College major, internship experience, and employment opportunities: Estimates from a résumé audit

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HIGHLIGHTS
• We present estimates from experimental data on the labor market for college graduates.
• Fictitious resumes are submitted to jobs in business-related categories.
• We find no evidence that business degrees improve job prospects.
• Internships improve employment prospects substantially.
• Internships appear to be signals of unobservables valued by employers.

ABSTRACT
We use experimental data from a résumé audit to estimate the impact of particular college majors and internship experience on employment prospects. Despite applying exclusively to business-related job openings, we find no evidence that business degrees improve employment prospects. By contrast, internship experience increases the interview rate by 14%. The returns to internship experience are larger for (a) nonbusiness majors and (b) applicants with high academic ability. Our data support signaling as the most likely explanation regarding the effect of internships on employment opportunities.

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1. Introduction

The reduction in initial employment opportunities for recent college graduates brought about by the last recession has led many policymakers, researchers, and prospective students to question the value of a college education. Popular internet newsgroups regularly feature articles which reference academic research on the projected labor-market demand for and life satisfaction associated with particular undergraduate degrees. However, such information on degree choice might be influenced by those who advertise on the same webpages that feature the articles.4

In addition to academic decisions, a bevy of extra-curricular activities are available to college students. The National Association of Colleges

4 For example, see the article and corresponding advertisements in the find-a-program tabs through the following webpage: http://education.yahoo.net/articles/avoid_these_majors.htm.
The return to education has long been of interest to labor economists. However, research on the effect of specific academic training on labor-market outcomes is relatively sparse. The existing literature focuses on the effects of college attendance, university quality, and degree choice on labor-market outcomes (e.g., Oreopoulos and Petronijevic, 2013; Altonji et al., 2012). These studies also share a common limitation: the choice of academic major could be driven by unobservables that make individuals more or less likely to have success in the labor market. To highlight this potential issue, the disparity in earnings between some undergraduate degrees has been shown to be as large as the difference between college and high-school graduates (Altonji et al., 2012).

Many university degrees are designed for students to enter the workforce in certain industries. Industry-specific skills acquired while studying for a degree may lessen training costs for new workers. For employers, this could help smooth the transition from school to work for young workers. From a policy standpoint, it is important to understand whether internship experience signals unobservables, such as innate ability, or augments a worker’s skill-set. It is also possible for internship experience to serve as a different type of signal. As an example, employers in the field of banking may use internship experience in the banking sector as a signal of fit or a desire on the part of applicants to continue working in the banking sector. Such a signal could improve the quality of employer–employee matches, which would be efficiency-enhancing. If internships only signal unobserved ability to employers, policy interventions could moderate the signal such that it no longer helps employers sort or rank job candidates. By contrast, if internship experience improves a job seeker’s skill-set or the quality of employer–employee matches, it is possible to justify government interventions designed to increase the demand for internships.

Four aspects of our experimental data suggest signaling as the most likely explanation for the effect of internships on employment opportunities. First, the return to three-month industry-relevant internships, which occurred about four years before the date of application, is about half that of post-graduation industry-relevant work experience of 20–38 months that is more recent. This finding suggests internship experience reveals something other than relevant work experience to prospective employers. Second, there is no statistically significant interaction effect between internship experience and post-graduation work experience. It is difficult to reconcile the lack of an interaction effect with a human-capital model, as we would expect industry-relevant experience to be stackable (e.g., Neal, 1995). Third, we model the initial phase of the hiring process for entry-level jobs, in which a cursory overview of résumés often takes place (see Pager, 2007). Fourth, the internship took place approximately four years prior to application, making it likely that any skills gained would have depreciated substantially.

The remainder of the manuscript is organized as follows. Section 2 discusses the relevant literature and the theoretical channels through which college majors and internship experience could affect employment prospects. Section 3 describes our experimental design and data. Section 4 presents the estimates from our econometric models. Section 5 provides a summary of our findings and discusses the possible explanations for our findings. In addition, we provide an online appendix that contains supplementary estimates as well as detailed information on the experiment.

2. Theoretical background and previous studies

The return to education has long been of interest to labor economists. However, research on the effect of specific academic training on labor-market outcomes is relatively sparse. The existing literature focuses on the effects of college attendance, university quality, and degree choice on labor-market outcomes (e.g., Oreopoulos and Petronijevic, 2013; Altonji et al., 2012). These studies also share a common limitation: the choice of academic major could be driven by unobservables that make individuals more or less likely to have success in the labor market. To highlight this potential issue, the disparity in earnings between some undergraduate degrees has been shown to be as large as the difference between college and high-school graduates (Altonji et al., 2012).

