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When choice excels obligation: about the effects of mandatory and voluntary internships on labour market outcomes for university graduates

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Abstract
Mandatory and voluntary internships present widespread opportunities for graduates of tertiary education to gain relevant work- and on-the-job experience during their years of study. However, it is questionable if these actually have positive effects on outcomes (income, job mismatch, and overall job satisfaction). By estimating linear and logistic regression models using data from Austria, we demonstrate that voluntary internships are associated with significantly better labour market outcomes across all models and dependent variables, while we find no complementary effects for mandatory internships. Advanced analyses underline that the functional form between all three dependent variables and length of voluntary internships is linear. Furthermore, we find no significant interaction effects between internships and other working episodes during the time of study. Both students, with and without field-related working experience, profit from extra-curricular internships. In summary, voluntary internships are associated with improved outcomes for both graduates, with and without other episodes of labour market experience, and study-related employment episodes cannot substitute the benefits of regular internships.

Keywords Internships · Transition from education to work · Income · Mismatch · Austrian higher education

Introduction

Building a successful career requires more than classical academic knowledge. Universities that focus solely on theoretical concepts and high academic standards often fall short of

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preparing graduates for real-world labour conditions, which demand soft skills, flexibility, and highly specialized knowledge. These skills are, in many cases, learned on-the-job, which means they cannot be acquired at an institution of higher education alone. Having recognized this training gap, students and universities began to supplement strict academic education with relevant internship experience (Teichler 2011). By leaving lecture halls and laboratories for real-life workplaces, students are able to acquire job-related skills (Wolter and Banscherus 2012). Recent statistics corroborate these findings and indicate that more than 85% of all university graduates in Germany report having done at least one internship (Sarcletti 2009). However, scant research examines the role of internships for graduates of tertiary education. We define a mandatory internship, as an internship specified by regulations as part of a curriculum of a given field of study, without whose completion the final degree cannot be awarded.[1] In contrast, a voluntary internship is completely optional (extra-curricular) and does not influence the legal achievement of a degree.

But what are the costs, benefits, and long-term effects of different types of internships? More importantly, are they actually fulfilling expectations of students and policymakers? We attempt to answer these questions in the current paper. Our study has several advantages over previous research in this domain: firstly, we distinguish between mandatory and voluntary internships to investigate whether they lead to different labour market outcomes, a question that has not been tackled by existing literature. Secondly, we consider the actual cumulative length of internships to assess the dose-response relationship in detail. Focusing solely on binary indicators to distinguish graduates with internships from those without is too imprecise, as internship duration might play a critical role in labour market effects. It is likely that internships prove beneficial only after a certain length, or that saturation effects occur, whereby internships exceeding a certain duration are a waste of time. Thirdly, we ask whether other study-related employment episodes during the time of study have the same effects as internships and can function as substitutes for them. Many students work alongside their studies to finance their costs of living and learn valuable on-the-job experience, for example, working as a student employee in a company relevant to their field of study. There might be an interaction between internships and working episodes, and it is likely that those students who do not have any other work experience will profit from internships the most. To shed light on these questions, we use three highly relevant labour market outcomes as indicators of success: income, job mismatch, and overall job satisfaction. In sum, our research questions are:

- How does the cumulative length of internships affect certain labour market outcomes for graduates of tertiary and education? Is this a linear relationship or do saturation effects occur?
- Is there a difference between mandatory and voluntary internships, or are the effects similar?
- Is there an interaction between internships and other field-related labour market episodes during the time of study? Do internships affect graduates with and without labour market experience differently?

The rest of the paper is structured as follows: In the next section, we outline our theoretical framework, from which we develop our working hypotheses. Then, we introduce our data source, sampling technique, and operationalization, after which we present our statistical

[1] Note that the terminology can differ by country, and in some Anglophone countries, this definition would include the so-called *sandwich placements*.

analyses. Finally, we conclude with a short summary and a discussion of our most important findings.

Theoretical framework

There are a number of theoretical concepts that could help explain why internships should improve labour market outcomes. Firstly, human capital theory states that knowledge and skills are not learned in educational institutions alone, but especially on-the-job (Becker 2009). The theory stipulates that the longer the duration of the on-the-job training, the larger the increase in productivity one should observe. Therefore, one would expect graduates with such experience to have a higher market value. Thus, students can use internships during their studies to accumulate practical competencies that cannot be acquired in university and, consequently, possess additional skills in comparison to students without internships (Sarcletti 2007a). Secondly, educational degrees are not the only signals for high employee productivity. Employers can also use letters of reference or certificates obtained during internships to gauge productivity (Akerlof 1978; Arrow 1973, p. 194; Spence 1978, p. 357). Therefore, according to signalling theory, one would expect that graduates with internships signal motivation, relevant abilities, and productivity, which should be rewarded by future employers. Thirdly, following social capital theory, internships increase one's social capital, particularly in the form of social networks, as students establish contacts to companies or institutes acting as potential employers (Bourdieu 2011; Burt and Minor 1983). Previous research indicates that larger social networks are positively correlated with labour market outcomes (Calvo-Armengol and Jackson 2004; Marmaros and Sacerdote 2002). Consequently, students who completed internships possess crucial resources that can facilitate their job search by either being hired by the same company or institute at which the internship was completed, or by another related employer (Lin 1999, p. 470). Moreover, valuable contacts are also established with potential colleagues, further increasing one's relevant social networks (Flap and Boxman2017; Granovetter 1995). Based on the reviewed concepts, we derive our first hypothesis: The longer the cumulative duration of internships during studies, the better the labour market outcomes (hypothesis one). However, the functional form of this relationship is harder to predict. While human capital theory assumes that more is better and every consecutive week of internships should improve productivity, hinting at a linear relationship, the other two theories are less conclusive. According to social capital theory, the length of internships should only play a minor role after initial contact with potential employers is established (Bruun and Bearden 2014). Thus, as long as the internships are not divided between different companies, additional length should not further improve the contacts.

