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Internships are an important and often mandatory part of academic education. They offer valuable insights into the labor market but can also expose students to negative aspects of the working world, such as gender pay disparities. Our paper provides first evidence of a gender pay gap in mandatory internships, with women earning up to 7% less per hour than men. Notably, this gap is not due to women choosing higher-quality internships over higher pay. Further analyses show that the internship pay gap is similar in magnitude to the labor market entry wage gap among graduates. We discuss potential mechanisms by which the internship pay gap may contribute to the graduation wage gap and present empirical evidence to support this.

Keywords: Gender Pay Gap, Internship, Higher Education

JEL-Classification: I23, J24, J31, J71

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1 Introduction

To get a good job these days, a university degree alone is often not enough. Employers seeking entry-level candidates are looking for graduates who can easily transition from the lecture hall to the corporate world. Internships are valuable in this regard, allowing students to put their classroom knowledge into practice, gain insight into the job market, and build valuable experience and networks.[1] The internship data analyzed in this paper supports this,[2] with 94% of students agreeing that they acquired competences during their internships that will be valuable for their future careers,[3] 53% continuing to work at their internship firms (e.g., as student assistants), and 90% considering their internship firm as a potential employer after graduation.[4]

Accordingly, internships are becoming increasingly important. In the US, for example, the overall internship participation of bachelor graduates increased from 29.9 percent in 1994 to 70.5 percent in 2017 (Shandra 2022). In India, the National Education Policy has lately recommended that every undergraduate student in the country should participate in a research internship of at least eight to ten weeks to enhance the employability of graduates.[5] And, about two-thirds of the 2010/11 student start cohort in Germany completed an internship during their studies.[6]

While internships provide students with valuable insights into the labor market, they can also expose them to negative aspects of the professional world. These negative experiences can have a detrimental effect when students enter the labor market and, subsequently, also on their long-term career

[1] For example, the Forbes Human Resources Council emphasizes the importance of internships and the experience and relationships they can create (see `https://www.forbes.com/sites/forbeshumanresourcescouncil/2022/08/12/the-importance-of-internships-and-the-invaluable-relationships-they-bring/`, retrieved on April 4, 2024). The importance of internships is also demonstrated by Margaryan et al. (2022), who show that there is a causal relationship between internships and future wages. Among many others, Rothman & Sisman (2016) suggest that internships provide valuable opportunities for students to explore career paths, identify suitable workplaces, and align their self-concept with future careers.

[2] The following values are based on 833 business internship reports from the university were we collect our data between 2019 and 2023. For details see Section 2.

[3] The information is derived from the following question: "Do you feel that you have gained competencies during your internship that could benefit you in the future?" Students rated their responses on a scale of 1 to 5. The reported percentage value aggregates strong and very strong agreements.

[4] When asked if they could imagine working for their internship firm in their future careers, 58% responded "yes" and 32% responded "maybe".

[5] See `https://www.ugc.gov.in/pdfnews/1887287_Rsearch-Internship-Guidelines-120522.pdf`, retrieved on April 30, 2024.

[6] Own calculation; Source: NEPS, SC5, 17.0.0, cohort 5, see NEPS Network (2022), weighted estimates.

paths.[7] One important and extensively studied negative aspect of working life are gender-based pay disparities.[8] The existence of a gender pay gap in internships would be particularly concerning as it might signal to women, even before they enter the workforce, that they will earn less in their future careers than men.[9]

This paper investigates the gender pay gap in internships using data from mandatory internships between 2019 and 2023 from a business program at a large public university of applied sciences (UAS) in Germany, and assesses the external validity of the results across a wide range of study programs based on the National Educational Panel Study (NEPS). Mandatory internships are quite common in higher education,[10] and of particular interest for several reasons: 1) They usually closely resemble real conditions in the labor market. For example, students at our university apply for their internship positions without support from the university, and the university does not provide detailed work instructions nor does it set rules for pay.[11] 2) Mandatory internships are a prerequisite for graduation; students usually receive credit points upon completion, and they are often accompanied by classes that allow students to reflect on the internship. As a result, students may perceive the experience gained during mandatory internship as more valuable and relevant to their future careers than during voluntary ones. 3) Mandatory internships are not subject to the German minimum wage regulations, leading to a significant variation in internship compensation.[12]

We provide first evidence that women earn significantly less than men during mandatory internships. In the UAS sample, women are paid between 52 and 56 euro cents per hour less than men.[13]

[7] See Kahn (2010) and Oreopoulos et al. (2012) for examples on the literature of the effects of entry-level wages on long-term career paths.

[8] For an excellent summary see Blau & Kahn (2017).

[9] We discuss possible reasons for the relation between the two pay gaps below and in Section 4.3.

[10] In the United Kingdom, for example, Shury & IFF Research (2017) report that around 30% of students completed a mandatory work placement. In Germany, about 75% of the internships conducted by the 2010/11 German student cohort were mandatory (own calculation; Source: NEPS, SC5, 17.0.0, cohort 5, weigheted estimates). In Europe, students at universities of applied sciences, which are an important part of academic education, e.g., in Austria, Germany, the Netherlands, and Switzerland, must generally earn about 1/7th of their credits through an internship semester. Similarly, universities and colleges in the United States have internship requirements for specific programs or majors. For example, cooperative education (co-op) programs often mandate alternating periods of classroom study with work experience in related fields (for details see `https://1997-2001.state.gov/careers/rcoop.html`, retrieved on July 5, 2024). Additionally, many universities in the U.S. and elsewhere, even if they do not require mandatory internships as part of the curriculum, offer the opportunity to earn creditpoints for a voluntary internship, making it an elective part of the study program.

[11] For more details on the institutional setting see Section 2.1.

[12] In the UAS data, about 3% of the students receive no monetary compensation at all. Among the payed students, the top (bottom) 5% earn at least (less than) 11.5 (2.56) euros per hour, the average payment is 6.06 euros per hour (SD=2.75). The German minimum wage between 2019 and 2023 (the period covered in our study) was between 9.19 and 12 euros.

[13] 52 cents is the unadjusted pay gap including semester fixed effects (FE) and a dummy for bachelor vs. pre-master

Internship characteristics such as the internship area (finance, human resources etc.), the industry and the size of the firm partly explain these differences and narrow the gap to imprecisely estimated 32 to 40 euro cents. Wage regressions using log transformed hourly internship pay show gaps between 6.3% (unadjusted gap), 7.2% (incl. human capital controls), and 3.3% to 4.9% (imprecise) when controlling for internship characteristics.

Estimation results using the National Education Panel Survey (NEPS) confirm these findings: the unadjusted internship wage gap is about 8.7%, and rises to 9.4% when we include human capital covariates. Unlike the internship reports, NEPS does not collect firm-specific data. However, it includes variables measuring risk aversion and competitiveness, two traits that are known in the literature to partly explain the gender wage gap.[14] When controlling for these characteristics, the gender gap (8.6%) slightly decreases, indicating that the two traits explain only a small part of gender related pay differences during internships.

Internship compensation is not only monetary. Firms compensate students also by providing insights into the industry and firm culture, work experience, and practical skills. This creates a potential trade-off between the quality of the internship and the pay received. Therefore, the wage gap could arise because women are more willing than men to trade payment for quality. To investigate this, we construct a standardized quality index and compare how women and men evaluate the quality of their internships. If women rated the quality of their internships higher than men, this could indicate that part of the wage gap may be due to women opting for higher quality internships over higher wages. Our results show quite the opposite: a negative relationship between internship quality and female gender; the gender quality gap in the UAS business sample is insignificant, ranging from -0.06 to -0.11 standard deviations (SD). The NEPS data supports this, revealing a significant gender gap in the evaluation of internship quality between -0.17 to -0.18 SD.

Importantly, the internship pay gap may also have implications for the gender gap in entry-level career wages. First, this could be because the internship experience may alter earnings expectations, leading to changes in graduates' job search behavior and wage negotiations for their first job.[15] Second, as Auspurg et al. (2017) show, shaped by individuals' experiences in the labor market, being male

internship, 56 cents is the gap controlling for a set of human capital variables.

[14] See, for example, Manning & Swaffield (2008), Reuben et al. (2015) and Cortés et al. (2023).

[15] For example, Kiessling et al. (2024) and Cortés et al. (2023) argue in their papers that wage expectations may impact the entry-level wages.

can become a status that justifies higher male earnings among both sexes. Therefore, experiencing a pay gap during internships may contribute to women's (and men's) acceptance of pay differences when entering the labor market. The fact that 80% of both female and male students in the UAS data can imagine starting their career in the same field as their internship,[16] and 90% even within the same firm (women: 89%, men: 92%; see footnote 4) strengthens both arguments, since firm (or industry) specific experience are more important for one's further career than general work experience (see Becker 1962 and Bagger et al. 2014), thereby increasing the likelihood that the internship pay gap will carry over to the career start.

To examine the entry-level wage gap, we use administrative data on MBA graduates from the same department where we collected the internship data, who received their masters's degrees between 2010 and 2021. The graduate data is linked to social insurance information from the Integrated Employment Biographies (IEB) of the Institute for Employment Research (IAB). To assess the external validity of the results across a wide range of bachelor's and master's programs, we again use the NEPS survey.

Our results show that there are significant differences in entry-level wages between women and men after graduating with a master's degree. Log transformed wage regressions show pay differences between 6.2% and 6.3% (time dummies and human capital controls). This difference increases slightly to 6.7% when controlling for firm characteristics. The NEPS data show a similar picture. Unadjusted and estimated with different sets of personal characteristics, the differences range from 7.0% to 8.3%. With additional controls for post-graduation characteristics, the gap decreases to a range of 6.6% to 6.9%. This shows that the internship wage gap roughly resembles the entry-level wage gap.

The NEPS data also allow us to examine the relationship between internship compensation and labor market entry wages (although theses analyses may omit unobserved variables). As expected, they are positively correlated, with elasticities ranging from 0.036 to 0.068. Including intern pay as a covariate also reduces the entry wage gap in all specifications, possibly implying that lower internship payments for women explain part of the entry wage gap.

