Do Internships Pay Off?
The Effects of Student Internships on Earnings

Shushanik Margaryan[*a], Nils Saniter[†b], Mathias Schumann[‡c], and Thomas Siedler[§d]

[a]Universität Hamburg
[b]DIW Berlin and IZA Bonn
[c]Universität Hamburg
[d]Universität Hamburg and IZA Bonn

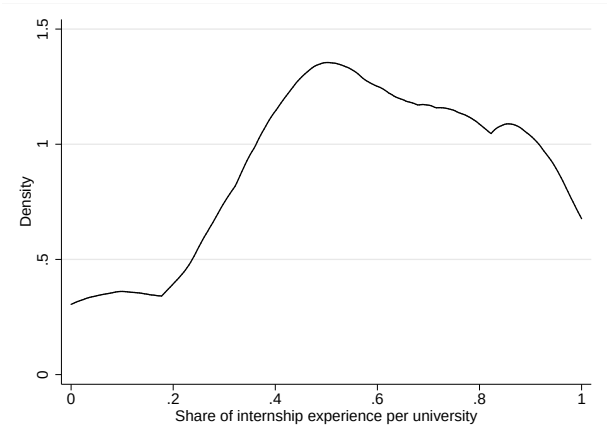
April 1, 2020

[*]E-Mail: shushanik.margaryan@uni-hamburg.de. Universität Hamburg, Esplanade 36, 20354 Hamburg, Germany.
[†]E-Mail: nils.saniter@posteo.de. DIW Berlin, Mohrenstrasse 58, 10117 Berlin, Germany.
[‡]E-Mail: schumann.m.u@gmx.de. Universität Hamburg, Esplanade 36, 20354 Hamburg, Germany.
[§]Corresponding author. E-Mail: thomas.siedler@uni-hamburg.de. Universität Hamburg, Esplanade 36, 20354 Hamburg, Germany.

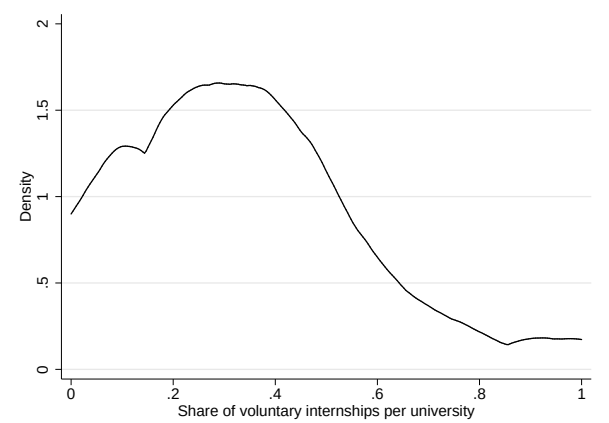
Appendix A: Additional Figures and Tables (For Online Publication)