Regarding the second research question, we argue that it is important to make a distinction between mandatory and voluntary internships. Currently, a large share of study regulations includes mandatory internships, especially in German-speaking countries (Krawietz et al. 2006). Signalling theory argues that only voluntary internships can be considered profitable signals, as they are related to higher student motivation and engagement. Conversely, mandatory internships, which students are obligated to take depending on their study curriculum, do not convey information about their initiative or effort. Human capital theory, on the other hand, assumes that the kind of internship should not matter, because performing the same job, no matter if obliged to or not, leads to similar endowment with human capital and, therefore, the same increase in productivity (Weiss et al. 2014, p. 792). Besides, it can be argued that even

mandatory internships require similar effort as, in most cases, the university only provides the regulations, but students have to apply for internships on their own (Bloch 2007, p. 87). This seems especially relevant for continental Europe, since a number of North American and Australian institutions offer placement matching services, which could potentially increase the quality of mandatory internships. Nevertheless, as this is rarely the case in continental Europe, we reject the assumption of qualitative differences between voluntary and mandatory internships. Finally, employers usually cannot differentiate between mandatory and voluntary internships once the internship is complete and the student has graduated. Hence, we formulate a second hypothesis: The effect of internships on labour market outcomes does not differ between mandatory and voluntary internships (hypothesis two).

Regarding the third research question, study-related practical competencies are not exclusively developed during internships. They can also be obtained through other working experiences, such as student assistant positions in institutes, through student employment at companies, or through volunteering, service learning, etc. (Bloch 2007, p. 102). All three theories reviewed consider field-related practical experience as equally profitable, as productivity is increased, students receive positive signals, improve their social skills, and extend their networks (Weiss et al. 2014, p. 791). Thus, internships and other working episodes should have similar effects on labour market outcomes (Hoy 2011). This could lead to interaction effects, as students with no relevant labour market experience at all might disproportionately profit from doing internships. Other students with more work experience should enjoy the same benefits, yet these will not add as much, possibly due to saturation effects (Hedberg 2004). Hence, our third hypothesis: The effect of internships on labour market outcomes is moderated by additional practical experience derived from further study-related occupations. We expect that students without extra practical experience will profit more from internships than students with additional practical experience. The entire theoretical framework is visualized in a simple causal graph (Fig. 1).

Austrian educational system is highly comparable to the system of other German-speaking countries, especially Germany (Radinger and Sommer-Binder 2017). After completing primary education (until age 10), pupils have the choice between three tracks in secondary education which are separated by academic abilities. The academic track concludes with the general certificate of higher education (*Matura*). This degree allows pupils to enter any institution of tertiary education, including universities, universities of applied sciences, and colleges of education. Tertiary education is, nowadays, arranged in accordance with the Bologna System, with Bachelor and Master Degrees. Before the introduction of the Bologna System, the most

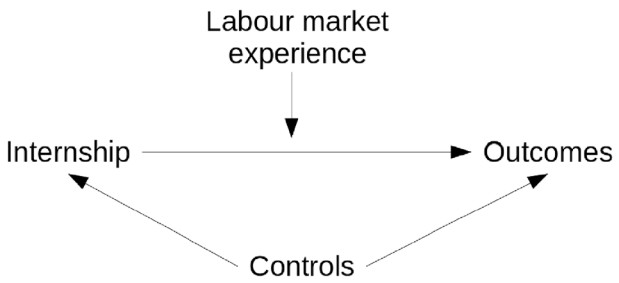

Fig. 1 Simple causal diagram about the role of internships. Source: own design. The arrow of labour market experience signifies an interaction effect between internships and labour market experience

relevant degrees were *Magister* and *Diplom*. In 2016, about 40% of all people between ages 25 and 34 had attained a degree of tertiary education (Toledo Figueroa 2017, p. 9).

Review of the literature

Previous literature presents contradicting results regarding effects of internships on labour market outcomes and largely ignores the role of mandatory internships. While there is a number of older studies that investigate certain aspects of internships (Brooks et al. 1995; Garavan and Murphy 2001; Knouse and Fontenot 2008; Taylor 1988), and other studies reporting correlations between internships and positive outcomes exist (Gault et al. 2000; Reimer and Schröder 2006; Richards 1984; Sweitzer and King 2014), only a small number of more recent analyses attempted to assess the actual causal influence of internships. Evidence from some Anglophone countries, in which internships are often referred to as sandwich placements, indicates partially positive effects for students (Brennan et al. 2002; Brooks and Youngson 2016; Jackson 2015; Wilton 2012). However, due to the design of the sandwich placements, which can be viewed in most cases as mandatory internships, comparability to continental European studies is not easily established.

