# The Gender Pay Gap in University Student Employment

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## Abstract

Gender pay gaps are commonly studied in populations with already completed educational careers. We focus on an earlier stage by investigating the gender pay gap among university students working alongside their studies. With data from five cohorts of a large-scale student survey from Germany, we use regression and wage decomposition techniques to describe gender pay gaps and potential explanations. We find that female students earn about 6% less on average than male students, which reduces to 4.1% when accounting for a rich set of explanatory variables. The largest explanatory factor is the type of jobs male and female students pursue.

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# 1 Introduction

A vast literature investigates the causes of pay gaps between men and women. Explanations range from differences in occupational and industry choice to differences in personality and attitudes. The question of *when* pay differences begin to manifest themselves has received far less attention: Most studies look at pay gaps in labor market outcomes at a point in workers' lives at which they have already completed their education.[1] This leaves out earlier, smaller-scale employment before the entry into the general labor market, which may offer important insights into the origins of gender pay gaps.

In this paper, we examine the gender pay gap in university student employment. Being the first to investigate gender pay gaps in this setting, we use data from a large-scale student survey from Germany, which includes rich information on employment, socio-economic background, living situation, study characteristics, high school performance and personality factors. This allows us to use regression analyses with an extensive battery of covariates to quantify the unexplained gender pay gap among students and seek potential explanations for it. We also derive stylized facts about its relation to differences in the field of study and the job types male and female students pursue.

We find an unconditional gender pay gap in hourly wages of about 6%, which reduces to about 4.1% after accounting for a wide range of student characteristics. This unexplained gap is robust to a range of different regression specifications and sample restrictions. We find large variation in the pay gap across different job types, as well as significant gender selection differences into these job types: Males are more likely to work in jobs that are related to their studies, whereas females are more likely to pursue jobs which require less or no subject knowledge.

The student setting is relevant to the gender pay gap literature as it reduces the importance of other factors which have been found to induce gender pay gaps later in life, for example family-formation decisions in the studies of, amongst others, Kleven *et al.* (2019), Bütikofer *et al.* (2018), and Albrecht *et al.* (2018). Following this idea, Francesconi and Parey (2018), Leuze and Strauß (2014) as well as Reimer and Schröder (2006) analyze starting salaries of German graduates and still find substantial gender gaps. We take this approach one step further by examining the difference in wages between genders for university students currently enrolled in university. Many student occupations differ decidedly from a general labor market setting. A majority of students is employed part-time, in jobs often unrelated to their education, earning relatively low wages. Being the first paper to apply gender pay gap analysis to the university setting is one of our major contributions. Our descriptive analyses shed new light on when gender differences in pay emerge and which factors may explain them. Additionally, our analyses contribute to the gender pay gap literature by providing new insights into gender differences in work experience before graduation. Existing literature usually defines work experience as the time spent working since graduation, omitting previous experience as a potential channel for gender pay gaps. Yet, this channel may be crucial if working experience matters for students' success in later recruitment processes and wage negotiations. Moreover,

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[1]An example is the literature on "child penalties": For instance, Kleven *et al.* (2019) document that parenthood widens the gender gap in earnings by around 20 percent.

as Auspurg *et al.* (2017) shows, the expectations of men and women for both sexes' earnings are shaped by specific experiences in the labor market. If already university students experience gender wage gaps, this can contribute early to status beliefs and social constructions which foster gender wage inequality in the long run (Auspurg *et al.*, 2017).

Besides studying the gender pay gap in this new setting, our paper contributes to the existing literature in four ways: First, we investigate the selection of students into working and different types of student jobs. In doing so, we document significant male-female differences in the type of jobs students choose to pursue alongside their studies. We thus extend the finding by Blau and Kahn (2017) who document that gender differences in occupations and industries continue to explain a significant part of the wage gap at later career stages. Second, a more recent strand of literature investigates the wage effects of psychological and attitudinal factors like gender differences in risk preferences, competitiveness, attitudes towards negotiation and career expectations (see Bertrand (2011) for a review). We provide suggestive evidence that gender wage gaps in the student environment are higher in jobs with plausibly larger scope for wage negotiation. Third, a growing literature addresses the labor market returns to different college majors: Altonji *et al.* (2016) find large effects of college major choice on future earnings, and Ochsenfeld (2014) shows that men choose more often majors which have higher paid jobs after finishing studies. Our paper contributes to this by investigating gender pay gaps and their relationship to gender differences in major choice. However, our findings suggest that student wages differ little across fields of study. Fourth, by analyzing gender gaps in student jobs, our findings complement recent studies documenting gender gaps in wage expectations of university students, such as Briel *et al.* (2021), Kießling *et al.* (2019) and Reuben *et al.* (2017).

Germany is a compelling setting to advance research for three reasons: First, its raw gender pay gap of 21% in 2018 (Destatis, 2019) is one of the highest among OECD countries. Second, as in many other countries including the US, it is common for students to work alongside their studies. In 2016, 68% of German university students were working during term time (Middendorff *et al.*, 2017), the highest share out of any European country and higher than the 2018 US share of 43% (Hussar *et al.*, 2020). Third, German students spend a comparatively long time at university, with 60% of undergraduate students subsequently enrolling in a postgraduate program. Consequently, students who work throughout their studies gain significant work experience, which may be relevant for later labor market outcomes.

The remainder of this paper is organized as follows. Section 2 briefly presents some institutional background on the German setting. Section 3 discusses our data and methodological strategy, and presents summary statistics of important variables. In Section 4, we present the empirical results, discuss some robustness checks, and investigate important channels. Section 5 concludes.

## 2 Institutional background on the German higher education system

According to Hauschildt *et al.* (2018), Germany has the largest share of university students working in regular paid jobs during term-time within Europe. Middendorff *et al.* (2017) find that in 2016, roughly 68% of the German student population was employed during lecture periods, up from 62% in 2012. In 2018, the share of working students in the US was 43% (Hussar *et al.*, 2020). Furthermore, there are gender differences in German student employment: In 2016, 70% of female students were working versus only 66% of male students. A compelling feature of German higher education and the student job market is the institution of student assistants at German universities. In contrast to US and UK universities, where graduate students occupy most student assistant positions, these positions are commonly held by undergraduates: In our sample, 28% of working Bachelor's students worked as student assistants.[2] This allows many German students to gain practical research experience and often provides a pathway for undergraduates into Master's and PhD programs.

A major reason for high rates of student employment is that study durations in Germany are comparatively long, with 60% of Bachelor's graduates subsequently enrolling in Master's programs. Even though standard durations of Bachelor's and Master's degrees add up to five years, in practice, the average time to degree is 6 years for students completing both a Bachelor's and a Master's degree (Autorengruppe Bildungsberichterstattung, 2020). Thus, students need to cover their living expenses for a substantial duration while also forgoing practical work experiences. Working alongside their studies offers students a path to address these issues.

Student employment as a funding source is also important as private student loans and public financing schemes are extremely uncommon. A publicly subsidized financing scheme exists only for students from low-income families, supporting well below 20% of the student population (Garritzmann, 2016, p. 78). Tuition fees are a secondary reason for students to work. Most German universities are public institutions that do not charge tuition fees, although most of them charge an administrative fee of around 300 Euros per semester. About 15% of students are enrolled in non-public institutions that may charge tuition fees (Autorengruppe Bildungsberichterstattung, 2020). Hence, in the classification of Garritzmann (2016), Germany belongs to the group of "low-tuition low-subsidy" countries where student employment is particularly common. Countries that also belong to this group include Austria, Belgium, France, Italy, Spain, Switzerland, and Mexico.

## 3 Data and methods

We pool student-level data from five waves (2003, 2006, 2009, 2012, 2016) of the Social Survey (*"Sozialerhebung"*), conducted by the German Center for Higher Education Research and Science Studies on behalf of the Deutsches Studentenwerk (DOI: https://doi.org/10.21249/

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[2]German universities distinguish between student assistants ("Studentische Hilfskräfte") and research assistants ("Wissenschaftliche Hilfskräfte"), the main difference being that research assistants are required to hold an academic degree.

DZHW:ssypool:1.0.1). The purpose of this survey is to monitor the social and economic situation of university students in Germany. First conducted in 1951, it is the most comprehensive German survey of its kind.[3] Questionnaires are sent to a random set of students from each of the participating institutions of higher education. These participating institutions account for roughly 90% of the German student population. Data provided by the survey include information on biographical and educational background, field of study, employment and income and, in recent years, personality traits. These data are thus the most comprehensive large-scale dataset for conducting research related to Germany's university students. Its sample size, its coverage of many cohorts, and its focus on university students makes it more suitable to our research question than the Socio-Economic Panel (SOEP) or the National Educational Panel Study (NEPS).

We restrict our main analysis sample to those students belonging to the reference group "focus type" defined by the 2016 Social Survey dataset. This is to improve comparability of students with respect to their financial situation. "Focus type" students are enrolled in a full-time program at an institution of higher education, are studying for their first or second higher education degree, are living alone or providing only for themselves, and are not married. Data from the four waves covering 2003-2012, which do not yet include the "focus type" definition, are sampled according to the same criteria.[4] Based on these restrictions, the sample for our main wage analysis contains 19,024 observations.

