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The Value of Postsecondary Credentials in the Labor Market: An Experimental Study
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ABSTRACT

We study employers' perceptions of postsecondary degrees using a field experiment. We randomly assign the sector (for-profit vs. public) and selectivity of institution to fictitious resumes and send them to real vacancy postings on a large online job board. We find that a bachelor's degree in business from a for-profit "online" institution is 22 percent less likely to receive a callback than a similar degree from a non-selective public institution. For health jobs that do not require a certificate, we find that a certificate from a for-profit institution is 57 percent less likely to receive a callback than a similar certificate from a public community college. For reasons that differ by each set of jobs, we find no difference in callback rates by postsecondary sector for business jobs that do not have degree requirements and we also find no difference for health jobs that require a certificate and valid license. Bachelor's degrees from selective public institutions are relatively more likely to receive callbacks from employers posting higher-salaried jobs, suggesting that employers value both college quality and the likelihood of a successful match when contacting job applicants.

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I. Introduction

The large increase in the U.S. college wage premium since 1980 strongly suggests that the supply of educated labor has not kept pace with its demand (Goldin and Katz 2008; Autor 2014). One impediment is that inflation-adjusted state funding of postsecondary education has stagnated since the mid-1990s and declined substantially in the last decade. The result is higher net tuition and fees for college students in public institutions (Baum and Ma 2014). Somewhat counteracting that trend is a marked increase in the generosity of federal Title IV financial aid. The for-profit sector has taken advantage of federal government largesse, as well as the increased demand for educated workers, to enlarge its presence in the postsecondary education market.

For-profit colleges account for 42 percent of postsecondary enrollment growth from 2002 to 2012, at which time they enrolled nearly one in seven U.S. college students.[1] For-profits have also driven a rapid increase in online enrollment. The 23 largest for-profit institutions, owned by publicly traded companies and offering postsecondary degrees entirely online, enrolled more than 1.1 million students in 2012 and accounted for nearly 20 percent of the growth of U.S. bachelor's degrees in the last decade. Yet little is known about how employers value for-profit degrees and online credentials.

In this paper we experimentally assess employers' perceptions of postsecondary degrees from different types of institutions using a resume audit study design. We draw upon an online bank of actual resumes of job seekers to construct fictitious, but realistic, resumes that randomly vary the fictitious job applicant's characteristics including postsecondary institution. We use these resumes in applying to job vacancies in five major U.S. metropolitan areas posted on a large, nationally-recognized job search website. Our experiment asks the straightforward question: Are employers more (or less) likely to express interest in a job applicant when the credential is from a particular institution?

We examine differences in callback rates by the presence of a degree or credential on the resume and by the type of postsecondary institution. We focus on three main comparisons: for-profit institutions vs. public institutions; for-profits that are primarily online vs. "brick and mortar" for-profits with an established local presence; and more-selective vs. less-selective public-sector institutions.

The job vacancies to which our fictitious applicants apply are in the business and health fields. The fictitious resumes have postsecondary credentials ranging from short, industry-relevant certificates to bachelor's degrees. We focus on job seekers who have just completed their schooling. We select vacancies that request only minimal work experience to maximize the

[1] These tabulations are based on authors' calculations using the Integrated Postsecondary Education Data System (IPEDS) downloaded from http://nces.ed.gov/ipeds/.

salience of the postsecondary credential to prospective employers.

We find that applicants with bachelor's degrees (BAs) in business from large online for-profit institutions are about 22 percent (2 percentage points) less likely to receive a callback than applicants with similar degrees from non-selective public schools, when the job vacancy requires a BA. But applicants with BAs from smaller "brick and mortar" for-profit colleges with a local presence are not significantly less likely to receive a callback than are applicants with BAs from public institutions.

Also with regard to the business positions, we find no mean difference in callback rates for resumes with BAs from selective vs. non-selective public institutions. But we find a strong, positive interaction between job quality and college selectivity with regard to the callback rate. Specifically, we find that applicants with degrees from more-selective public institutions are *less* likely to receive a callback for low-salaried jobs but *more* likely to receive a callback for high-salaried jobs. Employers, it appears, value college quality but also consider the likelihood of a successful match when contacting potential job candidates.

Many job postings do not state that applicants must have a postsecondary degree. For business job openings that do not require a postsecondary credential, we find no significant overall advantage to having one. Resumes with an associate's degree from a public or a for-profit institution are no more likely to receive a callback than resumes with identical work experience but no postsecondary degree at all.

Turning to the health jobs, we find that certificates from for-profit institutions are about 57 percent less likely to receive a callback than are similar certificates from public institutions, when the posting does not require a degree (primarily medical assistants). However, we find no significant difference in callback rates by type of postsecondary institution for health jobs (such as practical nursing and pharmacy technician) that require both a certificate and a valid occupational license. One explanation for this finding is that an occupational license sends a strong signal of competence to employers so that the identity of the postsecondary institution is unimportant conditional on the license. It is worth noting that our estimates will not fully capture differences in the expected return to postsecondary credentials by type of institution to the extent that licensure pass rates vary by sector.

For jobs without a degree requirement (for both the business and health positions), we find that any postsecondary degree (for-profit or public) significantly increases the probability of receiving a callback for whites but *decreases* the probability of receiving a callback for nonwhites. These results are consistent with those of Bertrand and Mullainathan (2004), who find that the racial gap in callbacks widens with resume quality.[2]

[2] Unlike Bertrand and Mullainathan (2004), we do not find significant mean differences in callback rates by race.

Few existing studies have attempted to estimate the labor market returns to a for-profit college degree. Research on this question has been hampered by data limitations and the lack of a credibly causal research design (Cellini and Chaudhary 2013; Deming, Goldin and Katz 2012; Lang and Weinstein 2013).

Contemporaneous with our study, Darolia et al. (2014) conducted an analogous field experiment examining employer perceptions of sub-baccalaureate degrees from for-profit versus public institutions. Our studies differ in many respects. But for the range of jobs (business and health) and credentials (sub-baccalaureate degrees and certificates) where there is overlap, the results are similar. An exception is health jobs that do not require a degree for which we find a large difference in callback rates by postsecondary sector and Darolia et al. (2014) find none.

Among the differences is that we examine various levels of postsecondary qualifications including the BA, whereas Darolia et al. (2014) limit their analysis to certificates and associates degrees granted by for-profit institutions. Our inclusion of resumes with BAs allows us to study jobs with higher skill qualifications and to examine variation in impacts by the selectivity of four-year public institutions. Darolia et al. (2014) focus on for-profit institutions with a physical location in each labor market, whereas we include a mix of in-person and online for-profit institutions and test for differences across the two groups. We study job openings and credentials only in business and health, while Darolia et al. (2014) also include administrative assistant and information technology openings. Finally, we collect data from job titles and job descriptions that allow us to examine heterogeneity in the effects of various qualifications by measures of job quality, such as the average salary.

Our study follows a long tradition of resume audit studies examining how employers respond to the characteristics of job seekers including race, gender, age, immigrant status and nationality, work experience, and unemployment duration (e.g. Bertrand and Mullainathan 2004; Eriksson and Rooth 2014; Ghayad 2013; Hinrichs 2013; Kroft, Lange and Notowidigdo 2013; Lahey 2008; Oreopoulos 2011; Riach and Rich 2002). As in previous work, our main outcome is employer contact (measured by callbacks) rather than the actual offer of a job. Moreover, differences in callback rates are a measure of employers' *perceptions* of applicant quality, rather than measuring actual differences in skill acquisition across educational institutions.

Nonetheless, our results suggest that employers value bachelor's degrees and certificates from public institutions more highly than they do those from for-profit institutions. The finding is notable given the high cost of for-profit institutions, both to students and to taxpayers. Yearly net tuition and fees at for-profit colleges are about 80 percent higher than at public four-year institutions.[3] One study estimates that the total cost of education (including public subsidies) is

[3] Authors' calculations using the 2012 National Postsecondary Student Aid Survey (NPSAS), accessed through the IES QuickStats web application (http://nces.ed.gov/datalab/quickstats/default.aspx) on September 8, 2014.

about 60 percent higher at for-profits compared to public institutions (Cellini 2012). Seven of the ten largest distributors of Pell Grant dollars are online for-profit institutions, and the for-profit sector overall receives about 25 percent of all Federal Title IV aid and is involved in about half of all Federal loan defaults (Deming, Goldin and Katz 2012).

The rest of this paper is organized as follows. Section II lays out the context for our study with basic background information on for-profit and online higher education, plus a discussion of the proper interpretation of our findings in light of the resume audit design. Section III describes the details of the experimental design, such as the labor markets studied and the jobs to which we applied, the details of resume construction, and the logistics of applying to eligible job vacancies. Section IV presents the main results. Section V provides additional results on job quality and discusses the interpretation of the results. Section VI concludes.

II. Background and Prior Research

The for-profit postsecondary education sector has tripled in size in the last 15 years, and in 2012 represented about 13.3 percent of all postsecondary enrollments and 23.8 percent of all undergraduate completions in the United States (Deming, Goldin and Katz 2012).[4] The enormous increase in U.S. for-profit sector enrollment has been driven almost entirely by large "chain" schools, many of which are owned by large, publicly-traded corporations (Deming, Goldin and Katz 2012).[5]

Rapid enrollment growth in the for-profit sector may have been fueled by declining state government support for public higher education. Cellini (2009) shows that for-profit colleges in California were more likely to open in local markets after community college bond referenda failed to pass. From 2000-2001 to 2010-2011, the share of public institutional revenues from federal and state sources fell from 79 to 66 percent in two-year institutions and from 70 to 54 percent in four-year institutions, with net tuition and fees making up the difference (Baum and Ma 2014). Time to degree has lengthened and completion rates have declined as students receive fewer public resources per capita and face difficulty enrolling in courses that are necessary for graduation (Barr and Turner 2013; Bound, Lovenheim and Turner 2012; Deming, Goldin and Katz 2013; Pearson Foundation 2011).

Whereas public institutions receive subsidies from state and local governments, for-profit colleges are more heavily reliant on federal student aid. Title IV-eligible for-profit institutions relied on Title IV student aid (i.e., Pell Grants and Stafford Loans) for about 76 percent of their

[4] Enrollment and completion figures are based on the authors' calculations using IPEDS. Undergraduate completions are defined as certificates or diplomas, associate's degrees and bachelor's degrees. The share of completions is higher than the share of enrollments in part because for-profits are more likely to offer short programs of study (Deming, Goldin and Katz 2012).

[5] For-profit higher education also has a growing international presence.

total revenue in 2011-2012.[6] The University of Phoenix alone accounted for $800 million in Pell Grants in 2012-2013, nearly four times the amount of the largest public institution. Cellini (2010) shows that increases in the maximum Pell Grant award over the last decade encouraged for-profit entry, and Cellini and Goldin (2014) document that for-profit Title IV eligible institutions charge higher tuition than comparable institutions that are not Title IV eligible.

Deming, Goldin and Katz (2012) document the most rapid enrollment growth has occurred among a small number of very large "chain" for-profits that offer programs and degrees online. Although many postsecondary institutions offer courses online in some form, the largest for-profit institutions either have a separate online campus or no physical campus at all.[7] In 2012, 23 large for-profit online campuses awarded nearly 75,000 bachelor's degrees (more than 5 percent of the U.S. total), up from about 4,000 a decade earlier. Importantly, the for-profit share of both bachelor's degrees and online enrollment has continued to expand in spite of the negative press and increased regulatory attention paid to the sector in recent years.[8] The rise of online campuses has occurred almost entirely in the for-profit sector, but public institutions are increasingly competing for students online, perhaps in response to cost pressures (Hoxby 2014). At the time of writing at least four major public universities (University of Maryland, Arizona State, Penn State and Colorado State) had enrolled students in online "global" campuses.

The few studies that estimate the labor market returns to for-profit college degrees and certificates focus on comparing observationally-similar students across sectors (Cellini and Chaudhary 2013; Deming, Goldin and Katz 2012; Lang and Weinstein 2013). Since for-profit college students are more disadvantaged on observed characteristics than students in public colleges, any observational research design can lead to a downward-biased estimate of the returns to for-profit college attendance relative to other types of institutions if there is similar sorting on unobservables (Deming, Goldin and Katz 2013). Moreover, given the tight link between public sector funding shortfalls and for-profit expansion, the appropriate counterfactual

[6] Authors' calculations using public disclosures of proprietary school revenue under the Higher Education Act available at https://studentaid.ed.gov/about/data-center/school/proprietary. Nearly all larger for-profit institutions, and all the schools studied here, are Title-IV eligible. Cellini and Goldin (2014) discuss the non-Title IV for-profit postsecondary sector.

