mullainathan (2004); Lahey (2008); Kroft, Lange and Notowidigdo (2013); Eriksson and Rooth (2014); Agan and Starr (2018); Farber, Herbst, Silverman and von Wachter (2019); Neumark, Burn and Button (2019).

degree as a potential mechanism for the returns to college selectivity. There is a correlation between college selectivity and time to degree: more selective colleges have a lower time to degree on average. Meanwhile, a large literature generally documents positive labor market returns to college selectivity (or quality), but who accrues these returns and why is less understood (Lovenheim and Smith, 2022). Part of the returns to college selectivity could operate through time to degree if more selective colleges cause students to graduate in less time.

With my experimental design I can separately estimate the effect of time to degree and college selectivity, which is not possible in studies that use observational data, even those with exogenous variation in college selectivity. For example, I compare outcomes between graduates of more and less selective colleges that graduate in the same number of years. Nevertheless, since I do not estimate large effects of time to degree, I also do not find strong evidence that time to degree is a major channel through which the returns to college selectivity operate.

A final contribution of this paper is providing a current estimate of the returns to college selectivity that is not subject to bias from spillover effects between resumes sent to the same job posting. This contribution is twofold. First, while there is a large literature that tends to find positive returns to college selectivity, these studies generally exploit natural experiments using observational data, which typically implies that estimates come from graduating cohorts of at least several years ago where data can observe individual's educational history and post-graduation outcomes. An advantage of my experimental setting is that the results reflect how the labor market currently views new bachelor's degree graduates with different educational characteristics. My results show that resumes listing a more selective college receive about 13 percent (1.7 percentage points) more responses than resumes listing a less selective college (with about 300 points lower average SAT scores). Although, with an estimated effect of about 33 percent, the return to a more selective college is much larger among higher quality jobs (using expected salary as a proxy for job quality).

Second, I assign treatment types to resumes using a non-stratified design where each resume has an equal probability of being each of the four treatment types, rather than a stratified design where exactly one of each resume treatment type is sent to each job. Consequently, my estimates avoid attenuation bias from spillover effects between resumes sent to the same job (Phillips, 2019), which has likely resulted in underestimating the return to college selectivity in previous resume

audits. For example, Deming et al. (2016)—who randomizes postsecondary sector and selectivity to resumes using a stratified design within job vacancy—estimate a null effect of resumes listing a more selective public college relative to listing a less selective public college. Meanwhile, I estimate a positive return to listing a more selective college, and I also show evidence that while spillover effects exist in my context, the spillovers do not bias my estimates because they are differenced out in the non-stratified design.

The rest of this paper is organized as follows. Section 2 describes the details of the experimental design, the labor markets studied, the job search criteria, the resume creation, and data collection. Section 3 presents the main results from the full sample, shows evidence that my estimates are not subject to spillover bias, and presents estimates of the heterogeneous effects of the educational treatments by job and applicant characteristics. Section 4 engages with the interpretation of the results. Finally, Section 5 concludes.

2 Experimental Design

2.1 Overview

The experimental design consists of four resume types that differ in terms of the name of the listed college where a bachelor's degree was earned, and the number of years indicated to complete the degree:

1. Four years to degree from a more selective public institution
2. Four years to degree from a less selective public institution
3. Six years to degree from a more selective public institution
4. Six years to degree from a less selective public institution

The other information listed on the resumes are randomly assigned from a set of options. Thus, these other resume characteristics are uncorrelated with the treatments that define the four resume types. More details of the resume content are described in the following subsections below.

I send four resumes to each job opening, which are drawn at random from the four resume types and the sets of other resume information. Each of the four resumes has an equal probability of being assigned one of the four resume types.

Thus, the composition of resume types that a job opening receives is completely random. For example, a given job opening may receive four resumes that are all type 2 from the list above. Another job opening may receive three resumes of type 1 and one resume of type 4. A third job may, by chance, receive one of each of the four types, etc.

2.2 Educational treatments

There are two educational treatments included in the experiment: time to degree (either four or six years) and the selectivity of the institution where the bachelor's degree was earned. I choose four years to degree since that is considered on-time graduation. I choose six years to degree as the delayed graduation comparison since it is distinct from four years to degree while still being relatively common. The interaction of the two educational treatments creates the four resume types listed above.

Time to bachelor's degree is signaled by the years listed next to the bachelor's degree granting institution indicated on the resume. This is a common revelation on resumes; exploring a sample of over 550,000 real resumes from an online job board reveals that 79 percent of resumes that indicate bachelor's degree completion include a year or range of years associated with that degree attainment, with about half of those listing a range of years. This is a similar signaling mechanism employed by resume audit experiments that are designed to test for age discrimination by listing different years in which applicants completed high school (e.g., Lahey, 2008; Neumark et al., 2019; Farber et al., 2019). Furthermore, evidence from resume audit experiments that study unemployment duration suggests that employers are capable of finely examining dates and date ranges on resumes (e.g., Kroft et al., 2013).

I focus on recent bachelor's degree recipients. Thus, all resumes list bachelor's degree completion in 2022, with time to degree indicated by the listed start year (i.e., 2018 or 2016). Thus, resumes sent before May will hypothetically be forthcoming graduates, while resumes sent after May would be very recent graduates. Focusing on recent graduates has the advantage that educational signals are likely the most valuable to employers early in a worker's career (Altonji and Pierret, 2001; Lange, 2007).

I carefully choose the institutions in which the fictitious job applicants received their bachelor's degree according to two criteria. First, the institutions are well

Table 1. College names listed on resumes

Labor market	College name	Selectivity
Atlanta	Georgia Gwinnett College	Less selective
Atlanta	University of Georgia	More selective
Chicago	Northeastern Illinois University	Less selective
Chicago	University of Illinois at Urbana-Champaign	More selective
Dallas	Tarleton State University	Less selective
Dallas	University of Texas at Dallas	More selective
Los Angeles	California State University, Northridge	Less selective
Los Angeles	University of California, Irvine	More selective
New York City	SUNY Farmingdale State College	Less selective
New York City	Stony Brook University	More selective
Philadelphia	Penn State Brandywine	Less selective
Philadelphia	Penn State University	More selective
San Francisco	California State University, East Bay	Less selective
San Francisco	University of California, Davis	More selective

known public colleges located near the metro area of the job search such that it is common that graduates of the college to search for jobs in that labor market. Second, the colleges are clearly distinct in terms their selectivity. The college names of the more and less selective institutions listed on resumes in each labor market are shown in Table 1. Using data from Conzelmann et al. (2022), the corresponding labor market for each college is the most common labor market where graduates of that college work after graduation. Meanwhile, the average difference in SAT scores between the more and less selective college used across the seven labor markets is about 300 points.

2.3 Study setting, labor markets, and occupations

I send resumes to openings for full-time, entry-level business jobs that require (or at least prefer) a bachelor's degree, with at most 3 years of experience required. The focus on business jobs simplifies the resume creation and the job search process. Specifically, I apply to jobs in the occupations of banking, finance, accounting, management, marketing, and sales. Business occupations are the largest employers of bachelor's degree holders and business-related fields are also by far the most common bachelor's degree in the U.S.

I send the resumes to job postings in seven large cities in the U.S.: Atlanta, Chicago, Dallas, Los Angeles, New York City, Philadelphia, and San Francisco. I

study large cities to ensure a large stock of job postings to apply to and to increase the generalizability of the results across different regions of the country. The number of cities to include in the study is chosen to balance these benefits with the fixed costs of creating realistic educational and employment histories within each labor market.

I apply to jobs on Indeed.com, a large online job board in the U.S. Many jobs posted on Indeed require following a link to the employer's website to apply. To avoid the less efficient application processes that characterize those jobs, I only apply to jobs where the employer allows applying to jobs and submitting resumes directly through Indeed's website.

2.4 Employment experience

Each resume includes a "Work Experience" section. These employment experiences are designed to be independent of the treatments such that work experience is similar between applicants with four and six years to degree. The work histories on my fictitious resumes are heavily influenced by real resumes posted online by job seekers. All resumes include two entries in their employment history section. The work experiences I list include various off-campus retail or food service jobs, such as "Customer Service Associate" at The Gap or Target or "Barista" at Starbucks, and on-campus jobs such as "Office Assistant" at the financial aid office, or "Food Service Worker" in the campus dining hall. The work experiences I list are likely relatively less valuable to employers than some work experiences typical of a top graduate (i.e., internships or other business industry experience) to mimic students that are more representative of students on the margin of longer time to degree.

Job titles and firm names are chosen based on commonly listed information on real resumes. All jobs indicate that they have occurred within the past three years before graduation, to look like part-time work while enrolled in college, or potentially full-time summer work. Descriptions of work experiences are also based in part on actual job descriptions recorded on real resumes. However, to simplify resume creation and generate more generic work descriptions that can be used in many settings, I also use and adapt some descriptions from Nunley et al. (2016).

2.5 Other resume attributes

Names listed on resumes are chosen so that the job applicants would vary by gender and race. To signal race, names are chosen that are racially distinctly, meaning they are common for a given race, but uncommon among other races. Although, following work by Gaddis (2016), names are chosen that are commonly given by mothers of relatively high education within race, to mitigate the socio-economic signal portrayed by the names. Resumes include contact information featuring email addresses and phone numbers corresponding to names that are generated through Google. To mimic a recent or forthcoming graduate, physical addresses are assigned to be in large apartment complexes with reasonable commutes to the institution in which the student earns their bachelor's degree.

Resumes are assigned one of seven business-related majors associated with their bachelor's degree: business, accounting, economics, finance, business management, marketing, or business economics. Resumes also list a high school name and graduation year. High schools were chosen to be a large and diverse public school located in the metropolitan area of the job search. High school graduation year is the same as the applicant's college start year, implying zero years between high school graduation and entry into college. I also include a high school start year, which always indicates four years spent in high school, to increase the salience of the range of years enrolled in college.