Finally, we show that female and male students hold different entry wage expectations immediately after completing their internships. In the internship survey, women report entry wage expec-

[16]The information is based on the following question: "Can you imagine your future profession in a similar field as your internship?" Students rated their responses on a scale of 1 to 5, with the reported percentage indicating a strong or very strong agreement. Among female (male) students 51% (41%) very strongly agree with the above statement.

tations that are 7% to 12% lower than men's. This suggests that one possible way the internship pay gap may affect the entry wage gap is by shaping students' wage expectations based on internship experience.

Contribution to the literature. This paper contributes to the literature in three ways. First, our study is the first to investigate the gender pay gap during internships, thereby expanding the literature on gender gaps with a specific focus on the pre-graduation period. To our knowledge, the only similar paper is Boll et al. (2022). However, they look at student part-time jobs rather than internships. The gender pay gap in these jobs is between 4.1% and 6%. While student jobs typically involve simple (assistant) tasks and are primarily for earning money, internships are often a mandatory part of education, involving high-skill tasks, and playing a crucial role in academic training by providing opportunities to gain insights and experience in the labor market. As a result, they may exert a much stronger impact on the wage gap post-graduation than student jobs.

Another strand of the gender-gap literature in higher education prior to graduation examines students' entry wage expectations. For example, Frick & Maihaus (2016), Reuben et al. (2017), Fernandes et al. (2021), Briel et al. (2022), Leibing et al. (2023) and Kiessling et al. (2024) show that women expect 5%-15% lower wages upon graduation. Interestingly, the expectation gap is comparable in size to the observed entry wage gap (Kiessling et al. 2024). Similar to the expectations literature, we argue that internships may influence expectations and, consequently, entry-level wages. Additionally, in Section 4.3, we present evidence suggesting that women report 7% to 12% lower salary expectations than men immediately after the internships in their internship reports.

Second, we complement the few studies on the importance of student internships for subsequent labor market outcomes. While Klein & Weiss (2011) find that mandatory student internships have no effect on several labor market outcomes, two other studies present clear evidence for the positive effects of mandatory internships. In a résumé audit study by Nunley et al. (2016), internship experience increases interview rates by 14%. Margaryan et al. (2022) use a natural experiment and find a 6% return on wages from internships, as well as a lower unemployment risk during the first years after graduation. Our results also highlight the importance of student internships for one's future career, as intern pay and entry-level wages are positively correlated, and since many students consider their internship firm as a potential employer in the future or even continue working for the same firm after

the internship (as student assistants).

Third, we add to the literature on the entry wage gap after graduation. The size of the gap in our study corresponds to the results of other studies which focus on German graduates of a single study program (e.g., Reimer & Schröder 2006, Bredtmann & Otten 2014). Studies which focus on students of several or all programs tend to find somewhat larger gender pay gaps after graduation, especially higher raw wage gaps, i.e. before controlling for differences in individual or firm level characteristics (e.g., Machin & Puhani 2003, Black et al. 2008, Braakmann 2013, Behr & Theune 2018, Francesconi & Parey 2018, Sandner & Yükselen 2024, Cortés et al. 2023).

The paper proceeds by providing information on the institutional background and the data as well as descriptive statistics. Section 3 presents the gender pay gap in mandatory internships, assesses the external validity of the findings and investigates gender-related quality differences in internships. In Section 4, we provide results for the gender wage gap upon entering the labor market and discuss potential links between the internship gap and the labor market entry gap. Section 5 concludes and raises several questions for future research.

2 Institutional Background, Data and Descriptives

We collect internship data from 833 internship reports between the winter semester 2019/20 and the winter semester 2022/23, submitted by students of the business bachelor program at one of the largest public universities of applied sciences in Germany.[17] Business is the largest program at our university and also the most popular one in all of German higher education. For instance, in the winter term 2021/22 approximately 8.3% of all freshman students in Germany chose business (Statistisches Bundesamt 2022).

We supplement the internship information with administrative data from the university (e.g., gender, age, high school GPA, university GPA and credits attained before the internship etc.) and refer to the linked data as *UAS Internship Data*. To estimate job entry-level wage equations in Section 4, we merge administrative data from business graduates of our university who received their masters' de-

[17] The university consists of 13 faculties and offers more than 20 bachelor's degree programs and a variety of master's programs. It has a student population of more than 13,000 students.

gree between 2010 and 2021 with administrative labor market biography data from the Institute for Employment Research (*UAS-IAB Labor Market Data*). We use data from the National Education Panel Survey (*NEPS Data*) to assess the external validity of our results.

2.1 UAS Internship Data

Institutional Background. The curriculum of the bachelor business program requires a mandatory 20-week full-time internship in the fifth semester.[18] To successfully complete the internship, students must also pass a course at the university and submit an internship report, which consists of a mandatory survey and an open report section. In total, the internship is worth 30 credits which is 1/7 of the credits needed to obtain the bachelor's degree. The internship closely reflects real-world conditions on the labor market, i.e., students must apply without the support of the university, the university does not set rules for pay and only provides general guidelines for job tasks.

Responses in the report indicate that most students have no trouble finding a job: When asked how difficult they consider the entire search and application process, 66% (88%) responded that it was easy or very (moderately) easy. On average, students start searching for an internship position 4.06 months before they start, the mean number of applications sent out is 5.46, and 47% of all students end up with more than one job offer.

Data and Descriptives. We derive the pay information from the mandatory internship survey. The question on internship compensation per month is optional. Of the 833 students who completed their internship, 129 (15.49%) chose not to diclose their compensation. Interestingly, the item response rate for this variable was significantly higher among women (90.27%) than men (76.94%).

Only 27 students (3.24%) reported that they did not receive monetary compensation. In the pay equations in Section 3, we consider only students who got paid. We also drop 10 observations with unrealistically low payments of 1-2 euros per month, resulting in a final sample size of N=667.

To construct our main outcome variable, hourly internship pay, we divide monthly intern compensation by the self-reported working hours per week multiplied with the average number of weeks per month and winsorize the hourly pay values at the 1% and 99% percentiles. The Internship Quality

[18] Our estimation sample also comprises 4% of students who are required to complete an internship for admission to the business master's program (pre-master internship). These internships follow the same regulations as internships during the bachelor.

Index in Table 3 is based on four survey questions on the quality of the internships (details are in the note below Table 3).

Table 8 in the Appendix shows that the characteristics of the 404 female and 263 male students in our sample are mostly balanced.[19] Apart from the pay gap, the only significant gender differences are as follows: When starting the internship, men are on average 0.87 years older than women, while women were 0.09 grade points better in school (= 0.2 male HS GPA SD).[20] The proportion of women who have obtained the general university entrance qualification ("Abitur") is almost 10 percentage points (pp) higher, and men are more likely to choose internships in fields like accounting, finance, organisation or business informatics, whereas more women opt for internships in human resources.

2.2 UAS-IAB Labor Market Data

To investigate the labor market entry-wage gap, we link our student data with the Integrated Employment Biographies (IEB) provided by the Institute of Employment Research (IAB). Since the students in the UAS internship data had not yet completed their degrees at the time of the data match, we analyze business master's graduates from the same university who received their degree between 2010 and 2021.[21] The record linkage is based on methods and software similar to those suggested by the German Record Linkage Center (GRLC, see Antoni & Schnell 2019). The linkage success rate of the UAS Data to the IAB Data in our application was around 94%.[22]

The IAB labor market data contains precise information on daily wages from employer notifications to social security, as well as information about the size and structure of the establishment.[23] Since the IAB data lack information on working hours but do specify whether a job is full-time or part-time, we restrict our analysis to full-time positions. We also exclude jobs that were preceded by unusually long search periods by only considering the first full-time job that a student took up within

[19] To keep all observations in the sample when using the university (high school) GPA as a covariate, we impute 3 (1) values based on linear regression of the GPA on age, age squared and gender. In the regressions, we added a dummy variable to the covariates which is one if university or HS-GPA was imputed.

[20] On the German grade scale 1.0 is the best and 4.0 the worst grade.

[21] We consider only master's graduates, because we cannot observe whether bachelor's graduates go on to complete a master's degree at another university, enter the labor market directly, or pursue a combination of both.

[22] A detailed step by step description of our linkage procedure can be found in Antoni et al. (2024).

[23] See Schmucker et al. (2023) and Ganzer et al. (2023) for more information on the worker-level and on the establishment-level data included in the IAB Data, respectively.

1.5 years after graduation.[24] The above adjustments, along with the presence of missing values on the covariate high school GPA, resulted in final estimation sample size of 1,370 observations.

The outcome variable of interest is daily wages. As with the UAS data, we winzorize daily wages at the 1% and 99% percentiles and calculate natural logarithms. Table 12 provides descriptive statistics. Pooled over all cohorts daily wages of women are around 5% lower than those of men (see rows 2 and 4 of Table 12). Other notable gender-specific differences are the following: Women are more likely to have a general higher education entrance qualification, they have done better at school, earned better grades at the university, studied less semesters to earn their degree, and a larger (smaller) proportion of women study Marketing and Business Administration (Financne and Law). In terms of career paths the entry-firms of men are smaller on average than those of women.

2.3 National Education Panel Survey (NEPS Data)

To evaluate the external validity of our results, we use data from the National Education Panel Survey's Starting Cohort 5, 'First Year University Students', collected between 2011 and 2020 (NEPS, SC5, 17.0.0, for details see NEPS Network 2022). Unlike the UAS data, the NEPS includes a wide range of study programs from various fields (see Table 13 for details) both at more research-oriented universities and universities of applied sciences.

NEPS Internship Data. When analyzing internship pay, we consider only full or harmonized spells of the following types: i) mandatory internships during the degree program, and ii) mandatory internships before the program which were later credited towards degree attainment. Regarding the first group, we only keep internships in the sample that began in 2011 or later, as 2011 is when individuals in Cohort 5 began their first year at the university.

Individuals studying to become school teachers were removed from our sample since internships in this field in Germany do not reflect real-world labor market conditions. As in the UAS Data, we only consider paid internships. These adjustments result in a final sample size of 4,261 spells from 3,345 students. We account for the fact that some students participated multiple internship by adding a set of binary variables to the regression control vector that reflect the number of internship spells per individual.