[7] Deming, Goldin and Katz (2012) define a school as "online" if no more than 33 percent of its students are from a single U.S. state. In this paper we employ an updated definition that uses the following survey question, included by the U.S. Department of Education on the annual IPEDS survey of institutions for the first time in 2012: "Are all the programs at your institution offered completely via distance education?" We call a school "online" if the answer is "yes" to this question, if the word "online" is in the school's name, or (in a few cases) if a campus branch of a chain institution is known to house online students. IPEDS data are collected at the campus level, so we can separate "University of Phoenix – Online Campus" from the other brick-and-mortar branches, for example. This definition is conservative since some students may be taking courses online despite being enrolled at a physical campus.

[8] Authors' tabulations from the IPEDS indicate that the for-profit share of all U.S. bachelor's degrees awarded grew from 2.5 percent in 2000 to 6 percent in 2007 to 10 percent in 2012. The share of bachelor's degrees awarded by "online" institutions grew from 0.5 percent in 2000 to 1.5 percent in 2005, 4 percent in 2010, and to over 6 percent in 2012. See Appendix Figures 1 and 2 for details.

for for-profit college attendance might be no college at all.[9] Data and research design constraints have limited the ability of previous work to examine heterogeneity in returns by degree level or field and prevented the examination of the labor market returns to degrees awarded online.

Our research design circumvents these problems by experimentally varying the information about job candidates observed by employers. Because we randomly assign institution name and degree to otherwise identical resumes (in expectation), any difference in callback rates (up to sampling error) represents a causal difference in how employers perceive degrees from each type of institution.

The audit study design has several important limitations, however. We emphasize that we measure employers' *perceptions* of applicant quality, not the actual differences in human capital acquisition across sectors. We test whether employers statistically discriminate against applicants with certain types of degrees, regardless of whether such beliefs are correct. We choose institutions with name recognition and/or an established local presence to minimize the risk that differences in callbacks result from employer ignorance about a particular institution. Our hope is that an employer's decision whether to contact an applicant reflects past experience with graduates of that institution.

A second limitation is that the outcome of interest is an employer callback rather than wages or a job offer.[10] If the probability of an interview or job offer, conditional on a callback, differs by institutional type or degree, the absence of information beyond a callback may be a concern. For example, employers may perceive some degrees to have higher variance than others, leading employers to be differentially likely to request an interview (and eventually extend an offer) conditional on the expected mean quality of the applicant (Heckman and Siegelman 1993; Neumark 2012). We address this concern by examining whether our results differ when we consider only employer contacts to set up an interview (an indicator of strong interest), rather than generic callbacks. Employers might also be concerned that an applicant is too qualified and would not accept the job if offered. In this "reverse discrimination" story, a lower callback rate would actually be evidence of *higher* perceived quality. We address this concern by studying how callback rates by institution type differ between high- and low-salaried jobs. We also note that in-person audit studies typically find that group differences in callback rates for interviews closely mirror group differences in job offer rates (Mincy 1993).

Another limitation of the research design is that our measure of employer perceptions is limited to direct applications from unfamiliar applicants. Yet institutions may differ in their formal connections with employers or in their ability to place students through informal channels

[9] Gilpin, Saunders and Stoddard (2013) find for-profit institutions expand enrollment in occupations experiencing employment growth, but community colleges do not respond similarly. Thus, marginal students might be choosing between a for-profit college and no college (or a program in some other field).
[10] Lanning (2013) calibrates a search model based on past in-person audit studies and shows that wage gaps can result from even small differences in job offer rates.

(Rosenbaum, Deil-Amen and Person 2006). Additionally, while our study focuses on students who have completed their degrees, *ex ante* differences in the probability of degree completion across institutions are an important consideration. Using a longitudinal sample of students who began in 2003 and were followed for six years, Deming, Goldin and Katz (2012) compare completion rates across public and for-profit institutions after controlling for student characteristics. Students in for-profit institutions, they found, are more likely to complete a short certificate program, equally likely to complete an associate's degree program, but less likely to complete a bachelor's degree program, compared with similar students in public institutions.[11]

Despite these limitations, we believe that our experiment is informative about employer preferences for *marginal* students, meaning job applicants who could plausibly have attended either a public or a for-profit institution, or no college at all. Our experimental design tries to create resumes with characteristics drawn from the "common support" across all types of institutions, and to reproduce an important part of the actual job search process for newly-minted graduates at each of those institutions.[12]

III. Experimental Design

A. Study Setting: Degrees, Occupations, and Labor Markets

We focus on degrees and certificates awarded in the two largest occupational categories in the United States: business and health.[13] Table 1 lists the occupation groups and degrees that we study: associate's degrees and bachelor's degrees in two broad business occupations (accounting/finance and customer service/sales/marketing), and certificates in four different health professions.[14] In 2012, about 43 percent of certificates and diplomas were awarded in health fields, and 12 percent of associate's degrees and 21 percent of all bachelor's degrees were awarded in the field of business.[15] These awards are spread relatively evenly across postsecondary sectors. The business field accounts for 10 percent of all associate's degrees and

[11] Consideration of differential attrition across institutional types thus strengthens our finding of lower callback rates among for-profit BAs: finishing a for-profit BA degree very likely involves more positive selection from the group of enrollees than finishing a BA in the public sector. The logic applies in the opposite direction for the certificates and AAs.

[12] As such, our study does not necessarily generalize to students whose characteristics make them highly likely to attend a particular type of institution (public or for-profit).

[13] IPEDS groups degrees and certificates into occupational categories using the Classification of Instructional Programs (CIP) coding scheme.

[14] The "allied health" professions, defined as health support roles for nurses, doctors and pharmacists, include ten of the 20 fastest growing occupations projected by the Bureau of Labor Statistics from 2012 to 2022 (http://www.bls.gov/ooh/fastest-growing.htm).

[15] The next largest categories for bachelor's degrees include health (8.5 percent), social sciences (7.9 percent), psychology (6.1 percent) and education (6.0 percent). The largest category for associate's degrees is liberal arts (31 percent), which is often the degree of community college students intending to transfer to a four-year institution. Health also comprises 21.6 percent of associate's degrees.

16 percent of all bachelor's degrees in public institutions, as compared with 20 and 43 percent among for-profits. And 33 percent of all certificates awarded by public institutions are in the health category, whereas the figure is 53 percent for the for-profits.

We group business jobs into two broad categories: jobs that require either no degree or, in rare cases, an associate's degree; and jobs that require a bachelor's degree. In practice, nearly all jobs in the first category do not have formal degree requirements.[16] However, it is quite common for employers to require a bachelor's degree, and jobs that require a bachelor's degree appear to be qualitatively different from jobs that require less. Col. (3) of Table 1 gives a sense for this distinction by listing sample job titles in each degree category.

Among health occupations, Licensed Practical Nursing and Pharmacy Technician jobs universally require a certificate from an accredited institution and a valid license. All of our resumes in these categories have these credentials. Medical Assistant vacancies (both administrative and clinical) do not always require a certificate or a specific license.

Our source of job openings is a large, nationally recognized online job search website.[17] During March 2014, this website listed about 32,000 new vacancies per day and about 60,000 new vacancies over successive three-day periods. Based on a comparison between these numbers and data from the BLS Job Openings and Labor Force Turnover Survey (JOLTS), we estimate that the job search website in our study captured between 15 and 24 percent of all U.S. job openings in March 2014.[18] The average share of all full-time job vacancies on the online job search website that fall into each occupation category is given in Table 1, col. (4).[19]

We apply to jobs that require four or fewer years of work experience, including entry-level positions. The focus on entry-level and early career positions has two advantages for our study. First, the identity of the postsecondary institution is arguably most salient to potential employers early in the career. All of our resumes list a school award date between April and June 2014, maximizing the salience of the credential to employers. Second, four years of post-high school work experience is roughly consistent with the modal age (about 23) for students who obtain degrees from for-profits and community colleges (Deming, Goldin and Katz 2012).

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[16] It is not uncommon for vacancies to say "associate's degree preferred."

[17] Our IRB prohibits us from revealing the name of the site.

[18] According to JOLTS, there were 4.17 million total nonfarm job openings (not seasonally adjusted) in the U.S. in March 2014. We use the 72 and 24 hour windows as estimates of the lower and upper bounds (respectively) of the number of new job vacancies per month posted on this job website. Some of the jobs posted over successive 24 hour periods may be duplicate listings. It is also common for employers to post job vacancies for only a day or two before pulling them down.

[19] We compute this share by taking the ratio of the full-time job vacancies in the last 24 hours within a particular occupation category (based on keyword searches) to all full-time job vacancies in the last 24 hours. We do this for three consecutive days in March 2014 and take the average to arrive at the shares in Table 1. Note that some vacancies may fall into multiple categories (e.g., customer service and finance) so the total shares across all categories could sum to more than one.

We conduct our study in five of the largest metropolitan labor markets in the United States: Chicago, Los Angeles, Miami, New York City and the San Francisco Bay Area.[20] The labor markets in our study represent about 20 percent of all postsecondary awards and about 16 percent of all full-time job vacancies in the United States. We study large labor markets to ensure sufficient overlap of degrees awarded and occupations across public and for-profit institutions. In many smaller markets, just one or two institutions offer a majority of postsecondary credentials, often within a single sector. Moreover, there are returns to scale in applying to similar types of jobs within the same labor market.

B. Resume Construction and Job Applications

1. Postsecondary Institutions

The degrees in our study have been designed to be representative of the postsecondary credentials awarded within each of our sample labor markets, occupations and sectors. We sampled from the larger programs in each labor market so that our institutions are roughly proportional to the share of awards given out in 2012, based on IPEDS data. In 2012, among degrees awarded in the for-profit sector, online institutions accounted for 50 percent of associate's degrees in business and 60 percent of bachelor's degrees in business. Therefore, we adopted the convention that at least half of all for-profit degrees on resumes that we sent to business jobs would come from online institutions, with the other half coming from local brick-and-mortar institutions in rough proportion with their 2012 enrollment. When there was no for-profit offering an in-person program in the locality, then all for-profit degrees on the resumes would come from online institutions.[21] We used local public institutions (weighted by size) in all cases.[22] To increase the probability that employers were familiar with the degree programs in our study, we imposed the restriction that every institution had to have been operating in the local labor market (or have been online) for at least eight consecutive years.

Our study includes four-year public institutions of varying selectivity. At least half of all public bachelor's degrees come from the least selective public institutions in the combined statistical area (CSA) as measured by the 2012 Barron's rankings, while the rest come from more selective institutions.[23] For example, in the two California labor markets, less-selective

[20] We search for jobs within the combined statistical area (CSA) definition of the labor market. Appendix Table 1 lists the CSAs in our study and their importance for postsecondary awards and job vacancies.
[21] There was an established local for-profit college offering associate's degrees in four of the five labor markets, and bachelor's degrees in two of the five labor markets. See Appendix Table 2 for details.
[22] Many community colleges offer courses online, but these are typically not fully online but, rather, part of a hybrid program with face-to-face contact. Moreover, in states such as California, Texas and Florida, students who live in the community college district receive preferential tuition pricing and course access.
[23] The non-selective institutions are rated "Competitive" or "Less Competitive" (i.e., the bottom 50 percent and bottom 20 percent of the selectivity distribution), and the selective institutions are rated "Very Competitive" or "Highly Competitive." Selective public institutions ended up being somewhat less than half of the sample of resumes with public bachelors' degrees due to logistical issues in some cities.

institutions are Cal State schools, and more-selective institutions are University of California schools. All public two-year degrees come from local community colleges, in rough proportion to 2012 enrollment in the local labor market. See Appendix Table 2 for a complete list of institutions that were included in the study.

Not surprisingly, online institutions award a very small share of diplomas and certificates in allied health. Many administrative programs, and nearly all of the clinical health programs, require the completion of an externship at a local hospital or healthcare provider. Therefore, all of our resumes for health jobs list local institutions in rough proportion with their total share of certificates in each category.