The final section of each resume is a "Skills" section. I create several skill "templates," based on resumes posted by real job seekers with bachelor's degrees in business fields. All templates list skills in "Microsoft Office" in some form since this is very common among real business job seekers. The templates also include some other technical skills such as "database management" or "Adobe software" and some templates may include some "soft" skills or general attributes, like "team player" or "detail-oriented". More details about the skills and work history templates I use to populate the resumes are included in Table A2.

2.6 Resume creation

To create resumes I use the "resume randomizer" software developed by Lahey and Beasley (2009). The program allows complete control over all components of and information included on each resume, including how attributes are randomized both within and across job vacancies. Figure A1 shows an example of a resume

used in the study. Each resume lists the sections in the same order, with name and contact information at the top, followed by the education section, the work experience section, and lastly, the skills section.

Resumes sent to the same job posting are designed to be visually distinct to mitigate the possibility that employers detect the experiment. Within job vacancy each resume uses a different font and distinct formatting features. Moreover, names, physical addresses, high school names, work histories, and skills templates are never repeated among resumes sent to the same job.

It is important to validate whether resume characteristics were successfully randomized so that all features of the generated resumes are not systematically different across the education treatments and will not confound treatment effect estimates. Table A3 confirms that resume characteristics were successfully randomized. I test for the balance of resume characteristics across the four resume types by regressing each characteristic on indicators for the four resume types and executing an F-test with a null hypothesis that the coefficients are jointly equal to zero. Out of the 30 characteristics tested, none of the characteristics reject the null hypothesis at a 5 percent significant level. Two characteristics reject the null hypothesis of the F-test at a 10 percent significance level, but this is within the range of what is expected to occur under a successful randomization.

2.7 Assignment of resumes to job openings

As described in Section 2.1, I submit four resumes to each job opening. Job postings are occasionally removed before all four resumes can be submitted, but 95 percent of jobs received all four resumes. I use a non-stratified design when assigning resumes their treatment type within job vacancy. This means that each resume has an equal probability of being one of the four treatment types. This differs from stratified designs, which are common in the audit study literature, where every job opening receives exactly one of each resume type. Using a non-stratified design is important to avoid bias from spillover effects between resumes sent to the same job (Phillips, 2019). The motivation for and value of this design choice is discussed more fully in Section 4.4.

To limit the risk of employers detecting the experiment, I wait at least three hours in between submitting resumes to the same job. However, all four resumes are typically submitted to job openings across two days. Also, I only submit resumes to one job per firm, per labor market, such that a given employer in a city

does not receive multiple sets of fictitious resumes.

While resume types are randomly assigned to job openings, it is useful to validate that observable job opening characteristics (e.g., city, occupation, etc.) as well as other characteristics of how resumes were assigned (e.g., order sent, day of week sent, time of day sent), are balanced across the resume types. In the same manner as Table A3, I conduct tests for balance of these characteristics in Table A4. The results confirm that theses characteristics are balanced across the resume types: none of the 31 characteristics tested can reject the null hypothesis that there are no differences across resume types at conventional significance levels.

2.8 Data collection

The outcome of interest is whether an employer responds positively to some applicants, typically a request for an interview, but not others. To track employer responses, I use the generated email addresses and phone numbers that correspond to applicant names. From these responses I create two outcomes: 1) any positive response and 2) a request for an interview. The positive response outcome excludes employer contact that are not clearly an indication of interest in the applicant, such as emails that confirm receipt of the application. The interview request outcome is a subset of the positive response outcome. I focus on the response rate outcome in Section 3, but results are qualitatively similar with the interview request outcome.

In addition to tracking employer responses, I record information about the job posting itself such as the firm name, job title, the text of the job description summary, and if available, the number of expected hires. I also collect data on the expected salary of each job, which comes from three sources. First, for roughly half of jobs the employer listed a salary or salary range on the job posting. Second, for about one-fourth of jobs, I use a salary range estimated by Indeed that the website sometimes lists on the job posting when an employer does not. Third, for the final one-fourth of jobs, I scrape median salaries from a separate tool on Indeed's website that allows one to search salaries based on job titles.

Additionally, after applying to a job Indeed displays how many people have applied to the job in a range of five applicants (i.e., 21-25, 26-30, 31-35, etc.). I record the number of applicants after waiting at least two weeks after applying to the job to allow others to submit applications.

3 Results

3.1 Summary statistics

Table 2 and Table 3 present descriptive statistics for characteristics of jobs and applicants in the full experimental sample. I sent a total of 7,245 resumes and received a 13.6 percent response rate overall. This response rate is evidence of the validity of the resumes used in the study and that employers considered them realistic. Other comforting evidence of the validity of the study is that response rates are higher for lower salary jobs and jobs hiring more than one candidate, while response rates are lower for higher salary jobs and jobs hiring only one candidate.

About 28 percent of jobs in the full sample are in sales or customer service related occupations. Meanwhile, 24 percent of jobs are in finance, 17 percent in accounting, 10 percent in marketing, and 21 percent are in business administration or other business occupations. About 55 percent of job postings specified the number of applicants the employers are looking to hire, with about 17 percent of jobs overall indicating a desire to hire multiple candidates. The median number of people who applied to the jobs in the sample falls within a range of 26-30.

Resumes sent with names typical of Black applicants received fewer responses than White applicants, and women applicants received fewer responses than men, but both differences are not statistically significant. At the intersection of race and gender, White men applicants have response rates 2.1 percentage points higher than Black women, which is statistically significant at the 5 percent level.

3.2 Main estimates

Given the random assignment of the resume treatments, a simple regression of an employer response outcome on indicator variables for the treatment characteristics can capture the causal difference in the probability of an employer response between the educational treatments. The estimating equations take one of two general and related forms:

$$\text{Response}_{ij} = \alpha^k \cdot T^k + \mu_{ij} \tag{1}$$

$$\text{Response}_{ij} = \beta_0 + \beta_1 \cdot 1(\text{Six years to degree}_i) + \beta_2 \cdot 1(\text{Selective college}_i) + \epsilon_{ij} \tag{2}$$

The outcome in both equations is an indicator variable that equals 1 if resume i gets an employer response for job vacancy j.[2] Equation 1 regresses this outcome

[2]I estimate both equations with a linear probability model using ordinary least squares. Results

Table 2. Descriptive statistics by job characteristics

	Positive response rate (1)	Interview request rate (2)	Number of resumes (3)
Total	0.136	0.100	7,245
Atlanta	0.137	0.090	1,373
Chicago	0.147	0.131	975
Dallas	0.175	0.127	733
Los Angeles	0.171	0.106	613
New York	0.109	0.073	1,526
Philadelphia	0.136	0.124	727
San Francisco	0.119	0.089	1,298
Sales and customer service	0.201	0.147	2,054
Marketing	0.091	0.070	726
Finance	0.100	0.071	1,736
Accounting	0.114	0.091	1,214
Business administration	0.081	0.067	958
Other	0.117	0.081	557
Above median salary	0.089	0.066	3,413
Below median salary	0.178	0.131	3,821
Salary posted by employer	0.175	0.124	3,916
Salary estimated by Indeed	0.090	0.067	1,742
Salary scraped from Indeed	0.091	0.080	1,576
Hiring one candidate	0.090	0.060	2,746
Hiring multiple candidates	0.300	0.217	1,257
Number of hires not specified	0.111	0.089	3,242
Above median number of applicants	0.144	0.103	3,270
Below median number of applicants	0.130	0.098	3,975

Notes: This table shows the number of resumes and response rates by characteristics of the job posting.

on indicators for each of the four resume types (denoted by the k superscripts),

are identical when estimating with a logistic model. The full sample estimates using a logistic model are shown in Table A8.

Table 3. Descriptive statistics by applicant characteristics

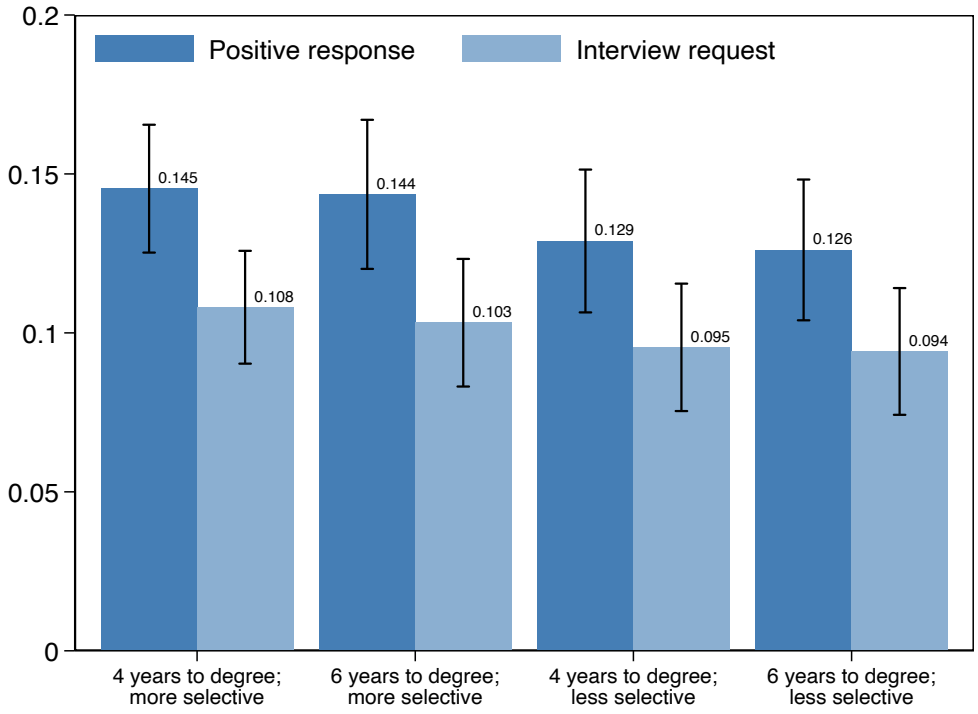
	Positive response rate (1)	Interview request rate (2)	Number of resumes (3)
Total	0.136	0.100	7,245
White man	0.144	0.112	1,735
White woman	0.142	0.106	1,805
Black man	0.137	0.097	1,872
Black woman	0.122	0.087	1,833
Business major	0.142	0.112	1,015
Marketing major	0.109	0.074	1,028
Accounting major	0.157	0.115	1,105
Economics major	0.133	0.103	1,031
Finance major	0.147	0.106	1,039
Business Management major	0.131	0.094	1,023
Business Economics major	0.131	0.097	1,004
BA degree	0.133	0.098	3,639
BS degree	0.139	0.102	3,606
1st resume sent	0.141	0.103	1,910
2nd resume sent	0.138	0.102	1,840
3rd resume sent	0.134	0.099	1,780
4th resume sent	0.129	0.096	1,715

