The Gender Wage Gap in East and West Germany

MASTERARBEIT

Vorgelegt im Rahmen des Master-Studiengangs “Soziologie - Europäische Gesellschaften”
and der Freien Universität Berlin

im

Oktober 2012

von
Georgi Adamov

Betreuer
Prof. Dr. Dieter Ohr

Zweitgutachter
Prof. Dr. Jürgen Schupp

Contents

1 Introduction **4**
- 1.1 Research Problem . . . 5
- 1.2 Outline . . . 8
- 1.3 Concepts . . . 9

2 Theories and Theoretical Approaches **11**
- 2.1 Theories of Wage Differentiation . . . 12
  - 2.1.1 The Human Capital Theory . . . 12
  - 2.1.2 The Atrophy Theory . . . 13
  - 2.1.3 Theory of Female Work Capacity . . . 15
- 2.2 Theories of Wage Discrimination . . . 17
  - 2.2.1 Becker's Discrimination Theory . . . 17
  - 2.2.2 Bergmann's Crowding Hypothesis . . . 18
- 2.3 Institutional Factors: Type of Bargaining Regime . . . 20
- 2.4 Summary . . . 22

3 Data Collection & Sampling **24**
- 3.1 Data . . . 24
- 3.2 Data of Relevance . . . 26

4 Descriptive Statistics **27**
- 4.1 Private-Public Sector Discrepancies . . . 27
- 4.2 The Crowding Hypothesis . . . 35

5 Methodology **39**
- 5.1 Quantile Regression . . . 39
- 5.2 Blinder-Oaxaca Decomposition . . . 48

6 Main Findings and Conclusions **55**

References **59**

Appendix **63**

A Graphs **63**

B Tables **64**

C Syntax Files **66**

D Questionnaire **72**

Chapter 1

Introduction

"Men and Women are equal. The state shall promote effective enforcement of equal rights for women and men and work towards the elimination of existing disadvantages." This declaration is found in Art. 3 Abs. 2 of the German constitution. By this it is meant that in the Federal Republic of Germany the discrimination against women and therefore the introduction of income inequality based solely on the gender of the employee and not on difference in productivity is forbidden by law. This quite general and abstract legal norm was adopted as a core principle of the European Union at the time of its foundation in 1957. It was further developed and reinforced by other declarations[1] concerning the EU's commitment to reducing the gender pay gap. Wage gaps are seen as legitimate if labor is rewarded according to performance. A pay gap is therefore an important motivator for employees with special qualifications. However, wage gaps should be illegitimate if based on personal characteristics which have no relation to performance.

A difference in the treatment of sexes is obvious in many realms of society. Is this actually an arbitrary discrimination against women? This question has been the topic of investigation in many studies and is usually answered in the positive. This means that women are often discriminated against without the presentation of objective reasons. Research results differ due to variation in techniques of investigation in terms of methods and data availability. However all together they show similar patterns. Personal characteristics

[1] See for instance the 1997 European Employment Strategy or the 2007 Communication on Tackling the Pay Gap between Women and Men

like age, education and experience do play a minor role in explaining the gender wage gap. A significant part of it as well is attributable to institutional components like sector, occupation, firm size and bargaining regime. In the next sections we will present several state of art studies on the topic and the problem of the current paper.

1.1 Research Problem

To analyze the gender wage gap in Germany there are mainly three data sources. Firstly, the Federal Statistical Office regularly produces wage data and occasionally in-depth data. The last available in-depth data is from 2006. That is the German Structure of Earnings Survey, data from which is applied also to the analysis in the current paper. The second source is the the German Socio-Economic Panel Study (SOEP). It is a representative panel of household data, taken with the purpose to analyze changes in households. The SOEP covers all sectors of the economy which makes it quite broad data base. Nevertheless it has a limited number of cases (11 000 households) which is not enough for a very detailed analysis. The third data source used is the IAB-Beschäftigungsstichprobe (IABS), which consists of employers' data for social security insurances. It encompasses all insured employees and covers between 80% and 90% of the employees in Germany. The data are detailed and allow specified analysis.

Data from IABS is used by Beblo and Wolf (2003) to analyze wages of males and females in West Germany. They use flexible wage-equations to account for employment interruptions - such as parental leave, long- and short-term unemployment and etc. The authors show that effect of being out of the labor force are different for women and men and that the negative effect of maternity leave or other interruptions contribute considerably to the gender pay gap. A study by of Gartner and Stephan (2004) on the effect of collective bargaining on the wage gap of Gartner and Stephan (2004) uses the same data source and reveal that the gender wage gap is smaller across workers employed in firms covered by collective agreements. In a study on similar topic Fitzenberger, Antonczyk and Sommerfeld (2010) use data from the 2001 and 2006 GSES cross-sections. They find a decline in