Figure A-1: Distribution of internship experience across universities

(a) Internships



(b) Voluntary internships



(c) Mandatory internships

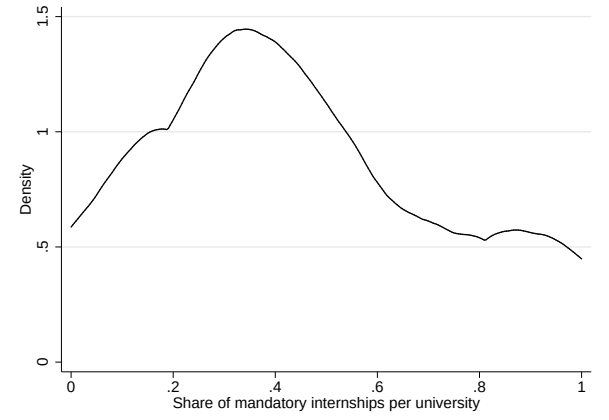
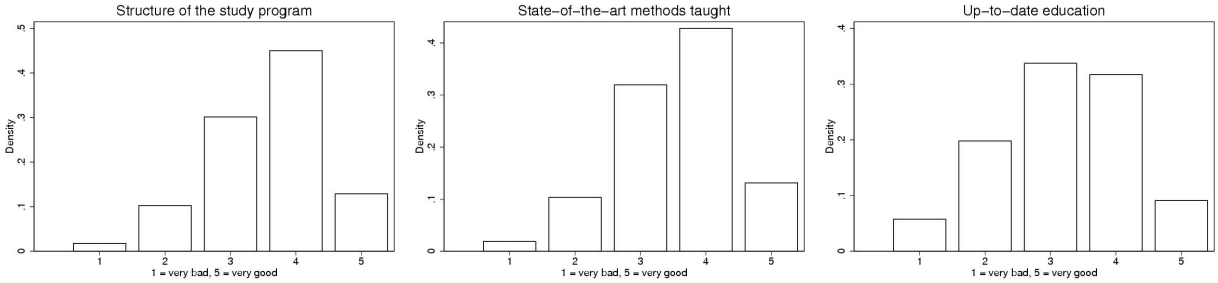
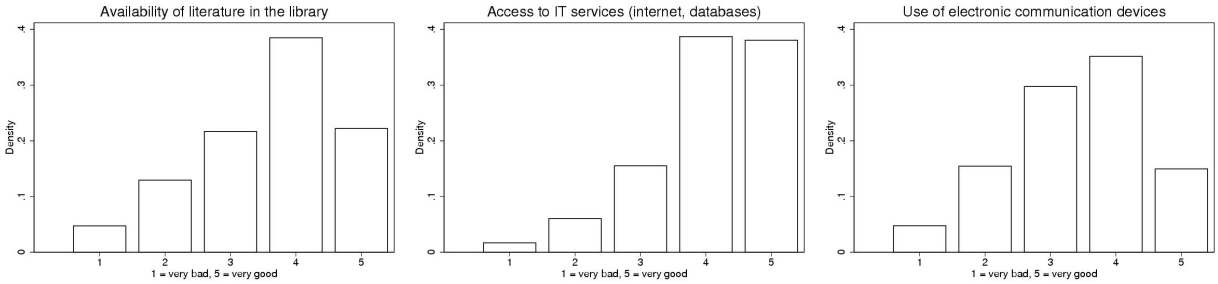


Figure A-2: Students' evaluation of study related aspects

(a) Overall Quality of Education

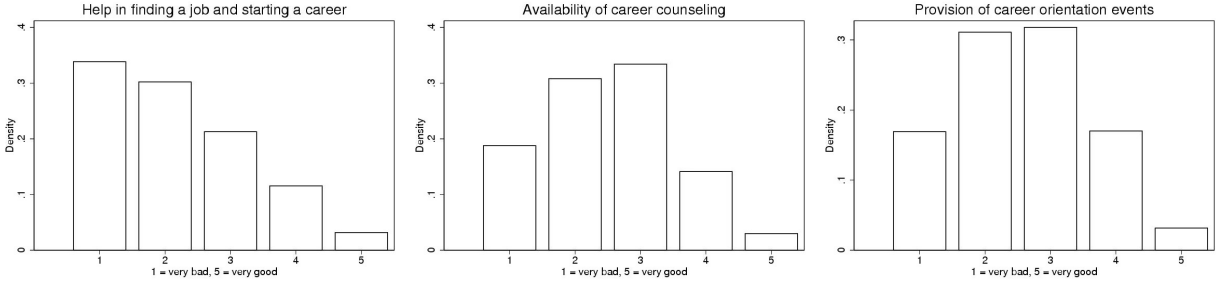


(b) Educational Media and Infrastructure



(c) Training

(d) Career Counseling



Note: The corresponding questionnaire item reads "How do you evaluate the following aspects of your completed studies?" Respondents are then asked to answer on a scale from 1 ("very bad") to 5 ("very good"). Data is taken from the first wave ($n = 12,964$). *Data:* DZHW Graduate Panel.