[24] The entries into the labor market took place between 2012 and 2021.

To construct hourly internship pay we divide monthly internship compensation by the self-reported working hours per week and the average number of weeks per month. The resulting hourly pay values are winsorized at the 1% and 99% percentiles. The Internship Quality Index in Table 4 is based on 14 survey questions on the quality of the internships (details are in the note below Table 4). Due to item non-response, the number of spells in Table 4 decreases to 3,986 (stemming from 3,194 students).

Women and men in the NEPS sample differ in many ways (see Table 14). For example, women on average hold a high school GPA that is 0.18 grade points better, their university GPA is 0.17 points better, and they are more risk averse and less competitive compared to men. The choice of subjects also differs by gender, with women being more likely to study linguistics, cultural studies, law, economics, social sciences and medicine, while men prefer engineering, math and science. These preferences also influence the degrees pursued, with women more (less) frequently opting for (against) a state examination (bachelor's degree) compared to men.

NEPS Labor Market Data. For the NEPS wage equations (Table 6), we analyze full or harmonized working episodes of non-student jobs reported by individuals who had completed at least one mandatory internship (i.e., students included in Table 2). We consider only the first full-time working episode following after the last intern spell. Self-employed individuals, teachers, and those who had not earned an academic degree prior to entering the labor market are excluded from the sample. These adjustments, together with item non-response and panel attrition, result in a sample size of N = 1,481.

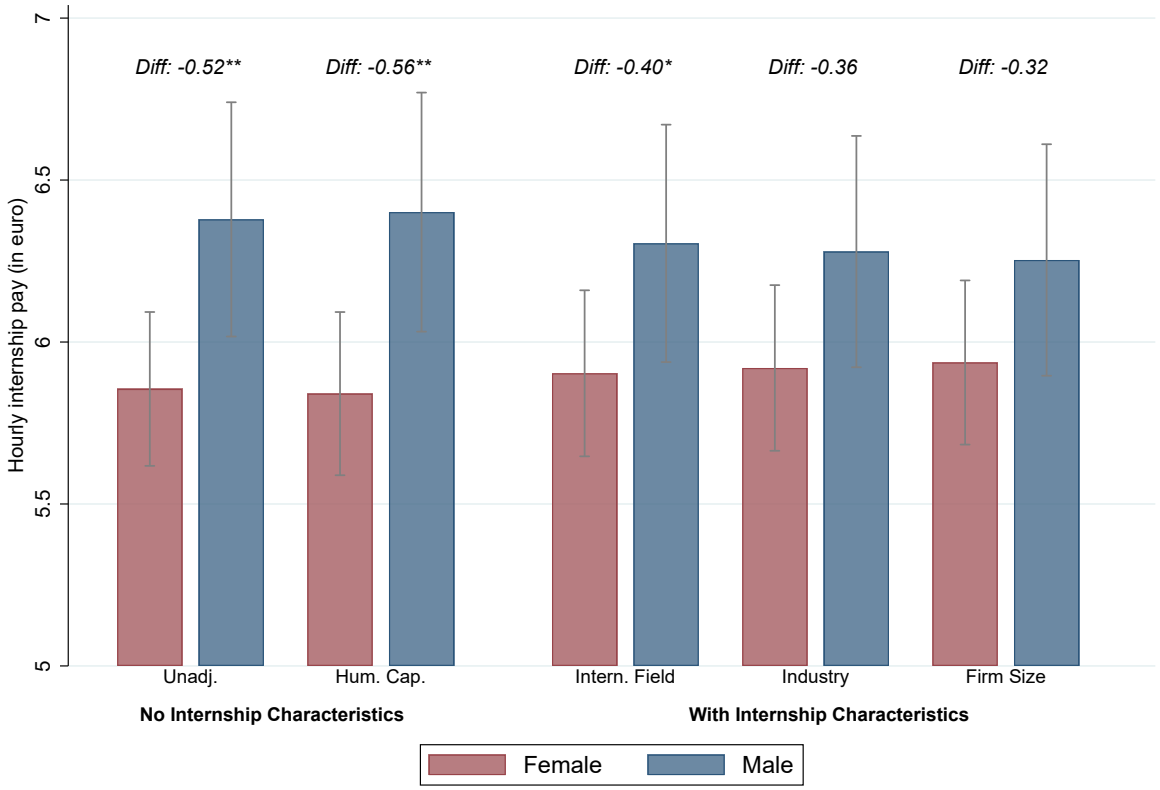
We construct gross hourly wages by dividing gross monthly salaries by the self-reported working hours per week and the average number of weeks per month. The resulting hourly wages are winsorized at the 1% and 99% percentiles.

We depict differences between women and men in Tables 15 and 16. For example, men are about half a year older when they enter the labor market. Gender related differences in educational outcomes are largely comparable to those in Table 14, which makes us confident that there is no gender-selective panel attrition. We find no systematic gender differences with respect to firm size, and the share of women working in clerical support occupations is 5.7 pp higher than for women, while among professionals it is 4.5 pp lower.

3 The Gender Pay Gap in Mandatory Student Internships

Figure 1 shows the average differences in hourly internship pay between female and male business students between 2019 and 2023. Controlling for the semester of the internship and pre-master vs. bachelor internships, the unadjusted pay gap is 0.52 euro cents, increasing slightly to 0.56 when we add human capital variables (for details, see the note below the figure).

Figure 1: Hourly Internship Pay, Women vs. Men, UAS Internship Data



Source: Internship Reports Business Students, UAS Internship Data, 2019-2023. $N = 667$. *Notes:* The figure shows the hourly internship pay of women and men based on OLS regressions of the hourly internship pay (winsorized at the 1% and 99% percentiles) on a gender dummy and an expanding set of covariates. Unadjusted: Internship semester FE (winter semester 2019/20 - winter semester 2022/23), dummy for bachelor vs. pre-master internship. Human capital: dummy variables for completed pre-internship semesters, age, age squared, type of university entrance qualification FE, HS GPA (missing values imputed), GPA and number of accumulated credits before internship (GPA imputed if pre-master internship), dummy for imputed values on HS and univ. GPA, dummy for having studied another program before. Internship field: Dummies for finance/accounting, human resources, logistics, organization/business informatics, others/missing values. Industry: Dummies for manufacturing, financial and insurance industry, other services, health/social/education, others. Firm size: Dummies for < 9, 9-49, 50-249, > 249 employees, unknown/not available/missing. Confidence intervals are based on robust standard errors.

Potential explanations for the gender pay gap range from differences in study program, industry and firm choices to variations in personality traits. While the UAS data do not allow us to control for

the latter, we can distinguish internship characteristics such as the field of the internship (e.g., human resources, marketing) or the industry and size of the firm.[25] Adding these variables as covariates in a stepwise approach reduces the pay gap to 0.40, 0.36 and finally 0.32 euro cent.

Due to the COVID-19 pandemic, between the summer of 2020 and the summer of 2021 (when the vaccine was introduced), professional activities, including internships, shifted to remote-work wherever possible. During this period, out of 318 students in the internship survey, 13.6% reported exclusively working from home, and 57.7% stated they worked at least partially from home. To investigate whether the shift in working conditions during the pandemic had an impact on the intern pay gap, Figure 2 in the Appendix presents the development of internship compensations between the winter semesters (WiSe) of 2019/20 and 2022/23. The graph shows that also during the pandemic, men were better paid for internships than women. In fact, men earn more than women throughout the entire observation period except for the summer semester (SuSe) 2022.

Table 1 shows percentage differences in internship pay between women and men, based on log pay estimates using the same covariates as in Figure 1. The unadjusted pay gap in Columns (1) and (2) ranges from 6.3% to 7.2%. Controlling for internship field, industry, and firm size reduces this gap to 4.9%, 4.4%, and 3.3%. As shown in Table 9 in the Appendix, the pay disparities get more pronounced when we leave out the 'outlier' semester SuSe 2022 (see also Figure 2 in the Appendix).

Table 1 further indicates that about one third of the pay difference can be attributed to the field in which the internship was conducted (see Column 3), while controlling for industry and firm size does not reduce the gap much further. The descriptives in Table 8 show that men tend to choose higher-paying areas, such as accounting, finance, organization, or business informatics. In these areas, the average hourly compensation in our sample is 6.5 euros. Conversely, significantly more women than men opt for internships in human resources, where the average hourly pay is lower at 5.65 euros (p-value of mean comparison between the two salaries: <0.01).

3.1 External Validity

Since the UAS data were only collected for business students, we use the NEPS survey (see Section 2.3) to assess the external validity of the above results. Table 2 presents estimates of the percentage hourly

[25] These variables could be considered as outcomes of gender-related differences itself; however, drawing on the extensive literature on wage gaps, we control them to calculate the "adjusted" pay gap.

Table 1: Gender Pay Gap in Mandatory Student Internships, UAS Data

	Log Hourly Internship Pay				
	(1)	(2)	(3)	(4)	(5)
Female	-0.0632*	-0.0716*	-0.0492	-0.0437	-0.0332
	(0.0365)	(0.0390)	(0.0397)	(0.0390)	(0.0385)
Controls	Yes	Yes	Yes	Yes	Yes
Human Capital Variables	No	Yes	Yes	Yes	Yes
Internship Field Dummies	No	No	Yes	Yes	Yes
Industry Dummies	No	No	No	Yes	Yes
Firm Size Dummies	No	No	No	No	Yes
N	667	667	667	667	667
R-squared	0.0644	0.0960	0.120	0.167	0.193

Source: Internship Reports Business Students, UAS Internship Data, 2019-2023. *Notes:* OLS estimates. Dependent variable: Log hourly internship pay winsorized at the 1% and 99% percentiles. Controls: Internship semester FE (winter semester 2019/20 - winter semester 2022/23), dummy for bachelor vs. pre-master internship. Human capital variables: dummy variables for completed pre-internship semesters, age, age squared, type of university entrance qualification FE, HS GPA (missing values imputed), university GPA and number of accumulated credits before internship (GPA imputed if pre-master internship), dummy for imputed values on HS GPA and univ. GPA, dummy for having studied another program before. Internship field dummies: Finance/Accounting, Human Resources, Logistics, Organization/Business Informatics, Others/Missing Values. Industry dummies: Manufacturing, Finance and Insurance, Other Services, Health/Social/Education, Others. Firm Size Dummies: < 9, 9-49, 50-249, > 249 employees, unknown/not available/missing. Robust standard errors in parentheses. Asterisks denote statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

gender pay gap for mandatory internships across various study programs at universities of applied sciences and more research-oriented universities in Germany. In Column (1), we present the unadjusted gap. To make the estimates comparable to the unadjusted gap among UAS business students (Table 1, Column 1) we control for the internship year, internship duration, the number of internship spells, study program fixed effext (FE), the intended degree, the type of university and institution FE. In Column (2), we additionally include several human capital variables. The pay gap using the NEPS data ranges from 8.7% to 9.4%. It is slightly larger than in the UAS data, and literally identical to the gap without the SuSe 2022 (see Table 1 and Table 9 in the Appendix).

