

The Employment Prospects of Public and Nonprofit Online Universities: Findings from a Correspondence Audit Study

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Abstract

Many students pursue online bachelor's degrees to advance their careers. However, it is uncertain whether online degrees offer the same employment benefits as traditional, in-person degrees, even when they are earned at public and nonprofit universities specializing in online learning. This paper provides the first causal estimates of employer interest in bachelor's degree graduates from public and nonprofit online universities, including standalone online universities and fully online campuses of traditional universities. Using a correspondence audit field experiment, I submitted 2,164 fictitious applications to real job openings in business, with applicants randomly assigned as graduates from either online or nonselective brick-and-mortar institutions. Given the prevalence of adult learners in online programs, I created resumes and cover letters to resemble recent college graduates in their early thirties with prior work experience. The results show that graduates from online universities are as likely to receive callbacks on their job applications as those from brick-and-mortar institutions. This paper demonstrates that public and nonprofit online universities offer a valuable pathway for adults considering nonselective postsecondary options for their bachelor's degree.

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The labor market value of a bachelor's degree is well-documented, with research linking degree completion with lower unemployment rates and higher earnings (Abel & Deitz, 2014; Barrow & Malamud, 2015; Creusere, 2019; Trostel, 2015; Vuolo et al., 2016; Webber, 2016). However, older students with full-time jobs or family responsibilities face barriers to degree completion (Bellare et al., 2023, Chen, 2017; Osam, Bergman, & Cumberland, 2017). Online universities assist adult learners who have difficulties attending on campus by providing accessible online programs with flexible coursework. While these features might appeal to students, the returns to degrees from online universities will ultimately depend on how they are viewed by employers. There is strong evidence that degrees from online for-profit schools are lesser valued (Darolia et al., 2015; Deming et al., 2012; Deming et al., 2016), but employer perceptions of public and nonprofit online universities are unknown despite their prominence. In the 2022-2023 academic year, public and nonprofit universities operating predominately online enrolled nearly one-third of the roughly 2.8 million exclusively online students at four-year institutions.¹ Attendance is highly concentrated at nonselective institutions with high acceptance rates.

This paper examines whether employers prefer bachelor's degrees from nonselective brick-and-mortar universities over those from public and nonprofit online universities. Using a correspondence audit field experiment, I simulated a job search for recent graduates of public and nonprofit online universities, including standalone online universities and fully online campuses of traditional universities. I represented the typical online student by focusing on learners in their early thirties with work experience (Friedman, 2017). Like other audit studies (e.g., Neumark et al., 2019), I created fictitious resumes from actual applicants on a large job board and submitted them in pairs to 1,082 real job openings. Pairs differed by whether the job applicant earned a bachelor's degree in business administration from an online or brick-and-mortar university, but were otherwise similarly qualified. Employer response—measured by callbacks—served as the primary outcome.

Audit studies are considered the gold standard to causally estimate labor market

¹ Twelve month unduplicated online student counts are based on author calculations of institution-level data from the Integrated Postsecondary Education Data System (IPEDS), <http://nces.ed.gov/ipeds/> (accessed September 3, 2024). Predominately online universities include institutions where at least 50 percent of students attend online.

preferences because they eliminate confounders through random assignment and generate a controlled pool of applicants with no average differences between groups (Neumark, 2018). Unlike other methods such as surveys, which are susceptible to self-reporting biases, and observational data, which may have self-selection issues, audit studies isolate the impact of job-seeker characteristics in actual hiring decisions (Gaddis, 2018). Importantly, differences in callback rates reflect employers' perceptions only. While most evidence suggests online students have worse academic outcomes than students in face-to-face courses (Albert, Coach, & Harmon, 2016; Altindag, Filiz, & Tekin, 2021; Bettinger et al., 2017; Krieg & Henson, 2016; Ortagus, Hughes, & Allchin, 2023), it is unclear if these differences translate to worker productivity.

This paper has three main findings. First, adult graduates with bachelor's degrees from public and nonprofit online universities receive similar interest from employers as those from nonselective brick-and-mortar institutions. After controlling for applicant characteristics, online graduates receive 0.5 percentage points *more* callbacks than brick-and-mortar graduates—a difference of 3.8 percent—but this effect is not statistically significant. The estimate's 95 percent confidence interval (-1.1 to 2.0 percentage points) suggests no substantial hiring penalty or advantage for online graduates. These findings diverge from prior audit studies of online students, which observed significantly fewer callbacks for traditional-aged students from for-profit online universities (Deming et al., 2016) or for traditional-aged students completing online programs within selective traditional universities compared to their in-person peers (Lennon, 2021). This suggests that degrees from nonprofit and public online universities can lead to comparable job opportunities as those from nonselective brick-and-mortar institutions, especially for adult learners who might also benefit from online learning's conveniences.

Second, the impact of online attendance does not vary between standalone online universities and online campuses of traditional institutions. Graduates from both standalone online universities and online campuses receive 0.5 percentage points more callbacks than brick-and-mortar graduates. Although hiring managers in prior research report preferring online programs within traditional universities over degrees from online institutions (Gallagher, 2018; SHRM, 2010), these benefits might not extend to online campuses. This is consistent with other audit studies: callback differences between nonselective institutions

are minor, if they exist at all (Bennett, 2022; Darolia et al., 2015; Deterding & Pedulla, 2016).

Finally, online graduates are contacted about job openings with as lucrative salary ranges as brick-and-mortar graduates. While expected salaries are slightly higher for online graduates (\$1,257), this difference is not statistically significant. This finding suggests that undergraduate attendance at a public or nonprofit online university does not impede adult learners' access to higher-paying positions, in contrast to the disadvantage faced by for-profit online graduates (Deming et al., 2016) or online master of business administration (MBA) graduates (Bennett, 2022).

This paper makes important contributions to the literature on the labor market value of online postsecondary education relative to brick-and-mortar, as it is the first audit study to examine the hiring of bachelor's degree holders from public and nonprofit online universities, and one of the few to examine online degrees of any kind (Bennett 2022; Deming et al., 2016; Lennon, 2021). These institutions are distinct in that they are neither for-profit universities with historically poor alumni outcomes, nor selective brick-and-mortar schools, which typically serve more traditional-aged students. While Bennett studied nonselective public and nonprivate online universities, he focused on students who enroll in a public brick-and-mortar institution after high school and later pursue an MBA online. Given this experiment's focus on nonselective institutions, these findings also relate to other audit studies examining the relationship between college selectivity and employment outcomes (Darolia et al., 2015; Deterding & Pedulla, 2016; Gaddis, 2015; Mullen et al., 2021) and are relevant to millions of prospective students.

This audit study is also one of the first to collect data about online postsecondary education after the COVID-19 pandemic, following Bennett (2022) who conducted his experiment about online MBAs in spring 2020. The timing matters: after lockdowns temporarily shifted all college students online, demand for online programs has remained significantly higher than pre-pandemic levels (Coffey, 2023). Consequently, employers will encounter more job applicants with online credentials in the future. New research has identified the challenges online learning poses (Lemay, Bazelaide, & Doleck, 2021; Hensley, Iaconelli, & Wolters, 2021; Tosto et al., 2023) and the potential for its long-term investment (McKenzie, 2021).

Additionally, this study adds to the limited research on the economic benefits of

bachelor's degrees for older students (Bowers & Bergman, 2016; Carnevale et al., 2015; Clochard et al., 2022). Most reporting on employment outcomes focuses on traditional-aged college students enrolling for the first time. However, universities are increasingly engaging older students who work (Wildavsky, 2021). This research provides valuable insights for working adults considering whether an online bachelor's degree could advance their careers.

The rest of the paper is organized as follows. Section 1 describes the experimental design, detailing the study's scope, the creation of resumes and cover letters, and the process to identify open job postings and apply to them. Section 2 explains my estimation strategy, and Section 3 reports the results. Finally, Section 4 addresses the limitations of the study and concludes.

1 Experimental Design

Between December 2023 and June 2024, I conducted a correspondence audit study to examine the job search experiences of graduates from public and nonprofit online universities. Using a matched design, I submitted two fictitious applications to each job posting: one from a graduate of an online university and the other from a graduate of a traditional brick-and-mortar institution. The two applicants were identical in all attributes that could influence callback rates, such as demographics and professional qualifications; the only distinction was the type of university attended. In total, 2,164 applications were submitted to 1,082 job postings. This experiment was pre-registered with the American Economic Association's Randomized Control Trial Registry (Trial #0012692; Greer, 2023).

