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

David J. Deming, Harvard University and NBER
Noam Yuchtman, UC-Berkeley and NBER
Amira Abulafi, NBER
Claudia Goldin, Harvard University and NBER
Lawrence F. Katz, Harvard University and NBER

September 2015

Abstract

We study employers' perceptions of the value of postsecondary degrees using a field experiment. We randomly assign the sector and selectivity of institutions to fictitious resumes and apply to real vacancy postings for business and health jobs on a large online job board. We find that a business bachelor's degree from a for-profit "online" institution is 22 percent less likely to receive a callback than one from a non-selective public institution. In applications to health jobs, we find that for-profit credentials receive fewer callbacks unless the job requires an external quality indicator such as an occupational license.

Acknowledgments: We thank Olivia Chi, Natalia Emanuel, Barbara Halla, Glenda Oskar, Megan Prasad, Lauren Reisig, Ali Rohde, Adela Soliz, Shichen Wang, Jonathan Whittinghill and Wenyu Zhou for superb research assistance. We also thank seminar participants at Harvard University, NYU, Princeton University, UC-Santa Barbara and the NBER Summer Institute for helpful feedback. This research is supported in part by the Institute of Education Sciences, U.S. Department of Education, through Grant R305C110011 to Teachers College, Columbia University. This study is approved by Harvard IRB (IRB13-1856) and was submitted to the American Economic Association Randomized Controlled Trial Registry on March 30, 2014.

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 (Autor 2014; Goldin and Katz 2008). 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 offer highly structured programs at convenient times and formats, and many have argued—at least going back to Freeman (1974)—that the for-profits respond more rapidly to changing employer demands than do public sector schools. For-profit institutions have expanded recently in fast-growing areas such as health and information technology.

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 also have been major contributors to the emerging market for online education and driven a rapid increase in online enrollment (e.g., Deming et al. 2015). 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 (BAs) from 2002 to 2012. 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 a vast 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 type of 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.

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

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 BAs and our fictitious job seekers have just completed their schooling. We select vacancies that request only minimal work experience to highlight the salience of the postsecondary credential to prospective employers.

We find that applicants with 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. Although we find no overall difference in callback rates by public university selectivity, we do find some evidence of higher returns to degrees from more-selective institutions for higher-salaried jobs.

Business job openings that do not require a BA rarely list an associate's degree as a job requirement and more commonly have no degree requirement listed at all. For business job openings that do not require a BA, we find no significant overall advantage to having a postsecondary credential. Resumes with an associate's degree from a public or a for-profit institution are no more likely to receive a callback than are resumes with identical work experience but no postsecondary degree at all.

Turning to the health jobs, we find that resumes with certificates from for-profit institutions are about 57 percent less likely to receive a callback than are those with similar certificates from public institutions, when the posting does not explicitly require a postsecondary certificate (primarily postings for 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.

Although our experiment is not designed to directly disentangle alternative causal mechanisms, we draw two broad lessons from the results. First, employers appear to view for-profit postsecondary credentials as a negative signal of applicant quality, particularly when objective measures of quality such as a licensing exam are unavailable. Our findings echo those of MacLeod et al. (2015), who find that making national college exit exam scores in Colombia available to students and employers reduces the earnings return to college reputation.

Second, we show that differences in callback rates across sector and institution type are strongly related to differences in objective measures of school resources and quality such as per-pupil spending and graduation rates. The pattern we find is consistent with employers' perceiving systematic value-added differences across postsecondary sectors. However, employers could discriminate against for-profit applicants based on demographics, work experience or other individual productivity-related characteristics even if employers believe for-

profit colleges are as effective as public institutions. We designed our experiment to minimize such concerns by making job applicants equal on every characteristic listed on the resumes, including work experience, demographics, skills and residential address. But we cannot fully rule out the possibility that employers infer pre-college applicant quality from postsecondary sector even after conditioning on other resume characteristics.

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 a field experiment examining employer perceptions of sub-baccalaureate degrees from for-profit versus public institutions. Although our studies differ in many respects, when considering the range of jobs (business and health) and credentials (sub-baccalaureate degrees and certificates) where the studies overlap, the results are broadly similar.[2]

There are four main differences between our study and Darolia et al. (2014). First, 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. Second, 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. Third, 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; Gaddis 2015; 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 an actual job offer. Moreover, differences in callback rates are a measure of employers' *perceptions* of applicant quality, rather than of actual differences in skill acquisition across educational institutions.

[2] 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.

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 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).

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

[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.
[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).

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 total revenue in 2011-2012.[5] 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.[6] 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.[7] 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

[5] 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.

[6] 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 follow Deming et al. (2015) in using direct survey questions about distance education that IPEDS began asking in 2012. 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.

[7] See Appendix Figures 1 and 2 for details.

for for-profit college attendance might be no college at all.[8] 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, potentially reflecting employer beliefs about both the quality of the education provided and the *ex ante* attributes of the graduates themselves from each sector. 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 the wages of the job or a job offer. 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 a generic callback. 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 contact from unfamiliar applicants through an online job board. Yet institutions may differ in their formal connections with employers or in their ability to place students through

[8] 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).

informal channels (Rosenbaum, Deil-Amen and Person 2006). Moreover, not all jobs are posted online, and employers may differ in their willingness to fill job vacancies with online applicants. Nevertheless, Internet job search is increasingly a viable pathway toward employment. Carnevale, Jayasundera, and Repnikov (2014) estimate that between 60 and 70 percent of all job vacancies are posted online, with better coverage for jobs with higher education requirements. Kuhn and Mansour (2014) show that the share of young unemployed workers who use the Internet to look for a job increased from 24 percent in 2000 to 74 percent in 2009, and that the unemployment durations of Internet searchers are about 25 percent shorter than comparable workers who search only offline.

Additionally, we focus on resumes for students who have completed their degrees and do not take into account differences in degree completion rates across institutions that may impact the full returns to postsecondary schooling by sector. 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 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 BA program, compared with similar students in public institutions.

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.