Unlike the UAS data, it is not possible to control for the characteristics of the intern firm in the NEPS data. However, NEPS provides individual characteristics of the students, specifically risk aversion and competitiveness. Both are personality traits that the literature considers relevant for the job search process and wage negotiations (see, e.g., Manning & Swaffield 2008, Reuben et al. 2015, Cortés et al. 2023). Since mandatory internships often closely resemble real conditions in the labor market, systematic gender differences in these traits – as observed in our data where women are more risk-averse and less competitive (see Table 14 in the Appendix) – could explain part of the gender pay gap in internships. Column (3) of Table 2, which includes estimates that control for both variables, shows

Table 2: Gender Pay Gap in Mandatory Student Internships, NEPS Data

	Log Hourly Internship Pay		
	(1)	(2)	(3)
Female	-0.0870***	-0.939***	-0.0859***
	(0.0261)	(0.0259)	(0.0265)
Controls	yes	yes	yes
Human Capital Variables	no	yes	yes
Dummies Risk Avers. Scale (0-10)	no	no	yes
Dummies Competitiveness Scale (0-4)	no	no	yes
N internship spells	4,261	4,261	4,261
N students	3,345	3,345	3,345
R-squared	0.240	0.247	0.250

Source: NEPS, SC5, 17.0.0. *Notes:* OLS estimates. Dependent variable: Log hourly internship pay winsorized at the 1% and 99% percentiles. *Controls:* Internship year FE, internship duration, number of internship spells FE, study subject FE, intended degree FE, a dummy for the type of university (University of Applied Science vs. University), and institution fixed effects. Human capital variables: Fixed effects for highest educational attainment prior to university entry in WiSE 2011/12 (ISCED-97), high school GPA (HS GPA), dummy indicator for imputed values of HS GPA, age at start of internship, age squared, first-semester university GPA, dummy for imputed values of university GPA, dummy variables for self-assessment scale of first-semester study effort compared to study plan (1-5), and a dummy for missing values on self-assessed 1st semester effort. Risk Avers. Scale: Risk aversion is measured on a scale between 0 (= not willing to take risks at all) and 10 (= very willing to take risks). Competitiveness Scale: Competitiveness (0 = does not apply at all – 4 = completely applies) is based on the two variables 'I learn because [...] I want to belong to the best' and '[...] want to be better than others in exams' which were accumulated and divided by two. Robust standard errors clustered at the institutional level in parentheses. Asterisks denote statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

that they slightly reduce the pay gap (back to 8.6%).

3.2 Internship Quality

Interns do not just get paid money. Firms also compensate students by providing insights into the industry and firm culture, fostering work experience, and enhancing practical skills. This creates a potential trade-off between internship quality and the received pay. Consequently, the gender pay gap might emerge because women prefer better internships over higher pay.

To investigate this, we compute a standardized internship quality index in both the UAS and NEPS data (for details see notes below Tables 3 and 4) and compare how women and men assess the quality of their internships using the same samples and regressions as in the pay equations.[26] If women rated the quality of their internships higher than men, it could suggest that part of the wage gap is attributable to women choosing superior quality internships over higher salaries.

[26]Due to item non-response the number of observations in the NEPS data is slightly lower than in the pay estimates in Table 2.

Table 3: Gender Differences in Internship Quality, UAS Internship Data

	Standardized Internship Quality Index				
	(1)	(2)	(3)	(4)	(5)
Female	-0.0599	-0.0798	-0.103	-0.102	-0.114
	(0.0766)	(0.0786)	(0.0811)	(0.0816)	(0.0816)
Controls	Yes	Yes	Yes	Yes	Yes
Human Capital Variables	No	Yes	Yes	Yes	Yes
Internship Field Dummies	No	No	Yes	Yes	Yes
Industry Dummies	No	No	No	Yes	Yes
Firm Size Dummies	No	No	No	No	Yes
N	667	667	667	667	667
R-squared	0.0273	0.0580	0.0678	0.0696	0.0828

Source: Internship Reports Business Students, UAS Internship Data, 2019-2023. *Notes:* OLS estimates. Dependent variable: Standardized internship quality index. The index is the standardized inverse-covariance weighted average (following Anderson 2008 and using the Stata Ado-file by Schwab et al. 2020) of four survey questions that asked students if they have a direct contact person at the firm, whether they worked in several departments, whether there was an education plan for the internship and whether learning objectives have been set. *Controls*: Internship semester FE (winter semester 2019/20 - winter semester 2022/23), dummy for bachelor vs. pre-master internship. Human capital variables: dummy variables for completed pre-internship semesters, age at start of internship, age squared, type of university entrance qualification FE, HS GPA (missing values imputed), university GPA and number of accumulated credits before internship (GPA imputed if pre-master internship), dummy for imputed values on HS GPA and univ. GPA, dummy for having studied another program before. Internship field dummies: Finance/Accounting, Human Resources, Logistics, Organization/Business Informatics, Others/Missing Values. Industry dummies: Manufacturing, Finance and Insurance, Other Services, Health/Social/Education, Others. Firm Size Dummies: < 9, 9-49, 50-249, > 249 employees, unknown/not available/missing. Robust standard errors in parentheses. Asterisks denote statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

However, if anything, the estimates in Tables 3 and 4 show a negative relationship between internship quality and female gender. In the UAS business sample (see Table 3), the gender quality gap is statistically insignificant, ranging from -0.06 to -0.11 SD. The NEPS data (Table 4) support this finding, showing that women rate the quality of their internships significantly lower than men (-0.16 to -0.17 SD).

4 Possible implications

The internship pay gap may also have implications for the gender gap in entry-level career wages. In this section, we first examine gender differences in the initial wages of business graduates from our university. To evaluate the external validity of the findings across a broader range of programs, we again use the NEPS survey. We then discuss possible mechanisms through which the internship gap may translate into the entry-wage gap and present some descriptive evidence for this.

Table 4: Gender Differences in Internship Quality, NEPS Data

	Std. Intern. Quality Index		
	(1)	(2)	(3)
Female	-0.170***	-0.176***	-0.166***
	(0.0456)	(0.0440)	(0.0438)
Controls	yes	yes	yes
Human Capital Variables	no	yes	yes
Dummies Risk Avers. Scale (0-10)	no	no	yes
Dummies Competitiveness Scale (0-4)	no	no	yes
N internship spells	3,986	3,986	3,986
N students	3,194	3,194	3,194
R-squared	0.073	0.083	0.087

Source: NEPS, SC5, 17.0.0. *Notes:* OLS estimates. Dependent variable: Internship quality index. The index is the standardized inverse-covariance weighted average (following Anderson 2008 and using the Stata Ado-file by Schwab et al. 2020) of 14 survey questions that asked students about the comprehensiveness, qualification requirement, task diversity, autonomy, supervision and qualifications capacity of their internship. *Controls:* Internship year FE, internship duration, number of internship spells FE, study subject FE, intended degree FE, a dummy for the type of university (University of Applied Science vs. University), and institution fixed effects. Human capital variables: Fixed effects for highest educational attainment prior to university entry in WiSE 2011/12 (ISCED-97), high school GPA (HS GPA), dummy indicator for imputed values of HS GPA, age at internship start, age squared, first-semester university GPA, dummy for imputed values of university GPA, dummy variables for self-assessment scale of first-semester study effort compared to study plan (1-5), and a dummy for missing values on self-assessed 1st semester effort. Risk Avers. Scale: Risk aversion is measured on a scale between 0 (= not willing to take risks at all) and 10 (= very willing to take risks). Competitiveness Scale: Competitiveness (0=does not apply at all - 4=completely applies) is based on the two variables 'I learn because [...] I want to belong to the best' and '[...] want to be better than others in exams' which were accumulated and divided by two. Robust standard errors clustered at the institutional level in parentheses. Asterisks denote statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

4.1 The Labor Market Entry Wage Gap

To examine the entry-level wage gap, we use administrative data (IEB, see Section 2.2) for 1,370 business graduates from the same department were the internship data was gathered, who completed their masters' degree between 2010 and 2021.[27]

Table 5 shows that that there exists a gender labor market entrance wage gap among the UAS business master's graduates in favor of men. Without controlling for personal and firm characteristics men earn about 6.2% more then women when entering the labor market. Estimates in Columns (2) and (3) show that the gap is robust to the additional inclusion of human capital covariates and firm characteristics (6.2% and 6.7%). Interestingly, the wage gap among the master's business graduates at our university is about the same size as the plain UAS internship pay gap in Table 1.

[27] Note that, although we have data on Master's graduates from 2010 to 2021, we do not observe labor market entries in 2010.