Using a propensity score matching design, Klein and Weiss (2011) did not find any positive effects of mandatory internships on outcomes, or any interactions with the social background of German graduates. These results were reproduced by Bittmann (2018), using data from the Bavarian Graduate Panel. Going further, using Klein and Weiss' (2011) dataset, Saniter and Siedler (2014) employed an instrumental-variable approach and found a positive effect of mandatory internship on wages, which they attribute to increased propensity to work full-time and experience fewer episodes of unemployment (p. 22). However, they did not find any positive effects on job mismatch. Although Weiss et al. (2014, p. 799) did not find any effects on the length of time before first significant employment, their results indicate that voluntary internships positively affect students' long-term income and social. In addition, Sarcletti (2007b, p. 73) observed positive effects of internships on the status-adequacy of the first significant employment, provided graduates found this occupation via their social contacts. Nevertheless, social networks established during internships seem to be less beneficial, compared to the usage of social contacts which were established during other occupations (Sarcletti 2007b, p. 67). A research team from Portugal concludes that, through the introduction of internships for university students, the overall youth unemployment rates decreased and study programmes that include mandatory internships increase the probability of finding proper employment (Silva et al. 2016).

While most of these results stem from Europe, studies from North America and Anglophone countries report similar findings. A research report from Mexico found that graduates with excellent internship performance have a higher chance of finding employment, but the number of completed internships is without significance (Galvan et al. 2013). In the USA, 40% of participants of an internship programme found employment through their internships (Rossi-Le 2015) and internships are associated with higher chances of finding career-oriented employment (Callanan and Benzing 2004). One recent study from the UK finds that especially practical extra-curricular activities, which we would consider voluntary internships, are associated with better labour market outcomes (Irwin et al. 2019). Researchers from Australia report that work-integrated learning, which can be compared to mandatory internships, leads to lower employment rates, but also to lower job mismatch (Jackson and Collings 2018).

In sum, previous studies have left a number of research gaps that we aim to fill with the current paper. Firstly, the functional form of the relationship between internships and outcomes has never been investigated, as both, propensity score matching as well as instrumental-variable approaches, treat internships as a binary indicator. Therefore, it is unclear if the trend is linear, or if saturation effects occur. Secondly, until now, only mandatory internships were in the focus of research. While these are certainly important, as knowledge about these effects is directly relevant for policymakers, more information about the benefits of voluntary internships would enable students themselves to take action. Finally, while in the past the interaction between students' social background and internships was central, the role of other field-related working experience has not been investigated. We argue that this is also crucial, because more than 60% of all German students work during their studies (Middendorff et al. 2013:371). If it was demonstrated that other types of working experiences were able to compensate for the effect of internships, it would send an important message for students and policymakers alike.

Empirical analyses

Data and sample

Our analyses are based on data from the Austrian study about the labour situation of graduates of universities and universities of applied sciences (ARUFA). This quantitative and cross-sectional survey includes all individuals who have graduated from an Austrian university or university of applied sciences between 2003/2004 and 2007/2008 (with an extension until 2010), which comprises about 116,659 individuals (full survey, excluding all private universities). Overall, 23,816 graduates participated (final number after data cleaning), which results in an effective participation rate of about 23% (Schomburg et al. 2010, p. 16). The survey was administered online, between December 2009 and February 2010, after inviting graduates by mail. The study contains a wide range of questions about the study process, labour market outcomes, and socio-demographic background. It was commissioned and financed by the Austrian Federal Ministry of Education, Science and Research and carried out by the International Centre for Higher Education Research-Kassel (INCHER). The information in this survey is ideally suited for our research questions, as it includes information about mandatory and voluntary internships, which is not readily available in many other datasets.

We restrict the original sample for the purpose of our analysis in a number of ways. Firstly, only individuals who graduated from their final study between 2003/2004 and 2006/2007 are retained to guarantee a minimum of 3 years between graduation and time of survey, giving almost all individuals had the chance to enter the labour market and develop their careers. According to human capital theory, long-term effects of internship should be of particular relevance for us, since productivity evolves over time (Weiss et al. 2014, p. 792). Therefore, we decided to allow for some time between graduation and assessment of effects. Secondly, individuals completing studies in medicine, veterinary medicine, law, or teaching were removed. We argue that graduates in these fields do not follow typical career trajectories, as these fields are highly regulated by the government, for example, through state examinations. Consequently, the theoretical arguments outlined above are not perfectly suited for these types of careers. By doing this, we follow the design of comparable studies (Klein and Weiss 2011, p. 10; Bittmann 2018). Thirdly, only individuals who report being in a dependent employment relationship are included. Others, for example, those who are still in the educational system,

report being self-employed, or take care of family members, are excluded from the study. Once again, our theoretical arguments assume a "proper" employment situation and might fail in different settings. This might introduce bias as the group with the most problematic developments (unemployed graduates) is also removed from analysis (259 cases). Taken together, the size of the restricted sample is 6819.

Variables and operationalization

There are three main outcomes (dependent variables) used to assess the effects of internships: income in the current job (current refers to the time of survey), the congruence of the current job with the final degree obtained, and the overall satisfaction with the current job. We operationalize income as the pre-tax income including all bonuses. Ordinal scaling of categories with a width of 500€ each, resulting in a variable with 14 distinct categories from 500€ up to 6500€, is used. Although ordinal in character, we treat this variable as metric, to simplify our models and interpretations. We deem it appropriate, given the large number of distinct categories and the distribution of the variable, which is illustrated below. We select income as a measurement of financial success because it is of the most central factors when judging career outcomes.