III. Experimental Design

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

We focus on degrees and certificates awarded in the two largest occupational categories by degree in the United States: business and health.[9] Table 1 lists the programs and degrees in our study. The associate's and bachelor's degrees are in two broad business programs (accounting/finance and customer service/sales/marketing) and the certificates are in four different health programs.[10] In 2012, about 43 percent of certificates and diplomas were awarded in the health fields, and 12 percent of associate's degrees and 21 percent of all bachelor's degrees

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

[10] 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).

were awarded in the business fields. These awards are spread relatively evenly across postsecondary sectors. The business field accounts for 10 percent of all associate's degrees and 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. Although it is unusual for employers to require an associate's degree, bachelor's degree requirements are common, and these jobs appear to be qualitatively different from jobs that require less education. 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 occupational license. All of our resumes in these categories include 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.[11] 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.[12] 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).[13]

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).

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

[12] 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.

[13] 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.[14] 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 Experimental Design

1. Postsecondary Institutions

The degrees in our study have been chosen 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 degrees awarded in 2012, based on IPEDS data. In 2012, online institutions in the for-profit sector accounted for 50 percent of associate's degrees and 60 percent of bachelor's degrees, both in business.

Our definition of "online" institutions includes schools that offer some in-person degrees, although on-line degrees predominate. Since it is rare for resumes to note that the degree was obtained online (e.g., "University of Phoenix – Online Campus"), our fictitious resumes do not indicate specifically whether a degree was obtained online or in-person. However, we think employers are likely to consider degrees from these institutions as "online" degrees, for three reasons.

First, four of the seven "online" institutions in our sample do not have any in-person branches in the five labor markets we study. Second, while the other three institutions do have local campuses, in-person enrollment at for-profit "chain" institutions has been rapidly declining. In 2000, about 16 percent of enrollment at the University of Phoenix was in the online campus. By 2010, the online campus enrolled 80 percent of all University of Phoenix students. Third, many students who are formally enrolled at in-person campuses take their classes online.

We adopt 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. These local institutions were chosen because they have little or no online degree presence. When no for-profit offering existed for an in-person program in the locality, all for-profit degrees on the

[14] 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.

resumes come from online institutions.[15] We use local public institutions (weighted by size) in all cases. To increase the probability that employers were familiar with the degree programs in our study, we impose the restriction that every institution operated in the local labor market (or existed 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.[16] For example, in the two California labor markets, less-selective 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.

Online institutions award a very small share of diplomas and certificates in allied health. 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 in our 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.[17] 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.[18]

---

[15] 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.

[16] 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."

[17] 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. We draw an equal proportion of work histories from the resumes of individuals who attended public and for-profit institutions.

[18] 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. This finding is consistent with data from the 2012

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, our design randomly assigns templates with both types of work history profiles to degrees from each sector. When possible, we draw from the space of resume characteristics with "common support" and 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). Our research design gives an estimate of the "return" to having a credential relative to an otherwise identical resume. This does not include the opportunity cost of foregone employment. An alternative approach is 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).

3. Experimental Design

We summarize the basic structure of the experiment in Table 2. When applying to business vacancies that do not require a degree (or that require an associate's degree), we send four resumes that vary by credential: 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 BA 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 a bachelor's degree, all of the for-profits are online institutions. Similarly, the resumes with BAs 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 do not require a degree or credential, we send one resume with a certificate from a local public institution and one with a certificate from a local for-profit institution. Each includes an externship plus three years of non-medical or "medical uncertified" experience. For those with high school only (see Table 2, Health) one resume has only non-medical experience and no postsecondary credential and the other resume also has no credential,

---

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.

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.

For health jobs that require a credential (in this case a certificate), 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.

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.

Because past work has shown that the race and gender of applicants predicts employer callbacks, 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.

We use the data we collect from each vacancy to construct a measure of job quality based on the salary associated with a given job title.[19] 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.

[19] See Online Appendix B for a detailed description of the process by which we matched job titles to salaries.

The study was conducted between April and November of 2014.[20] 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.[21] Online Appendix A provides additional details about the experimental protocol, resume construction and the job application procedure.

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."[22]

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. 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

[20] 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.

[21] 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.

[22] 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 results are qualitatively unchanged when using this alternative definition.

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.

The left four bars of Figure 1 give the results for business job vacancies that do not require a degree (or that require an associate's degree). Little difference exists 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—a difference of about 25 percent. The callback rate for resumes with degrees from locally operated ("not online") for-profits is 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 with no credential at all. Finally, the right two bars of Figure 2 give results for job vacancies in health that require a credential (all licensed practical nursing and pharmacy technician jobs, plus some medical assistant jobs). We find a modestly 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 applicant name; and col. (3) adds vacancy fixed effects (absorbing race, gender, and labor market variation) and continues to include fixed effects for applicant name, work history and skills.[23] 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.

[23] Specifically, we include fixed effects for each work history and skill template, as well as fixed effects for combinations of applicant initials (i.e. TD). Since race and gender are randomized across vacancies, and since we use the same combinations of initials for all race and gender combinations, fixed effects for applicant initials simply check whether particular initials in names are systematically related to callback rates and their inclusion does not meaningfully impact the other estimated coefficients. See Online Appendix A for details.

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 percent 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.

Table 5 presents results for business vacancies that require applicants to have a bachelor's degree. 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. 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.[24]

[24] 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. 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.

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.

Table 6 presents results for health jobs. 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. 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.[25]

V. Interpretation

A. Do Lower Callback Rates Reflect Employers' Negative Assessments of Applicants?

Broadly our results suggest that employers carefully screen resumes for signals of applicant quality, including the applicant's postsecondary credentials. In nearly all of the models in Tables 4 through 6, we can strongly reject the hypothesis that callbacks are equal across work history and skill templates. Thus, even in a sample of resumes that was designed to appear as similar as possible, employers are quite responsive to differences in resume characteristics.

Our main finding is that employers who post jobs that require a bachelor's degree are much less likely to call back applicants with degrees from online, "chain" for-profit institutions. Does a lower callback rate necessarily imply a more negative evaluation of a job applicant's credentials? It is possible that employers see applicants with for-profit degrees as *too* highly qualified. Over-qualified applicants may not accept a job offer, or if they do accept they may leave shortly thereafter for a better opportunity. In audit studies based on personal characteristics such as race and gender, the concern is referred to as "reverse discrimination" (Bertrand and Mullainathan 2004).