Table 5: Gender Wage Gap First Full-Time Employment, Business Master's Graduates, UAS-IAB Labor Market Data

	Log Daily Wages		
	(1)	(2)	(3)
Female	-0.0622***	-0.0627***	-0.0668***
	(0.0173)	(0.0188)	(0.0182)
Entry Year FE	Yes	Yes	Yes
Human Capital Variables	No	Yes	Yes
Firm Characteristics	No	No	Yes
N	1,370	1,370	1,370
R-squared	0.0942	0.1142	0.1927

Source: UAS-IAB Labor Market Data, 2010-2021, MBA graduates. *Notes:* OLS estimates based on the first full-time employment period within the first 1.5 years following an MBA graduation. Dependent variable: Log daily wages winsorized at the 1% and 99% percentiles. Entry Year FE: Time fixed effects for first full time employment spell (2011-2021). Human Capital Variables: age (at graduation), age squared, type of university entrance qualification, university GPA (master's degree), high school GPA, dummy for imputed high school GPA, number of semesters until completion of the Business Master's program, total semesters studied at a German university (including previous programs), foreign citizenship, study program FE. Firm Characteristics: Industry dummies, firm size dummies. Robust standard errors in parentheses. Asterisks denote statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

4.2 External Validity

Similar to Section 3, in Table 6 we also assess the external validity of the labor market entry-wage gap using the NEPS survey. We focus on students' first full-time employment period after their internship, regardless of which academic degree they have obtained. The estimates only include individuals who completed a paid mandatory internship during their higher education and exclude self-employed individuals, teachers and university drop-outs.

The results are presented in the odd-numbered columns of Table 6. Logarithmized gross hourly wages serve as dependent variable, allowing the gender gap to be interpreted as a percentage difference. Detailed descriptions of the control variables can be found in the notes below the table and in the Appendix in Tables 15 and 16. The unadjusted wage gap ranges from 7.8 to 8.3% (see Columns 1 and 3). Similar to the internship gap, the inclusion of personality traits (risk aversion and competitiveness) in the control vector hardly changes the results (8.1%, see Column 5). Controlling for various firm and job characteristics (firm size, industry, and occupation, all of which are potential outputs; see discussion in footnote 3) reduces the gap by a little more than one percentage point to 6.9% (see Column 7).

Table 6: Gender Wage Gap First Full-Time Employment, Students with Paid Mandatory Internships, NEPS Data

	Log of Hourly Wage in First Full-Time Job							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Female	-0.0779***	-0.0698***	-0.0832***	-0.0758***	-0.0814***	-0.0742***	-0.0690***	-0.0662***
	(0.0192)	(0.0197)	(0.0196)	(0.0200)	(0.0200)	(0.0204)	(0.0193)	(0.0195)
Log. Hrly. Intern Pay[b)]		0.0679***		0.0671***		0.0677***		0.0355**
		(0.0143)		(0.0142)		(0.0148)		(0.0142)
Controls	yes		yes		yes		yes	
Human Capital Variables	no		yes		yes		yes	
Dummies Risk Avers. Scale (0-10)	no		no		yes		yes	
Dummies Competitiveness Scale (0-4)	no		no		yes		yes	
Firm and Job Characteristics	no		no		no		yes	
N[a)]	1,481		1,481		1,481		1,481	
R-squared	0.267	0.278	0.284	0.295	0.291	0.302	0.427	0.429

Source: NEPS, SC5, 17.0.0. *Notes:* OLS estimates. Dependent variable: Log of first full-time hourly wages after internship, winsorized at the 1% and 99% percentiles. *Controls:* Employment start year FE, study subject FE, a dummy for the type of university (University of Applied Science vs. University), and education institution fixed effects. Human capital variables: High school GPA (HS GPA), dummy indicator for imputed values on HS GPA, age at employment start, age squared, first-semester university GPA, dummy for imputed values of university GPA, dummy variables for self-assessment scale of first-semester study effort compared to study plan (1-5) inkl. a dummy for missing values on self-assessed 1st semester effort, dummies for the highest degree attained before labor market entry (ISCED), dummies for each value of the overall years of education. Risk Avers. Scale: Risk aversion is measured on a scale between 0 (= not willing to take risks at all) and 10 (= very willing to take risks). Competitiveness Scale: Competitiveness (0 = does not apply at all - 4 = completely applies) is based on the two variables 'I learn because [...] I want to belong to the best' and '[...] want to be better than others in exams' which were accumulated and divided by two. Firm and Job Characteristics: Firm size FE, occupation FE, and industry FE. Robust standard errors clustered at the level of the education institution in parentheses. Asterisks denote statistical significance: *** p<0.01, ** p<0.05, * p<0.1.
a) Includes only students who reported paid mandatory internship spells, i.e., only individuals that also appear in Table 2. *b)* For students who completed multiple internships, the mean hourly wage was calculated.

When comparing these results to the previous sections, two points are of importance: 1) The entry wage gap in the NEPS sample is somewhat larger than the gap in the UAS-IAB data (see Table 5) and about the same size when controlling firm characteristics. 2) The NEPS entry wage gap is somewhat smaller but roughly resembles the NEPS internship pay gap (see Table 2).

4.3 Discussion

So far, we identified a gender pay gap both in internship compensation and in entry wages upon graduation. Two theoretical explanations link the two gaps. First, the experience gained during the internship may impact students' entry earnings expectations, which in turn may influence their job search behavior and wage negotiations for their first job. As already outlined in the introduction, the literature provides ample empirical evidence for a gender gap in students' entry wage expectations (see, e.g., Frick & Maihaus 2016, Reuben et al. 2017, Cortés et al. 2023, Fernandes et al. 2021, Kiessling et al. 2024, and Briel et al. 2022). In addition, Cortés et al. (2023) developed a search model that illustrates how different reservation wages for women and men, determined by their expectations, can lead to different job search durations and consequently to an entry wage gap.

Second, as Auspurg et al. (2017) suggest, experiences in the labor market can determine a status accepted by women and men that justifies higher wages for men. Translated to our context, this may imply that if students experience a pay gap during their internships, it could also influence their acceptance of pay differences when they enter the labor market. In other words, early experiences of gender-based pay disparities during internships might contribute to a mindset that expects or even accepts such differences in wages when starting a professional career.

Descriptive Evidence. In the following we present and summarize some evidence that fosters our idea that the internship pay gap may contribute to the entry wage gap among university graduates:

i) The size of the gender wage gap upon labor market entrance identified in Sections 4.1 and 4.2 is roughly equivalent to the estimated internship pay gaps in Section 3.

ii) Female and male students in the UAS data hold different entry wage expectations immediately after having completed their internship. To investigate this, we asked them about their expectations as part of the internship survey during the summer semester 2022 and the winter semester 2022/2023. It turns out that women's expectations of their entry wages are 7% to 12% lower than men's (see Table 10

in the Appendix).[28]

iii) Intern pay and entry wages are positively correlated. Other than the UAS data the NEPS data is a panel data set and allows us to investigate whether there is a correlation between internship pay and entry-level wages within the same cohort. Although it is certainly possible that there are omitted variables which may bias the parameter estimates upwards, the empirical results in Table 6 (even columns) tentatively indicate a positive relationship between internship pay and entry level wages, with elasticities ranging from 0.036 to 0.068.

iv) Including internship pay as a covariate reduces the entry wage gap in all specifications in Table 6. This could possibly suggests that narrowing the internship gap by paying higher intern compensation to women could help reduce the entry wage gap.

v) 80% of the students in the UAS data express interest in launching their careers in the same field where they interned, and 90% are open to the idea of working for the same company (for details see footnote 4). Because firm- (and industry-) specific experience are generally known to be more important for one's future career than general work experience (see, e.g., Becker 1962 and Bagger et al. 2014), the positive evaluation of our students regarding their intern employers strengthens both the idea that intern compensation and entrance wages are correlated and the idea that a pay gap during internships makes it more likely to accept one when entering the labor market.

5 Conclusion and Open Questions

Using both administrative and survey data, our study shows for the first time a gender pay gap in mandatory internships, with women earning up to 50 cents less per hour than men. Importantly, this pay gap is not attributable to women opting for higher-quality internships over higher pay. Additionally, we show that the internship pay gap is roughly similar in size to the gender pay gap observed in entry-level wages after graduation. This together with a gender gap in entry wage expectations and a positive correlation between intern pay and entry wages tentatively suggests that the internship pay gap may contribute to the overall gender wage gap among university graduates entering the labor market.

[28]The question was added to the intern survey at our initiative in the summer semester 2022. We asked "Imagine that you have completed your current studies with a bachelor's degree and are working full-time: What do you estimate your gross annual income will be in the first year after your graduation?". Responding to the question was voluntary.

Our study raises several important questions that can serve as starting points for further research:

i) Why do women earn less in internships than men? While our findings indicate that the pay difference cannot be attributed to internship quality or personal characteristics but rather to the field of the internship, there remains an unexplained difference, warranting further examination.

ii) Does the level of internship compensation have a causal effect on entry wages, possibly establishing a causal link between the internship gap and the labor market entry wage gap? Notably, there is a general lack of (quasi-) experimental studies in this area. To date, causal evidence regarding internships and later career outcomes was provided only by Nunley et al. (2016) and Margaryan et al. (2022). They find that completing an internship influences the number of job interview requests and the wage level.

iii) What are the possible mechanisms linking the internship gender pay gap to the entry wage gap? Specifically, do internships causally influence entry-wage expectations, leading to subsequent changes in entry wages through this channel?