Notes: This table shows the number of resumes sent and response rates by characteristics of the fictitious applicants.

while suppressing the constant term. Equation 2 pools the treatments into indicators for whether the resume lists six years to degree (relative to listing four years to degree) and whether the resume lists a selective college (relative to listing a less selective college). Occasionally, I add to Equation 2 the interaction between $1(\text{Six years to degree}_i)$ and $1(\text{Selective college}_i)$ to test for differences in the time to degree effect between more and less selective colleges. Following the recommendation from Lahey and Beasley (2009) and the convention in the literature (e.g., Darolia et al., 2015; Deming et al., 2016; Kline et al., 2022), I cluster standard errors at the job vacancy level in all analyses to account for non-independence of errors within firms.

In either equation I occasionally include a set of controls for other information listed on the resume including college major, the degree type (BA or BS), gender, race, the work experience and skill template, and formatting details. These controls are not necessary for internal validity, but they can slightly improve precision by reducing residual variance in the outcome.

Figure 1. Employer response rates by resume treatment



Notes: This figure shows coefficients from a regression of employer responses on indicators for the four resume treatment types.

Figure 1 summarizes the results in the full sample. The figure presents response rates by the four resume treatments using Equation 1. Small differences exist between resumes listing six years to degree relative to listing four years to degree. For resumes listing a bachelor's degree from a more selective college, those that also list six years to degree have response rates 0.1 percentage points lower. For resumes indicating a less selective college, those listing six years to degree receive response rates 0.3 percentage points lower. Neither of these differences are statistically significant. Meanwhile, regardless of time to degree, resumes listing a more selective college receive higher response rates than resumes listing a less selective college.

Column 1 of Table 4 presents the regression estimates from the pooled specification in Equation 2. Overall, resumes listing 6 years to degree have a response rate only 0.2 percentage points lower than resumes listing 4 years to degree, and this is not a statistically significant difference. Listing a more selective college, however, increases employer response rates by a statistically significant 1.7 percentage points, a 13 percent increase, relative to listing a less selective college.[3] Column 2 shows that including resumes controls produces nearly identical results.

The standard errors allow me to rule out a time to degree effect larger in magnitude than -1.8 percentage points (or -13.2 percent). In other words, I can rule out negative effects of time to degree as large as my estimated effect of listing one of the more selective colleges in my data, or as large as my estimated difference in response rate for resumes whose name suggested the applicant was a black woman relative to resumes whose name suggested the applicant was a white man (-14.6 percent). Putting my estimates into context of other resume audit studies with similar settings, my estimates rule out negative effects of time to degree as large as the effect of listing a for-profit college relative to a nonselective public college (-22 percent) (Deming et al., 2016), the effect of listing internship experience on resumes (13-14 percent) (Nunley et al., 2016; Baert et al., 2021), or the effect of listing a college GPA between 3.2–3.95 relative to listing a GPA between 2.5–3.2 (30 percent) (Quadlin, 2018).

Employers could interpret the time to degree signal differently between graduates of more or less selective colleges. For instance, the positive signal of attending a more selective college could mitigate any delayed graduation penalty. On the other hand, since longer time to degree is less common at more selective colleges, delayed graduation could represent a particularly negative signal to employers. To test for these dynamics, column 3 of Table 4 adds the interaction term between the indicators for six years to degree and selective college. The time to degree effect implied by these estimates is -0.3 percentage points for resumes listing a less selective college and -0.2 percentage points for resumes listing a more selective colleges.

[3]Comparing this estimate to others in the literature, Deming et al. (2016) find no significant difference in callback rates between resumes listing a selective public college and those listing a nonselective public college. However, given the stratified experimental design they use, this estimate may suffer from bias coming from spillover effects between resumes sent to the same job. See Phillips (2019) and my analyses in Section 4.4 for more details on bias from spillover effects in resume audit studies. Gaddis (2015) finds that listing an "elite" college on resumes increases employer response rates by 71 percent relative to listing a less selective college, although the difference between college groups are much greater (e.g., Harvard vs. UMass Amherst) than in my experiment.

Table 4. Full sample estimates

	(1)	(2)	(3)	(4)
Panel A: Positive response outcome				
6 years to degree	-0.002	-0.003	-0.003	-0.003
	(0.008)	(0.008)	(0.011)	(0.011)
	[-1.4%]	[-2.1%]	[-2.3%]	[-2.3%]
Selective college	0.017**	0.018**	0.016	0.019
	(0.008)	(0.008)	(0.011)	(0.011)
	[13.2%]	[14.0%]	[12.4%]	[14.7%]
6 years to degree × Selective college			0.001	-0.001
			(0.016)	(0.016)
Resume controls		✓		✓
Observations	7,245	7,245	7,245	7,245
Panel B: Interview request outcome				
6 years to degree	-0.003	-0.004	-0.001	-0.001
	(0.007)	(0.007)	(0.010)	(0.010)
	[-3.0%]	[-3.8%]	[-1.3%]	[-1.3%]
Selective college	0.011	0.012	0.013	0.014
	(0.007)	(0.007)	(0.010)	(0.010)
	[11.4%]	[12.3%]	[13.3%]	[15.0%]
6 years to degree × Selective college			-0.004	-0.005
			(0.014)	(0.014)
Resume controls		✓		✓
Observations	7,245	7,245	7,245	7,245

Notes: The outcome in Panel A is an indicator variable for a positive response from the potential employer. The outcome in Panel B is an indicator for an interview request from the employer. Columns 2 and 4 include controls for other attributes of the resume including college major, the degree type (BA or BS), gender, race, city, the work experience and skill template, and formatting details. Standard errors are clustered at the job vacancy level and shown in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$). Estimates in terms of percent changes relative to the appropriate comparison response rate mean are shown in brackets.

The test of a different time to degree effect between more and less selective colleges is not statistically significant. Results are nearly identical when including resume

controls in column 4.[4]

Panel B of Table 4 shows the full sample results using the interview request outcome. While the estimates of the effect of listing 6 years to degree (-0.3 percentage points, -3 percent) are slightly larger in magnitude than with the positive response outcome, the estimates are qualitatively similar across outcomes. The estimates of the effect of listing a more selective college are not statistically significant with the interview request outcome, but the magnitude of the effects are similar to the positive response outcome. For both treatments, the differences in the estimates across outcomes are not statistically significant.[5] For all remaining analyses, the results continue to be qualitatively very similar between the positive response and interview request outcomes, with no substantive differences in the takeaways, despite some differences in the levels of statistical significance of the estimates. Thus, I focus on the positive response outcome for the remainder of the paper for the sake of brevity. However, all figures also show the interview request outcomes, and corresponding estimates with the interview request outcome can be found in the appendix.

Finally, I test for differences in the effects of the educational treatments by the gender and race of the applicant which is signaled by the names listed on the resumes. Results for men and women applicants are reported in columns 1 and 2 of Table A6 and Figure A2, while results for White and Black applicants are reported in columns 3 and 4 of Table A6 and Figure A3. The point estimates for listing 6 years to degree and listing a selective college are both larger in magnitude for men applicants and for White applicants compared to women and Black applicants, respectively. Although, for both men and White applicants, the estimates of the time to degree effect are not statistically significant at conventional levels.

[4] Table A5 shows the full sample estimates while also reporting the coefficients on the resume controls.

[5] I use a stacked regression to carry out a test for differences in estimates across outcomes. First, I duplicate each resume observation in my sample. The first copy of each resume uses the positive response as the outcome, while the second copy of each resume use the interview request as the outcome. I then regress this outcome on the treatment indicators, an indicator for whether the outcome is the interview request outcome, and interactions between the treatments and the interview request outcome indicator. The coefficients on these interactions terms, which are not statistically significant, represent the test for differences in the treatment estimates across outcomes.

4 Interpretation

The main finding from the full sample analyses is that, while resumes listing a more selective college receive a response rate advantage, there is not a significant advantage for resumes listing graduation in four years relative to six years. A simple interpretation of this result is that, on average, many employers do not value time to degree as a signal of applicant quality. This section presents supplemental analyses to engage with alternative interpretations of the main results. First, I test whether estimates may be attenuated due to employers viewing applicants who graduated within four years as overqualified for the job and thus less likely to accept a job offer than those graduating in six years. Second, I assess whether employers simply did not notice the differences in time to degree indicated on the resumes. Third, I examine the robustness of the results to different subsamples of jobs. Lastly, I assess whether my estimates may be attenuated by bias from spillover effects between resumes sent to the same job.