We test for "reverse discrimination" by asking whether our results hold equally for lower- and higher-quality jobs, with the expected salary of a job opening as a proxy for job

[25] Results for individual health occupations are shown in Appendix Table 7.

quality. Table 7 shows results for business vacancies that do not require a degree or that require an associate's degree (median salary $36,000), and Table 8 shows results for business jobs that require a bachelor's degree (median salary $51,000). The first three columns of Table 7 and first four columns of Table 8 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 7 and 8 include vacancy fixed effects plus the usual controls for name, work history and skills templates.

The evidence in Table 7 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. However, there is some evidence of "reverse discrimination" against for-profit bachelor's degree holders applying to jobs that do not require a degree. We find a negative impact of having a for-profit BA on callbacks for the lowest-paying jobs, but a positive (about 2.5 percentage points, cols. 2 and 3) and borderline statistically significant advantage to resumes with a for-profit BA for higher-paid business jobs. These findings suggest that the overall impact of having a for-profit bachelor's degree is driven down by lower callback rates for low-salaried jobs. However, when examining the full range of jobs, as in col. (4), there is a positive gradient by expected salary in the callback differential for a for-profit BA, but one that is not statistically significant.

Table 8 shows no evidence of "reverse discrimination" against job applicants with bachelor's degrees from for-profit institutions when applying to jobs that *require* a bachelor's degree. 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

We do, however, find that 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). 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. 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.

Two recent surveys provide additional evidence that lower callback rates for resumes with credentials from for-profit institutions reflect employers' negative assessments of the credentials. First, 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). The survey also found that employer name recognition was higher for online "chains" compared to local for-profits and similar to community colleges suggesting that our results are not driven by lack of familiarity with the institution listed on the resume.[26]

Second, 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).

B. Postsecondary Institutions Serve as a Signal of Applicant Quality When Objective Measures are Unavailable

Overall, the evidence suggests that employers infer resume quality based on the postsecondary institutions attended by applicants, and that they statistically discriminate against for-profit, "chain" institutions when the job requires a bachelor's degree.[27] If employers treat a degree from a for-profit institution as a negative signal, why do we not find lower callback rates for for-profit credentials across all categories of job vacancies?

One possible explanation is that the postsecondary credential becomes less important when other job requirements can be used to screen applicants. As noted earlier, most health jobs that require a certificate also require applicants 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. Moreover, nearly all medical assistant programs require the completion of an externship in a medical setting. Thus vacancies that require a certificate in medical assisting also effectively require an externship that can serve as a tool for employers to screen out lower-quality applicants, similar to a license.

In contrast, health vacancies that do not require a certificate—mainly for administrative or back-office medical assistant positions—must infer applicant quality from other signals on the resume, including the postsecondary degree. This interpretation, while speculative, can explain

[26] The survey found that 50 percent of employers had not heard of a randomly selected online, "chain" for-profit, compared to 76 percent of local for-profits, 41 percent of community colleges and only 13 percent of four-year public universities. Although name recognition was much greater for public universities, the survey only listed the state flagship and did not include the local, non-selective institutions in our study (Hagelskamp, Schleifer and DiStasi 2014).

[27] Another possible concern regarding the interpretation of our results is that 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 (Heckman and Siegelman 1993, Neumark 2012). 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. However, 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).

the large negative coefficient on for-profit certificates for no certificate required jobs in cols. (1) and (2) of Table 6 and the null results for certificate-required health jobs in cols. (3) and (4). In the absence of objective information, employers infer applicant quality based on a variety of resume characteristics including the applicant's postsecondary institution. Screening tools such as licensing exams, when available, provide a signal of applicant quality that mitigates differences in employer perceptions across postsecondary institutions or sectors.[28] Consistent with this hypothesis, MacLeod et al. (2015) find that the introduction in Colombia of national college exit exams, a new potential signal of skills, reduced the earnings return to college reputation.

We also find some limited evidence that the negative impact of having a for-profit credential for jobs that require a bachelor's degree is smaller for accounting and finance jobs, compared to jobs in customer service, sales and marketing.[29] Since accounting and finance degrees produce competencies that appear to be easier for employers to identify, this pattern is broadly consistent with the hypothesis that employers use an applicant's postsecondary institution as a signal of quality when objective measures are unavailable.

Like Darolia et al. (2014), we find no differential callback rates by sector in the business occupations not requiring a bachelor's degree. Indeed, no qualification, public or for-profit, was significantly associated with increased callback rates for these positions. Perhaps this is not surprising given that so few employers require applicants to have an associate's degree. It is possible that employers posting these largely low-paid, entry-level jobs may be looking for skills that are only weakly correlated with degree receipt (e.g., "soft skills").

Interestingly, we find a large and statistically significant (4.2 percentage point) increase in callbacks among females compared with males for business jobs that do not require a degree. The female callback advantage is especially pronounced (5.1 percentage points) for customer service, sales and marketing jobs compared with accounting and finance jobs (1.9 percentage points). One hypothesis is that employers view women as more likely to possess the "soft skills" or "people skills" required for these positions (e.g., Deming 2015).

[28] If we separately estimate results from col. (4) of Table 6 for jobs that require a license compared to jobs that require a certificate but not a license, we obtain coefficients and standard errors of -0.0004 (0.0120) and -0.0107 (0.0125) on the for-profit indicator respectively. Our pre-analysis plan specifically mentioned the possibility of differences in impacts by license and certificate requirements, and we pre-specified our approach of separately analyzing results for allied health occupations that required applicants to hold a license.

[29] We estimate a version of col. (4) of Table 5 with interactions between each sector indicator and indicators for accounting/finance vs. customer services/sales/marketing. For all three types of institutions, the coefficient is larger for accounting/finance jobs. However, the estimates are noisy with the F-test for the difference between the accounting/finance coefficients and the customer services/sales/marketing coefficients yielding a p-value of 0.166.