Our outcome variable is (log) net hourly wage, which is the wage variable included in the data. Usually, the pay gap literature uses monthly or yearly labor income, divided by the respective contracted hours of work. In the student setting, however, working hours are much more varied and contracts usually specify the hourly wage, so that the self-reported hourly wage is a more reliable measure. Furthermore, it is more common to use gross instead of net wages. However, this does not pose a major problem for at least two reasons. First, the majority of students, especially in the "focus type" subset, should be very similar in terms of taxes and other wage deductions, and second, there is evidence by Granados and Geyer (2013) that using net hourly wages yields a lower bound for potential wage gaps. Nevertheless, we show that the results are robust to restricting the sample to students who work less than five hours per week, in which case there are no significant tax or social security deductions.

Table 1 presents descriptive statistics for the outcome variable, net hourly wage, and the major control variables (see Table A1 in the appendix for all variables). The first row shows a raw wage gap of about 7.5%,[5] as well as significant gender differences in several other variables. As documented in previous research, men are overrepresented in the natural sciences and engineering, and women are overrepresented in all other fields, most notably in the humanities. Moreover, there are significant differences in the types of jobs male and female students pursue: Men more often work as student or research assistants and are more often self-employed, whereas women are more likely to have more traditional part-time jobs

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[3]The waves 2003 through 2016 include between 15,000 and 55,000 students each.

[4]"Focus type" students make up roughly half of the respondents in each wave. We relax the restriction on "focus type" students in a robustness check by including also other types of students, which does not alter our main results. For details on further sample restrictions and corresponding robustness checks see the appendix.

[5]This is a pooled estimate across the survey waves, without including survey wave fixed effects.

like working as waiters, cashiers or office assistants (aggregated in the "Jobbing" category).[6] Women also more often work as private tutors.

In our main analysis, we employ multiple regression models with heteroskedasticity-robust standard errors, which have the form

$$\ln w_i = \alpha + \beta female_i + X_i'\gamma + \sum_{j=1}^{5} \alpha_j wave_{ij} + \epsilon_i \tag{1}$$

where $\ln w_i$ is the log hourly wage variable and $female_i$ indicates females, so that $\beta$ represents the adjusted wage gap in log points and is therefore our coefficient of interest. $wave_{ij}$ indicates if student $i$ is part of survey wave $j$, therefore $alpha_j$ captures survey wave fixed effects. $X_i$ is a vector of control variables for student $i$ which are grouped and introduced successively: First, age group dummies, second, additional socio-demographic controls like previous education and socio-economic background, third, field of study and type of degree, and fourth, controls for the type of job held. The assumption driving our strategy is the conditional independence assumption: We assume that we observe all variables which are correlated with both the outcome and the gender variable. This allows us to interpret $\beta$ as the adjusted gender wage gap. Though a strong assumption, it is supported by the observation that the estimate of $\beta$ changes very little as more controls are introduced (see Table 2). The regression results are further corroborated by Kitagawa-Oaxaca-Blinder decompositions (see Tables A6-A9).

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[6]This aggregation is present in the raw data, therefore we are not able to disaggregate these jobs further.

Table 1: Descriptive statistics

| Variable | Overall mean | Group means | | Difference | P-Value |
|---|---|---|---|---|---|
| | | Men | Women | | |
| Net hourly wage (euros) | 9.765 | 10.221 | 9.451 | 0.770 | 0.000*** |
| | (4.988) | (5.182) | (4.825) | | |
| Completed apprenticeship | 0.192 | 0.213 | 0.178 | 0.035 | 0.000*** |
| | (0.394) | (0.409) | (0.383) | | |
| Masters program | 0.118 | 0.138 | 0.105 | 0.034 | 0.000*** |
| | (0.323) | (0.345) | (0.306) | | |
| Uni. of Applied Sciences | 0.213 | 0.244 | 0.191 | 0.053 | 0.000*** |
| | (0.409) | (0.430) | (0.393) | | |
| Study abroad experience | 0.211 | 0.178 | 0.233 | −0.055 | 0.000*** |
| | (0.408) | (0.383) | (0.423) | | |
| *Parents' qualification* | | | | | |
| no qualification | 0.016 | 0.014 | 0.017 | −0.002 | 0.170 |
| | (0.124) | (0.118) | (0.127) | | |
| Apprent./skilled worker | 0.249 | 0.253 | 0.247 | 0.007 | 0.300 |
| | (0.433) | (0.435) | (0.431) | | |
| Master craft./tech. school | 0.199 | 0.197 | 0.200 | −0.003 | 0.563 |
| | (0.399) | (0.397) | (0.400) | | |
| Academic degree | 0.537 | 0.536 | 0.537 | −0.001 | 0.923 |
| | (0.499) | (0.499) | (0.499) | | |
| *Field of study* | | | | | |
| Humanities | 0.279 | 0.161 | 0.361 | −0.200 | 0.000*** |
| | (0.449) | (0.367) | (0.480) | | |
| Social sciences, law | 0.304 | 0.288 | 0.315 | −0.028 | 0.000*** |
| | (0.460) | (0.453) | (0.465) | | |
| Natural sciences, engineering | 0.317 | 0.475 | 0.208 | 0.267 | 0.000*** |
| | (0.465) | (0.499) | (0.406) | | |
| Human & Vet. Medicine | 0.100 | 0.077 | 0.116 | −0.040 | 0.000*** |
| | (0.300) | (0.266) | (0.321) | | |
| *Job type* | | | | | |
| Student/research assistant | 0.319 | 0.367 | 0.286 | 0.081 | 0.000*** |
| | (0.466) | (0.482) | (0.452) | | |
| Jobbing | 0.419 | 0.361 | 0.459 | −0.098 | 0.000*** |
| | (0.493) | (0.480) | (0.498) | | |
| Private tutoring | 0.054 | 0.039 | 0.064 | −0.024 | 0.000*** |
| | (0.226) | (0.195) | (0.244) | | |
| Job requiring qualification | 0.062 | 0.066 | 0.059 | 0.007 | 0.045** |
| | (0.241) | (0.248) | (0.235) | | |
| Self-employed work | 0.048 | 0.063 | 0.038 | 0.026 | 0.000*** |
| | (0.214) | (0.244) | (0.190) | | |
| Other | 0.098 | 0.104 | 0.095 | 0.009 | 0.041** |
| | (0.298) | (0.305) | (0.293) | | |
| Observations | 19024 | 7770 | 11254 | | |

*Notes.*– The table presents descriptive statistics on major variables, both for the full sample and split by gender. Standard deviations are reported in parentheses. P-Values derive from a t-test for equality of mean in the case of the wage variable and Pearson's $\chi^2$-tests for the remaining categorical variables. All variables except net hourly wage are indicator variables, their means therefore represent shares of the respective sample. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively. For all variables see Table A1.

# 4 Results

## 4.1 Evidence on gender pay gaps in university student employment

Table 2 shows the estimation results from four subsequent regressions of log net hourly wage on the gender dummy. From column (1) to (4), we include an increasing number of control variables. The female coefficient, displayed in the first row, represents the respective estimate for the gender wage gap in log points. As shown in column (1), controlling only for survey wave fixed effects yields an estimate of 6 log points for the raw wage gap. However, Table A1 in the appendix shows significant differences in the age structure between male and female students in our sample. Male students tend to be older than female students raising concerns about age effects on the wage. Thus, column (2) adds age group dummies, which reduces the gap to 4.7 log points. As shown in column (3), adding East German background, foreign nationality, previous vocational training and parents' professional qualification as further socio-demographic controls has little impact on the gap. Controlling for the type of degree, study abroad experience, the type of university and the field of study in column (4) even marginally increases the gap. However, controlling for the type of job in column (5) marginally reduces the gap to 4.1 log points. Across all specifications, the gap is highly significant. Table A6 in the appendix shows the results from a Kitagawa-Oaxaca-Blinder decomposition using the full set of covariates from column (5). As in Table 2, the unexplained gap according to the decomposition equals 4.1 log points. These results imply that a female student would earn about 4.1% less than a male student with otherwise identical observable characteristics.

These simple regressions document some highly significant factors explaining wage differences. In line with previous research, we find that wages are significantly lower for students living in East Germany, approximated by the location of their university, and students who grew up in East Germany, approximated by the location of their high school. Furthermore, wages are also increasing with the socio-economic status of students, as measured by their parents' highest professional qualification. Unsurprisingly, students studying for a Master's degree also earn significantly more than those studying for their first degree. Yet, some of this difference seems to be captured by differences in job types in column (4). Moreover, students who have spent part of their studies abroad earn higher wages than those who have not, although this may be driven by differences in ability or motivation.