4.1 Do estimates reflect employers' assessments of applicants with a different time to degree?

The results of the experiment broadly suggest that employers do screen resumes for signals of applicant quality, which is consistent with prior literature. For instance, I reject the hypothesis that employer response rates are equal across the work history templates listed on the resumes. Despite the resumes being designed to be similar to each other, employers are generally quite responsive to differences in resume attributes.

Since the full sample estimates find a small and statistically insignificant negative effect of a longer time to degree, does this imply that employers view the skills of applicants with different time to degree to be similar? One possible alternative explanation is that applicants listing 4 years to degree were not a good match for the jobs in my sample and that applying to a different set jobs would have revealed a larger negative effect of listing 6 years to degree. For example, employers in my sample may have viewed 4-year graduates as being unlikely to accept their job offer because they thought the 4-year graduates were over-qualified for their jobs or likely to get an offer to a better job. This phenomenon has been referred to as "reverse discrimination" in audit studies based on applicant characteristics like race and gender (Bertrand and Mullainathan, 2004). If some employers are

"reverse discriminating" against 4-year graduates, this could be what is leading to the small differences in response rates by time to degree that I observe in the full sample.

To test for whether "reverse discrimination" explains the full sample results, I assess how the results differ by the quality of the job, using expected salary as a proxy for job quality. Specifically, I split the sample of resumes by whether the jobs they were sent to are above or below the median expected salary and run the analyses separately for each subsample.[6] If "reverse discrimination" explains the small estimated effect of time to degree in the full sample, I would expect to see a larger time to degree effect among higher salary jobs where there is less mismatch between applicant and job quality. Meanwhile, I would expect a smaller, or perhaps even a positive, effect of time to degree among lower salary jobs where it is more likely that employers viewed 4-year graduates to be unlikely to accept their job offer and instead targeted 6-year graduates.

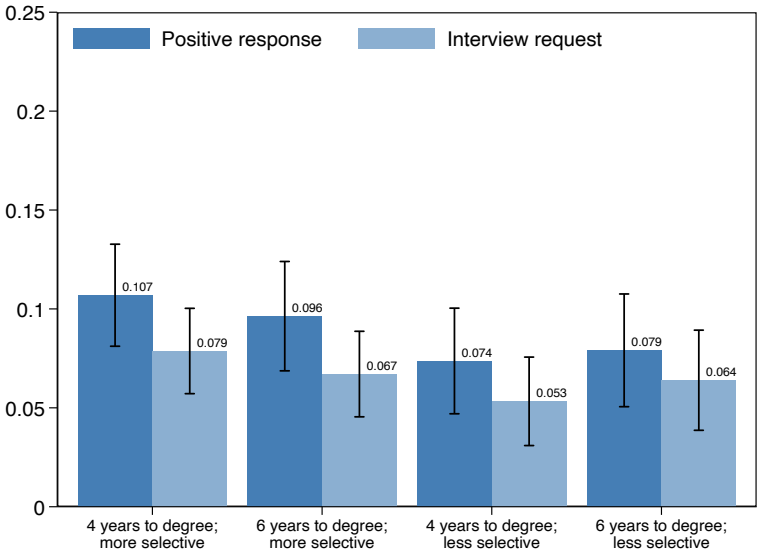
The results presented in Figure 2 and columns 1 and 2 of Table 5 shows little evidence of "reverse discrimination" based on time to degree, at least in the full sample. The estimated effect of listing six years to degree is actually larger in percentage point terms among lower salary jobs compared to higher salary jobs. But because overall response rates are much higher among lower salary jobs, these estimates are similar in magnitude when converted into percentages. Meanwhile, the effect of listing a more selective college is much higher among higher salary jobs, at about 33 percent (2.5 percentage points), compared to 4 percent (0.7 percentage points, and not statistically significant) among lower salary jobs.

These analyses highlight two takeaways: 1) It appears that lower salary jobs reverse discriminate against applicants from more selective colleges, preferring instead to pursue candidates from less selective colleges who may be more likely to accept their job offers. 2) It does not appear that employers are reverse discriminating against 4-year graduates, implying that this phenomena is not contaminating my full sample estimates.

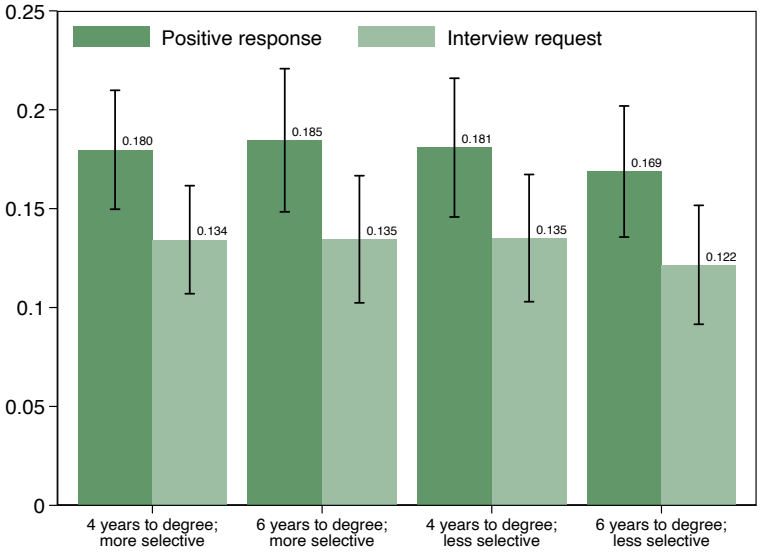
[6] I calculated a separate median for each of the salary data sources in my data. For jobs where the salary was listed on the job posting by the employer, the median was $50,000. For jobs where an estimated salary was listed on the job posting by Indeed, the median was $49,600. For jobs that I scraped Indeed's salary search tool (that did not include salary on the job posting), the median was $71,000. When a salary range was reported on the job posting, I use the low end of the range when characterizing jobs as "higher" or "lower" salary. The results do not depend on this decision.

Figure 2. Results by job quality

(a) Higher salary jobs



(b) Lower salary jobs



Notes: This figure shows results from a regression of employer responses on indicators for the four resume treatment types separately by the expected salary of the job the resume was sent to. Panel (a) shows results for jobs above the median in expected salary, while panel (b) shows results for jobs below the median in expected salary.

Table 5. Results by job opening characteristics

	Higher salary (1)	Lower salary (2)	More applicants (3)	Fewer applicants (4)
6 years to degree	-0.002	-0.004	-0.025**	0.022**
	(0.010)	(0.012)	(0.012)	(0.011)
	[-2.2%]	[-2.2%]	[-16.1%]	[19.0%]
Selective college	0.025**	0.007	0.014	0.020*
	(0.010)	(0.012)	(0.011)	(0.011)
	[32.7%]	[4.0%]	[10.3%]	[17.1%]
Observations	3,413	3,821	3,713	3,520

Notes: The dependent variable in the table above is an indicator variable for a positive response from the potential employer. Columns 1 and 2 split the sample by whether the job was above or below the median expected salary. Columns 3 and 4 split the sample by whether the job posting had above or below the median number of applicants. Standard errors are clustered at the job vacancy level and shown in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$). Estimates in terms of percent changes relative to the appropriate comparison group's mean response rate are shown in brackets.

4.2 Do employers notice time to degree on resumes?

Another interpretation of the small and not statistically significant estimates of the effect of time to degree in the full sample is that employers simply do not notice differences in time to degree indicated on resumes. While there is evidence that employers can notice fine details on resumes such as the range of years enrolled in high school to indicate applicant age (Lahey, 2008) and date ranges to indicate unemployment duration (Kroft et al., 2013), there is no prior empirical evidence to suggest employers notice college enrollment year ranges to indicate time to degree.

To assess whether employers can notice time to degree indicated on resumes, I focus on a subset of jobs that have a larger applicant pool where competition among applicants is relatively high and employers can be more selective with the characteristics they use to screen applicants. In larger applicant pools, the expected quality differences between applicants tend to be smaller than in smaller applicant pools (Scullen, 2013). It is more likely that the best applicant is significantly higher quality than the next best applicant in a small pool than in a large pool. Thus, in larger applicant pools, employers may be more likely to look towards relatively less

important resume characteristics, such as time to degree, to differentiate between their best candidates.

The counterargument would suggest that time to degree may be more irrelevant in larger applicant pools since employers may have plenty of acceptable candidates they would be willing to pursue and only need to consider the characteristics that are most important to them. However, since employers generally face time constraints, they cannot simply interview all applicants that have the characteristics most important to them and must use other characteristics to differentiate between applicants. In other words, my argument is that time to degree may be the type of characteristic that some employers only use as a way to break the tie between similarly ranked applicants. If any employers do use time to degree to screen applicants, it may be most likely to occur among jobs with larger applicant pools.

To conduct this analysis, I split the sample at the median number of applicants and run the analyses separately for each subgroup. Figure 3 and columns 4 and 5 of Table 5 report the results.[7] Among jobs with larger applicant pools, a response rate penalty emerges for resumes listing six years to degree. For resumes listing a more selective college, there is a response rate penalty of about 2.3 percentage points (p-value = 0.178) for listing six years to degree relative to four years to degree. Meanwhile, there is a 2.6 percentage point penalty (p-value = 0.102) for listing six years to degree among resumes also listing a less selective college. While these within-college selectivity estimates are not statistically significant at conventional levels, pooling across college types reveals a statistically significant 2.5 percentage point decrease in response rates for listing six years to degree.

