



# RUHR

ECONOMIC PAPERS

Peggy Bechara

## **Gender Segregation and Gender Wage Differences during the Early Labour Market Career**

# Imprint

## Ruhr Economic Papers

Published by

Ruhr-Universität Bochum (RUB), Department of Economics  
Universitätsstr. 150, 44801 Bochum, Germany

Technische Universität Dortmund, Department of Economic and Social Sciences  
Vogelpothsweg 87, 44227 Dortmund, Germany

Universität Duisburg-Essen, Department of Economics  
Universitätsstr. 12, 45117 Essen, Germany

Rheinisch-Westfälisches Institut für Wirtschaftsforschung (RWI)  
Hohenzollernstr. 1-3, 45128 Essen, Germany

## Editors

Prof. Dr. Thomas K. Bauer  
RUB, Department of Economics, Empirical Economics  
Phone: +49 (0) 234/3 22 83 41, e-mail: [thomas.bauer@rub.de](mailto:thomas.bauer@rub.de)

Prof. Dr. Wolfgang Leininger  
Technische Universität Dortmund, Department of Economic and Social Sciences  
Economics – Microeconomics  
Phone: +49 (0) 231/7 55-3297, email: [W.Leininger@wiso.uni-dortmund.de](mailto:W.Leininger@wiso.uni-dortmund.de)

Prof. Dr. Volker Clausen  
University of Duisburg-Essen, Department of Economics  
International Economics  
Phone: +49 (0) 201/1 83-3655, e-mail: [vclausen@vwl.uni-due.de](mailto:vclausen@vwl.uni-due.de)

Prof. Dr. Christoph M. Schmidt  
RWI, Phone: +49 (0) 201/81 49-227, e-mail: [christoph.schmidt@rwi-essen.de](mailto:christoph.schmidt@rwi-essen.de)

## Editorial Office

Joachim Schmidt  
RWI, Phone: +49 (0) 201/81 49-292, e-mail: [joachim.schmidt@rwi-essen.de](mailto:joachim.schmidt@rwi-essen.de)

## Ruhr Economic Papers #352

Responsible Editor: Christoph M. Schmidt

All rights reserved. Bochum, Dortmund, Duisburg, Essen, Germany, 2012

ISSN 1864-4872 (online) – ISBN 978-3-86788-406-8

The working papers published in the Series constitute work in progress circulated to stimulate discussion and critical comments. Views expressed represent exclusively the authors' own opinions and do not necessarily reflect those of the editors.

---

**Ruhr Economic Papers #352**

Peggy Bechara

**Gender Segregation and  
Gender Wage Differences during  
the Early Labour Market Career**

## Bibliografische Informationen der Deutschen Nationalbibliothek

---

Die Deutsche Bibliothek verzeichnet diese Publikation in der deutschen Nationalbibliografie; detaillierte bibliografische Daten sind im Internet über:  
*<http://dnb.d-nb.de>* abrufbar.

<http://dx.doi.org/10.4419/86788406>

ISSN 1864-4872 (online)

ISBN 978-3-86788-406-8

---

Peggy Bechara<sup>1</sup>

# Gender Segregation and Gender Wage Differences during the Early Labour Market Career

## Abstract

*Using German linked employer-employee data this paper investigates the gender wage gap at the time of entering the labour market and its development during workers' early career. The analysis contributes to the existing research on gender wage differentials among young workers by providing evidence on the impact of women's disproportionate concentration in lower-paying industries, occupations, establishments and job-cells, i.e. occupations within establishments. The estimation results reveal that all types of segregation and particularly job-cell segregation are significant determinants of the gender wage gap, while skill endowments and differences in work histories are found to be of minor importance. At the time of labour market entry women's wage disadvantages can almost entirely be explained by the fact that they start their working career in lower-paying occupations and establishments. With progressing labour market experience, however, gender segregation becomes less important and cannot fully account for a slight widening of the wage differential among young men and women. Therefore, part of the early career wage gap remains unexplained.*

*JEL Classification: J16, J24, J31, J62*

*Keywords: Gender wage gap; early career; labour market segregation*

*July 2012*

---

<sup>1</sup> RWI. – I am grateful to Thomas K. Bauer and Christoph M. Schmidt for valuable comments, and to the staff of the Research Data Centre of the IAB for help with the data. Part of this research was carried out while visiting the Economics Department of Columbia University, which I thank for the hospitality. Financial support from the Leibniz Association and the German Academic Exchange Service (DAAD) is gratefully acknowledged. – All correspondence to Peggy Bechara, RWI, Hohenzollernstr. 1-3, 45128 Essen, Germany, E-Mail: [peggy.bechara@rwi-essen.de](mailto:peggy.bechara@rwi-essen.de).

# 1 Introduction

Despite the increased labour market participation of women and the efforts of policy-makers to equal male and female wages through anti-discrimination legislation, the existing gender wage differential has not seen a significant change in the last decade. According to the latest report by the OECD (2010), women in OECD countries earn on average approximately 18 per cent less than men. In Germany this wage inequality is even higher, reaching more than 23 percent.

Attempts to find relevant explanations for the gender wage disparities have led to an extensive literature. Comparatively little attention has been given to gender differences in the early career wage development, although it is known that the initial stages of a worker's career account for a large part of lifetime wage growth. Looking at a sample of MBA graduates from a top U.S. business school, Bertrand, Goldin, and Katz (2010) provide one of the few studies analyzing the evolution of the gender wage gap with labour market experience. They find that directly after graduation male and female wages are almost identical, but considerably diverge within the first ten years after entering the labour market. This rapid increase of the gender wage gap has also been found by Manning and Swaffield (2008) and Loprest (1992) for broader samples of young workers.

Although differences in human capital accumulation, career interruptions as well as differences in mobility patterns have been found to be important factors, they cannot fully explain the rise in women's wage disadvantages. Del Bono and Vuri (2006) show that wage differences become insignificant when employer and job characteristics are controlled for, suggesting that women's segregation into lower-paying jobs is particularly important. In fact, Kunze (2005) shows that a substantial part of the early career wage gap can be attributed to differences in occupational qualification. However, the aspect that women might be further segregated into different establishments and occupations within establishments has not been taken into account yet.

This paper contributes to the economic literature by investigating the impact of gender segregation on the wage differential among workers in the early stages of their labour market career. Using a large German linked employer-employee data set, where individuals are followed over a long period of time, makes it possible to consider workers' complete labour market history as well as women's allocation to certain industries, occupations, establishments and job-cells, i.e. occupations within establishments. The

empirical results suggest that the disproportionate concentration of women in lower-paying occupations and establishments can explain a major part of the gender wage gap among young workers, while skill endowments and differences in work histories are found to be of minor importance. Moreover, at the time of labour market entry, job-cell segregation accounts for almost the entire wage differential, implying that male and female job starters working in the same occupation within the same establishment are almost equally rewarded. However, with progressing labour market experience segregation becomes less important and cannot account for the observed small widening of the gender wage differential. Therefore, an unexplained within-job-cell wage gap remains.

The remainder of this paper is structured as follows. The next section provides an overview of the theoretical and empirical literature on gender wage differentials. Section 3 presents a description of the data set and some descriptive statistics. The empirical strategy, the estimation results and several robustness checks are discussed in Section 4. The final section of this paper concludes.

## 2 Theoretical and Empirical Background

One common theoretical approach to explain gender wage differentials is based on the human capital model, developed by Becker (1964) and Mincer (1974). This model attributes women's wage disadvantages to gender differences in the acquisition of human capital. This results from the fact that women show a weaker labour market attachment and tend to experience more career interruptions than men. Despite the lower level in accumulated work experience, intermittent employment patterns may also cause depreciations of human capital, since job-related qualifications are forgotten. Empirical studies reveal that both factors adversely affect women's wages and significantly determine the gender wage gap (O'neill and Polacheck, 1993, Ruhm, 1998). Another dimension of human capital that causes wage differentials is education. Previous studies suggested that not necessarily the quantity, which nowadays hardly differs between men and women, but rather the differences in the field of education significantly contribute to the wage differentials (Machin and Puhani, 2003, Brown and Corcoran, 1997).

According to the theory of compensating wage differentials, the wage gap between men and women might arise due to gender differences in the valuation of certain job aspects. Several empirical studies provide evidence that women prefer to work in certain occupations and firms, since they

are related to lower investments in job-specific training (Becker, 1971), a less competitive environment (Niederle and Vesterlund, 2007), lower rates of human capital depreciation (Görlich and de Grip, 2009, and Polacheck, 1981), and more pleasant and family friendly working conditions (Bender, Donohue, and Heywood, 2005, Budig and England, 2001). For these desirable, non-pecuniary job characteristics women appear to be willing to accept lower wages.