Interestingly, there is no significant variation in wages across different fields of study. At first, this seems to contradict previous research into labor market returns to college majors (for example Altonji *et al.* (2016)). However, the observed differences in the general labor market may not materialize in the students' job market because many student jobs are relatively unspecific in the skills or qualifications they require. For example, Table 1 shows that 42% of the students in our sample work in jobs belonging to the "Jobbing" category, which comprises jobs as waiters, cashiers or office assistants. It is plausible that in this type of job, a student's field of study does not influence their wage.

As can be seen in the large increase in the R-squared from column (4) to column (5) (0.128 to 0.227), the single most important factor for explaining variation in students' wages is the type

Table 2: Wage regressions

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Female | −0.060*** | −0.047*** | −0.046*** | −0.049*** | −0.041*** |
| | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
| East German High School | | | −0.077*** | −0.077*** | −0.068*** |
| | | | (0.009) | (0.009) | (0.008) |
| East German University | | | −0.061*** | −0.061*** | −0.062*** |
| | | | (0.009) | (0.009) | (0.008) |
| Completed apprenticeship | | | 0.023*** | 0.035*** | −0.002 |
| | | | (0.007) | (0.007) | (0.007) |
| Foreign nationality | | | −0.034* | −0.029 | −0.029 |
| | | | (0.020) | (0.019) | (0.018) |
| *Parents' qualification* | | | | | |
| Apprent./skilled worker | | | 0.046*** | 0.044*** | 0.037** |
| | | | (0.016) | (0.015) | (0.015) |
| Master craft./tech. school | | | 0.057*** | 0.055*** | 0.044*** |
| | | | (0.016) | (0.016) | (0.015) |
| Academic degree | | | 0.075*** | 0.071*** | 0.055*** |
| | | | (0.015) | (0.015) | (0.014) |
| Master's program | | | | 0.045*** | 0.036*** |
| | | | | (0.007) | (0.007) |
| Study abroad experience | | | | 0.015*** | 0.017*** |
| | | | | (0.006) | (0.005) |
| Uni. of Applied Sciences | | | | −0.008 | −0.006 |
| | | | | (0.006) | (0.006) |
| *Field of Study* | | | | | |
| Social sciences, law | | | | −0.016** | −0.002 |
| | | | | (0.006) | (0.006) |
| Natur. scienc., engineer. | | | | −0.010 | −0.001 |
| | | | | (0.007) | (0.006) |
| Human & Vet. Medicine | | | | −0.005 | −0.006 |
| | | | | (0.008) | (0.008) |
| *Job type* | | | | | |
| Jobbing | | | | | −0.046*** |
| | | | | | (0.004) |
| Private tutoring | | | | | 0.237*** |
| | | | | | (0.011) |
| Job requiring qualification | | | | | 0.238*** |
| | | | | | (0.011) |
| Self-employed work | | | | | 0.294*** |
| | | | | | (0.017) |
| Other | | | | | 0.102*** |
| | | | | | (0.012) |
| *Survey wave fixed effects* | Yes | Yes | Yes | Yes | Yes |
| *Age group dummies* | No | Yes | Yes | Yes | Yes |
| Mean dep. var. | 2.213 | 2.213 | 2.213 | 2.213 | 2.213 |
| R-squared | 0.089 | 0.102 | 0.126 | 0.128 | 0.227 |
| Observations | 19,024 | 19,024 | 19,024 | 19,024 | 19,024 |

*Notes.*– The table shows results from OLS regressions as described in equation (1). For categorical variables, the base categories (omitted in the table) are "No qualification" for Parents' qualification, "Humanities" for Field of Study and "Student/research assistant" for Job type. Heteroskedasticity robust standard errors are reported in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.

of job pursued. With student/research assistant jobs as the base category, on average we find that working in the "Jobbing" category decreases the wage by 4.6 log points, whereas working as a private tutor or in a job requiring previous qualification increases the wage by roughly 24 log points. Self-employment is associated with a 29.4 log points increase. Relating this to Table 1, which shows the gender differences with respect to the types of jobs they hold, highlights

one explanation for gender differences in student wages: Women are highly overrepresented in the lower-paid "Jobbing" category, and underrepresented in the higher-paid categories (except private tutoring). Table A6 confirms this: The job type variable accounts for roughly one third (0.9 log points) of the explained component of the gap (2.7 log points).

We further test the robustness of our results by relaxing the "focus-type" sample restriction discussed in Section 3. To alleviate potential sample selection concerns, we run the full specification wage regression from Table 2 column (5) in a larger sample which includes focus-type and non-focus-type students. Detailed results can be found in Table A3 column (1) in the appendix. The female coefficient only marginally changes to 3.6 log points and remains significantly different from zero at the 1%-level, suggesting strong robustness of our main result.

As explained in Section 3, there are potential concerns about using net wages instead of gross wages in our analyses, as results may be biased by non-random distribution of wage deductions. We address these concerns by running our full wage regression in a sample restricted to students who work five hours or less per week. In Germany, jobs paying a monthly income of 450 Euros or less are practically exempt from taxes and most social security deductions. Therefore, this sample restriction should eliminate most of the potential bias. Table A3 column (3) in the appendix shows the results. The female coefficient for the restricted sample increases in absolute value to 4.7 log points, suggesting that if there is any bias stemming from net wages in our main sample, it attenuates rather than exaggerates the gap.

Finally, one may suspect gender differences in the time spent working or in disposable income from other sources to be driving the gap. These income sources may include parents, government loans or grants and scholarships. The reasons we do not include these variables in our main specification are twofold: First, there are reverse causality concerns. For example, higher wages could incentivize students to work longer hours via a substitution effect, or to work shorter hours via an income effect. Parents may reduce their financial support if their children earn more money working. Second, we only observe these variables for a subset of students. Table A4 in the appendix shows detailed results of adding them to our full wage regression (Table A9 shows the results from the respective Kitagawa-Oaxaca-Blinder decomposition). The resulting female coefficient equals 4.0 log points, which is very close to the main coefficient in Table 2 column (5).

## 4.2 The relevance of ability and personality

The 2016 wave of the Social Survey includes a more extensive set of questions enabling us to investigate the role of ability and personality for the gender wage gap across students. As noted by Blau and Kahn (2017), personality traits have been found to be an important explanatory factor in pay gap analyses. Personality is measured along the Big Five personality dimensions and an additional dimension of self-efficacy. We use students' high school grade point average as a proxy for ability. In addition, we include a variable from the 2016 wave capturing the extent to which a student's job is related to their studies.[7] Table 3 shows the results

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[7]Sample size is significantly reduced because the relevant questions do not feature in the 2003 through 2012 waves, and were only answered by a subset of respondents in the 2016 wave.

of successively adding these new controls to the full specification from Table 2. The female coefficient is very stable across the four specifications (about 5.5 log points), supporting the robustness of our qualitative results. Columns (2) through (4) show that our ability measure is not significantly related to wages. The study-relatedness of a job correlates positively with wages (columns (3) and (4)). Column (4) shows that neither self-efficacy nor the Big Five measures explain variation in wages, with the exception of a significant 1.6 log point coefficient on extraversion. Table A7 in the Appendix shows the results from a Kitagawa-Oaxaca-Blinder decomposition using the full set of covariates from column (4).

Table 3: Wage regressions with ability and personality controls (wave 2016)

|  | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Female | −0.055*** | −0.055*** | −0.053*** | −0.055*** |
|  | (0.011) | (0.012) | (0.011) | (0.013) |
| *High school GPA* |  |  |  |  |
| Very good |  | −0.107 | −0.110 | −0.112 |
|  |  | (0.079) | (0.079) | (0.078) |
| Good |  | −0.088 | −0.088 | −0.092 |
|  |  | (0.078) | (0.079) | (0.078) |
| Satisfactory |  | −0.090 | −0.090 | −0.096 |
|  |  | (0.078) | (0.079) | (0.078) |
| Job study-related |  |  | 0.036*** | 0.037*** |
|  |  |  | (0.013) | (0.013) |
| Self-efficacy |  |  |  | −0.006 |
|  |  |  |  | (0.011) |
| *Big Five personality* |  |  |  |  |
| Agreeableness |  |  |  | 0.010 |
|  |  |  |  | (0.007) |
| Conscientiousness |  |  |  | −0.001 |
|  |  |  |  | (0.007) |
| Openness |  |  |  | 0.002 |
|  |  |  |  | (0.005) |
| Neuroticism |  |  |  | −0.004 |
|  |  |  |  | (0.007) |
| Extraversion |  |  |  | 0.016*** |
|  |  |  |  | (0.005) |
| *Age group dummies* | Yes | Yes | Yes | Yes |
| *Further demographic controls* | Yes | Yes | Yes | Yes |
| *Study characteristics* | Yes | Yes | Yes | Yes |
| *Job types* | Yes | Yes | Yes | Yes |
| Mean dep. var. | 2.354 | 2.354 | 2.354 | 2.354 |
| R-squared | 0.126 | 0.127 | 0.130 | 0.134 |
| Observations | 2,780 | 2,780 | 2,780 | 2,780 |

*Notes.*– The table shows results from OLS regressions as described in equation (1). The omitted base category for High school GPA is "Sufficient". Heteroskedasticity robust standard errors are reported in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.