Table A-1: Internships by field of study subject

	Science, mathematics, engineering	Business and economics	Humanities and social sciences
Internship	0.62	0.68	0.74
Voluntary internship	0.33	0.51	0.51
Mandatory internship	0.50	0.40	0.50

Table A-2: Overview of survey evidence on students' reasons for the choice of university and study program in Germany

Author(s)	Survey and sample	Question	Type of question	Main results	Question on internship?
?	Representative survey of first-year students in Germany in the winter term 2004/05; 8,200 students.	How important are the following reasons for your choice of study?	5-point Likert scale (1 very important; 5 not important) on 20 different potential reasons/aspects with respect to the university and city.	Percent who answer that it is (very) important (1 & 2 on the scale): • Interest in content (91%) • Affinity/Ability (88%) • Many occupational choices later on (67%) • To be able to work independently (64%)	No
?	Survey of students in the middle of their studies.	How important were the following aspects for the choice of your university?	6-point Likert scale (1 very important; 6 not important at all).	Percent who answer that it is (very) important (1 & 2 on the scale): • To study preferred field of study (66%) • Good reputation of the university and professors (59%) • Proximity to home (58%) • Interesting city (51%)	No
?; ?	Survey among high school students in final grade; around 3,600 pupils.	How important were the following aspects for the choice of your university?	4-point Likert scale (1 applies very much; 4 does not apply at all).	Percent who answer that it is (very) important (1 & 2 on the scale): • Interest in content (100%) • Good facilities (90%) • Atmosphere in the city (89%) • Services for students (82%)	No
?	Online survey among first-year students at the Martin-Luther University Halle-Wittenberg in the winter term 2008/09; around 800 students.	How important were the following reasons in your choosing this university?	5-point Likert scale (1 very important; 5 not important).	Average value of the 5-point scale: • Interest in content (1.79) • No need to pay tuition fees (1.96) • Good life conditions (2.23) • Proximity to home (2.27) • University has a good reputation (2.48)	No
?	Representative survey among first-year students in Germany in the winter term 2007/08; 8,342 students.	How important are the following reasons for your choice of study?	5-point Likert scale (1 very important; 5 not important) on different reasons/aspects with respect to the university and city.	Percent who answer that it is (very) important (1 & 2 on the scale): • Interest in study program content (83%) • Proximity to home (66%) • Good reputation of the university (60%) • Good facilities (54%)	No
?	Representative online survey in 2013 among young people aged 16-24 who aim at studying at university; 500 individuals.	What is the most important aspect in the choice of the university?	5-point Likert scale (1 very important; 5 not important) on long list of aspects.	Percent who answer that it is very important (1 on the scale): • I do not want to be away too far from home (29%) • I will choose the university with the best study program (28%) • I want to live in a city that also has good recreational opportunities (23%) • I will choose a university with a good reputation (13%)	No

Table A-3: Classification of areas of study into strong and weak labor market orientation

Strong LM orientation	Weak LM orientation
administrative studies	ancient/classic philology, modern Greek
agricultural sciences	area studies
architecture and interior design	arts, general art history
biology	catholic theology/religious education
chemical science	composition and design
civil engineering	cultural studies/cultural sciences
computer science	English studies, American studies
dentistry/dental medicine	extra-European linguistic and cultural studies
economics	film studies
electrical engineering	fine arts
engineering management	comparative literary and linguistic sciences
food and beverage technology	general cultural studies
forestry, forest and wood management	general economic and social science
general engineering	general linguistics and philology
geomatic/geospatial engineering	geography
geosciences (without geography)	German philology and studies
health-care science	history
human medicine	library science, documentation, communication
jurisprudence/law	music, musicology
landscape conservation, - architecture	education
mathematics, natural sciences	performing arts, theater studies
mechanical engineering, process engineering	philosophy
mining and metallurgy	political sciences
nautical science / navigation	protestant theology/religious education
pharmacy	psychology
physics, astronomy	Romance philology and studies
social pedagogy	Slavic, Baltic, Finno-Ugrian studies
spatial planning	social sciences
teletraffic engineering	special education
trophology, nutritional and domestic science	sport science
veterinary medicine	

Note: Based on **?**.