This section details the study design, specifically (1) the scope of the study, (2) the creation of resumes and cover letters, and (3) the process for identifying job postings and submitting applications.

1.1 Study Scope

This study focuses on applicants with bachelor's degrees in business administration from public and nonprofit online universities, including online campuses of traditional universities, compared to brick-and-mortar institutions without online programs. I focus on

online universities and campuses rather than online programs within traditional universities so that it is clear to the employer that the degree was received fully online. The impact of online attendance within a traditional university on callback likelihood is a different question.

Business is a valuable field to examine due to its popularity, accounting for 28.0% of bachelor's degrees awarded by public and nonprofit universities with majority online enrollment and 19.4% of all bachelor's degrees across institutions. Business degrees are particularly well-suited for audit studies, as they lead to many in-demand, entry-level jobs, providing ample observations. Additionally, business degrees align with online students' aspirations of higher earnings (Capranos, Dyers, and Magda, 2022), as business graduates earn more on average than those in fields such as social sciences and humanities (Carnevale, Cheah, and Hanson, 2015). The focus on business also allows for direct comparisons by field of study with prior audits of online students (Bennett, 2022; Deming et al., 2016; Lennon, 2021). However, it is important to note that this study's focus on business may limit its generalizability to graduates from other disciplines.

I sourced job postings from a popular national job board and applied broadly to positions suited for recent business graduates, rather than to specific occupations (similar to Gaddis, 2015). To ensure applicants were still seen as competitive, I categorized the postings into four specializations (accounting, finance, management, and marketing) and customized applications with relevant qualifications for the respective specialization. By applying to diverse roles, my findings broadly represent outcomes for business graduates. I list common job titles applied for in this study in Table 1.

The study was carried out for jobs in eight major cities: Boston, Chicago, Detroit, New York City, Las Vegas, Los Angeles, Houston, and Miami. Since online students can enroll from virtually anywhere, it is impractical to account for every regional labor market they might enter. Instead, I focused on populous cities from diverse geographic regions (Northeast, Midwest, South, and West) with a high number of postings on the job board. I also considered differences in bachelor's degree attainment rates, as perceptions of online degrees may differ in cities with a sizable college-educated workforce (see Table 2). However, by narrowing the analysis to major urban hubs, the findings may be less generalizable to small- and medium-sized cities or rural communities.

1.2 Resumes and Cover Letters

Audit studies rely on carefully constructed resumes to isolate the characteristic of interest (Neumark, 2018). To ensure the experiment accurately represented graduates from public and nonprofit online universities, I designed resumes empirically. This process combined data from actual resumes found on the job board alongside simulated elements drawn from research about online students and adult learners (a common approach in audit studies—see Lahey and Beasley, 2016).

Resumes were created in pairs: one assigned to an online university graduate, and the other to a graduate from a brick-and-mortar institution. To make causal claims about the effect of online university attendance on job callbacks, the treatment (online) and control (brick-and-mortar) resumes were matched on other qualities that could influence employer responses, such as gender, race, age, work experience, and skills. Individual components conveying these traits were constructed, and a computer program randomly assigned them together to produce new resumes (Lahey and Beasley, 2009).

To avoid raising employers' suspicions, I used two distinct resume templates for each matched pair. One resume was randomly assigned to one template, while the other received the second template, ensuring that the two resumes submitted to each employer had different styles. Both templates included the same sections—education background, work experience, skills, and contact information—but varied slightly in formatting elements, such as font style, bullet points, and margin size.

I created 100 resume pairs for each of the four business specializations (800 resumes in total): accounting, finance, management, and marketing. Resumes were further tailored to depict applicants' city, which involved substituting school and employer names with local counterparts. An example of a matched resume pair (in accounting) is provided in Figure 1.

The ten online universities selected for this study include some of the largest public and nonprofit institutions specializing in online education, even if they offer some in-person programs (Table 3 lists all institutions selected).² The institutions include a combination of standalone online universities—some enrolling students on an unprecedented scale

² This definition aligns with Deming et al. (2016), who characterized online institutions as for-profit colleges where online degrees are predominant.

(Blumenstyk, 2018)³—and online campuses of traditional public universities. This study’s applicants resemble the working adults primarily served by these universities (D’Agostino, 2022). Specifically, 79.4 percent of enrolled students are at least 25 years old, with a majority (58.0 percent) being over 30.⁴

The type of degree (online or in-person) is not explicitly stated, but it can be inferred from the names of online universities.⁵ Institution name is typically how hiring managers determine whether an applicant completed their degree online (SHRM, 2010). To increase the signal’s strength, I selected well-known institutions: they have among the highest enrollment numbers of any public and nonprofit online university and have been operating online for several years. Many heavily advertise (Cellini and Chaudhary, 2020), and some, like Western Governors University and Southern New Hampshire University, spend more on marketing than any other postsecondary institution (Marcus, 2021). Others, like those affiliated with traditional universities, use terms like “Global” or “World” in their names to indicate their online modality (e.g., Colorado State Global Campus).

Moreover, these online universities are not located in the study’s labor markets, further indicating that applicants attended remotely while working full-time.⁶ Although some employers might not immediately recognize that these institutions are online, this does not affect the study’s external validity. After all, employers will not always be familiar with the names of every degree-granting institution, online or brick-and-mortar.⁷

Control resumes feature degrees from brick-and-mortar institutions located near the applicant’s residence, with minimal or no online programs. Most of the universities (13 out of 15) do not offer fully online bachelor’s degrees in business administration. The two exceptions, Nevada State University and the University of Houston–Clear Lake, offer an

³ These institutions have been coined “mega-universities” due to their large enrollment numbers (Gardner, 2019).

⁴ Authors calculation from IPEDS data.

⁵ While adding an explicit note like “(Online)” next to the university name on a resume could help clarify the mode of education for employers, this practice was uncommon in my review of resumes on the job board.

⁶ Discrepancies between the applicant’s residence and their school’s location is another way human resource professionals assess whether a degree was completed online (SHRM, 2010).

⁷ Only 15% of human resource professionals report difficulty identifying online degrees on resumes (SHRM, 2010)

online business bachelor's program but also have in-person management degrees under different names, which I used instead. Given the prevalence of online education, it was not feasible to exclude online programming entirely. Some control schools offer individual online business courses or even online master's programs. In all cases, they enroll very few undergraduates exclusively online—only 12.3% on average.⁸ As a result, employers are unlikely to perceive these institutions as online.

To account for the impact of admissions selectivity on callback rates (Gaddis, 2015), I further narrowed the selection to institutions with the highest acceptance rates in their region.⁹ In 7 of the 8 labor markets, I selected two brick-and-mortar schools that met these criteria. The University of Houston–Clear Lake was the only control institution picked in Houston due to the limited availability of other nonselective universities without online programs.

All applicants have recently earned a bachelor's degree in a business administration field, with their majors aligned to their specialization. For example, candidates applying for finance positions hold either a bachelor's in finance or a bachelor's in business administration with a concentration in finance. While degree titles may vary slightly between institutions, they are generally equivalent. The campus location is listed but left blank for online universities. All applicants matriculated in August or September 2019, depending on their university's academic calendar, and graduated in December 2023, completing their degrees in 4.5 years. A slightly extended timeline is not unusual for working students, who often require more time to finish their degrees (Ecton et al., 2023).¹⁰ Although new online students have typically completed prior credits at other institutions, research shows that some may strategically omit this information (Kreisman et al., 2021). About one-third do not disclose their previous educational history, with this tendency more

⁸ Author calculation of IPEDS data.

⁹ The average acceptance rate for brick-and-mortar institutions in this study is 81.7%, based on IPEDS data, while the acceptance rate for online universities is a bit higher at 97.5%.

¹⁰ Online degree programs can sometimes be completed in less than four years, particularly when they are self-paced. However, using a shorter time-to-degree for online graduates introduces a confounding variable. This would make it difficult for the experiment to isolate the impact of online enrollment from the shortened time-to-degree. To maintain consistency, I keep the time-to-degree constant at 4.5 years for both online and in-person candidates. As a result, I do not investigate how employers react to applicants who complete their degrees on nontraditional timelines.

pronounced among students with fewer than two years' worth of college credits, those attending less selective institutions, and those with work experience. Therefore, I do not include any previous postsecondary institutions.