## 4.3 The gender pay gap across job types

Job types are a significant factor influencing wage variation and the gender wage gap as Table 2 shows. We investigate this further by performing wage regressions for different subsamples defined by job type. Figure 1 shows the results. The regressions use the set of covariates

presented in column (4) of Table 2. For the full regression results, see Table A5 in the appendix (in addition, Table A8 shows the results from a Kitagawa-Oaxaca-Blinder decomposition for the different job types). As can be seen, there is substantial heterogeneity: While there is no significant gap in jobs requiring previous qualification, the gap between self-employed male and female students equals 18 log points. For the two largest groups, student research assistants and the "jobbing" category, the gap is 1.9 log points and 4.9 log points respectively. The gap in the jobbing category is thus 2.5 times larger. Since student research assistants are employed in public service, this result is consistent with previous research on differences in the gender pay gap between the public and the private sector. For Germany, Destatis (2020) finds that the unadjusted pay gap is 9% in the public sector and 22% in the private sector.

Figure 1: The gender pay gap across job types
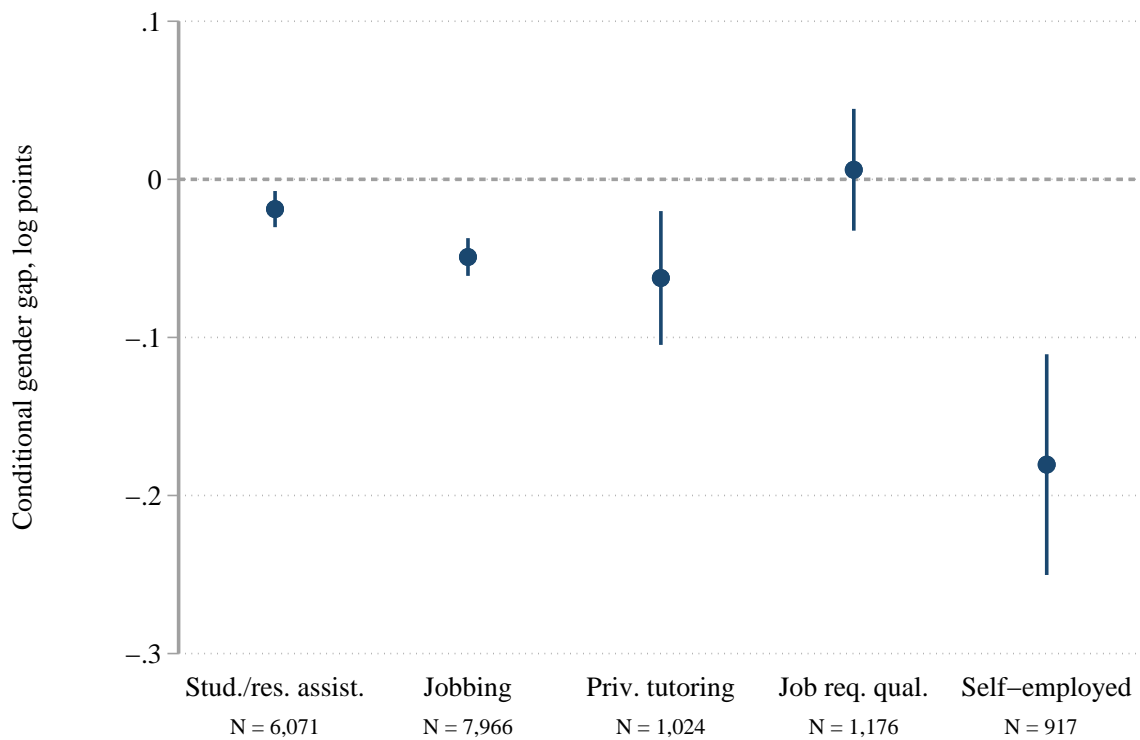


*Notes.*– The figure presents point estimates and 95%-level confidence intervals for the female coefficient $\beta$ from separate wage regressions of the form described in equation (1) in the respective job type subsample. Confidence intervals are computed using heteroskedasticity robust standard errors.

Besides the public-private dimension, this heterogeneity analysis also provides some tentative evidence in support of recent research into negotiating behavior and competitiveness as drivers of gender pay gaps (see Niederle (2017), Blau and Kahn (2017), Bertrand (2011) for reviews). We find that gaps in student employment are largest in private tutoring (6.2 log points) and self-employment (18 log points), which are likely to be the jobs with the largest scope for pay negotiations.

## 4.4 Selection into work and certain kinds of jobs

To better understand the interaction between gender and job types, we perform linear probability regressions[8] of different binary employment variables on the gender dummy and our full set of control variables, excluding job types. Column (1) of Table 4 shows the results for a variable indicating employment in general. As mentioned in Section 2, in Germany, female students are more likely to work alongside their studies than male students. The positive and significant female coefficient in column (1) shows that this descriptive fact is robust to the introduction of extensive controls: female students are 4 percentage points more likely to work. Furthermore, there is substantial variation between fields of study, with students of medicine 17 percentage points less likely to work than students of the humanities.

Columns (2) and (3) present the results from linear probability regressions of dependent variables indicating employment in the two largest job type categories, respectively: student/research assistants in column (2) and "Jobbing" in column (3). Together, these two columns provide more rigorous evidence for the descriptive gender differences in job types presented in Table 1. Female students are 3.6 percentage points less likely than male students to hold student/research assistant positions and 6.1 percentage points more likely than male students to work in jobs belonging to the "Jobbing" category. As we have documented, "Jobbing" carries a significant wage disadvantage compared to student/research assistant jobs, contributing to the unadjusted gender pay gap.

These results have potential implications for students' labor market outcomes beyond wage considerations. This could hold true especially for careers in academia: As student/research assistant positions enable students to gain research experience and build networks with professors and other researchers, these positions often pave the way for postgraduate and doctorate study. The comparatively small share of females in student/research assistant positions could therefore contribute to the "leaky pipeline" phenomenon, which describes the decline in the fraction of women along academic career paths in many disciplines (see, for example, Buckles (2019) for economics, Carrell *et al.* (2010) for STEM).

Column (4) shows the results of a related analysis. As discussed before, respondents in the 2016 wave were asked about the extent to which their job was related to their studies. A binarized version of this variable is the dependent variable of the regression presented in column (4). The results show that female students are 7 percentage points less likely than male students to work in a job which is related to their studies. This goes beyond the results in columns (2) and (3) by extending to all job types, but leads to a similar stylized result: Female students are more likely than male students to work in jobs which require relatively unspecific skills. This probably provides female students with relatively smaller work experience gains. Any resulting gender gap in work experience could impact women's later career prospects.

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[8]Probit regressions of the same specification generate qualitatively identical results, which can be found in Table A5 in the appendix.

Table 4: Linear regressions of binary employment variables

| | (1) Working | (2) Stud./res. assist | (3) Jobbing | (4) Job study-related |
|---|---|---|---|---|
| Female | 0.041*** | −0.036*** | 0.061*** | −0.070*** |
| | (0.005) | (0.007) | (0.008) | (0.013) |
| East German High School | 0.017** | 0.005 | 0.032*** | 0.005 |
| | (0.008) | (0.011) | (0.012) | (0.023) |
| East German University | −0.070*** | 0.016 | −0.012 | −0.030 |
| | (0.008) | (0.011) | (0.012) | (0.021) |
| Completed apprenticeship | −0.012 | −0.051*** | −0.072*** | 0.029 |
| | (0.007) | (0.009) | (0.010) | (0.020) |
| Foreign nationality | 0.026 | −0.014 | 0.025 | −0.096** |
| | (0.022) | (0.029) | (0.032) | (0.043) |
| *Parents' qualification* | | | | |
| Apprent./skilled worker | 0.037* | −0.042 | −0.005 | 0.057 |
| | (0.020) | (0.027) | (0.029) | (0.042) |
| Master craft./tech. school | 0.035* | −0.039 | −0.023 | 0.061 |
| | (0.020) | (0.027) | (0.029) | (0.042) |
| Academic degree | 0.014 | 0.003 | −0.071** | 0.100** |
| | (0.020) | (0.027) | (0.029) | (0.041) |
| Masters program | 0.043*** | 0.135*** | −0.139*** | 0.187*** |
| | (0.009) | (0.012) | (0.012) | (0.017) |
| Study abroad experience | 0.000 | 0.096*** | −0.075*** | 0.058*** |
| | (0.007) | (0.009) | (0.009) | (0.016) |
| Uni. of Applied Sciences | 0.013** | −0.083*** | 0.062*** | −0.030* |
| | (0.006) | (0.009) | (0.009) | (0.016) |
| *Field of Study* | | | | |
| Social sciences, law | −0.048*** | 0.059*** | 0.003 | 0.024 |
| | (0.007) | (0.009) | (0.010) | (0.019) |
| Natur. scienc., engineer. | −0.108*** | 0.181*** | −0.116*** | 0.138*** |
| | (0.007) | (0.009) | (0.010) | (0.020) |
| Human & Vet. Medicine | −0.168*** | 0.085*** | −0.087*** | 0.192*** |
| | (0.009) | (0.012) | (0.013) | (0.025) |
| *Survey wave fixed effects* | Yes | Yes | Yes | Yes |
| *Age group dummies* | Yes | Yes | Yes | Yes |
| Share of outcome = 1 | 0.549 | 0.319 | 0.419 | 0.483 |
| R-squared | 0.063 | 0.087 | 0.059 | 0.088 |
| Observations | 39,241 | 19,024 | 19,024 | 6,082 |

*Notes.*– The columns show the coefficients from OLS regressions of different binary outcome variables (linear probability models): (1) Working at all, (2) working in the "Jobbing" category, (3) working as a student/research assistant and (4) working in a job that is related to one's studies. For categorical variables, the base categories (omitted in the table) are "No qualification" for Parents' qualification, "Humanities" for Field of Study and "Student/research assistant" for Job type. Heteroskedasticity robust standard errors are reported in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.