Table A-4: Mandatory internships and local unemployment level

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Panel A: Individual level regressions					
Lag 5	−0.006	−0.018	−0.029	−0.029	−0.024	−0.026	−0.023
	(0.007)	(0.016)	(0.018)	(0.019)	(0.021)	(0.022)	(0.021)
Lag 4		0.011	0.034	0.034	0.017	0.025	0.013
		(0.013)	(0.024)	(0.025)	(0.025)	(0.028)	(0.027)
Lag 3			−0.022	−0.022	−0.012	−0.019	−0.005
			(0.015)	(0.017)	(0.019)	(0.021)	(0.020)
Lag 2				0.000	0.016	0.021	0.024
				(0.015)	(0.033)	(0.034)	(0.034)
Lag 1					−0.019	−0.029	−0.035
					(0.026)	(0.032)	(0.032)
Lag 0						0.007	−0.017
						(0.012)	(0.019)
Lead 1							0.026
							(0.021)
Obs.	17,978	17,978	17,978	17,978	17,978	17,978	17,978
		Panel B: Department level regressions					
Lag 5	−0.006	−0.025	−0.009	−0.016	−0.008	−0.009	−0.008
	(0.013)	(0.019)	(0.022)	(0.027)	(0.029)	(0.029)	(0.029)
Lag 4		0.018	−0.018	−0.008	−0.022	−0.017	−0.020
		(0.016)	(0.030)	(0.036)	(0.041)	(0.043)	(0.044)
Lag 3			0.034+	0.023	0.034	0.030	0.032
			(0.019)	(0.028)	(0.032)	(0.038)	(0.039)
Lag 2				0.013	0.014	0.019	0.021
				(0.026)	(0.050)	(0.053)	(0.052)
Lag 1					−0.007	−0.015	−0.016
					(0.033)	(0.045)	(0.045)
Lag 0						0.005	−0.003
						(0.018)	(0.030)
Lead 1							0.009
							(0.027)
Obs.	1,294	1,294	1,294	1,294	1,294	1,294	1,294

Note: The outcome in Panel A is a dummy variable that takes on the value one for students reporting a mandatory internship, and zero otherwise. The outcome in Panel B is a dummy variable that takes on the value one if more than 70% of the students in a given cohort-department cell report a mandatory internship, and zero otherwise. Lags and leads are calculated in years with respect to each graduation cohort. The unemployment rate comes from the Federal Statistical Office and is calculated at the county level. All regressions include university and department fixed effects. Standard errors (in parentheses) are clustered at the department level. $^{+}$ p<0.10, * p<0.05, ** p<0.01, *** p<0.001. *Data:* DZHW Graduate Panel and Federal Statistical Office.

Table A-5: Characteristics of compliers for the instruments IV_I and IV_{II}

Variable	IV_I: Mandatory (self-reported)		IV_{II}: Leave-one-out	
	First-stage estimate	Relative likelihood of compliers	First-stage estimate	Relative likelihood of compliers
(1)	(2)	(3)	(4)	(5)
Full sample	0.560		0.284	
Gender				
Female	0.510	0.911	0.258	0.908
Male	0.612	1.093	0.291	1.025
Apprenticeship				
Yes	0.576	1.029	0.254	0.894
No	0.552	0.986	0.297	1.046
High school grade				
Good or very good	0.587	1.048	0.258	0.908
Satisfactory or worse	0.514	0.918	0.319	1.123
Mother or father has upper secondary school degree				
Yes	0.539	0.963	0.309	1.088
No	0.587	1.048	0.252	0.887

Note: The table reports results for the characteristics of compliers for the two instruments IV_I (i.e., a dummy that equals one if a firm internship was mandatory during the course of studies, and zero otherwise) and IV_{II} (i.e., a dummy that is equal to one if 70 percent or more of the students at the department report that an internship was mandatory). Columns (2) and (4) report the first-stage estimates for sub-samples as indicated by the dummy variables in column (1). Columns (3) and (4) report the relative probability that compliers have the characteristic indicated in column (1).

Appendix B: Internship Characteristics (For Online Publication)

The analysis thus far relies on data from the DZHW Graduate Panel. Although the DZHW data contain a plethora of information, one of the data's drawbacks is the lack of information on internship characteristics. We therefore supplement our analysis by using data from the Bavarian Graduate Panel (BAP), which is a survey of university graduates (similar to the DZHW Graduate Panel) in the German federal state of Bavaria.[1] Similar to our main analysis, we include survey information gathered one and five years after graduation and pool information from the graduation cohorts 2003/04 and 2005/06.

The BAP has several assets. First, it contains detailed information on internship experiences, which enables us to descriptively analyze internship characteristics. Second, the similar survey structures of the DZHW Graduate Panel and the BAP enable us to replicate our main results to a certain degree. Third, the BAP offers information on the field of study rather than area of study (e.g., one category for Italian instead of only one category for Romance languages).

