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ABSTRACT

Student Internships and Employment Opportunities after Graduation: A Field Experiment*

Internships during tertiary education have become substantially more common over the past decades in many industrialised countries. This study examines the impact of a voluntary intra-curricular internship experience during university studies on the probability of being invited to a job interview. To estimate a causal relationship, we conducted a randomised field experiment in which we sent 1,248 fictitious, but realistic, resumes to real job openings. We find that applicants with internship experience have, on average, a 12.6% higher probability of being invited to a job interview.

JEL Classification: C93, I21, J23, J24

Keywords: internship, hiring, human capital, signalling, field experiment

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1. Introduction

Over the past decades, there has been a growing interest in internships, both by students looking for an internship and by universities or schools integrating them in their curricula or promoting them as extra-curricular activities (Saniter, Schumann, & Siedler, 2018). To illustrate this, while the number of US university graduates with internship experience was lower than 3% in 1980, this had increased to around 75% by 2000 (Cook, Parker, & Pettijohn, 2004). Likewise, according to the Eurobarometer survey conducted in 2013, about 45% of all EU citizens aged 18–35 reported undertaking an internship (European Commission, 2013).

Graduates indicate future labour market success to be the prime motivation to participate in internships (Krawietz, Müßig-Trapp, & Willige, 2006). Indeed, a growing body of evidence shows a positive relationship between internship participation during tertiary education and favourable labour market outcomes after graduation. However, as reviewed in the next section, these results are potentially biased because of the non-experimental nature of most of these studies. This would be the case when students who do an internship differ from students who do not in terms of characteristics that are not controlled for but which also affect labour market success. For example, students who choose to participate in an internship may be more motivated, hard-working, risk-averse, and/or ambitious than other students. In the present study, we deal with this problem by conducting a randomised field experiment in which pairs of fictitious applications of Belgian graduates (one with and one without internship experience) are sent to real job openings. By monitoring the subsequent callback, we are able to assess whether internships causally affect the likelihood of receiving an invitation to a job interview.

To the best of our knowledge, only one other study has already adopted experimental methods to examine the effect of internship experience on labour market success. Conducting a correspondence test in which resumes were sent to job vacancies in business-related industries in the United States[1], Nunley, Pugh, Romero, and Seals (2016) found that

[1] The authors randomly assigned a 3-month, industry-relevant extra-curricular internship to a portion of these resumes.

applicants with internship experience were 14.3% more likely to be invited to a job interview. This effect was stronger for non-business majors and for applicants with high academic ability, measured by the inclusion of applicants' grade point averages. Given that the internship took place 4 years before the fictitious application, the authors interpreted their results to be more likely explained by signalling than by human capital theory.

We explore the effect of internships on hiring chances in a comparable experimental setting. Apart from being the first European study in this respect, we aim at filling three research gaps. First, while Nunley et al. (2016) solely focus on the effect of internships on hiring chances in business-related industries, we include a broader set of occupations and vacancies. Not only does this increase the generalisability of the results, it also allows testing for whether the effects are heterogeneous across alternative contexts in terms of demand and supply in the labour market, as well as across types of employers. Second, we explore whether signalling and human capital theory explain the effect of internship experience. On the one hand, to investigate the empirical importance of signalling effects in this respect, we alternate applications with extensive and limited resumes. We argue that finding a relatively stronger treatment effect for internship experience when combined with a limited resume would be consistent with this theory. On the other hand, to explore the importance of human capital theory in this context, we alternate resumes with and without additional hard or soft skills and explore whether internships are a substitute for other forms of human capital. Third, rather than studying extra-curricular internships, we consider intra-curricular internships that are offered as elective courses at universities. Knowing whether they are beneficial for students is particularly relevant for universities and faculties that consider integrating internships in their curricula.

The remainder of this study is structured as follows. In the next section, we summarise the empirical literature on internships and labour market outcomes and outline relevant theories in this context. Then, we describe our experimental design along with the institutional setting in which our research took place. Subsequently, in section 4, we present our results. Section 5 concludes with a discussion.

2. Empirical Evidence and Theoretical Mechanisms

The previous literature on the relationship between internships during tertiary education and labour market outcomes is summarised schematically in Table 1. The table includes research on both intra- and extra-curricular internships. Since our focus is on the comparison between graduates with internship experience during studies and those without such an experience but otherwise identical in terms of education and work experience,[2] we exclude studies that compare post-graduation internship experience with graduates who immediately enter the labour market with a standard labour market contract.[3] Among the 14 studies in Table 1, 12 find a positive association between internship experience and favourable labour market outcomes, such as employment opportunities, wages, job satisfaction, and job status. However, this pattern is different when confined to those studies that account for non-random selection in internships by relying on (quasi-)experimental methods. Apart from the correspondence experiment study by Nunley et al. (2016), four articles use matching techniques (Gault, Leach, & Duey, 2010; Klein & Weiss, 2011) or an instrumental variable approach (Saniter et al., 2018; Verhaest & Baert, 2018). Out of these four studies, two do not find a clear positive effect of internship experience during studies on labour market success after graduation. Hence, the empirical evidence to date is mixed and inconclusive.

<Table 1 about here>

Despite this empirical evidence not being fully conclusive, most (economic) theoretical frameworks predict internship experience to heighten the labour market chances of graduates. First, in line with human capital theory (Becker, 1964), internships allow students to increase both their social and professional skills (Divine, Linrud, Miller, & Wilson, 2007; Chen, Hu, Wang, & Chen, 2011). For the latter, this is more likely to be achieved by putting into practice the theoretical knowledge learned in class (Gault et al., 2000; Divine et al., 2007), by obtaining occupation-specific skills, by acquiring more general skills such as time

[2] Except for one alternative elective course that students who did not opt for an internship had to follow (see below).