Many university degrees are designed for students to enter the workforce in certain industries. Industry-specific skills acquired while studying for a degree may lessen training costs for new workers. For
example, job applicants with degrees in finance or economics may be more likely to receive interviews for financial and economic analyst positions. However, the majority of courses taken by college students in the United States are not specific to a major.10 Because a small proportion of industry-specific courses could be taken during one's undergraduate years, the impact of specific degrees on initial and subsequent employment prospects may be less pronounced.

Although college graduates with business degrees (i.e., accounting, economics, finance, management and marketing) are more likely to work in business-related occupations, it is not uncommon for college graduates with degrees in biology, English, history and psychology to work in business-related occupations. In Panel A of Table 1, we present the share of workers employed in general and specific business-related occupations who possess the majors used in our experiment. For individuals with the same non-business degrees used in our experiment, over 10% of the workers in business-related (column 1) and specific business occupations (columns 2–6) possess such degrees. Among the specific nonbusiness majors, psychology majors are the most likely to work in business-related occupations. However, workers who possess the non-business degrees used in our experiment tend to earn less than business majors in the same occupation categories (See Panel B of Table 1).11

Applicants who have worked in specific industries, either post-graduation or as college interns, may also be preferred because of the skills acquired through that experience (e.g., Neal, 1995).12 To our knowledge, the economics literature on labor-market consequences associated with internship experience is currently limited to two studies: ours and Saniter and Siedler (2014).13 The relative absence of economic studies on the impact of internship experience on labor-market outcomes is likely due to the lack of data on internships and for the complications associated with identification. In the latter case, it is likely that high-ability students are more likely to obtain internships. Such students would also tend to have greater success in the labor market. Saniter and Siedler (2014) control for self-selection into internships by estimating the impact of mandatory internships and their subsequent abolishment in Germany. For those who complete internships, wages rise by approximately six percent. However, these wage gains appear to be driven by initial placement in workforce (e.g., working full time in lieu of part time) during the first five years after graduation.

Internship experience, particular degrees, and overall academic performance could also signal higher future productivity because the costs of acquiring such credentials could be greater for lower-quality job applicants. Although the résumé-audit framework allows the researcher to control for selection bias and experimenter effects, the observation of the hiring process ends at the conclusion of the first phase, i.e. whether an applicant receives an interview.14 Hence, signaling may be more important for receiving an interview request and an applicant's skillset may influence the hiring decision to a greater extent during the interview stage. Even if researchers conclude that signaling is the likely explanation behind a particular result, it is difficult to know what type of signaling is being sent. On the one hand, the signal could indicate unobserved ability. On the other hand, the signal may improve the quality of matches between employers and employees, creating a more efficient matching process.

Using our experimental data, we examine the human-capital and signaling hypotheses with our data by testing whether the returns to internships experience vary with (a) academic ability and (b) the type of work experience obtained after graduating from college. In our experiment, academic ability is signaled via the inclusion of one’s grade point average (GPA). For the type of work experience obtained after graduating, the fictive applicants obtained either a job that matches or does not match the industry for which the applicant is applying. We refer to the former as in-field or industry-relevant experience and the latter as out-of-field experience.

3. Experimental design

From January 2013 through the end of July 2013, we submitted approximately 9400 randomly-generated, fictitious résumés to online job openings in the following job categories: banking, finance, insurance, management, marketing and sales.15 We submitted résumés to cities with large labor markets in the northwestern, southwestern, northeastern, midwestern and southeastern regions of the United States. The cities in which applicants applied to job openings are Atlanta, GA, Baltimore, MD, Boston, MA, Dallas, TX, Los Angeles, CA, Minneapolis, MN and Portland, OR. We submitted résumés to jobs that were entry level, required a college degree, only required the submission of a résumé to be considered for the job16 and did not require a certificate or special training. Four résumés were submitted to each advertisement.

The unit of observation in our study is the firm. Because firms are not human subjects, Institutional Review Boards (IRBs) generally deem such experiments exempt. Indeed, the IRBs at both Auburn University (AU) and University of Wisconsin–La Crosse (UWL) concluded our study did not constitute human-subjects research. However, three aspects of our experiment warrant brief discussion: the use of deception, legal liability and uncompensated work time for human resources personnel.17 Our experiment uses deception as a means to maintain a pure subject pool. If firms were told beforehand they are the subjects of a hiring experiment, it is possible we would no longer elicit the behavior exhibited in actual hiring decisions. Per our agreement with the IRBs at AU and UWL, we were required to maintain the anonymity of the universities and firms included on the resumes as well as the identities of firms to which resumes were submitted, which alleviates concerns about firms being held accountable for discriminatory hiring practices. Our experiment imposes a cost on firms who receive the

10 As an anecdotal example, at Auburn University, students majoring in economics are only required to take 36 credit hours (of the 120 credit hours required to graduate) of classes with economics as the subject heading. As another example, consider an accounting major at the University of Wisconsin–La Crosse. The successful accounting major must complete 48 general education credits and 34 accounting credits. The remainder of the 120 total credits required to graduate might come from other business-related courses (at least 16 credits must come from courses in the business school) or non-business-related courses. Thus, only about 30% of the student’s coursework is required to be taken in the field of accounting.