the collective bargaining and report that the gender wage gap in West Germany remains almost constant in that period. They apply a sequential decomposition analysis using quantile regression to find that effects of firm wage policies contribute to an increase in the gender wage gap. The authors claim that personal characteristics reduce between the pay gap. In their analysis Achatz, Gartner and Glück use a linked employer-employee database for East and West Germany in 2000, made available by the Institute for Labor Market Research. The study questions what extent is the actual gender wage gap due to differences in productivity characteristics and to discrimination of female employees. For the purpose they apply a two-fold Blinder and Oaxaca decomposition. Their findings are that with the increase of the proportion of women employed within a particular firm, wage level decrease, but "with higher rates of decline for women than for men"(p.3f.) Work councils have overall positive impact on wage levels and women are those who profit most from their presence. Ziegler (2005) applies the same decomposition method to explore the gender wage gap, but using all of the three different major data sources. She shows that one 40% of the wage gap in the West (using GLS), 37% (IABS) or 18% (SOEP) of the wage gap is due to differences in characteristics - that is the different educational level, occupational status which women have. For East Germany this part is lower. The parts of the wage gap, which cannot be attributed to the characteristics are interpreted as discrimination or they are due to other unobserved factors. The author concludes that in East Germany the fender pay gap is smaller than in the West and the explained part is more relevant than the discrimination part (Ziegler 2005:294).

As hinted above, pay gaps between genders can be reduced to two main components. The first provides for differentiation in pay based on objective features. In other words it creates the legitimate wage gap. The second part accounts for discrimination based on gender, or the illegitimate reasons for wage discrepancies between women and man. However it includes possible impact of unobserved variables. In the present I follow the newly available suggestions by Jann (2008) to apply a three-fold decomposition which is considered to avoid this problem. Because of the heterogeneity of wages and trends in their development in East and West Germany (Gernandt and Pfeiffer 2007) authors often

restrict their analysis to the latter (Fitzenberger et al. 2010:13). Despite this considerations I construct a model which delineates the wage discrepancies between genders in East and West Germany in comparison. For this purpose, both personal and occupational characteristics will be included. All of these are objective characteristics that influence individuals' salaries and render an account of what we called a legitimate wage gap. When adding a gender variable into the model crates an approximate parameter estimate about the presence and the extent of gender based wage discrepancies – the illegitimate wage gap. The basic purpose of this work is to delineate between underlying gender differences in the wage distribution in East and West Germany. To do this data from the 2006 cross-sections of the German Structure of Earnings Survey (GSES) are applied. As is commonly known, a model is merely an adjustable and extensible statistical construction that is assumed to describe the data fairly well. Basing on theoretical assumptions, I include their operationalizations of theoretical approaches in terms of variables, considered to have an impact on wage differences. Of course one always has the trade-off between theory and variable accessibility. However the study attempts to extract the best combination in terms of breadth and relevance of the model given the mentioned data set. So for instance, covariates like sex composition at the job have received little and almost no attention in researche studies covering the same topic. To provide a more extensive view of the wage differentials than just decomposing effects to the mean outcomes, a set of quantile regressions are applied. This presents information about the wage gap for respondents with different income levels. I assume that the dimensions of the gender wage gap differ between respondents reporting lower income levels and those with higher earnings for instance. Further this studiy attempts to provide a better understanding of the reasons why women have a lower average pay rate than men by applying the above mentioned method of Blinder-Oaxaca decomposition with details for the estimates of each separate variable. This allows separate treatment of the impact of gender differences in characteristics and gender differences in coefficients. Hence this method can provide answers to questions like "How much of the difference in earnings between males and females can be explained by differences in education (characteristics) and how much by differences in the effectiveness of the attained

education (coefficients effect)?".

This study has a mainly exploratory and descriptive character. Based on empirical evidences it will draw some explanatory conclusions about the causes and effects of gender wage gaps in East and West Germany. I address the following questions: What is the actual size of the gender wage gap in the both regions and does it differ across the wage distribution? What are the gender differences in the wage inequality? To what extend are they due to difference in personal, institutional characteristics or to unequal treatment of genders at the work place?

Nevertheless I shall abstain from prescribing conclusions some generality. Here I attempt to construct an innovative model to present the approximate statistics about the gender differences in the wage equality. In this way it is possible to delineate and compare gender wage discrepancies and related factors in both regions. Of particular interest will be those at the upper and lower ends of the wage distribution - the so-called glass ceiling and sticky floor effects.

1.2 Outline

The paper begins with an introduction to the main opposing theoretical approaches seeking to explain reasons for the persistence of gender wage inequalities. This discussion does not pretend to be exhaustive in the sense of encompassing all aspects of the problem of gender wage discrimination at the workplace. The theories and theoretical approaches cited here have both a direct and indirect relation to the aims of this study. Following the presentation of each theory its direct relevance to the study problem shall be proposed. In other words it will be explained whether its postulations are able to be operationalized given the data set. Next the work proceeds with a short presentation of the data set to be applied. The descriptive section will practically illustrate the relevance of some of the variables already operationalized in the theoretical section. The analytical section of the work will draw the contours of the estimation method - a quantile regression model, and present its results. Those has to provide us an answer how does the wage discrepancies between sexes vary

over the wage distribution. It is followed by a Blinder-Oaxaca decomposition, which shall be used to provide a better explanation for why females tend to have lower wages on average than males. The paper finishes with concluding observations and a summary of the findings.

1.3 Concepts

Before proceeding to the theoretical framework, it is necessary to shed some light over the main concepts to be in use in the analysis. This aims to avoid flexibility in their interpretation. The terms and their actual meaning in this study shall be clarified.