Economic theories of discrimination attribute women's disadvantages either to employers' prejudice or imperfect information. In particular, employers might have a *taste for discrimination* and are prejudiced against women (Becker, 1957), implying that they prefer hiring male workers even if those are more highly paid than equally skilled female workers. *Statistical discrimination* arises if employers have limited information about workers' skills and use easily observable characteristics to infer their productivity (Phelps, 1972 and Arrow, 1974). That is, if women are perceived as less productive and more likely to exit employment, they may earn lower wages or have less access to traditional male jobs and jobs involving costly training and high responsibilities. The employer learning literature predicts that if employers discriminate upon gender, the wage gap would decrease with rising experience, as women's actual productivity is revealed.<sup>1</sup>

Compensating wage differentials as well as gender discrimination are strongly related to women's segregation into lower-paying jobs. Previous empirical studies have shown that the wage gap between men and women decreases considerably when women's allocation to certain industries (Fields and Wolff, 1995), occupations (Loprest, 1992, Macpherson and Hirsch, 1995) and establishments (Blau, 1977, Carrington and Troske, 1998) is accounted for. With the availability of linked employer-employee data, researchers also started to consider the aspect that women might be further segregated into certain job-cells, i.e. occupations within establishments. Groshen (1991) as well as Petersen and Morgan (1995) argue that the various dimensions of gender segregation essentially account for the entire gender wage gap. Similar analyses have been conducted by Bayard, Hellerstein, Neumark, and Troske (2003), Datta Gupta and Rothstein (2005), and Korkeamäki and Kyyrä (2006). Although in these studies a sizeable portion of the overall wage differential can be attributed to segregation, a significant within job-cell gender wage gap remains unexplained.

---

<sup>1</sup>In the context of education, Altonji and Pierret (2001) hypothesize and empirically show that as employers learn more about the workers' productivity, the wage becomes less dependent on easily observable characteristics. Bauer and Haisken-DeNew (2001), however, find no evidence for the employer learning hypothesis for the German labour market.



Similarly, for Germany Hinz and Gartner (2005) find that women working in the same occupation within the same establishment still earn 12% less than equally skilled men.

Finally, job search (Burdett, 1978) and job matching models (Jovanovic, 1979) offer another theoretical explanation for women's wage disadvantages. Both models predict that workers can experience wage gains by moving to better jobs, giving job mobility an important role in shaping workers' earnings profiles. Differences in job mobility are therefore likely to explain part of the gender wage differential. Several empirical studies suggest that female workers are not only less likely to quit jobs, but also receive lower returns to mobility than their male counterparts (Napari, 2009 and Del Bono and Vuri, 2006). These variations in mobility returns could be the result of the above mentioned compensating wage differentials. That is, while men change jobs in order to advance in their careers, women are more likely to renounce wage gains and to switch to jobs which are, for example, easier to combine with family responsibilities (Altonji and Paxson, 1988).

Although there exists an enormous and still growing literature attempting to explain the overall gender wage gap (for a review see Altonji and Blank, 1999, Blau and Kahn, 2000), comparatively little attention has been given to the evolution of these wage differences during the early career. The gender wage gap is likely to increase within the first years after labour market entry, since a large part of lifetime wage growth and job mobility occurs during this period (Topel and Ward, 1992). Thus, analyzing gender differences in the determination of young workers' wages appears to be of great importance. In fact, most of the studies analyzing workers' early career find that the gap between women's and men's wages is rather small at the time of entering the labour market, but rapidly diverges within the first ten years of their career (Bertrand, Goldin, and Katz, 2010, and Manning and Swaffield, 2008). Factors found to partly contribute to the increase in the gender wage differential are differences in human capital accumulation (Manning and Swaffield, 2008), mobility patterns and search behaviour (Loprest, 1992, Keith and McWilliams, 1999) as well as differences in career interruptions and working hours (Bertrand, Goldin, and Katz, 2010, Light and Ureta, 1995).

Despite the variety of possible explanations that have been assessed, empirical evidence on women's labour market segregation during the early career and its impact on the evolution of the gender wage gap is scarce. Looking at a sample of German workers who have undertaken vocational

training, Kunze (2005) provides one of the few studies on gender segregation among young employees. She shows that a significant gender wage gap exists already at the time of labour market entry and remains relatively constant throughout the early career. While differences in human capital are found to be of minor importance, approximately half of the observed wage disadvantage can be attributed to women's disproportionate concentration in certain occupations. Other dimensions of gender segregation, however, are not taken into account in the literature on early career wage gaps.

### 3 Data and Descriptive Statistics

#### 3.1 The data set

The empirical analysis in this paper is based on the LIAB, a linked employer-employee data set provided by the Institute for Employment Research (IAB). The LIAB was constructed by combining the establishment-level data from the Institute for Employment Research (*IAB Establishment Panel*) with employment statistics from the Federal Employment Agency (*Employment Statistics Register*).

The *IAB Establishment Panel* is an annual representative survey of German establishments that employ at least one worker who pays social security contributions.<sup>2</sup> Starting in 1993, a random and stratified sample of establishments were questioned each year about various issues, such as number of employees, the composition of the workforce, sales, investment expenditures, and wage policies. The second data source, the *Employment Statistics Register*, is an administrative panel data set of the employment history of all individuals in Germany who worked in an employment covered by social security between 1975 and 2007. For 1995, this data source contains the labour market history of 79.4% of all employed persons in Western Germany and 86.2% of all employed persons in Eastern Germany. The employee history is based on the integrated notification procedure for health insurance, the statutory pension scheme, and unemployment insurance. At the beginning and at the end of any employment spell, employers are required to notify the social security agencies. This information is exact to the day. For spells spanning more than one calendar year, an annual report for each employee registered within the social insurance system is compulsory, and provides an update on, for example, the qualification and

---

<sup>2</sup>See Kölling (2000) for a detailed description of the IAB Establishment Panel.

the current occupation of the employee. Self employed, civil servants and workers in marginal employment are not included.<sup>3</sup>

A key information of these reports are gross daily wages subject to social security contributions, which are deflated using consumer prices (base year 2000). Further employee characteristics included are workers' age, gender, occupation, industry, date of entering the labour market and education. To meet the problem of inconsistent and missing information on the individual's education, the education variable is corrected following an imputation procedure provided by Fitzenberger, Osikumino, and Völter (2006).<sup>4</sup> The empirical analysis focuses on young workers, who enter the labour market for the first time during the period under consideration.

Using the unique establishment identification number, available in both data sources, one is able to match the information on workers' employment and unemployment history with the establishment panel, and obtain a linked employer-employee data set providing detailed information on individual and establishment characteristics.<sup>5</sup> In a first step of this matching process, West-German establishments who participated in the IAB Establishment Panel between 1996 and 2005 are selected. In a second step, the Employment Statistics Register is used to link the sample of establishments with the employment history information for all young individuals who worked at least one day in one of the selected establishments between 1993 and 2007.

In order to examine a more homogenous group in terms of individual preferences, the empirical analysis focuses on full-time workers and exclude part-time workers, homeworkers, apprentices, and trainees from the analysis.<sup>6</sup> Furthermore, I leave unconsidered individuals with right-censored wages and those with wages of less than the minimum income limit.<sup>7</sup> Finally, spells with missing information in any of the covariates are dropped.

---

<sup>3</sup>A detailed description of the Employment Statistics Register and the notification procedure is given by Bender, Haas, and Klose (2000).

<sup>4</sup>Particularly, I employ the imputation procedure 2B by Fitzenberger, Osikumino, and Völter (2006), where education reports are extrapolated if a person's education sequence is consistent, i.e. non-decreasing over time.

<sup>5</sup>Information on the LIAB data set is provided by Alda, Bender, and Gartner (2005).

<sup>6</sup>For Germany it can be shown that hourly wages of part-time workers are significantly lower than those of full-time workers (cf. Wolf, 2010). This might be due to the fixed costs firms face when employing a worker, leading to part-time workers being more expensive than full-time workers. Moreover, part-time workers might earn less due to differences in individual preferences and the valuation of work. As predominantly women work in part-time jobs, the inclusion of part-time workers tends to result in an increase in the gender wage differential.

<sup>7</sup>Because I only consider individuals during their early labour market career, only 3.8 % of workers reach wages affected by the contribution ceiling. For 0.24 % of the workers implausibly low wages of less than the minimum income limit are reported.

Applying these selection criteria, the final sample comprises 478,402 individual observations. Based on this sample it is possible to classify 14 industries (one-digit level), 81 occupations (two-digit level), and 1169 establishments.<sup>8</sup> Jobs are defined as occupations within establishments, resulting in 6902 job-cells. Table A.1 provides a definition of the variables used in the descriptive and empirical analysis.