I also listed high school education to convey applicants' ages, following the method used by Neumark et al. (2019). Assuming most students graduate high school at 18, those who finished in 2009 would be approximately 32, the average age of online bachelor's degree students (Friedman, 2017), by December 2023. To avoid matched applicants being identical ages, I randomly adjusted the high school graduation year by one year, either earlier or later.

Using the Common Core of Data, I selected public high schools in cities near the applicants' current residences. Following Deming et al. (2016), I chose high schools based on the applicant's race, selecting schools where the largest share of students reflects the same racial background (i.e., White applications attended high schools where the average student was also White). Additionally, I controlled for socioeconomic status by excluding schools in the highest and lowest quartiles for free- or reduced-price lunch.¹¹ Finally, I ensured that selected schools have operating since 2000 and lack distinctive characteristics, such as charter status, selective enrollment, or national recognition. I created a pool of two high schools per city-race combination.

I also included detailed work histories typical of adult learners, filling the period between high school graduation and college enrollment with an average of ten years of work experience. Since adult learners often work while studying, the applicants remain employed throughout their four and a half years of college. These extensive work histories—averaging 14.5 years since high school graduation—distinguish this study from previous experiments on online bachelor's degrees, which primarily focus on traditional-aged students.¹² Employment is held constant, as factors such as unemployment spells (Kroft et al., 2013, Farber et al., 2019) or family leaves (Weisshaar, 2018) can influence callback rates.

To construct realistic work histories, I extracted job titles and descriptions from a sample of publicly available resumes on the job board, following a similar approach to Neumark et al. (2019). I prioritized resumes of adult learners with online bachelor's degrees

¹¹ Social class had been found to be determinant in callback rates (Rivera and Tilcsik, 2016).

¹² For instance, Lennon's (2021) applicants had 1.71 years of work experience, on average.

that included complete, error-free job descriptions. The work histories were reworded, anonymized with new employer names, and separated by job to create distinct job templates (see Table 4 for the full list).¹³ These templates were then combined to create coherent work histories that reflected the pre-college employment observed in actual resumes. In all work histories, applicants started with minimum wage retail jobs, such as sales associate or cashier, before advancing to supervisor roles and eventually transitioning into entry-level positions within their respective business administration fields. These business roles do not require postsecondary education but represent the typical career trajectories of individuals pursuing a business career post-graduation. For instance, future accounting majors might begin as accounts payable clerks before completing their bachelor's degrees. In total, I generated sixteen complete work histories—four for each of the four specializations.

I followed a similar process to design the skill sections. I extracted individual skills from real resumes, rephrased them into several variations, and created a pool of soft and technical skills to use when constructing the sixteen skill sections (four for each specialization). Each skill template included three technical skills and three soft skills relevant to the applicant's specialization. I created skill variation by designing "high skill" versions of each template with two extra technical skills and two extra soft skills. To ensure skill differences did not bias my results, matched pairs were either entirely "high skill" or "low skill." The complete list of skills is provided in Table 5.

Lastly, I included applicants' contact details: name, residential address, email, and phone number. Names are used to signal an applicant's race (White or Black) and gender (male or female). However, names that indicate race may also inadvertently imply socioeconomic status (SES). To address this concern, I draw from Gaddis's (2017) survey on the racial and SES perceptions of names, using data from New York state birth records between 1994 and 2012. I selected a subset of first names that were perceived as white by at least 90 percent of survey respondents or Black by at least 90 percent of survey respondents and excluded names from the first and fourth quartiles of mother's education level, a proxy for strong SES signals. Last names were also selected from Gaddis's work, using

¹³ As a result of this process, the job descriptions were no longer identifiable as coming from the original applicants.

common surnames from the 2000 Census that had a population-level racial occurrence of at least 50% white or Black. For each gender and race combination, I selected four first names and four last names. Instead of using all sixty-four possible name combinations, I chose four full names for each gender and race pairing: Black female, white female, black male, white male (see Table 6).

For residential addresses, I used a subset of the fictitious addresses in Neumark et al. (2019), who exclude neighborhoods strongly associated with race or socioeconomic status. All applicants were presented as residing in the same city where they are applying. Since I did not anticipate employers responding via postal mail, I included other contact methods on the resume: a unique Gmail account and a valid phone number with a local area code.

Jobs requiring postsecondary education typically also request a cover letter. For each resume, I submitted a cover letter randomly assigned from one of two templates specific to each specialization. The templates differed slightly in phrasing and formatting but conveyed the same key points and maintain a similar word count. All cover letters expressed interest in the company, outlined the applicant's professional experience and skills, and communicated a desire to discuss the position further in an interview. The content was customized to highlight relevant work history and skills based on the applicant's specialization. For example, accounting majors emphasized their experience managing financial records, while management majors focused on their leadership abilities. Each cover letter is personalized with the applicant's contact information. Examples are provided in Figure 1.

1.3 Job Postings and Applications

Each week during data collection, my team of research assistants (RAs) and I followed a structured process to identify and apply to job postings.¹⁴ This involved: (1) extracting job

¹⁴ Using the statistical software GPower (Faul et al., 2007), I conducted a power analysis to determine the minimum number of observations required for the experiment. I applied conventional thresholds for significance ($\alpha = 0.05$) and power ($\beta = 0.80$), along with an estimated callback rate for brick-and-mortar graduates (14.8%) based on a pilot study from October 2023. GPower indicated that 915 job postings would be necessary to detect a 30 percent difference in response rates using a two-tailed Fisher exact test. However, this estimate had to be adjusted

listings from a large national job board, (2) verifying that the listings met the study's inclusion criteria, and (3) submitting randomly selected applicant pairs to each posting.

We focused on job opportunities for recent bachelor's degree graduates in business administration. Using the search term "bachelor's" alongside specializations like "accounting," "finance," "management," and "marketing," we set parameters to narrow the search. Additional parameters included job postings created within the past seven days, entry- and mid-level positions, full-time employment, and locations within 25 miles of the designated study cities.

RAs reviewed the listings carefully, removing postings that required additional certifications, specialized industry experience, or more than five years of experience in a similar role. This process ensured that we targeted a diverse range of postings that represented realistic employment opportunities for new graduates with some prior work history.

Further screening focused on the application process itself. RAs excluded listings that did not provide a streamlined submission process, prioritizing those that allowed applications directly through the job platform. Postings that redirected applicants to third-party websites, often requiring time-consuming manual entry of resume details, were omitted to ensure efficient data collection. We also removed postings that required skill assessments or free-response answers (e.g., describing personal strengths), as writing unique responses for each application would have been cumbersome. However, listings with multiple-choice or numeric questions—such as years of bookkeeping experience—were accepted, as these could be quickly answered using resume information. Lastly, we excluded postings requiring additional materials not created for the study, such as graphic design portfolios for marketing positions.

Once the weekly sample of job postings was finalized, I randomly assigned matched applicant pairs to each position. Cover letters were customized to reflect specific job titles.

upward to account for auditing the same employers twice and the subsequent inter-cluster correlation (ICC), or the relatedness of employer callbacks within matched pairs (Lahey & Beasley, 2016). Assuming a standard ICC of 0.2 (implying an inflation factor of 1.2), I projected needing 1,096 job postings. The final analytic sample was reduced to 1,082 postings because some vacancies required a follow-up application directly on the company website, even after submitting an initial application through the job board.

Then, applications were submitted through their respective profiles on the job board. To minimize the risk of employers detecting similarities between the two applications, I submitted the second application one day after the first, with the submission order determined randomly. The division of applications submitted by city was proportional to the city's relative population size.

The primary outcome measured was employers' responses to job applications, tracked for up to four weeks after submission via phone, email, or direct messages on the job board. Responses were classified as positive (explicit interview offers), ambiguous (requests for additional information or further discussion), or negative (rejections or no response).

For the main binary callback measure, responses were coded as 1 for positive or ambiguous and 0 otherwise. As a robustness check, ambiguous responses were recoded as 0, with only responses explicitly mentioning an "interview" counted as callbacks.

2 Estimation Strategy

I estimate labor market preferences for online university graduates using a linear probability model (LPM):

$$(1) \text{Callback}_{ik} = \alpha \text{Online}_i + \beta_1 \text{Female}_i + \beta_2 \text{Black}_i + \beta_3 \text{Age}_i + \beta_4 \text{FirstSubmission}_i + \beta_5 \text{HighSkill}_i + \text{BusinessSpecialization}_i \delta_s + \text{Region}_i \gamma_r + \varepsilon_i$$

The dependent variable, Callback_{ik} , denotes the probability that applicant i receives a callback after applying to job posting k . Online_i is a binary indicator equal to 1 if the applicant graduated from an online university. Since applicants' postsecondary institutions are randomly assigned, α estimates the causal difference in callback probabilities between online and brick-and-mortar graduates. A negative α indicates that online graduates are less likely to receive callbacks, while a positive value means the opposite.