[3] See, for example, Cerulli-Harms (2017) and Holford (2017).

management skills (Mihail, 2006), or by learning job acquisition skills (Gault et al., 2000; Divine et al., 2007). Second, signalling theory (Spence, 1973) states that students who choose to do an internship signal to potential future employers that they are highly motivated, hard-working, and/or ambitious. In addition, successful completion of an internship may signal more occupation-specific talents and abilities. Third, students may benefit from internship experience by using it as a probationary period in which they find out for themselves whether they are suited to a job or occupation (Cook et al., 2004). This argument is consistent with the matching theory framework (Jovanovic, 1979), which states that match quality is an experience good. Fourth, in line with screening theory (Stiglitz, 1975), also employers may use internships as a probationary period (Morrow, 1995; Divine et al., 2007): by being evaluated and cultivated as potential future employees, internships may thus serve as a stepping stone to a regular job with the same firm (Saniter et al., 2018). Finally, social network theory (Granovetter, 1973) argues that students with internship experience have an enlarged professional network and are more aware of potential labour market opportunities, which in turn could improve hiring chances with other employers (Gault et al., 2000; Zopiatis, 2007).

As the fictitious applicants in a correspondence experiment apply for the same types of jobs outside their network, only signalling and human capital mechanisms may explain a non-zero treatment effect of internship experience on hiring chances in our study.[4] We explore the relative importance of the signalling and human capital theory by deliberately introducing small variations in the resumes. First, we alternate between extended and more limited versions of the resumes to analyse the importance of signalling. We assume and argue that a more extended resume, in which the graduate, amongst other things, indicates being eager to get the job, is another way of signalling a high level of motivation and ambition. A more extended resume may thus, at least partly, serve as a substitute for internship experience in case internships signal similar characteristics. If so, we expect the treatment effect of internship experience to be more pronounced when combined with a more limited resume. Second, to explore the importance of human capital theory as a

[4] Stated otherwise, explanations in terms of social network theory or screening theory cannot be relevant in our setting because the internship experiences are fictitious; therefore, building network ties or using internships as a screening device are not possible.

potential explanation, we add variations of additional hard and soft skills, measured by participation in additional extra-curricular courses. These courses focus on the acquisition of skills that are often considered to be acquired through internship training as well, such as corporate communication skills or time management skills. If so, we expect the treatment effect of the internship to be the most pronounced for candidates without these additional courses.

The relative importance of the various channels may also depend on the type of internship that is considered. As we focus on voluntary intra-curricular internships, which may substitute part of the in-class instruction time for on-the-job learning (see below), the human capital channel may be less important than for extra-curricular internships, in which students participate during holiday periods or after graduation. Moreover, the signal of motivation may be less pronounced since these interns need to give up less free time in comparison to extra-curricular interns.[5] Still, their effects may be stronger in comparison to mandatory intra-curricular internships, as the latter are less likely to signal being motivated or ambitious. While the literature review is not entirely conclusive with respect to these predictions concerning the relative effects of alternative types of internships (see Table 1), two out of three former studies that focussed on mandatory internships did indeed not find evidence for a positive effect on labour market success later in life (Klein & Weiss, 2011; Verhaest & Baert, 2018).

3. Experiment

To investigate the impact of student internships on the probability of being invited to a job interview, we conduct a randomised field experiment which builds on the correspondence

[5] Cerulli-Harms (2017) argues that extra-curricular internships that are undertaken after graduation are likely to signal problems in finding a regular job. This argument makes sense when the comparison is with individuals who immediately start in a regular job; it makes less sense when the comparison is of individuals that are, apart from their internships participation, identical in terms of work experience.

experimentation framework of Bertrand and Mullainathan (2004). In the following subsections, we discuss the experimentation framework, the experimental identities, the resume templates, the randomisation procedure, the employer responses, the variation in characteristics of the tested vacancies, the resulting data, and the limitations of our experimental approach.

3.1 Correspondence Experimentation Framework

Correspondence experiments have been applied extensively to investigate illegal hiring discrimination, such as ethnic and gender discrimination (Baert, 2017; Neumark, in press). Within this type of experiment, pairs of fictitious job applications are sent to real job openings. These applicants differ only by the tested characteristic—in our case, a 3-month voluntary internship experience during university—which is randomly assigned to these applications. The correspondence experimentation framework is considered the golden standard to identify discrimination in the labour market for two reasons. First, the method enables us to detach employer discrimination from supply-side determinants of labour market outcomes (Riach & Rich, 2002; Pager, 2007). Second, selection based on unobservables is not a concern, as all information available to the employer is controlled by the researchers (Riach & Rich, 2002; Pager, 2007).

Given these methodological strengths, an emerging literature also relies on correspondence experiments to investigate the recruitment behaviour of employers with respect to various attributes of job seekers based on which unequal treatment is not forbidden by law. In particular, several studies have used this method to study the causal impact on hiring chances of treatments related to a person's labour market career history, such as unemployment duration (Kroft, Lange, & Notowidigdo, 2013; Baert & Verhaest, 2014; Eriksson & Rooth, 2014) or student employment (Baert, Rotsaert, Verhaest, & Omey, 2016). The use of this methodology for testing the impact of a person's educational career on hiring chances is yet more limited. Along with the study by Nunley et al. (2016) on firm internships, other examples are publications studying the impact of the value of various post-secondary education qualifications (Deming, Yuchtman, Abulafi, Goldin, & Katz, 2016; Verhaest et al., 2018) or university reputation (Drydakis, 2016).