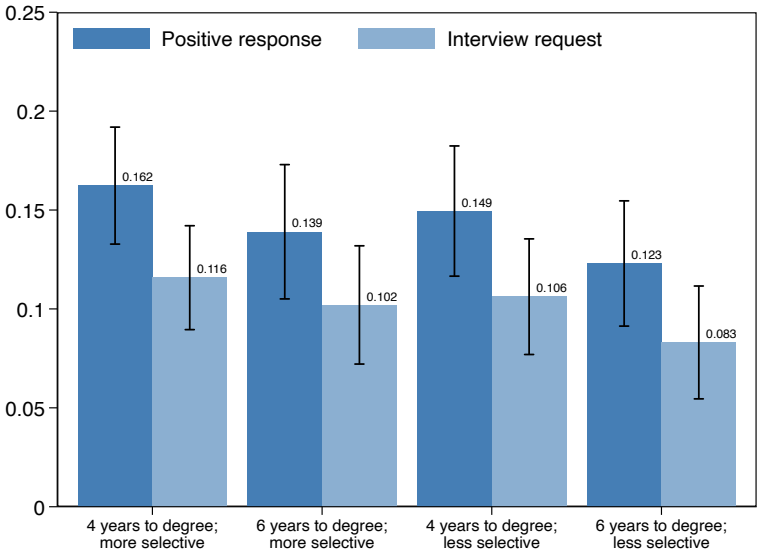
For jobs with smaller applicant pools, there is actually evidence of a positive effect of listing six years to degree. For instance, among resumes listing a more selective college, those also listing six years to degree receive response rates 2.1 percentage points higher (p-value = 0.218) than those listing four years to degree. This delayed graduation penalty is 2.3 percentage points (p-value = 0.101) among resumes listing a less selective college. The pooled specification estimates a statistically significant 2.2 percentage point effect of listing six years to degree.

These results suggest that employers do seem to recognize time to degree and some use it to screen applicants when the applicant pool is particularly competitive. The positive effect of a longer time to degree among jobs with smaller applicant pools could be a case where employers are more aggressive in pursuing lower qual-

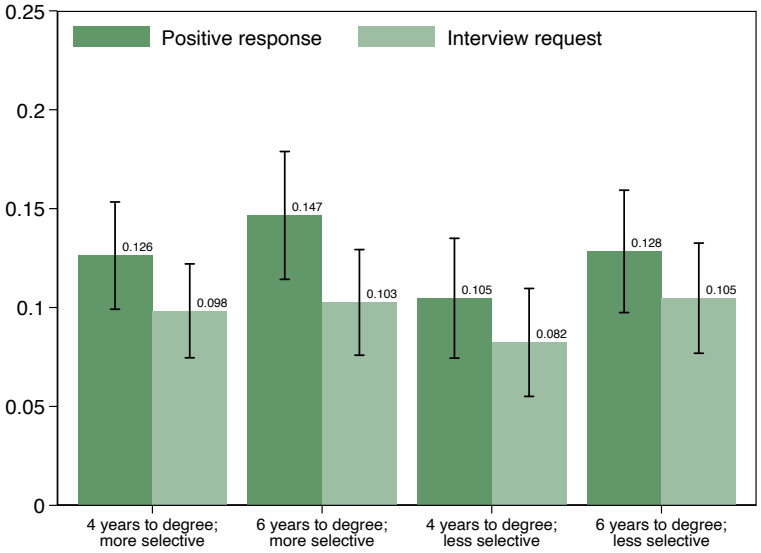
[7] Table A7 shows the results using the interview request outcome.

Figure 3. Results by number of applicants

(a) More applicants



(b) Fewer applicants



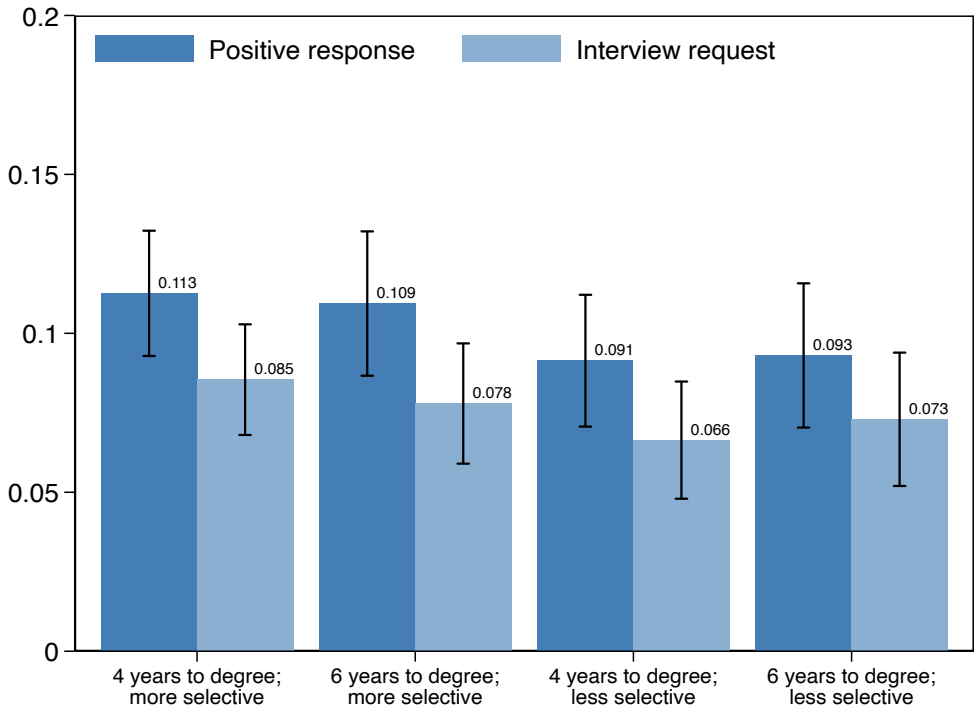
Notes: This figure shows results from a regression of employer responses on indicators for the four resume treatment types separately by the number of applicants to the job posting. Panel (a) shows results for jobs above the median number of applicants, while panel (b) shows results for jobs below the median number of applicants.

ity candidates who are perceived to be more likely to accept a job offer. Although, the data cannot rule out that employers of these jobs with small applicant pools could simply prefer the skills of candidates with longer time to degree.

4.3 Robustness to alternative subsamples

I also examine the robustness of the main results to excluding certain jobs from the sample. A potential concern with the study setting is that the full sample results are driven by jobs that are looking to hire multiple candidates for their open positions. If these jobs have relatively low standards for responding to applicants, it could be the case that characteristics like time to degree simply may not be important if hiring standards are lower than usual. In Figure 4 and column 1 of Table A9 I exclude job postings that indicate they are hiring multiple candidates to focus on jobs where resumes characteristics are plausibly considered with greater scrutiny. In this subset of jobs, the results look very similar to the full sample results.

Figure 4. Employer response rates excluding jobs hiring multiple candidates



Notes: This figure shows coefficients from a regression of employer responses on indicators for the four resume treatment types excluding jobs that indicated that the employer was looking to hire multiple candidates for the position.

I also consider whether jobs of a single occupation solely drive the results. In columns 2 through 7 of Table A9 I report results from sequentially excluding a single occupation category from the sample. There is some variation in the coefficients across the samples for estimates of both time to degree and college selectivity, suggesting that the effects of the educational treatments are not homogeneous across occupations. However, the results are qualitatively similar across the samples and there is little evidence that results are driven by jobs in a single occupation.

4.4 Are estimates attenuated by bias from spillover effects between resumes?

Phillips (2019) documents theoretically and empirically that resumes in audit studies have spillover effects on each other. While it seems plausible in theory that a high quality applicant could have either a positive or negative effect on the other applicants in the pool, Phillips (2019) shows that these spillover effects are positive: resumes randomly assigned to compete against higher quality applicant pools receive *more* callbacks. Phillips (2019)'s theory to explain these spillover effects is that employers statistically discriminate by using the quality of a given applicant to infer the quality of the rest of the applicant pool. Thus, when a high quality resume is added to an applicant pool, the chances the other resumes in the pool will receive a callback increase. An alternative theory is that employers desire to interview a certain number of candidates for a position and will not interview any of the candidates in the pool if this number is not achieved. Thus, an additional high quality applicant may increase the chances that other applicants in the pool receive a callback by increasing the chances the employer decides to engage with the pool altogether.

These spillover effects will bias treatment effect estimates in audit studies that send exactly one of each treatment type to each job vacancy, known as a stratified design. In these stratified designs, the average treatment statuses of the *other* resumes sent by the experimenter to the same job will be unbalanced across the *own*-resume treatment types. In my setting, for example, if I sent one of each of the four resume types listed in Section 2.1 to each job opening, then each resume listing a less selective college would be competing with one other resume listing a less selective college and two resumes listing a more selective college. Meanwhile, each resume listing a more selective college would compete against two resumes listing a less selective college and one resume listing a more selective college. Thus, the average college characteristics of the other resumes sent to the same job

opening are unbalanced across the resume treatments, and the associated spillover effects of each resume will confound the estimates of the treatments. Since the spillover effects tend to be positive, the bias results in attenuation of the estimates, understating differences in employer response rates across resume treatments.

With the knowledge that spillover effects will bias treatment effect estimates with a stratified design, I used a non-stratified design where the composition of resume types submitted to each job is completely random, ensuring that the treatment statuses of the other resumes sent to the same job will be balanced across the own-resume treatment types. Thus, the spillover effects should "net-out" and the treatment effect estimates will not be biased by the within-vacancy spillover effects.

Nevertheless, since my estimate of the effect of listing 6 years to degree on a resume is close to zero, it is worth testing whether this estimate is close to zero due to bias from within-vacancy spillover effects, even though my experiment was designed to avoid this bias. An additional benefit of the non-stratified design is that it provides the means to explicitly test for the presence of spillovers ex-post. All that is required to carry out this test is to include the share of other resumes I sent to the same job that list the educational treatment characteristics to Equation 2. Specifically, this tests whether the treatment types of the *other* resumes sent to the same job influences the probability that a given resume gets a response. The non-stratified design makes this test possible since these other resume treatment types are exogenous to the own-resume treatments.