I control for applicant demographics that may affect employer responses, including gender (male or female), race (Black or White), and age (with applicants in matched pairs differing by one year). I also control for whether the applicant was the first submission in the matched pair, whether the individual had a high skill resume with four additional skills, and

add fixed effects for business specialization s (accounting, finance, management, and marketing) and region r (Northeast, Midwest, South, and West). The error term ε_i captures unobserved factors, and I cluster standard errors by job posting, as each employer receives two applications, creating dependency between observations.

Next, I explore heterogeneity by gender, race, specialization, and region in separate models that interact $Online_i$ with each of these variables. While the sample size may limit my ability to detect subtle subgroup differences, any large, significant disparities would indicate that some employers perceive certain subsets of online graduates very differently. Such findings could have important practical implications for prospective students with these characteristics, as students enroll in online postsecondary education to improve their job prospects (Capranos, Dyers, and Magda, 2022).

Finally, I investigate whether employer preferences vary based on the type of university attended by online graduates. To motivate this analysis, I consider a 2010 survey by the Society for Human Resource Management (SHRM) that found hiring managers generally prefer online degrees from public brick-and-mortar universities over those from exclusively online institutions, even when both are similarly accredited (SHRM, 2010). Only 39 percent of respondents considered standalone online universities to be 'equally credible' as online degree programs from traditional universities. These findings are supported by more recent survey data from Northeastern University, where 58 percent of hiring managers identified an institution's reputation as the most important factor in determining the value of its credentials (Gallagher, 2018). If employers view online campuses as closely linked to their parent brick-and-mortar universities—rather than as independent entities with distinct brands—graduates from these programs may have a competitive edge over those from standalone online universities. To test this hypothesis, I decompose the $Online_i$ variable into two categories: standalone online universities ($OnlineStandalone_i$) and online campuses ($OnlineCampus_i$). Graduates from brick-and-mortar universities serve as the reference group.

$$(2) \text{ Callback}_{ik} = \alpha_1 \text{OnlineStandalone}_i + \alpha_2 \text{OnlineCampus}_i + \beta_1 \text{Female}_i + \beta_2 \text{Black}_i + \beta_3 \text{Age}_i + \beta_4 \text{FirstSubmission}_i + \beta_5 \text{HighSkill}_i + \text{BusinessSpecialization}_s \delta_s + \text{Region}_r \gamma_r + \varepsilon_i$$

Researchers will often use nonlinear models to predict binary outcomes, but prior work has argued LPMs are best suited to identify causal effects in experiments (Gomila, 2021). LPMs generate unbiased estimates and are more easily interpreted than nonlinear models when interaction terms (Simonsohn, 2017) and fixed effects (Beck, 2018) are included. Still, for robustness, I re-estimate the main results using a probit specification in place of a LPM (Appendix A.2). Additionally, I verify my results are consistent across other measures of employer response (Appendix A.1) and alternative model specifications with fixed effects for work history, skills, and cover letter templates (Appendix A.2).¹⁵

3 Results

3.1 Are online university graduates less likely to receive job callbacks than those from nonselective brick-and-mortar institutions?

I begin by reporting the raw callback rates for graduates from both online and nonselective brick-and-mortar universities (Table 7). The overall callback rate is 12.1 percent. The difference in callback rates between online (12.3 percent) and brick-and-mortar (11.8 percent) university graduates is small and statistically insignificant, as determined by a two-sided Fisher exact test.

Although callback rates vary across subgroups, I do not observe a *differential* effect by university type. Graduates in accounting (16.4 percent) and finance (14.4 percent) have higher callback rates compared to those in marketing (10.0 percent) and management (7.5 percent). By demographics, Black applicants (11.3 percent) and male applicants (11.1 percent) receive fewer callbacks than their White (12.8 percent) and female (12.9 percent) counterparts. Regional differences also exist, with the Midwest having the highest callback

¹⁵ Despite the random assignment of templates, slight variations in their distribution between online and brick-and-mortar graduates may still occur. If templates have differing effects on callback probabilities, these random variations could potentially influence the results. To account for this, I include template fixed effects in the model as a robustness check. However, due to the large number of possible template combinations, incorporating these fixed effects raises the risk of overfitting by introducing too many parameters. A more detailed discussion of this issue is provided in Appendix A.2.

rate (19.5 percent) and the West the lowest (6.4 percent). Lastly, when categorizing job postings by the median listed salary in the sample (\$60,000), applicants to higher-salary positions receive fewer callbacks (8.5 percent) compared to those applying to lower-salary positions (17.7 percent).

Table 8 presents the estimated impact of graduating from an online university on callback probability, as estimated from the linear probability model in equation (1). After controlling for other applicant characteristics, online graduates receive 0.5 percentage points more callbacks, or 3.8 *percent* more, than graduates from nonselective brick-and-mortar universities. However, this difference is not statistically significant (p-value = 0.54). The 95 percent confidence interval (-1.1 to +2.0 percentage points) likely rules out any consequential advantage or disadvantage to attending an online university versus a brick-and-mortar institution, though minor effects cannot be dismissed. This finding is robust to additional analyses and sensitivity checks, including: (1) applying a stricter definition of callbacks and testing other measures of employer response, and (2) re-specifying the model with alternative controls and assumptions. Detailed results are available in the appendix.

To test the heterogeneity of these results, I interacted *Online_i* from equation (1) with various subgroups of interest, including race, gender, region, and specialization. Due to sample size limitations, only large effects can be detected.

Table 9 displays model estimates by race, gender, and region. Notably, no demographic subgroup of online graduates receives significantly fewer callbacks than their brick-and-mortar counterparts, according to conventional statistical significance standards. For example, White online applicants receive 1.2 percentage points more callbacks than brick-and-mortar graduates, while Black online applicants receive 0.2 percentage points fewer. However, these differences, as well as those between races (p-value = 0.39), are not statistically significant. Similar patterns are observed for gender: male online applicants fare slightly better compared with their brick-and-mortar peers (+1.0 percentage points) than female applicants (-0.1 percentage points), but neither subgroup shows significant differences from brick-and-mortar graduates or each other (p-value = 0.48). Regional differences are also minimal, except for West Coast online applicants, who receive 2.5 percentage points more callbacks than their brick-and-mortar counterparts (p-value = 0.08). This regional difference is largely driven by one control school with a particularly low

callback rate (2.6 percent).¹⁶ Without this institution, the West Coast advantage for online graduates disappears.

Next, I examine differences by specialization (Table 10). The estimates vary across groups—marketing (+2.3 percentage points), management (+1.0 percentage points), accounting (-0.4 percentage points), and finance (-1.1 percentage points)—but none are statistically significant, either compared to brick-and-mortar graduates or between specializations. This may be due to small sample sizes when dividing the data into four groups. Although this analysis provides limited insights into how different business administration fields are perceived in the labor market, it alleviates concerns that completing any particular specialization online is especially poorly received. Even the largest negative effect, in finance, is relatively small.

Finally, using equation (2), I estimate separate effects for two types of online universities: standalone online institutions and online campuses of traditional brick-and-mortar universities (Table 11). Both groups of online graduates perform the same to those from nonselective brick-and-mortar universities (+0.5 percentage points). Neither effect is statistically significant.

3.2 Do online university graduates receive callbacks from lower-salary jobs than nonselective brick-and-mortar institutions?

I do not find evidence that adult graduates from public and nonprofit online universities receive fewer callbacks than those from nonselective brick-and-mortar institutions. However, this does not necessarily imply that online graduates have equal access to higher-paying positions. A disproportionately larger share of callbacks for online graduates could be for lower-paying jobs, where employers might pass over brick-and-mortar applicants they perceive as overqualified and therefore less likely to accept an offer. Given the main callback findings, I analyze the listed salaries from job postings to test whether online graduates receive callbacks from employers providing similar pay as the ones interested in

¹⁶ After reviewing correspondence with this brick-and-mortar institution, no clear reason emerged to explain the unusually low callback rate. The school appears to be an outlier.

brick-and-mortar graduates.