2. Work Experience

We populate our resumes with actual work histories, using resumes drawn from a large employment website that contains more than two million resumes for the five labor markets that we study. We find resumes of job seekers in each labor market and occupation group who attended the degree programs in our study, and we collect their actual work experience profiles from the years preceding their graduation from the program. Whenever possible, we use complete work histories prior to post-secondary schooling without modification. In some cases we omit older jobs and we change employer names for small employers, such as professional offices. We draw an equal proportion of work histories from the resumes of individuals who attended public and for-profit institutions. The process generates a manageable number of work history templates, to which we randomly assign degrees from different institutions.

We assign four years of work experience to all of the resumes that we send to health jobs and business jobs that do not require a degree (or only require an associate's), and six years of work experience for business jobs that require a bachelor's degree. In all cases, work experience contains no breaks and is continuous from high school graduation and concurrent with the applicant's recently completed degree. When sampling from the online resume bank, we observe that the modal work history pattern for students in certificate and associate's degree programs is full-time work, although often in relatively low-skilled jobs. This finding is consistent with data from the 2012 National Postsecondary Student Aid study (NPSAS), which shows that more than two-thirds of undergraduates at both public and for-profit institutions worked for pay while enrolled in school.

Broadly, we observe two distinct work history profiles for students in bachelor's degree programs. The first is full-time work, and the second is intermittent full-time work with part-time jobs and internships. The former profile is more common for those attending for-profit institutions, whereas the latter is more common for students at public institutions. Therefore, we create a 2×2 design that matches these work history patterns with degrees from each sector. When possible, to draw from the space of resume characteristics with "common support," we

pull actual work histories from the "off-diagonal" groups (i.e., students who attended four-year publics but worked full-time, for-profit students who worked part-time).

When submitting resumes that do not list any degree or certificate, we simply hold work history constant (i.e., four or six years). The resume design implies that our estimate of the "return" to having a credential is relative to an otherwise identical resume, and does not include the opportunity cost of foregone employment. An alternative approach would have been to add years of work experience equal to the length of the degree, simulating the decision to continue working. Because of the increasing prevalence of work during college, even among traditional undergraduates, we decided to study the counterfactual that we believe is the more common and relevant one (Scott-Clayton 2012).

We summarize the basic structure of the experiment in Table 2. When applying to business vacancies that do not require a degree at all (or that require an associate's degree), we send four resumes with the following variation in credentials: no degree (high school diploma only); an associate's degree from a for-profit institution (either online or local); an associate's degree from a public institution; and a bachelor's degree from an online for-profit institution. When applying to business vacancies that require a bachelor's degree, we send two resumes with a BA from a for-profit and two resumes with a BA from a public institution. When possible, half of the resumes have a BA from an online for-profit and half have a BA from a local (brick and mortar) for-profit. In labor markets with no local for-profit that awards bachelor's degrees, all of the for-profits are online institutions. Similarly, the resumes with bachelor's degrees from a public institution are split evenly between less-selective and selective public institutions. Thus, our experimental design generates within-vacancy variation both in for-profit college type (local vs. online) and in public sector selectivity for business vacancies that require a BA.

For health jobs that require a credential, we send two resumes that list a certificate from a local public institution and two resumes that list a certificate from a local for-profit institution. All of these resumes include three years of non-medical, or "medical uncertified" work experience (e.g., working at the front desk in a doctor's office, or unlicensed care jobs such as home health aides). The resumes also include an externship completed concurrently with the certificate program. Most accredited programs in allied health require the completion of an externship of specified length (e.g., 75 hours, 160 hours) in a clinical setting. We draw these externships from actual resumes in the online resume bank.

For health jobs that do not require a credential, we send one resume of each of the public and for-profit types described above, with an externship plus three years of non-medical or "medical uncertified" experience. The third and fourth resumes do not have a diploma or certificate, but they vary in their work history profiles. The third resume is identical to the first and second except that it does not have a postsecondary credential. The fourth resume also has no credential, but contains one year of "relevant" work experience. The "relevant" work

experience is constructed by lengthening the spells of the externships on the resumes that include a credential and altering the description, when necessary, so that it appears to be full-time work.

Our goal in selecting work history templates was to find the "common support" across job seekers in a particular labor market and occupational category. We wanted our work history templates to look reasonably representative of students in each type of institution. We also wanted the work histories to be somewhat similar in quality, so that employers would reasonably be using the educational institution on the resume as a deciding factor in whom to select for an interview. Although it is possible that resumes are better on average for actual students who attend public (or for-profit) schools, our research design yields the impact of postsecondary institution for the *marginal* student whose work experience profile fits well at both types of institutions.

3. Skills, Race, Gender and Other Characteristics of the Resumes

We adopt a standard template for all resumes that lists (in order) name, contact information, degree, work history, and skills and additional information. Job seekers who post their resumes in the resume bank (from which we extracted work history information) are required to submit information in a series of fields. A resume is then produced using a standardized template. We follow the template exactly, except that we list degree directly beneath contact information to maximize salience (the default is to list the degree after work experience, which is more common among experienced job seekers). Most resumes have a "skills" section, which often includes knowledge of common software programs (i.e., Microsoft Office), standard certifications (i.e., CPR certification for health jobs), and sometimes claims of "soft" skills like "team player" and "detail-oriented." Similar to our method of assigning work experience, we select entire skills templates from actual graduates at each type of institution and randomly assign them across resumes. In cases where skills are extremely common (i.e., Microsoft Office), we assign them to all resumes.

We include a specific high school and graduation date on every resume. Listing the date of high school graduation bounds past work history and ensures that resumes are not hiding work history gaps, known to be important to employers (Kroft, Lange, and Notowidigdo 2013). It is not unusual for resumes with a postsecondary degree to list the name of the applicant's high school. Moreover, it is common for resumes that do not have a postsecondary credential to list a high school diploma and the school attended, perhaps because many jobs require applicants to have a high school diploma or GED. Using the Common Core of Data (CCD), we sort all regular (non-charter, non-specialized) high schools in a CSA by racial composition and select the four schools that represent the median student of each race. We randomly assign each of these high schools to resumes within a racial category.

We are also interested in the extent to which postsecondary educational credentials have differential impacts on employer callbacks by race and gender. Because past work has already

demonstrated the importance of demographics, we randomize race and gender *across job vacancies* to maximize power (Bertrand and Mullainathan 2004; Lahey 2008; Riach and Rich 2002). Specifically, we randomly send either four white males; four white females; four nonwhite males (two African-American, two Latino); or four nonwhite females to each vacancy. Postsecondary credentials are randomly assigned to the four resumes *within* each vacancy, and thus within each race and gender category. We follow past audit study conventions and signal race/ethnicity and gender through first and last names (e.g., Bertrand and Mullainathan 2004), choosing common names for each race/ethnicity and gender.[24]

Each resume lists an email address and a local phone number that we created to monitor callbacks. We use a standard voicemail recording that prompts callers to leave a message, and we record all callbacks and emails that were directed to the applicant (i.e., not mass emails to job candidates) as data. Following our IRB-required protocol, we destroyed the phone and email records immediately after collecting the relevant information for our study, and callbacks and email contacts were not answered. Finally, we generated four fictitious addresses in large apartment complexes within each labor market and randomly assigned them to resumes on the relatively rare occasions when an address was requested.

4. Job Application Procedure

The study was conducted between April and November of 2014. [25] The compressed time frame allowed us to apply for jobs with resumes that represented soon-to-be or newly-minted graduates of various degree and certificate programs.[26] Members of our research team were assigned to particular labor markets and degree programs and instructed to search daily for eligible jobs in each category using a combination of keyword searches and default occupational

[24] We chose common names, subject to the logistical constraint that the names conform to a common set of first and last initials so that we can re-use email addresses across names (e.g., tj251@gmail.com could be Timothy Johnson, Tyrone Johnson, or Tomas Jimenez).

[25] We sent business resumes between April and July 2014. At the end of July, we had our current sample of business jobs (N = 8,110 resumes). We sent out health resumes from April to July 2014 as well. But the much smaller number of health job postings (N = 1,460 through July 2014) did not provide us with adequate statistical power. Thus, we decided to send additional resumes in health from September through November 2014. The additional months boosted our sample of health job applications by more than 60 percent, and got us closer to our target for health jobs (from our pre-analysis plan filed with the American Economic Association Randomized Controlled Trial Registry on March 30, 2014). We pre-specified a study cutoff of December 1 based on our estimate of job flow and expected power, and did not analyze the results again until after the study was closed.

[26] All resumes listed the credential as having been or about to be completed in May of 2014. Analogous resumes sent further from graduation could be 1) graduates with a potentially long spell of unemployment altering the probability of callback (Kroft, Lange, and Notowidigdo 2013); 2) "off-cycle" graduates; or 3) students reentering the job market following or from a post-graduation job. Each could cloud the interpretation, so we elected to send resumes between April and July except in the case of health jobs where the smaller number of listings required us to extend the study through November.

classifications used by the website that are based on the Occupational Information Network classification scheme (O*NET).

In addition to the job requirements described in the previous section, we attempted to eliminate job postings from staffing companies and those that gave commission-based pay. Our concern with staffing companies was that their postings were meant to add applicants to a resume pool, rather than actual job vacancies. Commission-based jobs did not appear to provide stable employment opportunities for graduates of postsecondary programs (e.g., "20 free sales leads!"). We managed to eliminate most, but probably not all, staffing companies and commission-based pay jobs.

After identifying a set of vacancies that satisfied the requirements of our study, members of our research team generated resumes with randomly assigned combinations of characteristics using the *Resume Randomizer* program developed by Lahey and Beasley (2009). The four generated resumes were then uploaded to each job vacancy in random order and using different accounts for each resume. After completing each application, key information about the job was saved including firm name, job title, requirements, salary if available, and the text of the job description. Recording vacancy information helped us ensure that we did not apply to the same job if it was re-posted, and that we did not apply to the same firm within a four-week period.

The data collected from each business vacancy was used to construct a measure of job quality based on the salary associated with a given job title. We use a salary search tool created by a large online job search website (indeed.com) giving the median salary for all vacancies posted on the website in the last 12 months.[27] We can match about 95 percent of business jobs to a salary, but we did not match health jobs to salaries because health job titles (e.g., medical assistant) are often standardized and produced little meaningful salary variation.

IV. Main Results

Table 3 presents initial descriptive statistics for the experimental sample. We sent a total of 10,492 resumes, and 8.2 percent received a callback. We define a "callback" as a personalized phone or email contact by a potential employer (not an email sent to all applicants, for example). Usually the callback is a request for an interview, but employers also contact applicants asking for "more information" or state that they "have a few questions."[28]

[27] We used the salary data without modification whenever possible. However, to reduce measurement error, we employed a trimming procedure to bound salaries for customer service and sales job titles that were unusually high or low compared to more common variants. This procedure yields results of very similar magnitude to the raw salary data but with smaller standard errors. See the Appendix for a detailed description of the process by which we matched job titles to salaries.

[28] In Appendix Table 3, we report results using an alternative callback definition that is restricted to the 50 percent of cases (4.1 percent of all resumes) where an employer used the word "interview." The main

Three important patterns can be seen in Table 3. First, there is considerable variation in baseline callback rates by city (from 5.8 percent in Miami to 11.5 percent in Los Angeles). However, we find no consistent evidence of *differential* callback rates across cities by type of postsecondary institution.[29] Second, there is considerable variation in callback rates by occupation, with customer service and sales jobs having the highest callback rates (10 to 12.5 percent) and accounting and finance (4.5 percent) the lowest. Different callback rates by occupation reflect a pattern of lower callback rates for *higher* quality jobs. Vacancies requiring a BA have lower callback rates than those not requiring a degree, as do job titles that are associated with higher average salaries. Third, unlike Bertrand and Mullainathan (2004), we find no consistent evidence of lower callback rates for racial minorities. We also find a higher callback rate for females than males, particularly for whites.

Figures 1 and 2 summarize the main results of the paper. Each figure presents callback rates by postsecondary credentials for one of the four experimental designs in Table 2. To balance the comparison across treatment cells, we report results from a regression of an indicator for receiving a callback on the credential categories in each graph plus vacancy fixed effects, with no other covariates. Figure 1 (left four bars) gives results for business job vacancies that do not require a degree (or that require an associate's degree). There is little difference in callback rates by the level or sector of postsecondary credentials. Resumes with a bachelor's degree from a for-profit institution are modestly (about 1 percentage point) more likely to receive a callback than identical resumes with no postsecondary degree at all, and those with an associate's degree show no advantage over those with only a high school degree.

