Tracing the gender wage gap: Income differences between male and female university graduates in Germany

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The aim of this paper is to shed light on the causal mechanisms leading to the gender wage gap, drawing on neoclassical as well as sociological labor market theories. A unique dataset from the 2001/2002 Mannheim University Social Sciences Graduate Survey, which overcomes several limitations of standard population surveys when investigating the gender wage gap, is used for the empirical analysis. The sample is homogenous with respect to the measures normally used in income analyses – all of the respondents are university graduates, have a degree in the same field of study, and are observed at career entry. Furthermore, the dataset includes detailed measures of human capital, job search, and career attitudes, which are usually not included in standard population surveys. The results of a sequence of nested regression models show that none of these measures reduces the gender wage gap substantially: on the contrary, the introduction of variables capturing human capital even leads to a small increase in the gap. This indicates that the earnings differential between female and male graduates in the study would be even larger if women had the same human capital endowment as men. Considering that a wage gap of almost 7 percent remains even with the extensive set of variables in the analysis, there is some indication that female university graduates are facing wage discrimination on the German labor market.

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1 Introduction

Research has shown that in Germany – as in other industrialized nations – women's wages are lower than those of men. Although the gender wage gap has decreased in Germany in recent decades (Lauer 2000), on average women still earn 24 percent less than men (Hinz/Gartner 2005). In contrast to results from a number of US studies which examined the earnings differentials between men and women, for example Petersen and Morgan (1995), a new study by Hinz and Gartner (2005) finds that the distribution of men and women into different kinds of occupations, firms, and establishments cannot explain all of the gender differences in wages in Germany. When comparing men's and women's pay for the same job, in the same occupation and the same firm, Hinz and Gartner (2005) still find that women earn 15 percent less than men.[1] Adding further controls for experience and education leads to a reduction of the wage gap to 12 percent and even in more narrowly defined occupational (ISCO) groups they find earnings differentials; the differences are smallest among academics and upper management but still add up to 5–7 percent (Hinz/Gartner 2005: 34). In a recent German study using data from the German Socio-Economic Panel (GSOEP), Lauer (2000) finds a gender wage gap of 15 % in Germany for the GSOEP waves from 1994 to 1997, controlling for level of education, experience, training-occupation match and feminization of occupation.

When providing estimates of the gender earnings gap, most German studies only rarely address the causal mechanisms responsible for the gender gap, mainly due to a lack of adequate measures in most representative population surveys. We try to complement existing research on gender earnings differentials by examining earnings for male and female university graduates from the same field of study at the same university. By analyzing wage differences at career entry, potential gender differences in the accumulation of human capital during working life and further market constraints between men and women are reduced to a minimum (e. g. Marini and Fan 1997: 588). Furthermore, a unique dataset from the Mannheim Social Sciences Graduate Survey is used, which includes a number of detailed measures concerning skills and qualifications. These data enable us to control for gender differences in human capital acquired at university and outside university studies, as well as in ability and attitudes towards work in a more refined way than is possible with standard population surveys, thus reducing potential problems due to unobserved heterogeneity between male and female graduates.

Only scant research focusing on gender differences in wages for university graduates is available in Germany. A considerable number of international studies, most of them from the United States, have demonstrated that among university graduates the gender wage gap can to some extent be attributed to men and women choosing different fields of study: controlling for the field of study explains a sizeable part of the gender wage gap (Daymont/Andrisani 1984; Finnie/Frenette 2003; Loury 1997). However, earnings differences also exist between male and female graduates within the same field. Hecker (1998), who analyzes earnings differentials between university graduates with different major fields of studies in the US and differentiates between age groups and qualificational levels (bachelor, master, doctoral degree), finds that women earn less at most degree levels in most fields of study, with some interesting variation between fields. Looking at the results on earnings differentials between social sciences graduates, namely sociologists and psychologists, men earn more than their female counterparts at all degree levels (Hecker 1998: 64).[2] Nevertheless, advanced tertiary degrees seem to reduce the gender differences in wages compared to lower degree levels (Montgomery/Powell 2003). In one of the few German studies on income differentials between university graduates, Machin and Puhani (2003), who use data from the German 1996 Labor Force Survey, find large gross differences in pay (28 %). They show that differentiating between fields of study helps to explain part of the wage gap between male and female graduates. However, the set of explanatory variables used in their analyses is fairly limited.[3] Before turning to the analysis we give a brief overview of the mechanisms that have been identified in the literature as causing gender differentials in earnings.

2 Theoretical background

Human capital

Human capital theory suggests that women acquire less or different types of human capital than men and are therefore paid less (Becker 1991; Mincer/

[1] The analyses by Hinz and Gartner were restricted to full-time employees in 2001.

[2] With the exception of psychologists with a master's degree in the age group 25–34, where no gender wage gap was found.

[3] Unfortunately they do not report the size of the gender wage gap after controlling for the field of study.

Polachek 1974). Earnings differentials stem from productivity differences associated with human capital. It is assumed that initially women invest less in human capital than men because of the anticipated division of labor in the family and that after forming a family union they acquire less human capital because of the actual division of labor between the spouses. Becker (1985) argues further that (married) women economize on the effort they expend on market work by seeking less demanding jobs. Following these propositions, the gender wage gap can be explained by human capital differences between men and women and should disappear if human capital is adequately measured. Consequently, it can be argued that the gender wage gap found using standard population surveys could be a result of poor measures for human capital due to data limitations – usually only the level or years of education and the amount of work experience are available. Because university graduates can have other skills that are highly valued by German employers – such as internship experience, foreign language skills, or computer skills – it is likely that these additional skills are important human capital endowments that are relevant for the labor market. Gender differences concerning investment in these endowments might therefore result in income differences. Hence, differences in human capital which usually remain unobserved may possibly result in an overestimation of the gender wage gap. Consequently an existing gender wage gap for university graduates should disappear – or at least be reduced substantially – after controlling for human capital with detailed measures.

Job search

Differences between men and women with respect to the *search effort* prior to accepting employment are another possible explanation for differences in starting pay. In neoclassical search models the duration of the search depends on the reservation wage of the individual searching for a job – with higher reservation wages resulting in a longer job search. In the typical sequential model, job-seekers obtain information about one employer at every time-interval and if they receive a job offer they decide whether to accept it or not, depending on the wage offered. The distribution of wage offers is known and the reservation wage is chosen so that the net income of the search is maximized. Differences in the expected tenure of the job therefore have an influence on the reservation wage (depending on the model): individuals with a shorter time horizon have lower reservation wages (Pissarides 1985; Ziegler/Brüderl/Diekmann 1988). If women expect to work less due to childrearing or other family obligations, these differences between the sexes as regards expected labor force attachment would result in women's reservation wages being lower and consequently their job search being shorter and accepted wages lower. Standard population surveys do not usually include information on reservation wages and the duration of the job search. Therefore, part of the unexplained gender wage gap could be the result of differences between men and women in their search effort caused by differences in reservation wages. Following these arguments, an existing gender wage gap should diminish if the job-search effort is adequately controlled for.