# 5 Conclusion

While being well-documented for employees with completed education careers, gender pay gaps in student jobs have received little attention in the labor market literature. Since a growing proportion of university students is working alongside their studies, this omits an increasingly important part of workers' employment biographies. Using data from a large-scale student survey, we document a sizable pay gap between male and female university students in Germany. We find that female students earn about 6% less than male students on average. This unadjusted gap reduces to 4.1% when controlling for a large set of covariates including demographic information, study characteristics and employment variables. Results are robust to the inclusion of ability and personality controls, as well as to various sample restrictions. We find the most important factor in explaining gender wage gaps to be differences in the types of jobs male and female students hold: Male students are more often employed as student or research assistants or generally in jobs that are related to their studies, whereas female students more often work in jobs with less specific skill requirements, for example as waiters or office assistants. Beyond explaining wage differences, these findings are relevant to the literature on occupational differences between men and women and relate, for example, to the work of Ochsenfeld (2014) who shows that men choose more often majors which have higher paid jobs after finishing studies. Additionally, the experiences in the student labor market potentially shape the future wage expectations and social constructions of young men and women, which could lead to even more wage inequality in the long run (Auspurg *et al.*, 2017).

Our study provides at least two starting points for future research. First, our results suggest that gender pay gaps may stem from factors that even precede the pursuit of tertiary education. Further research is needed to understand at which point in workers' lives the differences we measure begin to manifest themselves. Second, eliciting more nuanced occupational data among students could enable a detailed analysis of gender differences in job choice as a driver of pay gaps.

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# A  Appendix

## A.1  Further information on the data

Besides the sample restrictions discussed in Section 3, there are several other details worth noting: Firstly, an additional sample restriction arises from a limitation in the 2003, 2006 and 2009 waves: Respondents were able to specify several jobs, but only one wage. Therefore, wages can only be linked to jobs for observations in which only one job was reported. This was improved upon in the 2012 and 2016 waves, but for our main analysis, we exclude all students with more than one job. Relaxing this in the 2012 and 2016 waves does not change the results significantly, as can be seen in Table A3 column (2). Secondly, further sample restrictions result from implausible values. This refers to the hourly wage variable. The survey waves 2003 through 2012 restrict this variable to values below 100 Euros. For consistency, we apply the same restriction to the 2016 wave. These values are particularly prevalent in the 2016 wave, which was the first wave to use internet-based questionnaires instead of a pen-and-paper format. This allowed for a considerable increase in the sample size and the number of observed variables, but also seems to have diminished response quality. To rule out biases from pooling methodologically different surveys, we add survey wave dummies throughout and also conduct the analysis separately for each wave, finding similar results (see Table A2).

Furthermore, Table 3 introduces several variables which may raise questions as to their coding and accuracy. Firstly, for our ability measure we use an aggregated version of High School GPA: German university entrance qualifications (most commonly the Abitur) are graded on a scale ranging from 1.0 (best possible grade) to 4.0 (worst passing grade). Our aggregate measure comprises four categories: Very good (1.0 - 1.5), Good (1.6 - 2.5), Satisfactory (2.6 - 3.5), Sufficient (3.6 - 4.0). Secondly, the variable "Job study-related is based on a question asking respondents to report the extent to which their job was related to their studies in terms of content on a five-point Likert scale. Our binary measure codes 1, 2 and 3 as "Job not-study-related" and 4 and 5 as "Job study-related". Thirdly, self-efficacy is measured in the survey using the AKSU framework proposed by Beierlein *et al.* (2013), consisting of three five-point Likert items. We use the simple mean of the three items as our self-efficacy measure. Fourthly, to measure Big Five personality dimensions, the survey uses the BFI-10 framework proposed by Rammstedt *et al.* (2013). This comprises ten questions, two for each of the five personality dimensions, which are answered on a five-point Likert scale. Each dimension is measured by one positive and one negative item. For example, surveys include one item for agreeableness and one item for disagreeableness. We combine these measures by reversing the negative item and taking the simple mean of the two items for each dimension.

## A.2 Additional Tables

Table A1: Descriptive statistics for all variables in the main specification

| Variable | Overall mean | Group means | | Difference | P-Value |
|---|---|---|---|---|---|
| | | Men | Women | | |
| Net hourly wage (euros) | 9.765 | 10.221 | 9.451 | 0.770 | 0.000*** |
| | (4.988) | (5.182) | (4.825) | | |
| *Wave* | | | | | |
| 2003 wave | 0.202 | 0.206 | 0.200 | 0.006 | 0.301 |
| | (0.402) | (0.404) | (0.400) | | |
| 2006 wave | 0.160 | 0.149 | 0.167 | −0.018 | 0.001*** |
| | (0.366) | (0.356) | (0.373) | | |
| 2009 wave | 0.172 | 0.165 | 0.176 | −0.011 | 0.041** |
| | (0.377) | (0.371) | (0.381) | | |
| 2012 wave | 0.145 | 0.135 | 0.153 | −0.018 | 0.001*** |
| | (0.353) | (0.342) | (0.360) | | |
| 2016 wave | 0.321 | 0.345 | 0.304 | 0.041 | 0.000*** |
| | (0.467) | (0.475) | (0.460) | | |
| *Age* | | | | | |
| under 20 | 0.025 | 0.016 | 0.030 | −0.014 | 0.000*** |
| | (0.155) | (0.126) | (0.171) | | |
| 20 - 22 | 0.332 | 0.261 | 0.381 | −0.120 | 0.000*** |
| | (0.471) | (0.439) | (0.486) | | |
| 23 - 25 | 0.413 | 0.427 | 0.404 | 0.023 | 0.002*** |
| | (0.492) | (0.495) | (0.491) | | |
| 26 - 30 | 0.197 | 0.250 | 0.160 | 0.090 | 0.000*** |
| | (0.398) | (0.433) | (0.367) | | |
| over 30 | 0.033 | 0.046 | 0.025 | 0.021 | 0.000*** |
| | (0.180) | (0.209) | (0.156) | | |
| East German High School | 0.184 | 0.174 | 0.191 | −0.017 | 0.003*** |
| | (0.388) | (0.379) | (0.393) | | |
| East German University | 0.196 | 0.195 | 0.196 | −0.001 | 0.887 |
| | (0.397) | (0.397) | (0.397) | | |
| Completed apprenticeship | 0.192 | 0.213 | 0.178 | 0.035 | 0.000*** |
| | (0.394) | (0.409) | (0.383) | | |
| Foreign nationality | 0.012 | 0.012 | 0.012 | 0.001 | 0.738 |
| | (0.109) | (0.110) | (0.108) | | |
| Masters program | 0.118 | 0.138 | 0.105 | 0.034 | 0.000*** |
| | (0.323) | (0.345) | (0.306) | | |
| Uni. of Applied Sciences | 0.213 | 0.244 | 0.191 | 0.053 | 0.000*** |
| | (0.409) | (0.430) | (0.393) | | |
| Study abroad experience | 0.211 | 0.178 | 0.233 | −0.055 | 0.000*** |
| | (0.408) | (0.383) | (0.423) | | |
| *Parents' education* | | | | | |
| no qualification | 0.016 | 0.014 | 0.017 | −0.002 | 0.170 |