C. Are Employers' Views of For-Profit Credentials Explained by College Quality Differences?

The high cost to students and taxpayers of postsecondary credentials makes it critical to understand differences across sectors in the production of human capital. The audit study design allows us to hold fixed all applicant characteristics that commonly appear on a resume, but we cannot rule out the possibility that employers statistically discriminate by using the applicant's postsecondary institution as a signal of *unobserved* pre-college determinants of productivity. Employers may think that all degrees provide equal human capital, but that applicants who attend for-profit colleges have characteristics that make them less capable workers even prior to attending college. Deming, Goldin and Katz (2013) find that for-profit college students are more disadvantaged than students in public institutions across a variety of characteristics that may be correlated with productivity.

Although our audit study design provides causal evidence that employers are less likely to call back applicants with a bachelor's degree from a for-profit institution, we cannot definitively say the extent to which the difference in callback rates reflects employer beliefs about sectoral differences in college quality versus *ex ante* student quality. But we can examine the whether sectoral differences in college quality indicators are correlated with our experimental estimates of differences in callback rates.

Using data from the 2013 IPEDS, we calculate instructional spending per enrolled student for each institution in the bachelor's degree-required sample. When weighted by the total number of resumes sent, online, "chain" for-profit institutions in our sample spent about $1,258 per student on instruction in 2013. Per-student instructional spending was $4,670 for the in-person for-profits in our sample, compared with $5,257 for non-selective publics and $21,431 for the selective publics respectively. The instructional spending differences line up well with the results in Table 5.[30] Similarly, we also find some weak evidence that differences in impacts across labor markets are correlated with differences in local public institution quality.[31]

Spending and quality differences across sectors may be driven by the market incentives faced by for-profit institutions. For-profit firms have stronger incentives to "shade" on the quality of services provided when quality is difficult for customers to observe (Hansmann 1996).

[30] If we replace the indicators for postsecondary sector with the natural log of instructional spending per pupil in col. (4) of Table 5, we find a positive and statistically significant impact of spending on callback rates. If we interact log spending with indicators for postsecondary sector, the coefficients are positive but not statistically significant suggesting that within-sector differences in spending do not explain within-sector differences in callback rates.

[31] In a pooled model with all business jobs, the coefficients on an indicator for for-profit status are most negative in San Francisco, Los Angeles and Chicago and least negative in New York and Miami. The pattern is broadly consistent with differences across labor markets in per-pupil spending in the colleges in our sample, as well as with subjective measures of selectivity such as the Barron's or U.S. News and World Report rankings.

Online for-profits also have substantially lower graduation rates than do other sectors. According to the 2013 IPEDS, the online for-profits in our sample have a weighted six-year graduation of 25.6 percent, compared with 55.1 percent for in-person for-profits, 42.8 percent for non-selective publics, and 79.2 percent for selective publics. It is unclear how differences in graduation rates should affect the interpretation of our results. Employers may infer that graduates from institutions with low graduation rates are more capable on average. This interpretation would suggest our results for online for-profits are biased upward relative to inferences made about the average attendee. On the other hand, employers may interpret graduation rates as an indicator of the institution's overall quality or the quality of the students who initially choose to attend. In that case, our results would be biased downward relative to the average student.

Overall, our results are consistent with the hypothesis that sectoral differences in callback rates reflect employers' perceptions of sectoral differences in the human capital provided by the institutions themselves. However, it is also possible that our results are driven by employers' perceptions of pre-existing differences between students who attend different types of institutions. We designed our experiment to reduce the scope for discrimination on observed characteristics whenever possible—for example, by holding both gender and race constant within job applications—but ultimately we cannot control for the inferences employers make about the unobserved characteristics of applicants across sectors.

We find no consistent pattern of differences in callback rates by race, unlike Bertrand and Mullainathan (2004). The possible reasons include differing study settings, time periods, labor markets, application processes, employers, and job quality.[32] We do find racial differences in the relative returns to resume quality, similar to Bertrand and Mullainathan (2004).[33] In Appendix Tables 6 and 7, we show that there is no systematic evidence of differential impacts of postsecondary sector by gender or for different occupation groups within the business and health categories.

[32] 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). Finally, we note that a lack of explicit racial discrimination may actually be due to the online, recordable nature of employer-employee contact. Large companies are increasingly using Applicant Tracking System (ATS) software to winnow down large pools of applicants based on customized sets of characteristics such as years of work experience and school attended (See http://online.wsj.com/news/articles/SB10001424052970204624204577178941034941330). Discrimination at the callback stage would be easy to detect and record with ATS software. However, we note that the use of these programs would not meaningfully affect the interpretation of our results if employers make deliberate decisions to screen out some postsecondary institutions.

[33] In Appendix Table 5 we present results that allow the impact of postsecondary credentials to vary by race. For both business and health vacancies that do not require a degree, we find a significantly higher return to having a degree for whites compared to nonwhites. This is similar to Bertrand and Mullainathan (2004), who find that the black-white gap in callbacks is increasing in resume quality. In contrast, we find no difference in the returns to postsecondary credentials by race when applying to jobs that require applicants to have a degree or a certificate.

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. These online, for-profit colleges 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 from 2002 to 2012. 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 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.

More generally, our results support the idea that employers view a credential from a for-profit institution as a negative signal of applicant quality in the absence of objective measures. Since per-pupil instructional spending and graduation rates are much lower in online, "chain" for-profits compared with public institutions, one interpretation is that these results reflect employers' perceptions about sectoral differences in human capital provision (or college quality). Our results are also consistent, though, with a role for statistical discrimination based on employers' perceptions of the *unobserved* characteristics of applicants.

Our study can potentially 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), 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.

References

Autor, David H. 2014. "Skills, Education and the Rise of Earnings Inequality among the 'Other 99 Percent,'" *Science* 344 (6186): 843-51.

Barr, Andrew and Sarah Turner. 2013. "Expanding Enrollments and Contracting Budgets: The Effect of the Great Recession Higher Education," *The Annals: American Academy of*

Baum, Sandy and Jennifer Ma. 2014. "Trends in College Pricing 2013". The College Board: Princeton, NJ.