11 We note that the occupation categories provided by the American Community Survey (ACS) are broad. Thus, it is impossible to know whether business and nonbusiness majors are employed in the same jobs. That is, it could be that nonbusiness majors are more likely to place into lower-paying jobs within a particular occupation category, and that business majors are more likely to place in higher-paying jobs within the same occupation category. One would need detailed data on job titles to conduct such a comparison. Unfortunately, such data are not available.

12 Unfortunately, we are unable to pin down whether or not industry-specific human capital is a channel through which internships affect employment opportunities because we do not randomly assign out-of-industry internship experience to any of our fictitious applicants.

13 One example from the human-resources literature is Knouse et al. (1999), who use survey data to estimate the effect of internships on employment outcomes. They find that internships increase employment opportunities for business majors. However, they also find that those who receive internship experience had significantly higher grade point averages, which suggests that there may be estimation problems associated with self-selection. Saniter and Siedler (2014) cite several studies from the education literature. But these studies, with the exception of Klein and Weiss (2011), lack identification strategies to address the problem of self selection. Klein and Weiss (2011) examine the effect of compulsory internships in Germany and find no effect of internships on employment outcomes.

14 Although the résumé-audit framework does not allow the observation of employment outcomes beyond the interview request, differences in interview rates are strong predictors of differences in wages and employment (Lanning, 2013).

15 We performed power calculations before beginning our experiment. For detectable effect size of 0.1, alpha error probability of 0.01, and power of 0.89, with 50 regressors (counting interaction terms), we would need 2407 observations. These requirements are more stringent than “conventional” effect size, alpha error and power criteria.

16 Some job openings require that applicants complete a detailed firm-specific application. We did not submit résumés to these job openings for two reasons. First, the detailed application introduces unwanted variation into the experimental design that is difficult to hold constant across applicants. Second, the completion of detailed applications takes considerable time, and our objective was to generate as many data points as possible at the lowest possible cost.