## Table A1: (continued from previous page)

| Variable | Overall mean | Group means | | Difference | P-Value |
|---|---|---|---|---|---|
| | | Men | Women | | |
| | (0.124) | (0.118) | (0.127) | | |
| Apprent./skilled worker | 0.249 | 0.253 | 0.247 | 0.007 | 0.300 |
| | (0.433) | (0.435) | (0.431) | | |
| Master craft./tech. school | 0.199 | 0.197 | 0.200 | −0.003 | 0.563 |
| | (0.399) | (0.397) | (0.400) | | |
| Academic degree | 0.537 | 0.536 | 0.537 | −0.001 | 0.923 |
| | (0.499) | (0.499) | (0.499) | | |
| *Studyfield* | | | | | |
| Humanities | 0.279 | 0.161 | 0.361 | −0.200 | 0.000*** |
| | (0.449) | (0.367) | (0.480) | | |
| Social sciences, law | 0.304 | 0.288 | 0.315 | −0.028 | 0.000*** |
| | (0.460) | (0.453) | (0.465) | | |
| Natur. scienc., engineer. | 0.317 | 0.475 | 0.208 | 0.267 | 0.000*** |
| | (0.465) | (0.499) | (0.406) | | |
| Human & Vet. Medicine | 0.100 | 0.077 | 0.116 | −0.040 | 0.000*** |
| | (0.300) | (0.266) | (0.321) | | |
| *Job type* | | | | | |
| Student/research assistant | 0.319 | 0.367 | 0.286 | 0.081 | 0.000*** |
| | (0.466) | (0.482) | (0.452) | | |
| Jobbing | 0.419 | 0.361 | 0.459 | −0.098 | 0.000*** |
| | (0.493) | (0.480) | (0.498) | | |
| Private tutoring | 0.054 | 0.039 | 0.064 | −0.024 | 0.000*** |
| | (0.226) | (0.195) | (0.244) | | |
| Job requiring qualification | 0.062 | 0.066 | 0.059 | 0.007 | 0.045** |
| | (0.241) | (0.248) | (0.235) | | |
| Self-employed work | 0.048 | 0.063 | 0.038 | 0.026 | 0.000*** |
| | (0.214) | (0.244) | (0.190) | | |
| Other | 0.098 | 0.104 | 0.095 | 0.009 | 0.041** |
| | (0.298) | (0.305) | (0.293) | | |
| Observations | 19024 | 7770 | 11254 | | |

*Notes.*– The table presents descriptive statistics on all variables in the main specification, both for the full sample and split by gender. Standard deviations are reported in parentheses. P-Values refer to t-tests for equality of means between men and women. All variables except net hourly wage are indicator variables, their means therefore represent shares of the respective sample. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.

Table A2: Wage regressions by survey wave

| | (1) 2003 | (2) 2006 | (3) 2009 | (4) 2012 | (5) 2016 |
|---|---|---|---|---|---|
| Female | −0.046*** | −0.013 | −0.036*** | −0.061*** | −0.040*** |
| | (0.012) | (0.014) | (0.011) | (0.013) | (0.007) |
| East German High School | −0.077*** | −0.052** | −0.071*** | −0.061*** | −0.037*** |
| | (0.022) | (0.021) | (0.018) | (0.021) | (0.013) |
| East German University | −0.084*** | −0.128*** | −0.078*** | −0.050** | −0.015 |
| | (0.022) | (0.022) | (0.019) | (0.021) | (0.013) |
| Completed apprenticeship | −0.005 | −0.017 | −0.012 | 0.000 | 0.017 |
| | (0.015) | (0.019) | (0.016) | (0.017) | (0.011) |
| *Parents' qualification* | | | | | |
| Apprent./skilled worker | −0.053 | −0.015 | 0.056* | 0.082 | 0.072*** |
| | (0.040) | (0.054) | (0.032) | (0.054) | (0.019) |
| Master craft./tech. school | −0.043 | 0.014 | 0.062* | 0.078 | 0.076*** |
| | (0.040) | (0.054) | (0.032) | (0.054) | (0.019) |
| Academic degree | −0.020 | 0.027 | 0.066** | 0.089* | 0.084*** |
| | (0.040) | (0.053) | (0.031) | (0.054) | (0.018) |
| Masters program | 0.024 | −0.071 | −0.013 | 0.059*** | 0.051*** |
| | (0.055) | (0.099) | (0.021) | (0.016) | (0.009) |
| Study abroad experience | 0.040*** | 0.010 | 0.007 | 0.035** | 0.006 |
| | (0.013) | (0.015) | (0.013) | (0.016) | (0.008) |
| Uni. of Applied Sciences | −0.038** | −0.008 | −0.013 | 0.010 | 0.010 |
| | (0.016) | (0.017) | (0.015) | (0.015) | (0.009) |
| *Field of study* | | | | | |
| Social sciences, law | −0.002 | −0.005 | −0.003 | −0.005 | 0.009 |
| | (0.014) | (0.015) | (0.013) | (0.015) | (0.011) |
| Natur. scienc., engineer. | −0.022 | −0.003 | 0.001 | 0.011 | 0.015 |
| | (0.015) | (0.018) | (0.014) | (0.015) | (0.011) |
| Human & Vet. Medicine | −0.007 | −0.002 | −0.019 | 0.009 | 0.004 |
| | (0.018) | (0.023) | (0.018) | (0.022) | (0.014) |
| *Job type* | | | | | |
| Jobbing | −0.014 | −0.037*** | −0.057*** | −0.106*** | −0.033*** |
| | (0.010) | (0.012) | (0.009) | (0.011) | (0.007) |
| Private tutoring | 0.267*** | 0.264*** | 0.262*** | 0.208*** | 0.213*** |
| | (0.028) | (0.031) | (0.024) | (0.023) | (0.017) |
| Job requiring qualification | 0.254*** | 0.216*** | 0.273*** | 0.231*** | 0.240*** |
| | (0.023) | (0.029) | (0.028) | (0.031) | (0.017) |
| Self-employed work | 0.368*** | 0.278*** | 0.225*** | 0.260*** | 0.365*** |
| | (0.034) | (0.036) | (0.032) | (0.037) | (0.070) |
| Other | 0.161*** | 0.094*** | 0.106*** | 0.014 | 0.113*** |
| | (0.024) | (0.030) | (0.025) | (0.027) | (0.025) |
| *Survey wave fixed effects* | Yes | Yes | Yes | Yes | Yes |
| *Age group dummies* | Yes | Yes | Yes | Yes | Yes |
| Mean dep. var. | 2.143 | 2.110 | 2.152 | 2.202 | 2.347 |
| R-squared | 0.200 | 0.157 | 0.172 | 0.191 | 0.136 |
| Observations | 3,846 | 3,036 | 3,267 | 2,766 | 6,109 |

*Notes.*– The table shows results from OLS regressions of the form of equation (1), performed separately in the five survey waves. For categorical variables, the base categories (omitted in the table) are "No qualification" for Parents' qualification, "Humanities" for Field of Study and "Student/research assistant" for Job type. Heteroskedasticity robust standard errors are reported in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.

## Table A3: Robustness to sample restrictions

|  | (1) | (2) | (3) |
|---|---|---|---|
| Female | −0.036*** | −0.036*** | −0.047*** |
|  | (0.004) | (0.004) | (0.011) |
| East German High School | −0.070*** | −0.031*** | −0.067*** |
|  | (0.007) | (0.008) | (0.019) |
| East German University | −0.063*** | −0.040*** | −0.090*** |
|  | (0.007) | (0.008) | (0.019) |
| Completed apprenticeship | −0.012** | −0.011* | 0.006 |
|  | (0.005) | (0.006) | (0.017) |
| Foreign nationality | −0.010 | −0.006 | −0.016 |
|  | (0.012) | (0.013) | (0.035) |
| *Parents' qualification* |  |  |  |
| Apprent./skilled worker | 0.019* | 0.046*** | −0.002 |
|  | (0.011) | (0.012) | (0.037) |
| Master craft./tech. school | 0.021* | 0.046*** | −0.003 |
|  | (0.011) | (0.012) | (0.037) |
| Academic degree | 0.036*** | 0.058*** | 0.018 |
|  | (0.011) | (0.012) | (0.036) |
| Masters program | 0.039*** | 0.037*** | −0.001 |
|  | (0.005) | (0.005) | (0.018) |
| Study abroad experience | 0.022*** | 0.011** | 0.049*** |
|  | (0.004) | (0.005) | (0.013) |
| Uni. of Applied Sciences | −0.020*** | −0.003 | −0.029** |
|  | (0.004) | (0.005) | (0.014) |
| *Field of Study* |  |  |  |
| Social sciences, law | −0.004 | −0.007 | −0.040*** |
|  | (0.005) | (0.006) | (0.014) |
| Natur. scienc., engineer. | −0.008* | 0.001 | −0.026* |
|  | (0.005) | (0.006) | (0.015) |
| Human & Vet. Medicine | −0.005 | −0.008 | −0.040** |
|  | (0.006) | (0.007) | (0.017) |
| *Job type* |  |  |  |
| Jobbing | −0.058*** | −0.052*** | 0.017* |
|  | (0.003) | (0.004) | (0.010) |
| Private tutoring | 0.216*** | 0.206*** | 0.268*** |
|  | (0.007) | (0.009) | (0.016) |
| Job requiring qualification | 0.253*** | 0.269*** | 0.288*** |
|  | (0.007) | (0.009) | (0.029) |
| Self-employed work | 0.325*** | 0.348*** | 0.328*** |
|  | (0.013) | (0.023) | (0.031) |
| Other | 0.079*** | 0.065*** | 0.130*** |
|  | (0.008) | (0.012) | (0.023) |
| *Survey wave fixed effects* | Yes | Yes | Yes |
| *Age group dummies* | Yes | Yes | Yes |
| Mean dep. var. | 2.240 | 2.325 | 2.207 |
| R-squared | 0.234 | 0.190 | 0.172 |
| Observations | 37,774 | 24,337 | 5,094 |

*Notes.*– The table shows results from the main wage regression (equation (1)) performed in different samples. In column (1), the "focus type" restriction is relaxed, including students who do not satisfy the conditions mentioned in Section 3. Column (2) relaxes the restriction excluding students with more than one job. For the reasons mentioned in Section 3, this is only possible in the 2012 and 2016 waves, the other waves are not represented here. Column (3) shows the results of restricting the sample to those students who work five hours or less per week. For categorical variables, the base categories (omitted in the table) are "No qualification" for Parents' qualification, "Humanities" for Field of Study and "Student/research assistant" for Job type. Heteroskedasticity robust standard errors are reported in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.