The second dependent variable measures mismatches between graduates' educational degrees and current employment. We operationalized this variable by using the following Likert-scaled item with five distinct categories: "When you consider all aspects of your current employment situation: to what extent is your employment situation appropriate for your education?". Subsequently, we recoded scores on this variable into a binary indicator, where categories one and two ("to a very high degree") were considered as "adequate", while the lower three categories with the most extreme category "not at all" were considered as "not adequate". By doing this, we obtained a simplified variable with about equal sizes of categories. 66.4% of all graduates in the sample report that their employment is "adequate" given their education.

While general unemployment is quite low for graduates of tertiary education in German-speaking countries (Auer et al. 2018, p. 37), finding a job congruent with one's degree is much more challenging (Sarcletti 2007a, p. 550). Testing whether graduates work at a position that fits their educational background, thus, appears relevant. Lastly, we computed our last dependent variable, job satisfaction, by combining 21 different Likert-scaled items, with five categories each. The items asked about different aspects of the current job, e.g. income, job security, integration of family life, or advancement opportunities. By combining these ordinally scaled items, we obtained a new metric variable with 220 distinct values and a Cronbach's alpha of 0.85. We argue that this variable captures a wide range of different aspects of current employment and can be regarded as a metric variable. It was designed to assess the overall attractiveness of graduates' current job and should include a large number of dimensions that contribute to the overall perceived quality of the position. The distribution of both metric dependent variables is shown in Fig. 2.

Following Judea Pearl's framework of causality (2009), we use causal graphs to identify all relevant control variables to recover any causal effects. To achieve this, we selected all variables that influence the outcomes and the length of internships simultaneously. Although we do not argue that we can account for all relevant factors, and our results probably do not estimate pure causal effects, we think that attempting this should be the goal of most applied research studies (Hernán 2018). All control variables are listed separately in Table 1.

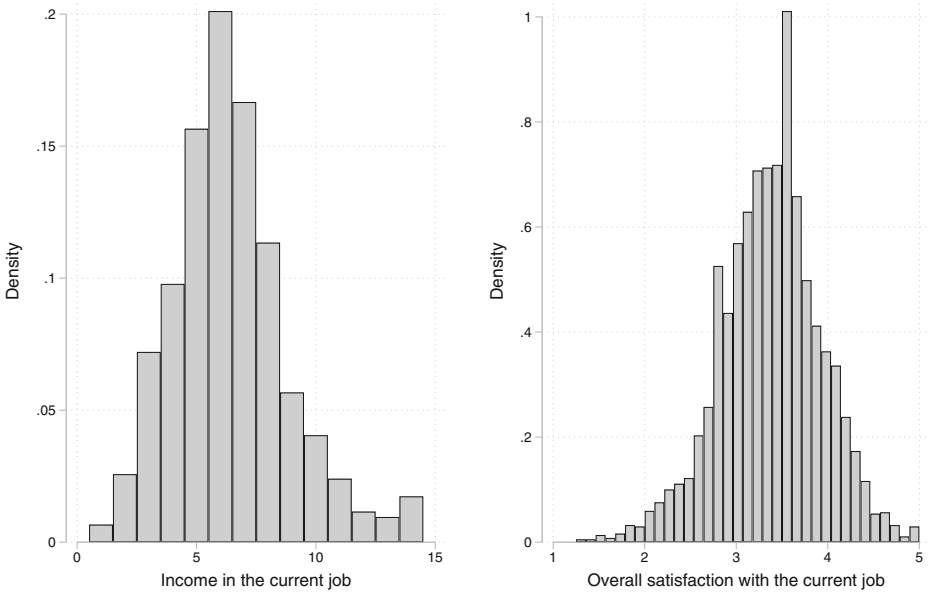

Fig. 2 Distribution of income and job satisfaction. Source: ARUFA 2010. The income variable (left side) contains 14 distinct categories from 500€ to 6500€ and measures pre-tax income including bonuses

Methods and models

Depending on the outcome variables, linear (OLS) and binary logistic regressions are estimated (Kohler and Kreuter 2012). For the first two research questions, we estimated six different models for each outcome variable. The first model only includes the outcome and the cumulative length of all mandatory internships. The second model adds a binary variable, indicating whether any voluntary internships have been completed. By doing this, we isolate the net effect of mandatory internships, controlling for the status of voluntary internships. The third model finally adds all control variables. Exactly the same model building is repeated for the cumulative length of all voluntary internships, while here it is controlled for any mandatory internships in a binary fashion.

For the last research question, we decided to focus on voluntary internships, as mandatory internships did not display any significant effects in the first models, as will be explained below. For each outcome, the first model contains the cumulative length of all internships and all control variables. The second model adds the binary indicator of any study-related job during the study. The third model finally includes the interaction effect between the length of internships and the indicator of any study-related job. All models are estimated in Stata 15, using the commands *regress* and *logit* (complete do-files are available upon request). As a short side note, standard regression designs can be as valuable for identifying causal effects as other statistical methods, like propensity score matching or IV approaches. Just like the two other designs, which do not rely on actual experimental data, the estimation of causal effects requires the selection of all important control variables (or a perfect instrument, which cannot be proven statistically) to rule out confounding. The major advantage of regression designs is that the function form between outcomes and main independent variables can be assessed.