Table 12 presents the linear relationship between online university attendance and listed salary, controlling for applicant characteristics and whether employers called back both applicants in a matched pair. Of the 261 callbacks, 212 (81.2 percent) were from a job posting with a salary range. I calculate the expected salary by averaging the lower and upper bounds of these ranges. On average, online graduates were called back for jobs offering slightly higher expected salaries (\$1,257), although this difference is neither statistically significant nor substantial in magnitude. Comparable results are observed in models estimating the lower and upper salary bounds. Overall, these models suggest that the employers contacting online graduates are not listing positions with lower pay than those responding to brick-and-mortar graduates.

4 Conclusion

The economic value of a college degree depends on how well it is viewed by employers. Adult learners interested in attending a public or nonprofit online university may have concerns about whether their degree will be disadvantaged to an in-person degree. To explore this issue, I conducted a correspondence audit study, submitting 2,164 job applications from adult graduates of both online and brick-and-mortar universities. This research is the first to focus on adult learners at public and nonprofit online universities specifically and contributes to a limited body of work on the labor market outcomes of online education.

This paper has three main findings. First, online university graduates are as likely to receive callbacks on job applications as graduates from brick-and-mortar universities. Second, both fully online universities and online campuses of brick-and-mortar institutions perform similarly to traditional schools, suggesting that none of the online universities in the study face significant labor market penalties. Third, employers offering callbacks to online graduates proposed similar salaries to those offered to traditional graduates, indicating that online graduates are competitive for higher-paying positions.

I suggest some caution when interpreting these results. Differences at the initial callback stage might not fully capture employers' hiring preferences (Quillian, Lee, and Oliver, 2020). While online graduates were not less likely to receive callbacks, their online

education could become a factor later in the interview process—potentially to the applicant's detriment. Additionally, due to the COVID-19 pandemic, even typically in-person students had to attend classes remotely in spring and, in some cases, fall 2020. Given the challenges students faced during this abrupt transition (Bird, Castleman, & Lohner, 2022), the temporary overlap should not be disregarded entirely. Employers' perceptions of in-person students without this brief period of online learning might differ from those in this study. Still, this is unlikely to be a large distinction, as pandemic-related remote learning was only a small share of students' total enrollment.

While audit studies provide causal inferences, they face a key limitation: they cannot disentangle the specific mechanisms behind observed labor market preferences (Gaddis, 2017). Why do adult learners from public and nonprofit online universities perform as well as their brick-and-mortar counterparts, while other online students from prior audits do not? To contextualize these findings, I propose three potential explanations.

First, employer perceptions of public and nonprofit online universities may not differ significantly from their nonselective brick-and-mortar counterparts, though this is not the case for for-profit institutions. Major public and nonprofit online universities have distanced themselves from for-profit institutions—which are sometimes called predatory (Deming, Goldin, & Katz, 2012)—through regional accreditation (as opposed to the less-valued national accreditation typical of for-profits), lower tuition costs, and better alumni outcomes. These factors have led to higher alumni satisfaction at public and nonprofit schools (Silliman & David Schleifer, 2023). Despite ongoing skepticism about online learning, employers are more likely to accept online degrees when the institution is accredited (Kohlmeyer et al., 2011) and has a strong reputation (Zupek, 2010; Tabatabaei et al., 2014).

Second, employers may be prioritizing adult graduates' work histories over their educational backgrounds. In prior work, employers have raised concerns about online learning that indicate perceived quality differences, including less rigorous coursework (Adams, 2008), issues with academic integrity (Richards et al., 2018), and fewer opportunities for developing social interaction and soft skills (Adams & Cortese, 2012). However, when candidates have substantial professional experience, employers might not need to rely as heavily on educational credentials to assess their abilities. In fact, hiring managers are more likely to report accepting online degrees from applicants with more work

experience (Tabatabaei et al., 2014). For adult learners, a bachelor's degree may serve primarily to pass initial screening, with work experience playing a more significant role in hiring decisions.

Finally, online credentials have become more widely accepted over time, regardless of the institution or its students. Approval of online degrees was already on the rise before COVID-19, but post-pandemic attitudes towards online education has reinforced this trend (Nietzel, 2023). The line between online and brick-and-mortar universities has become less clear, and employers increasingly acknowledge that online learning is here to stay (Coffey, 2023). If these trends reverse in the near-term, this paper's findings might not generalize beyond the post-pandemic period. However, if these shifts in perceptions are long-lasting, the labor market value of online credentials, broadly, may continue to increase.

This study provides a promising outlook for public and nonprofit online universities. However, the online education landscape is becoming increasingly complex. While adult learners remain the norm, traditional-aged students are a fast-growing group within the largest online institutions (D'Agostino, 2022; Hall, 2023). Additionally, more elite colleges and state flagships are launching online campuses (Lederman and Liberman, 2019; Gardner, 2021), and new digital micro-credentials are emerging to substitute the traditional college degree (Gallagher and Palmer, 2020). Future research should focus on disentangling the mechanisms that drive the labor market value of online learning in these evolving contexts.

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Tables and Figures

Table 1: Common Job Titles Applied to in this Study

Business Specialization	Job Titles
Accounting	Accountant, Accounting Coordinator, Accounting Manager, Accounts Payable Clerk, Accounts Payable Specialist, Accounts Receivable Clerk, Bookkeeper, Junior Accountant, Project Accountant, Property Accountant, Senior Staff Accountant, Staff Accountant
Finance	Assistant Controller, Finance Associate, Finance Manager, Financial Advisor, Financial Analyst, Financial Planner, Financial Services Representative, Risk Analyst, Underwriter
Management	Account Executive, Account Manager, Assistant Store Manager, Business Development Representative, Executive Assistant, Front Office Manager, General Manager, Management Trainee, Office Manager, Operations Manager, Project Manager, Sales Manager
Marketing	Account Executive, Digital Marketing Specialist, Field Marketing Associate, Marketing Assistant, Marketing Coordinator, Marketing Manager, Sales Representative, Social Media Coordinator, Strategic Account Manager

Note: This table presents a sample of the job titles applied to in this study. While not exhaustive, it represents common occupations listed on the job board. Certain positions—such as executive assistant—may typically be filled by candidates with or without a bachelor's degree, depending on the specific job posting. However, all job postings included in this study either required or preferred a bachelor's degree.

Table 2: Cities

City	Region	Bachelor's Degree Attainment (persons age 25 and over)
Boston	Northeast	47.0%
Chicago	Midwest	43.4%
Detroit	Midwest	39.3%
Houston	South	33.8%
Las Vegas	West	26.8%
Los Angeles	West	33.8%
Miami	South	36.6%
New York City	Northeast	44.8%

Note: Bachelor's degree attainment data is extracted from U.S. Department of Commerce, Census Bureau, Current Population Survey (2019). Across all localities in the United States, the bachelor's degree attainment rate among persons age 25 and older is 36 percent (the average rate for metropolitan areas in this study is 38.2 percent).

Figure 1: Matched Pair of Resumes and Cover Letters (Accounting)

<p style="text-align: center;">TYRA WASHINGTON Chicago, IL • (847) 756-7974 • tyrawashington817@gmail.com</p>	
EDUCATION	
Southern New Hampshire University Bachelor of Science in Accounting	August 2019 – December 2023
Wells High School	2009
PROFESSIONAL EXPERIENCE	
Aramark Accounting Assistant	January 2020 – Present Chicago, IL
<ul style="list-style-type: none"> Review and post vendor invoices for payment. Assist in preparing financial reports and balancing all books at the end of each month and year. Support the finance team during internal and external audits by compiling requested documents as needed. Perform basic office tasks, such as filing, data entry, answering phones, processing mail, and tracking inventory of office supplies. 	
Chicagoland Complete Healthcare Front Desk Clerk	December 2015 – December 2019 Chicago, IL
<ul style="list-style-type: none"> Managed the front desk by greeting visitors, scheduling appointments by phone or in-person, and directing unresolved issues to the relevant departments. Handled accounts payable for the office. Coordinated office administration tasks, such as maintaining office equipment and supplies, distributing incoming mail, and organizing records. 	
Macy's Store Supervisor	October 2013 – November 2015 Chicago, IL
<ul style="list-style-type: none"> Supervised staff members in a fast-paced customer service environment. Handled staff scheduling, restocking merchandise, and assisting customers. 	
Macy's Sales Associate	December 2011 – September 2013 Chicago, IL
<ul style="list-style-type: none"> Provided assistance by greeting customers, responding to questions, and directing customers to merchandise within store. 	
CVS Cashier	July 2009 – November 2011 Oak Park, IL
<ul style="list-style-type: none"> Provided services to meet customers' needs, including shopping assistance, exchanges/returns, and efficient checkout. 	
SKILLS	
Google suite, data analysis, financial modeling, critical thinking skills, interpersonal communication, ability to learn new tasks quickly	

Tyra Washington
5074 N Natchez Ave, Chicago, IL 60656
(847) 756-7974, tyrawashington817@gmail.com

To Whom It May Concern:

Please accept this letter and attached resume as my application for the advertised JOBTITLE position. I am a recent graduate from Southern New Hampshire University with prior accounting experience, seeking to hone my skills at a new organization.