## Table A4: Wage regression including work hours and income

|  | (1) |
|---|---|
| Female | −0.040*** |
|  | (0.005) |
| East German High School | −0.067*** |
|  | (0.009) |
| East German University | −0.063*** |
|  | (0.009) |
| Completed apprenticeship | −0.006 |
|  | (0.008) |
| Foreign nationality | −0.020 |
|  | (0.019) |
| *Parents' qualification* |  |
| Apprent./skilled worker | 0.014 |
|  | (0.019) |
| Master craft./tech. school | 0.020 |
|  | (0.019) |
| Academic degree | 0.031 |
|  | (0.019) |
| Masters program | 0.041*** |
|  | (0.009) |
| Study abroad experience | 0.022*** |
|  | (0.006) |
| Uni. of Applied Sciences | −0.008 |
|  | (0.007) |
| *Field of Study* |  |
| Social sciences, law | 0.004 |
|  | (0.007) |
| Natur. scienc., engineer. | 0.012* |
|  | (0.007) |
| Human & Vet. Medicine | 0.001 |
|  | (0.009) |
| *Job type* |  |
| Jobbing | −0.043*** |
|  | (0.005) |
| Private tutoring | 0.235*** |
|  | (0.013) |
| Job requiring qualification | 0.228*** |
|  | (0.013) |
| Self-employed work | 0.275*** |
|  | (0.019) |
| Other | 0.108*** |
|  | (0.013) |
| Log work hours per week | −0.026*** |
|  | (0.005) |
| Log income excluding work income | −0.012*** |
|  | (0.005) |
| *Survey wave fixed effects* | Yes |
| *Age group dummies* | Yes |
| Mean dep. var. | 2.180 |
| R-squared | 0.228 |
| Observations | 12,835 |

*Notes*.– The table shows results from an OLS regression of the form described in equation (1), where logarithmized work hours per week and logarithmized income excluding work income have been added to the main regression presented in Table 2. For categorical variables, the base categories (omitted in the table) are "No qualification" for Parents' qualification, "Humanities" for Field of Study and "Student/research assistant" for Job type. Heteroskedasticity robust standard errors are reported in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.

## Table A5: Employment probit regressions

| | (1) Working | (2) Stud./res. assist | (3 )Jobbing | (4) Job study-related |
|---|---|---|---|---|
| Female | 0.109*** | −0.105*** | 0.165*** | −0.188*** |
| | (0.014) | (0.021) | (0.020) | (0.035) |
| East German High School | 0.044** | 0.014 | 0.083** | 0.015 |
| | (0.022) | (0.034) | (0.033) | (0.063) |
| East German University | −0.185*** | 0.051 | −0.031 | −0.081 |
| | (0.021) | (0.033) | (0.032) | (0.056) |
| Completed apprenticeship | −0.034* | −0.155*** | −0.194*** | 0.079 |
| | (0.020) | (0.029) | (0.028) | (0.052) |
| Foreign nationality | 0.072 | −0.044 | 0.064 | −0.261** |
| | (0.059) | (0.091) | (0.087) | (0.121) |
| *Parents' qualification* | | | | |
| Apprent./skilled worker | 0.100* | −0.127 | −0.012 | 0.154 |
| | (0.055) | (0.081) | (0.078) | (0.114) |
| Master craft./tech. school | 0.093* | −0.117 | −0.059 | 0.165 |
| | (0.055) | (0.082) | (0.078) | (0.115) |
| Academic degree | 0.037 | 0.011 | −0.188** | 0.270** |
| | (0.054) | (0.080) | (0.077) | (0.111) |
| Masters program | 0.119*** | 0.338*** | −0.403*** | 0.489*** |
| | (0.024) | (0.033) | (0.035) | (0.045) |
| Study abroad experience | −0.001 | 0.276*** | −0.203*** | 0.153*** |
| | (0.018) | (0.024) | (0.024) | (0.042) |
| Uni. of Applied Sciences | 0.035** | −0.245*** | 0.168*** | −0.081* |
| | (0.017) | (0.026) | (0.025) | (0.042) |
| *Field of Study* | | | | |
| Social sciences, law | −0.129*** | 0.175*** | 0.007 | 0.060 |
| | (0.019) | (0.027) | (0.025) | (0.051) |
| Natural sciences, engineering | −0.286*** | 0.525*** | −0.314*** | 0.362*** |
| | (0.019) | (0.028) | (0.026) | (0.052) |
| Human & Vet. Medicine | −0.442*** | 0.256*** | −0.231*** | 0.499*** |
| | (0.023) | (0.037) | (0.035) | (0.064) |
| *Survey wave fixed effects* | Yes | Yes | Yes | Yes |
| *Age group dummies* | Yes | Yes | Yes | Yes |
| Observations | 39,241 | 19,024 | 19,024 | 6,082 |

*Notes.*– The columns show the coefficients from probit regressions of different binary outcome variables: (1) Working at all, (2) working in the "Jobbing" category, (3) working as a student/research assistant and (4) working in a job that is related to one's studies. The outcome variable for (4) is an aggregated version of a five-level Likert scale variable, with "Agree" and "Strongly agree" coded as 1 and the other levels as 0. For categorical variables, the base categories (omitted in the table) are "No qualification" for Parents' qualification, "Humanities" for Field of Study and "Student/research assistant" for Job type. Standard errors are reported in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.

Table A6: Kitagawa-Oaxaca-Blinder wage decomposition (main specification)

|  | Estimate | Standard error |
|---|---|---|
| *Aggregate decomposition* | | |
| Mean males | 2.253*** | (0.004) |
| Mean females | 2.186*** | (0.003) |
| Difference | 0.067*** | (0.005) |
| Explained part | 0.027*** | (0.003) |
| Unexplained part | 0.041*** | (0.005) |
| *Contribution of variables to explained part* | | |
| Survey wave fixed effects | 0.008*** | (0.001) |
| Age group dummies | 0.008*** | (0.001) |
| East German High School | 0.001*** | (0.000) |
| East German University | 0.000 | (0.000) |
| Completed apprenticeship | −0.000 | (0.000) |
| Foreign nationality | −0.000 | (0.000) |
| Parents' qualification | 0.000 | (0.000) |
| Master's program | 0.001*** | (0.000) |
| Study abroad experience | −0.001*** | (0.000) |
| University of Applied Sciences | −0.000 | (0.000) |
| Field of study | 0.000 | (0.002) |
| Job type | 0.009*** | (0.002) |
| *Contribution of variables to unexplained part* | | |
| Survey wave fixed effects | 0.001 | (0.001) |
| Age group dummies | −0.008 | (0.007) |
| East German High School | −0.003 | (0.006) |
| East German University | −0.000 | (0.005) |
| Completed apprenticeship | −0.005 | (0.004) |
| Foreign nationality | −0.003 | (0.018) |
| Parents' qualification | 0.002 | (0.007) |
| Master's program | 0.000 | (0.005) |
| Study abroad experience | 0.000 | (0.003) |
| University of Applied Sciences | 0.001 | (0.003) |
| Field of study | 0.003 | (0.003) |
| Job type | −0.012** | (0.006) |
| Constant | 0.065*** | (0.024) |
| Observations | 19,024 | |

*Notes.*– The table shows results from a Kitagawa-Oaxaca-Blinder wage decomposition, as implemented by Jann (2008). The male coefficient vector is used as the reference. Heteroskedasticity robust standard errors are reported in the second column in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.