Career attitudes and job characteristics

Sociologists emphasize the role of gender differences in *career attitudes and aspirations* as mechanisms responsible for the sorting of men and women into different kinds of jobs that offer different kinds of career rewards. This means that gender-specific socialization patterns cause women to aspire to different jobs (Marini et al. 1996; Shu/Marini 1998). Even men and women with a similar amount and type of education choose different jobs (Marini/Fan 1997: 591). Thus, the distribution of men and women in different economic sectors and jobs or working time arrangements offering different levels of rewards can be seen as the result of differing career attitudes and aspirations. Additionally, demand-side factors might play a role in the sorting of women into different sectors, occupations, functions and hierarchical levels (see next section). Career attitudes and – irrespective of the mechanisms at work – economic sectors and job characteristics can be expected to explain part of the gender wage gap. Therefore, an existing gender wage gap should be reduced when career attitudes and job characteristics are controlled for.

Discrimination

A final explanation for the gender wage gap is discrimination. Altonji and Blank (1999: 3168) define labor market discrimination as "a situation in which persons who provide labor market services and who are equally productive in a physical or material sense are treated unequally in a way that is related to an observable characteristic such as race, ethnicity, or gender." Economic theories of discrimination can be broadly classified into two categories: The first is "statistical discrimination", which refers to the strategy of employers using group-level characteristics such as gender or race, which are easy to observe (and at group level are correlated with productivity), to evaluate the productivity of applicants. Gender might be used as an indicator of lower pro-

ductivity or lower expected job tenure. The second theory, introduced by Becker (1971), relates discrimination to employer preferences: employers with a "taste for discrimination" are prejudiced against members of a specific (minority) group. For example, employers with a taste for discrimination against women will employ less than the profit-maximizing number of women. Instead, they will hire a greater number of equally skilled but more highly paid men. Becker's model suggests that in a perfectly competitive market, discriminating employers cannot survive. The wage gap between men and women will therefore decline as discriminators are forced to leave the market altogether.[4]

In addition to these theories that explain employers' motivation for discrimination, it is useful to differentiate between the different mechanisms by which discrimination can come about. Petersen and Saporta (2004) differentiate between "allocative discrimination" and "within-job discrimination".[5] They define allocative discrimination as the differential allocation of men and women to occupations and establishments that differ in the wages they pay. This entails sorting men and women into different jobs at the point of hire and differences in the subsequent rates of promotion and dismissal (Petersen/Saporta 2004: 853). Within-job discrimination on the other hand is differential payment of a man and a woman who are equally qualified and are doing the same work for the same employer. This type of discrimination could also be labeled direct wage discrimination. Following Petersen and Saporta (2004) allocative discrimination at the point of hire presents the most advantageous "opportunity structure for discrimination" because discriminatory employer practices are hard to trace or document at this point.

While it can be investigated directly with survey data whether the previously mentioned mechanisms contribute to the gender wage gap, it is very difficult to assess the extent to which the gender wage gap is caused by discrimination. New approaches for measuring discrimination use non-standard research designs such as Goldin and Rouse's (2000) analysis of data from (gender-) blind auditions for music orchestras or Bertrand and Mullainathans' (2004) analysis of employer responses to fictitious résumés. However, analyses of the gender wage gap using survey data can only measure discrimination as a residual – the unexplained portion of the gender wage gap (see Gerlach 1987: 590). Following this approach, analyses based on standard surveys run the risk of overestimating wage discrimination because important gender differences might not be observed. However, given the extensive set of measures available in the dataset used in the subsequent analysis, we are fairly confident that the major part of a potentially remaining gap could be attributed to wage discrimination.

To sum up, gender differences in earnings can be caused by gender differences in human capital and gender differences in job-search effort. Furthermore, the sorting of men and women into different economic sectors, occupations and job functions because of men's and women's differing gender preferences or because of allocative discrimination could lead to a gender wage gap. If the listed mechanisms cannot explain gender differences in earnings this could be seen as an indication of direct wage discrimination, which, however, cannot be measured directly but only as a residual category.

3 Data and measures

We use unique data from the 2001/2002 Mannheim University Social Sciences Graduate Survey, which overcome several of the previously mentioned limitations of standard population surveys in investigating the gender wage gap. First, the sample is homogenous with respect to the measures normally used in income analyses – all of the respondents are university graduates, have a degree in the same field of study and are observed at career entry. Second, detailed measures of human capital, job search and career attitudes are available, which are usually not included in standard population surveys.

The 2001/2002 Mannheim University Social Sciences Graduate Survey is a mail survey of all former students of the social sciences department who graduated between the winter semester 1994/1995 and the summer semester 2000. All of them graduated with a *Diplom* or a *Magister Artium* degree, both of which are roughly equivalent to a master's degree at an Anglo-Saxon higher education institution. By means of intensive research it was possible to update the addresses of 895 of a total of 1100 students who graduated during that period. Overall, 629 of the 895 graduates (70.3 %) who received the questionnaire took part in the survey. Both the relatively high response rate and a comparison of the demographics between respondents and non-respondents indicate the good quality of the data. The standard-

[4] For a review of economic theories of discrimination see Altonji and Blank (1999: 3168–3191).
[5] They list "valuative discrimination" as a third discriminatory practice, which is discrimination against a whole class of jobs held primarily by women.

ized questionnaire included a wide range of questions concerning the retrospective evaluation of the completed course of studies, the acquisition of qualifications and work experience during the time at university, information on job search, an extensive career biography with information on each employment spell after graduation, current career aspirations, and attitudes toward the work-life balance as well as detailed demographics.[6]

Measures

This section gives a short description of the measures that were constructed in order to identify the described explanatory mechanisms. The dependent variable is the hourly wage at the beginning of the first regular job, and for the multivariate analysis the logarithm of the hourly wage is used. This variable is constructed on the basis of the self-reported monthly income before tax at the beginning of the first regular job. Since the respondents entered the labor market in different years, their starting salaries were adjusted for inflation using the German consumer price index (Statistisches Bundesamt 2002: 612). To account for working time we use hourly income, that is, we divide the reported monthly income by the reported contracted hours per week multiplied by 4.33 (the average number of weeks in a month).[7] We will proceed by discussing our explanatory variables (Table 1).

Human capital

Since women might choose to acquire different – less highly valued – types of human capital than men, two measures indicating their chosen specialization within the social sciences are used to measure the human capital acquired *at university*: the degree subject (psychology, sociology, social sciences major and social sciences minor[8]) and whether business administration or economics was chosen as a minor subject. Because women might put less effort into their studies than men due to a shorter expected labor market career, we include two additional measures for human capital acquired at university: the final grade and the duration of studies. In Germany, employers typically associate short study times with a high level of ability and motivation of graduates. Students also acquire human capital *outside their university studies*. Again, following human capital theory, women might invest less in these additional qualifications than men do. Therefore we utilize measures of students' skills and competencies in addition to their formal tertiary education. We include four dummy variables that indicate whether the student completed vocational training before entering university, whether she/he completed an internship while at university, whether she/he had a student job equal or equivalent to that of a research or teaching assistant, and whether she/he spent time studying or working abroad, a measure that indicates the acquisition of intercultural skills. Furthermore, we include measures of self-reported foreign language skills and computer skills at the time of graduation.