17 See Pager (2007) for more details.
Table 1
Percentage employed and earnings by major and occupation category.

<table>
<thead>
<tr>
<th>Occupation category</th>
<th>General degree</th>
<th>Business related</th>
<th>Banking/Finance</th>
<th>Insurance</th>
<th>Management</th>
<th>Marketing</th>
<th>Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel A: Percentage employed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td>29.7%</td>
<td>46.5%</td>
<td>23.7%</td>
<td>28.9%</td>
<td>31.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonbusiness</td>
<td>11.5%</td>
<td>10.1%</td>
<td>13.5%</td>
<td>12.8%</td>
<td>10.4%</td>
<td>10.8%</td>
<td></td>
</tr>
<tr>
<td>Accounting</td>
<td>2.3%</td>
<td>6.9%</td>
<td>1.9%</td>
<td>1.9%</td>
<td>0.5%</td>
<td>1.2%</td>
<td></td>
</tr>
<tr>
<td>Economics</td>
<td>14.8%</td>
<td>20.3%</td>
<td>18.8%</td>
<td>13.7%</td>
<td>9.9%</td>
<td>15.1%</td>
<td></td>
</tr>
<tr>
<td>Finance</td>
<td>5.1%</td>
<td>14.6%</td>
<td>8.7%</td>
<td>3.3%</td>
<td>1.8%</td>
<td>4.1%</td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td>11.5%</td>
<td>14.8%</td>
<td>15.3%</td>
<td>10.6%</td>
<td>7.8%</td>
<td>12.2%</td>
<td></td>
</tr>
<tr>
<td>Marketing</td>
<td>7.5%</td>
<td>4.7%</td>
<td>6.3%</td>
<td>4.8%</td>
<td>16.8%</td>
<td>11.5%</td>
<td></td>
</tr>
<tr>
<td>Biology</td>
<td>2.4%</td>
<td>1.8%</td>
<td>2.6%</td>
<td>2.7%</td>
<td>1.6%</td>
<td>2.6%</td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>2.7%</td>
<td>2.0%</td>
<td>2.5%</td>
<td>2.8%</td>
<td>4.1%</td>
<td>2.1%</td>
<td></td>
</tr>
<tr>
<td>History</td>
<td>1.9%</td>
<td>1.7%</td>
<td>2.6%</td>
<td>1.9%</td>
<td>1.5%</td>
<td>2.1%</td>
<td></td>
</tr>
<tr>
<td>Psychology</td>
<td>4.8%</td>
<td>4.5%</td>
<td>5.8%</td>
<td>5.4%</td>
<td>3.2%</td>
<td>4.0%</td>
<td></td>
</tr>
<tr>
<td>Panel B: Earnings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General degree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business</td>
<td>$48,335</td>
<td>$49,532</td>
<td>$43,976</td>
<td>$47,740</td>
<td>$49,896</td>
<td>$48,880</td>
<td></td>
</tr>
<tr>
<td>Nonbusiness</td>
<td>$40,714</td>
<td>$38,563</td>
<td>$37,675</td>
<td>$40,459</td>
<td>$45,281</td>
<td>$42,003</td>
<td></td>
</tr>
<tr>
<td>Accounting</td>
<td>$43,098</td>
<td>$44,095</td>
<td>$40,547</td>
<td>$44,557</td>
<td>$57,384</td>
<td>$38,022</td>
<td></td>
</tr>
<tr>
<td>Economics</td>
<td>$47,508</td>
<td>$47,217</td>
<td>$42,507</td>
<td>$47,663</td>
<td>$52,109</td>
<td>$47,712</td>
<td></td>
</tr>
<tr>
<td>Finance</td>
<td>$55,493</td>
<td>$57,700</td>
<td>$48,867</td>
<td>$54,222</td>
<td>$63,933</td>
<td>$54,458</td>
<td></td>
</tr>
<tr>
<td>Management</td>
<td>$45,381</td>
<td>$41,262</td>
<td>$42,824</td>
<td>$45,786</td>
<td>$46,870</td>
<td>$49,549</td>
<td></td>
</tr>
<tr>
<td>Marketing</td>
<td>$46,453</td>
<td>$41,831</td>
<td>$41,772</td>
<td>$44,650</td>
<td>$50,810</td>
<td>$47,428</td>
<td></td>
</tr>
<tr>
<td>Biology</td>
<td>$43,607</td>
<td>$44,147</td>
<td>$37,366</td>
<td>$43,318</td>
<td>$44,805</td>
<td>$46,196</td>
<td></td>
</tr>
<tr>
<td>English</td>
<td>$38,141</td>
<td>$36,287</td>
<td>$36,371</td>
<td>$37,700</td>
<td>$41,181</td>
<td>$38,798</td>
<td></td>
</tr>
<tr>
<td>History</td>
<td>$43,088</td>
<td>$41,482</td>
<td>$43,419</td>
<td>$42,651</td>
<td>$51,875</td>
<td>$41,931</td>
<td></td>
</tr>
<tr>
<td>Psychology</td>
<td>$39,780</td>
<td>$36,337</td>
<td>$35,738</td>
<td>$39,692</td>
<td>$47,833</td>
<td>$41,116</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Calculations are based on data from the 2010–2013 American Community Surveys (ACS). The sample is composed of respondents who are 24–28 years-old and employed in the previous year. In Panel B, the sample is restricted to include respondents who earn between $5000 and $250,000 per year. The occupation categories are based on the “occ1990” variable provided by the ACS (See Ruggles et al. (2015)).
Although using interview requests as an outcome variable has limitations, the receipt of an interview request is a necessary step to obtain employment. Lanning (2013) develops a search model calibrated with data from prominent résumé-audit studies combined with nationally-representative survey data, and he demonstrates that differences in callback/interview rates can translate into large differences in employment and earnings. Thus, it appears the initial step in the interview process is an important determinant of subsequent labor-market outcomes.

To gain insight into the interview rates for (a) business and nonbusiness majors and (b) applicants with and without internship experience, we present the average interview rates for all applicants and for each group in Table 2. The overall interview rate is about 16% (column 1); the interview rates for business and nonbusiness majors (columns 2 and 3) range from 16 to 17%; and the interview rate for applicants with internship experience is higher than that for those without internship experience (18.4 versus 16.1%).

4. Results

We begin by estimating the returns (in terms of interview requests) generated by business degrees and internship experience. Formally, we estimate the following regression model:

\[
\text{interview}_{ijkl} = \beta_0 + \beta_1 \text{bus}_{i} + \beta_2 \text{intern}_{j} + \chi_{k} + \phi_m + \phi_f + \phi_i + u_{ijkl}. \tag{1}
\]