Table 1 Control variables used in the advanced models

Variable	Scaling
Gender	Binary
Age	Metric
Age squared (higher-ordered term)	Metric
Highest parental level of education	Categorical
Highest occupational position of the father	Categorical
Austrian citizenship	Binary
Completion of a vocational training before study	Binary
General labour market experience before study	Binary
Field-related labour market experience before study	Binary
Importance of labour market outcomes when choosing a field of study	Categorical
Type of higher education eligibility	Categorical
Federal state where eligibility was obtained	Categorical
Field of study	Categorical
Type of finale degree	Categorical
Overall number of tertiary degrees obtained	Categorical
Year of graduation	Categorical
Type of university (regular vs. university of applied sciences)	Binary
Motivation to focus on the study	Categorical
Semester abroad	Binary
Federal state of university (Vienna vs all other)	Binary
Time worked for study per week (standardized by field)	Metric
Study being the main activity	Binary
Infrastructure of the university*	Metric
Supervision of the university*	Metric
Courses offered by the university*	Metric

Source: ARUFA 2010, own calculations. *The last three items are metric variables generated from at least four ordinally scaled items to assess the general quality of the study programme. Cronbach's alpha is always larger than 0.82 for each variable. Using these generated items should clearly improve the model above using a large number of categorical variables as the number of parameters to be estimated is significantly reduced

Results

Descriptive overview

In contrast to all following analyses, the descriptive statistics are calculated for the entire sample, including all fields of studies and graduation years as only the overall distribution of the central variables is investigated. Thirty-eight percent of all graduates completed neither a mandatory nor a voluntary internship, while 19.8% reported having both. 21.9% reported only a mandatory, and 20.2% reported only a voluntary internship. Figure 3 traces internship trends over time and for different fields. Medicine and law are included in this graph for descriptive comparison, but are not included in any of the following causal analyses. The data indicate that the popularity of mandatory internships increases over time, but there are significant differences between fields of study in almost all cases. Luckily, we find quite a large variation within each field of study, which should benefit the following analyses. Next, we examine the actual length and distribution of internships. To do this, we restricted the sample to graduates who reported at least one internship, as otherwise the zero category would be extremely large and distort the graph. Figure 4 presents kernel-density plots used to visualize the distribution. It appears that the distribution for mandatory and voluntary internships is rather similar.

Advanced analyses

To answer the first two research questions, which refer to the effect of the duration of internships and to the distinction between mandatory and voluntary internships, respectively, different regression models are estimated, as described in the previous section. The results are displayed in a compressed form in Table 2 (Effects of further controls are missing due to the large space required and are available upon request.). For the first dependent variable, income in current job, we find no significant effects for mandatory internships. In case of voluntary internships, we find a positive and highly significant result (0.009) which does not change after controlling for mandatory internships and all other possible confounders. Consequently, each consecutive week of voluntary internships benefits the income, while there is no effect for mandatory internships. In fact, the binary indicator for mandatory internships is negative and highly significant in model M6-1.

The results are quite similar for the other two dependent variables. Regarding job mismatch, mandatory internships show a small positive effect at first, which vanishes after introducing the controls. In contrast to that, voluntary internships are and stay highly significant in all three models. For overall job satisfaction, the last dependent variable, the results are very much alike. While mandatory internships show no significant coefficients, voluntary internships keep their positive and significant effects for all models. Thus, even after controlling for a wide range of variables, voluntary internships have a positive effect on all three outcome variables.

To answer the third research question, nine additional models are estimated. We decided to use the cumulative length of voluntary internships as the main independent variable, as it was the only variable that displayed any significant results in the previous analyses. The effect of mandatory internships is, therefore, not further investigated, although we still control for the binary indicator of mandatory internships. The second independent variable of interest is

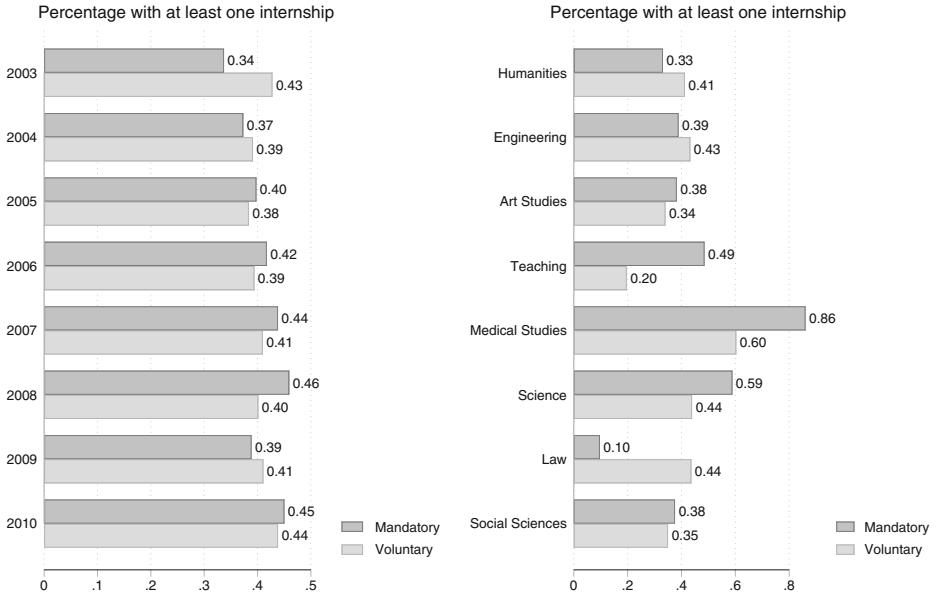

Fig. 3 Descriptive statistics by year of graduation and field of study. Source: ARUFA 2010, own calculations. Only fields of study are depicted with at least 200 graduates