Legitimate and *illegitimate* wage gap - wage gaps are seen as legitimate if labor is rewarded in accordance with performance. A pay gap is therefore an important motivator for employees with special qualifications. However, wage gaps are considered to be be illegitimate if based on personal characteristics which have no relation to performance.

Glass ceiling and *sticky floor* effects - the magnitude of the remuneration gap is variable at different points along the wage distribution. A glass ceiling is usually defined as a widening of the pay gap at the upper limits of this range. Albrecht describes it as "the phenomenon whereby women do quite well in the labor market up to a point after which there is an effective limit on their prospects"[2]. Hence the presence of a glass ceiling indicates that wages of females are at a lower level compared to those of males presumably mostly at the top of the wage distribution than at the bottom or in the middle.

Sticky floor - initially Booth, Francesconi and Frank (2003) characterized the "sticky floors" situation as one in which women with identical characteristics to men are appointed at the same pay level or rank within a certain firm, but in contrast to men they gain the lowest possible wage at this level. Consequently, when promoted women still receive lower wages than men. Thus "in firms with formal wage scales, women remain stuck to the lower wage points on the wage scale of their new, higher job grade."[3] This

[2]Albrecht et al. 2003:146

[3]Booth, A.L., Francesconi, M. Frank, J., 2003 :297

approach can elude some discrimination laws as the assignment rank is practically the same, but women are placed at the bottom of each one. In later studies the term is used more generally. It describes a gender pay gap which widens at the bottom of the wage distribution continuum(Arulampalam et al. 2007). In this paper we will adhere namely to this conceptualization of the term.

Chapter 2

Theories and Theoretical Approaches

In general, two theoretical doctrines can be distinguished. Explanations within the framework of the Human Capital Theory focus on the supply-side of the labor market − the personal characteristics of working men and women. Here differences in human capital are considered a reason for gender discrepancies in earnings. On the other hand, segregation theories aim to explain gender discrimination at the workplace. They have a "demand-side-focus" (Levine Division 2001:7). That is job characteristics are what determines wages and therefore wage discrepancies. Hence women are seen namely as limited in their choices. Discrimination models focus on restrictions confronted by women, whereas human-capital explanations consider women to be free in their career choices.

Not all of the theories which shall presented here are suitable as a direct basis for an empirical investigation of wage discrimination. However different approaches reveal complex reasons for the pay gap, which in itself is of particular relevance for this analysis. In a parsimonious way I will elucidate the main conceptualizations of several approaches, which will give us a basis of empirical operationalizations of explanatory variables for wage dependencies and therefore - a gender wage gap.

2.1 Theories of Wage Differentiation

2.1.1 The Human Capital Theory

The human capital theory was developed by Becker at the end of the 1950s. It focuses on employers and thus on the labor market supply. Its core assumption is that schooling and job training that a particular labor force has enjoyed -its human capital, determines its productivity and therefore its remuneration potential. The theory breaks up the homogeneity of labor as a factor. Hence differences in human capital should explain discrepancies in earnings.

According to this view lower income of females on average is partly due to their poorer educational background compared to men. This leads to the fact that women are situated primarily at inferior positions in the corporate hierarchy. That is termed also vertical segregation. Thus educational features of women are often explained by social norms, values and beliefs. In contrast, the theory of social capital provides an explanation, which takes the educational behavior of males and females to be exogenous.

According to the human capital theory, an individual's incentive to invest in training is directly proportional to the time one expects to work over his/her lifetime. Rising women's labor force participation relative to men's implies that women's human capital investments should intensify compared to men's. In turn, rising female relative to male human capital investments suggest a narrowing in the gender wage gap (Polachek, 2004:4). There are costs and benefits for those investments to human capital acquisition. The costs can be direct (such as tuition and learning materials) and indirect (mostly lost wages during training). The benefits are mostly increased lifetime earnings.

However, there are some other more intangible benefits like how one conducts him/herself in everyday life, as well as social benefits such as reduced crime, lower unemployment, and greater economic growth. The longer one works the greater the probability of higher earnings. For instance, if an individual has not gained any working experience, his/her marketable benefits will be zero, no matter how high is the qualifications s/he has

acquired in terms of education. Similarly, dropping out of the labor force to raise a child reduces years of work experience, which itself hand decreases the potential gains from the already accumulated human capital. These reward reductions decrease the value of human capital investment. In other words those who expect to work longer and those who foresee the greatest number of years at work have the highest expected returns. Thus all else remaining constant, the less one's lifetime labor force participation, the lower the benefits to investment, and thus the smaller one's incentives to invest in training. Anticipated responsibilities of women within the household and family organization have an impact on their decisions regarding the amount and the kind of human capital to be invested in. Since on average they expect to work fewer hours throughout their lifetimes compared to men, women are willing to acquire less human capital investments than men. In this sense lower human capital investments relative to men translate to lower per hour relative wages for females. Hence the male-female wage gap widens. On the other hand, as women's lifetime labor force participation rises, and as men's lifetime labor force participation falls, one should expect the gender wage gap to narrow.

Econometric models within the framework of the human capital explanation theory, typically consider the amount and the kind of investment in education or training,the number of years spend in schooling and the length of time spent in market work as covariates having direct effect over individuals' wages. Given our data set, the human capital theory receives its common operationalization. Education, experience and tenure - time spent with the current employer, account for one's human capital. The relevance of the cited variables for the current study's model is undeniable, which is why they will not receive further special attention in the following descriptive section.