Job search

The data include detailed information about the respondents' job search. Respondents were asked to report the duration of their job search as well as the number of times they applied for a job, which gives us a detailed picture of their job-search effort. We use these two dimensions of the job-search effort in our analysis by including one dummy variable indicating the number of times the respondent applied for a job (more than five times) and one dummy variable for the duration of the job search (more than two months, see Table 1).[9] We decided against using a linear functional form for both measures due to their skewed distribution. We also included dummy variables for respondents with missing values for one or both of the search variables.[10]

Job attitudes

Since our study is a cross-section, the information available on job attitudes and career preferences does not refer to the time of the labor-market entry but to the time of the survey. Trying to explain the starting salary with attitudes measured after the first job is problematic; nevertheless we think that at least to some extent one can assume a stability of career attitudes and preferences during the first years after graduation. If current career attitudes could explain gender differences in starting pay, this finding could be treated as a possible, albeit uncertain, hint of an effect at work. In the survey, respon-

[6] The questionnaire can be accessed at: http://www.sowi.uni-mannheim.de/lehrstuehle/lessm/absol/absol01_frabo.pdf.

[7] For 12 respondents who did not report contracted working hours we used the self-reported real working hours that respondents were also asked to specify.

[8] Students with a social sciences major were graduates who had one major in the Social Sciences Department and another major in another department of the university. Students with a social sciences minor only had a minor subject in the Social Sciences Department and a major in a different department.

[9] Having measures of both job-search duration and the number of job applications is advantageous because the assumption of job-search theory that the number of intervals of the job search is equivalent to the number of employer contacts seems unrealistic: some job-seekers apply for 10 jobs per month whilst others apply for only one per month.

[10] 16 cases have missing values on both search variables.

Table 1
List of independent variables

Variable name	Description of variable (variable range in parentheses)
Female	1 = woman
Human capital	
Degree type	Four dummy variables: • Psychology (Diplom) • Sociology (Diplom) • Social sciences major (Magister with main subject in political science or sociology) • Social sciences minor (Magister with a minor subject in political science or sociology)
Business minor	1 = Minor subject in business administration or economics
Grade	Final grade of course of study, 1 (best)–4 (worst)
Duration of studies	Time needed until completion of degree in semesters; 6-month intervals (6–24.7)
Vocational training	1 = Vocational training qualification gained before entering university
Research/teaching assistant	1 = Work experience with connection to course of studies or desired field of work
Internship	1 = Internship before or while studying (for psychologists in addition to compulsory internships)
Experience abroad	1 = Before or during studies: experience gained as an au pair, or during work, internship or study abroad
Languages	Number of foreign languages of which the respondent has at least "good" knowledge (1–4)
Computer skills	Number of computer applications of which the respondent has at least "good" knowledge; broad categories, for example word-processing (1–4)
Job search	
More than 5 applications	1= Applied more than 5 times (+ dummy for applications missing)
More than 2-month search	1= More than 2 months reported search time (+ dummy for search duration missing)
Job attitudes	Indices based on rating scales (1=not important at all, 5=very important) of the following items:
Income	Income relevancy
Skill utilization	Application of knowledge acquired at university/Level of work tasks adequate for university graduate
Job content	Interesting work content/Realization of own ideas/Independent work/Responsibility
Career prospects	Possibilities for upward career mobility/Possibilities for training and development
Social environment/job security	Teamwork/Good work climate/Job security
Work-life balance	Opportunities of re-entry after career break/Flexible working hours/Work and family balance/Possibility of living in preferred region
Economic sector	Seven dummy variables • Industry • Services • Publishing and press • Health care/social services • Universities/research institutes • Federal (public) sector/non-governmental organizations • Others
Job characteristics	
Educational mismatch	Self-reported educational prerequisite for job: 1 = university degree not norm/degree irrelevant 0 = university degree entry requirement/the norm
Temporary job	1 = Fixed-term contract
Part-time job	1 = Job with up to 30 hours of working time per week
Surplus hours	1 = Real working time more than 120 % of contracted working time
Control variables	
Child	1 = Respondent had at least one child at time of graduation
Age	Age at graduation in years (24–42)
Year of graduation	Seven dummy variables for graduation year (1994–2000)

dents were asked how "important" they considered 17 different aspects of their working life (for example "flexible working hours"). For each item they answered on a scale ranging from 1 (not important at all) to 5 (very important). We use only one of the items – the importance of "high income" – as a single variable in our analysis and combine the other items to five indices on the basis of a principal component factor analysis.[11] The five indices used are labeled: "Skill utilization", "Job content", "Career prospects", "Social environment/job security" and "Work-life balance".

Economic sector and job characteristics

Respondents were also asked to indicate the economic sector of their job. We combine the original category scheme to seven sectors based on the similarity of the sectors to each other as well as cell frequencies. In addition to the economic sectors, four measures of job characteristics are included in the analysis, in order to account for the allocation of women into jobs associated with earnings disadvantages. We include dummy variables for whether the respondent had a temporary job or a part-time job, whether the job was a self-reported educational mismatch for a person with a tertiary degree, and whether the respondents reported that real working hours exceeded 120 % of the reported contracted hours.

Control variables

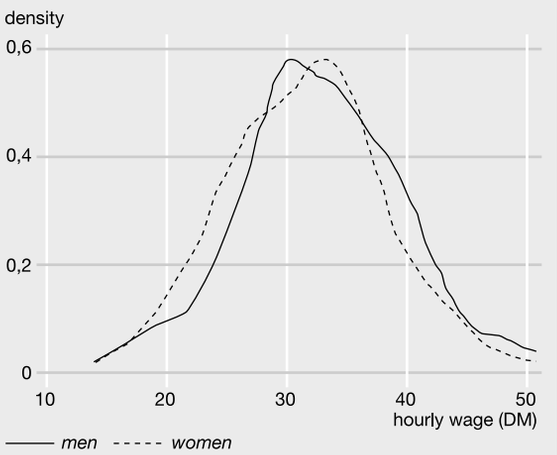
A set of control variables is included in addition to the explanatory variables. We include age at career entry, especially because wage scales in the public sector are a function of the position held (job title) and age, irrespective of work experience. Furthermore, we include dummy variables for the year of graduation in order to capture possible differences in the job market at the time of graduation. Finally, we include a dummy capturing whether the respondent had a child at the time of graduation, because in Germany public sector employees who have children receive child benefits as part of their salary.[12]

The dataset contains 629 cases. However, it was not possible to use all of the cases in the analysis. After excluding respondents with a teaching degree ("Lehramt"), as well as respondents who had not entered a regular job, were self-employed, working abroad, or worked fewer than 16 hours per week[13], 465 cases from the basis for the analysis. Due to missing values – mainly for the dependent variable – 399 cases remain for the analyses.

3.1 Descriptive statistics

As shown in Table 2, the mean hourly wage is DM 31.36 for women and DM 32.79 for men, the difference being significant at the 5 percent level. Figure 1 illustrates the distribution of hourly wages by gender. In the area of low hourly wages the distribution of women's wages has a higher density than men's. In the area of high hourly wages, on the other hand, the distribution of men's wages has a higher density than women's. Comparing the wages of men and women at the 25 %, 50 % and 75 % quantiles of the male and female wage distribution (not reported), one can see that the 25 % and 75 % quantiles of the female distribution are clearly lower than

Figure 1
Kernel densitiy estimate of hourly wage (DM) by gender



[11] We calculated the factor analysis with and without the "income" item. The same set of factors was identified irrespective of the inclusion of the income-attitude variable.

[12] Marital status could not be included as a control variable in the regression models for starting salaries because the data contains only information about marital status at the time of the interview – and not at the beginning of the first job.