In our extension of the framework of Bertrand and Mullainathan (2004), we introduced

both within-pair and between-pair randomised candidate characteristics. More concretely, student internship was assigned randomly within each pair of fictitious applications. Other characteristics, such as gender, resume length, and additional skills, were assigned randomly between pairs of fictitious applications to investigate potential heterogeneity in the effect of student internship on the likelihood of receiving a job invitation.

3.2 Experimental Identities

The experiment was conducted from November 2015 to April 2016. We sent pairs of fictitious applications to genuine vacancies in Flanders, the northern, Dutch-speaking part of Belgium. One application was from an applicant with a voluntary internship experience during studies and another was from an applicant without this experience. Both applicants obtained a master's degree at a university in June 2015 and had been searching for a job since then.[6]

Graduates from Flemish universities may have participated in three different types of internships during their tertiary education. Historically, mandatory internships or work placements that are an integral part of the curriculum have been the most substantial. They are included in a broad range of fields of study and programmes, and their cumulative duration ranges from just a couple of weeks to several months (Verhaest, Bogaert, Dereymaeker, Mestdagh, & Baert, 2018). Nowadays, universities also offer voluntary internships, either as an extra-curricular activity under supervision of the university or, for some programmes, as an elective course that serves as a substitute for an in-class course. In our study, we focus on intra-curricular internships as an elective course for two main reasons. First of all, given the lack of an identical counterfactual applicant (i.e. a graduate from the same programme but without internship experience), correspondence experiments are less suited to investigate the labour market effects of mandatory internships and work placements. Second, by focussing on intra-curricular internships, we differentiate from and complement the study of Nunley et al. (2016).

For the fictitious applications sent, we thus selected master's programmes that offer the option to participate in an internship as an elective course only. Hence, there exists no

[6] About 96.1% of the Flemish graduates find a job within a year after graduation (VDAB, 2018).

variation in mandatory internships during these programmes that might potentially bias our estimates. In addition, we only selected programmes from Ghent University and KU Leuven, the two major universities in Flanders. These universities are comparable in reputation.[7] Moreover, given that the full Flemish territory as well as the Brussels-Capital Region is reachable within a reasonable commuting time from either Ghent or Leuven, this allows us to apply for vacant jobs across this region. Our selection criteria resulted in 16 master's programmes: three in humanities and social sciences at Ghent University (communication science; economics; and law), eight in exact sciences at Ghent University (biology; bioscience engineering; chemistry; electronics: information and communication technology (ICT); geography; geology; mathematics; and industrial sciences), three in humanities and social sciences at KU Leuven (business economics; business engineering; and economics), and four in exact sciences at KU Leuven (biology and biotechnology; bioscience engineering; civil engineering; nanoscience, nanotechnology, and nano-engineering).

3.3 Resume Pair Templates

For each pair of applications, we created two resume and motivation letter templates, Type A and Type B, each being in line with the general requirements for a starter job. Both types of applications were equivalent with regard to all crucial characteristics.

All applicants were assumed to be single and living in Ghent (upon graduation from Ghent University) or Leuven (upon graduation from KU Leuven). Along with the information related to educational career, we added the following characteristics to the resume: a common Flemish-sounding name, a fictitious postal address (an existing street name in a middle-class neighbourhood was used, but a non-existing house number was indicated), a telephone number and an email address (from major providers), a birthdate, Belgian nationality, comparable language (Dutch, French, and English) and computer skills, and a driving licence. The motivation letters mentioned that the job applicant (i) had found the vacancy in the database of the Public Employment Agency of Flanders (i.e. the region's main

[7] In the Academic Ranking of World Universities (Shanghai ranking; ARWU) of 2017, Ghent University was placed 69th, and KU Leuven 90th. In the QS World University Rankings (QS), Ghent University was placed 125th, and KU Leuven 71st. In the Times Higher Education World University Rankings (THE) of 2017, Ghent University was placed 107th, and KU Leuven 47th.

job search channel; Baert, Cockx, Gheyle, & Van Damme, 2015) and (ii) was looking forward to a job interview. To avoid employers detecting our experimental setup, a variety of common terminology was used for the different motivation letters. The resume and motivation letter templates are available upon request.

3.4 Vacancy Selection and Randomisation Procedure

Between November 2015 and April 2016, vacancies for jobs requiring a master's degree within one of the 16 considered programmes were selected from the database of the Public Employment Agency in Flanders. We only focussed on vacancies for jobs in Flanders and the Brussels-Capital Region. Moreover, we only selected vacancies for starter jobs, which are defined as vacancies for which work experience is not an essential condition. We applied to no more than one vacancy from each employer to limit the burden on the employers and to avoid detection of the experiment. In total, 624 vacancies were selected, resulting in a total of 1,248 (=624×2) applications. Of these vacancies, 240 were in the field of humanities, and 384 vacancies were in the field of exact sciences.

Within each pair of applications, we randomly assigned the student internship to either the Type A or Type B template. Apart from mentioning the participation in an internship in a company in the motivation letter, we added the following information to the resume: the organisation where the internship took place,[8] the internship duration, and the position of the intern.[9] The internship took place in the master's year of the applicant's education and

[8] "Claessens NV", a fictitious company name, where "Claessens" is a regular family name and "NV" is the (Dutch) abbreviation of "naamloze vennootschap" (limited liability company), was chosen to prevent signalling through a company's reputation. When checked on the internet, the company name gave various hits, so that recruiters could not relate it to a particular place where the internship took place.