2.1.2 The Atrophy Theory

The atrophy theory stems from Polachek (1981) and was developed as a critique to the Traditional Human Capital Approach. As discussed in the previous abstract the latter alleges that women's lower earnings are due to their responsibilities in the household, which

on its hand leads to different productivity patterns between sexes. In the human capital theory just the variation in size of the human capital is considered in the analysis. In other words different income patterns should due only to size of human capital. One does not differentiates between different kinds of human capital. Atrophy theory claims that gender specified career choice has to be considered. With his work Polachek aimed to embed career choice into the human capital framework. His idea is based on previous analysis postulating that variations in different kinds of human capital are not less important than such in amount (see Fuchs, 1971).

In sociological and psychological approaches the fact that women always choose the same "female occupations" is ultimately ascribed to inclinations and capabilities typical for the female gender. Those are both genetically given and also incorporated through the process of socialization. In contrary, economists presume that in decisions about their education individuals are driven only by personal preferences and try to explain wage discrepancies solely relying on basic economic and social conditions.

Yet, just as in the human capital theory, the atrophy theory assumes that individual wage expectations are determined by starting salary and career opportunities. Women's career brakes are considered here as a further criterion for lost income. It depresses their wages, which has an impact on their career choice and vice versa - "intermittent workers are lesser lifetime investors (in human capital) than continuous workers" (Mincer & Ofek 1982:19). In this manner knowledge also loses its value. In his work Polachek models the effect of "home time" on occupational choice, such that an individual's human capital experiences a significant drawback, due to labor interruption. However knowledge decline is not the same in all professions. This of course implies that income loss after maternity leave is also different for each profession. The atrophy theory presumes that there are diverse kinds of human capital relevant to different labor occupations.

In practice one can observe that the decline in knowledge is more intens in occupational areas of greater technical progress and higher qualifications. Here requirements change rapidly. One can gain an insight into this process by tracing how often and how long certain scientific work is cited in other papers. For instance changes and transfor-

mations in the natural sciences are more dynamic in comparison with linguistics. Hence the devaluation of human capital in those areas is more rapid. This leads to the fact that women are more frequently occupied in artistic, linguistic and healthcare professions (Osterlich & Oberholzer 1993:6). Those are usually sectors with lower wages. Therefore this theory explains to a great extent wage gaps in workplaces where different types of jobs in the organization can be distinguished by the particular characteristics of the employees doing those jobs - the so-called horizontal segregation.

2.1.3 Theory of Female Work Capacity

This sociological approach was developed in the 1970s by Elisabeth Beck Gernsheim and Ilona Ostner (1978). It also claims to explain horizontal segregation i.e. the different distribution of the sexes in professions. Quite opposite to the atrophy theory it does not assume that individuals are free in their career choices. It places women explicitly in the sphere of reproduction and locates the socialization as well as the development of a "female labor capacity" primarily in the area of housework. The authors assume that the structure of contemporary occupation trends is a result of capitalistic industrial development. In this males are occupied in professional activities, whereas women are involved in household and child-bearing duties. In so doing, women develop certain female capabilities. Those are of importance for family care and organization. This is how female working capacity comes into being.

Here, a key explanation of gender inequality in the labor market is the division between housework and market work and the basic ascription of the roles of women and men respectively. The theory indicates that women's involvement in housework and reproductive roles makes them less inclined to specialize in production roles, compared to men. So the female working capacity implies a kind of detachment from purely economic and instrumental roles (Beck-Gernsheim Ostner, 1978:268).

The approach of Beck-Gernsheim and Ostner towards sex differentiation is exemplified in their collaboration on research on nursing. They traced the attitudes of young

nurses towards their patients. Initially nurses were not able to remain empathic towards the needs of their patients; however they developed the capacity to act empathetically later on the job. The authors argue that nevertheless involved in a paid work â“ women still remain inclined to do caring jobs if they are such of lower pay. They elucidate that skills and interests of women are aimed at directly satisfying the needs of others. On the contrary - those of men are not. Beck-Gernsheim and Ostner speculate on the fact that doing housework is a part of the individuals' socialization process. Doing housework develops this specific female human capital, which has a direct impact on career choice. A concrete example is the distinction between nursing and medicine. The former is closer to housework. The latter requires functional-specific (male) work capital (Ostner 1993:110).

Overall, not just the theory of female work capacity but also Polacheck's atrophy theory speculates that time spend on housework has a negative effect on wages and especially on women's wages. Unfortunately, the current work will not be able to trace the impact on housework division or time spend in housework on the individual's wage. This is due to a lack of indicators for this in the present dataset. However outcomes in this study are interwoven with different aspects of social life - which is time spent in housework and results of recent researches on the topic are of particular interest. In this manner findings on the topic for Germany worth mentioning

The American literature devoted to the topic (Hersch and Stratton, 1994; 2002; McLennan, 2000; Keith and Malone, 2005) finds on general a negative impact of the hours spent doing housework on wages. Studies with data from Denmark (Bonke et al., 2005) and the UK (Bryan and Sevilla-Sanz, 2010) have similar conclusions as the U.S. studies. However continental European economies differ from the Anglo-Saxon countries, such as the UK. In European countries women are less attached to the labor market. In this respect, in a very recent study, Hirsch and Konietzko (2001) found that in Germany housework has no negative effect on wages. Using data from the German Socio-Economic Panel and the German Time Use Survey the authors observe the effects for both East and West Germany separately.