[13] Because the salary of teachers is fixed in Germany, these cases [43] are not used for the analysis. Of the remaining 586 graduates, 522 had a regular job after graduation, but 35 of them were self-employed and 15 were working abroad; 7 of the respondents were working part-time with fewer than 16 hours per week. Examining the female/male distribution across the different categories shows that more women than men (13 percent and 7 percent respectively) have not held a regular job yet and of those with a regular job more men than women took up self employment (10 percent and 4 percent respectively) Thus the wage disadvantage for females might be slightly underestimated in the subsequent analysis assuming that individuals with poor career prospects are more likely not to enter the labour market. No substantial gender differences can be found in the other categories (working abroad, part-time work with fewer than 16 hours, missing in the dependent variable).

Table 2
Means and standard deviations of all the variables used in the analyses

	Women (N=237)		Men (N=162)		
Variable	**mean**	**s.d.**	**mean**	**s.d.**	**p-value[a]**
Hourly wage (in Deutsche Mark)	31.36	6.84	32.79	7.01	0.04
Human capital					
Degree: Psychology	0.47		0.34		0.01
Degree: Sociology	0.27		0.22		0.32
Degree: Social sciences major	0.22		0.37		0.00
Degree: Social sciences minor	0.05		0.07		0.36
Business minor	0.22		0.36		0.00
Grade	1.79		1.87		0.18
Duration of studies	12.92	2.45	13.05	2.94	0.64
Vocational training	0.29		0.14		0.00
Research/teaching assistant	0.57		0.60		0.54
Internship	0.59		0.54		0.33
Experience abroad	0.34		0.27		0.14
Languages	1.42	0.72	1.10	0.59	0.00
Computer skills	2.79	1.51	3.12	1.64	0.04
Job-search					
Applied up to 5 times	0.56		0.51		0.28
Applied more than 5 times	0.40		0.45		0.32
Number of applications missing	0.04		0.04		0.79
Up to two-month search	0.51		0.44		0.23
More than 2-month search	0.46		0.51		0.27
Search time missing	0.04		0.04		0.79
Economic sector					
Industry	0.05		0.09		0.22
Services	0.35		0.37		0.75
Publishing and press	0.05		0.10		0.06
Health care/social services	0.14		0.07		0.06
Universities/research institutes	0.23		0.23		0.99
Federal public sector/NGOs	0.07		0.08		0.75
Others	0.10		0.06		0.10
Job characteristics					
Educational mismatch	0.17		0.14		0.41
Temporary job	0.41		0.37		0.39
Part-time job	0.32		0.19		0.00
Surplus hours	0.44		0.36		0.12
Job attitudes					
Income	3.77	0.75	3.74	0.89	0.75
Skill utilization	3.56	0.85	3.49	0.87	0.49
Job content	4.49	0.46	4.37	0.53	0.01
Career prospects	4.08	0.70	4.06	0.72	0.73
Social environment/job security	4.28	0.53	4.17	0.59	0.06
Work-life balance	3.94	0.87	3.58	0.80	0.00
Control variables[b]					
Child	0.07		0.06		0.52
Age	28.61	3.39	29.31	2.59	0.03

Notes: a: Based on t-test (two-tailed) for difference in means; b: Dummies for year of graduation not reported.

the respective quantiles of the male distribution even though the median wage is fairly similar for the two groups, at about DM 32.

Table 2 gives an overview of gender differences for the independent variables. If the gender wage gap is due to human capital differences one would expect men to have more human capital than women or different types of human capital which are valued more highly on the labor market.

The picture is not clear-cut, however. There are significant differences in the distribution of males and females across degree types, which might contribute to the explanation of the gender wage gap if the degrees are valued differently on the labor market. Women's duration of studies is shorter, their grades are better than those of men (not significant) and women do not seem to have less additional human capital than men. Women perform better than men on several of the variables capturing additional human capital: a larger proportion of women have completed vocational training, internships, and have experience abroad (only vocational training is significant) and women have significantly more language skills. Men, however, have worked more as research/teaching assistants (not significant) and possess significantly more computer skills.

With regard to the job search, results are in line with the assumption of women making a smaller search effort: the proportion of women who submit more than five applications is smaller than that of men; the same is true of the proportion of respondents looking for a job for more than two months. However, the differences are not significant.

No significant differences are found when looking at the distribution of men and women across economic sectors. The biggest difference appears for social services and health care: the proportion of women working in this sector is seven percentage points larger than that of men. In contrast, significant differences exist regarding job attitudes. In general, women tend to have higher scores on all attitude dimensions – even income. But while the differences for income, skill utilization and career prospects are small and insignificant, they are larger for social environment/job security, job content, and work-life balance, with the last two being significant. Furthermore, differences appear concerning the jobs held by men and women: women more often hold part-time jobs (significant), temporary jobs and jobs for which a university degree is not necessary (not significant). These job characteristics are likely to be associated with lower remuneration, and could explain part of the gender wage gap. Finally a greater proportion of women compared to men work surplus hours in our sample (not significant).[14]

3.2 Multivariate analysis

Our strategy for investigating the wage gap is to estimate a sequence of nested regression models of the hourly wage at the beginning of the first job. We start with the model containing the variable Female (F_i), the control variables (X_{ij}) and an error term (e_i). In our baseline model the hourly wage (W_i) is thus:

$$\ln W_i = \alpha + \gamma F_i + \sum_j \beta_j X_{ij} + e_i$$

The effect of Female in Model A measures relative wage differences between men and women controlling for age, year of graduation and whether the respondent had a child at the time of graduation. Expressed in percentages, women earn $100*[1-\exp(\gamma)]$ percent less than men. We then add to the model one by one the different sets of measures that were identified as possible mechanisms explaining the gender wage gap. The first column of Table 3 gives an overview of the additional variables included in the successive models. In Model B, human capital variables are added. If the effect of female declines after adding the human capital variables, it can be assumed that part of the gender wage gap is caused by gender differences in human capital. Namely: the decrease in $100*[1-\exp(\gamma)]$ would indicate how many percent women earn less relative to men due to human capital differences. In Model C, the job search variables are added with the intention of determining how much of the gender wage gap is due to a different search effort. In Model D we introduce job attitudes. Because of the problematic post hoc measurement of job attitudes, they are excluded in Models E and F. In Model E we add dummy variables for economic sector, and finally, in Model F job characteristics are included.

In order to identify the unexplained part of the gender wage gap – and thus possible wage discrimination more clearly – we additionally conduct a standard Blinder-Oaxaca wage decomposition (Blinder 1973; Oaxaca 1973) for our final Model (F). The wage decomposition is based on separate regressions for males (M) and females (F):

$$\ln W_i^F = \alpha^F + \sum_j \beta_j^F X_{ij}^F + e_i^F$$

[14] This difference is partly due to the fact that more women hold part-time positions and overtime is more likely in part-time positions than in full-time positions.