Despite these advantages, the BAP has several shortcomings compared to the DZHW Graduate Panel for our analysis. First, the BAP only comprises information on graduates from Bavaria, which is only one of the 16 federal states in Germany. Because Bavaria has one of the strongest economies and labor markets in Germany, the BAP data might not be representative of Germany at large. Second, the BAP dataset is only about half the size of the DZHW Graduate Panel's—the smaller sample renders most of our previous instrumental variable analysis infeasible with respect to statistical power. Third, the wording of the questions on the existence of mandatory internships differs between the two surveys: while the DZHW Graduate Panel explicitly asks for mandatory internships *in firms*, the BAP does not. Fourth, the data do not include a university indicator; instead, we include indicators for the interaction of university type and study subject.

According to the BAP, students do, on average, 2.3 internships during the course of their university studies. Table B-1 shows further descriptive statistics on the first and last internship during studies.[2] It shows that the duration of an internship is, on average, about 4 months, and that mandatory internships are longer than voluntary internships. Moreover, the first internship usually takes place in the third or fourth semester, and the last internship between the sixth and eighth semester.[3] The respondents were further asked to evaluate the first and last internship during their studies with respect to several dimensions. Notably, students evaluate mandatory internships to be more helpful than

[1] Detailed information on the BAP surveys is available at `http://www.bap.ihf.bayern.de`.

[2] The information is available only for the cohort 2003/04.

[3] Thus, the first internship usually takes place at the end of the second year of university and the last internship in the fourth year.

voluntary internships in giving them guidance on how to organize their studies. The table also indicates that students benefit more from mandatory internships in terms of job knowledge and skills.

Internships completed during the course of university study are a commonly used job search method. Figure B-1 displays the share of graduates in the 2003/04 cohort who used a particular job search method to find their first job. Furthermore, the figure shows, conditional on having used a particular method, the share of graduates who assessed this particular method to be beneficial. The most common search methods are job advertisements, speculative applications, and contacts from jobs during studies. Contacts from internships during studies rank fifth—40% of graduates have used this job search channel. Moreover, more than 70% of graduates who used internships during their university studies as a job search method indicate having benefited from contacts acquired during that internship. Thus, a large share of university graduates make use of contacts from internships and find this channel to be a useful job search method.

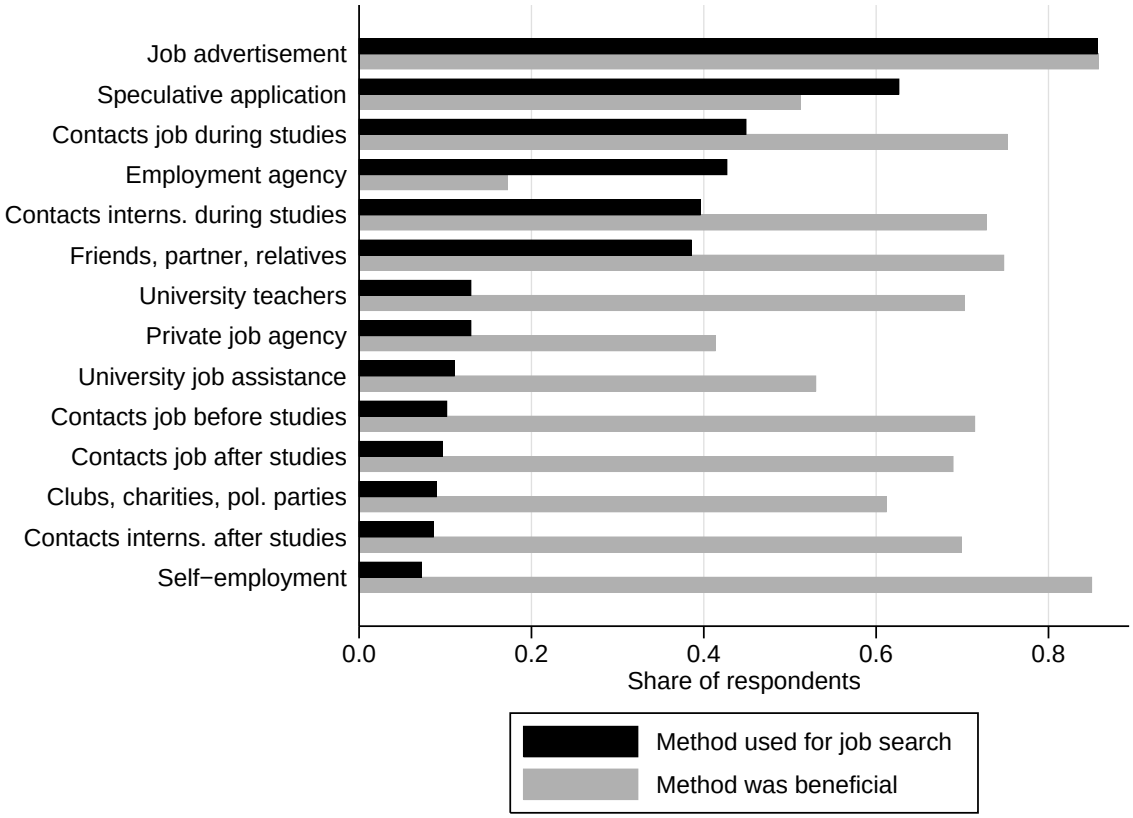
As previously mentioned, participants in the BAP were asked whether internships during studies were mandatory; however, they were not asked whether internships *in firms* were mandatory. Nonetheless, Tables B-2, B-3, and B-4 in Appendix A show that the OLS and IV point estimates are quite similar to those of the main analysis. In Table B-2, the OLS coefficient of the internship indicator of the full model is 0.042 and statistically significant at the 1% level. The estimate implies that doing an internship while attending university increases earnings after graduation by 4.3%, thus the effect is about 2 percentage points lower than in the main analysis. The lower effect size is likely due to the lower importance of internships in the Bavarian labor market, which exhibits more or less full employment (in contrast to other federal states). Moreover, the coefficients of the covariates have the same sign as in the main analysis.