In my bachelor's degree program, I completed a rigorous course load in accounting fundamentals and financial analysis. During my studies, I also became highly proficient in using accounting software, such as QuickBooks, to manage and report financial data. I have been successful in my coursework because I am motivated, analytical, and detail-oriented.

My professional experience has allowed me to apply my learning to practical scenarios. In previous roles, I have processed transactions accurately and timely, maintained and organized financial records, and prepared financial reports for my supervisor's review. I am precise in all aspects of my work. I adhere to company processes with high accuracy and can quickly identify errors. In addition, my passion for learning new skills will make me an asset in the future.

I am eager to discuss in an interview how my background aligns with your organization's needs. Thank you for your consideration.

Best regards,
Tyra Washington

Tanisha Jefferson

Chicago, IL ❖ (847) 393-0126 ❖ tanisharjefferson@gmail.com

EDUCATION

Roosevelt University August 2019 – December 2023
Bachelor of Science in Business Administration in Accounting Chicago, IL

Thornton Fractional South High School Graduated 2010

WORK EXPERIENCE

Kennicott Brothers May 2019 – Present
Accounts Payable Clerk Chicago, IL

- Responsible for paying all bills, writing checks, and balancing books at the end of each month and year.
- Prepare monthly and year-end financial statements, invoices, and accounts payable reports.
- Maintain well-organized and accurate ledgers and records of invoices and other documents.
- Coordinate with CPAs on issues that may occur.

Beacon Hill Staffing Group September 2014 – April 2019
Administrative Assistant Chicago, IL

- Responsible for the receptionist area, including greeting visitors, answering calls and taking messages, and responding to inquiries.
- Handled all incoming and outgoing mail, made copies, and sent faxes.
- Organized office operations by maintaining a meticulous filing system and managing Outlook calendars for executive staff.
- Maintained inventory of all office equipment and supplies, purchasing more as needed.

Target October 2012 – August 2014
Assistant Store Manager Chicago, IL

- Worked closely with the store manager to oversee staff operations, recruit and onboard new store employees, resolve customer disputes, monitor inventory levels, and ensure the merchandise is properly displayed.

Target June 2011 – September 2012
Sales Associate Chicago, IL

- Rang customers up at the cash register.
- Assisted customers while they shopped, answering questions and directing them towards the products that best fit their needs.

Home Depot June 2010 – June 2011
Sales Associate Chicago, IL

- Assisted customers at check out, stocked shelves, and set up merchandise displays.

SKILLS

- Financial statement preparation, general ledger accounting, data analysis skills, presentation skills, customer support experience, problem-solving skills

Tanisha Jefferson
7304 W Balmoral Ave
Chicago, IL 60656

Dear Hiring Manager,

I would like to express my interest in the JOBTITLE role within your organization. With a strong track record of relevant work in accounting processes, I am confident I can contribute to your team's success.

My bachelor's degree from Roosevelt University has given me a comprehensive foundation in accounting practices. I am well-versed in using spreadsheets and QuickBooks to efficiently manage and analyze financial data. My coursework has also sharpened my communication skills to present financial information clearly to non-financial stakeholders. I am eager to build on my studies and grow professionally at a new organization.

Throughout my career, I have demonstrated strong organizational and analytical skills, enabling me to maintain up-to-date financial records and prepare accurate financial reports. In my current position, I have managed competing priorities and met tight deadlines, and I am always a dependable and punctual team member. My time in fast-paced business environments has prepared me to quickly adapt to new accounting software and company practices.

Thank you for considering my application. I have attached my resume for your review, which provides more details on my background. I am excited about the opportunity to discuss the position and my qualifications in an interview.

Sincerely,
Tanisha Jefferson

(847) 393-0126
tanisharjefferson@gmail.com

Table 3. Postsecondary Institutions Used in the Study

Region	Postsecondary Institutions	
Online	<u>Standalone university</u> Bellevue University Excelsior University Southern New Hampshire University Thomas Edison State University Western Governors University	<u>Online campuses</u> Colorado State University-Global Campus Pennsylvania State University-World Campus Purdue University Global University of Maryland Global Campus University of Massachusetts Global
Northeast	<u>Boston</u> Salem State University Suffolk University	<u>New York</u> CUNY College of Staten Island CUNY Brooklyn College
Midwest	<u>Chicago</u> Northeastern Illinois University Roosevelt University	<u>Detroit</u> Oakland University Wayne State University
South	<u>Houston</u> University of Houston-Clear Lake	<u>Miami</u> Nova Southeastern University Florida Atlantic University
West	<u>Las Vegas</u> Nevada State College University of Nevada-Las Vegas	<u>Los Angeles</u> California State University, Northridge California State University, Dominguez Hills

Note: Postsecondary institutions were sourced from the Integrated Postsecondary Education Data System. Online universities are defined as those where the majority of degrees are offered online, even if some in-person programs exist. These institutions are categorized into two groups: standalone online universities and online campuses of traditional brick-and-mortar institutions. Although Southern New Hampshire University began as a brick-and-mortar institution, it is classified as a standalone online university since nearly all of its students attend online. Altogether, the online universities are among the largest public and nonprofit online universities in the United States. Each labor market includes one or two regional brick-and-mortar colleges, depending on availability. The selected brick-and-mortar institutions have minimal undergraduate enrollment exclusively in online programs.

Table 4: Job Titles in Applicants' Work Histories

Job Type	Job Titles
Initial jobs after high school graduation	<i>Entry:</i> Cashier, Customer Service Representative, Retail Associate, Sales Associate
	<i>Supervisory:</i> Assistant Manager, Assistant Store Manager, Customer Service Supervisor, Store Supervisor
Specialized positions before completing bachelor's degree	<i>Accounting:</i> Accounting Assistant, Accounting Clerk, Accounts Payable Clerk, Administrative Assistant, Assistant Bookkeeper, Bookkeeper, Front Desk Clerk
	<i>Finance:</i> Accounts Payable Clerk, Administrative Assistant, Assistant Bookkeeper, Bank Teller, Bookkeeper, Finance Assistant, Finance Clerk, Front Desk Clerk
	<i>Management:</i> Administrative Assistant, Executive Assistant, Front Desk Clerk, Office Administrator, Office Coordinator, Office Manager, Project Assistant, Project Coordinator
	<i>Marketing:</i> Administrative Assistant, Executive Assistant, Front Desk Clerk, Marketing Assistant, Marketing Coordinator, Marketing Specialist, Office Coordinator

Note: This table lists the job titles featured in the applicants' work histories. In all cases, applicants begin their careers in retail positions after graduating from high school. Over time, they advance into more specialized roles within their chosen business field. Although these positions do not require postsecondary education, they reflect the typical career paths of individuals pursuing a postgraduate business career.

Table 5: Skills

Skill Type	Skills
Soft skills	Analytic thinking, communication skills, conflict resolution, creative thinking, critical thinking, customer service, detail-oriented, fast learner, interpersonal communication, leadership skills, problem-solving, public speaking, presentation skills, relationship management, team player, time management
Accounting	Account management, account reconciliation, administrative experience, balance sheet reconciliation, bookkeeping, data analysis, financial analysis and reporting, financial modeling, financial statement preparation, GAAP, general ledger accounting, Google Suite, Microsoft Office, software troubleshooting, tax knowledge
Finance	Account analysis, account reconciliation, administrative experience, auditing, billing, budgeting, cash handling, financial accounting, financial data analysis, financial modeling, financial planning, GAAP, general ledger accounting, Microsoft Office, notary public, QuickBooks
Management	Administrative experience, bookkeeping, budgeting, computer skills, data analysis, database management, event planning, lean management, logistics, meeting planning, Microsoft Office, negotiation, office management, process improvement, project management, quantitative analysis, sales
Marketing	Administrative experience, Adobe Creative suite, B2B marketing, brand awareness, budgeting, campaign strategy, content management, digital marketing, email marketing, event planning, graphic design, meeting planning, public relations, search engine marketing, social media marketing, web management

Note: This table lists the individual skills used to construct applicants' skill sections. Each specialization has its own set of technical skills. To ensure resumes do not look suspiciously similar, variants of these base skills were constructed with minor rephrasing. For example, "detail-oriented" is also listed as "strong attention to detail", or "communication skills" includes "verbal and written communication skills."