2.2 Theories of Wage Discrimination

2.2.1 Becker's Discrimination Theory

The illegitimate gender wage gap in this study refers to the fact that when given the same working hours, education, training and experience women are rewarded differently than men. In contrast to human capital theory, Becker now accentuates the demand side of the labor market. He assumes that employers have a "taste for discrimination" and therefore preferences for certain employees. Here the matter of hand is "employer discrimination"(see Becker, G. 1971:55). Becker assumes that employers are reluctant to hire particular groups of people. Such group would be women, for instance. The implication of that in his model is that when an employee hired, the employer considers both her wage and disutility and compares their characteristics to those of men. Here I will not go comprehensively through the empirical formulation of Becker's wage differential model, as it is not of particular interest for this research. It suffices to mention that in general a market wage differential is generated because of employers' preferences towards certain groups. As for him "tastes for discrimination" are individual properties and they are the most important "immediate cause" for discrimination. In his scientific attempts to shed light on this phenomenon, he limited his investigations to racial discrimination. However in the conclusion of his "The Economics of Discrimination" Becker mentions that his model is suitable for "analyzing discrimination in the market place because of race, religion, sex, color, social class, personality, or other non-pecuniary considerations"[1]. This elaboration has not been spared critique.

Becker's assumed "tastes for discrimination" are problematic in the sense of conceptualization. They are given in the model, but nowhere does Becker explain how they emerge (Lorenz 1988:18). Further this model could not be taken as permanent or even appropriate for a longer length of time. It does not consider assumptions about free competition in the market. So, for instance, if at least one employer is without preferences

[1]Ibid. p. 153

towards certain groups of employees comes on the stage, s/he will have the advantage of cheaper labor (Kulmiz 1999:52). In other words, Garry Becker's wage residual approach functions in a kind of equilibrium, which is quite impossible in the free labor market. Therefore the model is also not compatible with any kind of income inequality, as this is assumed to be a long-term phenomenon.

2.2.2 Bergmann's Crowding Hypothesis

Barbara Bergmann's (1971) approach is based partly on the theory of Becker just mentioned and partly on the considerations of the British economist Francis Edgeworth. In 1922 the latter described industries which are densely occupied by women as experiencing "crowding". He argued that women's lower pay was explained by the fact that women crowded into a small number of occupations. Women are excluded from male work, and that is why they have to be satisfied with certain kinds of occupations accessible to them and where wages are preliminary lower. In his analysis Edgeworth explains, that unions had deprived women of the right to take jobs typical by that type for men. Hence crowding and therefore wage differences were caused by institutional regulations. Those twisted the function of the labor market. Women not only had to be satisfied with certain occupations, but namely because of that, those occupations became overcrowded by females, which resulted in higher wages for certain groups and lower for others. Edgeworth's "crowding hypothesis" received little attention until Barbara Bergmann's publication in 1971 in which she analyzed how people of Afro-American origin were concentrated in certain occupations and excluded from others. As mentioned above, she used both the approaches of Becker and Edgeworth for the mathematical construction of her research model.

She assumes blacks and whites to be equal substitutes in terms of productivity and taking into account education and of course "crowding", she estimates the returns of all these variables to wages. Her hypothesis is that "as a result of discrimination in employment, Negros are crowded into certain occupations because of the refusal of most employers to consider hiring them for jobs in other occupations" (Bergmann 1971:310).

As a result the marginal effects of productivity of Afro-Americans would be lower in comparison with that of whites. She finds the model as plausible, as a sharper discrepancy would be evident comparing groups of lower education. Here whites would lose up to 20 % of their income, because of "the heavy concentration of Negro females in domestic work" (ibid.).

In 1974 Bergmann used the same model to find "crowding" also among female workers. She postulates that women are distributed among occupations differently than men, even after differences in education are accounted for. Within occupations men earn more than women (see Bergmann, 1974:13). Since then economists consider occupational segregation by sex to be one of the major determinants for the gender disparity in wages. Hence segregation is considered a cause, not as a consequence of discrimination. Main winners from the consequences of discrimination are male employers on the one hand and employers of organizations, occupied primarily with women on the other.

Of course there has been also some critique expressed towards the Bergmann's model. For instance it is not clear that if institutional borders were removed, employers would hire women in the otherwise "female-constrained" jobs. The application of this model in reality seems quite problematic, however Bergman admits that her model is not adjusted for a discrimination research over all occupations (Bergmann 1974:107). It is best applicable when comparing types of occupation, however in the real world there are many more. Applying her strategy over to a diversity of occupations means one has to make the assumption, that everyone is a potential substitution for everyone else in the labor market. But as she explains, we live in a situation that includes a series of labor markets than in a single one. Different occupations require different patterns of schooling and particular personal characteristics. Nevertheless Bergmann considers that her model is of use for finding discrepancies in labor markets occupied by workers of lower educational level as such markets were quite similar to each other.