The subscripts \(i, m, c, f, j\) and index applicants, months, cities, job categories/industries and job advertisements, respectively. The variable interview is a zero–one indicator equal to one when an applicant receives an interview request and zero otherwise; bus is a zero–one indicator that equals one when an applicant is assigned a business degree (i.e., accounting, economics, finance, management or marketing) and zero otherwise; intern is a zero–one indicator equal to one when an applicant is assigned an industry-specific internship and zero otherwise; \(X\) is a vector of résumé controls; \(\phi_m, \phi_c, \phi_f\) and \(\phi_i\) represent intercept terms for the month the résumé was submitted, the city where the résumé was submitted, the job category/industry in which the job advertisement fits (i.e., banking, finance, insurance, management, marketing and sales), and the job advertisement, respectively; and \(u\) represents unobserved determinants of the dependent variable not accounted for in Eq. (1). The \(\beta_0, \beta_1, \beta_2\) and \(\theta\) are parameters to be estimated. The random assignment of business majors and internship experience to fictitious job seekers implies the variables bus and intern are assigned independent of the error term in Eq. (1). Thus, the estimate for \(\beta_1\) gives the causal average difference in the interview rate between business and nonbusiness majors, and the estimate for \(\beta_2\) gives the average causal difference in the interview rate between applicants with and without internship experience. Although we interpret the estimates as causal effects, we must rely on existing theory to determine the channel through which business degrees and internship experience affect employment prospects. We return to this issue toward the end of this section.

Six columns of estimates are presented in Table 3, which vary based on the control variables held constant. The successive addition of right-
hand-side control variables is a useful means to gauge the sensitivity of the estimates. In column 1, we present estimates from a regression model that includes none of the controls listed in Eq. (1). In columns 2–6, we successively add the controls listed in Eq. (1) (i.e., X, φ_m, φ_b, φ_f, and φ_i). The estimates for β_1 and β_2 are stable as control variables are successively added to the regression models. The stability of the estimates provides additional support that the randomization of résumé credentials was effective. We find no statistical evidence linking business degrees to interview rates, despite applying exclusively for jobs in business-related job categories. Furthermore, the sizes of the estimated differentials in interview rates between business and nonbusiness majors are small (i.e. less than one-half of a percentage point). By contrast, we find strong evidence that internship experience increases interview rates. Applicants with internship experience are 14% (2.2 percentage points) more likely to receive an interview request than those without internship experience.

The estimates presented in Table 3 suggest business degrees do not materially affect employment prospects. However, it is possible that particular business degrees yield better job opportunities than particular non-business degrees. Our next specification examines this possibility. Formally, we estimate the following regression equation:

$$\text{interview}_{mbf} = \beta_0 + \beta_1 \text{acct} + \beta_2 \text{bio} + \beta_3 \text{econ} + \beta_4 \text{eng} + \beta_5 \text{fin} + \beta_6 \text{hist} + \beta_7 \text{mgmt} + \beta_8 \text{mkt} + X_i \theta + \phi_m + \phi_b + \phi_f + \phi_i + u_{mbf}.$$  \hfill (2)

The variables are defined in Eq. (1). The subscript m, c, f and j correspond to respective majors and are equal when an applicant is assigned the particular undergraduate degree and zero otherwise. The base category in Eq. (2) is psych (psychology).

Table 4 presents the estimated interview differentials for each non-business degree and each business degree.28 Rather than comment on each of the estimates, it is sufficient to note that none of the particular business majors give job seekers an advantage, at least statistically, over the particular nonbusiness majors. Although the estimated differences are not statistically significant, economic significance could be argued for a few of the estimated interview differentials. In particular, finance majors have a 1.9 (column 3, row 1) and 2.3 (column 3, row 3) percentage point higher interview rates than biology and history majors, respectively. Additionally, economics majors have a 2.1 percentage point higher interview rate than history majors (column 2, row 3). The remaining estimated interview differentials presented in Table 4 are small in an economic sense. Because we find that particular business degrees do not generate markedly higher interview rates, we return to analyzing business degrees in general in the next and subsequent econometric specifications.30

Because the return to internship experience could depend on whether applicants possess business or nonbusiness degrees, we augment Eq. (1) by adding an interaction term between bus and intern. Thus, we estimate the following regression model:

$$\text{interview}_{mbf} = \beta_0 + \beta_1 \text{bus} + \beta_2 \text{intern} + \beta_3 \text{bus} \times \text{intern}_i + X_i \theta + \phi_m + \phi_b + \phi_f + \phi_i + u_{mbf}.$$  \hfill (3)

The subscripts m, c, f and j and variables bus, intern, X, φ_m, φ_b, φ_f, and u are defined in Eq. (1). We are interested in a number of different parameters and linear combinations of parameters from Eq. (3), including the average difference between business and nonbusiness majors with internship experience (β_1 + β_2), the average difference between business and nonbusiness majors without internship experience (β_1), the average difference between job seekers with and without internship experience who have business degrees (β_1 + β_3), and the average difference between job seekers with and without internship experience who have nonbusiness degrees (β_2). In addition, the estimate for β_2 is of interest, as it tests whether the “return” to internship experience differs between business and nonbusiness majors.