The IV results in columns (3) and (4) are based on an instrument that takes the value one if a student indicates having done at least one mandatory internship while attending university, and takes the value zero otherwise. The point estimates are somewhat lower and statistically non-significant. The non-significance is not surprising given the much smaller sample size. The low point estimates, however, warrant discussion. They are likely due to the kind of mandatory internships that the instrument captures. Instead of solely measuring internships in firms, the instrument is likely to also pick up internships at university to a certain degree. The smaller coefficient is nonetheless informative, because it points to a positive return of internships in general, but also highlights the additional value of completing an internship in a firm.

For the graduation cohort 2003/04, information is available on whether the intern's performance was assessed at the firm and/or university where the internship was completed. We use this information to redefine the instrument by assuming that interns who

were assessed at a university but not at a firm did not complete a firm internship, that is, we assign internships that are unlikely to be a firm internship a zero in the instrument. Columns (5) and (6) show the results of this alternative instrument definition: the point estimates—although statistically non-significant—are larger and similar to the OLS results with a point estimate of 0.047 in the full model. Moreover, Table B-3 shows that the first-stage relationship between the instrument and internship experience during studies is almost identical to the main analysis; and Table B-4 indicates that internships have larger earnings returns in areas of study with lower labor market orientation. Overall, the results of the BAP confirm the results of the DZHW Graduate Panel.

Figure B-1: Job search methods



Note: Respondents of the cohort 2003 who had already found their first job by the time of the first survey wave were asked which methods they used to find their first job ($n = 2,258$). Respondents could give multiple answers. The black bars indicate the share of respondents who used a particular search method. Conditional on having used a method, the gray bars show the share of respondents who found that this method was useful. *Data:* Bavarian Graduate Panel.