### 3.2 Summary statistics

The summary statistics reported in Table A.2 show that about 37% of the young full-time employed workers are female. They earn on average 0.136 log points less than their male counterparts, whereby this wage differential is smaller at the time of labour market entry.<sup>9</sup> The difference in log wage growth indicates that the gender wage gap tends to increase with labour market experience. A comparison of the mean age, educational attainment and average labour market experience does not reveal any remarkable differences that might account for the observed female wage disadvantage. Women exhibit slightly longer experience in both fulltime and part-time employment. This might be due to the fact that young men in the considered sample spent longer time in unemployment or nonparticipation, which is reflected by longer non-employment spells.<sup>10</sup> The observed gender differences in firm tenure and particularly occupation tenure suggest differential mobility patterns. As indicated by the share of workers who have changed the entry firm or entry occupation, men tend to be more mobile at the beginning of their labour market career and, compared to women, are more likely to switch firms and occupations. The female shares give a first indication of the extent of women's allocation to different industries, occupations and establishments. Gender segregation is most evident at the job-cell level: women work in jobs with an average female share of 57.4%,

---

<sup>8</sup>Using the two-digit level of occupational classification rather than the three-digit level reduces problems of measurement error. In the sensitivity analysis I also run regression using the three-digit occupations.

<sup>9</sup>A gap of 0.136 log points resembles a gender wage differential of  $(exp(0.136) - 1) \times 100 = 12.7\%$ .

<sup>10</sup>Since the LIAB only includes individuals covered by social security legislation, the definition of nonparticipation comprises for example spells of self-employment and marginal employment as well as civilian and military service. Moreover, it includes those unemployed who are not entitled to transfer payments. Workers are not counted as unemployed, if they fail to report to the unemployment office. The same is true for workers who, during the two years prior to unemployment, have worked less than 12 months in a job covered by social security legislation. Also, workers can be temporarily denied unemployment benefits for different reasons (e.g. unjustified job quits, failure to take up an acceptable job), and are not recorded as unemployed for periods of non-receipt of benefits.

while men work in male-dominated jobs with a female share of only 16.9%. Previous research suggested that in terms of personal characteristics, the field of education, marital status as well as number of children are important determinants of lower female earnings (e.g. Machin and Puhani, 2003, Bertrand, Goldin, and Katz, 2010). However, the data set used in this analysis either includes only unreliable information (marital status, no. of children) or does not contain the information at all (field of education).

### 3.3 Wages

Due to the administrative nature of the individual data the reported wages are highly reliable, making the LIAB particularly suitable to analyse gender wage differentials. However, hourly wages cannot be calculated due to the lack of information on working hours. This shortcoming will be lessened by restricting the sample to full-time workers.<sup>11</sup> Another limitation of the wage data is the right-censoring at the social security contribution ceiling, which might lead to an underestimation of women's wage disadvantages. Table A.3 shows that this is especially true with respect to the whole working age population. Not considering right-censored wages, women earn 0.171 log points (around 15.7%) less than men. This wage differential sharply increases to 0.261 log points (around 22.9%) when the missing wage information is imputed.<sup>12</sup> Focusing on young workers, i.e. those with less than ten years of work experience, greatly diminishes the censoring problem. As only a relatively small proportion of young workers' wages are top-coded, the early career gender wage gap of 0.132 log points (12.4%) increases by only 0.030 log points when imputed wages are taken into account. Regarding the development of gender wage differentials Figure A.1 shows that the gap in censored wages rises from 0.118 log points at the time of labour market entry to 0.155 log points ten years later. The gender gap in imputed wages is quite similar at the beginning of workers' labour market career (around 0.124 log points). However, with increasing experience more women and particularly more men reach wages affected by the contribution ceiling. The differential in imputed wages therefore is growing slightly faster and reaches about 0.21 log points ten years after labour market entry. As, especially in the first years of young workers' ca-

---

<sup>11</sup>Because I exclusively consider young workers dropping part-time employed individuals barely affects the analysis. Within the first ten years of labour market experience less than 5% of the individuals work longer than 6 month in part-time employment.

<sup>12</sup>Wages are imputed by employing a single imputation approach specifically developed for the IABS data set by Gartner (2005). The independent variables used are age, education, industry, occupation, region, and year.

reers, the censoring problem seems to be of minor importance I will focus on individuals with wages below the social security contribution ceiling. Nevertheless, in the sensitivity analysis I will perform the same empirical analysis using imputed wages in order to test the robustness of the estimation results.

### 3.4 Gender segregation

In the subsequent empirical analysis it is of particular interest to assess to what extent the differential allocation of men and women to industries, occupations and establishments accounts for the gender wage gap. In order to investigate the magnitude of the different dimensions of gender segregation and its evolution over the early labour market career, I calculate an index of dissimilarity (cf. Duncan and Duncan, 1955):

$$D_t = \frac{1}{2} \sum_s |M_{ts} - F_{ts}|, \quad (1)$$

where  $t$  refers to the year since labour market entry, and  $s$  to the type of labour market segregation.  $M_{ts}$  and  $F_{ts}$  are the proportions of men and women working in the same industry ( $s = k$ ), occupation ( $s = o$ ), establishment ( $s = e$ ), or job-cell ( $s = jc$ ). This dissimilarity measure indicates the fraction of male or female workers that would have to change jobs to achieve an even gender allocation. Table A.4 shows that occupations and job-cells exhibit the highest degree of gender segregation. The table, moreover, illustrates that differences in labour market allocation are substantial already at the time of entry and remain relatively constant throughout the early career. This is in contrast to findings for the US and UK, which suggest a sharp increase in occupational segregation over the lifecycle (cf. Manning, 2006).

### 3.5 Work history

The main advantage of the sample under consideration is that workers can be observed right from the beginning of their labour market career, such that the data do not suffer from the problem of left-censoring of individual employment and non-employment spells. Hence, it is possible to reconstruct the complete work history for both men and women. Table A.5 displays the gender differences in cumulative work experience and mobility patterns by year since labour market entry. In the considered sample of young workers the share of women only slightly decreases with labour

market experience. Therefore, the concern that a selected group of women leave employment due to family responsibilities does not seem to play an important role when focusing on workers' early careers. The cumulative months of fulltime employment show that women gain slightly more work experience throughout the early career, reflecting the strong labour market attachment of women in the considered sample of fulltime employees. Three years after entering the labour market the mean cumulative work experience amounts to 40.1 months for women and to 36.8 for men. Ten years after entry the average female worker has accumulated 115.8 months of actual work experience, while the male counterpart has accumulated 6 months less. As already mentioned above, women's slightly longer experience might be induced by the longer time men spent in non-employment. The cumulative share of men with at least one interruption in employment covered by social security is 9% in the year after entry and 65% ten years later. In contrast, the cumulative share of women who experienced a non-employment spell is 31% after ten years of labour market experience. Since male workers are generally more mobile throughout their early labour market career, for them non-employment spells might include military/civil service or times they spend for job-searching, while they are in between two jobs. For women, however, these spells might rather reflect a withdrawing from work due to childcare responsibilities.

With respect to labour market mobility, there exist strong gender differences, as indicated by the cumulative share of workers who change the entry occupation. While a roughly equal fraction of men and women has left the initial firm ten years after labour market entry, a much higher proportion of men switch occupational careers. Ten years after labour market entry 35% of women have switched their occupational career, while for men with 0.59% this fraction is much higher.

## 4 Empirical Analysis

### 4.1 Estimation strategy

The aim of this study is to evaluate the determinants of the early career gender wage gap, particularly taking into account various dimensions of gender segregation. Thus, according to Datta Gupta and Rothstein (2005) and Hinz and Gartner (2005) I estimate different specifications of the fol-

lowing fixed effects model:

$$\ln w_{is} = \alpha_1 + \alpha_2 F_i + \delta' X_i + \eta_s + \epsilon_{is}, \quad (2)$$

where  $i$  refers to the individual and  $s$  to the type of labour market segregation under consideration (industry  $k$ , occupation  $o$ , establishment  $e$ , or occupation-establishment cell  $jc$ ). The variable  $\ln w_{is}$  denotes the individual's log real daily wage, while  $X_i$  is a standard vector of individual characteristics, and  $F_i$  a dummy variable indicating worker's gender (0=men, 1=women). In addition to that, Equation (2) also includes a fixed effect  $\eta_s$ . By estimating the model as a fixed effects model, I capture the wage effect between industries ( $s = k$ ), occupations ( $s = o$ ), establishments ( $s = e$ ), and between occupation-establishment cells ( $s = jc$ ), and thus am able to account for women's labour market segregation along all four dimensions.  $\alpha_1$ ,  $\alpha_2$  and  $\delta$  are the parameters or vectors of parameters to be estimated, with  $\alpha_2$  referring to the gender wage differential, which can neither be explained by observable person characteristics nor by the allocation of men and women in different labour markets.

In order to investigate the development of the gender wage gap during the workers' early labour market career, a set of dummy variables indicating the years since labour market entry  $T1_t, \dots, T10_t$  and their interaction with the female dummy  $T0_t \cdot F_i, \dots, T10_t \cdot F_i$  are added to Equation (2). Thus, the modified fixed effects model is given by:

$$\begin{aligned} \ln w_{ist} = & \beta_1 + \delta' X_i + \gamma_1 T1_t + \dots + \gamma_{10} T10_t \\ & + \delta_0 T0_t \cdot F_i + \dots + \delta_{10} T10_t \cdot F_i + \eta_s + u_{ist}. \end{aligned} \quad (3)$$

The coefficients on the interaction terms,  $\delta_0$  to  $\delta_{10}$ , show the evolution of the gender wage differential, with  $\delta_0$  referring to the wage gap at the time of labour market entry. Again a fixed effect  $\eta_s$  is additionally included in order to account for the different types of gender segregation.