The estimates for each of the aforementioned parameters and linear combinations of parameters are presented in Table 5. For applicants with and without internship experience, business and nonbusiness majors receive interview request rates that are not statistically different from one another. However, the signs of the estimated interview differentials differ: business majors with internship experience tend to receive fewer interview requests than nonbusiness majors with internship experience (column 1), while business majors without internship experience tend to receive more interview requests than nonbusiness majors without internship experience (column 2). The return to internship experience differs between nonbusiness and nonbusiness majors (columns 3 and 4). However, both business and nonbusiness majors with internship experience have higher interview rates than their counterparts who did not work as interns. In particular, relative to nonbusiness majors without internship experience, nonbusiness majors with internship experience have a 19% higher probability of receiving an interview request. In comparison to business majors without internship experience, business majors with internship experience have an 8% higher probability of receiving an interview request. The difference between the estimates in columns 1 and 2 (and, equivalently, columns 3 and 4), which tests whether the return to internship experience is statistically different for business and nonbusiness majors, is negative, but it is not statistically significant at conventional levels (column 5). However, an argument can be made for economic significance, as the estimate

28 In Appendix Table A3, we present estimates from an augmented version of Eq. (1) by including a set of interaction terms between intern and φ_i which allows us to test whether the return to internship experience varies across industries. Overall, we find the economic impact of internship experience is smallest in the banking and marketing industries, as we find null effects in those industries. By contrast, the returns to internship experience are economically large (between 2.6 and 3.0 percentage points) in the finance, insurance, management and sales job categories.

29 It should be pointed out that intern is in the vector X in Eq. (2). We omit the estimated effects of internship experience because the point estimate is identical to that presented in Table 3.

30 In Appendix Tables A4 and A5, we present estimates from Eq. (2) that test for differences in interview rates between particular business degrees (e.g., marketing versus management) (Appendix Table A4) and particular nonbusiness degrees (e.g., history versus biology) (Appendix Table A5). In Appendix Table A6, we present estimates on the impact of majoring in a degree program that matches the industry of the prospective employer (e.g., economics and finance “match” the banking and financial industries). In Appendix Tables A4, A5 and A6, we continue to find no statistical evidence linking particular majors to better (or worse) job opportunities.
indicates that the return to internship experience is 11% lower for business majors than it is for nonbusiness majors.31

For signaling and human capital models, the returns to business degrees and internship experience should be greater for applicants with more innate ability. In our experiment, a portion of the applicants and internship experience should be greater for applicants with business degrees, and Panel B presents the estimates for applicants without and with internship experience. In particular, the returns to pre-graduation industry-relevant work experience and the returns to post-graduation industry-relevant work experience do not depend on post-graduation industry-relevant internship experience.

Our strategy to shed light on the mechanism through which internships affect employment opportunities is to estimate a regression model that interacts pre- and post-graduation industry-relevant work experience. In the context of this specification, a signaling interpretation could be justified if the returns to pre-graduation industry-relevant internship experience do not depend on post-graduation industry-relevant work experience and the returns to post-graduation industry-relevant work experience do not depend on post-graduation industry-relevant internship experience. By contrast, one could not reject the human-capital model in the event that there is a positive interaction effect between pre- and post-graduation industry-relevant work experience. A second way to examine the signaling hypothesis is to examine the relative returns to pre- and post-graduation industry-relevant experience. In particular, finding that industry-relevant internship experience provides a greater return (at the margin) than industry-relevant work experience would be indicative of signaling, as the internships occurred about four years prior to the date of application and the

Table 3

<table>
<thead>
<tr>
<th>Comparison group</th>
<th>Accounting</th>
<th>Economics</th>
<th>Finance</th>
<th>Management</th>
<th>Marketing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biology</td>
<td>0.005</td>
<td>0.018</td>
<td>0.019</td>
<td>0.010</td>
<td>0.003</td>
</tr>
<tr>
<td>English</td>
<td>0.004</td>
<td>0.004</td>
<td>0.005</td>
<td>0.004</td>
<td>0.014</td>
</tr>
<tr>
<td>History</td>
<td>0.002</td>
<td>0.021</td>
<td>0.023</td>
<td>0.013</td>
<td>0.000</td>
</tr>
<tr>
<td>Psychology</td>
<td>0.013</td>
<td>0.004</td>
<td>0.002</td>
<td>0.008</td>
<td>0.017</td>
</tr>
</tbody>
</table>

Notes: Estimates are marginal effects from linear probability models. Standard errors clustered at the job-advertisement level are in parentheses. *** indicates statistical significance at the one-percent level. To produce the estimates presented, we estimate Eq. (1). However, the estimates in columns (1)–(6) differ based on the control variables that are held constant in regression model. In column (1), we estimate a simple regression model that include no control variables; column (2) adds controls for the résumé characteristics (See Table 1); column (3) adds controls for the city in which the applications were submitted; column (4) adds controls for the month in which the applications were submitted; column (5) adds controls for the job category that describes the opening; and column (6) adds controls for the job advertisement.