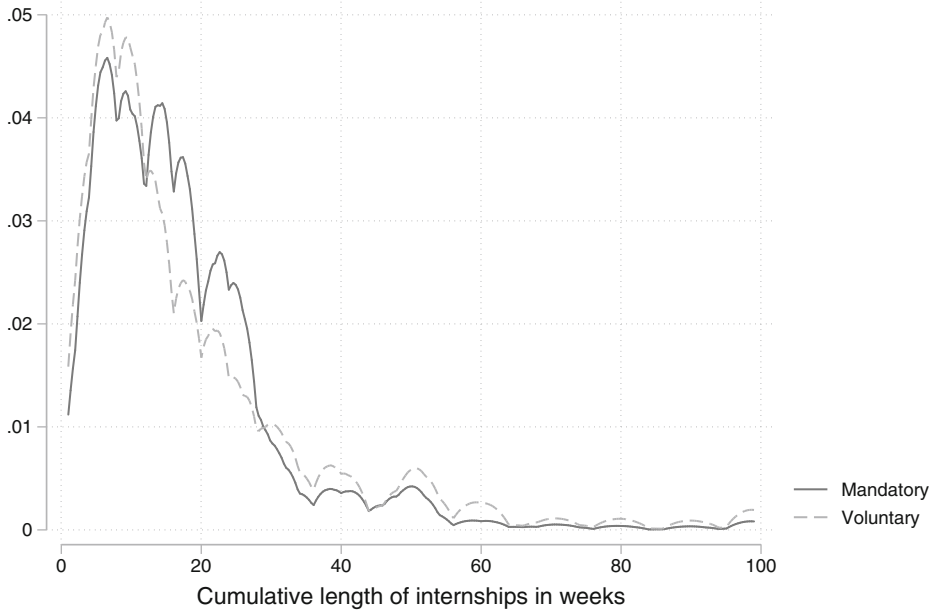

Fig. 4 Kernel-density plots for cumulative length of internships. Source: ARUFA 2010, own calculations

binary and indicates whether graduates report any study-related labour force episodes during their studies. By further including the interaction term between the two variables, we can check whether internships affect graduates with and without labour market experience differently. The results are reported in Table 3. For the first dependent variable, income, it is evident that voluntary internships keep their positive effect in all three models. The interaction term is not significant, and the model fit deteriorates in its presence. The results are very similar for the other two outcomes. We, thus, conclude that graduates with and without labour market experience are not affected differently by internships. Conditional-effects-plots were produced for a more convenient interpretation based on the final models without interaction effects (N2, N5, N8), see Fig. 5. The linear relation between the length of voluntary internships is visible and especially robust in the logistic regression, which would model non-linearities implicitly due to the non-linear link-function of this model (Berry et al. 2010).

Finally, we applied additional robustness checks to investigate the stability of the results. However, due to space restrictions, we do not present all checks, but rather summarize our findings. The following aspects were addressed: non-linearity in parameters, heteroscedasticity, and multicollinearity. Our findings indicate that all requirements were satisfactory fulfilled and inferences should be valid.

Discussion

Starting with research question one, our results clearly indicate that the cumulative length of internships significantly affects outcomes for graduates of tertiary education. Particularly voluntary internships show a significant effect on all three outcomes, even after adding mandatory internships and all controls to the models. Interestingly, the effect is extremely

Table 2 Regression results for income, job mismatch, and job satisfaction

Income						
	M1-1	M2-1	M3-1	M4-1	M5-1	M6-1
Mandatory internships (weeks)	0.001	0.001	− 0.005			
	(0.004)	(0.004)	(0.004)			
Voluntary internships (weeks)				0.009**	0.010***	0.009***
				(0.003)	(0.003)	(0.003)
Voluntary internships (0/1)		− 0.001	0.234**			
		(0.089)	(0.080)			
Mandatory internships (0/1)					− 0.526***	− 0.318***
					(0.090)	(0.092)
Controls	No	No	Yes	No	No	Yes
Constant	6.514***	6.515***	0.440	6.454***	6.639***	0.721
	(0.050)	(0.060)	(1.078)	(0.049)	(0.058)	(1.074)
Observations	3142	3142	3142	3142	3142	3142
Adjusted R^2	0.000	0.001	0.294	0.003	0.013	0.297
AIC	14499	14501	13466	14489	14457	13453
Job mismatch (logistic)						
	M1-2	M2-2	M3-2	M4-2	M5-2	M6-2
Mandatory internships (weeks)	0.008*	0.007*	0.001			
	(0.003)	(0.003)	(0.004)			
Voluntary internships (weeks)				0.012***	0.012***	0.012***
				(0.003)	(0.003)	(0.003)
Voluntary internships (0/1)		0.370***	0.419***			
		(0.081)	(0.090)			
Mandatory internships (0/1)					0.017	− 0.016
					(0.080)	(0.102)
Controls	No	No	Yes	No	No	Yes
Constant	0.752***	0.622***	− 0.193	0.713***	0.707***	0.124
	(0.044)	(0.052)	(1.332)	(0.043)	(0.051)	(1.341)
Observations	3179	3179	3179	3179	3179	3179
Pseudo R^2	0.001	0.007	0.074	0.005	0.005	0.073
AIC	3936	3916	3772	3922	3923	3778
Job satisfaction						
	M1-3	M2-3	M3-3	M4-3	M5-3	M6-3
Mandatory internships (weeks)	0.002**	0.002**	0.001			
	(0.001)	(0.001)	(0.001)			
Voluntary internships (weeks)		0.053**	0.072***	0.002**	0.002**	0.002***
		(0.020)	(0.020)	(0.001)	(0.001)	(0.001)
Voluntary internships (0/1)						
Mandatory internships (0/1)					0.062**	0.033
					(0.020)	(0.023)
Controls	No	No	Yes	No	No	Yes
Constant	3.365***	3.346***	2.788***	3.356***	3.333***	2.778***
	(0.011)	(0.013)	(0.274)	(0.010)	(0.012)	(0.258)
Observations	3133	3133	3133	3133	3133	3133
Adjusted R^2	0.002	0.004	0.087	0.002	0.005	0.087
AIC	5024	5019	4809	5023	5016	4808