[9] This position was a position as a junior marketeer (programme of communication science); junior economist (economics); junior company lawyer (law); junior biologist (biology); junior engineer (bioscience engineering, electronics: ICT, industrial sciences, bioscience engineering, civil engineering and nanoscience, nanotechnology, and nano-engineering); junior chemist (chemistry); junior geographer (geography); junior geologist (geology); junior mathematician (mathematics); junior

lasted 3 months. We decided to disclose a 3-month internship duration to simulate a relevant and representative labour market situation. As a consequence of this within-pair randomisation of internship experience, the small differences between the Type A and Type B templates mentioned in section 3.3 could not bias our results.

In addition to this within-pair randomisation of internship experience, we randomly assigned other candidate characteristics between the candidate pairs to study potential heterogeneity in the internship effect by these characteristics. So, these latter characteristics were equal at the pair level but differed randomly between pairs. More concretely, first, we alternated between male and female candidate pairs. Second, aiming at differentiating between signalling and human capital as possible underlying mechanisms of an internship effect, we alternated between limited and extensive resumes. Besides the elements mentioned in section 3.3, the extensive resumes mentioned the following candidate assets: (i) favourable personality traits (Type A candidates with an extensive resume described themselves as 'highly-motivated, well-organised, social, and eager to learn', Type B applicants as 'flexible, enthusiastic, precise, and social'); (ii) sports hobbies (soccer for male Type A applicants, volleyball for female Type A applicants, and fitness and tennis for Type B applicants); and (iii) social engagement (student union membership and youth movement activities for Type A and Type B applicants, respectively). Finally, we alternated between candidate pairs with additional hard skills, additional soft skills, and no such additional skills. Candidates with additional hard skills mentioned two additional credits gathered at university (in corporate communication and business administration for Type A candidates, and in English business communication and financial and cost price reporting in companies for Type B candidates). Candidates with additional softs skills mentioned participation in two additional night school courses: time management and effective and efficient meetings (Type A applicants) or project management and assertiveness (Type B applicants). For each of the selected Master's programmes, we thus generated a total of 24 pairs of resumes, resulting from two combinations of CV templates and internship

accountant (business economics); junior planner (business engineering); and junior biotechnologist (biology and biotechnology).

conditions,[10] two gender conditions, two resume length conditions and three skill conditions.

3.5 Responses from Employer Side

To each selected vacancy, we assigned one of the 24 pairs of applications matching the Master's program requirements of the job. These two applications were sent in an alternating order, via email and with 12 to 36 hours in between submissions. Subsequently, we registered the responses from the employers' side via telephone voicemail and email. The exact content of each response was documented and is available upon request. After receiving a positive response, we replied to the employers as soon as possible by means of an email in which the offer was turned down. This should have minimised the inconvenience for the employers. Reactions later than 30 days after application are treated as censored and assumed to be negative. The outcome variable of our analyses is equal to 1 if the applicant received an invitation to a job interview, and 0 otherwise.

3.6 Variation in Vacancy and Employer Characteristics

Apart from looking at whether the treatment effect is heterogeneous with respect to the aforementioned application characteristics that were randomised across vacancies (gender, resume length, and additionally mentioned skills), we also investigate whether the responses by the prospective employer depend on the required field of study, the labour market tightness of the occupation, and employer characteristics.

First, we differentiate between vacancies for graduates with a humanities and social sciences degree and those for graduates with an exact science degree. Earlier research by Saniter et al. (2018) found the effect of internships during studies on wages to be more pronounced for graduates with humanities and social sciences degrees. This is consistent with the often-reported oversupply of graduates with humanities and social sciences

[10] Either a Type A resume with internship experience that is paired with a Type B resume without internship experience, or a Type A resume without internship experience that is paired with a Type B resume with internship experience.

degrees, making internships an important factor to distinguish oneself on the labour market. Another explanation for a more favourable effect of internships in the case of humanities and social sciences may be that students within humanities and social sciences acquire relatively less specific knowledge and competences during their educational career in comparison to students in exact sciences, making internships relatively more valuable for them.

Second, to investigate more directly whether demand and supply conditions might matter, we differentiate between vacancies for occupations with high and low labour market tightness. This tightness is proxied by the median vacancy duration in days for all vacancies in the occupation in the database of the Public Employment Agency of Flanders in 2015 (Baert et al., 2015; VDAB, 2015). When a vacancy is difficult to fill, employers are faced with a smaller pool of applicants from which they can select a candidate. The room for (un)favourable treatment of applicants with or without a certain characteristic, in our case the voluntary firm internship during studies, is smaller in that case (Baert et al., 2015). We thus expect the internship treatment effect to be negatively related to the median vacancy duration of the occupation.

Third, we look at whether the treatment effect is heterogeneous by firm size. The information on firm size, defined as the average number of workers in the firm in 2010, was retrieved from the Bel-First database. We differentiate between relatively small firms (less than 50 workers on average in 2010) and relatively large firms (more than 50 workers on average in 2010). A third category with 'unknown firm size' includes the firms for which the average number of workers was not included in Bel-first. Firm size may affect the strength of the treatment effect in both directions. On the one hand, large firms may face higher monitoring costs and may thus be more inclined to rely on external signals such as internship experience (Stigler, 1962). On the other hand, large firms may just as well be less selective as the risk of hiring a bad match is likely to be distributed across several hiring decisions. This risk spreading is not possible in small firms, making these companies probably more likely to discriminate against students without an internship.

Last, we investigate whether the treatment effect is heterogeneous with respect to the technological intensity of the sector in which the firm operates. The technological intensity is labelled high or low following the 'High Technology (HT) Industry / Knowledge Intensive

Services (KIS)' nomenclature developed by Eurostat (2016).[11] A third group with 'unknown technological intensity' includes the firms for which we were not able to identify the technological intensity and the employment agencies, as these agencies most likely are not recruiting for their own firm. Firms confronted with fast technological change are expected to be less eager to hire students with an internship, as a significant part of the knowledge and competences acquired during an internship is likely to be rather specific and therefore vulnerable to becoming obsolete quickly (Gault et al., 2000).