Column 1 of Table 6 reprints the main estimates while excluding a small number of observations where only one resume was submitted to a job, since those singleton observations will be dropped naturally in the specifications in subsequent columns of the table. Column 2 of Table 6 carries out the test for spillovers. Having all other resumes I sent to the same job listing a selective college, relative to zero other resumes listing a selective college, increases the probability of a given resume getting a response from an employer by 4.3 percentage points. This is evidence of spillover effects in terms of the college selectivity treatment. The magnitude of these spillovers is consistent with the spillovers documented in Phillips (2019). Meanwhile, I estimate no significant spillovers coming from time to degree treatment.

Notice that, when comparing columns 1 and 2, the coefficients on resumes' *own* treatments remain essentially unchanged after including the treatment character-

Table 6. Test of within-vacancy spillovers

	(1)	(2)	(3)
Own resume listing...			
6 years to degree	-0.002	-0.002	-0.001
	(0.008)	(0.008)	(0.006)
Selective college	0.017**	0.018**	0.003
	(0.008)	(0.009)	(0.006)
Share of other resumes to same job listing...			
6 years to degree		-0.006	
		(0.020)	
Selective college		0.043**	
		(0.021)	
Job vacancy fixed effects			✓
Observations	7,154	7,154	7,154

Notes: The dependent variable in the table above is an indicator variable for a positive response from the potential employer. Column 2 includes variables that represent the share of other resumes sent to the same job that list the two educational treatments. Column 3 includes fixed effects for the job vacancy. Standard errors are clustered at the job vacancy level and shown in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

istics of the other resumes sent to the same job opening. Thus, accounting for the possible spillover effects that my resume treatments have on each other do not change my main estimates. Despite the fact that spillover effects exist in my setting (at least in terms of the college selectivity treatment), these spillover effects do not bias my estimates.

The cost of using a non-stratified design is that job vacancy fixed effects cannot be included in the estimation without reintroducing bias from spillover effects, since the other resume treatment statuses are not balanced within job openings by construction after conditioning on the vacancy fixed effects. Recall that some job openings could receive, for example, three resumes listing a more selective college and one listing a less selective college. Thus, forcing the treatment effect estimates to come only from within-vacancy variation will remove the balance of other resume characteristics that my non-stratified design creates and reintroduce

the bias from spillover effects. While job vacancy fixed effects are not necessary for internal validity, they would improve precision of the estimates.

For illustrative purposes, column 3 adds the job vacancy fixed effects. Comparing columns 1 and 3, the coefficient on 6 years to degree remains similar, but the coefficient on selective college changes dramatically, dropping close to zero. This attenuation on the estimate of the effect of listing a selective college is consistent with bias from spillovers as documented by Phillips (2019). This further highlights the value of my non-stratified experimental design.

5 Conclusion

This paper asks how employers value otherwise-identical job seekers who completed bachelor's degrees in different amounts of time. I use a resume audit study in which resumes were sent to thousands of online job openings for entry-level business jobs to estimate the causal effect of indicating taking six years to complete a bachelor's degree on a resume relative to listing four years to degree on employer response rates.

In the full sample of jobs, I estimate small and statistically insignificant negative effects of listing six years to degree on resumes relative to listing four years to degree. Response rates differ by only 1-2 percent (0.2-0.3 percentage points). I also find no evidence in the full sample that the effect of time to degree differs by the selectivity of the college where the bachelor's degree was earned. I do find a 13 percent increase (1.7 percentage points) in response rates for resumes listing a more selective college, and this premium increases to 33 percent among jobs in the top half of the distribution of expected salary. There is evidence of some heterogeneous effects of time to degree based on characteristics of the job opening. In particular, there is a negative effect of time to degree among jobs with larger applicant pools.

Together, these results suggest that many employers do not place a significant value on time to degree as a signal of an applicant's quality. But it appears that some do. When applicant pools are larger, applicants face more competition and employers can be more selective in who they respond to. In these more competitive environments employers may begin to weigh resumes characteristics like time to degree more heavily. Or, it is possible that employers that draw larger applicant pools for their open positions could have more sophisticated or simply different processes for screening applicants.

My results provide evidence that colleges and students should not have significant concerns about the initial labor market consequences of delayed graduation. Employers may only value time to degree on the margin when job openings are particularly competitive. Even so, the skills and employment experiences that graduates are able to list on their resumes likely will be more valuable than time to degree. If students can afford it, extending college enrollment beyond the standard on-time amount of time may not have large private costs, especially if the extended enrollment allows a student to pursue a major in a more lucrative field. However, issues of the affordability of extended enrollment should not be minimized. The tuition costs and opportunity costs associated with extended enrollment are often large and worthy of consideration. Policy efforts should continue to focus attention on helping students to graduate, regardless of whether it takes an extra couple of years to do so. And given the continued labor market benefits, policies should also focus on guiding students toward higher quality colleges, if and where possible.

Finally, the experimental results warrant a few caveats. First, it should be noted that the context of this experimental study is fairly specific. Given the college enrollment ranges listed on the resumes, it is implied that the graduates in my study were enrolled in college during the Covid-19 pandemic. Reporting from the National Student Clearinghouse shows that 6-year graduation rates have dropped modestly for cohorts entering college in 2016 and 2017 relative to the 2015 entering cohort (Lee and Shapiro, 2023). It is possible that employers are more lenient about delayed graduation after the onset of the pandemic than before. However, for similar reasons, graduating in four years may be viewed as more impressive now than before the pandemic, so it is unclear how the pandemic may have influenced the results. Also, the audit study occurred during a relatively tight labor market, and it also considered only jobs within business occupations. Results could conceivably be different in other labor market conditions and in other occupations, although business occupations are the most common jobs held by bachelor's degree graduates and I applied to jobs in a regionally diverse set of cities.

Second, while this paper provides evidence of only small labor market consequences of delayed graduation, more research is warranted to provide a comprehensive understanding of the possible dynamics. For instance, a limitation of the audit study method is that I only observe initial contacts from employers. While there is evidence that employer response rates are informative about later hiring de-

cisions (Lanning, 2013; Quillian et al., 2020), it is possible that larger effects of time to degree materialize in later stages of the hiring process. Also, my experimental design ensured that applicants with a different time to bachelor's degree the same (on average) across all other information on the resumes, and the reason for why applicants took more or less time to finish their degree was left ambiguous. The particular reasons for delayed graduation, some of which may end up on a resume while others may not, could be important in determining outcomes. Finally, my study naturally conditions the analysis on graduation. The true labor market costs of extending college enrollment beyond the standard on-time number of years may be at the graduation margin. In this indirect way, time to degree should remain an important area of study, especially given the evidence on the returns to having a college degree relative to not having a college degree.

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A Appendix Tables and Figures

Table A1. Correlates of Delayed Graduation

	(1)	(2)	(3)	(4)
Stopped out	0.251***	0.252***	0.188***	0.187***
	(0.014)	(0.013)	(0.013)	(0.013)
Placed on academic probation	0.168***	0.112***	0.099***	0.096***
	(0.019)	(0.019)	(0.018)	(0.018)
Withdrew from course or incomplete grade	0.090***	0.077***	0.066***	0.065***
	(0.010)	(0.010)	(0.010)	(0.010)
Repeated a course for higher grade	0.191***	0.129***	0.063***	0.065***
	(0.011)	(0.011)	(0.011)	(0.011)
Took remedial courses	0.119***	0.048***	-0.001	0.003
	(0.011)	(0.011)	(0.012)	(0.012)
Transferred any credits	0.133***	0.112***	0.108***	0.111***
	(0.009)	(0.009)	(0.009)	(0.008)
Changed major	0.028***	0.031**	0.023**	0.026**
	(0.010)	(0.010)	(0.009)	(0.009)
SAT score (100s)		-0.054***	-0.025***	-0.030***
		(0.003)	(0.003)	(0.003)
College GPA (0.1s)		-0.010***	-0.019***	-0.017***
		(0.001)	(0.001)	(0.001)
Female				-0.103***
				(0.009)
Black				-0.047**
				(0.018)
Hispanic				-0.010
				(0.017)
Asian				-0.030*
				(0.016)
College fixed effects			✓	✓
College major fixed effects			✓	✓
Observations	11,515	11,515	11,515	11,515

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. The data source is the 2008 bachelor's degree graduating cohort of the Baccalaureate and Beyond survey. The sample includes first-time bachelor's degree graduates 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. Descriptions of Work History and Skills Templates

Panel A: Work History Templates	Listed jobs
Template #1	Barista, Starbucks Customer Service Associate, [Target/Walmart]
Template #2	Sales Associate, [The GAP/Old Navy] Barista, [On-campus coffee shop]
Template #3	Student Tutor, [On-campus] Food Service Worker, [On-campus]
Template #4	Office Assistant and Peer Counselor, [On-campus] Customer Service Representative, [On-campus]
Panel B: Skills Templates	Listed skills
Template #1	Microsoft Office Database management Proficient in Spanish
Template #2	Microsoft Word, Excel, and Powerpoint Adobe InDesign and Illustrator Excellent written and verbal presentation skills Detail-oriented, team player
Template #3	Microsoft Office Salesforce CRM SQL Reliable, quick learner
Template #4	Microsoft Word, Excel, Powerpoint, and Outlook Proficient in Salesforce Intermediate skills in Adobe software suite
Template #5	Microsoft Office suite Proficient in Spanish Excellent communicator Reliable, quick learner, hard worker
Template #6	Microsoft office Experienced in project management Organized problem solver

Notes: This table shows descriptions of the information for the templates that are used to populate the work experiences and skills sections on the resumes.