Bertrand, Marianne and Sendhil Mullainathan. 2004. "Are Emily and Greg More Employable than Lakisha and Jamal? A Field Experiment on Labor Market Discrimination," *American Economic Review* 94(4): 991-1013.

Bound, John, Michael F. Lovenheim and Sarah Turner. (2012). "Increasing Time to Baccalaureate Degree in the United States," *Education Finance and Policy 7*(4): 375-424.

Carnevale, Anthony P., Tamara Jayasundera, and Dmitri Repnikov. (2014). "Understanding Online Job Ads Data." Georgetown University, Center on Education and the Workforce, Technical Report (April).

Cellini, Stephanie Riegg. 2009. "Crowded Colleges and College Crowd-Out: The Impact of Public Subsidies on the Two-Year College Market," *American Economic Journal: Economic Policy* 1(2): 1-30.

Cellini, Stephanie Riegg. 2010. "Financial Aid and For-Profit Colleges: Does Aid Encourage Entry?," *Journal of Policy Analysis and Management* 29(3): 526-52.

Cellini, Stephanie Riegg. 2012. "For-Profit Higher Education: An Assessment of Costs and Benefits," *National Tax Journal* 65(1): 153-80.

Cellini, Stephanie Riegg and Latika Chaudhary. 2013. "The Labor Market Returns to a For-Profit College Education." George Washington University (October).

Cellini, Stephanie Riegg and Claudia Goldin. 2014. "Does Federal Student Aid Raise Tuition? New Evidence on For-Profit Colleges," *American Economic Journal: Economic Policy*, forthcoming.

Chronicle of Higher Education. 2012. "The Role of Higher Education in Career Development: Employer Perceptions;" https://chronicle.com/items/biz/pdf/Employers%20Survey.pdf, last accessed September 15th, 2014.

Darolia, Rajeev, Cory Koedel, Paco Martorell, Katie Wilson and Francisco Perez-Arce. 2014. "Do Employers Prefer Workers Who Attend For-Profit Colleges? Evidence from a Field Experiment." University of Missouri (June).

Deming, David J., Claudia Goldin and Lawrence F. Katz. 2012. "The For-Profit Postsecondary School Sector: Nimble Critters or Agile Predators?," *Journal of Economic Perspectives* 26(1): 139-64.

Deming, David J., Claudia Goldin and Lawrence F. Katz. 2013. "For-Profit Colleges," *The Future of Children* 23(1): 137-163.

Deming, David J., Claudia Goldin, Lawrence F. Katz, and Noam Yuchtman. 2015. "Can Online Learning Bend the Higher Education Cost Curve?" *American Economic Review* 105(5): 496-501.

Deming, David J. 2015. "The Growing Importance of Social Skills in the Labor Market". NBER Working Paper No. 21473.

Eriksson, Stefan and Dan-Olof Rooth. 2014. "Do Employers Use Unemployment as a Sorting Criterion When Hiring? Evidence from a Field Experiment," *American Economic Review* 104(3): 1014-39.

Freeman, Richard B. 1974. "Occupational Training in Proprietary Schools and Technical Institutes," *Review of Economics and Statistics* 56(3): 310-18.

Gaddis, S. Michael. 2015. "Discrimination in the Credential Society: An Audit Study of Race and College Selectivity in the Labor Market." *Social Forces* 93(4): 1451-1479.

Ghayad, Rand. 2013. "Why Is It so Hard for Job-Seekers with Valuable Experience to Find Work? Evidence from a Field Experiment," Northeastern University, working paper.

Gilpin, Gregory, Joe Saunders and Christina Stoddard. 2013. "Why Have For-Profit Colleges Expanded so Rapidly? The Role of Labor Market Changes in Student Enrollment and Degree Completion at Two-Year Colleges." http://ssrn.com/abstract=2279688.

Goldin, Claudia and Lawrence F. Katz. 2008. *The Race between Education and Technology.* Cambridge, MA: The Belknap Press of Harvard University Press.

Hagelskamp, Carolin, David Schleifer and Christopher DiStasi. 2014. "Profiting Higher Education? What Students, Alumni and Employers Think About For-Profit Colleges." Public Agenda; http://www.publicagenda.org/pages/profiting-higher-education.

Hansmann, Henry. 1996. *The Ownership of Enterprise*. Cambridge, MA: Harvard University Press.

Heckman, James and Peter Siegelman. 1993. "The Urban Institute Audit Studies: Their Methods and Findings." In M. Fix and R. Struyk, eds., *Clear and Convincing Evidence: Measurement of Discrimination in America*. Washington, D.C.: The Urban Institute Press, pp. 187-258.

Hinrichs, Peter. 2013. "What Kind of Teachers Are Schools Looking For? Evidence from a Randomized Field Experiment." Georgetown University (November).

Hoxby, Caroline M. 2014. "The Economics of Online Postsecondary Education: MOOCs, Nonselective Education, and Highly Selective Education," *American Economic Review* 104(5): 528-33.

Kroft, Kory, Fabian Lange, and Matthew Notowidigdo. 2013. "Duration Dependence and Labor Market Conditions: Evidence from a Field Experiment," *Quarterly Journal of Economics* 128(3): 1123-1167.

Kuhn, Peter and Hani Mansour. 2014. "Is Internet Job Search Still Ineffective?" *The Economic Journal* 124(581): 1213-1233.

Lahey, Joanna N. 2008. "Age, Women, and Hiring: An Experimental Study," *Journal of Human Resources*, 43(1): 30-56.

Lahey, Joanna N. and Ryan A. Beasley. 2009. "Computerizing Audit Studies," *Journal of Economic Behavior and Organization* 70(3): 508-514.

Lang, Kevin and Russell Weinstein. 2013. "The Wage Effects of Not-for-Profit and For-Profit Certifications: Better Data, Somewhat Different Results," *Labour Economics* 24(October): 230-43.