## 4.2 Estimation results

Table A.6 displays the estimated gender wage differentials obtained from estimating Equation (2) with fixed effects at the industry, occupation, establishment and job-cell level. Estimation results are reported for the sample of early career workers (with work experience  $\leq 10$  years) as well as for labour market entrants and compared to those obtained for the whole working population. Considering workers of all ages, the average gender



difference in log real daily wages is 0.171. It reduces to 0.132 log points among workers in their early career and to 0.118 log points among workers entering the labour market for the first time. As mentioned above, young men and women are very similar with respect to their education. Therefore, controlling for the educational level only explains approximately 6% of the entry wage gap and only 3% of the wage differential among young workers. These results are in line with Kunze (2005), who shows that the explanatory power of human capital characteristics is low at the time of labour market entry and further diminishes with work experience.

As already found by Hinz and Gartner (2005), the estimation results further reveal that gender segregation into industries and occupations plays only a minor role in explaining the gender wage gap among the entire working age population. For young workers, however, these types of segregation largely contribute to women's disadvantages. For example, women's allocation to different occupations accounts for about 30% of the early career wage gap and for about 50% of the entry wage gap, suggesting that occupational segregation is even more relevant at the time of labour market entry. A similar pattern can be observed for industrial segregation. Furthermore, gender differences in the allocation to establishments and job-cells are highly relevant for workers at all stages of their career, although its contribution also seems to decrease over the lifecycle. Thereby, job-cell segregation appears to explain the highest proportion of women's disadvantages and, at least at the beginning of a worker's career, leaves only a small part of the overall entry wage gap unexplained. This implies that women with zero work experience, the same educational level and working in the same occupation within the same establishment earn 0.021 log points less than their male counterparts and therefore are almost equally rewarded.

To further investigate how the wage differences between men and women and the impact of gender segregation evolve over the early labour market career, Table A.7 and Figure A.2 show the development of the overall gender wage gap as well as the development of the gender wage gap within industries, occupations, establishments, and job-cells. At this stage I only account for the year of observation as well as the educational level and neglect gender differences in the accumulated mobility and work history. The wage regression without any fixed effects shows that the average female labour market entrant earns about 0.113 log points less than the male counterpart. This wage differential increases to 0.131 log points five years later and to 0.155 log points ten years later. The evidence of a rising gender wage gap coincides with empirical findings from the UK and US (cf. Man-

ning and Swaffield, 2008, Loprest, 1992, and Bertrand, Goldin, and Katz, 2010). It, however, differs from results obtained by Kunze (2005) for the German labour market. Based on a sample of workers who finished their apprenticeship between 1975 and 1990, she finds that the wage differential between male and female workers stays constant throughout the early career. These diverse results for Germany might be related to the different time periods and worker samples used for the analysis.

Concerning gender segregation, Table A.7 suggests that the impact of the differential allocation to industries, occupations, establishments and job-cells is particularly large at the beginning of the working career, but decreases as labour market experience elapses. For example, at the time of labour market entry, female workers employed in the same occupation as their male counterparts earn about 0.063 log points less. This within-occupation gender wage differential gradually increases during the early labour market career and reaches 0.112 log points ten years after entry. A similar pattern emerges when the aspect of further segregation into job-cells is taken into account. In particular, during the early career the wage differential within job-cells gradually increases from 0.028 log points to 0.081 log points. This implies, as already mentioned above, that women's concentration in lower-paying jobs almost entirely accounts for the lower entry wages received by female workers. The contribution of gender segregation gradually decreases with rising work experience, implying that, ten years after labour market entry, half of the gender wage differential remains unexplained.

In order to examine why women's wage disadvantages increase during the early labour market career, I pool all individual-year observations and estimate Equation (2) including different sets of explanatory variables. Estimation results without controlling for the different types of labour market segregation are displayed in Table A.8. The mean gender wage differential of 0.132 log points (cf. Table 5.5) slightly reduces to 0.128 log points when educational level and year of observation is controlled for. As already shown in the descriptive statistics, during the early labour market career women accumulate somewhat longer work experience than men. Therefore, augmenting the model with a quadratic term for months of actual fulltime experience and a dummy variable indicating nonemployment spells of at least six months raises the gender wage differential to 0.143 log points. The gender differences in young workers' mobility patterns can only account for a wage differential of 0.002 log points. More precisely, the additional inclusion of dummy variables, which indicate whether an employer and occupa-

tion change took place, leads to a gender wage gap of 0.141 log points. The preceding regressions restrict the wage effect of career interruptions and labour market changes to be the same for male and female workers. Thus, in the last column of Table A.8, I additionally control for the interaction of these variables with the female dummy. The estimation results reveal that for men the wage penalty of experiencing a non-employment spell is 0.049 log points, while for women it is 0.057 log points higher. As mentioned in the previous section, women might take time off due to completely different reasons and therefore might be more heavily penalized. The results also reveal gender differences in the wage effect of employer changes and occupation changes. A change of the entry occupation raises men's wages by 0.016 log points, whereas women's wages only increase by 0.003 log points. Moreover, the wage loss induced by an employer change is 0.098 log points for men and with 0.133 log points even higher for women. Although spells of non-employment as well as labour market changes appear to have a differential impact on the wages of both genders, conditioning on the interaction terms only slightly reduces the gender wage differential to 0.136 log points.

The corresponding results obtained from estimating wage regressions including fixed effects for industry, occupation, establishment and job-cell are shown in Table A.9. Taking into account the different types of gender segregation reduces the wage differential between young men and women considerably. However, as already shown in the OLS specification, the inclusion of covariates regarding educational level, work history and mobility patterns cannot explain the remaining early career wage gap. For example, in the fullest specification shown in column (4) the uncorrected within-job-cell wage gap of 0.057 log points (cf. Table 5.5) is reduced by only 0.005 log points, whereby education mostly contributes to this decline. Overall, the results of the empirical analysis point to the substantial role of women's labour market segregation in explaining the gender wage differential during the early career, while other covariates are found to be of minor importance.

### 4.3 Sensitivity analysis

As already discussed above, excluding right-censored wages might lead to an underestimation of the gender wage differential among young workers. Therefore, I perform the same regressions using imputed wages. A comparison of the estimated gender gaps in censored and imputed wages in Table A.10 reveals that, imputing the missing wage information leads to

slightly higher gender wage differentials, but does not qualitatively change the results. In particular, Figure A.3 illustrates that at the time of labour market entry the gap in imputed wages is close to the gap in censored wages. During the early career the gender differentials in imputed wages grow faster as those in censored wages, implying that the magnitude of underestimation rises with years in the labour market. When segregation into job-cells is taken into account, a quite similar pattern emerges, though with a more moderate increase during the first ten years of labour market experience.

In a second robustness test, I conduct separate analyses for workers employed in low-skill occupations and those employed in high-skill occupations. The definition of low-skill occupations comprises farmers, operators, craft workers, service workers and clerks, while the definition of high-skill occupations comprises managers, professionals, technicians and sales workers. The results in Table A.10 suggest that the overall gender gap in censored wages is considerably higher for low-skilled workers than for their high-skilled counterparts. However, accounting for the disproportionate concentration of women in job-cells yields similar gender wage differentials for both groups of workers. This implies that gender segregation plays a more important role for low-skilled workers. The results, moreover, show that imputing the missing wages hardly changes the estimated gender wage differentials for workers employed in low-skill occupations, since those are barely affected by right-censored wage data. This is not the case for high-skilled workers. Table A.10 shows that the exclusion of top-coded wages underestimates the overall gender wage gap by about 0.036 log points and the within job-cell gap by about 0.023 log points. More specifically, Figure A.4 illustrates that wages of workers employed in high-skill occupations are increasingly affected by the contribution ceiling as labour market experience rises. At the beginning of workers' careers the usage of censored wages only marginally underestimates the gender wage differential. But, as labour market experience elapses, the extent of underestimation rapidly increases, which might suggest the presence of glass ceilings. This applies to the overall gender wage differentials as well as to those within job-cells.

Another robustness check attempts to examine how estimation results change when a more detailed definition of occupations and job-cells is used. Table A.11 compares the previous results on the two-digit level of occupational classification with those obtained from estimating occupation and job-cell fixed effects specifications that use the three-digit level. A comparison reveals that occupational and job-cell segregation appears to be

even more marked when the detailed definition of occupational categories is taken into account. Nevertheless, since the estimated development of the gender wage gap during workers' early career remains quite similar, the qualitative results of the analysis do not change with the degree of occupational classification.

## 5 Conclusion

This paper examines the gender wage differential at the time of labour market entry as well as its development during workers' early careers. Employing a large linked employer-employee data set makes it possible to evaluate the extent to which women's disadvantages can be attributed to their disproportionate concentration in lower-paying industries, occupations, establishments and job-cells.