Source: ARUFA 2010, own calculations. Standard errors in parentheses

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

stable and does not change in the full model. Therefore, we conclude that there is a clear and strong association between the length of voluntary internships and all outcomes. Furthermore, the functional form appears to be linear, which is indicated by the conditional-effects-plots (Fig. 5) and the fact that adding higher-ordered terms always results in a deterioration of model fit. Hypothesis one is, thus, retained.

Regarding the second research question, our results point to the importance of the kind of internship on labour market outcomes. While only voluntary internships display discussed positive effects, we find no significant effects for mandatory internships. Hence, based on our data, we can conclude that only voluntary internships are associated with improved outcomes. This finding is in line with previous studies (Klein and Weiss 2011; Bittmann 2018), which also do not find any positive effects of mandatory internships. Consequently, hypothesis two is rejected. Interestingly, the binary control variable for mandatory internships in the models with voluntary internships actually reveals a large and highly significant *negative* effect. While this is rarely addressed by the literature, there are a number of reasons to assume that internships can also worsen outcomes, especially for mandatory internships. For example, less able students have to invest time and energy in mandatory internships, which could result in reduced academic performance and worse grades.

Regarding the third research question, we find that both graduates with and without field-related labour market experience profit from voluntary internships. As there is no significant interaction present in any of the models (N1–N9), hypothesis three is rejected. Voluntary internships are valuable for all students. It is unclear why we observe this result, as hypothesized mechanisms should be similar for internships and other working experience. It is possible that employers value internships as a distinct category of signals and rate them higher than other working episodes, although this reason is not entirely convincing with regard to expected productivity.

To summarize, our findings suggest that voluntary internships are of great benefit for students, who should be encouraged to pursue these opportunities, as they are clearly associated with better labour market outcomes. Educators should acknowledge this evidence and accommodate enough time and liberties in their study programmes for these extra-curricular activities. Our analyses corroborate the results of previous studies and indicate that mandatory internships are not linked to any form of more positive labour market outcomes. Despite their high popularity, educators in charge should consider the reduction of these programmes in the light of empirical findings. Students should be aware of the fact that internships, in addition to other field-related working experience, are not a waste of time, but can result in more positive labour market outcomes after graduation, even if they might be less well paid than other jobs.

Limitations

Our analyses have a number of limitations. Firstly, much like all studies based on retrospectively collected survey data, our results should be interpreted with caution. Respondents might lie or adjust their answers accordingly, for example, when facing problematic labour market outcomes. The only solution to this problem is using prospective data, which are often not available. Secondly, the ARUFA dataset does not include a measurement of academic performance, for example, the grade of eligibility or the final study grade. This is a minor difference to similar studies (Klein and Weiss 2011; Bittmann 2018). However, we argue that this was counterbalanced by using a set of additional variables, for example, motivation, which was missing from previous studies. Given the robustness of the effects found, we are confident that they are relatively stable with respect to the missing variable bias. Additionally, the measurement of working episodes is rather coarse, as only a binary indicator is available. Therefore, it is unclear whether students worked only a few weeks or through their entire studies, which would probably make a difference. A more detailed measurement might improve precision in future studies.

Table 3 Regression results for labour market experience and interactions with voluntary internships

	Income			Job mismatch (logistic)			Job satisfaction		
	N1	N2	N3	N4	N5	N6	N7	N8	N9
Cumulative length of voluntary internships (weeks)	0.009***	0.009***	0.010*	0.012***	0.012***	0.020***	0.002***	0.002***	0.002
	(0.003)	(0.003)	(0.005)	(0.003)	(0.003)	(0.006)	(0.001)	(0.001)	(0.001)
Mandatory internships (0/1)	− 0.318***	− 0.309***	− 0.308***	− 0.016	− 0.001	0.007	0.033	0.035	0.035
	(0.092)	(0.092)	(0.092)	(0.102)	(0.102)	(0.102)	(0.023)	(0.023)	(0.023)
Study-related labour force exp. (0/1)		0.154	0.162		0.221*	0.293**		0.032	0.033
		(0.080)	(0.089)		(0.088)	(0.097)		(0.020)	(0.023)
Internships * experience			− 0.001			− 0.012			− 0.000
			(0.005)			(0.007)			(0.001)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.721	0.610	0.604	0.124	0.013	− 0.013	2.829***	2.805***	2.805***
	(1.074)	(1.075)	(1.075)	(1.341)	(1.359)	(1.363)	(0.274)	(0.274)	(0.274)
Observations	3142	3142	3142	3179	3179	3179	3133	3133	3133
Adjusted/pseudo R^2	0.297	0.297	0.297	0.073	0.074	0.075	0.087	0.087	0.087
AIC	13453	13451	13453	3778	3774	3773	4808	4808	4810