The right four bars of Figure 1 give results for business vacancies that require applicants to have a bachelor's degree. About 6.3 percent of resumes with a bachelor's degree from an online for-profit institution receive a callback, compared with 8.5 percent of resumes from both non-selective and selective public institutions. The callback rate for resumes with degrees from locally operated for-profits is about 7.8 percent.

Figure 2 (left three bars) gives results for job vacancies in health that do not require a credential. The callback rate for resumes with a public sector certificate is about 8.9 percent, compared with 4.2 percent for resumes with a for-profit certificate and 5.9 percent for resumes

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results are qualitatively unchanged when using this alternative definition. Thus we focus on results for the initial "callback" outcome.

[29] To test for differential impacts of postsecondary institution, we interact indicators for each postsecondary sector with city indicators, and then test for the joint significance of the interactions. Of the four experimental categories (business and health, degree required and degree not required), only one—business jobs that require a BA—is jointly significant at the 5 percent level or less. In these models, only two interactions are individually statistically significant at the 5 percent level or less – selective public degrees in Miami and New York perform far worse than selective public degrees in the three other cities. There are no other strong patterns (statistically significant or otherwise) in the results for health jobs or for business jobs that do not require a degree.

with no credential at all. Finally, the right two bars give results for job vacancies in health that require a credential (all licensed practical nursing and pharmacy technician jobs, plus some medical assistant jobs). Again we find a higher callback rate for public certificates compared with for-profit certificates (5.8 versus 4.9 percent).

Tables 4 and 5 present more detailed analyses and tests of differences in callback rates by postsecondary credentials for business job openings. Each column includes a different set of covariates. Since these covariates are also randomly assigned, in some cases within vacancies, we can test for causal differences in callback rates by a variety of characteristics. Each table follows a similar structure: col. (1) includes only indicator variables for each postsecondary treatment but no other covariates; col. (2) adds fixed effects for race, gender, labor market, work history template, skill template, and name; and col. (3) adds vacancy fixed effects (absorbing race, gender, and labor market variation) and continues to include fixed effects for name, work history and skills. In Table 5 we also add whether a for-profit BA was done online. We present p-values on F-tests for the hypotheses that important categories of covariates (i.e., work history, race and gender) are equal to zero. In all cases, standard errors are clustered at the vacancy level.

Table 4 presents results for business jobs that do not require a bachelor's degree and typically do not require any postsecondary credential (although some indicate a preference or requirement for an associate's degree). In all three specifications, we find no statistically significant differences in callback rates among the four treatments, including no postsecondary degree at all. The standard errors allow us to rule out (with 95% confidence) an impact of having an associate's degree from either sector of more than 1.4 to 1.7 percentage points, relative to no degree. There appears to be a modest (but not statistically significant) advantage in callback rates of less than 1 percentage point for a for-profit BA from an online institution relative to no degree for business vacancies not requiring a bachelor's degree.

Overall, for job openings that do not require a bachelor's degree, having a postsecondary degree does not significantly increase the likelihood of receiving a callback. The results in Table 4 closely match the main findings of Darolia et al. (2014), who also find no difference in callback rates for resumes having no postsecondary education compared with a public or for-profit associate's degree, when applying to similar jobs.

Although we find no significant impacts of degree type, we do find some important differences in callback rates across other characteristics. Males receive significantly lower callback rates than females ($p=0.013$) as can be seen in col. (2), and the hypothesis that callbacks are equal across work history and skill templates can be strongly rejected ($p=0.000$). Callback rates are modestly higher for nonwhites, although we cannot reject equality by race ($p=0.260$). Employers who post business jobs that do not require a bachelor's degree appear to statistically discriminate in callback rates on some applicant characteristics, but they do not seem to value postsecondary credentials highly or to discriminate by postsecondary sector.

The results for business vacancies that require applicants to have a bachelor's degree are given in Table 5. Cols. (1) to (3) pool all for-profit institutions and also pool all public institutions (with publics as the omitted category), and col. (4) allows different impacts for for-profits by whether they are online or local and different impacts for public institutions depending on selectivity (with less-selective publics as the omitted category).

Resumes with a bachelor's degree from a for-profit institution are about 2 percentage points less likely to receive a callback than otherwise-identical resumes with a degree from a public institution. Relative to the baseline mean of 9.1 percent for non-selective publics, the effect is a decrease of 22 percent in the probability of callback. There is no detectable impact of race or gender on callback rates for business vacancies that require a bachelor's degree (col. 2). Work histories and skills appear to matter somewhat, although we fail to reject the hypothesis that they are not jointly significant (p=0.116). The results by disaggregated institution type, col. (4), show that the negative impacts of for-profit bachelor's degrees are concentrated among large online for-profit institutions, although the difference within the for-profit sector is not statistically significant (p=0.263).

To increase the sample size, when comparing different types of for-profit institutions, we estimate a pooled model that also includes the resumes sent to business vacancies that do not require a degree. The pooled model with vacancy fixed effects (shown in col. 2 of Appendix Table 4) yields a weak rejection at the 10 percent level (p=0.055) of the hypothesis that the callback rate is the same for local and online for-profit institutions.[30] Returning to Table 5, we cannot reject the hypothesis that callback rates for BAs from local for-profits and public institutions (both selective and less-selective) are equivalent in jobs requiring a BA. Perhaps surprisingly, we find no mean impact of college selectivity on callback rates for resumes with bachelor's degrees from public institutions. The strong conclusion from these estimates is that resumes with BAs from online for-profit institutions receive callbacks at a far lower rate than those with BAs from public institutions, regardless of selectivity.

The results for health jobs are given in Table 6. Cols. (1) and (2) cover health jobs not requiring a certificate, and cols. (3) and (4) cover health jobs that require a postsecondary certificate. We find that applicants with a certificate from a for-profit institution are about 5 percentage points less likely to receive a callback than identical applicants with a certificate from a public institution. Applicants with only a high school degree are about 3.5 percentage points less likely to receive a callback than are applicants with a certificate from a public institution.

[30] When sending resumes to vacancies that did not require a degree, we did not directly build in within-vacancy variation in whether the for-profit institution was local or online. Instead, we elected to vary the degree type (AA or BA) as indicated in Table 2. Thus we present results with and without vacancy fixed effects in Appendix Table 4. The point estimates are very similar in both cases, although the model with vacancy fixed effects has more power to reject differences across groups. An F-test for the hypothesis that online and local for-profits are equivalent yields a p-value of 0.118 without vacancy fixed effects, and p=0.055 with vacancy fixed effects.

Notably, having a for-profit certificate is slightly worse than having no credential at all, although the difference is not statistically significant (p=0.253, col. 2). In cols. (3) and (4), we find no statistically significant difference in callbacks for health jobs that require a certificate. [31] Nearly all these jobs also require the applicant to have a valid occupational license. Practical/vocational nurses and pharmacy technicians (about 70 percent of the certificate-required sample) must pass a licensing exam in all states in our study. Thus one possible explanation for the null results in cols. (3) and (4) is that the licensing exam acts as a stronger signal of expected productivity than the postsecondary institution.[32]

Unlike Bertrand and Mullainathan (2004), we find no consistent pattern of differences in callback rates by race. The possible reasons are many and include differing study settings, time periods, labor markets, application processes, employers, and job quality.[33] One similarity between our findings and theirs, however, comes from the impact of race on the relative returns to resume quality.

In Table 7 we allow the impact of postsecondary credentials to differ by race. For ease of presentation, we pool business and health jobs to create two broad categories based on required qualifications.[34] In col. (1), which is for jobs that do not require a credential, we see markedly different impacts by race. White applicants are significantly more likely to receive a callback with a degree from either sector, compared with having only a high school degree. Yet for nonwhite applicants there is no return to a public degree and the estimate for a for-profit degree is *negative* and statistically significant in jobs not requiring a degree.

In contrast, col. (2) of Table 7, covering jobs that require a BA or health certificate, shows no evidence of a differential return to a for-profit relative to a public degree by race. For-profit degrees generate lower callback rates than public degrees for both whites and nonwhites. In Appendix Tables 5 and 6 we show that there is no systematic evidence of differential impacts by gender or for different occupation groups within the business and health categories.

Finally, we note that the results of our resume audit study on employers' *revealed*

[31] Results for individual health occupations (shown in Appendix Table 6), reveal negative (but statistically insignificant) impacts of for-profit certificates in all jobs, except pharmacy technicians (where the impact is positive but statistically insignificant). In a pooled model with all health jobs (regardless of certificate requirements), we find a negative impact of having a for-profit certificate, relative to a public certificate, of about 1.5 percentage points (significant at the 10 percent level).

[32] Our pre-analysis plan specifically mentioned this possibility, and we pre-specified our approach of separately analyzing results for allied health occupations that required applicants to hold a license.

[33] In addition, our experiment was carried out 13 years after theirs. We applied to vacancies posted on an online job board instead of to help-wanted ads in a newspaper, and thus it is likely that the employers in our study are larger. Additionally, the jobs in Bertrand and Mullainathan (2004) were often in clerical and administrative support occupations (which tend to be lower-paid) and less so in accounting, finance and analytical positions (which tend to be higher-paid).

[34] The pattern of impacts is very similar when we estimate separate results for business and health jobs.

preferences for job candidates by type of postsecondary institution are consistent with two recent surveys of employers' *stated* preferences. A survey of employers in four U.S. cities found that although 46 percent of employers rated public universities and for-profits as "about the same" at "preparing students to work at your company," 41 percent rated public universities higher as compared with only 5 percent in favor of for-profits (Hagelskamp, Schleifer, and DiStasi 2014).[35] The report also indicates that name recognition is higher for national and online chain schools than for local, independently-operated for-profits.

A 2012 survey by the *Chronicle of Higher Education* found that employers view recent graduates with bachelor's degrees from public colleges to be more desirable hires than those from for-profit colleges, with the graduates of online colleges the least desirable (*Chronicle of Higher Education*, 2012).[36] It is important to note that employers may not be holding other differences in resume quality constant across institutions when making these judgments. Our study explicitly makes job candidates identical, except for the institution from which they received their degree, to identify the causal impact on callback rates of institution type.

V. Additional Results and Interpretation

A potential threat to the interpretation of our results is that employers may not call back resumes if applicants are too highly qualified. In audit studies based on personal characteristics such as race and gender, the concern is referred to as "reverse discrimination" (Bertrand and Mullainathan 2004). One natural way to test for "reverse discrimination" is to see whether our overall results hold equally for lower- and higher-quality jobs.

To test for heterogeneous impacts of credentials by job quality for business jobs, we examine how the effects of postsecondary sector differ by the expected salary of a job opening (based on imputed median salaries by job title using the approach described in the Appendix). Table 8 shows results for business vacancies that do not require a degree or that require an associate's degree, and Table 9 shows results for business jobs that require a bachelor's degree. The median salary is $36,000 for jobs that do not require a degree and $51,000 for jobs that require a bachelor's degree. The first three columns of Table 8 and first four columns of Table 9 examine sub-samples divided by expected salary ranges. The final column in each table uses the full sample of jobs and includes interaction effects for post-secondary degrees and expected salary. All the specifications in Tables 8 and 9 include vacancy fixed effects plus the usual controls for name, work history and skills templates.

[35] The four cities were Philadelphia, Detroit, El Paso and Los Angeles. When asking about community colleges, they found that 51 percent said about the same, 31 percent preferred community colleges, and 11 percent preferred for-profits. 8 percent of respondents said they didn't know or refused to answer.
[36] The survey response rate appears to have been quite low (about 1.5 percent) with only 704 responses out of 50,000 invited employers. And the report does not provide standard errors or measures of the statistical significance of the observed differences in employer ratings of graduates by type of institution.

The evidence in Table 8 shows, if anything, a negative (but not significant) gradient in the impact of an associate's degree from either a for-profit or public institution on callback rates relative to just a high school degree for business jobs not requiring a degree. There is some evidence in cols. (2) and (3) of a positive (about 2.5 percentage point) and significant advantage to resumes with a for-profit BA for the higher-paid business jobs not requiring a college degree. When examining the full range of jobs in col. (4), there is a positive gradient by expected salary in the callback differential for a for-profit BA, but it is not statistically significant.