Table 3
Comparisons of model fit statistics, Models A–F in Table 2 (N = 399)

Model	R^2	R^2 adjusted	Incremental F test[a]		Effect of female as %: 100*(1-exp(β))
A: Base model with controls	0.054	0.033			–4.69
B: A + Human capital	0.210	0.166	6.19***	(12; 377)	–6.57
C: B + Job search	0.229	0.177	2.28+	(4; 373)	–6.67
D: C + Job attitudes	0.275	0.214	3.91***	(6; 367)	–6.48
E: C + Economic sector	0.255	0.192	2.15*	(6; 367)	–6.11
F: E + Job characteristics	0.310	0.244	7.28***	(4; 363)	–6.67

*Notes: + p<0.10; * p<0.05; ** p<0.01; *** p<0.001; a: Degrees of freedom in parentheses.*

$$\ln W_i^M = \alpha^M + \sum_j \beta_j^M X_{ij}^M + e_i^M$$

The raw wage differential between men and women is decomposed into the explained gap and the unexplained gap.[15]

$$\underbrace{\ln \overline{W}^M - \ln \overline{W}^F}_{\text{Raw gap}} = \underbrace{(\alpha^M - \alpha^F) + \sum_j \overline{X}_j^F (\beta_j^M - \beta_j^F)}_{\text{Unexplained gap}} + \underbrace{\sum_j \beta_j^M (\overline{X}_j^M - \overline{X}_j^F)}_{\text{Explained gap}}$$

The explained gap is the difference between men and women that is attributable to observed differences in the independent variables. The unexplained gap is the difference attributable to differing wage equations of men and women; this means the wage difference due to differing returns on the independent variables (= differing coefficients) plus the wage difference between men and women, which is not captured by independent variables (= difference in shift parameter). The unexplained part of the gender wage gap is often labeled discrimination. However, if important control variables are missing in the model, the unexplained gap captures not only wage discrimination but also these unobserved differences (Altonji/Blank 1999: 3156).

Turning to the results of the nested regression estimation, the model fit statistics for Models A to F are displayed in Table 3 and the regression coefficients are displayed in Table 4. Model A, which includes the control variables, confirms the bivariate analysis from the previous section: women earn significantly[16] less than men, the female disadvantage being 4.7 % of men's income. This difference can be considered substantial bearing in mind the homogenous nature of our sample. In Model B the human capital variables are introduced. The direction of effects for grade, duration of studies and all the variables capturing human capital acquired outside university are in line with expectations – that is, more human capital is associated with higher wages. Good grades, vocational training, internships and computer skills increase the hourly wage significantly. The effects for duration of studies, teaching assistance, experience abroad and languages, however, are not significant. Some significant effects appear concerning the degree subject: graduates with a social sciences minor degree – typically graduates with a major in the humanities – earn significantly less than the psychology graduates in the reference category. Furthermore, graduates who had chosen a business minor earn significantly more. The explained variance of the logarithm of the hourly wage increases from 5 percent in Model A to 21 percent in Model B. Apparently the human capital measures used are important predictors for explaining variance in the hourly wages of social sciences graduates. Unexpectedly however, the gender wage gap does not decline with the inclusion of human capital measures in the model; on the contrary, it even increases by two percentage points to 6.6 %. This is because the women in the sample do better on many

[15] Because standard Blinder-Oaxaca wage decomposition analyses refer to the wage of the high-income group in relation to the low-income group, we follow this standard and report the wage of men in relation to the wage of women in our wage decomposition even though we report the income of women in relation to men in the regression models.

[16] Due to the small analytical sample we chose to report if coefficients are significant at the 10 % level in the tables. In the discussion of the results, however, we report the 5 % level of significance only.

relevant human capital measures. Consequently, the female graduates in our sample would be even more disadvantaged if they had the same human capital endowment as men.

In Model C the indicators for job-search effort are introduced. The search variables do not improve the model fit significantly (Table 3). Nevertheless, graduates who applied for more than five jobs (keeping the search time constant), have significantly higher wages than graduates who applied for fewer than five jobs. On the other hand a longer search time (over two months) has a significantly negative effect on income. The hypothesis that part of the gender wage gap is caused by lower investment in the job search associated with a lower reservation wage for women is not confirmed here: the gender wage gap does not decline, but remains constant when job-search variables are included in the model.

In Model D we look at whether the gender wage gap could be a result of men's and women's different job attitudes. The model contains the indices measuring job attitudes. These variables improve the model fit significantly; the explained variance increases by about five percentage points. Not surprisingly, graduates who place value on "high income" earn more while graduates who find the social environment of the job important earn less. The negative effect of career prospects might indicate that graduates who value future career opportunities have entry-level jobs offering low starting salaries but possibly higher returns later on in the career. The effects for the other three indices are not significant. Surprisingly, even with the introduction of attitudes, the gender wage gap does not decline substantially. Because job attitudes were measured at the time of the interview, i.e. after starting the first job, the measured job attitudes might be a result of experiences made on the labor market, which would mean that the causal link could be reversed. However, the absence of a substantial decline in the gender wage gap indicates that differences in job attitudes do not contribute much to the explanation of the gender wage gap in our sample of graduates. Because of the problematic post hoc measurement of job attitudes we do not include them in the two subsequent models.

In Model E, the economic sector of the job is introduced as an independent variable. Because job attitudes are not included in Model E (or Model F), Model E has to be compared with Model C in order to judge the contribution of the economic sector to explaining income variance and the gender wage gap. The comparison shows that only a small part of the gender wage gap is due to the sorting of men and women into different economic sectors: the gender wage gap declines by about half a percentage point, from 6.7 to 6.1 percent.[17]

In a final step, job characteristics are added to the model (Model F). The explained variance increases by 5.5 percentage points, indicating the importance of job characteristics for explaining the wages of social sciences graduates. The educational mismatch variable has the largest impact: graduates with a job for which a university degree is not the norm or not needed at all earn 11 percent less than graduates with a job for which a degree is the norm. Graduates with temporary jobs also earn significantly less, and those working more than 120 percent of the contracted working hours earn significantly more. From our point of view, jobs with a lot of overtime work are paid better because when the work contract is concluded (with official working hours) an implicit work contract already exists which entails overtime work. The last job characteristic – part-time work – has a positive effect, which is not significant however. Part-time positions for social sciences graduates at career entry are apparently not associated with a per hour earnings disadvantage. Surprisingly, the gender wage gap does not decrease when job characteristics are controlled for, but increases marginally by about half a percentage point to 6.7 percent. Therefore, even job characteristics cannot explain the gender wage gap. In an attempt to shed light on this unexpected result, we introduced the four job characteristics one by one into the regression (not reported). These regressions show that both degree mismatch and a temporary job lead to a small decrease in the gender wage gap and that the small increase in the gender wage gap from Model E to Model F can be attributed to the job characteristics part-time job and surplus hours – these job characteristics have a positive effect, and women hold jobs with these characteristics more often than men. Following the argument above regarding surplus hours it is evident – as already in the case of human capital variables – that the gender wage gap for social sciences graduates would be even larger if women did not invest more in their careers than men do.[18]

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[17] We checked whether a finer classification of economic sectors would explain more of the wage gap, but the wage difference between men and women remained constant regardless of different classifications.

[18] In Model F a dummy for surplus hours is included. However, to make sure that the estimated gender wage gap cannot be explained by men's unpaid overtime work, we ran Model F (excluding the dummy for surplus hours) using the hourly wage computed on the basis of the real working hours as a dependent variable. The estimated gender wage gap was even one percentage point larger in this specification.