Lanning, Jonathan. "Opportunities Denied, Wages Diminished: Using Search Theory to Translate Audit Pair Study Findings into Wage Differentials," *B.E. Journal of Economic Analysis & Policy* 13(2): 921-58.

MacLeod, W. Bentley, Evan Riehl, Juan E. Saavedra and Miguel Urquiola. 2015. "The Big Sort: College Reputation and Labor Market Outcomes." NBER Working Paper No. 21230.

Mincy, Ronald B. 1993. "The Urban Institute Audit Studies: Their Research and Policy Context." In M. Fix and R. Struyk, eds., *Clear and Convincing Evidence: Measurement of Discrimination in America*. Washington, D.C.: The Urban Institute Press, pp. 165-86.

Neumark, David. 2012. "Detecting Discrimination in Audit and Correspondence Studies," *Journal of Human Resources* 47(4): 1128-1157

Oreopoulos, Philip. 2011. "Why Do Skilled Immigrants Struggle in the Labor Market? A Field Experiment with Thirteen Thousand Resumes," *American Economic Journal: Economic Policy* 3(4): 148-71.

Pearson Foundation. (2011). *Second Annual Pearson Foundation Community College Student Survey*, Washington: DC.

Riach, P. A. and Rich, J. 2002. "Field Experiments of Discrimination in the Market Place," *Economic Journal* 112 (November): F480-F518.

Rosenbaum, James E., Regina Deil-Amien and Ann E. Person. 2006. *After Admission: From College Access to College Success*. New York: Russell Sage Foundation Press.

Scott-Clayton, Judith. 2012. "What Explains Trends in Labor Supply among U.S. Undergraduates?," *National Tax Journal* 65(1): 185-210.

Table 1: Programs/ Occupations and Sample Job Titles

(1) Program/ Occupation Category	(2) Degree Required	(3) Sample Job Titles	(4) 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

Source: A nationally recognized online job search website (our IRB prohibits revealing the name). Searches were performed from March to July 2014 for Business and Health and, in addition, from September to November 2014 for Health.

Notes: Program/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 or Credential 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	10,484
By city		
Chicago	0.082	2,036
Los Angeles	0.115	1,580
Miami	0.058	2,480
New York City	0.083	2,284
San Francisco Bay	0.083	2,104
By occupation and degree requirements		
AA, Accounting/Finance	0.045	1,084
AA, Customer Service/Sales	0.125	2,920
BA, Accounting/Finance	0.044	1,928
BA, Customer Service/Sales	0.104	2,172
Licensed Practical Nurse	0.057	804
Pharmacy Technician	0.070	200
Medical Assistant (Administrative)	0.046	1,016
Medical Assistant (Clinical)	0.078	360
By race and gender		
White female	0.092	2,620
White male	0.066	2,456
Nonwhite female	0.090	2,680
Nonwhite male	0.077	2,728
By Average Salary (business jobs only)		
less than $35,000	0.104	2,585
$35,000 to $49,999	0.107	2,528
$50,000 to $64,999	0.079	1,282
$65,000 or more	0.048	1,456
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 template, and names (applicant initials). 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 template, and names (applicant initials). 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**	-0.0040	-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		-0.0020	
	(0.0370)		(0.0294)	
Nonwhite female	-0.0717*		0.0280	
	(0.0391)		(0.0318)	
Nonwhite male	-0.0516		-0.0014	
	(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	1,432	1,432
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		0.493	
F(Male=Female)	0.188		0.464	
F(Race and gender)	0.338		0.744	
F(Names)	0.359	0.352	0.591	0.586
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 template, and names (applicant initials). Standard errors are clustered at the vacancy level.

** $p < 0.05$

* $p < 0.10$

Table 7: 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 template, and name (i.e. applicant initials). 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 8: Callback Regressions by Quality of Job (for Business Jobs, BA required)

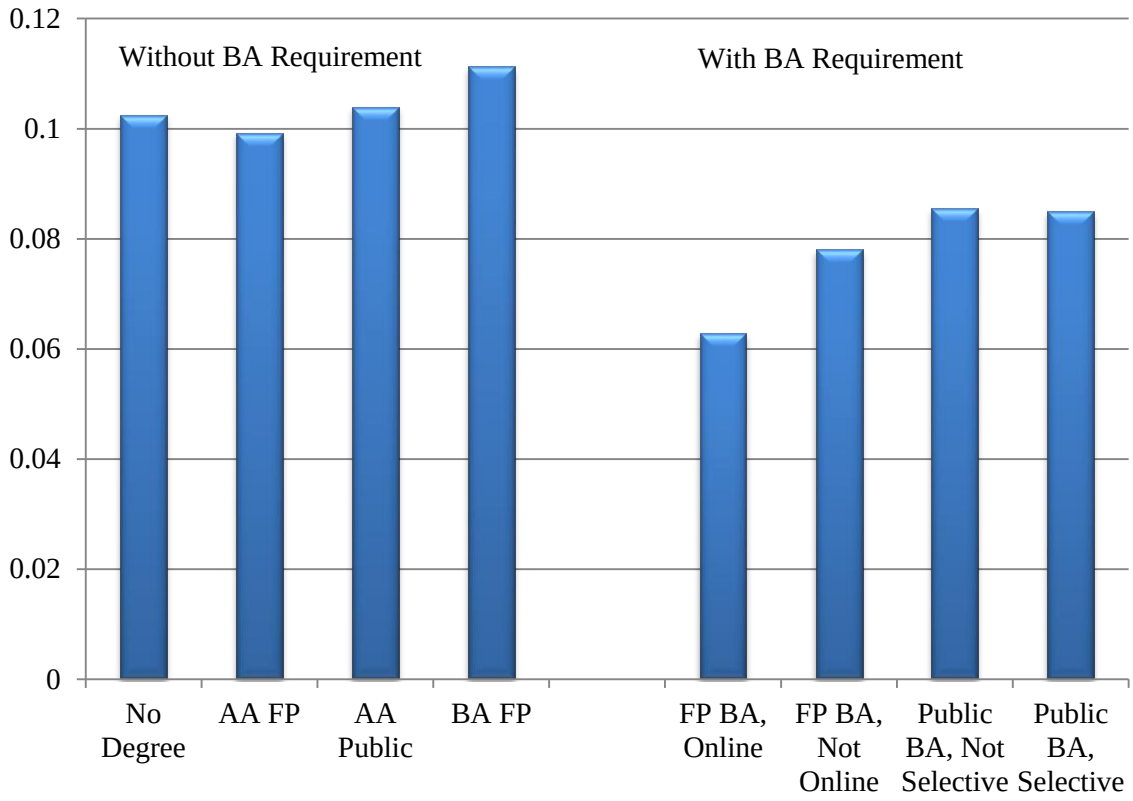
	(1) Less than $35,000	(2) $35,000 to $49,999	(3) $50,000 to $64,999	(4) $65,000 and greater	(5) All
For-profit BA, online	-0.0277	-0.0153	-0.0286**	-0.0157**	-0.0328*
	(0.0176)	(0.0117)	(0.0144)	(0.0074)	(0.0168)
× Salary (in $10,000s)					0.0020
					(0.0024)
For-profit BA, local	-0.0277	0.0039	-0.0084	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 template, and name (i.e. applicant initials). 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.