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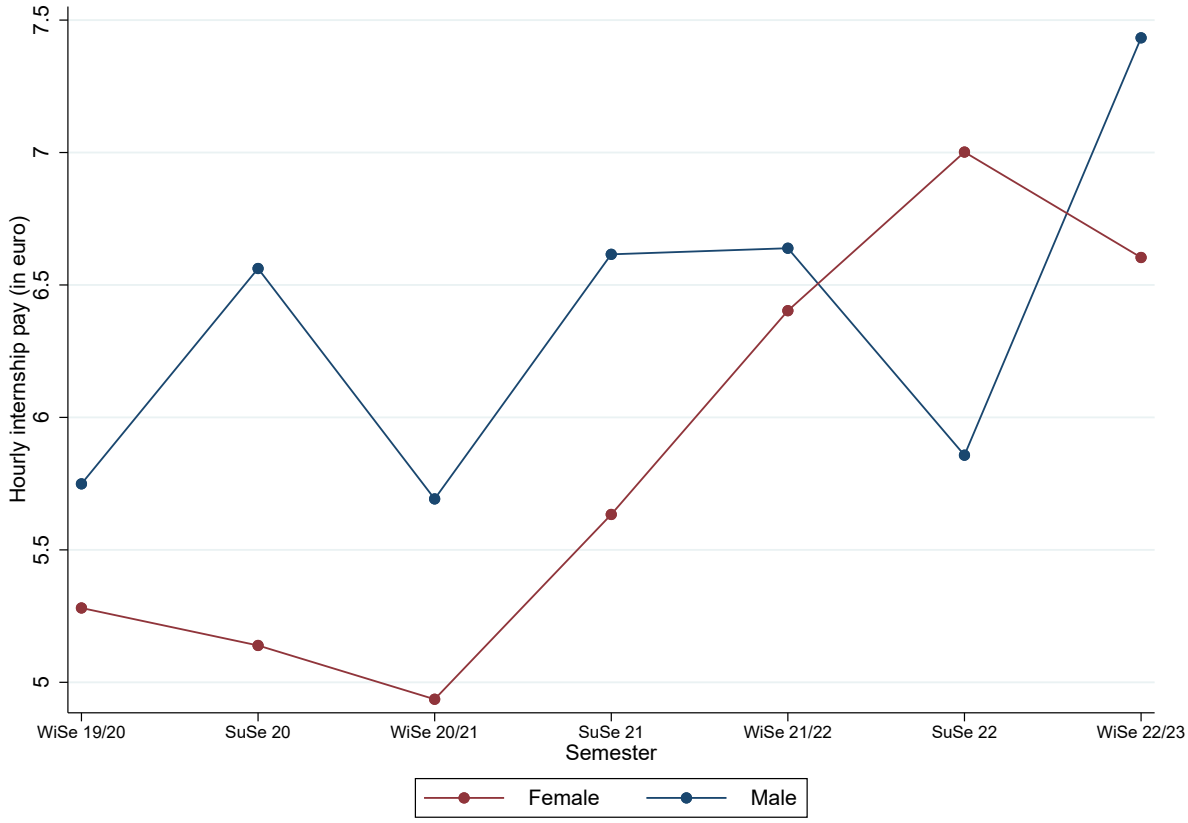
Appendix

Table 7: Variable description: UAS Internship Data

Variable	Description
Outcome variables	
Hourly internship pay	Monthly internship compensation divided by working hours per week × 4.3.
Hourly internship pay winsorized	Hourly internship compensation with extreme values replaced by the 99th and 1st percentiles.
Log Hourly internship pay	Natural Logarithm of hourly internship pay.
Log Hourly internship pay winsorized	Natural Logarithm of hourly internship pay with extreme values replaced by the 99th and 1st percentiles.
Quality index	Standardized internship quality index computed as the weighted average, using standardized inverse-covariance (see Anderson 2008), of responses to four survey questions derived from business reports. These questions evaluate: i) the presence of a contact person within the firm, ii) the extent of cross-departmental work, iii) the existence of an education plan within the firm, and iv) the formalization of learning objectives during the internship. The index is constructed using the Stata ado-file by Schwab et al. 2020.
Controls	
Internship semester FE	Binary variables indicating the timing of the internship (winter semester 2019/20 - winter semester 2022/23).
Dummy for bachelor vs. pre-master internship	Binary variable indicating whether the internship was completed during the bachelor's or as a qualification for the master's degree.
Human capital variables	
Dummy variables for completed pre-internship semesters	Binary variables indicating the number of semesters completed prior to the internship.
Age, age squared	Age (squared) at start of internship.
Type of university entrance qualification FE	Binary variable for each of the following entrance qualifications: Abitur (general German secondary school leaving certificate), fachgebundenes Abitur (subject-specific Abitur), Fachabitur (vocational baccalaureate/technical diploma) Foreign University entrance qualification, Vocational qualification.
HS GPA	High school (HS) grade point average (GPA), missing values imputed.
University GPA	GPA at the university (univ.) prior to the internship (imputed if pre-master internship).
Dummy for imputed values on GPA	Binary variable indicating missing values on HS GPA and univ. GPA.
Number of accumulated credits before internship	Number of credits at the university prior to the internship.
Dummy for having studied another program before	Binary variable indicating if individual studies another program before.
Internship characteristics	
Internship field dummies	Binary variables indicating the following internship fields: Finance/Accounting, Human Resources, Logistics, Organization/Business Informatics, Others/Missing Values.
Industry dummies	Binary variables indicating the following industries: Manufacturing, financial and insurance industry, other services, health/social/education, others.
Firm size dummies	Binary variables indicating the following firm sizes: < 9, 9-49, 50-249, > 249 employees, unknown/not available/missing.

Figure 2: Plain Gender Pay Gap in Mandatory Student Internships, by Semester, UAS Internship Data



Source: Internship Reports Business Students, UAS Internship Data, 2019-2023. $N = 667$. *Notes:* Bottom and top 1% pay values winsorized at the 1% and 99% percentiles. Based on a regression of hourly internship pay on gender, semester dummies, a dummy variable for bachelor vs. pre-master internships, and interactions of semester dummies and gender.

Table 8: Summary Statistics, UAS Internship Data

	(1) Female		(2) Male		(3) Diff.
	Mean	SD	Mean	SD	
Hourly internship pay	5.882	2.585	6.373	3.127	-0.491**
Hourly internship pay winsorized[a)]	5.878	2.555	6.344	3.006	-0.466**
Working hours per week	37.745	2.643	37.834	2.874	-0.089
Quality index[b)]	-0.027	1.042	0.042	0.933	-0.069
Time of internship					
Winter semester (WiSe) 2019/20	0.213	0.410	0.205	0.405	0.008
Summer semester (SuSe) 2020	0.042	0.201	0.065	0.246	-0.023
WiSe 2020/21	0.161	0.368	0.156	0.363	0.005
SuSe 2021	0.111	0.315	0.144	0.352	-0.033
WiSe 2021/22	0.218	0.413	0.202	0.402	0.016
SuSe 2022	0.094	0.292	0.087	0.283	0.007
WiSe 2022/23	0.161	0.368	0.141	0.348	0.020
Pre-master internship	0.047	0.212	0.030	0.172	-0.017
Age at start of internship	22.797	2.359	23.662	2.702	-0.865***
High school (HS) degree "Abitur"	0.488	0.500	0.392	0.489	0.096**
High school GPA	2.492	0.457	2.582	0.424	-0.090**
Univ. GPA before internship semester	2.399	0.434	2.426	0.409	-0.026
Share of missing val. on HS or Univ. GPA	0.000	0.000	0.015	0.123	-0.015**
Accum. credits before internship	125.861	28.725	125.681	29.089	0.181
Share of students with prior studies	0.245	0.431	0.274	0.447	-0.029
Internship field					
Accounting/Finance	0.359	0.480	0.529	0.500	-0.170***
Human Resources	0.295	0.456	0.125	0.332	0.169***
Logistics	0.186	0.389	0.175	0.381	0.011
Marketing	0.295	0.456	0.281	0.451	0.013
Organization/Business Informatics	0.109	0.312	0.186	0.390	-0.077***
Others/missing values	0.012	0.111	0.019	0.137	-0.007
Industry					
Manufacturing	0.379	0.486	0.342	0.475	0.037
Finance & Insurance	0.057	0.232	0.095	0.294	-0.038*
Other Services	0.252	0.435	0.243	0.430	0.009
Health, Education, Social Services	0.037	0.189	0.046	0.209	-0.008
Others	0.275	0.447	0.274	0.447	0.001
Firm size					
< 9 empl.	0.047	0.212	0.049	0.217	-0.002
9-49 empl.	0.139	0.346	0.144	0.352	-0.006
50-249 empl.	0.163	0.370	0.141	0.348	0.023
> 249 empl.	0.559	0.497	0.593	0.492	-0.034
Unknown, not available, missing	0.092	0.289	0.072	0.259	0.019
N	404		263		667

Source: Internship Reports Business Students, UAS Internship Data, 2019-2023. *Notes:* Columns (1) and (2) display the means and standard deviations of the outcomes and covariates for females and males of the regressions in Table 1. Column (3) reports the difference of means and the results of a t-test on the equality of means. Asterisks denote statistical significance: *** p<0.01, ** p<0.05, * p<0.1. *a)* Winsorized at the 1% and 99% percentiles. *b)* The quality index is the standardized inverse-covariance weighted average (following Anderson 2008 and using the Stata Ado-file by Schwab et al. 2020) of four survey questions that asked students about the internship quality.

Table 9: Gender Pay Gap in Mandatory Student Internships (without Summer Semester 2022), UAS Internship Data

	Log Hourly Internship Pay				
	(1)	(2)	(3)	(4)	(5)
Female	-0.0888**	-0.101**	-0.0755*	-0.0705*	-0.0597
	(0.0382)	(0.0397)	(0.0405)	(0.0397)	(0.0394)
Controls	Yes	Yes	Yes	Yes	Yes
Human Capital Variables	No	Yes	Yes	Yes	Yes
Internship Field Dummies	No	No	Yes	Yes	Yes
Industry Dummies	No	No	No	Yes	Yes
Firm Size Dummies	No	No	No	No	Yes
N	606	606	606	606	606
R-squared	0.0636	0.113	0.140	0.189	0.208

Source: Internship Reports Business Students, UAS Internship Data, 2019-2023, without Summer Semester 2022. *Notes:* OLS estimates. Dependent variable: Log hourly internship pay winsorized at the 1% and 99% percentiles. *Controls*: Internship semester FE (winter semester 2019/20 - winter semester 2022/23), dummy for bachelor vs. pre-master internship. Human capital variables: dummy variables for completed pre-internship semesters, age at start of internship, age squared, type of university entrance qualification FE, HS GPA (missing values imputed), university GPA and number of accumulated credits before internship (GPA imputed if pre-master internship), dummy for imputed values on HS GPA and univ. GPA, dummy for having studied another program before. Internship field dummies: Finance/Accounting, Human Resources, Logistics, Organization/Business Informatics, Others/Missing Values. Industry dummies: Manufacturing, Finance and Insurance, Other Services, Health/Social/Education, Others. Firm Size Dummies: < 9, 9-49, 50-249, > 249 employees, unknown/not available/missing. Robust standard errors in parentheses. Asterisks denote statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

Table 10: Gender Wage Gap in Entry Wage Expectations, Post-Internship, Summer Semester 2022 and Winter Semester 2022/23, UAS Internship Data