The empirical findings show that at the time of labour market entry female workers earn about 11% less than their male counterparts. This wage disadvantage increases during the early career and reaches more than 14% ten years after entering the labour market. Estimating log daily wage equations with fixed effects at the industry, occupation, establishment and job-cell level reveals that all types of segregation and particularly job-cell segregation are significant determinants of the gender wage gap, while skill endowments are found to be of minor importance. Women's concentration in lower-paying jobs can explain essentially all of the entry wage differential, implying that men and women working in the same occupation within the same establishment are almost equally rewarded at the beginning of their labour market career. However, with increasing labour market experience segregation loses its explanatory power and is not able to account for the rise in women's wage disadvantages. The estimation results moreover suggest that differences in work histories and mobility patterns do not contribute to the slight widening of the wage gap. Therefore, within job-cells an early career wage gap of approximately 5.1% remains unexplained, which is even larger when the analysis is performed using imputed wages.

To some extent the unexplained part of the early career wage differential might be attributed to gender differences in certain characteristics that cannot be observed in the data. First, previous studies on gender differences in working hours find that male workers tend to work overtime more often than their female counterparts (cf. van Bastelaer and Vaguer, 2004). As the information on working hours is lacking, the gender gap is based on daily wages which is likely to be larger than the gender gap

based on hourly wages. Second, the gender wage differential might also be affected by professional and qualitative differences in educational achievements, which the IABS data do not allow to take into account. Third, occupational groups differ in the precision they have been recorded, e.g. the classification for male-dominated craft occupations is more detailed than for office and service occupations, where women are most numerous. As a result the measurement of the gender wage gap to some extent suffers from inaccuracies. Moreover, men and women might differ in their career development within occupations. As hierarchical levels are not covered by the data, it is likely that part of the unexplained gender wage gap is due to vertical segregation within occupations and job-cells. This, however, is a matter of further research.

Besides data limitations other possible reasons for the increase in the unexplained gender wage gap are discrimination or differences in personal preferences. On the one hand, as employers expect women to be less productive and more likely to interrupt their careers due to family responsibilities they might be discriminated and thus not be promoted. On the other hand women might value work/life balance more than men and, with regard to family planning, renounce higher level jobs which usually are accompanied by a higher workload and responsibility. These problems as well as the problem of segregation into lower-paying occupations and job-cells could presumably be alleviated by facilitating the reconciliation of family and employment. Providing access to affordable and flexible child care services and improving the flexibility in work arrangements for families with young children would help to revise the opinion that children prevent women from climbing the job ladder.

Overall, the empirical results highlight the major role of segregation in explaining gender wage differentials and show that the allocation of women into lower-paying jobs is substantial already at the beginning of the labour market career. Thus, there is a need to conduct further research focussing on an in-depth analysis of these segregation processes. Moreover, although the reasons for segregation remain unclear, the analysis nevertheless stresses the importance to equal hiring and promotion practices and to increase the compatibility of family and working life.

## References

- ALDA, H., S. BENDER, AND H. GARTNER (2005): “The Linked Employer-Employee Dataset of the IAB (LIAB),” IAB Discussion Paper 6, Institute for Employment Research (IAB).
- ALTONJI, J. G., AND R. M. BLANK (1999): “Race and Gender in the Labor Market,” in *Handbook of Labor Economics, Volume 3C*, ed. by O. Ashenfelter, and D. Card, pp. 3143–3259. Elsevier Science, Amsterdam et al.
- ALTONJI, J. G., AND C. PAXSON (1988): “Labor Supply Preferences, Hours Constraints, and Hours-Wage Trade-Offs,” *Journal of Labor Economics*, 6(2), 254–276.
- ALTONJI, J. G., AND C. PIERRET (2001): “Employer Learning and Statistical Discrimination,” *Journal of Economics*, 116, 313–350.
- ARROW, K. J. (1974): “Limited Knowledge and Economic Analysis,” *American Economic Review*, 64, 1–10.
- BAUER, T. K., AND J. P. HAISKEN-DENEW (2001): “Employer Learning and the Returns to Schooling,” *Labour Economics*, 8(2), 161–180.
- BAYARD, K., J. HELLERSTEIN, D. NEUMARK, AND K. TROSKE (2003): “New Evidence on Sex Segregation and Sex Differences in Wages from Matched Employee-Employer Data,” *Journal of Labor Economics*, 21(4), 887–922.
- BECKER, G. (1957): *The Economics of Discrimination*. University of Chicago Press.
- (1964): *Human Capital - A Theoretical and Empirical Analysis with Special Reference to Education*. Chicago University Press, 3rd edition.
- (1971): *Economics of Discrimination*. Chicago University Press.
- BENDER, K., S. DONOHUE, AND J. HEYWOOD (2005): “Job Satisfaction and Gender Segregation,” *Oxford Economic Papers*, 57, 479–496.
- BENDER, S., A. HAAS, AND C. KLOSE (2000): “IAB Employment Subsample 1975-1995. Opportunities for Analysis Provided by the Anonymised Subsample,” IZA Discussion Paper 117, Institute for the Study of Labor (IZA).

- BERTRAND, M., C. GOLDIN, AND L. F. KATZ (2010): “Dynamics of the Gender Gap for Young Professionals in the Financial and Corporate Sectors,” *American Economic Journal: Applied Economics*, 2(3), 228–255.
- BLAU, F. D. (1977): *Equal Pay in the Office*. Lexington, MA: Heath.
- BLAU, F. D., AND L. M. KAHN (2000): “Gender Differences in Pay,” *The Journal of Economic Perspectives*, 14(4), 75–100.
- BROWN, C., AND M. CORCORAN (1997): “Sex-Based Differences in School Content and the Male-Female Wage Gap,” *Journal of Labor Economics*, 15(3), 431–465.
- BUDIG, M., AND P. ENGLAND (2001): “The Wage Penalty for Motherhood,” *American Sociological Review*, 66(2), 204–225.
- BURDETT, K. (1978): “A Theory of Employee Job Search and Quit Rates,” *American Economic Review*, 68(1), 212–220.
- CARRINGTON, W. J., AND K. R. TROSKE (1998): “Sex Segregation in U.S. Manufacturing,” *Industrial and Labor Relations Review*, 51, 445–464.
- DATTA GUPTA, N., AND D. ROTHSTEIN (2005): “The Impact of Worker and Establishment-level Characteristics on Male-Female Wage Differentials: Evidence from Danish Matched Employee-Employer Data,” *Labour*, 19(1), 1–34.
- DEL BONO, E., AND D. VURI (2006): “Is it the Way She Moves?: New Evidence on the Gender Wage Growth Gap in the Early Careers of Men and Women in Italy,” Discussion Paper 2523, IZA.
- DUNCAN, O., AND B. DUNCAN (1955): “A Methodological Analysis of Segregation Indexes,” *American Sociological Review*, 20, 210–217.
- FIELDS, J., AND E. WOLFF (1995): “Interindustry Wage Differentials and the Gender Wage Gap,” *Industrial and Labor Relations Review*, 49, 105–120.
- FITZENBERGER, B., A. OSIKUMINO, AND R. VÖLTER (2006): “Imputation Rules to Improve the Education Variable in the IAB Employment Subsample,” *Schmollers Jahrbuch / Journal of Applied Social Science Studies*, 126(3), 405–436.



- GARTNER, H. (2005): “The Imputation of Wages above the Contribution Limit with the German IAB Employment Sample,” *Methodenreport* 02/2005, FDZ.
- GÖRLICH, D., AND A. DE GRIP (2009): “Human Capital Depreciation During Hometown,” *Oxford Economic Papers*, 61(1), 98–121.
- GROSHEN, E. L. (1991): “The Structure of the Female/Male Differential: Is it Who You Are, What You Do, or Where You Work?,” *Journal of Human Resources*, 26(3), 457–472.
- HINZ, T., AND H. GARTNER (2005): “Geschlechtsspezifische Lohnunterschiede in Branchen, Berufen und Betrieben,” *Zeitschrift für Soziologie*, 34, 22–39.
- JOVANOVIĆ, B. (1979): “Job Matching and the Theory of Labor Turnover,” *Journal of Political Economy*, 87, 972–990.
- KEITH, K., AND A. MCWILLIAMS (1999): “The Returns to Job Mobility and Search by Gender,” *Industrial and Labor Relations Review*, 52(3), 460–477.
- KÖLLING, A. (2000): “The IAB-Establishment Panel,” *Schmollers Jahrbuch / Journal of Applied Social Science Studies*, 120(2), 291–300.
- KORKEAMÄKI, O., AND T. KYRÄ (2006): “A Gender Wage Gap Decomposition for Matched Employer-Employee Data,” *Labour Economics*, 13(5), 611–38.
- KUNZE, A. (2005): “The Evolution of the Gender Wage Gap,” *Labour Economics*, 12(1), 73–97.
- LIGHT, A., AND M. URETA (1995): “Early-Career Work Experience and Gender Wage Differentials,” *Journal of Labor Economics*, 13(1), 121–154.
- LOPREST, P. J. (1992): “Gender Differences in Wage Growth and Job Mobility,” *American Economic Review*, 82(2), 526–532.
- MACHIN, S., AND P. PUHANI (2003): “Subject of Degree and the Gender Wage Differential - Evidence from the UK and Germany,” *Economics Letters*, 79(3), 393–400.
- MACPHERSON, D. A., AND B. T. HIRSCH (1995): “Wage and Gender Decomposition: Why Do Women’s Jobs Pay Less,” *Journal of Labour Economics*, 13(3), 426–471.