3.7 Data Description

Table 2 provides an overview of all variables within our dataset and reports their means[12] and standard deviations. We consider four groups of variables, namely (i) the treatment, (ii) the other applicant characteristics, (iii) the vacancy characteristics, and (iv) the outcome measure. Apart from the field of study, all applicant characteristics ((i) and (ii)) were under control in our experiment by means of randomisation. This randomisation is reflected in the statistics in Panels A and B. With respect to the outcome variable, we find that more than one in five applicants (21.6%) received an interview invitation.

<Table 2 about here>

3.8 Limitations of the Experimental Design

We end this section with a discussion of the limitations of our experimental design. For an in-depth discussion of the ethical aspects of the correspondence experimentation framework, we refer to Riach and Rich (2004). An important limitation of this study is the generalisability. First, we only focus on a specific—but crucial—labour market outcome, namely the initial hiring decisions of employers (outside the candidates' network) for the first job of graduates. Therefore, our research cannot inform about potential differences in final hiring decisions, let alone in wages and long-term labour market outcomes after

[11] This framework is adopted from Mahy, Rycx, and Vermeylen (2015).

[12] When the means are broken down by treatment status, they are, by construction, exactly the same for the two subsamples.

graduation. Note that this is a general weakness of correspondence experiments aiming at examining causal effects on labour market success in terms of job interview invitations (e.g. Bertrand & Mullainathan, 2004; Kroft et al., 2013; Eriksson & Rooth, 2014; Baert et al., 2015; Nunley et al., 2016). Nonetheless, previous research indicates that the invitation to the first job interview is a critical factor for the chances to be hired (Cédiey, Foroni, & Garner, 2008). The only method to overcome this limitation and obtain causal measures of the treatment effect of student internship on later labour market success of the recruitment process is audit testing in which actors partake in job interviews. However, the audit tests are costly and have been criticised on various grounds (Heckman & Siegelman, 1993; Riach & Rich, 2002). Second, due to methodological reasons we solely investigate the impact of voluntary intra-curricular internships. Our results can therefore not be translated to the impact of mandatory internships. Third, even though we selected various study programmes within different study fields, full representation for all fields of study cannot be achieved. We only focus on applicants with a master's degree within the selected master's programmes and only apply for particular vacancies posted at the Flemish Public Employment Agency. This problem is inherent to the experimental framework and is traded off against the benefit of resolving the endogeneity of educational choices and unobservable factors with respect to labour market success.

4. Results

4.1 Bivariate Analyses

In this section, we describe the bivariate results. Table 3 reports the number of tested vacancies and the invitation rates for the full sample and various subsamples. For all (sub)samples, the average probability of obtaining an invitation to a job interview is displayed for both the treatment group (graduates with an internship) and the control group (graduates without an internship) (column 2 and 3 of Table 3).

<Table 3 about here>

Overall, we find that students with internship experience get an invitation to a job

interview in 22.9% of their applications, in contrast to 20.4% for the control group. So, an internship experience increases the invitation probability by 2.5 percentage points (column 4 of Table 3). The ratio of the invitation rates (column 5 of Table 3) is 1.126, suggesting that applicants with a firm internship experience during university get as much as 12.6% more invitations. This ratio is different from one at the 5% significance level. This suggests that employers treat students with internship experience more favourably than students without this labour market experience. So, the statistics for the overall sample indicate that student internships boost early career success.

Next, we look at subsamples by the other applicant characteristics. Splitting the overall sample by gender, we find that only the subsample of women has a significantly higher interview rate when they mention an internship experience. The response ratio for women is equal to 1.143 and is statistically different from one at the 5% level, indicating that women with an internship get 14.3% more interview requests than the female control group. This suggests that our overall positive treatment effect is driven by the female subsample.

Dividing the overall sample by resume length (extensive versus limited resume), we find that only the limited resume subsample generates a significantly positive internship effect. Applicants with a limited resume and an internship experience are found to have 20.4% more interview requests than their otherwise identical peers without this experience. This is consistent with the idea that internship experience, just like a more extended resume, signals work motivation.

Next, we investigate whether the recruiters' behaviour depends on the additional skills (additional credits or courses) mentioned in the resume. We only find a significant effect of internship experience for those mentioning no additional credits or courses. Internships and additional (hard or soft) skills thus seem to be substitutes for each other, which is in line with the human capital theory.

Finally, we break down the data by the field of study. We find that the overall positive effect of internships on the invitation rate is driven by applicants from the field of humanities and social sciences. For them, the invitation ratio is statistically different from one at the 1% significance level. Graduates within the field of humanities and social sciences with an internship experience receive 26.3% more interview requests than their otherwise identical peers without internship experience. This is in line with our expectations and confirms

earlier findings in this respect by Saniter et al. (2018).

4.2 Multivariate Analyses

The invitation ratios reported in the previous section allow us to assess whether the main conclusion is robust across various subsamples, but they do not reveal whether differences in relative responses across various subgroups of candidates are statistically significant. Furthermore, the bivariate analyses are less suited to investigate the role of the considered vacancy and employer characteristics since these characteristics may be correlated with each other and, by the finite nature of our data, with the candidate characteristics. Therefore, we estimate multivariate logistic regressions with the individual application as the observation unit and receiving an invitation to a job interview as the outcome variable. The dichotomous outcome measure is equal to one for applicants with an invitation to a job interview, and zero in case of another reaction or no response. The results are reported in Table 4.