Despite all considerations towards plausibility of the Bergman's crowding hypothesis, in my work I will control for crowding with a separate variable for sex composition at the working place. In the descriptive part I will present its effects on the distribution

of female and male wages.

2.3 Institutional Factors: Type of Bargaining Regime

In times of increasing heterogeneity in economic conditions, the impact of institutions plays a more important role regarding economic performance. It is often argued that institutional formalities constrain labor market performance and the dynamics of economic development. This often refers to the impact of trade unions and wage agreements initiated by them (e.g. Addison and Schnabel 2003).

A research question typical for modern econometrics and quite in the light of the just described "crowding hypothesis" is a vital part of any study on the topic of gender wage gap. It is not purely related to the techniques of decomposition the wage differentiation or wage discrimination among the sexes. Actually it cannot even be described as a model built on deeper theoretical foundations. However, and especially in a comparative study, one cannot escape testing the wage differentials in the public and private sector in societies, or among different bargaining regimes [2] . It is often presumed that both sectors require different personal characteristics and expectations of the workers according to their career path (Chatterji et al. 2007; Arulampalam et al. 2007; Fitzenberger et al. 2008; Antonczyk et al. 2010). In the private sector remuneration is related to performance and often company pension schemes are provided to employees with higher earnings. Employment in the public sector is usually governed by family oriented work practices - like paternity and maternity leave with full pay, working from home, fairly paid holiday leave, regulated working hours, etc. Further in the public sector the wage bargaining power of the employee is lower, as remunerations are more stable and regulated. All these factors suggest that women would tend to select themselves into jobs in the public sector, which in Germany are covered by collective bargaining regimes. Therefore gender wage differentials here are supposed to be milder. With these speculations in mind and with a brief reference to the

[2] it depends on the data set construction. Usually just the public/private sector division presents in more general studies. Into its greater extend the public sector is associated with collective bargaining (Schnabel et al. 2005:22)

"crowding hypothesis" one could argue that a kind of female crowding could be evident in the public sector.

In Germany three regimes of wage bargaining are predominant. The above mentioned collective bargaining is situated between a union and an employers' association. A union can negotiate firm-level collective contracts with single firms. In addition, employers and employees may also negotiate individual contracts. According to the German Collective Bargaining Act (*Tarifvertragsgesetz*), collectively negotiated agreements are exclusively valid for individual job matches only if the firm is a member of an employer association and the worker is a union member (see Fitzenberger et al., 2008). Practically the scope of collective agreements goes beyond the organized parties. This is what also distinguishes Germany from the Anglo-Saxon concept of union membership. In Germany, collective agreements constituting discriminatory wage policies with disadvantages for non-union members are forbidden by constitutional law for reasons of negative freedom of association, *negative Koalitionsfreiheit, Grundgesetz Art.9.* As wage gains from union membership are not internaly affiliated, there exists a freee rider problem of missing individual incentives to join a union (see Booth 1985). Therefore collective agreements in Germany cannot distinguish and discriminate between members and nonmembers.

The data from the German Stricture of Earnings survey makes it possible to distinguish between individual (no collective bargaining), firm-level and collective bargaining regimes among full-time employees. This is something which has not been possible to trace in other datasets from Germany. The next section will briefly explicate their meaning.

The majority of workers in Germany are paid according to collective agreements (see also Table 1. in the descriptive section). These collective agreements consist of sectoral agreements. Hence, a collective agreement can be negotiated between a union and an employers' organization, a union and a firm, or a works council and a firm. Collective wage agreements are of the most importance in Germany (Kohn and Lembcke 2007:18), although it is observed a persistent decline in their coverage in the past years (Schnabel and Wagner 2007).

A smaller number of employees are covered by firm-level agreements. Firms

which are not members of any employers' association and do not have any specific agreement for wage regulation may voluntary choose to be part of the respective collective agreement. Firm-level negotiations involving an union are also allowed to set wages even if a collective agreement exists, as long as the firm-level agreement is more detailed than the collective one. Collective agreements regulate the basic pay and additional wage elements, such as extra pay for shift work, holiday pay, Christmas bonus, etc. Other payments such as bonuses at the end of the year or company based pension payments are normally not part of the collective agreements. However, they could be a matter of other supplemental agreements or individual contracts. Hence collective contracts may also contain opening clauses explicitly allowing deviations from the terms of the contract under particular circumstances. The basic pay is the most relevant component of the overall pay which amounts to 60 to 70 per cent of the individual earnings (see Maier 2007:12).