Table A3. Balance tests - Resume characteristics

	More selective; TTD = 4 years (1)	More selective; TTD = 6 years (2)	Less selective; TTD = 4 years (3)	Less selective; TTD = 6 years (4)	F-test p-value (5)
Woman	0.485	0.495	0.525	0.501	0.097
Black	0.510	0.515	0.502	0.514	0.859
BA degree	0.505	0.487	0.508	0.509	0.526
BS degree	0.495	0.513	0.492	0.491	0.526
Business major	0.144	0.138	0.141	0.134	0.809
Marketing major	0.141	0.156	0.139	0.140	0.395
Accounting major	0.151	0.144	0.150	0.161	0.560
Economics major	0.146	0.139	0.146	0.134	0.663
Finance major	0.135	0.142	0.148	0.146	0.649
Business Management major	0.135	0.153	0.138	0.140	0.427
Business Economics major	0.148	0.128	0.138	0.145	0.303
Work history template 1	0.253	0.245	0.251	0.246	0.928
Work history template 2	0.256	0.255	0.253	0.246	0.907
Work history template 3	0.251	0.250	0.239	0.260	0.518
Work history template 4	0.239	0.250	0.257	0.248	0.665
Skill template 1	0.183	0.168	0.165	0.154	0.119
Skill template 2	0.167	0.174	0.164	0.161	0.755
Skill template 3	0.171	0.166	0.164	0.171	0.905
Skill template 4	0.165	0.156	0.164	0.167	0.816
Skill template 5	0.155	0.162	0.167	0.175	0.426
Skill template 6	0.158	0.174	0.175	0.172	0.515
tgbonum font	0.264	0.251	0.247	0.237	0.280
lmodern font	0.239	0.255	0.252	0.256	0.632
times font	0.255	0.240	0.242	0.255	0.602
charter font	0.242	0.253	0.259	0.252	0.661
Format template 1	0.249	0.252	0.251	0.254	0.991
Format template 2	0.265	0.263	0.234	0.244	0.080
Format template 3	0.248	0.249	0.249	0.249	1.000
Format template 4	0.238	0.235	0.266	0.254	0.111

Notes: This table shows results of tests of balance of resume characteristics. I regress each characteristic on indicators for the four resume types and execute an F-test with a null hypothesis that the coefficients are jointly equal to zero. Columns 1-4 show the share of resumes with the resume characteristic for each resume type. Column 5 shows the p-value from the F-test.

Table A4. Balance tests - Assignment to job openings

	More selective; TTD = 4 years (1)	More selective; TTD = 6 years (2)	Less selective; TTD = 4 years (3)	Less selective; TTD = 6 years (4)	F-test p-value (5)
Higher salary	0.471	0.459	0.486	0.478	0.412
More applications	0.501	0.500	0.527	0.508	0.330
Multiple hires	0.171	0.175	0.162	0.177	0.674
Atlanta	0.191	0.185	0.184	0.190	0.910
Chicago	0.137	0.134	0.143	0.146	0.718
Dallas	0.101	0.114	0.104	0.095	0.291
Los Angeles	0.065	0.079	0.084	0.078	0.166
New York City	0.224	0.201	0.217	0.216	0.364
Philadelphia	0.095	0.101	0.098	0.101	0.909
San Francisco	0.185	0.186	0.171	0.173	0.461
Sales jobs	0.181	0.191	0.188	0.192	0.841
Marketing jobs	0.093	0.107	0.101	0.103	0.528
Finance jobs	0.240	0.238	0.242	0.242	0.986
Accounting jobs	0.175	0.163	0.168	0.169	0.822
Business Administration jobs	0.133	0.122	0.141	0.134	0.398
Customer service/management jobs	0.104	0.103	0.089	0.091	0.290
Other occupation jobs	0.075	0.077	0.072	0.070	0.856
1st resume sent	0.262	0.260	0.265	0.275	0.722
2nd resume sent	0.258	0.254	0.263	0.241	0.442
3rd resume sent	0.231	0.261	0.238	0.244	0.173
4th resume sent	0.249	0.226	0.234	0.240	0.411
Sent in morning	0.394	0.394	0.392	0.391	0.999
Sent in afternoon	0.389	0.371	0.367	0.375	0.536
Sent in evening	0.193	0.208	0.216	0.213	0.319
Sent in late night	0.024	0.027	0.025	0.020	0.563
Sent on Sunday	0.059	0.057	0.056	0.061	0.959
Sent on Monday	0.119	0.121	0.133	0.124	0.577
Sent on Tuesday	0.169	0.177	0.175	0.173	0.923
Sent on Wednesday	0.176	0.178	0.163	0.174	0.479
Sent on Thursday	0.208	0.203	0.192	0.213	0.445
Sent on Friday	0.155	0.163	0.160	0.165	0.852

Notes: This table shows results of tests of balance of characteristics of the assignment of resumes to job openings. I regress each characteristic on indicators for the four resume types and execute an F-test with a null hypothesis that the coefficients are jointly equal to zero. Columns 1-4 show the share of resumes with the resume characteristic for each resume type. Column 5 shows the p-value from the F-test.

Table A5. Full Sample Estimates, with Coefficients on Resume Controls

	Positive response (1)	Interview request (2)
6 years to degree	-0.003	-0.003
	(0.008)	(0.007)
Selective college	0.018**	0.012
	(0.008)	(0.007)
White man	(reference)	(reference)
White woman	-0.002	-0.006
	(0.010)	(0.009)
Black man	-0.007	-0.015*
	(0.010)	(0.009)
Black woman	-0.021**	-0.025***
	(0.010)	(0.009)
Business major	(reference)	(reference)
Marketing major	-0.033**	-0.038***
	(0.015)	(0.013)
Accounting major	0.015	0.003
	(0.016)	(0.014)
Economics major	-0.008	-0.009
	(0.015)	(0.013)
Finance major	0.006	-0.006
	(0.015)	(0.013)
Business Management major	-0.011	-0.019
	(0.015)	(0.013)
Business Economics major	-0.010	-0.016
	(0.015)	(0.013)
Work history template #1	(reference)	(reference)
Work history template #2	0.016**	0.015**
	(0.007)	(0.006)
Work history template #3	0.009	0.007
	(0.007)	(0.006)
Work history template #4	0.024***	0.018***
	(0.007)	(0.006)
Skills template #1	(reference)	(reference)
Skills template #2	0.010	0.006
	(0.011)	(0.010)
Skills template #3	0.020*	0.015
	(0.011)	(0.010)
Skills template #4	0.010	0.004
	(0.011)	(0.010)
Skills template #5	0.026**	0.025***
	(0.011)	(0.009)
Skills template #6	0.022**	0.020**
	(0.011)	(0.010)
Observations	7,245	7,245

Notes: Standard errors are clustered at the job vacancy level and shown in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Table A6. Heterogeneity by applicant characteristics

	Men applicants (1)	Women applicants (2)	White applicants (3)	Black applicants (4)
Panel A: Positive response outcome				
6 years to degree	-0.011	0.007	-0.010	0.005
	(0.012)	(0.011)	(0.011)	(0.011)
Selective college	0.025**	0.009	0.018*	0.016
	(0.012)	(0.011)	(0.011)	(0.011)
Observations	3,607	3,638	3,540	3,705
Panel B: Interview request outcome				
6 years to degree	-0.005	0.001	-0.006	0.000
	(0.010)	(0.010)	(0.010)	(0.010)
Selective college	0.014	0.008	0.024**	-0.002
	(0.011)	(0.010)	(0.010)	(0.010)
Observations	3,607	3,638	3,540	3,705

Notes: The outcome in Panel A is an indicator variable for a positive response from the potential employer. The outcome in Panel B is an indicator for an interview request from the employer. Columns 1 and 2 split the sample by the gender of the applicant. Columns 3 and 4 split the sample by the race that is common among the names on the resumes. Standard errors are clustered at the job vacancy level and shown in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Table A7. Results by job opening characteristics - Interview request outcome

	Higher salary (1)	Lower salary (2)	More applicants (3)	Fewer applicants (4)
6 years to degree	-0.000	-0.007	-0.019*	0.013
	(0.009)	(0.011)	(0.010)	(0.010)
Selective college	0.014	0.006	0.014	0.007
	(0.009)	(0.011)	(0.010)	(0.010)
Observations	3,413	3,821	3,713	3,520

Notes: The dependent variable in the table above is an indicator variable for an interview request from the potential employer. Columns 1 and 2 split the sample by whether the job was above or below the median expected salary. Columns 3 and 4 split the sample by whether the job posting had above or below the median number of applicants. Standard errors are clustered at the job vacancy level and shown in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$). Estimates in terms of percent changes relative to the appropriate comparison group's mean response rate are shown in brackets.

Table A8. Full sample estimates using a logit model

	Positive response		Interview request	
	(1)	(2)	(3)	(4)
6 years to degree	-0.002	-0.003	-0.003	-0.004
	(0.008)	(0.008)	(0.007)	(0.007)
Selective college	0.017**	0.018**	0.011	0.012
	(0.008)	(0.008)	(0.007)	(0.007)
Resume controls		✓		✓
Observations	7,245	7,245	7,245	7,245

Notes: This table uses a logistic model instead of a linear probability model. The outcome in columns 1-2 is an indicator variable for a positive response from the potential employer. The outcome in columns 3-4 is an indicator for an interview request from the employer.