<Table 4 about here>

First, we estimate a logistic model (Model 1) including only the internship dummy variable. The results of this analysis confirm our findings of the bivariate analysis. As the odds ratio 1.163 is significantly larger than one, we conclude that an internship experience indeed positively impacts the likelihood of an invitation to a job interview.

Second, we examine the heterogeneity of the internship effect concerning the applicant characteristics. To this end, we include dummy variables for the variables capturing the gender, resume length, additional skills, and field of study of the candidate, as well as interactions between these characteristics and the internship dummy variable (Model 2). While the bivariate analysis indicated that the results with respect to the likelihood of receiving an invitation to a job interview were mainly driven by the subsample of women, we no longer find significant gender differences in the multivariate analysis. Similarly, while the bivariate analyses suggested the treatment effect depends on the resume length (extensive versus limited), the additional hard or soft skills and the field of study, we do not obtain any significant interaction effects between these variables and the internship dummy variable. Our aforementioned conclusion concerning the role of internships as signals for

work motivation and producers of hard and soft skills can therefore not be retained.[13]

In the third specification, we investigate whether the employers' recruitment behaviour regarding internship experience depends on vacancy and employer characteristics such as the labour market tightness in the occupation, firm size, and technology intensity of the sector. None of the additionally added interaction effects are statistically significant, suggesting that the internship effect does not differ with respect to any of these characteristics.

Finally, we perform various robustness analyses.[14] An analysis with vacancy, occupation and/or sector fixed effects, as well as an analysis with other indicators of labour market tightness, and an analysis in which an interaction with an indicator for KU Leuven (versus Ghent University as a reference) are added, yield similar conclusions. Furthermore, we perform various regression models such as a linear probability model and an ordered logistic regression model (with '2' an immediate interview invitation, '1' any other positive reaction and '0' a negative or no reaction). Also, these models yield similar results. Last, we include three-way interactions. These interactions are found to be insignificant and the main conclusions remain.

4.3 Discussion

Overall, we find that graduates with internship experience receive 12.6% more invitations to job interviews. To shed some light on the size of the effect, we compare our findings with those from aforementioned correspondence experiments. First, our internship effect is quite comparable with the aforementioned 14.3% more invitations for graduates with extra-curricular internship experience in the United States reported by Nunley et al. (2016). Second, among others, Bertrand and Mullainathan (2004) report differences in invitation rates for job interviews between low- and high-quality resumes in the United States. High-quality candidates are defined as the following: 'Higher-quality applicants have on average

[13] When running the regression analysis with one general dummy variable for additional skills, instead of the two dummy variables for hard and soft skills, no significant interaction effect is found for these skills.

[14] The detailed estimation results are available upon request.

a little more labour market experience and fewer holes in their employment history; they are also more likely to have an email address, have completed some certification degree, possess foreign language skills, or have been awarded some honors (Bertrand & Mullainathan, 2004, p. 992).' From this description, one might expect that the strength of the treatment (capturing a bundle of different treatments) in their case might be larger in magnitude compared to the difference in invitation rates for graduates with and without an internship experience. Indeed, Bertrand and Mullainathan (2004) find a statistically significant difference of 26.9% between high- and low-quality resumes, compared to a difference of 12.6% in our study. Third, the invitation ratio of 1.126 found in the present study is also lower than the invitation ratios of 1.170 and 1.409 found by Baert and Verhaest (2014) comparing recent graduates with individuals who graduated a year earlier and had been underemployed or unemployed since that time.

With respect to the homogeneity of the internship effect by other candidate characteristics as well as by the labour market tightness in the occupation and firm characteristics, one could argue that our null interaction effects rather reflect the finite size of our sample than a genuine null effect. However, it is important to keep in mind that, both in our bivariate and in our multivariate analysis, we investigate dimensions of heterogeneity in the internship premium dimension by dimension. As a consequence of this and of the balanced nature of our experimental data by characteristics such as education level and gender, the number of observations in most of the relevant cells is 624 or 416, i.e. 2 (candidates) times 312 (half of the vacancies tested) or 208 (a third of the vacancies tested). Even the smallest subsample in our data, i.e. that with vacancies with a low technology intensity in the sector, comprises 121 vacancies and 242 applications. Moreover, the internship premiums presented in Table 3 lie within a rather small interval, with invitation ratios of 1.065 (for the subsample of applications with extra soft skills) and 1.263 (applications with humanities and social sciences as the field of study) as boundaries. This becomes even more clear when focussing on the distribution of these premiums in terms of percentage point differences. As can be seen from column 4 of Table 3, these differences in invitation rate between candidates with an internship experience and control applicants vary between 1.5 percentage points (applications with extra soft skills and applications with exact sciences as the field of study) and 4.2 percentage points (applications with humanities and social sciences as the field of study). Therefore, we believe our null interaction effects

are not due to the finite size of our sample but likely reflect a true high level of homogeneity in the internship premium.

5. Conclusion

This study contributed to the small empirical literature on the effect of internship experience on labour market success. We argued that many earlier studies examining this effect had been unable to estimate a causal relationship because of endogeneity problems. We contributed to this literature by estimating the causal impact of voluntary intra-curricular internship experience during university studies on the probability of being invited to a job interview by means of a correspondence experiment. We found that university graduates with internship experience are more likely to be invited to a job interview compared to students without this experience. This internship effect turned out to be quite homogeneous by other candidate characteristics such as gender and field of study as well as by the labour market tightness in the occupation, firm size and technology intensity of the sector.