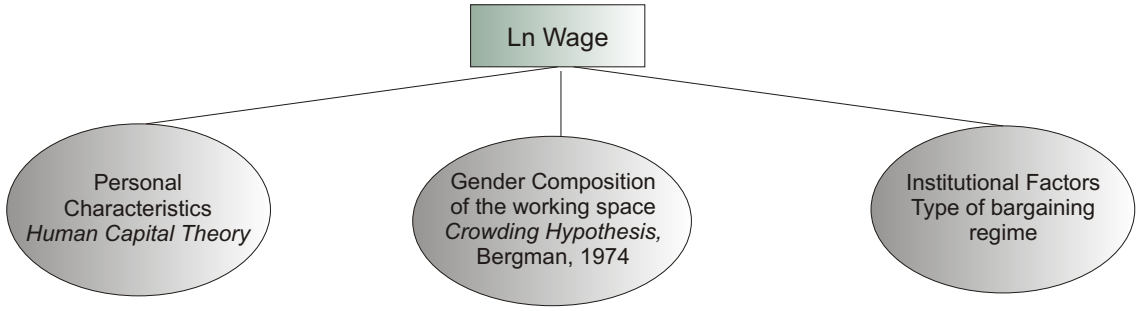
As it was mentioned above, the data set of use in our study is quite innovative as it provides the possibility to control for different bargaining regimes. Institutional regulations play an important role in the wage composition. In the descriptive section we will observe the impact of the bargaining regime on wage differentiation. Different types of bargaining regimes will be explicated also in the analytical section later in the work.

2.4 Summary

Up to now, without the claim of completeness I delineated the doctrines for explaining gender based discrimination. Of course there exists a greater variety in the literature on this topic. In the list of segregation theories we should mention also "the theory of statistical discrimination", which is a special case of the so-called "screening-theory". Here women are characterized by employers as underqualified and unsuitable jobholders as a group (see Phelps 1972:659). The divide-and-conquer model of racial segregation of Michael Reich is a neomarxist model where all employees are exposed to racism, irrespective of their race (see Reich 1981:186). We cannot miss to mention also the approach developed by Oaxaca (1973) and Blinder (1973) which is gives completeness of the Becker's wage residual approach.

As I stated at the beginning the theoretical discussion will be the material from which I will extract the basic concepts to be included by empirical operationalizations into the research model. Figure 1 illustrates namely how theories provided the operationalizations for composing a model for the empirical investigation of the gender wage gap in East and West Germany.

Chart 1: Operationalized theories



Chapter 3

Data Collection & Sampling

3.1 Data

To address the question of wage discrepancies in East and West Germany this research uses data from the 2006 cross-sections of the German Structure of Earnings Survey (GSES; "Gehalts- und Lohnstrukturerhebung"). It is a large mandatory linked employer-employee data set, which is very reliable due to its compulsory character. It has been conducted by the statistical offices of the Federation and the Länder since 1951. In the past, the survey was held at irregular intervals, with a long gap between 1978 and 1990, but it will be conducted every four years in the future. Based on an EC regulation of 1999, the survey is held in all EU countries, so that the data produced are comparable all over Europe. The German SES is the second of a series of four yearly earnings surveys to be conducted under the Council Regulation 530/1999 and the Commission Regulation 1916/2000 as amended by Commission regulation 1738/2005.

Information on hours worked and earnings always refer to the reference month October. The group of reporting units comprises local units of the industry and selected parts of the service sector. Besides retail and financial intermediation there is information on hotels and restaurants, transport, storage and communication, real estate, renting and business activities. The employees queried include apprentices, minimally employed (a

specific form of part-time employment in Germany) and partially retired employees.

The SES is a two-stage sample survey. In the first sampling stage, a stratified random sample is drawn from the local units. Stratification is done by 17 regions (L[̈]ander), 64 groups of economic activity and 7 employee size classes. At the second stage, the employees to be included from the selected local units are determined through the personal identification number shown on the staff lists. For that purpose, the statistical offices provide a starting number and a sampling interval. The distribution of the sample size over the Läender is done in a way ensuring that the results for any region have a comparable standard error. This means that the sampling fraction for the small Läender is higher than for the large ones. Therefore representative information cannot be produced for regional breakdowns that are more detailed than the Läender level. Since the data file also contains the municipality identifier of the location of the local unit, it is possible to add information at the district level as, for instance, the types of settlement structure of the Federal Office for Building and Regional Planning or regional rates of unemployment.

These data allow for a very detailed analysis of the wage distribution because of the link between employer-specific information and employee information and because of its large size. The data set for 2006 contains about 3.2 million employees in some 28 500 firms. However, in this research I will work with a simulated CAMPUS-file of the Structure of Earnings Survey, which contains information for about 60 000 employees from over 1500 companies. From the original data set is drawn a 5% sample of the establishments. Then from all the individuals falling in this data set of selected companies is drawn a sample with a variable sampling ratio ranging between 20% and 90%. From the fully covered sector of education a 0.7% sample of employees was drawn. Among other measures for anonymity it should be mentioned that there was a division between new and old federal states, according to which Berlin has been entirely assigned to the group of old federal states; a summarization of industrial sectors in 10 categories (contrary to the initial 64 mentioned above) and a topcoding of high incomes (up to 7000 Euro). The calculation of the gross annual earnings for 2006 includes only workers employed at least 30 weeks in the year. Only full-time workers are considered. The self-employed are not included in the

survey.

3.2 Data of Relevance

As remarked above, this study focuses on employees from East and West Germany of prime working age. Therefore I exclude respondents currently taking part in vocational training or an internship. Employees younger than 25 or older than 55 years of age are also excluded from the population of interest. Based on localization of the establishments, the sample is divided into two parts - for East and West Germany respectively. In addition only employees working full time are included in the analysis. They are selected if they were paid at least 30 hours per week including overtime in October 2006. After the selection procedure we obtain two samples. That for the former East Germany territories (excluding Berlin) amounts to 7 321 individuals while West Germany includes 29 676.