	Log Yearly Entry Wage Expectations				
	(1)	(2)	(3)	(4)	(5)
Female	-0.119***	-0.0835**	-0.0655	-0.0664	-0.0716
	(0.0368)	(0.0419)	(0.0435)	(0.0453)	(0.0436)
Controls	Yes	Yes	Yes	Yes	Yes
Human Capital Variables	No	Yes	Yes	Yes	Yes
Internship Field Dummies	No	No	Yes	Yes	Yes
Industry Dummies	No	No	No	Yes	Yes
Firm Size Dummies	No	No	No	No	Yes
N	111	111	111	111	111
R-squared	0.112	0.240	0.298	0.316	0.417

Source: Internship Reports Business Students, UAS Internship Data, 2022-2023. *Notes:* OLS estimates. Dependent variable: Log yearly entry wage expectations. Controls: Internship semester FE (summer semester 2022, winter semester 2022/23), dummy for bachelor vs. pre-master internship. Human capital variables: dummy variables for completed pre-internship semesters, age, age squared, type of university entrance qualification FE, HS GPA (missing values imputed), university GPA and number of accumulated credits before internship (GPA imputed if pre-master internship), dummy for imputed values on HS GPA and univ. GPA, dummy for having studied another program before. Internship field dummies: Finance/Accounting, Human Resources, Logistics, Organization/Business Informatics, Others/Missing Values. Industry dummies: Manufacturing, Finance and Insurance, Other Services, Health/Social/Education, Others. Firm Size Dummies: < 9, 9-49, 50-249, > 249 employees, unknown/not available/missing. Robust standard errors in parentheses. Asterisks denote statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

Table 11: Variable description: Business Master's Graduates, UAS-IAB Labor Market Data

Variable	Description
Outcome variables	
Log daily wages	Natural logarithm of daily wages during the first full-time employment period of UAS business students within the first 1.5 years following graduation.
Labor market entry year	
Entry Year FE	Binary variables indicating the year of first full time employment spell (2011-2021).
Human capital variables	
Age, age squared	Age (squared) at graduation.
Type of university entrance qualification FE	Binary variable for each of the following entrance qualifications: Abitur (general German secondary school leaving certificate), fachgebundenes Abitur (subject-specific Abitur), Fachabitur (vocational baccalaureate/technical diploma) foreign university entrance qualification, vocational qualification.
University GPA (Master's degree)	Master's degree grade point average.
High School GPA	High school (HS) grade point average (GPA), missing values imputed.
Dummy for imputed high school graduation grade	Binary variable indicating whether the high school GPA was imputed.
Number of semesters until graduation	Number of semesters required until graduation in the Master's Business program.
Total semesters studied at a German university	Total number of semesters studied at German universities, including any previous programs.
German citizenship	Binary variable indicating if student holds a German citizenship.
Study program	Type of Business Master's program (Business Administration, Finance and Economics, Marketing, and Buesiness Law).
Firm Characteristics	
Industry dummies	Binary variables indicating the industry of the graduates' first full time job: 1) Agriculture, production and construction, 2) Business related service industries, restaurants, hotels, transportation, 3§ Financial services, information services, 4) other services, including consulting and research, 5) schooling, public sector, health, social work, 6) others.
Firm size dummies	Binary variables indicating the following firm sizes: < 9, 9-49, 50-249, > 249 employees.

Table 12: Summary Statistics, Business Master's Graduates, UAS-IAB Labor Market Data

	(1)		(2)		(3)
	Female		Male		Diff.
	Mean	SD	Mean	SD	
Daily wages	120.030	33.031	124.724	29.870	-4.694***
Log. daily wages	4.735	0.368	4.789	0.299	-0.054***
Daily wages winsorized[a)]	119.966	32.779	124.600	29.515	-4.634***
Log. daily wages winsorized	4.736	0.358	4.789	0.298	-0.052***
Labor market entry year[b)]					
Year 2011	n.a.[c)]	n.a.	n.a.	n.a.	n.a.
Year 2012	0.037	0.189	0.046	0.210	-0.009
Year 2013	0.043	0.204	0.055	0.228	-0.012
Year 2014	0.083	0.276	0.091	0.288	-0.008
Year 2015	0.109	0.312	0.130	0.337	-0.021
Year 2016	0.117	0.322	0.114	0.318	0.003
Year 2017	0.167	0.373	0.157	0.364	0.010
Year 2018	0.131	0.338	0.132	0.339	-0.001
Year 2019	0.103	0.304	0.080	0.272	0.022
Year 2020	0.118	0.323	0.094	0.293	0.016
Year 2021	0.079	0.270	0.075	0.262	0.004
Human Capital Variables					
Age at graduation	26.451	2.117	27.328	2.243	-0.877***
General entrance qualification (Abitur)	0.480	0.500	0.380	0.486	0.100***
Subject-specific Abitur	n.a.	n.a.	n.a.	n.a.	n.a.
Fachabitur (vocational baccalaureate/technical diploma)	0.366	0.482	0.485	0.500	-0.119***
Foreign university entrance qualification	0.116	0.321	0.094	0.293	0.022
Vocational qualification	n.a.	n.a.	n.a.	n.a.	n.a.
University GPA (Master's degree)	1.679	0.313	1.716	0.347	-0.036**
High School GPA	2.366	0.502	2.548	0.502	-0.182***
Dummy for imputed high school graduation grade	0.168	0.374	0.112	0.316	0.056***
Number of semesters until completion of the Master's program	4.572	0.840	4.717	1.074	-0.144***
Total semesters studied at a German university	11.509	3.000	11.980	3.205	-0.471***
German Citizenship	0.858	0.349	0.889	0.314	-0.032*
Study program fixed effects					
Business Adm.	0.633	0.482	0.747	0.435	-0.114***
Finance and Economics	0.091	0.288	0.109	0.312	-0.017
Marketing	0.136	0.343	0.064	0.245	0.072***
Business Law	0.140	0.347	0.080	0.272	0.059***
Firm Characteristics: Industry Dummies					
Agriculture, production and construction	0.265	0.441	0.250	0.433	0.015
Business related service industries	0.229	0.420	0.232	0.422	-0.003
Financial services, information services	0.080	0.272	0.102	0.302	-0.021
Other services, including consulting and research	0.386	0.487	0.383	0.487	0.002
Schooling, public sector, health, social work	0.028	0.166	n.a.	n.a.	n.a.
Others	n.a.	n.a.	n.a.	n.a.	n.a.
Firm Characteristics: Firm Size Dummies					
Number of employees < 9 empl.	0.028	0.166	0.050	0.218	-0.021**
9-49 empl.	0.126	0.332	0.141	0.341	-0.015
50-249 empl.	0.298	0.458	0.267	0.443	0.031
> 249 empl.	0.548	0.498	0.542	0.499	0.005
N	809		561		1,370

Source: UAS-IAB Labor Market Data, 2010-2021, MBA graduates. *Notes:* Columns (1) and (2) display the means and standard deviations of the outcomes and covariates for females and males of the regressions in Table 5. Column (3) reports the difference of means and the results of a t-test on the equality of means. Asterisks denote statistical significance: *** p<0.01, ** p<0.05, * p<0.1. n.a. means not available due to low number of observations. *a)* Winsorized at the 1% and 99% percentiles. *b)* UAS graduate data ranges from 2010 to 2011, but labor market entries (in the IAB data) were only observed between 2011 and 2021. *c)* Not available (n.a.) indicates that, in accordance with data protection regulations, the descriptive statistic cannot be published due to the small number of observations.

Table 13: Variable description: NEPS Data

Variable	Description
Outcome variables	
Hourly internship pay	Monthly internship compensation divided by working hours per week × 4.3.
Hourly internship pay winsorized	Hourly internship compensation with extreme values replaced by the 99th and 1st percentiles.
Log hourly internship pay	Natural logarithm of hourly internship pay.
Log hourly internship pay winsorized	Natural logarithm of hourly internship pay with extreme values replaced by the 99th and 1st percentiles.
Quality index	Standardized internship quality index computed as the weighted average using the standardized inverse-covariance (see Anderson 2008) of responses to 14 survey questions. The questions evaluate the comprehensiveness, qualification requirement, task diversity, autonomy, supervision and qualifications capacity of the students' internships. The index is constructed using the Stata ado-file by Schwab et al. 2020.
Controls	
Internship year FE	Binary variables indicating the year of the internship. Internships before 2010 and after 2018 were combined into the categories "before 2011" and "after 2018", respectively, due to the small number of internships in these years.
Internship duration	Internship duration in month.
Number of internship spells FE	Binary variables indicating the number of mandatory internship spells per student. More than three internships were combined in the category "3 or more".
Study subject FE	Binary variable indicating the following study subjects: Linguistic and cultural studies; law, economics, and social sciences; mathematics and science; human medicine and health science; engineering; others (incl. not available).
Intended degree FE	Bachelor, state examination, others.
University type	Binary variables indicating the following university types: university of applied science (incl. others not-available), research-oriented university.
Institution FE	Binary variable for each educational institution from which the sample was drawn. All students from institutions with fewer than 10 students in the dataset were grouped into one category
Human capital variables	
Age, age squared	Age (squared) at start of internship.
Highest educational attainment FE	Binary variables indicating the highest educational attainment (ISCED-97): intermediate school-leaving qualification, vocational school, civil servant or clerical class; entry qualification for universities of applied science; higher education entrance qualification; bachelor, , master, diploma, state examination etc.
HS GPA	High school (HS) grade point average (GPA), missing values imputed.
Dummy for imputed values on GPA	Binary variable indicating missing values on HS GPA.
First-semester university GPA	GPA at the university (univ.) after the first semester, missing values imputed.
Dummy for imputed values of university GPA	Binary variable indicating missing values on firs semester univ. GPA.
Study effort compared to study plan	Binary variable indicating the following response to the question on correspondence of study effort with study regulations: much less, slightly less, about the same, slightly more, much more. Missing values are imputed.
Dummy missing values on effort	Binary variable indicating missing values on self-reported study effort.
Personality traits	
Dummies Risk Avers. Scale	Binary variables measuring risk aversion on a scale between 0 (= not willing to take risks at all) and 10 (= very willing to take risks), as well as a dummy variable for missing values. Values 0 - 3 and values 9 and 10 were combined into one category, respectively, due to the small number of responses in these categories.
Dummies Competitiveness Scale	Binary variables measuring competitiveness on a scale between 0 (= does not apply at all) to 4 (= does completely apply) based on the two survey questions ('I learn because [...] I want to belong to the best' and '[...] want to be better than others in exams') which were accumulated and divided by two. An additional dummy variable is set for missing values.
Firm and Job characteristics	
Economic sector dummies	Binary variable indicating different industries (WZ 2008, two-digit level), not available for internships.
Firm Size dummies	Binary variables indicating different firm sizes, not available for internships.
Occupation dummies	Binary variables indicating different occupations, not available for internships.