From Panel A of Table 6, the interview rates of business majors and nonbusiness majors are not statistically different from one another, regardless of whether a high grade point average is signaled (columns 1 and 2). The test for whether the impact of high academic ability differs between business and nonbusiness majors indicates no statistical evidence of an interview differential (column 3). From Panel B of Table 6, applicants with internship experience have higher interview rates than those without internship experience both without (column 1) and with (column 2) a high GPA. These estimated differentials are statistically significant at the 10- and one-percent levels, respectively. The return to internship experience is markedly higher for those who signal a high GPA (28% higher interview rate) than it is for those who do not signal a high GPA (8% higher interview rate). The greater return to internship experience for applicants who report a high GPA is also statistically different from that of applicants who do not report a high GPA.

The estimates presented in Tables 3, 4, 5 and 6 indicate that business degrees do not affect employment prospects in business-related occupations. By contrast, the return to internship experience is positive and significant in an economic and statistical sense. The return to internships is larger for nonbusiness majors and applicants who report high academic ability. The strong positive link between internships and employment opportunities warrants further attention, as it is important from a policy and theoretical perspective to determine whether internships signal unobservables, such as innate ability, or augment skill-sets. The estimates presented in Tables 3, 5 and 6 regarding the impact of internship experience on employment prospects are reconcilable with both signaling and human-capital models.

1 In Appendix Tables A7, A8 and A9, we present estimates based on an augmented version of Eq. (3), which replaces business degrees in general with the full set of specific college major categories and interacts those variables with the internship-experience indicator. With this specification, we are able to test whether the return to internship experience varies across particular college majors. It is important to point out that the standard errors for the estimates are quite large. The inflated standard errors are due to the relatively small numbers of observations in the cells of interest. However, the size of the estimated interaction differentials has the potential to be informative. Overall, the patterns in the data are somewhat nuanced. However, we can conclude from Appendix Table A7 that the overall greater return to internship experience realized by nonbusiness majors is driven primarily by relatively larger returns received by history and psychology majors (as opposed to biology and English majors).
and linear combinations of parameters in Table 7:

From Eq. (5), we present the following parameters

\[ \beta \]

Business degrees, internship experience and grade point average.

Returns to internship experience for business and nonbusiness majors.

Table 5

<table>
<thead>
<tr>
<th></th>
<th>Business majors</th>
<th>Internship versus no internship</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With internship</td>
<td>Without internship</td>
</tr>
<tr>
<td>(1)</td>
<td>0.018</td>
<td>0.014*</td>
</tr>
<tr>
<td>(2)</td>
<td>0.013</td>
<td>0.009</td>
</tr>
<tr>
<td>(3)</td>
<td>0.012</td>
<td>0.011</td>
</tr>
<tr>
<td>(4)</td>
<td>0.018</td>
<td>0.015</td>
</tr>
<tr>
<td>(5)</td>
<td>0.018</td>
<td>0.011</td>
</tr>
</tbody>
</table>

Table 6

Business degrees, internship experience and grade point average.

Note: Estimates are marginal effects from linear probability models. Standard errors clustered at the job-advertisement level are in parentheses. * and ** indicate statistical significance at the 10- and one-percent levels, respectively. The estimates in columns (1)–(5) are based on Eq. (3), which uses the full set of control variables (i.e., the résumé characteristics and the dummy variables for the month, city, job category and job advertisement) and full sample of 9396 observations.

Table 7

Parameter or linear combination of parameters

Internship experience: Estimates are marginal effects from linear probability models. Standard errors clustered at the job-advertisement level are in parentheses. * and ** indicate statistical significance at the 10- and one-percent levels, respectively. The estimates in columns (1)–(5) are based on Eq. (3), which uses the full set of control variables (i.e., the résumé characteristics and the dummy variables for the month, city, job category and job advertisement) and full sample of 9396 observations.

The subscripts i, m, c, f and j and variables intern, X, Øm, Øs, Øx and u are defined in Eq. (1). The variable infeld is a zero–one indicator that equals one when an applicant is assigned industry-specific work experience after graduation and zero when the applicant is assigned out-of-industry work experience after graduation, and intern × infeld is an interaction term. From Eq. (5), we present the following parameters and linear combinations of parameters in Table 7: \( \beta_i \) (column 1), \( \beta_1 + \beta_2 \) (column 2), \( \beta_1 \) (column 3) and \( \beta_2 + \beta_3 \) (column 4). From Table 7, the return to internship experience does not depend on the type of work experience obtained after graduation, as evidenced by identical percentage point differences in the interview rates between applicants with out-of-field work experience (column 1) and those with in-field work experience (column 2). Moreover, the return to post-graduate in-field work experience does not depend on whether the applicant had prior work experience as an undergraduate student, as the percentage point differences in the interview rates are identical (columns 3 and 4). The estimates presented in Table 7 are supportive of a signaling interpretation, as there is no interaction effect between internship experience and post-graduation work experience, which are both industry-relevant, and the return to a three-month internship that took place about four years prior generates about 55% of the return to industry-relevant work experience that is lengthier in duration and more recent.33