Table B-1: Internship characteristics and perceived benefits

	Internship	Voluntary	Mandatory	p-value
	(1)	(2)	(3)	(4)
First internship during studies				
Duration (in months)	3.9	2.9	4.3	0.000
In/after which semester[a]?	3.6	4.2	3.5	0.000
Internship benefits[b]				
Guidance for organizing studies	3.2	3.0	3.3	0.000
Better notion of job content	3.8	3.8	3.8	0.782
Job knowledge and skills	3.6	3.5	3.7	0.001
Soft skills	3.4	3.4	3.3	0.495
Making contacts for job entry	2.8	2.9	2.8	0.158
Number of observations	2,395	578	1,817	2,395
Last internship during studies				
Duration (in months)	4.3	3.4	4.7	0.000
In/after which semester[a]?	6.7	7.7	6.2	0.000
Internship benefits[b]				
Guidance for organizing studies	3.4	3.1	3.6	0.000
Better notion of job content	4.3	4.3	4.3	0.889
Job knowledge and skills	4.1	4.0	4.1	0.155
Soft skills	3.9	3.9	3.9	0.832
Making contacts for job entry	3.4	3.4	3.4	0.807
Number of observations	1,718	576	1,142	1,718

Note: [a] In Germany, an academic year consists of two semesters. [b] The items are measured on a scale from 1 'not useful at all' to 5 'very useful'. Column 4 reports the p-values of two-sample t-tests comparing voluntary and mandatory internships. *Data:* Bavarian Graduate Panel.

Table B-2: The effect of student internship experience on log earnings

	OLS		IV		IV firm	
	Base	Full	Base	Full	Base	Full
	(1)	(2)	(3)	(4)	(5)	(6)
Internship	0.040**	0.042**	0.020	0.028	0.033	0.047
	(0.014)	(0.014)	(0.020)	(0.020)	(0.044)	(0.044)
Female	−0.096***	−0.101***	−0.096***	−0.101***	−0.081***	−0.087***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.022)	(0.022)
University of applied sciences	−0.097	−0.113	−0.095	−0.111	−0.008	−0.098
	(0.080)	(0.081)	(0.080)	(0.080)	(0.155)	(0.156)
Apprenticeship		0.073***		0.073***		0.100***
		(0.012)		(0.012)		(0.023)
High school grade		−0.014		−0.014+		−0.002
		(0.008)		(0.008)		(0.016)
Labor market orientation		0.009*		0.009*		0.016*
		(0.004)		(0.004)		(0.007)
Cohort FE	Yes	Yes	Yes	Yes	No	No
Wave FE	Yes	Yes	Yes	Yes	Yes	Yes
Birth year FE	Yes	Yes	Yes	Yes	Yes	Yes
Area of study FE	Yes	Yes	Yes	Yes	Yes	Yes
Degree type FE	Yes	Yes	Yes	Yes	Yes	Yes
Uni type*study area FE	Yes	Yes	Yes	Yes	Yes	Yes
Parental job qual. FE	No	Yes	No	Yes	No	Yes
Adjusted R2	0.285	0.287	0.284	0.287	0.220	0.225
Number of observations	11,603	11,603	11,603	11,603	4,494	4,494

Note: The dependent variable is log(earnings). Standard errors (in parentheses) are clustered at the individual level. $^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. *Data:* Bavarian Graduate Panel.

Table B-3: First-stage results

	IV		IV firm	
	Base	Full	Base	Full
	(1)	(2)	(3)	(4)
Mandatory internship	0.592***	0.591***	0.525***	0.525***
	(0.012)	(0.011)	(0.021)	(0.021)
Female	0.026**	0.025**	0.016	0.015
	(0.008)	(0.008)	(0.014)	(0.014)
University of applied sciences	−0.063	−0.053	−0.018	−0.020
	(0.072)	(0.073)	(0.102)	(0.105)
Apprenticeship		0.008		0.000
		(0.008)		(0.013)
High school grade		−0.012*		−0.013
		(0.006)		(0.010)
Labor market orientation		0.002		0.002
		(0.003)		(0.004)
Cohort FE	Yes	Yes	No	No
Wave FE	Yes	Yes	Yes	Yes
Birth year FE	Yes	Yes	Yes	Yes
Area of study FE	Yes	Yes	Yes	Yes
Degree type FE	Yes	Yes	Yes	Yes
Uni type*study area FE	Yes	Yes	Yes	Yes
Parental job qual. FE	No	Yes	No	Yes
F-statistic[a]	2,664	2,659	618	617
Partial correlation coefficient	0.410	0.407	0.313	0.310
Adjusted R2	0.536	0.537	0.478	0.479
Number of observations	11,603	11,603	4,494	4,494

Note: The dependent variable is equal to one if a graduate completed an internship during the course of studies, and zero otherwise. Standard errors (in parentheses) are clustered at the individual level. [a] Relates to the instrument variable "Mandatory internship". $^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. *Data:* Bavarian Graduate Panel.