Table 4

OLS regression of log of hourly wages on selected independent variables[ab], N = 399

	A	B	C	D	E	F
Female	–0.048* (0.023)	–0.068** (0.025)	–0.069** (0.025)	–0.067** (0.025)	–0.063* (0.025)	–0.069** (0.024)
Human capital						
Degree: Sociology (Ref.: Psychology D.)		–0.022 (0.032)	–0.022 (0.032)	–0.011 (0.032)	–0.032 (0.033)	–0.024 (0.032)
Degree: Social sciences major		–0.041 (0.032)	–0.045 (0.032)	–0.039 (0.032)	–0.042 (0.034)	–0.026 (0.034)
Degree: Social sciences minor		–0.127* (0.052)	–0.127* (0.051)	–0.122* (0.050)	–0.123* (0.052)	–0.106* (0.051)
Business minor		0.054* (0.026)	0.042 (0.026)	0.028 (0.026)	0.044+ (0.027)	0.036 (0.026)
Grade		–0.053* (0.022)	–0.050* (0.022)	–0.050* (0.022)	–0.036 (0.023)	–0.028 (0.022)
Duration of studies		–0.007 (0.005)	–0.008+ (0.005)	–0.009* (0.005)	–0.007 (0.005)	–0.006 (0.004)
Vocational training		0.096** (0.032)	0.096** (0.032)	0.083** (0.032)	0.095** (0.032)	0.097** (0.031)
Research/teaching assistant		0.042+ (0.022)	0.041+ (0.022)	0.044* (0.022)	0.038+ (0.022)	0.033 (0.022)
Internship		0.048* (0.023)	0.042+ (0.023)	0.054* (0.023)	0.049* (0.023)	0.044+ (0.023)
Experience abroad		0.020 (0.025)	0.015 (0.025)	0.009 (0.024)	0.016 (0.025)	0.011 (0.025)
Languages		0.003 (0.017)	0.000 (0.017)	–0.005 (0.016)	0.000 (0.017)	–0.001 (0.016)
Computer skills		0.015* (0.008)	0.014+ (0.007)	0.013+ (0.008)	0.011 (0.008)	0.008 (0.008)
Job search						
More than 5 applications			0.060* (0.027)	0.061* (0.027)	0.064* (0.028)	0.065* (0.027)
More than 2-month search			–0.075** (0.027)	–0.077** (0.027)	–0.066* (0.027)	–0.054* (0.027)
Job attitudes						
Income				0.035** (0.014)		
Skill utilization				0.018 (0.013)		
Job content				0.045+ (0.023)		
Career prospects				–0.058*** (0.017)		
Social environment/job security				–0.046* (0.021)		
Work-life balance				–0.005 (0.013)		
Economic sector						
Industry (Ref.: Services)					0.072 (0.045)	0.061 (0.044)
Publishing and press					0.014 (0.045)	–0.019 (0.045)
Health care/social services					0.038 (0.040)	0.042 (0.040)
Universities/research institutes					0.085** (0.032)	0.070+ (0.041)
Federal public sector/NGOs					0.061 (0.043)	0.077+ (0.043)
Others					–0.039 (0.041)	–0.037 (0.040)
Job characteristics						
Educational mismatch						–0.112*** (0.030)
Temporary job						–0.069* (0.029)
Part-time job						0.063+ (0.034)
Surplus hours						0.046* (0.023)
Control variables						
Child	0.137** (0.048)	0.158*** (0.046)	0.152*** (0.046)	0.154*** (0.045)	0.138** (0.046)	0.125** (0.045)
Age	0.005 (0.004)	0.004 (0.005)	0.004 (0.005)	0.004 (0.005)	0.005 (0.005)	0.005 (0.004)
α	3.327*** (0.118)	3.426*** (0.143)	3.435*** (0.143)	3.537*** (0.182)	3.370*** (0.143)	3.234*** (0.143)

*Notes: + p<0.10; * p<0.05; ** p<0.01; *** p<0.001; a: Standard errors in parentheses; b: Not reported: Year of graduation dummies & missing dummies for job search.*

The result of the regression analysis presented here is supplemented by the Oaxaca-Blinder wage decomposition. The Oaxaca-Blinder wage decomposition is based on Model F estimated separately for men and women (Table 5). Looking first at the differences between the coefficients in the male model and the female model, we obtain a mixed picture: the increase in wages due to vocational training, for example, is larger for male graduates, but the income increase for a business minor is greater for women. The coefficients of almost all of the variables point in the same direction for men and women. Exceptions are the economic sector and language skills, although the coefficients in the latter case are close to zero for men and women. To test whether the effects of our explanatory variables differed significantly between men and women Model F is estimated including interactions of all variables with the dummy female (not reported). Apart from economic sector none of the interactions is significant.[19]

Turning to the wage decomposition, Table 6 shows that differing values between men and women for the independent variables cannot explain the gender wage gap: On the contrary, the 3.0 percent gap explained by differing values for the independent variables is negative, indicating that if women maintained their human capital and job characteristics but were given the male coefficients and shift parameter, men would earn 3 percent less than women. The unexplained gap due to differing coefficients and shift parameters is 7.9 percent, which implies that if men and women kept their wage equation, but men had the same values for the independent variables on average as women, men would earn 7.9 percent more than women. The unexplained gap is therefore larger than the raw gap, which is 4.7 percent. The result of the wage decomposition is thus consistent with the outcome of the previous regression models: the gender wage gap would be even larger if women had the same human capital and job characteristics as men.

To find out how robust our findings are and to investigate further the mechanisms influencing the wage gap we conduct several additional analyses. The first analysis addresses the question of whether the mechanisms influencing the gender wage gap are the same for the public and the private sector. Since full-time and part-time employees are included in the analyses, we further investigate whether the results

[19] Because of high collinearity in the model with full interactions we tested whether interaction effects would turn out significant if we introduced them one at a time in Model F. However, the results did not differ.

Table 5

OLS regression of log of hourly wages by gender[ab]

	Women (N=237)	Men (N=162)
Human capital		
Degree: Sociology (Ref.: Psychology D.)	–0.016 (0.043)	–0.037 (0.056)
Degree: Social sciences major	–0.030 (0.048)	–0.005 (0.055)
Degree: Social sciences minor	–0.040 (0.076)	–0.174* (0.081)
Business minor	0.053 (0.039)	0.005 (0.040)
Grade	–0.031 (0.030)	–0.050 (0.038)
Duration of studies	–0.002 (0.007)	–0.008 (0.006)
Vocational training	0.081+ (0.043)	0.158** (0.055)
Research/teaching assistant	0.023 (0.030)	0.048 (0.036)
Internship	0.054+ (0.031)	0.043 (0.039)
Experience abroad	0.008 (0.033)	0.026 (0.043)
Languages	0.008 (0.021)	–0.009 (0.030)
Computer skills	0.016 (0.011)	0.000 (0.013)
Economic sector		
Industry *(Ref.: Services)*	0.104 (0.067)	0.004 (0.065)
Publishing and press	–0.029 (0.068)	–0.043 (0.069)
Health care/social services	0.094+ (0.052)	–0.075 (0.073)
Universities/research institutes	0.070 (0.054)	0.069 (0.072)
Federal public sector/NGOs	0.173** (0.060)	–0.043 (0.072)
Others	–0.016 *(0.051)*	–0.090 (0.079)
Job search		
More than 5 applications	0.053 (0.036)	0.063 (0.047)
More than 2-month search	–0.049 (0.035)	–0.053 (0.047)
Job characteristics		
Educational mismatch	–0.109** (0.039)	–0.091 (0.057)
Temporary job	–0.075+ (0.039)	–0.048 (0.051)
Part-time job	0.094* (0.044)	0.018 (0.060)
Surplus hours	0.029 (0.031)	0.064+ (0.038)
Control variables		
Child	0.128* (0.060)	0.153* (0.075)
Age	0.004 (0.006)	0.006 (0.008)
α	3.135*** (0.172)	3.307*** (0.275)
R^2	0.336	0.373
R^2 adjusted	0.224	0.211

*Notes: + p<0.10; * p<0.05; ** p<0.01; *** p<0.001; a: Standard errors in parentheses; b: Not reported: Year of graduation dummies & missing dummies for job search.*

Table 6
Blinder-Oaxaca decomposition of the gender wage gap (log of hourly wages)

Raw gap	$\ln \overline{W}^M - \ln \overline{W}^F$	0.046
Explained gap	$\sum_j \beta^M_j (\overline{X}^M_j - \overline{X}^F_j)$	–0.031
Unexplained gap	$(\alpha^M - \alpha^F) + \sum_j \overline{X}^F_j (\beta^M_j - \beta^F_j)$	0.076

Notes: A positive sign indicates an advantage for men; a negative sign indicates an advantage for women. Components do not add up to the raw gap due to rounding.

hold if the analysis is restricted to full-time employees. Finally, we look at how the gender wage gap develops with work experience and whether controlling for human capital, economic sector and job characteristics has the same result later in the career.