** $p < 0.05$

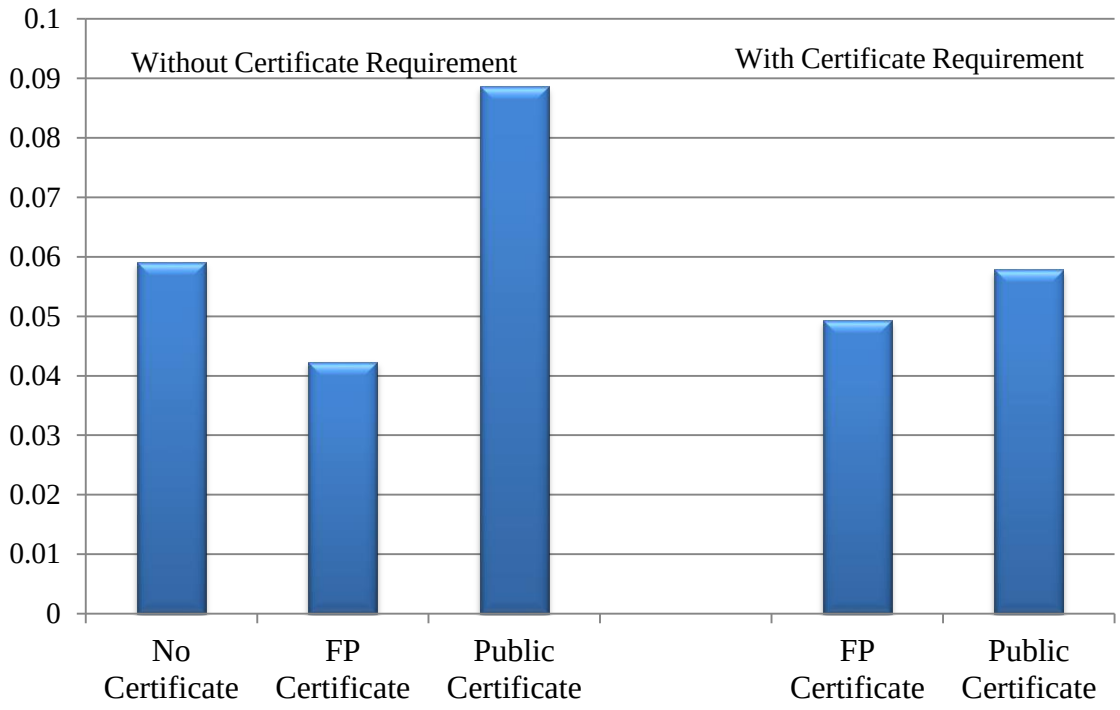
* $p < 0.10$

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
College of Staten Island	Public (Not Selective)	New York
Hunter College	Public (Not Selective)	New York
Queens 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
California State Univ., Long Beach	Public (Not Selective)	Los Angeles
California State Univ., Los Angeles	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 template, and name (applicant initials). 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 template, and name (applicant initials). 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 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 template, and name (i.e. applicant initials). 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).

** $p < 0.05$

* $p < 0.10$

Appendix Table 6: 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 online,				
FP, BA female	0.005	female	-0.019**	Public, female	0.024	
	(0.013)		(0.008)		(0.020)	
Public AA,		Public selective,				
male	0.001	male	0.002			
	(0.010)		(0.013)			
Public AA ,		Public selective,				
female	0.004	female	-0.001			
	(0.009)		(0.014)			
Number of		Number of		Number of		
observations	4,004	observations	4,100	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 template, and name (applicant initials). 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.