Table A7: Kitagawa-Oaxaca-Blinder wage decomposition with ability and personality controls

| | Estimate | Standard error |
|---|---|---|
| *Aggregate decomposition* | | |
| Mean males | 2.390*** | (0.009) |
| Mean females | 2.326*** | (0.007) |
| Difference | 0.064*** | (0.011) |
| Explained part | 0.009 | (0.007) |
| Unexplained part | 0.055*** | (0.013) |
| *Contribution of variables to explained part* | | |
| Age group dummies | 0.004** | (0.002) |
| East German High School | 0.001 | (0.000) |
| East German University | 0.000 | (0.000) |
| Completed apprenticeship | 0.001 | (0.001) |
| Foreign nationality | 0.000 | (0.000) |
| Parents' qualification | 0.000 | (0.001) |
| Master's program | 0.003*** | (0.001) |
| Study abroad experience | 0.000 | (0.001) |
| University of Applied Sciences | 0.000 | (0.000) |
| Field of study | −0.003 | (0.004) |
| Job type | 0.002 | (0.003) |
| High school GPA | 0.001 | (0.001) |
| Job study-related | 0.004** | (0.001) |
| Self-efficacy | −0.001 | (0.001) |
| Agreeableness | −0.001 | (0.001) |
| Conscientiousness | 0.000 | (0.003) |
| Openness | −0.000 | (0.001) |
| Neuroticism | 0.002 | (0.004) |
| Extraversion | −0.003** | (0.001) |
| *Contribution of variables to unexplained part* | | |
| Age group dummies | 0.012 | (0.018) |
| East German High School | −0.008 | (0.014) |
| East German University | 0.008 | (0.012) |
| Completed apprenticeship | 0.008 | (0.011) |
| Foreign nationality | −0.013 | (0.045) |
| Parents' qualification | 0.008 | (0.017) |
| Master's program | 0.001 | (0.007) |
| Study abroad experience | −0.001 | (0.008) |
| University of Applied Sciences | 0.001 | (0.007) |
| Field of study | 0.002 | (0.008) |
| Job type | −0.081** | (0.033) |
| High school GPA | 0.047 | (0.035) |
| Job study-related | 0.000 | (0.000) |
| Self-efficacy | 0.114 | (0.089) |
| Agreeableness | 0.041 | (0.044) |
| Conscientiousness | −0.035 | (0.050) |
| Openness | 0.050 | (0.038) |
| Neuroticism | 0.062* | (0.036) |
| Extraversion | −0.020 | (0.039) |
| Constant | −0.140 | (0.142) |
| Observations | 2,780 | |

*Notes.*– The table shows results from a Kitagawa-Oaxaca-Blinder wage decomposition, as implemented by Jann (2008), where ability and personality measures have been added to the main specification presented in Table A6. This corresponds to the results presented in Table 3. The male coefficient vector is used as the reference. Heteroskedasticity robust standard errors are reported in the second column in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.

Table A8: Kitagawa-Oaxaca-Blinder wage decomposition by job type

| | Stud. assist. | Jobbing | Priv. tutor. | Job req. qual. | Self-emp. |
|---|---|---|---|---|---|
| *Aggregate decomposition* | | | | | |
| Mean males | 2.222*** | 2.174*** | 2.476*** | 2.455*** | 2.504*** |
| | (0.005) | (0.005) | (0.019) | (0.016) | (0.025) |
| Mean females | 2.189*** | 2.098*** | 2.388*** | 2.445*** | 2.320*** |
| | (0.004) | (0.004) | (0.013) | (0.013) | (0.022) |
| Difference | 0.033*** | 0.076*** | 0.088*** | 0.010 | 0.184*** |
| | (0.006) | (0.007) | (0.023) | (0.020) | (0.033) |
| Explained part | 0.015*** | 0.027*** | 0.026** | 0.016 | 0.004 |
| | (0.004) | (0.004) | (0.011) | (0.010) | (0.018) |
| Unexplained part | 0.019*** | 0.049*** | 0.062*** | −0.006 | 0.180*** |
| | (0.006) | (0.006) | (0.021) | (0.019) | (0.035) |
| *Contr. of variables to expl. part* | | | | | |
| Survey wave fixed effects | 0.005** | 0.013*** | 0.010* | 0.022*** | 0.007 |
| | (0.002) | (0.002) | (0.006) | (0.007) | (0.006) |
| Age group dummies | 0.004*** | 0.008*** | 0.009* | −0.003 | 0.014** |
| | (0.001) | (0.001) | (0.005) | (0.003) | (0.006) |
| Socio-demographic controls | 0.000 | 0.004*** | 0.001 | 0.003 | −0.003 |
| | (0.001) | (0.001) | (0.004) | (0.004) | (0.006) |
| Master's program | 0.003*** | 0.000 | −0.001 | 0.005 | 0.000 |
| | (0.001) | (0.000) | (0.001) | (0.003) | (0.001) |
| Study abroad experience | 0.000 | −0.001*** | −0.000 | 0.001 | −0.007 |
| | (0.001) | (0.000) | (0.001) | (0.002) | (0.005) |
| University of Applied Sciences | 0.001* | −0.001 | −0.002 | −0.002 | −0.001 |
| | (0.000) | (0.001) | (0.001) | (0.002) | (0.004) |
| Field of study | 0.001 | 0.004** | 0.008 | −0.009 | −0.007 |
| | (0.002) | (0.002) | (0.007) | (0.006) | (0.014) |
| *Contr. of variables to unexpl. part* | | | | | |
| Survey wave fixed effects | 0.003 | −0.001 | −0.000 | 0.000 | −0.007 |
| | (0.003) | (0.002) | (0.008) | (0.010) | (0.024) |
| Age group dummies | 0.007 | −0.004 | 0.001 | −0.151*** | −0.058 |
| | (0.010) | (0.009) | (0.053) | (0.023) | (0.053) |
| Socio-demographic controls | −0.002 | 0.014 | −0.027 | 0.049 | −0.014 |
| | (0.022) | (0.027) | (0.076) | (0.192) | (0.081) |
| Master's program | 0.005 | −0.015 | 0.070** | −0.010 | 0.021 |
| | (0.005) | (0.010) | (0.032) | (0.026) | (0.064) |
| Study abroad experience | −0.001 | −0.007 | −0.006 | −0.006 | −0.005 |
| | (0.003) | (0.005) | (0.019) | (0.021) | (0.025) |
| University of Applied Sciences | −0.001 | −0.003 | 0.046* | 0.003 | −0.019 |
| | (0.006) | (0.004) | (0.026) | (0.003) | (0.031) |
| Field of study | 0.001 | −0.002 | −0.027 | 0.007 | 0.014 |
| | (0.004) | (0.004) | (0.023) | (0.009) | (0.026) |
| Constant | 0.007 | 0.067** | 0.007 | 0.101 | 0.247** |
| | (0.028) | (0.032) | (0.106) | (0.195) | (0.123) |
| Observations | 6,071 | 7,966 | 1,024 | 1,176 | 917 |

*Notes.*– The table shows results from a Kitagawa-Oaxaca-Blinder wage decomposition, as implemented by Jann (2008), where the total sample is split by job type. The male coefficient vector is used as the reference. Heteroskedasticity robust standard errors are reported in parentheses. "Socio-demographic controls" subsumes "East German High School", "East German University", "Completed apprenticeship", "Foreign nationality" and "Parents' qualification". *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.

Table A9: Kitagawa-Oaxaca-Blinder wage decomposition including work hours and income

|  | Estimate | Standard error |
|---|---|---|
| *Aggregate decomposition* |  |  |
| Mean males | 2.220*** | (0.005) |
| Mean females | 2.155*** | (0.003) |
| Difference | 0.065*** | (0.006) |
| Explained part | 0.025*** | (0.003) |
| Unexplained part | 0.040*** | (0.005) |
| *Contribution of variables to explained part* |  |  |
| Survey wave fixed effects | 0.006*** | (0.001) |
| Age group dummies | 0.008*** | (0.001) |
| East German High School | 0.001*** | (0.001) |
| East German University | 0.000 | (0.000) |
| Completed apprenticeship | −0.000 | (0.000) |
| Foreign nationality | −0.000 | (0.000) |
| Parents' qualification | 0.000 | (0.000) |
| Master's program | 0.001*** | (0.000) |
| Study abroad experience | −0.001*** | (0.000) |
| University of Applied Sciences | −0.000 | (0.000) |
| Field of study | 0.003* | (0.002) |
| Job type | 0.008*** | (0.002) |
| Log work hours per week | −0.001*** | (0.000) |
| Log income excluding work income | 0.000 | (0.000) |
| *Contribution of variables to unexplained part* |  |  |
| Survey wave fixed effects | −0.000 | (0.001) |
| Age group dummies | −0.011 | (0.009) |
| East German High School | 0.007 | (0.006) |
| East German University | −0.010* | (0.006) |
| Completed apprenticeship | −0.004 | (0.005) |
| Foreign nationality | 0.018 | (0.019) |
| Parents' qualification | −0.005 | (0.009) |
| Master's program | 0.004 | (0.007) |
| Study abroad experience | −0.004 | (0.004) |
| University of Applied Sciences | 0.005 | (0.004) |
| Field of study | 0.003 | (0.003) |
| Job type | −0.004 | (0.007) |
| Log work hours per week | −0.003 | (0.022) |
| Log income excluding work income | 0.080 | (0.057) |
| Constant | −0.034 | (0.070) |
| Observations | 12,835 |  |

*Notes.–* The table shows results from a Kitagawa-Oaxaca-Blinder wage decomposition, as implemented by Jann (2008), where logarithmized work hours per week and logarithmized income excluding work income have been added to the main specification presented in Table A6. The male coefficient vector is used as the reference. Heteroskedasticity robust standard errors are reported in the second column in parentheses. *, ** and *** indicate statistical significance at the 10%-, 5%- and 1%-level, respectively.