We next turn to business jobs requiring a bachelor's degree. Compared with degrees from less-selective public colleges, resumes with bachelor's degrees from selective public institutions have modestly *lower* callback rates at low salaries and significantly *higher* callback rates (by almost 4 percentage points) at high salaries (above $65,000), as shown in Table 9. The full linear interaction specification in col. (5) indicates that the callback rate advantage from college selectivity for those with bachelor's degrees from public institutions rises by 1 percentage point per each $10,000 increase in expected salary and the impact of public sector college selectivity becomes significant and *positive* at around $75,000, which is around the 75th percentile of the distribution for jobs that require a bachelor's degree.[37]

Employers at lower-salaried jobs may be concerned that applicants with degrees from selective public institutions are over-qualified and would not accept an offer or would not remain in the job. We also find a modest positive gradient in job quality for resumes with a bachelor's degree from a local for-profit relative to non-selective public institutions, although the interaction term is not significantly different from zero. Finally, we find lower callback rates for resumes with bachelor's degrees from online for-profits than for non-selective public institutions in *all* salary ranges, not just in the low-salary jobs. These findings suggest that the low average callback rate for resumes with online for-profit degrees is not from reverse discrimination.

Another possible concern regarding the interpretation of our results is that differences in callback rates do not map linearly into a difference in applicants' mean expected productivity. According to Heckman and Siegelman (1993) and Neumark (2012) differences in the *variance* of expected productivity could lead to differences in callback rates between two groups in an audit study, even if mean expected productivity is the same. If employers offer scarce interview slots to applicants based on expected productivity relative to a standard, then they will be more likely to contact higher-variance applicants. In our context, the concern would be that the lower callback rate for for-profit degrees is due to higher variance for applicants with degrees from *public* institutions. We think this is an unlikely possibility.

[37] Although $75,000 is a high salary for an entry-level college graduate, our imputed salaries are based on average salaries for job postings (not actual salary offers) and are likely to be over-estimates. Employers that publicly post salaries are likely to be on the upper end of the wage distribution. In addition, the reported salary is likely to be the steady state for a given occupation, whereas our resumes are for entry-level graduates. Thus, although our imputed salaries tend to be overestimates for entry-level jobs, the ordering and proportional differences across jobs in our sample are likely to be reasonably accurate.

The available evidence suggests a greater variance in the quality of students from for-profit institutions, as well as greater variance in the experiences and qualifications of students that attend them (e.g., Deming, Goldin and Katz 2013; Lang and Weinstein 2013). Furthermore, the result that higher-variance applicants are preferred depends on the assumption that employers maximize expected applicant quality. But as we showed in the job quality results above, employers may also consider the probability an applicant will accept the job when making decisions about callbacks. If so, higher-variance applicants would not be strictly preferred.

The use of resume screening technologies that mechanically assign weights to resume characteristics could also influence our results. A 2012 article in the *Wall Street Journal* discussed the increasing use of resume screening software, known as Applicant Tracking Systems (ATSs), to winnow down the large pools of applicants based on characteristics (customized by employers) such as years of work experience and schools attended.[38] We did, on occasion, receive automatically-generated email responses and, in a few cases, found a "score" assigned to our application. Such screening software might also explain why our results for race and gender are somewhat different from previous studies. We note that the use of these programs would not meaningfully affect the interpretation of our findings if employers carefully specify the screening criteria used, including choices to screen out particular educational institutions.

VI. Conclusion

We have asked how employers value otherwise-identical job applicants who obtained degrees and certificates from different types of postsecondary institutions. Using a resume audit study in which resumes were submitted to thousands of job openings posted online, we are able to identify causal effects of various post-secondary qualifications on employer callback rates. In particular, we are able to estimate the causal effects of degrees and certificates from for-profit institutions, including the rapidly growing online for-profit sector, for which little evidence currently exists.

Our study has two clear findings. First, for business job vacancies that require a bachelor's degree, employers strongly prefer applicants with degrees from public institutions as opposed to applicants with degrees from for-profits. Callback rates differ by more than 20 percent. Importantly, the penalty for having a bachelor's degree from a for-profit college varies across types of institutions. Applicants with degrees from local "brick and mortar" for-profits are not as severely penalized as are applicants with degrees from large, online "chain" institutions that have grown rapidly during the last 15 years.[39] These online, for-profit colleges

[38] One "expert" on these systems puts their use among Fortune 500 companies in the "high 90% range." See http://online.wsj.com/news/articles/SB10001424052970204624204577178941034941330.
[39] Differences in callback rates between resumes with bachelor's degrees from local for-profits vs. online for-profits only approach statistical significance for job openings with high expected salaries (Table 9).

have been responsible for 21 percent of the growth in all bachelor's degrees and 33 percent of the growth in bachelor's degrees in business over the last decade. In comparison, the share of postsecondary enrollment in local, independent for-profits has been relatively constant since 2000 (Deming, Goldin and Katz 2012). Yet it is precisely the bachelor's degrees granted by the fastest-growing set of institutions that are associated with the worst callback outcomes, in our study, for jobs requiring a bachelor's degree.

Our second main finding is that employers who are hiring for health jobs with no certificate or license requirements (primarily medical assistant jobs) strongly prefer applicants with certificates from public institutions, compared with applicants with a for-profit certificate or no credential at all. Although many of these jobs are entry-level and are relatively low paid, they are also entry points for job seekers who hope to acquire additional, more highly compensated credentials while working within a large health organization. In contrast, we find no differences in callbacks for health jobs that require a certificate and a valid license. One explanation for this result is that passing the licensure exam (which is content-based) provides a stronger signal of skill to employers than the applicant's postsecondary institution.

We find no difference in callback rates for business jobs that do not require a degree, and we find no overall differences in callback rates by race or gender. However, we do find that the returns to having any postsecondary degree are positive for whites but *negative* for nonwhites, echoing the result of Bertrand and Mullainathan (2004) that the racial gap in employer perceptions widens with resume quality. Finally, we find that the impact of (public) college quality increases in job quality for jobs requiring a bachelor's degree, with positive returns only for job titles that are above the 75^{th} percentile of average salary.

Our results potentially can inform the decisions of "marginal" students who must make cost-benefit calculations about where to enroll in college and whether to enroll at all. The findings do not support the notion that a for-profit degree is a good investment relative to one from a public institution. We cannot easily translate a difference in callback rates into a difference in wages. But because yearly tuition at a for-profit college typically greatly exceeds that at a public university and for-profit degrees seem to be less valued by employers, the for-profit degree appears to be the less attractive investment. It is important to note that the comparison assumes the availability of both public and for-profit options.

A defense of for-profits is that public colleges are often overcrowded and that for-profits may be able to move into expanding fields not well-served by public institutions. In that case, the most appropriate comparison would be between a for-profit credential and no credential. With one exception (the returns to a for-profit BA relative to no degree for high-salaried jobs, cols. 2 and 3 of Table 8), we find no evidence that obtaining a for-profit credential will improve the job prospects of workers who would otherwise not attend college at all.

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Table 1: Occupations and Sample Job Titles

Occupation Category	Degree Required	Sample Job Titles	Share of All Full-Time Vacancies
Business			
Accounting / Finance	None or AA	Payroll Manager, Billing / Collection Specialist	0.111
	BA	Business Analyst, Accountant (non-CPA)	
Customer Service / Sales / Marketing	None or AA	Customer Care Rep, Sales Associate	0.344
	BA	Account Executive, Product Representative	
Allied Health			
Medical Assistant: Administrative	None or Certificate	Medical Biller, Medical Secretary	0.050
Medical Assistant: Clinical	None or Certificate	Medical Assistant, Clinical Support	0.036
Practical/Vocational Nursing	Certificate	Licensed Practical Nurse	0.012
Pharmacy Technician	Certificate	Pharmacy Technician	0.011

Notes: Occupation categories are based on the Classification of Instructional Programs (CIP) codes. Certificates include postsecondary awards of less than one year and awards of more than one but less than two years. Sample job titles are pulled from the job search website using the occupation and keyword searches described in the text. The share of full-time job vacancies is computed by dividing the total number of vacancies posted for particular keyword search by the total number of all vacancies posted on the job search website. We compute this share for three consecutive 24-hour periods and report the average.

Table 2: Experimental Design

Occupation	Degree Required	Resume Structure
Business	None (or AA)	1: High School only 2: For-profit AA 3: Public AA 4: For-profit BA (online)
	BA	1: BA, public, not selective 2: BA, public, selective 3: BA, for-profit, online 4: BA, for-profit, local in-person (if available)
Health	None	1: Public Certificate 2: For-Profit Certificate 3: High School only 4: High School only (but one year relevant work experience)
	Certificate	1: Public Certificate 2: Public Certificate 3: For-Profit Certificate 4: For-Profit Certificate

Table 3: Summary Statistics for the Resumes used in the Audit Study

	Callback Rate	Number of Resumes
Total	0.082	10492
By city		
Chicago	0.082	2036
Los Angeles	0.115	1580
Miami	0.058	2480
New York City	0.083	2288
San Francisco Bay	0.083	2108
By occupation and degree requirements		
AA, Accounting/Finance	0.045	1084
AA, Customer Service/Sales	0.125	2920
BA, Accounting/Finance	0.044	1928
BA, Customer Service/Sales	0.104	2180
Licensed Practical Nurse	0.057	804
Pharmacy Technician	0.070	200
Medical Assistant (Administrative)	0.046	1016
Medical Assistant (Clinical)	0.078	360
By race and gender		
White female	0.092	2620
White male	0.066	2456
Nonwhite female	0.090	2680
Nonwhite male	0.077	2728
By Average Salary (business jobs only)		
less than $35,000	0.104	2585
$35,000 to $49,999	0.107	2528
$50,000 to $64,999	0.079	1282
$65,000 or more	0.048	1456
No salary data	0.046	417

Notes: The callback rate is the share of resumes that received a personalized callback (by phone or email) from a potential employer.

Table 4: Callback Regressions for Business Jobs (that do not require a Bachelor's degree)

	(1) Callback	(2) Callback	(3) Callback
For-profit (AA)	-0.0041	-0.0014	-0.0019
	(0.0070)	(0.0069)	(0.0066)
For-profit (BA)	0.0054	0.0086	0.0088
	(0.0105)	(0.0100)	(0.0083)
Public (AA)	-0.0001	0.0031	0.0026
	(0.0071)	(0.0070)	(0.0066)
White male		-0.0443**	
		(0.0226)	
Nonwhite female		0.0170	
		(0.0258)	
Nonwhite male		-0.0233	
		(0.0238)	
High School-only callback rate	0.104	0.104	0.104
Number of observations	4,004	4,004	4,004
Vacancy fixed effects			X
F(FP AA = FP BA)	0.460	0.434	0.387
F(FP AA = Public AA)	0.547	0.498	0.503
F(Pub AA = FP BA)	0.624	0.621	0.562
F(Names)		0.812	0.780
F(Work histories and Skills)		0.000	0.444
F(Labor markets)		0.008	
F(White=Nonwhite)		0.260	
F(Male=Female)		0.013	
F(Race and Gender)		0.051	

Notes: The dependent variable is an indicator variable for any personalized callback from the potential employer. No postsecondary degree is the omitted education category, and white female is omitted for race/gender. Col. (2) includes indictor variables for labor market. Cols. (2) and (3) include fixed effects for skill template, work history, and name. Standard errors are clustered at the vacancy level.