Public and private sector and full-time employees

A large percentage of the graduates in our sample, 36.8 %, works in the public sector. Empirical results show that the gender wage gap is usually smaller in the public sector than in the private sector (Gornick/Jacobs 1998). To check whether this holds true for our sample and to see whether the effects of our theoretically relevant independent variables are the same in both sectors, we ran separate regressions for the two sectors (Table 7).[20] The models are equivalent to Model F in Table 4, apart from the economic sector variables, which are not included. The estimated gender wage gap for the private sector is 9.8 percent, the estimated wage gap for the public sector 6.3 percent. In the regression for the public sector, the gender effect is not significant. The results show interesting differences between the models: first of all, the effect of educational mismatch is far greater in the public sector. This makes sense since in the public sector wages are firmly linked to the educational requirements of a position. Regulated wage standards in the public sector could also explain why jobs with surplus hours are only paid more in the private sector: wages in the public sector cannot be adjusted to an implicit work contract, at least not at entry level. The described effects are the only ones which differ significantly between the sectors (tested in a model with all interactions). Surprisingly, part-time work does not have a negative effect in the private sector.

In the next step Model F is estimated for full-time employees only (Table 7) in order to confirm that the estimated wage gap is not a result of job placement into full-time and part-time jobs. Despite the fact that this regression is based on only 73 % of the cases used in the previous model, the estimated wage gap – with a female earnings disadvantage of 6.9 % – is about the same as in the model with the full sample, where it was 6.7 %.

Development of the gender wage gap with work experience

Since the dataset used includes a career biography with all of the respondents' employment episodes after graduation, we capitalize on this feature in order to test whether the gender wage gap widens with work experience. We also want to investigate whether the result that the gender wage gap cannot be explained by the set of explanatory variables used can be replicated when income later in the career is used.

We therefore run two models resembling Model A and Model F (from Table 4), except for the job-search indicators, using the logarithm of the hourly wage at the time of the survey as the dependent variable. We additionally control for work experience[21] in these models because the respondents in our sample graduated in different years.[22]

All of the variables concerning the job refer to the job held at the time of the interview. The child variable also refers to the time of the interview. We exclude respondents whose graduation was less than two years before the interview in order to guarantee a minimum of potential work experience. Table A1 (Appendix) shows that the mean hourly wage at the time of the interview was substantially higher than the mean of the first hourly wage, with women earning on average DM 38.98 and men earning DM 42.34.

Turning to the regression results, Model $A_{current}$ shows that the estimated female wage disadvantage is 6.6 percent of men's income (Table 8). Controlling additionally for human capital, economic sector and

[20] A dummy variable for private and public sector was not included in the previous models because of the high collinearity with economic sector.

[21] Work experience disregarding unemployment spells, childcare-leave and other non-work related spells.

[22] In the regression models for the current job, we could have additionally included marital status as the control variable. However, to maintain comparability with the models of the first job (for which information about the marital status is not available), we did not. We did, however, check what effect the introduction of a dummy variable indicating whether the respondent was married at the time of interview has. There is no substantial change in the gender wage gap, the variable itself has an insignificant negative effect.

Table 7

OLS regression of log of hourly wages, restricted samples[ab]

	Private S. (N=252)	Public S. (N=147)	Full-time (N=292)
Female	–0.103***	–0.065	–0.071*
	(0.030)	(0.043)	(0.028)
Human Capital			
Degree: Sociology *(Ref.: Psychology D.)*	–0.064	0.035	–0.043
	(0.042)	(0.047)	(0.041)
Degree: Social sciences major	–0.061	0.035	–0.034
	(0.039)	(0.057)	(0.039)
Degree: Social sciences minor	–0.142*	0.047	–0.122*
	(0.058)	(0.104)	(0.055)
Business minor	0.047	0.019	0.039
	(0.032)	(0.044)	(0.031)
Grade	–0.021	–0.028	–0.035
	(0.027)	(0.039)	(0.025)
Duration of studies	–0.006	–0.005	–0.004
	(0.005)	(0.008)	(0.005)
Vocational training	0.074+	0.130*	0.094*
	(0.040)	(0.051)	(0.038)
Research/teaching assistant	0.026	0.038	0.036
	(0.026)	(0.040)	(0.025)
Internship	0.022	0.057	0.034
	(0.029)	(0.037)	(0.027)
Experience abroad	0.039	–0.026	0.023
	(0.030)	(0.045)	(0.028)
Languages	0.016	–0.031	0.005
	(0.020)	(0.028)	(0.019)
Computer skills	0.011	–0.000	0.016+
	(0.010)	(0.012)	(0.009)
Economic sector			
Industry *(Ref.: Services)*			0.054
			(0.045)
Publishing and press			0.014
			(0.047)
Health care/social services			0.034
			(0.049)
Universities/research institutes			0.073
			(0.056)
Federal public sector/NGOs			0.103*
			(0.046)
Others			–0.056
			(0.044)
Job search			
More than 5 applications	0.090**	0.001	0.061*
	(0.031)	(0.057)	(0.030)
More than 2-month search	–0.075*	0.004	–0.049
	(0.032)	(0.052)	(0.030)
Job characteristics			
Educational mismatch	–0.069*	–0.265***	–0.102**
	(0.033)	(0.069)	(0.032)
Temporary job	–0.078*	–0.043	–0.069*
	(0.036)	(0.048)	(0.033)
Part-time job	0.080	0.093+	–
	(0.052)	(0.047)	
Surplus hours	0.090**	–0.040	0.051+
	(0.028)	(0.044)	(0.027)
Control variables			
Child	0.096	0.172**	0.071
	(0.075)	(0.057)	(0.067)
Age	0.003	0.003	0.006
	(0.006)	(0.007)	(0.006)
α	3.336***	3.186***	3.182***
	0.186	0.235	(0.174)
R^2	0.329	0.362	0.331
R^2 adjusted	0.242	0.203	0.242

*Notes: + p<0.10; * p<0.05; ** p<0.01; *** p<0.001; a: Standard errors in parentheses; b: Not reported: Year of graduation dummies & missing dummies for job search.*