Source: ARUFA 2010, own calculations. Standard errors in parentheses

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

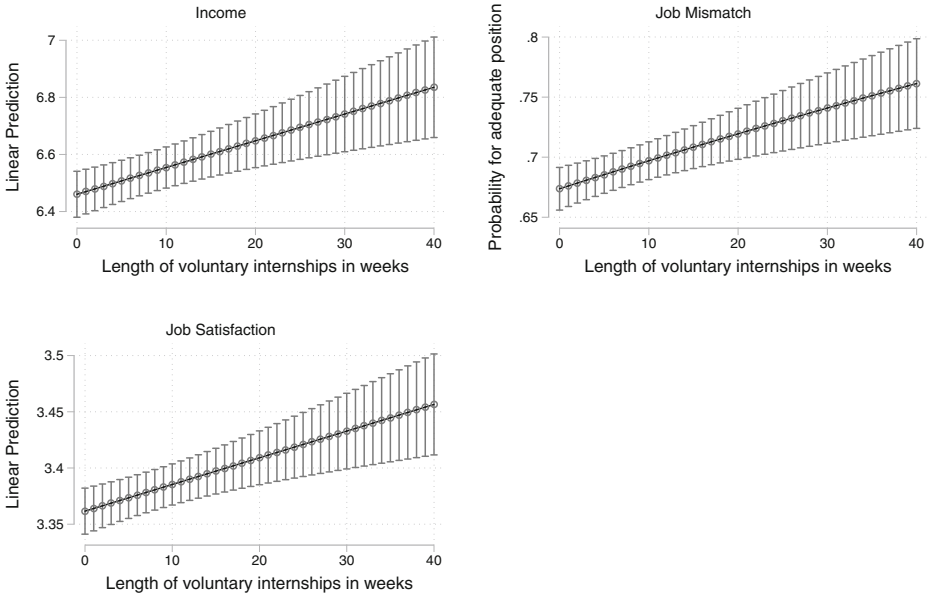

Fig. 5 Conditional-effects-plots for all dependent variables. Source: ARUFA 2010, own calculations. Conditional effects are calculated for models N2, N5, and N8

In addition, we could not measure how long a person is employed between graduation and time of survey, which could have influenced our results, as the time available to develop skills is not controlled for. With regard to field of study, it was not possible to compute interaction effects between internships and field, due to a low number of cases. Future studies should focus on this aspect and collect more data to test whether internships have the same effects for all fields of study. Finally, as the dataset used for the current study is not from the most recent cohorts, it is possible that the study situation has changed after the introduction of the Bologna process. While, in the past, degrees like *Magister* or *Diplom* made up the majority, nowadays, virtually only Bachelor and Master degrees are left. However, we assume that effects are similar for more recent cohorts, as the theoretical foundations of internships should work similarly with the newer degrees and effects should still be positive. More decisive conclusion can only be drawn after collecting newer data, which will take some time, especially given that researchers should allow some room for career development between graduation and measurement of outcomes.

Conclusion

The main goal of the current study was to investigate the effects of both mandatory and voluntary internships on labour market outcomes, including income, job mismatch, and job satisfaction. After controlling for a large number of possible confounders, the results indicate that only voluntary internships display highly significant positive effects, while we find no effects for mandatory internships. The functional form of the relationship is linear for all three outcomes. The robustness of the results was confirmed using several statistical approaches. Finally, we demonstrated that there is no interaction between internships and other field-related

working episodes, and both graduates, with and without job experience, profit from voluntary internships. Therefore, only hypothesis one was retained, while the others were rejected.

We argue that these results are highly relevant and should motivate students to pursue voluntary internships. As the relationship between completing voluntary internships and positive labour market outcomes is linear, and no thresholds must be achieved, any length of internship results in more positive outcomes. Although the dataset was from Austria, we can assume that other modern, industrialized countries will show similar effects, at least when their educational systems are comparable. For example, countries like Germany, Switzerland, or the Netherlands have similar systems and are, thus, highly comparable. Subsequent studies should collect more data to assess the development of these effects over time and attempt to investigate the mechanisms behind them in more detail. Focusing on different fields of study to investigate the possibility of heterogeneous effects would also be highly desirable, yet would require larger sample sizes for a sophisticated analysis. Collecting a larger number of diverse data, for example, from different countries, should be one of the main goals of future research activities. In addition, it would be beneficial to focus on cross-country comparisons to test whether our results are generalizable to a wider context. Although the educational system of Austria is comparable to some others, as outlined above, differences might arise due to contextual factors, or differently structured labour markets.

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Compliance with ethical standards

Conflict of Interest The authors declare that they have no conflict of interest.

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