** $p < 0.05$, * $p < 0.10$

Table 5: Callback Regressions for Business Jobs (that require a Bachelor's degree)

	(1) Callback	(2) Callback	(3) Callback	(4) Callback
For-profit BA	-0.0199***	-0.0191***	-0.0200***	
	(0.0052)	(0.0051)	(0.0052)	
For-profit BA, online				-0.0213***
				(0.0058)
For-profit BA, local				-0.0074
				(0.0121)
Selective public BA				0.0007
				(0.0095)
White male		-0.0143		
		(0.0195)		
Nonwhite female		-0.0098		
		(0.0194)		
Nonwhite male		0.0015		
		(0.0198)		
Non-selective public BA callback rate	0.091	0.091	0.091	0.091
Number of observations	4,100	4,100	4,100	4,100
Vacancy fixed effects			X	X
F(FP online = Local)				0.263
F(FP online = Selective public)				0.015
F(FP not online = Selective public)				0.549
F(Labor markets)		0.501		
F(White=Nonwhite)		0.824		
F(Male=Female)		0.913		
F(Race and gender)		0.813		
F(Names)		0.524		0.666
F(Work histories and Skills)		0.116		0.031

Notes: The dependent variable is an indicator variable for any personalized callback from the potential employer. Public BA (non-selective) is the omitted education category, and white female is omitted for race/gender. Col. (2) includes indictor variables for labor market. Cols. (2) and (4) include fixed effects for skill template, work history, and name. Standard errors are clustered at the vacancy level.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 6: Callback Regressions for Health-sector Jobs

	(1) Callback	(2) Callback	(3) Callback	(4) Callback
For-profit certificate	-0.0501**	-0.0507**	-0.0047	-0.0054
	(0.0179)	(0.0179)	(0.0100)	(0.0094)
No postsecondary certificate	-0.0349**	-0.0357**		
(high school degree only)	(0.0147)	(0.0148)		
White male	-0.0514		-0.0019	
	(0.0370)		(0.0294)	
Nonwhite female	-0.0717*		0.0279	
	(0.0391)		(0.0318)	
Nonwhite male	-0.0516		-0.0015	
	(0.0419)		(0.0291)	
Public certificate callback rate	0.089	0.089	0.056	0.056
Sample	No Certificate Required	No Certificate Required	Certificate Required	Certificate Required
Number of observations	948	948	1,440	1,440
Vacancy fixed effects		X		X
F(FP certificate = HS degree only)	0.235	0.253		
F(Labor Markets)	0.005		0.002	
F(White=Nonwhite)	0.170		0.495	
F(Male=Female)	0.188		0.465	
F(Race and gender)	0.338		0.745	
F(Names)	0.359	0.352	0.458	0.453
F(Work histories and Skills)	0.000	0.000	0.000	0.000

Notes: The dependent variable is an indicator variable for any personalized callback from the potential employer. A certificate from a public community college is the omitted education category in cols. (1) through (4). White female is the omitted category for race/gender in cols. (1) and (3). All the specifications include fixed effects for skill template, work history, and name. Standard errors are clustered at the vacancy level.

** $p < 0.05$

* $p < 0.10$

Table 7: Heterogeneous Callback Returns by Race of Applicant

	No Degree Required	Degree Required
	(1)	(2)
	Callback	Callback
For-profit, white applicant	0.0150**	-0.0170**
	(0.0074)	(0.0070)
Public, white applicant	0.0233**	
	(0.0088)	
For-profit, nonwhite applicant	-0.0183**	-0.0149**
	(0.0083)	(0.0057)
Public, nonwhite applicant	-0.0073	
	(0.0081)	
Vacancy Fixed Effects	X	X
Number of observations	4,952	5,540
F(FP white=FP nonwhite)	0.003	0.813
F(Public white=Public nonwhite)	0.010	

Notes: The dependent variable is an indicator variable for any personalized callback from the potential employer. Standard errors are clustered at the vacancy level. The regressions in both columns include fixed effects for skill template, work history, and name. The sample used in col. (1) pools business with no degree required and health jobs with no certificate required. The sample used in col. (2) pools business jobs with a BA required and health jobs with a certificate required. No postsecondary degree or certificate is the omitted education group in col. (1), and a degree or certificate from a public institution is the omitted education group in col. (2).

** $p < 0.05$

* $p < 0.10$

Table 8: Callback Regressions by Quality of Job (for Business Jobs, no BA degree required)

	(1) Less than $35,000	(2) $35,000 to $49,999	(3) $50,000 and greater	(4) All
For-profit (AA)	0.0004	-0.0041	-0.0133	0.0023
	(0.0105)	(0.0130)	(0.0133)	(0.0151)
× Salary (in $10,000s)				-0.0014
				(0.0031)
For-profit (BA)	-0.0049	0.0238*	0.0273*	-0.0053
	(0.0134)	(0.0142)	(0.0154)	(0.0174)
× Salary (in $10,000s)				0.0041
				(0.0034)
Public (AA)	0.0020	0.0020	-0.0089	0.0047
	(0.0102)	(0.0125)	(0.0124)	(0.0149)
× Salary (in $10,000s)				-0.0011
				(0.0031)
Baseline callback rate	0.105	0.125	0.075	0.104
Number of observations	1,704	1,432	617	3,753
Vacancy fixed effects	X	X	X	X
F(FP AA = FP BA)	0.788	0.214	0.081	
F(FP AA = Public AA)	0.885	0.602	0.604	
F(Public AA = FP BA)	0.669	0.265	0.100	

Notes: The dependent variable is an indicator variable for any personalized callback from the potential employer. Standard errors are clustered at the vacancy level. All the specifications include fixed effects for skill template, work history, and name. The line "× Salary" is an interaction of the variable above that line times the expected salary for the job opening (based on the median salary for the job title). The first three columns split the sample into expected salary ranges (less than $35,000; $35,000 to $49,999; and $50,000 or more). Col. (4) includes the entire expected salary range. The omitted education group is no postsecondary degree.

* $p < 0.10$

Table 9: Callback Regressions by Quality of Job (for Business Jobs, BA required)

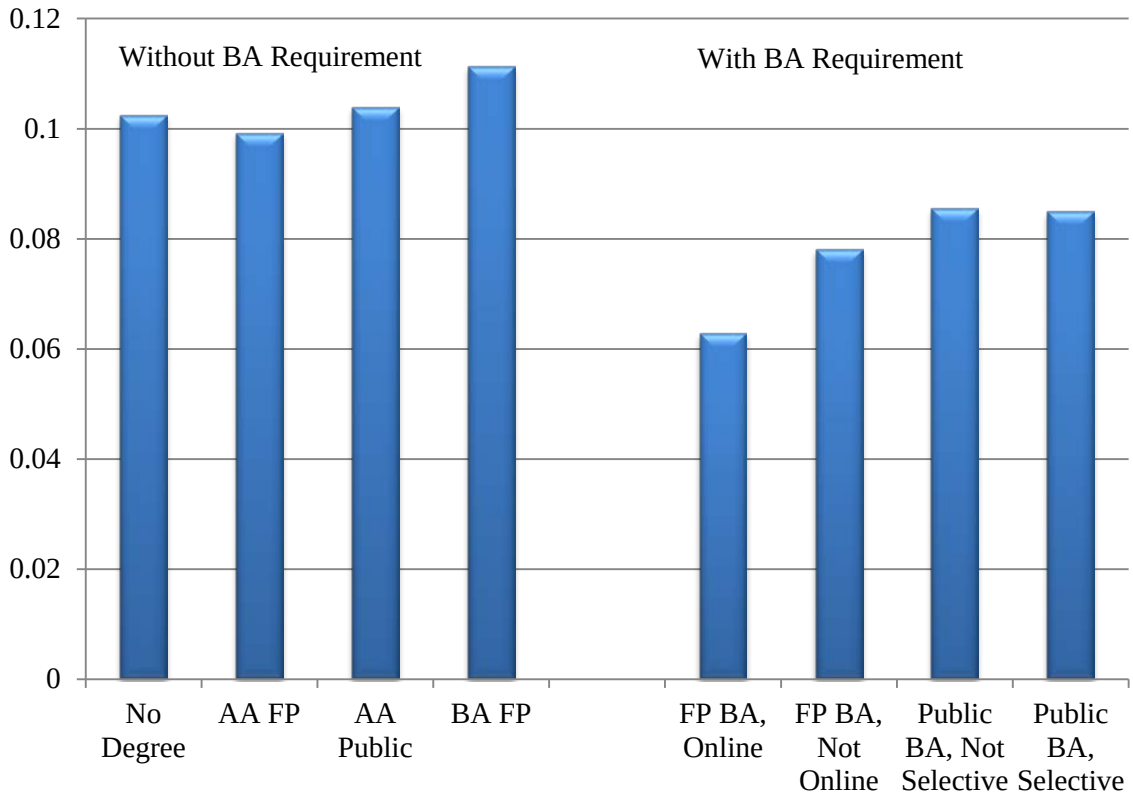
	(1) Less than $35,000	(2) $35,000 to $49,999	(3) $50,000 to $64,999	(4) $65,000 and greater	(5) All
For-profit BA, online	-0.0277	-0.0153	-0.0286**	-0.0157**	-0.0328*
	(0.0176)	(0.0117)	(0.0144)	(0.0074)	(0.0168)
× Salary (in $10,000s)					0.0020
					(0.0024)
For-profit BA, local	-0.0277	0.0039	-0.0084	0.0109	-0.0314
	(0.0235)	(0.0286)	(0.0213)	(0.0156)	(0.0290)
× Salary (in $10,000s)					0.0053
					(0.0042)
Selective public BA	-0.0130	-0.0209	-0.0059	0.0392**	-0.0515**
	(0.0217)	(0.0179)	(0.0211)	(0.0197)	(0.0250)
× Salary (in $10,000s)					0.0096**
					(0.0043)
Baseline callback rate	0.119	0.114	0.096	0.057	0.091
Number of observations	793	1,036	893	1,192	3,914
Vacancy fixed effects	X	X	X	X	X
F(FP online = FP local)	1.000	0.506	0.343	0.073	
F(FP online = Selective public)	0.484	0.743	0.262	0.003	
F(FP local = Selective public)	0.622	0.443	0.902	0.158	

Notes: The dependent variable is an indicator variable for any personalized callback from the potential employer. Standard errors are clustered at the vacancy level. All the specifications include fixed effects for skill template, work history, and name. The line "× Salary" is an interaction of the variable above that line times the expected salary for the job opening (based on the median salary for the job title). The first four columns split the sample into expected salary ranges (less than $35,000; $35,000 to $49,999; and $50,000 to $64,999; and $65,000 or more). Col. (5) includes the entire expected salary range. The omitted education group is non-selective public BA.

** $p < 0.05$

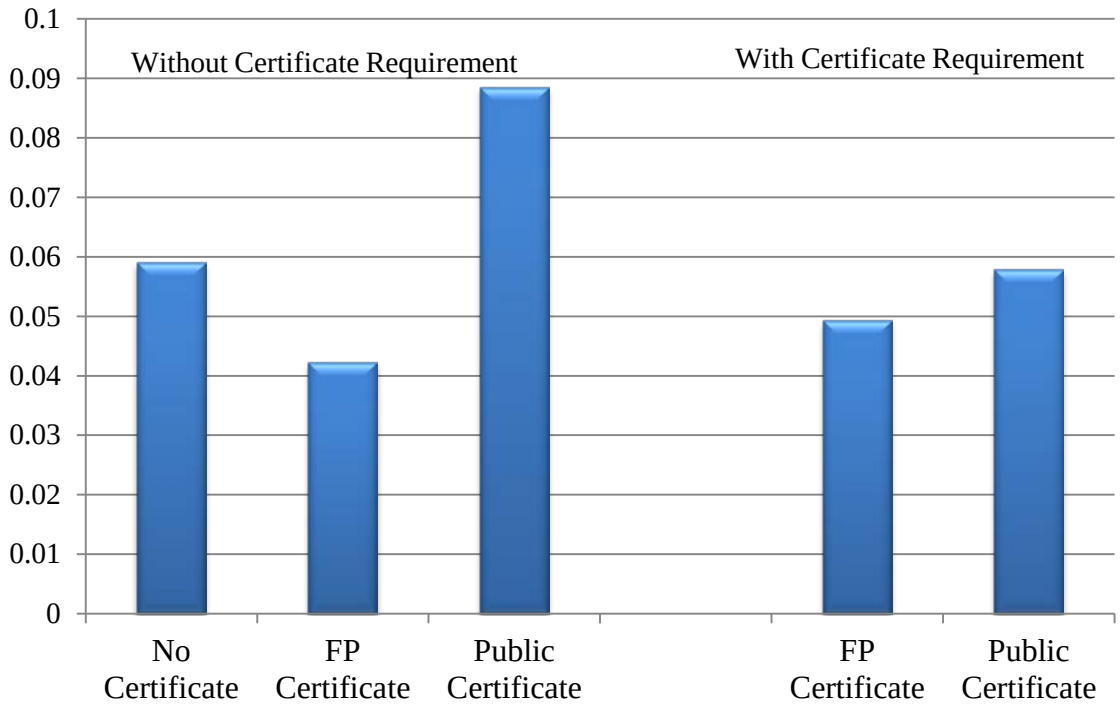
* $p < 0.10$

Figure 1: Callback Rates by Postsecondary Sector for Business Jobs: Without and With BA Requirement



Notes: From a regression of callbacks on indicators of postsecondary sector and vacancy fixed effects. "FP" represents a for-profit postsecondary institution, "Public" represents a public postsecondary institution, and "No Degree" indicates no postsecondary degree.