Table 14: Summary Statistics, Mandatory Internships, NEPS Data

	(1) Female		(2) Male		(3) Diff.
	Mean	SD	Mean	SD	
Hourly wage	3.365	2.814	3.995	2.805	-0.630***
Hourly wage winsorized[a)]	3.309	2.297	3.937	2.401	-0.629***
Log. hourly wage	0.980	0.702	1.200	0.626	-0.220***
Log. hourly wage winsorized[a)]	0.983	0.675	1.199	0.610	-0.216***
Working hours per week	37.723	6.586	37.868	6.533	-0.146
Duration	4.188	2.644	4.350	2.672	-0.162**
Num. of intern spells	1.521	0.730	1.488	0.698	0.033
Quality index[b)]	-0.099	1.002	0.094	0.989	-0.193***
Study subject					
Linguistic and cultural studies	0.144	0.351	0.019	0.135	0.126***
Law, economics and social science	0.425	0.494	0.310	0.462	0.115***
Mathematics, sciences	0.076	0.265	0.120	0.325	-0.044***
Human medicine/health sciences	0.160	0.367	0.066	0.248	0.094***
Engineering	0.129	0.336	0.458	0.498	-0.328***
Others and not available	0.066	0.248	0.028	0.166	0.038***
Intended degree					
Bachelor	0.779	0.415	0.895	0.306	-0.117***
State examination	0.209	0.406	0.097	0.295	0.112***
Others	0.013	0.112	0.008	0.090	0.004
University type					
Applied Science (incl. n.a.)	0.401	0.490	0.442	0.497	-0.040***
Research-oriented university	0.599	0.490	0.558	0.497	0.040***
Highest educational attainment prior to univ. entry in WiSE 2011/12 (ISCED-97)					
Intermediate school-leaving qual., voc. school etc.	0.108	0.310	0.109	0.312	-0.001
Entry qualification for universities of applied science	0.799	0.401	0.770	0.421	-0.029**
Higher education entrance qualification	0.038	0.192	0.086	0.280	-0.047***
Bachelor, master, diploma, state examination etc.	0.055	0.228	0.036	0.185	0.020***
Age at internship begin	23.899	3.474	23.941	2.823	-0.042
School-leaving GPA (missing val. imputed)	2.033	0.621	2.211	0.638	-0.179***
Share of missing val. on school-leaving GPA	0.021	0.143	0.021	0.145	-0.001
University GPA (1st semester, missing values imputed)	2.140	0.451	2.308	0.478	-0.168***
Share of missing val. on univ. GPA	0.468	0.499	0.434	0.496	0.035**
Study effort compared to study plan (1-5, 1st sem., miss. val. imputed)	3.043	0.600	2.990	0.691	0.053***
Share of missing val. on study effort	0.238	0.426	0.301	0.459	-0.063***
Risk aversion[c)] (self-assessed, 0-10)	5.378	1.659	5.860	1.718	-0.482***
Competitiveness[d)] (self-assessed, 1-4)	2.634	0.698	2.694	0.723	-0.060***
N internship spells	2,065		2,196		4,261
N students	1,612		1,773		3,345

Source: NEPS, SC5, 17.0.0. *Notes:* Columns (1) and (2) display the means and standard deviations of the outcomes and covariates (except internship year FE) for females and males of the regressions in Table 2. Column (3) reports the difference of means and the results of a t-test on the equality of means. Asterisks denote statistical significance: *** p<0.01, ** p<0.05, * p<0.1. *a)* Winsorized at the 1% and 99% percentiles. *b)* *N*=3,986 (from 3,194 students). The quality index is the standardized inverse-covariance weighted average (following Anderson 2008 and using the Stata Ado-file by Schwab et al. 2020) of four survey questions that asked students about the internship quality. *c)* *N*=2,738. Risk aversion is measured on a scale between 0 (= not willing to take risks at all) and 10 (= very willing to take risks). *d)* *N*=2,907. Competitiveness (0=does not apply at all - 4=completely applies) is based on the two variables 'I learn because [...] I want to belong to the best' and '[...] want to be better than others in exams' which were accumulated and divided by two.

Table 15: Summary Statistics, First Full-Time Employment, NEPS Data, Part I

	(1) Female		(2) Male		(3) Diff.
	Mean	SD	Mean	SD	
Hourly wage	20.807	7.613	23.654	8.392	-2.846***
Hourly wage winsorized[a)]	20.677	6.659	23.420	6.850	-2.743***
Log hourly wage	2.971	0.361	3.108	0.313	-0.137***
Log hourly wage winsorized[a)]	2.974	0.346	3.109	0.309	-0.135***
Working hours per week	43.004	7.098	42.654	6.981	0.349
Internship payment[b)]					
Hourly wage	3.498	2.450	4.171	2.563	-0.673***
Log hourly wage	1.058	0.637	1.283	0.545	-0.225***
Study subject					
Linguistic and cultural studies	0.129	0.336	0.010	0.099	0.119***
Law, economics and social science	0.432	0.496	0.265	0.442	0.168***
Mathematics, sciences	0.079	0.270	0.124	0.330	-0.045***
Human medicine/health sciences	0.168	0.374	0.067	0.250	0.101***
Engineering	0.059	0.237	0.026	0.159	0.033***
Others and not available	0.132	0.339	0.509	0.500	-0.376***
University type					
Applied Sciences (incl. n.a.)	0.418	0.494	0.453	0.498	-0.035
Research-oriented university	0.582	0.494	0.547	0.498	0.035
Highest educational attainment (ISCED-97, year of employment start)					
Bachelor, master, diploma, state examination etc.	0.905	0.294	0.908	0.289	-0.004
Doctorate, habilitation	0.095	0.294	0.092	0.289	0.004
Age at employment begin	26.878	3.202	27.364	2.543	-0.486***
School-leaving GPA (missing val. imputed)	2.007	0.605	2.198	0.621	-0.191***
Share of missing val. on school-leaving GPA	0.012	0.108	0.022	0.148	-0.010
University GPA (1st semester, missing values imputed)	2.149	0.479	2.304	0.496	-0.155***
Share of missing val. on univ. GPA	0.410	0.492	0.368	0.482	0.043*
Study effort compared to study plan (1-5, 1st sem., miss. val. imputed)	3.091	0.624	2.986	0.715	0.104***
Share of missing val. on study effort	0.155	0.362	0.255	0.436	-0.100***
Years of Education (CASMIN, year of employment start)	17.230	1.014	17.142	1.018	0.088*
Risk aversion[c)] (self-assessed, 0-10)	5.341	1.649	5.831	1.724	-0.490***
Competitiveness[d)] (self-assessed, 1-4)	2.664	0.706	2.695	0.723	-0.031
N	673		808		1,481

[Continued on next page.]

Table 16: Summary Statistics, First Full-Time Employment, NEPS Data, Part II

	(1) Female		(2) Male		(3) Diff.
	Mean	SD	Mean	SD	
Firm characteristics[e]: Firm size					
1 to less than 5	0.030	0.170	0.022	0.148	0.007
5 to less than 10	0.042	0.200	0.038	0.192	0.003
10 to less than 20	0.055	0.228	0.064	0.246	-0.009
20 to less than 50	0.129	0.336	0.106	0.309	0.023
50 to less than 100	0.107	0.309	0.085	0.280	0.022
100 to less than 200	0.083	0.276	0.090	0.287	-0.007
200 to less than 250	0.048	0.213	0.037	0.189	0.010
250 to less than 500	0.116	0.320	0.097	0.296	0.019
500 to less than 1,000	0.092	0.289	0.110	0.313	-0.018
1,000 to less than 2,000	0.082	0.274	0.100	0.301	-0.019
2,000 and more	0.193	0.395	0.222	0.416	-0.028
Missing value	0.024	0.152	0.027	0.163	-0.003
Job characteristics: Occupation (ISCO)					
Managers	0.036	0.186	0.043	0.204	-0.008
Professional	0.649	0.478	0.694	0.461	-0.045*
Technicians and associate professionals	0.105	0.307	0.108	0.310	-0.002
Clerical support workers	0.147	0.354	0.090	0.287	0.057***
Service and sales workers	0.004	0.067	0.005	0.070	-0.000
Skilled agricultural, forestry and fishery workers	0.003	0.054	0.002	0.050	0.000
Craft related trades workers	0.007	0.086	0.006	0.078	0.001
Plant and machine operators, and assemblers	0.006	0.077	0.011	0.105	-0.005
Elementary occupations	0.003	0.054	0.002	0.050	0.000
Missing values	0.039	0.193	0.037	0.189	0.002
N	673		808		1,481

Source: NEPS, SC5, 17.0.0. *Notes:* Columns (1) and (2) display the means and standard deviations of the outcomes and covariates (except employment start year FE) for females and males of the regressions in Table 6. Column (3) reports the difference of means and the results of a t-test on the equality of means. Asterisks denote statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

a) Winsorized at the 1% and 99% percentiles. *b)* For students who completed multiple internships the mean hourly wage was calculated. *c)* *N*=1,436. Risk aversion is measured on a scale between 0 (= not willing to take risks at all) and 10 (= very willing to take risks). *d)* *N*=1,360. Competitiveness (0=does not apply at all - 4=completely applies) is based on the two variables 'I learn because [...] I want to belong to the best' and '[...] want to be better than others in exams' which were accumulated and divided by two. *e)* Further firm variable not included in summary: Economic sector (WZ 2008, two-digit level).