- MANNING, A. (2006): “The Gender Pay Gap,” *CentrePiece*, 11(1), 13–16.
- MANNING, A., AND J. SWAFFIELD (2008): “The Gender Gap in Early-Career Wage Growth,” *The Economic Journal*, 118(530), 983–1024.
- MINCER, J. (1974): *Schooling, Experience and Earnings*. New York: National Bureau of Economic Research.
- NAPARI, S. (2009): “Gender Differences in Early-Career Wage Growth,” *Labour Economics*, 16(2), 140–148.
- NIEDERLE, M., AND L. VESTERLUND (2007): “Do Women Shy Away from Competition? Do Men Compete too Much?,” *Quarterly Journal of Economics*, 122, 1067–1101.
- OECD (2010): “Overview of Gender Differences in OECD Countries,” Discussion paper, OECD Paris.
- O’NEILL, J., AND S. POLACHECK (1993): “Why the Gender Gap in Wages narrowed in the 1980s,” *Journal of Labor Economics*, 31(1), 205–228.
- PETERSEN, T., AND L. A. MORGAN (1995): “Separate and Unequal: Occupation-Establishment Sex Segregation and the Gender Wage Gap,” *The American Journal of Sociology*, 101(2), 329–365.
- PHELPS, E. (1972): “The Statistical Theory of Racism and Sexism,” *American Economic Review*, 62(4), 659–661.
- POLACHECK, S. (1981): “Occupational Self-Selection: A Human Capital Approach to Sex Differences in Occupational Structure,” *Review of Economics and Statistics*, 63(1), 60–69.
- RUHM, C. J. (1998): “The Economic Consequences of Parental Leave Mandates: Lessons from Europe,” *Quarterly Journal of Economics*, 113, 285–317.
- TOPEL, R. H., AND M. P. WARD (1992): “Job Mobility and the Careers of Young Men,” *Quarterly Journal of Economics*, 107(2), 439–479.
- VAN BASTELAER, A., AND C. VAGUER (2004): “Arbeitszeiten. Statistik kurz gefasst,” *Bevölkerung und soziale Bedingungen Thema 3-7*, 7, 1–7.
- WOLF, E. (2010): “Lohndifferenziale zwischen Vollzeit- und Teilzeitbeschäftigten in Ost- und Westdeutschland,” WSI-Diskussionspapier 174, Wirtschafts- und Sozialwissenschaftliches Institut.

## Appendix A Tables

Table A.1: Summary statistics by gender

Variable	Definition
Log wage	Log real daily wage.
Log entry wage	Log real daily wage at the time of entry.
Wage growth	Wage growth since labour market entry.
Age	Age of individual.
Low-skilled	Dummy=1 if individual holds a lower secondary school diploma without a professional degree.
Medium-skilled	Dummy=1 if individual holds a lower secondary school diploma and professional degree; or a high school diploma with or without a professional degree.
High-skilled	Dummy=1 if individual holds a university degree or university of applied sciences degree.
Act. experience	Actual labour market experience, months.
FT experience	Months of full-time employment.
PT experience	Months of part-time employment.
Unempl. experience	Months of unemployment with receipt of transfer payments.
Non-empl. experience	Months of non-activity (out of sample).
Firm tenure	Experience within establishment, months.
Occ. tenure	Experience within occupation, months.
Firm change	Dummy=1 if individual has changed entry firm.
Occ. change	Dummy=1 if individual has changed entry occupation.
Fem. share ind.	Share of women within industry.
Fem. share firm	Share of women within establishment.
Fem. share occ.	Share of women within occupation.
Fem. share job-cell	Share of women within job-cell.

Table A.2: Summary statistics by gender

Variable	Men		Women		Difference in means	
	Mean	(S.D.)	Mean	(S.D.)		(S.E.)
Log wage	4.421	(0.311)	4.285	(0.328)	-0.136	(0.001)
Log entry wage	4.152	(0.375)	4.071	(0.348)	-0.081	(0.001)
Wage growth	0.269	(0.372)	0.213	(0.363)	-0.018	(0.001)
Age	25.67	(4.024)	25.27	(3.754)	-0.391	(0.011)
Low-skilled	0.072	(0.259)	0.067	(0.250)	-0.005	(0.001)
Medium-skilled	0.825	(0.380)	0.847	(0.360)	0.022	(0.001)
High-skilled	0.103	(0.304)	0.086	(0.280)	-0.017	(0.001)
Act. experience	46.66	(34.21)	47.67	(34.09)	1.016	(0.100)
FT experience	44.64	(33.76)	45.43	(33.44)	0.789	(0.099)
PT experience	0.602	(3.735)	0.782	(4.439)	0.180	(0.007)
Unempl. experience	1.219	(4.334)	0.654	(3.112)	-0.565	(0.011)
Non-empl. experience	6.311	(11.97)	2.506	(8.762)	-3.805	(0.030)
Firm tenure	26.57	(29.38)	29.16	(30.66)	2.592	(0.089)
Occupation tenure	27.67	(30.08)	32.39	(31.91)	4.723	(0.091)
Firm mover	0.371	(0.483)	0.328	(0.469)	-0.043	(0.001)
Occupation mover	0.370	(0.483)	0.199	(0.399)	-0.171	(0.001)
Fem. share ind.	0.220	(0.127)	0.368	(0.189)	0.148	(0.001)
Fem. share firm	0.208	(0.171)	0.434	(0.222)	0.227	(0.001)
Fem. share occ.	0.192	(0.203)	0.501	(0.209)	0.309	(0.001)
Fem. share job-cell	0.169	(0.224)	0.574	(0.242)	0.405	(0.001)
No. of obs.	313,098		184,085			

*Source:* Author's calculations, based on LIAB 1993-2007.

Table A.3: Gender wage differential - censored vs. imputed wages

	All workers			Young workers		
	Men	Women	Wage Gap	Men	Women	Wage Gap
censored wages	4.544	4.373	0.171	4.402	4.289	0.132
imputed wages	4.687	4.426	0.261	4.463	4.301	0.162

*Source:* Author's calculations, based on LIAB 1993-2007.

*Note:* All workers refer to the whole working population, while young workers refer to individuals with not more than 10 years of work experience.

Table A.4: Labour market segregation

Years since entry	Level of segregation			
	Industry	Occupation	Establ.	Job-cell
0	0.395	0.572	0.481	0.651
1	0.410	0.587	0.492	0.670
2	0.413	0.597	0.499	0.684
3	0.408	0.598	0.496	0.686
4	0.416	0.601	0.501	0.691
5	0.411	0.594	0.498	0.691
6	0.407	0.585	0.494	0.687
7	0.398	0.582	0.494	0.687
8	0.398	0.585	0.494	0.691
9	0.399	0.580	0.497	0.693
10	0.393	0.575	0.494	0.699

*Source:* Author's calculations, based on LIAB 1993-2007.

Table A.5: Gender differences in work and mobility histories

Years since entry	Share of women	Cum. months of fulltime empl.		Cum. share with non-act. spell		Cum. share of firm changers		Cum. share of occ. changers	
		Men	Women	Men	Women	Men	Women	Men	Women
0	37.90	6.07	5.83	0.09	0.08	0.06	0.06	0.06	0.04
1	38.10	16.70	17.79	0.26	0.11	0.22	0.20	0.22	0.11
2	38.00	26.51	29.08	0.40	0.13	0.31	0.28	0.31	0.15
3	37.70	36.79	40.06	0.45	0.15	0.38	0.35	0.36	0.21
4	37.50	47.10	51.01	0.50	0.17	0.43	0.40	0.41	0.24
5	36.80	57.40	61.83	0.53	0.21	0.48	0.43	0.45	0.26
6	36.50	67.40	72.60	0.58	0.23	0.52	0.47	0.50	0.28
7	36.10	77.56	83.27	0.60	0.26	0.55	0.49	0.52	0.30
8	35.60	88.15	94.01	0.62	0.28	0.58	0.51	0.54	0.32
9	34.70	98.64	104.7	0.64	0.30	0.60	0.53	0.57	0.34
10	33.90	109.4	115.8	0.65	0.31	0.61	0.53	0.59	0.35

*Source:* Author's calculations, based on LIAB 1993-2007.