Table B-4: Heterogeneous effects

	OLS	IV	Number of observations
Panel A: Labor market orientation of study subject			
Strong LM orientation	0.033*	0.030	10,068
	(0.014)	(0.020)	
Weak LM orientation	0.106*	0.052	1,535
	(0.047)	(0.138)	
P-value of interaction	0.156	0.906	11,603
Panel B: Field of study [a]			
Science, mathematics, engineering	0.019	0.008	5,012
	(0.016)	(0.020)	
Business and economics	0.064*	0.056	4,098
	(0.029)	(0.046)	
Humanities and social sciences	0.082*	0.074	2,473
	(0.035)	(0.066)	
P-value of interaction (internship × BE)	0.196	0.509	11,583
P-value of interaction (internship × HSS)	0.144	0.377	

Note: All models control for gender, year of birth FE, area of study FE, Uni type-study area FE, degree type FE, university type, job qualification mother and father FE, apprenticeship, high school grade, degree of labor market orientation and a dummy for the 2nd wave. [a] See Table A-3 in Appendix A for a classification of areas of studies into weak and strong labor market orientation. 20 observations are outside of the study field categorization. $^{+}$ p<0.10, * p<0.05, ** p<0.01, *** p<0.001. *Data:* Bavarian Graduate Panel.

Appendix C: Replication of Klein and Weiss (2011)

In this section, we replicate the results from **?** and extend their estimation strategy to additional waves. KW use data from the DZHW 1997 graduation cohort to asses the effect of mandatory internships on earnings five years after graduation. After sample restrictions similar to the ones in the present study, the authors end up with a sample of 1,971 observations. They focus on compulsory internships and use propensity score matching methods to reduce the potential bias naive OLS estimator might generate. They match on characteristics of the study program and on individual characteristics to estimate the propensity to be in a study program with a mandatory internship. The authors estimate an average treatment effect of -0.039 with a z-value of -1.58, implying negative but statistically insignificant returns to mandatory internships. In Table C-1 in column (1) we replicate their findings. We report both unmatched OLS results as well as the estimated average treatment effect on the treated (ATT) after matching. Our sample is somewhat larger than KW's sample; nevertheless we get point estimates very close to theirs. In column (2), we again use the 1997 graduation cohort and propensity score matching methods similar to **?**, but this time we use as matching characteristics the variables we use in the present study. We show that the variable choice is not changing the results qualitatively. In column (3)-(5) we extend the sample to 2001, 2005, 2009 graduation cohorts, and in column (6) we pool these cohorts. The results clearly show that the experience of the 1997 graduation cohort is unique, as for all the other cohorts we get positive returns to internship, and in the full sample the effect is also statistically significant at 5% level.

Table C-1: Mandatory Internships and Log Hourly Wages

Graduate Cohort	1997		2001	2005	2009	2001-2009
	Klein and Weiss					
	(1)	(2)	(3)	(4)	(5)	(6)
OLS (unmatched)	-0.047*	-0.040*	0.025	0.010	0.066*	0.027*
	(0.018)	(0.018)	(0.016)	(0.016)	(0.028)	(0.010)
ATT (prop. score matching)	-0.041	-0.034	0.040	0.045	0.080	0.054*
	(0.031)	(0.025)	(0.030)	(0.029)	(0.056)	(0.020)
Number of observations	2,089	2,046	7,229	8,826	2,639	19,415

Notes: The first column replicates the estimates of Klein and Weiss (2011), Table 3, column 3, page 982, using the same sample selection criteria and the same explanatory variables. KW report a point estimate of -0.039 [z-value$=-1.58$]. Column (2) uses the same sample selection criteria as in Klein and Weiss (2011) and similar explanatory variables as in our main specification (see Table 5, column 2), with the exception of university FE, because they are not included in the standard data format. Columns (3)-(6) report OLS and propensity score matching estimates for the different graduate cohorts, using our preferred specification (see Table 6, column 2). Estimates in columns (3)-(5) do not control for cohort and wave FE. Bootstrapped standard errors in parantheses. $^{+}$ p<0.10, * p<0.05, ** p<0.01.