Table 8

OLS regression of log of hourly wages: current job[ab], N = 308

	$A_{current}$	$F_{current}$
Female	–0.068* (0.028)	–0.076* (0.028)
Human capital		
Degree: Sociology *(Ref.: Psychology degree)*		–0.033 (0.040)
Degree: Social sciences major		–0.006 (0.042)
Degree: Social sciences minor		–0.085 (0.064)
Business minor		0.029 (0.031)
Grade		–0.002 (0.028)
Duration of studies		–0.009+ (0.005)
Vocational training		0.046 (0.036)
Research/teaching assistant		–0.027 (0.026)
Internship		0.044+ (0.026)
Experience abroad		0.028 (0.028)
Languages		0.019 (0.019)
Computer skills		0.007 (0.009)
Economic sector		
Industry *(Ref.: Services)*		0.027 (0.048)
Publishing and press		–0.081+ (0.045)
Health care/social services		–0.093+ (0.047)
Universities/research institutes		–0.044 (0.055)
Federal public sector/ NGOs		–0.065 (0.048)
Others		–0.070 (0.046)
Job characteristics		
Educational mismatch		–0.201*** (0.039)
Temporary job		–0.137*** (0.039)
Part-time job	–0.025 (0.038)	0.047 (0.039)
Surplus hours		0.049+ (0.026)
Control variables		
Child	0.054 (0.034)	0.057+ (0.031)
Job experience	0.046*** (0.009)	0.048*** (0.008)
Age	0.002 (0.004)	0.006 (0.005)
α	3.432*** (0.136)	3.239*** (0.165)
R^2	0.121	0.376
R^2 adjusted	0.107	0.318

*Notes: + p<0.10; * p<0.0; ** p<0.01; *** p<0.001;*
a: Standard errors in parentheses; b: Sample restricted to graduates with more than two years' experience.

job characteristics (Model $F_{current}$), the gap increases to 7.3 percent, the difference being significant in both models. Therefore, the analysis using income at the time of the interview confirms the result that the gender wage gap would – if at all – be bigger if women had the same amount and type of human capital as men and held jobs with the same characteristics. Comparing the results with the estimated wage gap at job entry there is no sign of a reduction in the gender wage gap with work experience. If anything, the gender wage gap widens. In the model with controls only, the gender wage gap is about two percentage points higher for the current job than for the first job, and in the model with all explanatory variables (excluding attitudes) it is 0.6 percentage points higher. Overall, these results are in line with findings which suggest that gender differences in earnings at career entry put women at a disadvantage that they cannot make up for later in their career (Gerhart 1990; Kunze 2005).

To sum up the results presented in this paper, regression models of the hourly wage at job entry show that the gender difference in wages does not disappear even if a full set of theoretically relevant measures is introduced into the models. On the contrary, the introduction of variables capturing human capital even leads to a small increase in the wage gap at job entry from 4.7 to 6.7 percent. The introduction of further measures for job-search effort, job attitudes, economic sectors and job characteristics hardly changes the size of the gender coefficient at all. This is remarkable considering that all the sets of variables – apart from the measures for job search – increased the model fit significantly. In the final model (Model F, Table 4), 31 % of the variance of log hourly wages is explained, which is substantial considering that educational level and work experience are held constant due to the nature of our sample. A wage decomposition of the final model also confirmed that the gap would even be larger if women had the same human capital and job characteristics as men.

Further analyses revealed that some of the mechanisms we identified as influencing wages for university graduates operate quite differently in the public and the private sector. When restricting the model to full-time employees the gap remains significant at around 7 percent. Furthermore, the additional analyses using the current job show the same pattern: the gender wage gap does not decline but rather increases when all of the explanatory variables are included in the model.

4 Conclusion

By looking at a very homogenous population of male and female university graduates who all have the same level and type of education this paper has shed light on gender earnings differentials at career entry. To analyze the impact of various explanatory mechanisms on the gender wage gap, different sets of measures were added one by one in a sequence of nested regression models. Through the introduction of detailed measures of human capital that are usually not available in standard population surveys, we tested the human capital explanation for gender differences in earnings. Contrary to the predictions of human capital theory, the gender wage gap did not decline but rather increased when human capital measures were introduced. This implies that the female graduates in the study would be even more disadvantaged if they had the same human capital endowment as men. We see this as an indication that studies looking at university graduates without taking into account such detailed measures for skills and competencies might underestimate the gender earnings differential. The introduction of measures of the job-search effort, which were intended to capture possible differences in income expectancies, also failed to reduce the gender gap. Furthermore, turning to the mechanisms that allocate men and women into sectors of the economy and jobs offering differing rewards we found that although important for explaining variance in hourly wages, neither attitudes toward the labor market nor the measured job characteristics could explain the earnings gap in our study. In line with these results a Blinder-Oaxaca wage decomposition showed that if the women in our sample had the same average characteristics as men the gender wage gap would be even larger.

Considering that a wage gap of almost 7 percent remains even with the extensive set of variables in the analysis, there is at least some indication that female university graduates are facing wage discrimination on the German labor market. The analysis does not permit us to specify what type of discrimination this difference can be attributed to. Nevertheless – given that the introduction of the job-related variables did not reduce the gender wage gap substantially – it seems unlikely that the allocation of female and male graduates into different economic sectors or jobs is the mechanism behind the residual gap. Thus, it seems most likely that direct wage discrimination is the mechanism behind the earnings differential. Because of different "tastes" or productivity expectations employers might choose to offer equally qualified female graduates lower salaries than men. However, part of the unexplained gap might result from differences in reservation wages that were possibly not fully captured by the job-search variables. Furthermore, differences in the negotiation behavior of men and women, which might partly be related to gender differences in reservation wages, could play a role: male graduates might be more likely to ask for more money and employers might reward this boldness with higher wages. New research by Babcock et al. (2003) showed for MBA graduates in the United States that more women than men accepted the initial salary offer: only 7 % of women but 57 % of men had attempted to negotiate after the employer had made the initial offer.

Our findings are in line with the previously mentioned findings of Hinz and Gartner (2005). Both their results and the results presented here suggest that women in Germany have an earnings disadvantage compared to men which cannot be attributed entirely to human capital differences or the allocation of women into less attractive jobs. As argued before, wage discrimination seems to be the likely explanation. However, to ensure that differences in the negotiation behavior of men and women are not the reason for the earnings gap, future research should address this issue. Thus, future labor market survey studies should try to incorporate measures on negotiation behavior and reservation wages. Furthermore, when looking at university graduates, detailed measures such as those we used are recommendable since they proved to be highly relevant for the explanation of wages. An ideal survey design would no doubt be a large-scale German panel study that includes information about ability, career aspirations as well as job-search behavior, similar to the National Longitudinal Study of Youth (NLS-72) or the High School and Beyond Study (HS&B) conducted in the United States.

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Appendix – Table A1

Means and standard deviations for additional variables (current job)

Variable	Women	s.d.	Men	s.d.	p-value[a]
Hourly wage	38.98	10.08	42.34	11.59	0.01
Economic sector					
Industry	0.08		0.09		0.78
Services	0.35		0.37		0.78
Publishing and press	0.09		0.13		0.18
Health care/social services	0.15		0.09		0.11
Universities/research institutes	0.13		0.18		0.26
Federal public sector/NGOs	0.10		0.07		0.34
Others	0.10		0.07		0.38
Job characteristics					
Job adequacy	0.87		0.89		0.59
Temporary job	0.29		0.23		0.27
Surplus hours	0.36		0.36		0.94
Part-time	0.21		0.08		0.00
Control variables					
Experience	4.28	1.55	4.38	1.51	0.56
Child	0.21	0.41	0.23	0.42	0.61

Notes: a: Based on t-test (two-tailed) for differences in means; b: Dummies for year of graduation not reported.