Figure 2: Callback Rates by Postsecondary Sector for Healthcare Jobs: Without and With Certificate Requirement



Notes: From a regression of callbacks on indicators of postsecondary sector and vacancy fixed effects. "FP" stands for a for-profit postsecondary institution, "Public" stands for a public postsecondary institution, and "No Certificate" indicates no postsecondary credential.

Web Appendix – FROM HERE FORWARD NOT FOR PUBLICATION

Appendix Table 1: Awards and Job Vacancy Shares by Labor Market

Combined Statistical Area (CSA)	Health Certificates	Business		Share of All FT Vacancies
		AA	BA	
	(1)	(2)	(3)	(4)
New York-Newark, NY-NJ-CT-PA	0.059	0.088	0.064	0.041
Los Angeles-Long Beach, CA	0.082	0.040	0.043	0.032
Chicago-Naperville, IL-IN-WI	0.041	0.043	0.031	0.041
Miami-Fort Lauderdale-Port St. Lucie, FL	0.033	0.010	0.019	0.019
San Jose-San Francisco-Oakland, CA	0.018	0.021	0.017	0.029
Total share of U.S. awards in category	0.233	0.202	0.174	0.163

Notes: Occupation categories are based on the Classification of Instructional Programs (CIP) codes. Certificates include awards of less than one year and awards of more than one but fewer than two years. The share of full-time job vacancies is computed by summing the number of vacancies posted in the last 24 hours over three consecutive days, and then dividing the share of jobs in each occupation or keyword search into the total. FT stands for full-time.

Appendix Table 2: Institutions in the Resume Audit Study

Name	Sector	City
University of Phoenix	For-Profit (Online)	New York, Chicago, SF, LA, Miami
Colorado Technical University	For-Profit (Online)	New York, Chicago, SF, LA, Miami
American Public University	For-Profit (Online)	New York, Chicago, SF, LA, Miami
Ashford University	For-Profit (Online)	New York, Chicago, SF, LA, Miami
Kaplan University	For-Profit (Online)	New York, Chicago, SF, LA, Miami
Strayer University	For-Profit (Online)	New York, Chicago, SF, LA, Miami
DeVry University	For-Profit (Online)	New York, Chicago, SF, LA, Miami
Everest College/Institute	For-Profit (Local Not Online)	New York, Chicago, SF, LA, Miami
Sanford-Brown Institute	For-Profit (Local Not Online)	New York, Miami
Monroe College	For-Profit (Local Not Online)	New York
Lincoln Technical Institute	For-Profit (Local Not Online)	New York
Coyne College	For-Profit (Local Not Online)	Chicago
Midwestern Career College	For-Profit (Local Not Online)	Chicago
Northwestern College	For-Profit (Local Not Online)	Chicago
J Renee Career Facilitation	For-Profit (Local Not Online)	Chicago
Brown Mackie College	For-Profit (Local Not Online)	Chicago
Florida National University	For-Profit (Local Not Online)	Miami
Southeastern College	For-Profit (Local Not Online)	Miami
Fortis Institute	For-Profit (Local Not Online)	Miami
Florida Career College	For-Profit (Local Not Online)	Miami
Dade Medical College	For-Profit (Local Not Online)	Miami
Heald College	For-Profit (Local Not Online)	SF, LA
Unitek College	For-Profit (Local Not Online)	SF
Carrington College	For-Profit (Local Not Online)	SF
NCP College of Nursing	For-Profit (Local Not Online)	SF
Gurnick Academy of Medical Arts	For-Profit (Local Not Online)	SF
Summit College	For-Profit (Local Not Online)	LA
UEI College	For-Profit (Local Not Online)	LA
American Career College	For-Profit (Local Not Online)	LA
Concorde Career College	For-Profit (Local Not Online)	LA
North-West College	For-Profit (Local Not Online)	LA
CUNY – Medgar Evers College	Public	New York
Hostos Community College	Public	New York
Bronx Community College	Public	New York
LaGuardia Community College	Public	New York
Manhattan Community College	Public	New York
Queensborough Community College	Public	New York
Kingsborough Community College	Public	New York
Baruch College	Public (Not Selective)	New York
Brooklyn College	Public (Not Selective)	New York
Lehman College	Public (Not Selective)	New York
Stony Brook University	Public (Selective)	New York
Joliet Junior College	Public	Chicago
Richard Daley College	Public	Chicago
Harry Truman College	Public	Chicago
Wilbur Wright College	Public	Chicago
College of DuPage	Public	Chicago

Triton College	Public	Chicago
Olive Harvey College	Public	Chicago
Moraine Valley Community College	Public	Chicago
Elgin Community College	Public	Chicago
Chicago State University	Public (Not Selective)	Chicago
Northeastern Illinois University	Public (Not Selective)	Chicago
University of Illinois, Chicago	Public (Selective)	Chicago
Univ. of IL, Urbana / Champaign	Public (Selective)	Chicago
Palm Beach State College	Public	Miami
Broward College	Public	Miami
Miami Dade College	Public	Miami
Florida International University	Public (Not Selective)	Miami
University of Florida	Public (Selective)	Miami
De Anza College	Public	San Francisco
City College of San Francisco	Public	San Francisco
Skyline College	Public	San Francisco
San Joaquin Delta College	Public	San Francisco
San Jose City College	Public	San Francisco
Contra Costa College	Public	San Francisco
California State Univ., East Bay	Public (Not Selective)	San Francisco
Sonoma State University	Public (Not Selective)	San Francisco
University of California, Berkeley	Public (Selective)	San Francisco, Los Angeles
Chaffey College	Public	Los Angeles
Long Beach City College	Public	Los Angeles
Riverside City College	Public	Los Angeles
Pasadena City College	Public	Los Angeles
Santa Ana College	Public	Los Angeles
College of the Canyons	Public	Los Angeles
Glendale Community College	Public	Los Angeles
Santa Monica College	Public	Los Angeles
East Los Angeles College	Public	Los Angeles
El Camino Community College	Public	Los Angeles
Cerritos College	Public	Los Angeles
California State Univ., Fullerton	Public (Not Selective)	Los Angeles
California State Univ., Northridge	Public (Not Selective)	Los Angeles
Univ. of California, Los Angeles	Public (Selective)	San Francisco, Los Angeles

Appendix Table 3: Core Results from Interview Callback Regressions

	(1) Interview	(2) Interview	(3) Interview	(4) Interview	(5) Interview
For-Profit (AA)	-0.0030	-0.0067			
	(0.0042)	(0.0093)			
× Salary (in $10,000s)		0.0007			
		(0.0016)			
For-Profit (BA)	-0.0001	-0.0021			
	(0.0059)	(0.0138)			
× Salary (in $10,000s)		0.0009			
		(0.0026)			
Public (AA)	-0.0004	-0.0091			
	(0.0039)	(0.0083)			
× Salary (in $10,000s)		0.0020			
		(0.0017)			
For-Profit BA, Online			-0.0127***	-0.0249**	
			(0.0041)	(0.0115)	
× Salary (in $10,000s)				0.0022	
				(0.0016)	
For-Profit BA, Local			-0.0054	-0.0073	
			(0.0090)	(0.0215)	
× Salary (in $10,000s)				0.0007	
				(0.0027)	
Selective Public BA			-0.0018	-0.0402**	
			(0.0067)	(0.0160)	
× Salary (in $10,000s)				0.0070***	
				(0.0026)	
FP certificate, no degree required					-0.0036
					(0.0094)
Public certificate, no degree required					0.0102
					(0.0071)
FP certificate, degree required					0.0026
					(0.0058)
Baseline interview callback rate	0.060	0.060	0.043	0.043	0.034
Occupation / Degree required	Business, no degree	Business, no degree	Business, BA	Business, BA	Health
Number of observations	4,004	3,753	4,100	3,914	2,388
Vacancy fixed effects	X	X	X	X	X

Notes: The dependent variable is an indicator variable for an interview callback, defined as a callback (by phone or email) from the potential employer that includes mention of an interview. The omitted education category is no postsecondary degree in cols. (1) and (2), a non-selective public BA in cols. (3) and (4), and no postsecondary degree or certificate in col. (5). All the specifications include fixed effects for skill template, work history, and name. The line "× Salary" is an interaction of the variable above that line times the expected salary for the job opening (based on the median salary for the job title). Standard errors are clustered at the vacancy level.

*** $p < 0.01$, ** $p < 0.05$, and * $p < 0.10$

Appendix Table 4: Pooled Analysis of For-Profit On-line vs. Local Institutions (for Business Jobs including vacancies both with a BA required and with no BA degree required)

	(1) Callback	(2) Callback
For-Profit AA/BA, Online	-0.0142***	-0.0151***
	[0.0048]	[0.0044]
For-Profit AA/BA, Local	0.0044	0.0012
	[0.0109]	[0.0080]
High School Degree Only	-0.0026	-0.0071
	[0.0090]	[0.0062]
Vacancy Fixed Effects		X
Observations	8,104	8,104
F(FP AA/BA, Online= FP AA/BA, Local)	0.118	0.055
F(FP AA/BA, Online = HS Only)	0.180	0.202
F(FP AA/BA, Local = HS Only)	0.576	0.376

Notes: The dependent variable is an indicator variable for any personalized callback from the potential employer. Standard errors are clustered at the vacancy level. The omitted education category is a degree (BA or AA) from a public institution. All the specifications include fixed effects for skill template, work history, and name. Col. (1) includes indicators for race/gender and labor market. The sample used in the regressions pools the sample of business jobs that do not require a bachelor's degree from Table 4 with the sample of business jobs that require a bachelor's degree from Table 5.

*** $p < 0.01$

Appendix Table 5: Heterogeneous Callback Returns by Gender of Applicant

	Business, No Degree Required		Business, BA Required		Health, No Certificate Required	Health, Certificate Required
	(1)		(2)		(3)	(4)
	Callback		Callback		Callback	Callback
FP AA, male	-0.004	FP local, male	-0.021	FP, male	-0.010	0.006
	(0.008)		(0.018)		(0.022)	(0.012)
FP AA, female	0.000	FP local, female	0.008	FP, female	-0.020	-0.017
	(0.011)		(0.016)		(0.015)	(0.014)
FP, BA male	0.012	FP online, male	-0.023***	Public, male	0.050**	
	(0.010)		(0.008)		(0.021)	
FP, BA female	0.005	FP online, female	-0.019**	Public, female	0.024	
	(0.013)		(0.008)		(0.020)	
Public AA, male	0.001	Public selective, male	0.002			
	(0.010)		(0.013)			
Public AA , female	0.004	Public selective, female	-0.001			
	(0.009)		(0.014)			
Number of observations	4,004	Number of observations	4,100	Number of observations	948	1,440
R-squared	0.011	R-squared	0.018	R-squared	0.072	0.037

Notes: The dependent variable is an indicator variable for any personalized callback from the potential employer. Standard errors are clustered at the vacancy level. The regressions include fixed effects for vacancy, skill template, work history, and name. The base education category is no postsecondary degree or certificate in cols. (1) and (3), a non-selective public BA in col. (2), and a public certificate in col. (4). All the educational credentials in col. (2) are BAs, and all the credentials in cols. (3) and (4) are certificates.
*** $p < 0.01$, ** $p < 0.05$,* $p < 0.10$