Table A.6: Gender wage differential

	All workers		Young workers		Entrants	
	Coeff.	(S.E.)	Coeff.	(S.E.)	Coeff.	(S.E.)
<b>Raw</b>						
OLS	-0.171*	(0.000)	-0.132*	(0.001)	-0.118*	(0.003)
Industry FE	-0.159*	(0.000)	-0.096*	(0.001)	-0.079*	(0.003)
Occupation FE	-0.170*	(0.000)	-0.095*	(0.001)	-0.066*	(0.003)
Establishment FE	-0.138*	(0.000)	-0.074*	(0.001)	-0.051*	(0.003)
Job-cell FE	-0.129*	(0.000)	-0.057*	(0.001)	-0.029*	(0.003)
<b>+ Education</b>						
OLS	-0.165*	(0.000)	-0.128*	(0.001)	-0.111*	(0.002)
Industry FE	-0.145*	(0.000)	-0.085*	(0.001)	-0.064*	(0.003)
Occupation FE	-0.162*	(0.000)	-0.083*	(0.001)	-0.050*	(0.003)
Establishment FE	-0.126*	(0.000)	-0.064*	(0.001)	-0.040*	(0.003)
Job-cell FE	-0.125*	(0.000)	-0.051*	(0.001)	-0.021*	(0.003)
No. of obs.	4,504,507		497,183		88,912	

*Source:* Author's calculations, based on LIAB 1993-2007.

*Note:* Dependent variable is the log real daily wage. Each cell corresponds to a different regression. Numbers shown are the coefficients on the female dummy variable which result from estimating Equation (2). The first set of regressions contains year dummies, while the second set additionally includes the workers' educational level. \*: statistically significant at least at the 5%-level.

Table A.7: Development of gender wage differential over the early career

	OLS		Industry FE		Occupation FE		Establishment FE		Job-cell FE	
	Coef.	(S.E)	Coef.	(S.E)	Coef.	(S.E)	Coef.	(S.E)	Coef.	(S.E)
Exp. year 1	0.075*	(0.002)	0.071*	(0.002)	0.071*	(0.002)	0.072*	(0.002)	0.063*	(0.002)
Exp. year 2	0.129*	(0.002)	0.125*	(0.002)	0.125*	(0.002)	0.126*	(0.002)	0.115*	(0.002)
Exp. year 3	0.161*	(0.002)	0.157*	(0.002)	0.158*	(0.002)	0.159*	(0.002)	0.147*	(0.002)
Exp. year 4	0.189*	(0.002)	0.185*	(0.002)	0.186*	(0.002)	0.188*	(0.002)	0.174*	(0.002)
Exp. year 5	0.212*	(0.002)	0.208*	(0.002)	0.209*	(0.002)	0.211*	(0.002)	0.197*	(0.002)
Exp. year 6	0.234*	(0.002)	0.229*	(0.002)	0.231*	(0.002)	0.233*	(0.002)	0.218*	(0.002)
Exp. year 7	0.252*	(0.002)	0.247*	(0.002)	0.249*	(0.002)	0.250*	(0.002)	0.235*	(0.002)
Exp. year 8	0.269*	(0.002)	0.263*	(0.002)	0.265*	(0.002)	0.267*	(0.002)	0.251*	(0.002)
Exp. year 9	0.283*	(0.003)	0.278*	(0.002)	0.279*	(0.002)	0.283*	(0.002)	0.266*	(0.002)
Exp. year 10	0.299*	(0.003)	0.295*	(0.003)	0.294*	(0.003)	0.300*	(0.002)	0.281*	(0.002)
Female*Exp. year 0	-0.113*	(0.002)	-0.064*	(0.002)	-0.063*	(0.002)	-0.041*	(0.002)	-0.028*	(0.002)
Female*Exp. year 1	-0.115*	(0.002)	-0.072*	(0.002)	-0.068*	(0.002)	-0.047*	(0.002)	-0.033*	(0.002)
Female*Exp. year 2	-0.120*	(0.003)	-0.073*	(0.002)	-0.072*	(0.003)	-0.050*	(0.002)	-0.037*	(0.002)
Female*Exp. year 3	-0.125*	(0.003)	-0.079*	(0.002)	-0.078*	(0.003)	-0.058*	(0.002)	-0.045*	(0.002)
Female*Exp. year 4	-0.126*	(0.003)	-0.082*	(0.003)	-0.080*	(0.003)	-0.063*	(0.002)	-0.049*	(0.002)
Female*Exp. year 5	-0.131*	(0.003)	-0.088*	(0.003)	-0.086*	(0.003)	-0.069*	(0.002)	-0.057*	(0.002)
Female*Exp. year 6	-0.135*	(0.003)	-0.094*	(0.003)	-0.092*	(0.003)	-0.074*	(0.002)	-0.062*	(0.002)
Female*Exp. year 7	-0.137*	(0.003)	-0.097*	(0.003)	-0.095*	(0.003)	-0.077*	(0.003)	-0.063*	(0.003)
Female*Exp. year 8	-0.137*	(0.003)	-0.096*	(0.003)	-0.094*	(0.003)	-0.076*	(0.003)	-0.064*	(0.003)
Female*Exp. year 9	-0.151*	(0.004)	-0.110*	(0.004)	-0.107*	(0.004)	-0.090*	(0.003)	-0.079*	(0.003)
Female*Exp. year 10	-0.155*	(0.004)	-0.113*	(0.004)	-0.112*	(0.004)	-0.093*	(0.004)	-0.081*	(0.003)
Medium-skilled	0.140*	(0.002)	0.146*	(0.002)	0.112*	(0.002)	0.109*	(0.001)	0.071*	(0.001)
High-skilled	0.411*	(0.002)	0.438*	(0.002)	0.333*	(0.002)	0.376*	(0.002)	0.236*	(0.002)
No. of obs	497,183		497,183		497,183		497,183		497,183	

Source: Author's calculations, based on LIAB 1993-2007.

Note: Dependent variable is the log real daily wage. Regressions additionally contain year dummies as well as 14 industry fixed effects, 81 occupation fixed effects, 1169 establishment fixed effects or 6902 job-cell fixed effects, respectively. \*: statistically significant at least at the 5%-level.

Table A.8: Pooled wage regression, OLS

	(1)		(2)		(3)		(4)	
	Coef.	(S.E)	Coef.	(S.E)	Coef.	(S.E)	Coef.	(S.E)
Female	-0.128*	(0.001)	-0.143*	(0.001)	-0.141*	(0.001)	-0.136*	(0.001)
Medium-skilled	0.182*	(0.002)	0.134*	(0.002)	0.131*	(0.002)	0.129*	(0.002)
High-skilled	0.461*	(0.002)	0.405*	(0.002)	0.415*	(0.002)	0.416*	(0.002)
FT exp			0.005*	(0.000)	0.006*	(0.000)	0.006*	(0.000)
FT exp <sup>2</sup> (x100)			-0.002*	(0.000)	-0.003*	(0.000)	-0.002*	(0.000)
Non-empl. spell			-0.078*	(0.001)	-0.064*	(0.001)	-0.049*	(0.001)
Occ. change					0.011*	(0.001)	0.016*	(0.001)
Firm change					-0.085*	(0.001)	-0.098*	(0.001)
<i>Interaction with female dummy</i>								
Non-empl. spell							-0.057*	(0.002)
Occ. change							-0.013*	(0.002)
Firm change							-0.035*	(0.002)
No. of obs.	497,183		497,183		497,183		497,183	

*Source:* Author's calculations, based on LIAB 1993-2007.

*Note:* Dependent variable is the log real daily wage. All regressions include the year dummies as well as the covariates as indicated. \*: statistically significant at least at the 5%-level.

Table A.9: Wage regression, fixed effects models

	(1)		(2)		(3)		(4)	
	Coef.	(S.E)	Coef.	(S.E)	Coef.	(S.E)	Coef.	(S.E)
OLS	-0.128*	(0.001)	-0.143*	(0.001)	-0.141*	(0.001)	-0.136*	(0.001)
Industry FE	-0.085*	(0.001)	-0.098*	(0.001)	-0.098*	(0.001)	-0.089*	(0.001)
Occupation FE	-0.083*	(0.001)	-0.093*	(0.001)	-0.092*	(0.001)	-0.083*	(0.001)
Establishment FE	-0.064*	(0.001)	-0.074*	(0.001)	-0.075*	(0.001)	-0.068*	(0.001)
Job-cell FE	-0.051*	(0.001)	-0.059*	(0.001)	-0.060*	(0.001)	-0.052*	(0.001)

*Source:* Author's calculations, based on LIAB 1993-2007.

*Note:* Dependent variable is the log real daily wage. Each cell corresponds to a different regression. Numbers shown are the coefficients on the female dummy variable which result from estimating the different specifications displayed in Table A.8. \*: statistically significant at least at the 5%-level.