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

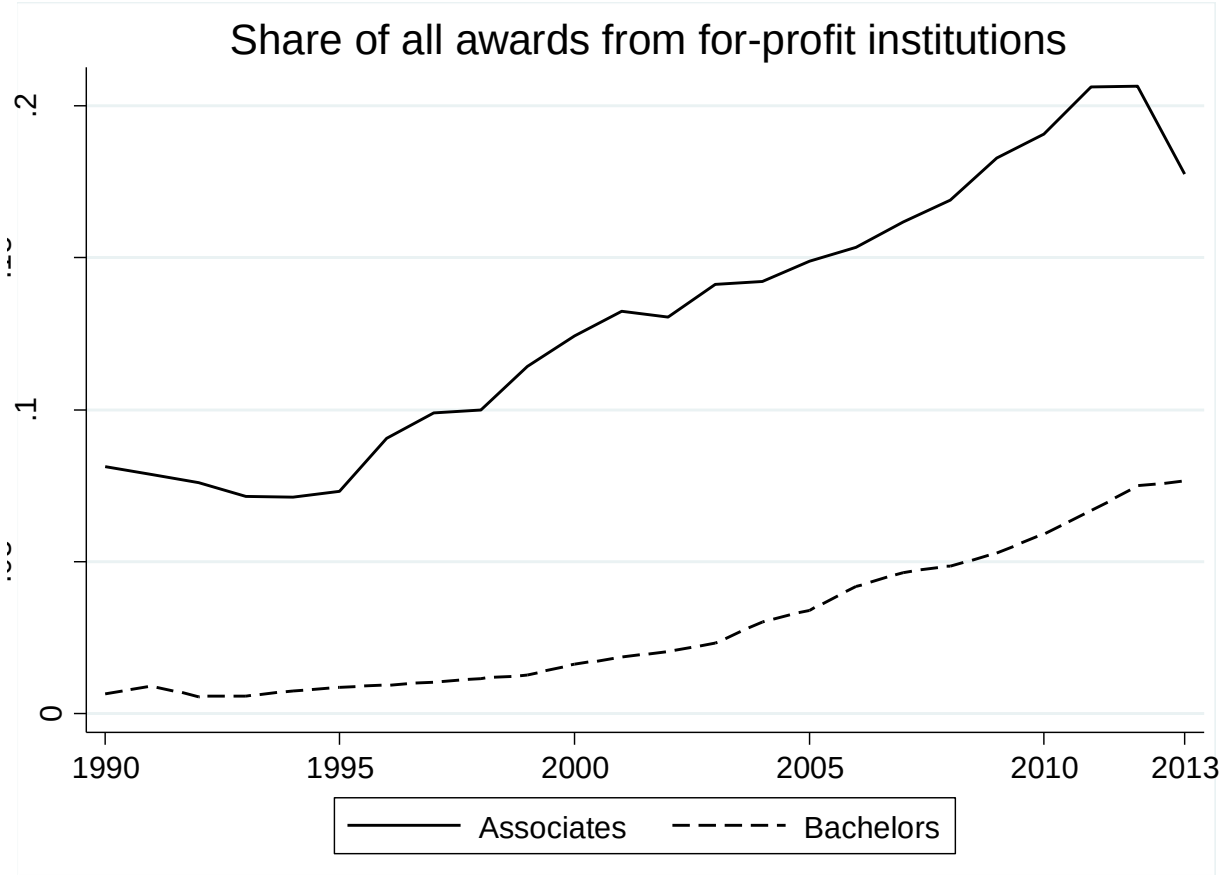
Appendix Table 7: Heterogeneous Callback Returns by Occupation

	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 template, and name (applicant initials). 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).

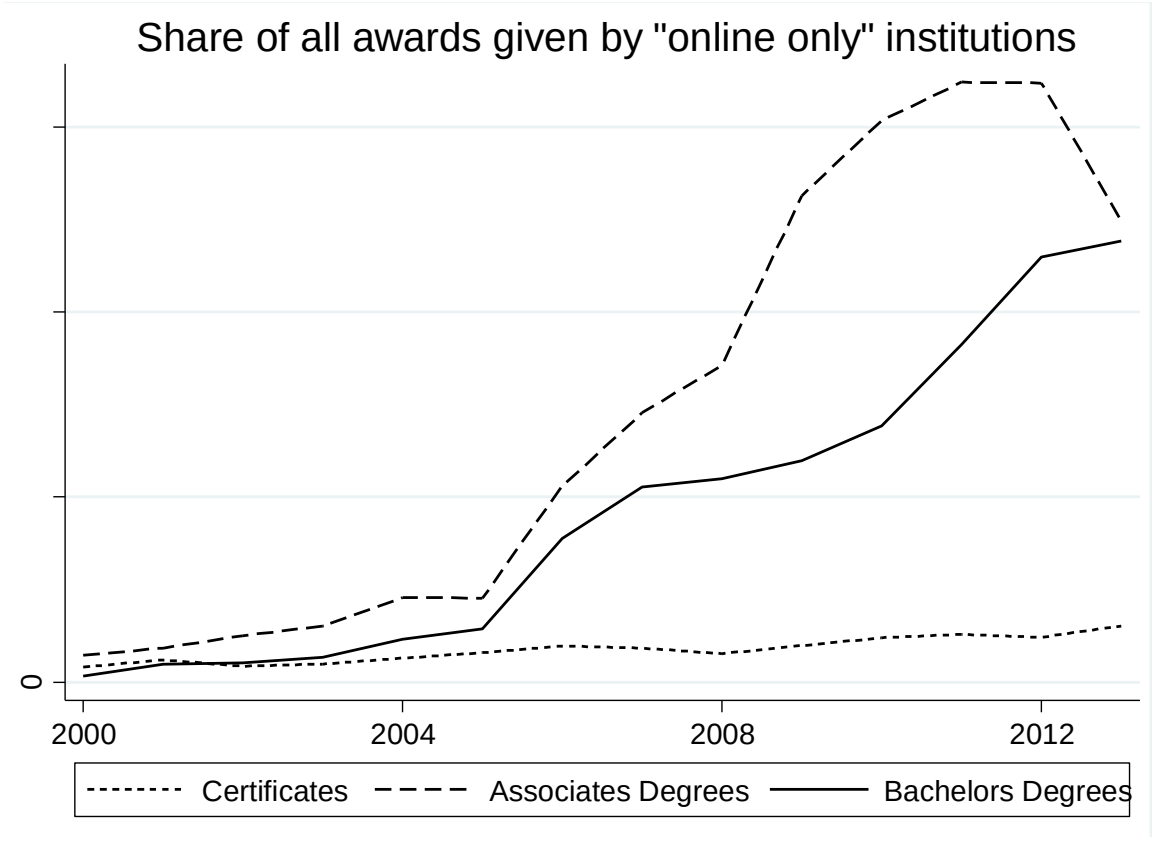
*** $p < 0.01$, ** $p < 0.05$,* $p < 0.10$

Appendix Figure 1: For-Profit Institution Share of Degrees Awarded by Title IV Postsecondary Institutions, 1990-2013



Source: Integrated Postsecondary Education Data System (IPEDS).

Appendix Figure 2: Share of Postsecondary Awards from “Online Only” Institutions, 2000-2013



*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 A: Details of Resume Construction and Job Application Procedure

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.

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.

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 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.

Appendix B: 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.[34] 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.

[34] 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).

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 $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.