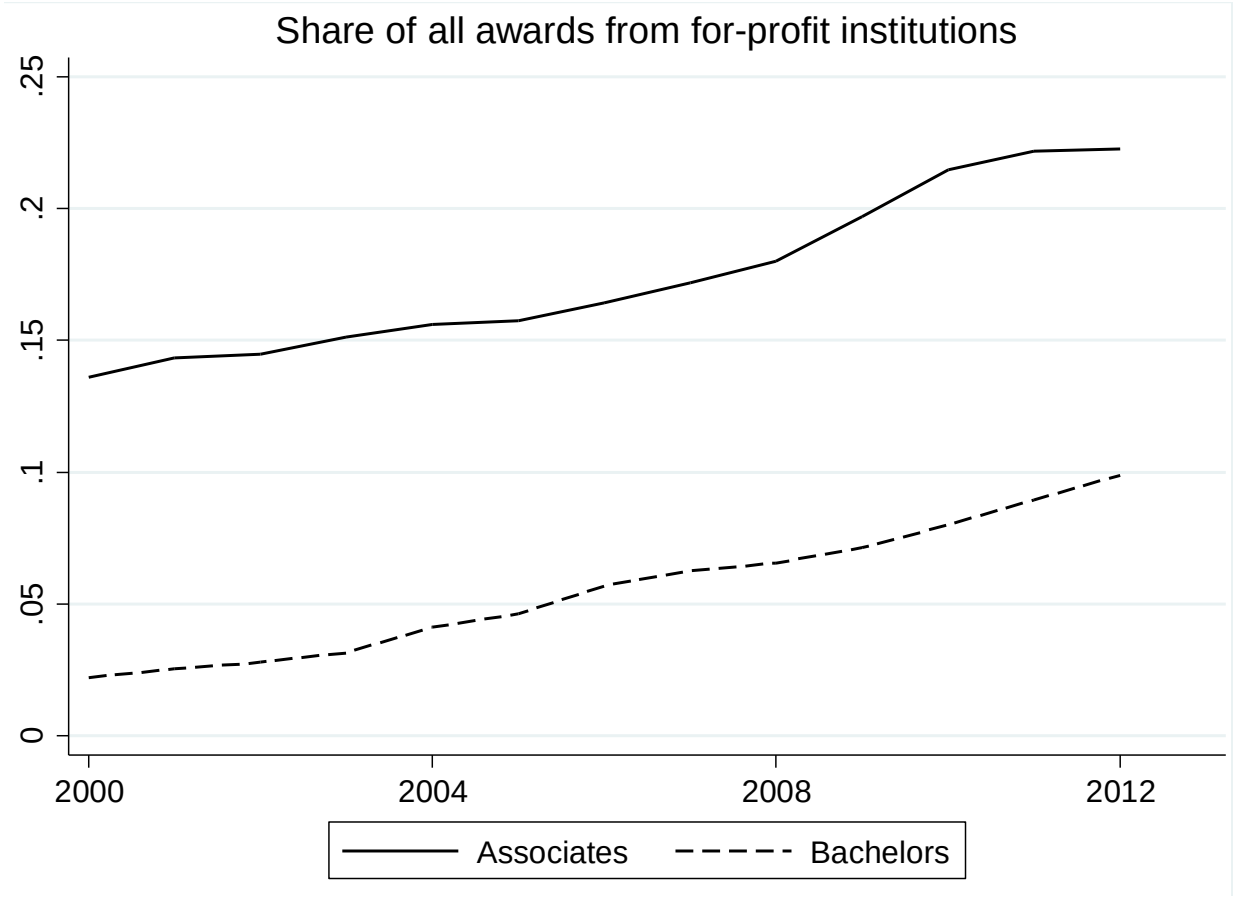
Appendix Table 6: Heterogeneous Callback Returns by Occupation

	Business, no degree Required		Business, BA Required		Licensed Practical Nurse	Pharmacy Technician	Medical Assistant, Certificate Required	Medical Assistant, No Certificate Required
	(1) Callback		(2) Callback		(3) Callback	(4) Callback	(5) Callback	(6) Callback
FP AA, sales	-0.002	FP BA local, sales	-0.012	For profit cert	-0.012	0.055	-0.011	-0.015
	(0.008)		(0.022)		(0.011)	(0.040)	(0.013)	(0.013)
FP AA, accounting	-0.001	FP BA local, accounting	-0.002	Public cert				0.036**
	(0.009)		(0.012)					(0.015)
FP BA, sales	0.008	FP BA online, sales	-0.029***					
	(0.010)		(0.010)					
FP BA, accounting	0.011	FP BA online, accounting	-0.012**					
	(0.014)		(0.006)					
Public AA, sales	0.005	Public BA selective, sales	-0.012					
	(0.008)		(0.014)					
Public AA, accounting	-0.005	Public BA selective, accounting	0.016					
	(0.010)		(0.013)					
Number of observations	4,004	Number of observations	4,100	Number of observations	804	200	436	948
R-squared	0.011	R-squared	0.018	R-squared	0.016	0.213	0.041	0.071

Notes: The dependent variable is an indicator variable for any personalized callback from the potential employer. Standard errors are clustered at the vacancy level. The regressions include fixed effects for vacancy, skill template, work history, and name. The base education category is no postsecondary degree or certificate in cols. (1) and (6), a non-selective public BA in col. (2), and a public certificate in cols. (3), (4), and (5).

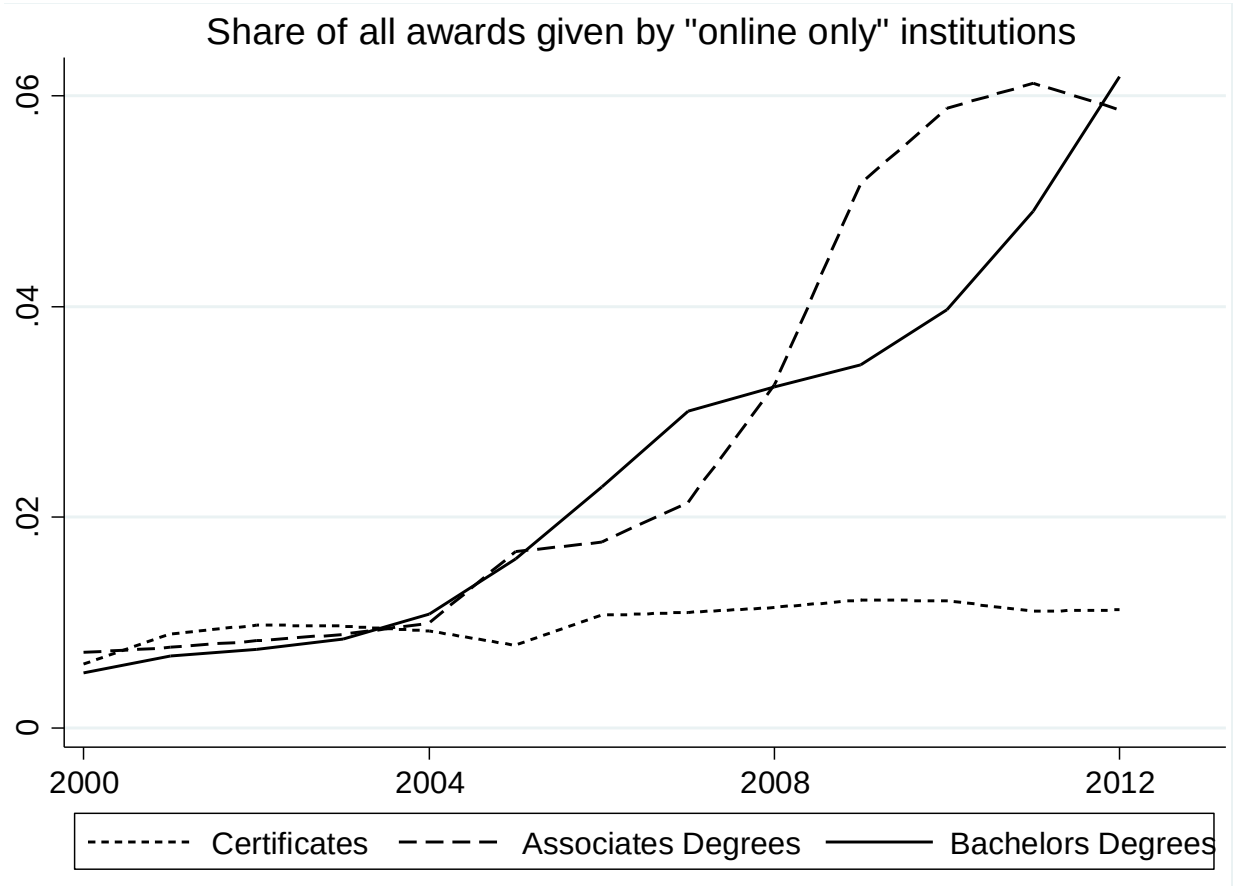
*** $p < 0.01$, ** $p < 0.05$,* $p < 0.10$

Appendix Figure 1: For-Profit Institution Share of Degrees Awarded by Title IV Postsecondary Institutions, 2000-2012



Source: Integrated Postsecondary Education Data System (IPEDS).

Appendix Figure 2: Share of Postsecondary Awards from “Online Only” Institutions, 2000-2012



*Source***:** Integrated Postsecondary Education Data System (IPEDS). IPEDS collects data on enrollment and completions at the campus (not institution) level, and “Online Only” institutions are defined as campuses that are solely dedicated to distance education or that have “online” in the institution title. See the text for details.

Appendix: Measuring job quality by collecting job title-specific salaries

To estimate expected salaries for the job titles to which we apply, we collect data from indeed.com, a website with a database of millions of job postings that provides median salaries by job title based on postings from the last 12 months.

The indeed.com website allows one to search for the typical (median) salaries associated with specific job titles (job title search) or salaries associated with job postings containing particular keywords (keyword search). The site also allows one to search for salaries associated with job postings in a particular location, or to search for salaries nationally.

We use a data-scraping program (available from the authors upon request) to enter into the indeed.com salary search bar (http://www.indeed.com/salary) the job titles from the postings to which we applied, one title at a time.

We tried to ensure that our results are robust to measurement error arising from imperfect matches of the job titles to which we applied with job postings in the indeed.com database.[40] In particular, we checked the sensitivity of our findings to conducting each job title search in four different ways:

1. National title search: we did not specify the location of the job, and we matched the title of the job to which we applied only to job posting titles in the indeed.com database.
2. National keyword search: we did not specify the location of the job, and we matched the title of the job to which we applied to job posting titles or to other keywords in the indeed.com database.
3. Labor market-specific title search: we specified the location of the job to which we applied, and we matched the title of the job to which we applied only to job posting titles in the indeed.com database.
4. Labor market-specific keyword search: we specified the location of the job to which we applied, and we matched the title of the job to which we applied to job posting titles or to other keywords in the indeed.com database.

The results are not much affected by the particular choice of indeed.com queries for job salaries. Our baseline query is the national title search. This approach limits Type I errors arising from irrelevant (for our purposes) information in job postings and limits Type II errors by allowing for close matches between the job titles to which we applied in our resume audit study and job posting titles in the indeed.com database from across the country.

Despite the steps we took to standardize salaries across similar job titles, significant variation remained. In particular, salaries for sales and customer service jobs varied considerably for seemingly arbitrary differences in job titles. For example, a "sales representative" salary was estimated to be

[40] We were concerned about both Type I and Type II errors. A Type I error (indeed.com matches a job title to which we applied with a job posting in their database, when in fact the jobs were very different) would be of greatest concern in broader searches (national, keyword searches). For example, a search for "Sales Associate" may yield a match with an "Administrative Assistant" job posting on indeed.com, if the "Administrative Assistant" job posting included in the job description mention that the position would be in support of a sales team. A Type II error (indeed.com fails to match a job title to which we applied to similar job postings in their database) would be of greatest concern in narrower searches (labor market-specific, title searches).

$31,000, while an "automotive sales representative" salary was $65,000 and an "enterprise sales representative" was $108,000. Thus, prior to analyzing the data from the experiment, we designed the following solution for sales representative and customer service jobs:

1. We defined sales jobs as job titles with the word "Sales" in it, and customer service jobs as jobs with the phrase "Customer Service" in it. Most of these fell into the "Sales" category.
2. We created a list of keywords that were commonly associated with higher salaries, such as "senior," "analyst," "manager," "executive," "director," "engineer," and "president." We left the salary data unchanged for any job title that had one of these keywords in it (i.e., "sales manager").
3. For all remaining customer service and sales jobs, we created a range that was approximately equal to the 10^{th} and 90^{th} percentile of expected salaries for all jobs in each category. For customer service, this range was $25,000 to $45,000. For sales, the range was $20,000 to $50,000. Any job title with a salary outside of the range was assigned the minimum or maximum salary (unless it had one of the keywords in #2 above).

This rule is likely to significantly reduce measurement error and seemed appropriate for our purpose of constructing a rough proxy for job quality. When we do not trim outliers in the salary data, our point estimates are substantively very similar, but noisier.