Table A.10: Gender wage differential by skill level

	censored wages		imputed wages	
	Coeff.	(S.E.)	Coeff.	(S.E.)
<b>All young workers</b>				
OLS	-0.141*	(0.001)	-0.157*	(0.001)
Industry	-0.098*	(0.001)	-0.110*	(0.001)
Occupation	-0.092*	(0.001)	-0.113*	(0.001)
Establishment	-0.075*	(0.001)	-0.090*	(0.001)
Job-cell	-0.060*	(0.001)	-0.076*	(0.001)
No. of obs	497,183		524,098	
<b>Young workers in lowskill occupations</b>				
OLS	-0.175*	(0.001)	-0.179*	(0.001)
Industry	-0.116*	(0.001)	-0.118*	(0.001)
Occupation	-0.105*	(0.002)	-0.111*	(0.002)
Establishment	-0.078*	(0.001)	-0.080*	(0.001)
Job-cell	-0.056*	(0.001)	-0.057*	(0.001)
No. of obs	297,520		300,126	
<b>Young workers in highskill occupations</b>				
OLS	-0.117*	(0.001)	-0.153*	(0.001)
Industry	-0.101*	(0.001)	-0.133*	(0.001)
Occupation	-0.084*	(0.001)	-0.115*	(0.001)
Establishment	-0.088*	(0.001)	-0.115*	(0.001)
Job-cell	-0.066*	(0.001)	-0.089*	(0.001)
No. of obs	199,663		223,972	

*Source:* Author's calculations, based on LIAB 1993-2007.

*Note:* Estimation results correspond to column (3) in Table A.9. Highskill occupations comprise managers, professionals, technicians and sales workers, while lowskill occupations comprise farmers, operators, craft and service workers as well as clerks. \*: statistically significant at least at the 5%-level.

Table A.11: Development of gender wage gap by degree of occupational disaggregation

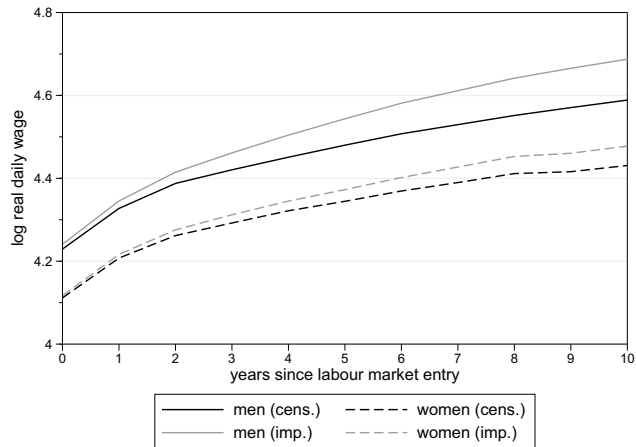
	Occupation FE				Job-cell FE			
	Two digit		Three digit		Two digit		Three digit	
	Coef.	(S.E)	Coef.	(S.E)	Coef.	(S.E)	Coef.	(S.E)
Female*Exp. year 0	-0.063*	(0.002)	-0.064*	(0.002)	-0.030*	(0.002)	-0.028*	(0.002)
Female*Exp. year 1	-0.068*	(0.002)	-0.067*	(0.002)	-0.033*	(0.002)	-0.031*	(0.002)
Female*Exp. year 2	-0.072*	(0.003)	-0.074*	(0.002)	-0.037*	(0.002)	-0.036*	(0.002)
Female*Exp. year 3	-0.078*	(0.003)	-0.080*	(0.002)	-0.045*	(0.002)	-0.043*	(0.002)
Female*Exp. year 4	-0.080*	(0.003)	-0.084*	(0.003)	-0.049*	(0.002)	-0.048*	(0.002)
Female*Exp. year 5	-0.086*	(0.003)	-0.089*	(0.003)	-0.057*	(0.002)	-0.056*	(0.002)
Female*Exp. year 6	-0.092*	(0.003)	-0.093*	(0.003)	-0.062*	(0.002)	-0.061*	(0.002)
Female*Exp. year 7	-0.095*	(0.003)	-0.095*	(0.003)	-0.063*	(0.003)	-0.062*	(0.002)
Female*Exp. year 8	-0.094*	(0.003)	-0.094*	(0.003)	-0.064*	(0.003)	-0.063*	(0.003)
Female*Exp. year 9	-0.107*	(0.004)	-0.107*	(0.003)	-0.079*	(0.003)	-0.078*	(0.003)
Female*Exp. year 10	-0.112*	(0.004)	-0.109*	(0.004)	-0.081*	(0.003)	-0.080*	(0.003)
No. of obs	497,183		497,183		497,183		497,183	

*Source:* Author's calculations, based on LIAB 1993-2007.

*Note:* See notes to Table A.7. Regressions based on two-digit occupations additionally include 81 occupation and 6902 job-cell fixed effects, while regression based on the three-digit occupational code include 305 occupations and 9819 job-cell fixed effects, respectively. \*: statistically significant at least at the 5%-level.

## Appendix B Figures

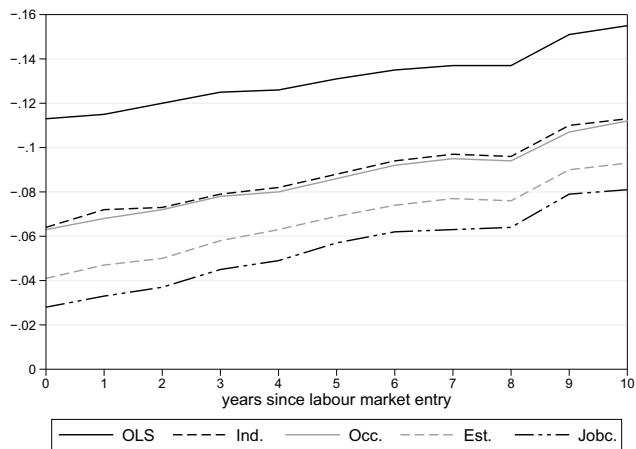
Figure A.1: Wages by year since labour market entry



*Source:* Author's calculations based on LIAB 1993-2007, for West Germany.

*Note:* The black and grey lines show the evolution of censored and imputed wages, respectively.

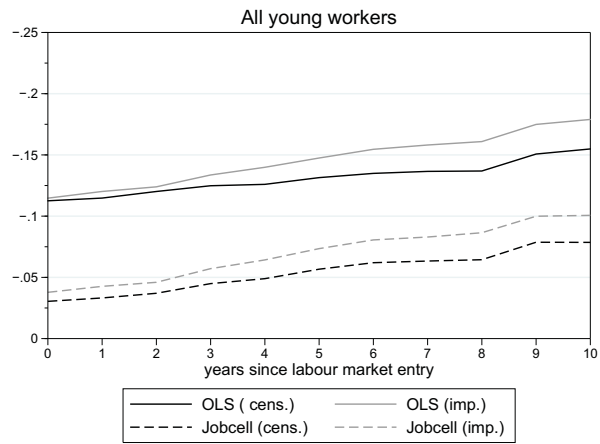
Figure A.2: Development of gender wage differential over the early career



*Source:* Author's calculations based on LIAB 1993-2007, for West Germany.

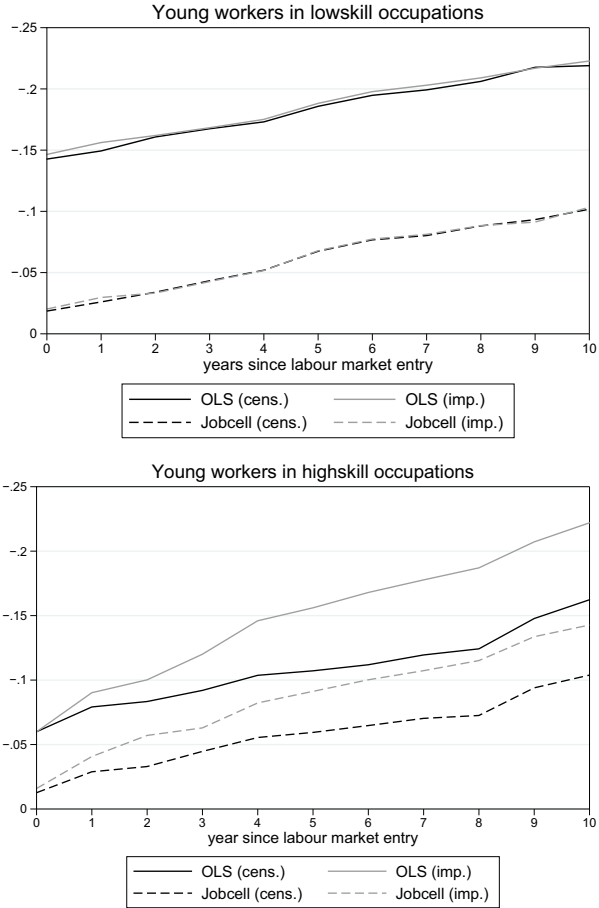
*Note:* See notes to Table A.7.

Figure A.3: Development of gender gap in imputed and censored wages



Source: Author's calculations based on LIAB 1993-2007, for West Germany.  
Note: See notes to Table A.7.

Figure A.4: Development of gender wage gap by skill level



Source: Author's calculations based on LIAB 1993-2007, for West Germany.

Note: See notes to Table A.7. Highskill occupations comprise managers, professionals, technicians and sales workers, while lowskill occupations comprise farmers, operators, craft and service workers as well as clerks.