Several important implications can be drawn from these results. First of all, they confirm that the positive relationship between internship experience and labour market success is more than just a correlational one. This is in line with Nunley et al. (2016), who relied on a similar design, as well as with Saniter et al. (2018), who relied on instrumental variable estimation strategy. Nonetheless, several other quasi-experimental studies did not identify any positive effect. One explanation for these different findings may be our focus on the chances to be invited to a job interview. However, since Saniter et al. (2018) did find a positive impact on earnings as well, this cannot be the full story. Second, some of the quasi-experimental studies that did not detect a positive association applied matching related techniques. These approaches rely on strong identifying assumptions which may not always be met. Third, the internship effect may depend on the type of internship that is considered. This may explain the difference in outcomes with Klein and Weiss (2011) and Verhaest and Baert (2018). As argued, the signalling effect may be lower in the case of mandatory intra-curricular work experiences, the effect which the latter authors study.

A second implication is related to the mechanism explaining the relationship between internships and labour market outcomes. Since our experiment only considers jobs outside the network of the fictitious graduates, the estimated internship effect cannot be due to networking or screening effects and may thus represent a lower bound. With respect to the question whether the estimated effect is primarily explained by human capital or signalling theory, our results were less conclusive. The relative importance of these two mechanisms was tested by including variations of additional resume characteristics such as length and additional skills. While our bivariate results suggested that both mechanisms matter, our regression analysis did not detect significant differences in treatment effects depending on these resume characteristics. Employers probably consider the signalling and human capital value of these additional resume characteristics to be relatively low, thus making it difficult to distinguish between the signalling and human capital value of internships by adding variations of these characteristics to the resume.

These implications suggest interesting avenues for further research. First of all, more in-depth research looking at the differential impact of alternative types of internships (extra- versus intra-curricular, voluntary versus mandatory) is necessary. Secondly, additional research is needed to assess the relative importance of the signalling and human capital channel of internships, for instance, by relying on stated choice experiments. Finally, to guide universities and graduates, more research is needed to study the extent to which the effectiveness of internships depends on their content, the orientation of a person's study programme, and the relationship between both.

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Table 1. Literature Review

(1)	(2)	(3)	(4)	(5)	(6)
Study	**Country**	**Type of internship**	**Labour market outcome variable(s)**	**Main results: empirical relation between (3) and (4)**	**Approach to deal with endogeneity problem**
Callanan and Benzing (2004).	US.	Voluntary or mandatory (not specified) intra-curricular.	Securing a career-oriented job and experiencing a good personal fit with the job.	Positive association with securing a career-oriented job.	None.
Gault et al. (2000).	US.	Voluntary or mandatory (not specified) intra-curricular.	Ease of finding first job, annual wage, satisfaction with co-workers and supervisor, and overall job satisfaction.	Positive effect on ease of finding first job, annual wage, and overall job satisfaction.	Matching (on: age, years of work experience, GPA, major area of study, and gender).
Gault et al. (2010).	US.	Voluntary or mandatory (not specified) intra-curricular.	Job and wage offers.	Positive association with job offers. Positive association with wage offers, but only for high performing interns.	None.
Klein and Weiss (2011).	Germany.	Mandatory intra-curricular.	Ease of finding first job, job match, and annual wage.	No significant effect.	Propensity score matching.
Knouse et al. (1999).	US.	Voluntary intra-curricular.	Employment status at graduation and employment status six months after graduating.	Positive association with having a job at graduation.	None.
Neumark and Rothstein (2007).	US.	Not specified.	Hourly earnings, hourly wage, and employment status.	Positive association with having a job, but only for males. Positive association with hourly earnings and hourly wage, but only for females.	Control for observable factors.
Nunley et al. (2016).	US.	Voluntary extra-curricular.	Interview requests.	Positive effect.	Experimental design.
Pasewark et al. (1989).	US.	Not specified.	Interview process success.[a]	Positive association with obtaining an off-campus office visit with a 'Big Eight' firm.	Control for observable factors.
Rigsby et al. (2013).	US.	Voluntary intra-curricular.	Job offers.	Positive association.	Control for observable factors.
Saniter et al. (2018).	Germany.	Mandatory and voluntary intra-curricular.	Monthly wage.	Positive effect, especially in (i) areas of study with a weak labour market orientation and (ii) humanities and social sciences.	IV approach (instruments: introduction and abolition of mandatory internships).
Siegel and Rigsby (1988).	US.	Voluntary intra-curricular.	Performance evaluation and speed to promotion.	Positive association.	None.

Silva et al. (2016).	Portugal.	Voluntary and mandatory intra-curricular.	Ease of finding first job.	Positive association.	None.
Taylor (1988).	US.	Voluntary intra-curricular.	Job offers, starting wage, extrinsic satisfaction (pay and geographic location), and position satisfaction.	Positive association with starting wage and extrinsic job satisfaction.	None.
Verhaest and Baert (2018).	Belgium.	Mandatory intra-curricular.	Ease of finding first job and ease of finding first job at educational level.	No effect.	Discrete choice model with exclusion restriction (instruments: distance to supply of programmes with internships).

Notes. The following abbreviations are used: US (United States), GPA (Grade Point Average), and IV (Instrumental Variable). [a]Two success ratios: (i) number of off-campus office visits divided by number of on-campus interviews and (ii) number of job offers divided by number of off-campus office visits.