5. Summary and conclusions

We use experimental data from a résumé audit to assess the impact of different college majors and internship experience on job opportunities, which are measured via interview requests from prospective employers. Despite applying exclusively to business-related jobs, we find no statistical evidence linking business degrees in general or particular business degrees to better job opportunities. However, we find strong evidence that industry-relevant internship experience has a large, positive effect on employment opportunities. Job seekers with internship experience, obtained while completing their college degree, have interview rates approximately 14% higher than those without internship experience. The positive effects of internship experience are greater for those who obtain nonbusiness degrees and indicate a high academic ability on their résumé (signaled via a high grade point average).

It is unclear why business degrees do not translate into better job opportunities, given that we applied exclusively to business-related job openings. We put forward four explanations for the null effects. First, the fictive applicants in our experiment completed their Bachelor’s degrees approximately three years prior to submitting their résumés to the job openings. Thus, business degrees might matter for initial job placement, but their effects fade over a short period of time. Second, business and nonbusiness students take about 40% of their coursework from general education categories in the United States. Even for business students, about 60–70% of the coursework is taken in areas outside of their major. Hence, it is possible a business degree does not provide the requisite skill in a particular subject area to affect hiring. Third, non-business majors applying for business-related jobs may send a strong, positive signal. Perhaps nonbusiness majors who apply for business-related jobs possess unobservables, on average, that employers value, such as ability, motivation, and/or general skills (e.g., communication and critical thinking). Indeed, statistics from the National ACT Profile Report for the graduating class of 2011 indicate that the ACT scores, which could proxy for cognitive ability, of students who planned to major in business are lower than those in nonbusiness fields (http://www.act.org/newsroom/data/2011/pdf/profile/National2011.pdf, Table 4.1). Fourth, non-business degree holders earn less on average in business occupations, making it possible that some employers prefer to hire nonbusiness majors over business majors for entry-level positions in an effort to reduce costs.

32 Note that the variation in months worked after graduation stems from the random assignment of different unemployment spells, either immediately after graduation or at the time of application, to the fictive applicants.

33 We present the main effects from Eqs. (3), (4) and (4) in Appendix Table A10. The main effects from Eq. (2) are omitted from Appendix Table A10, but these estimates are available upon request.
The empirical evidence supporting a positive link between industry-relevant internship experience and employment prospects is potentially policy-relevant, as the government could incentivize firms to offer internships and/or universities to work more closely with employers to facilitate internships. These interventions could be justified if internships help the transition from school to work for young college graduates, a group which has had a difficult time finding employment commensurate with their education during and following the Great Recession. However, it is important to determine whether internship experience signals unobservables or augments a worker’s human capital. If internship experience simply signals innate, unobserved ability, a government intervention that boosts the demand for interns could muddle the effectiveness of the signal, which would make sorting and ranking job candidates more difficult for employers. However, it is possible to justify government interventions designed to increase the availability of internships if they improve employer–employee matching and/or enhance worker productivity.

Four aspects of our experiment support signaling as the mostly likely explanation for our findings. First, there is no evidence of a positive interaction effect between internship experience and post-graduation work experience, which are both industry-relevant. The absence of a positive interaction effect contests a human-capital explanation, as one would expect both types of industry-relevant work experience to generate about two times the return associated with industry-relevant internship experience. The hypothesis lasted from 20 to 38 months and is more recent. Third, the interaction effect between internship experience and post-graduation work experience only generates about two times the return associated with internship experience if they improve employer–employee matching and/or enhance worker productivity.

Table 7

<table>
<thead>
<tr>
<th>Parameters and linear combinations of parameters</th>
<th>Returns to internship experience</th>
<th>Returns to infeld experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>β1</td>
<td>With out-of-field experience</td>
<td>With infeld experience</td>
</tr>
<tr>
<td>0.022***</td>
<td>(0.009)</td>
<td>0.022***</td>
</tr>
<tr>
<td>β2</td>
<td>Without internship</td>
<td>With internship</td>
</tr>
<tr>
<td>0.040***</td>
<td>(0.007)</td>
<td>0.040***</td>
</tr>
<tr>
<td>β0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>β1 + β0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.040***</td>
<td>(0.012)</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Estimates are marginal effects from linear probability models. Standard errors clustered at the job-advertisement level are in parentheses. ** and *** indicate statistical significance at the five- and one-percent levels, respectively. The estimates in columns (1)-(5) are based on Eq. (5), which uses the full set of control variables (i.e. the résumé characteristics and the dummy variables for the month, city, job category and job advertisement) and full sample of 9390 observations.

Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.labeco.2015.11.002.

References