Table 6. Names of Fictitious Applicants Used in this Study

Perceived Race	Perceived Gender	Names
White	Male	Dustin Walsh Hunter Anderson Luke Nielson Todd Meyer
White	Female	Amy Meyer Hilary Anderson Kristen Walsh Susan Nielson
Black	Male	D'Andre Banks Jayvon Washington Keyshawn Jefferson Tyrone Booker
Black	Female	Ebony Booker Keisha Banks Tanisha Jefferson Tyra Washington

Note: First names were drawn from Gaddis' (2017) survey on the racial and socioeconomic (SES) perceptions of names, based on New York state birth records from 1994 to 2012. I selected a subset of first names commonly perceived as White or Black (as identified by at least 90% of survey respondents) and excluded names from the first and fourth quartiles of the mother's education level (used as a proxy for strong socioeconomic signals). Last names were also sourced from Gaddis' work, using common surnames from the 2012 Census Data with a population-level racial occurrence of at least 50% White or Black.

Table 7: Callback Rate by Group

	All	Online	In-person	Difference	P-value	Sample Size
All Applicants	0.121	0.123	0.118	0.005	0.792	2164
Major						
Accounting	0.164	0.162	0.165	-0.004	1.000	544
Finance	0.144	0.138	0.149	-0.011	0.806	536
Management	0.075	0.081	0.070	0.011	0.746	544
Marketing	0.100	0.111	0.089	0.022	0.474	540
Race						
White	0.128	0.133	0.124	0.009	0.714	1068
Black	0.113	0.113	0.113	0.000	1.000	1096
Gender						
Male	0.111	0.116	0.107	0.010	0.690	1014
Female	0.129	0.129	0.129	0.000	1.000	1150
Region						
Northeast	0.111	0.110	0.112	-0.002	1.000	838
Midwest	0.195	0.192	0.197	-0.005	1.000	416
South	0.142	0.142	0.142	0.000	1.000	366
West	0.064	0.077	0.051	0.026	0.294	544
Salary						
< \$60,000	0.177	0.178	0.176	0.003	1.000	762
≥ \$60,000	0.085	0.092	0.077	0.015	0.475	910
Missing	0.100	0.093	0.106	-0.012	0.764	492

Note: This table reports callback rates by subgroup. Differences between online and brick-and-mortar university graduates are calculated, with p-values reported from two-sided Fisher Exact Tests.

Table 8: Callback Estimates for Online University Graduates

	(1) Callback	(2) Callback
Online	0.005 (0.008) [-0.010, 0.020]	0.005 (0.008) [-0.011, 0.020]
Observations	2,164	2,164
Applicant controls		X

Note: This table reports estimated callback differences between online and brick-and-mortar university graduates from the linear probability model described in equation (1) with applicant controls added sequentially. Standard errors (in parentheses) are clustered at the job posting level. The 95 percent confidence intervals are reported in square brackets. The “online” coefficient is not statistically significant.

Table 9: Callback Estimates for Online University Graduates, by Race, Gender, and Region

	(1) Callback	(2) Callback	(3) Callback
White, online applicant	0.012 (0.011) [-0.009, 0.032]		
Black, online applicant	-0.002 (0.011) [-0.025, 0.020]		
Male, online applicant		0.010 (0.010) [-0.010, 0.030]	
Female, online applicant		-0.001 (0.011) [-0.023, 0.022]	
Northeast, online applicant			-0.001 (0.012) [-0.026, 0.023]
South, online applicant			0.001 (0.021) [-0.040, 0.041]
Midwest, online applicant			-0.006 (0.017) [-0.040, 0.028]
West, online applicant			0.025* (0.014) [-0.003, 0.053]
Observations	2,164	2,164	2,164
F(White = Black)	0.386		
F(Male = Female)		0.476	
F(Northeast = South)			0.934
F(Northeast = Midwest)			0.821
F(Northeast = West)			0.164

Note: This table reports estimated callback differences between online and brick-and-mortar university graduates from the linear probability model described in equation (1) with heterogenous effects by race (column 1), gender (column 2), and region (column 3). Models include applicant controls. Standard errors (in parentheses) are clustered at the job posting level. The 95 percent confidence intervals are reported in square brackets. Stars indicate statistical significance: *** 1% level, ** 5% level, * 10% level.

Table 10: Callback Estimates for Online University Graduates, by Specialization

	(1) Callback
Accounting, online applicant	-0.004 (0.017) [-0.037, 0.029]
Finance, online applicant	-0.011 (0.013) [-0.035, 0.014]
Management, online applicant	0.010 (0.015) [-0.020, 0.040]
Marketing, online applicant	0.023 (0.017) [-0.009, 0.056]
Observations	2,164
F(Accounting = Finance)	0.757
F(Accounting = Management)	0.540
F(Accounting = Marketing)	0.249

Note: This table reports estimated callback differences between online and brick-and-mortar university graduates from the linear probability model described in equation (1) with heterogenous effects by college major. The model includes applicant controls. Standard errors (in parentheses) are clustered at the job posting level. The 95 percent confidence intervals are reported in square brackets. The “online” coefficients are not statistically significant.

Table 11: Callback Estimates By Online University Type

	(1) Callback
Standalone Online University	0.005 (0.013) [-0.020, 0.029]
Online Campus	0.005 (0.012) [-0.020, 0.029]
Observations	2,164
F(standalone online university = online campus)	0.998

Note: This table reports estimated callback differences between online and brick-and-mortar university graduates from the linear probability model described in equation (2) with separate effects for standalone online universities and online campuses of traditional universities. The model includes applicant controls. Standard errors (in parentheses) are clustered at the job posting level. The 95 percent confidence intervals are reported in square brackets. The “online” coefficients are not statistically significant. The “online” coefficients are also not different from each other, as determined by an F test.

Table 12: Salaries from Responsive Job Postings

	(1) Lower Bound	(2) Mean	(3) Upper Bound
Online	419.54 (832.71) [-1,227.75, 2,066.83]	1,257.05 (1,511.16) [-1,732.38, 4,246.47]	2,094.55 (2,584.54) [-3,018.28, 7,207.38]
Observations	212	212	212

Note: This table reports OLS estimates of the listed salaries from responsive job postings. Of the 261 job postings with responding employers, 212 (81.2 percent) provided a salary range. Job postings with no employer responses are excluded. The model includes applicant controls and an indicator for when both applicants received a callback. Standard errors (in parentheses) are clustered at the job posting level. The 95 percent confidence intervals are reported in square brackets. The “online” coefficients are not statistically significant.

Appendix

A.1 Additional Outcome Measures

I explored other aspects of employer response to test the robustness of my results. For instance, employers more interested in an applicant may explicitly request an interview, respond more quickly, or send follow-up messages, indicating stronger preferences. Using a stricter definition of callbacks, I recoded neutral responses as 0 and only included explicit interview requests as callbacks (summary statistics in Table A1).¹⁷ The main estimates remain similar: online university graduates receive 0.4 percentage points more interview requests than brick-and-mortar graduates, but the difference is not statistically significant (p-value = 0.56) (Table A2). Results are also substantively similar by demographics (Table A3), specialization (Table A4), and online university type (Table A5).

Next, I examine the intensity of employer responses by analyzing (1) the average number of days until an applicant received their first callback and (2) the total number of personalized responses received within four weeks, including follow-up messages. Both models show negative effects for online university graduates (-0.415 days and -0.173 total responses), but neither difference is statistically significant nor large in magnitude (Table A6). These alternative measures of employer response support the main findings of the study.