Table 2. Data Description

(1) Variable	(2) Description	(3) Mean	(4) SD
A. Treatment			
Internship	1 if the candidate reveals a voluntary intra-curricular firm internship during university, 0 otherwise	0.500	-
B. Candidate characteristics			
Female	1 if the candidate is female, 0 otherwise	0.500	-
Male	1 if the candidate is male, 0 otherwise	0.500	-
Extended resume	1 if the candidate applies with an extended resume, 0 otherwise	0.500	-
Limited resume	1 if the candidate applies with a limited resume, 0 otherwise	0.500	-
Additional skills: hard	1 if the candidate mentions two additional credits gathered at university, 0 otherwise	0.333	-
Additional skills: soft	1 if the candidate mentions two additional night school courses, 0 otherwise	0.333	-
Additional skills: none	1 if the candidate mentions no additional credits or courses, 0 otherwise	0.333	-
Humanities and social sciences	1 if the candidate holds a master's degree in humanities and social sciences, 0 otherwise	0.385	-
Exact sciences	1 if the candidate holds a master's degree in exact sciences, 0 otherwise	0.615	-
C. Vacancy characteristics			
Median vacancy duration	Median vacancy duration in days for all vacancies in the occupation (in database Public Employment Agency of Flanders) in 2015	74.33	39.77
Firm size: big	1 if the average number of workers in the firm in 2010 could be found and was 50 or more, 0 otherwise	0.215	-
Firm size: small	1 if the average number of workers in the firm in 2010 could be found and was less than 50, 0 otherwise	0.381	-
Firm size: unknown	1 if the average number of workers in the firm in 2010 could not be found, 0 otherwise	0.404	-
Technology intensity in sector: high	1 if the sector was labelled as 'High Technology / Knowledge Intensive Services' following Mahy et al. (2015), 0 otherwise	0.505	-
Technology intensity in sector: low	1 if the sector was not labelled as 'High Technology / Knowledge Intensive Services' following Mahy et al. (2015), 0 otherwise	0.194	-
Technology intensity in sector: unknown	1 if the sector could not be labelled with respect to technology intensity following Mahy et al. (2015), 0 otherwise	0.301	-
D. Outcome			
Interview invitation	1 if the candidate receives an interview invitation, 0 otherwise	0.216	-

Notes. No standard deviations are reported for binary variables. The number of observations (job applications) is 1,248. See section 2 for a description of the data gathering process.

Table 3. Bivariate Analysis

Subsample by candidate characteristics	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Number of vacancies	Invitation rate		Difference in invitation rate: (2) – (3)	Invitation ratio: (2) / (3)	Significance of (4) and (5):	
		Candidate with internship	Control candidate			P-value	T-value
Full sample	624	0.229	0.204	0.025	1.126	0.016	2.422
Female	312	0.205	0.179	0.026	1.143	0.045	2.010
Male	312	0.253	0.228	0.025	1.113	0.131	1.515
Extended resume	312	0.250	0.234	0.016	1.068	0.276	1.091
Limited resume	312	0.208	0.173	0.035	1.204	0.022	2.310
Additional skills: hard	208	0.226	0.192	0.034	1.175	0.109	1.612
Additional skills: soft	208	0.236	0.221	0.015	1.065	0.440	0.774
Additional skills: none	208	0.226	0.197	0.029	1.146	0.058	1.909
Humanities and social sciences	240	0.200	0.158	0.042	1.263	0.007	2.708
Exact sciences	384	0.247	0.232	0.015	1.067	0.274	1.096

Notes. The p-values (column 6) are based on a t-test testing the null hypothesis that the invitation ratio is not significantly different from 1 (testing whether the difference in invitation rate is not different from 0 yields the same values).

Table 4. Multivariate Analysis

	(1)	(2)	(3)
Internship	1.163** (0.073)	1.188*** (0.076)	1.201** (0.085)
Internship x Female (demeaned)		1.028 (0.128)	1.030 (0.131)
Internship x Extended resume (demeaned)		0.865 (0.111)	0.861 (0.112)
Internship x Additional skills: hard (demeaned)		1.032 (0.162)	1.025 (0.172)
Internship x Additional skills: soft (demeaned)		0.911 (0.128)	0.913 (0.139)
Internship x Additional skills: none (reference)			
Internship x Humanities and social sciences (demeaned)		1.224 (0.161)	1.194 (0.168)
Internship x Median vacancy duration (demeaned)			1.000 (0.001)
Internship x Firm size: big (demeaned)			1.139 (0.215)
Internship x Firm size: unknown (demeaned)			1.076 (0.155)
Internship x Firm size: small (reference)			
Internship x Technology intensity in sector: high (demeaned)			0.824 (0.157)
Internship x Technology intensity in sector: unknown (demeaned)			0.775 (0.187)
Internship x Technology intensity in sector: low (reference)			
Female (demeaned)		0.739 (0.149)	0.713* (0.146)
Extended resume (demeaned)		1.466* (0.296)	1.476* (0.302)
Additional skills: hard (demeaned)		0.969 (0.244)	0.966 (0.249)
Additional skills: soft (demeaned)		1.160 (0.283)	1.043 (0.262)
Additional skills: none (reference)			
Humanities and social sciences (demeaned)		0.621** (0.133)	0.689** (0.159)
Median vacancy duration (demeaned)			1.004 (0.003)
Firm size: big (demeaned)			0.619 (0.183)
Firm size: unknown (demeaned)			0.847 (0.194)
Firm size: small (reference)			
Technology intensity in sector: high (demeaned)			1.991** (0.589)
Technology intensity in sector: unknown (demeaned)			0.963 (0.337)
Technology intensity in sector: low (reference)			
Observations	1,248	1,248	1,248

Notes. The presented statistics are odds ratios based on a logistic regression. The dependent variable is 1 when the candidate receives a job interview, and 0 otherwise. Standard errors, corrected for clustering at the vacancy level, are in parentheses. * (**) ((***)) indicates significance at the 10% (5%) ((1%)) level.