Table A9. Results using alternative samples

	Excl. multiple hire jobs (1)	Excl. sales jobs (2)	Excl. marketing jobs (3)	Excl. finance jobs (4)	Excl. accounting jobs (5)	Excl. business admin. jobs (6)	Excl. customer service jobs (7)
6 years to degree	-0.001	-0.002	-0.001	-0.005	-0.000	-0.004	-0.007
	(0.008)	(0.009)	(0.009)	(0.010)	(0.009)	(0.009)	(0.008)
Selective college	0.019**	0.013	0.021**	0.019*	0.015*	0.023**	0.011
	(0.008)	(0.008)	(0.009)	(0.010)	(0.009)	(0.009)	(0.008)
Observations	5,988	5,888	6,519	5,509	6,031	6,287	6,548

Notes: The dependent variable in the table above is an indicator variable for a positive response from the potential employer. Each column excludes some type of jobs from the full sample. Column 1 excludes jobs the indicated the employers was hiring multiple candidates for the position. Columns 2 through 7 sequentially exclude jobs in a single occupation group. Standard errors are clustered at the job vacancy level and shown in parentheses (* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$).

Figure A1. Example resume

Emily Martin

1000 Redwood Ln
Athens, GA 30606
(385) 450-7351
emily.martin3421@gmail.com

Education

2018-2022 University of Georgia – Athens, GA
B.S. in Finance

2014-2018 Midtown High School – Atlanta, GA

Work Experience

Student Tutor
University of Georgia – Atlanta, GA
2021-2022

- Provided instruction to diverse groups of students
- Developed supplemental course materials, and helped to thoroughly explained assigned coursework
- Taught tailored large-group review sessions before exams

Food Service Worker
University of Georgia – Athens, GA
2019-2021

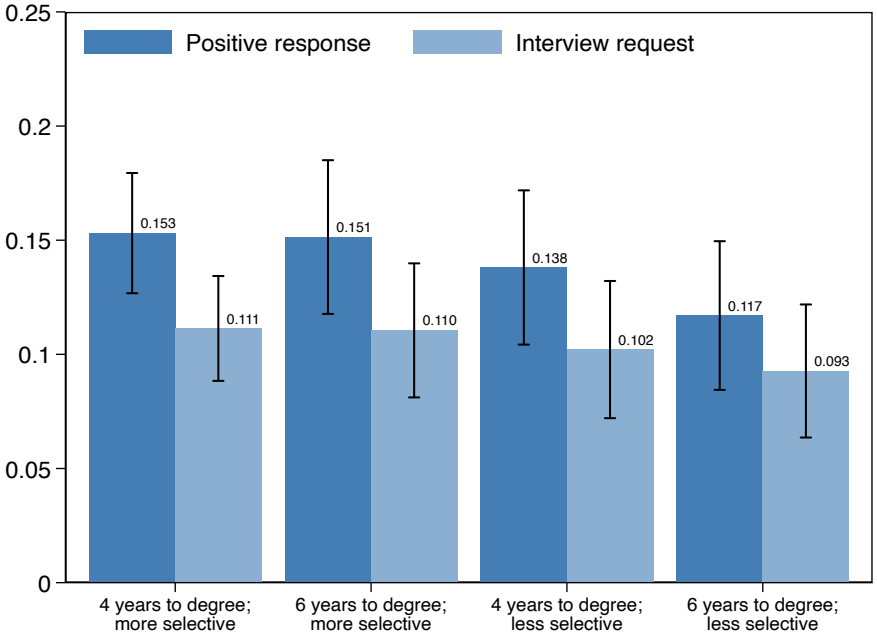
- Engaged in preparing foods, cleaning facilities and equipment, and preparing serving meal lines
- Responsible for the supervision and training of new food service employees on dining hall procedures
- Provided excellent customer service while handling varying sums of money as a cashier

Skills

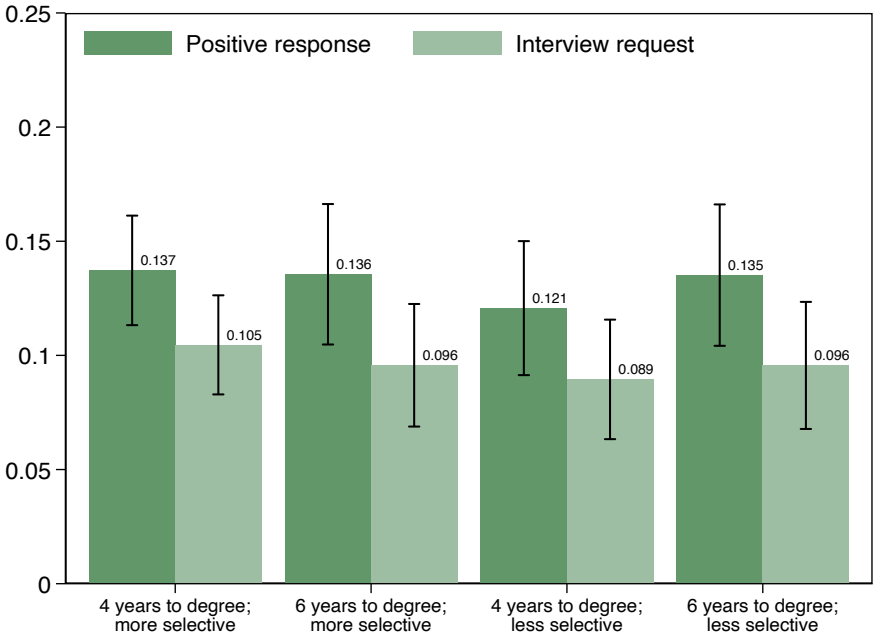
- Microsoft Office suite
- Proficient in Spanish
- Excellent communicator
- Reliable, quick learner, hard worker

Figure A2. Results by gender of the applicant

(a) Men



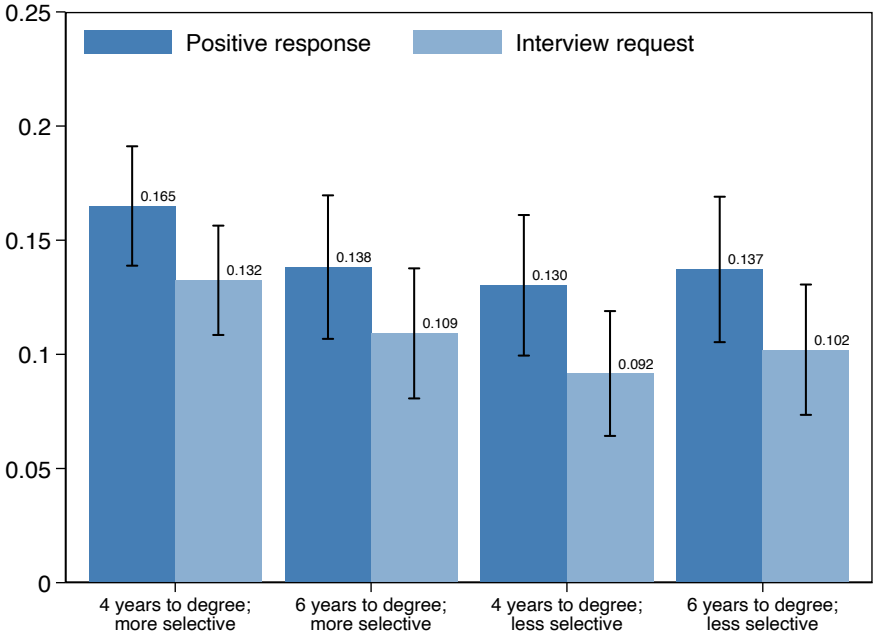
(b) Women



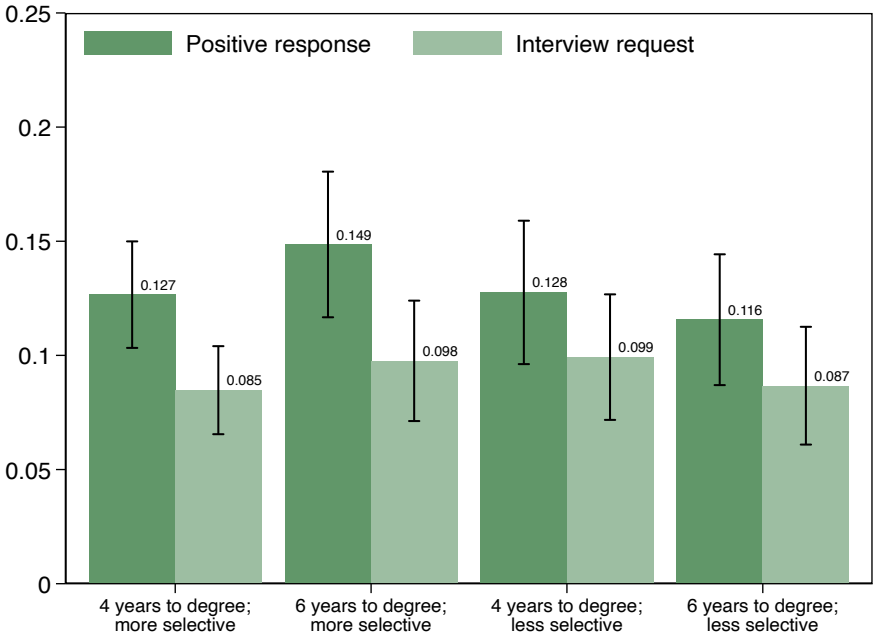
Notes: This figure shows results from a regression of employer responses on indicators for the four resume treatment types separately by the gender of the applicant. Panel (a) shows results for men applicants, while panel (b) shows results for women applicants.

Figure A3. Results by race of the applicant

(a) White applicants



(b) Black applicants



Notes: This figure shows results from a regression of employer responses on indicators for the four resume treatment types separately by the race of the applicant implied by the name on the resume. Panel (a) shows results for names common for white applicants, while panel (b) shows results for names common for black applicants.