A.2 Alternative Model Specifications

The audit study's randomization created two labor pools with comparable observed and unobserved characteristics, reducing the likelihood that omitted variables—such as specific work history templates, skills, or cover letters—would systematically bias the results. However, random assignment does not always guarantee a perfectly even distribution of these characteristics. If certain resume templates are preferred by employers,

¹⁷ 57.5 percent of callbacks remain under the new definition. 89 of the 111 dropped callbacks (80.2 percent) are instances where employers requested to speak with the applicant but did not explicitly mention an “interview”.

random differences in their assignment between online and brick-and-mortar applicants could affect the results.

In Table A7, I re-estimate the main model from equation (1) with four different sets of controls: (1) applicant controls without template fixed effects, (2) work history templates without applicant controls, (3) skill templates without applicant controls, and (4) cover letter templates without applicant controls. Given the large number of template fixed effects, including all controls in one model risks overfitting due to too many parameters. There are 16 work history templates, 32 skill templates, and 8 cover letter templates, resulting in very small cells—many with single-digit observations or zero—before adding applicant controls for gender, race, age, submission order, region, and specialization. Therefore, I estimate the model separately for each set of fixed effects and find no meaningful differences between them. The model with skill templates yields a slightly larger estimate (+1.0 percentage point), but this difference is not statistically significant (p-value = 0.20).

I also replicate the main results using a probit model instead of a linear probability model (Tables A8). The estimates are nearly identical.

Appendix Tables

Table A1: Callback Rate by Group (Positive Responses Only)

	All	Online	In-person	Difference	P-value	Sample Size
All Applicants	0.069	0.071	0.067	0.004	0.800	2164
Major						
Accounting	0.088	0.088	0.088	0.000	1.000	544
Finance	0.069	0.063	0.075	-0.011	0.734	536
Management	0.050	0.055	0.044	0.011	0.694	544
Marketing	0.070	0.078	0.063	0.015	0.614	540
Race						
White	0.077	0.077	0.077	0.000	1.000	1068
Black	0.062	0.066	0.058	0.007	0.707	1096
Gender						
Male	0.072	0.077	0.067	0.010	0.627	1014
Female	0.067	0.066	0.068	-0.002	1.000	1150
Region						
Northeast	0.064	0.060	0.069	-0.010	0.673	838
Midwest	0.118	0.120	0.115	0.005	1.000	416
South	0.068	0.071	0.066	0.005	1.000	366
West	0.040	0.051	0.029	0.022	0.276	544
Salary						
< \$60,000	0.109	0.108	0.110	-0.003	1.000	762
≥ \$60,000	0.052	0.053	0.051	0.002	1.000	910
Missing	0.041	0.049	0.033	0.016	0.494	492

Note: This table reports callback rates by subgroup. Callbacks include interview requests only. Differences between online and brick-and-mortar university graduates are calculated, with p-values reported from two-sided Fisher Exact Tests.

Table A2: Callback Estimates for Online University Graduates (Positive Responses Only)

	(1) Interview Requests	(2) Interview Requests
Online	0.004 (0.006) [-0.008, 0.016]	0.004 (0.006) [-0.08, 0.016]
Observations	2,164	2,164
Applicant controls		X

Note: This table reports estimated callback differences between online and brick-and-mortar university graduates from the linear probability model described in equation (1) with applicant controls added sequentially. The callback outcome includes interview requests only. Standard errors (in parentheses) are clustered at the job posting level. The 95 percent confidence intervals are reported in square brackets. The “online” coefficients are not statistically significant.

Table A3: Callback Estimates for Online University Graduates, by Race, Gender, and Region (Positive Responses Only)

	(1) Callback	(2) Callback	(3) Callback
White, online applicant	0.000 (0.008) [-0.015, 0.016]		
Black, online applicant	0.007 (0.009) [-0.012, 0.025]		
Male, online applicant		0.010 (0.009) [-0.007, 0.027]	
Female, online applicant		-0.002 (0.009) [-0.019, 0.015]	
Northeast, online applicant			-0.009 (0.010) [-0.028, 0.009]
South, online applicant			0.006 (0.018) [-0.030, 0.041]
Midwest, online applicant			0.004 (0.014) [-0.024, 0.032]
West, online applicant			0.022** (0.010) [0.002, 0.042]
Observations	2,164	2,164	2,164
F(White = Black)	0.588		
F(Male = Female)		0.332	
F(Northeast = South)			0.467
F(Northeast = Midwest)			0.435
F(Northeast = West)			0.026

Note: This table reports estimated callback differences between online and brick-and-mortar university graduates from the linear probability model described in equation (1) with heterogeneous effects by race (column 1), gender (column 2), and region (column 3). Models include applicant controls. Standard errors (in parentheses) are clustered at the job posting level. The 95 percent confidence intervals are reported in square brackets. The callback outcome includes interview requests only. Stars indicate statistical significance: *** 1% level, ** 5% level, * 10% level.

Table A4: Callback Estimates for Online University Graduates, by Specialization (Positive Responses Only)

	(1) Callback
Accounting, online applicant	-0.000 (0.013) [-0.025, 0.025]
Finance, online applicant	-0.011 (0.008) [-0.028, 0.005]
Management, online applicant	0.011 (0.013) [-0.015, 0.037]
Marketing, online applicant	0.015 (0.014) [-0.012, 0.042]
Observations	2,164
F(Accounting = Finance)	0.471
F(Accounting = Management)	0.558
F(Accounting = Marketing)	0.419

Note: This table reports estimated callback differences between online and brick-and-mortar university graduates from the linear probability model described in equation (1) with heterogenous effects by college major. The model includes applicant controls. The callback outcome includes interview requests only. Standard errors (in parentheses) are clustered at the job posting level. The 95 percent confidence intervals are reported in square brackets. The “online” coefficients are not statistically significant.

Table A5: Callback Estimates By Online University Type (Positive Response Only)

	(1) Callback
Standalone Online University	-0.002 (0.010) [-0.021, 0.018]
Online Campus	0.009 (0.010) [-0.011, 0.028]
Observations	2,164
F(standalone online university = online campus)	0.506

Note: This table reports estimated callback differences between online and brick-and-mortar university graduates from the linear probability model described in equation (2) with separate effects for standalone online universities and online campuses of traditional universities. The model includes applicant controls. The callback outcome includes interview requests only. Standard errors (in parentheses) are clustered at the job posting level. The 95 percent confidence intervals are reported in square brackets. The “online” coefficients are not statistically significant. The “online” coefficients are also not different from each other, as determined by an F test.

Table A6: Alternative Callback Measure for Online University Graduates

	(1) Days Until First Callback	(2) Total Callbacks
Online	-0.415 (0.508) [-1.417, 0.588]	-0.173 (0.142) [-0.453, 0.106]
Observations	261	261

Note: This table reports OLS estimates of the number of days until receiving a callback (column 1) and the number of callbacks received (column 2). Job postings with no employer responses are excluded. The model includes applicant controls and an indicator for when both applicants received a callback. Standard errors (in parentheses) are clustered at the job posting level. The 95 percent confidence intervals are reported in square brackets. The “online” coefficients are not statistically significant.

Table A7: Callback Estimates for Online University Graduates with Alternative Controls

	(1)	(2)	(3)	(4)
	Callback	Callback	Callback	Callback
Online	0.005 (0.008) [-0.010, 0.020]	0.005 (0.008) [-0.010, 0.021]	0.010 (0.008) [-0.005, 0.025]	0.006 (0.008) [-0.010, 0.021]
Observations	2,164	2,164	2,164	2,164
Applicant controls	X			
Work history fixed effects		X		
Skill fixed effects			X	
Cover letter fixed effects				X

Note: This table reports estimated callback differences between online and brick-and-mortar university graduates from the linear probability model described in equation (1) with applicant controls but no template fixed effects (column 1), work history template fixed effects (column 2), skill templates fixed effects (column 3), and cover letter fixed effects (column 4). Standard errors (in parentheses) are clustered at the job posting level. The 95 percent confidence intervals are reported in square brackets. Stars indicate statistical significance: *** 1% level, ** 5% level, * 10% level.

Table A8: Callback Estimates for Online University Graduates (Probit Model)

	(1)	(2)
	Callback	Callback
Online	0.005 (0.008) [-0.010, 0.020]	0.007 (0.008) [-0.009, 0.022]
Observations	2,164	2,164
Applicant controls		X

Note: This table reports average marginal effects from probit models described in equation (1) with applicant controls added sequentially. Standard errors (in parentheses) are clustered at the job posting level. The 95 percent confidence intervals are reported in square brackets. Stars indicate statistical significance: *** 1% level, ** 5% level, * 10% level.