To specify the wage of the respondents we take their income for the month of October. This includes also overtime pay and bonuses for Sunday, shift and night-shift work, which are divided by the corresponding working hours for October (similar to Drolet and Mumford 2009). As bonuses are often considered as standard and important wage components (Fitzenberger et.al. 2008) they are also included in the definition of the variable. For verisimilitude reasons I limit the working hours to a maximum of 300 per month. The hourly wage pay is limited to values over 4 Euros. This gives a possible range between 4 and 56.67 Euros per hour for the whole population. The outcome dependent variable is the log real hourly wage.

Chapter 4

Descriptive Statistics

4.1 Private-Public Sector Discrepancies

As the current study focuses namely on the comparison between the subsamples for East and West Germany descriptive statistics will be calculated in real log wage values for selected quantiles and not in real wages. Hence the unconditional wage distribution in logs appears in Figure 1. Workers under no collective agreement are selected in Figure 2. The wage distribution for those under collective agreement is presented in Figure 3. Figure 4 encompasses the distribution for employees and employers under sector or firm bargaining regime. Table 1 is a numerical presentation of the former figures. Therefore it consists of four panels and shows the individual distribution by genders into the different types of sectors. Each panel replicates the corresponding figure above. Graph 1 in the appendix is a Kernel density for the distribution of wages for males and females in East and West Germany. It sheds light over the raw gender wage gap presented in Figure 1.

Figure 1: Unconditional Log Wages

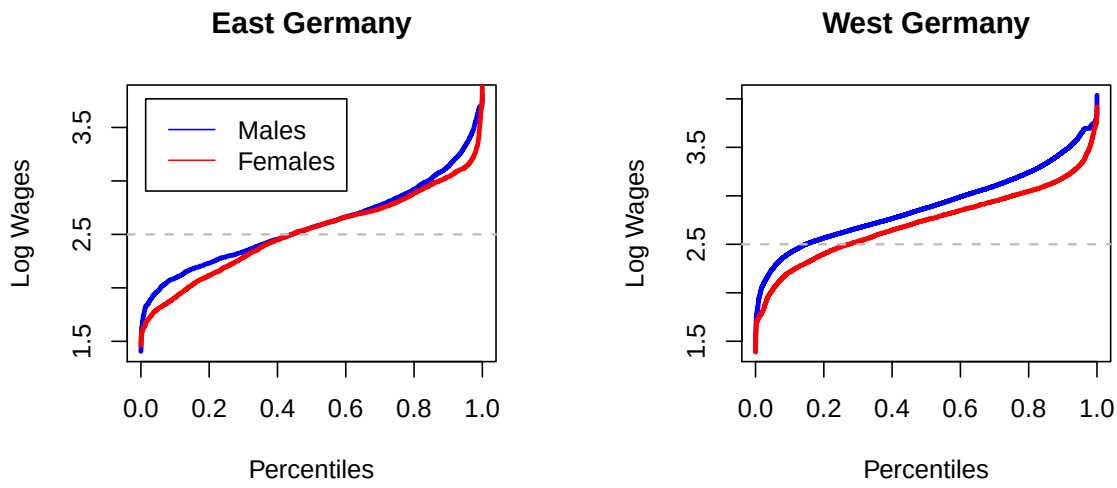


Figure 2: Unconditional Log Wages: No Collective Bargaining

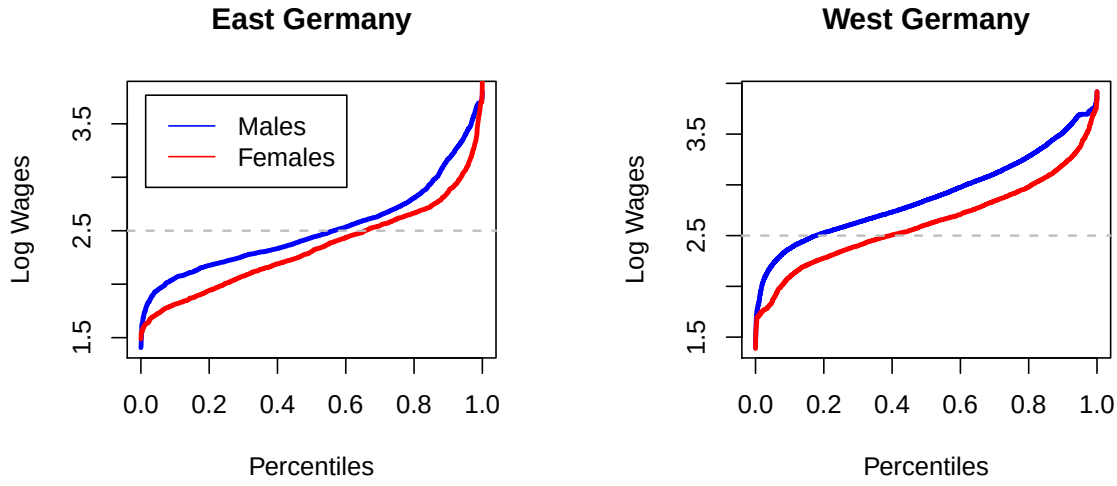


Figure 3: Unconditional Log Wages: Collective Wage Agreement

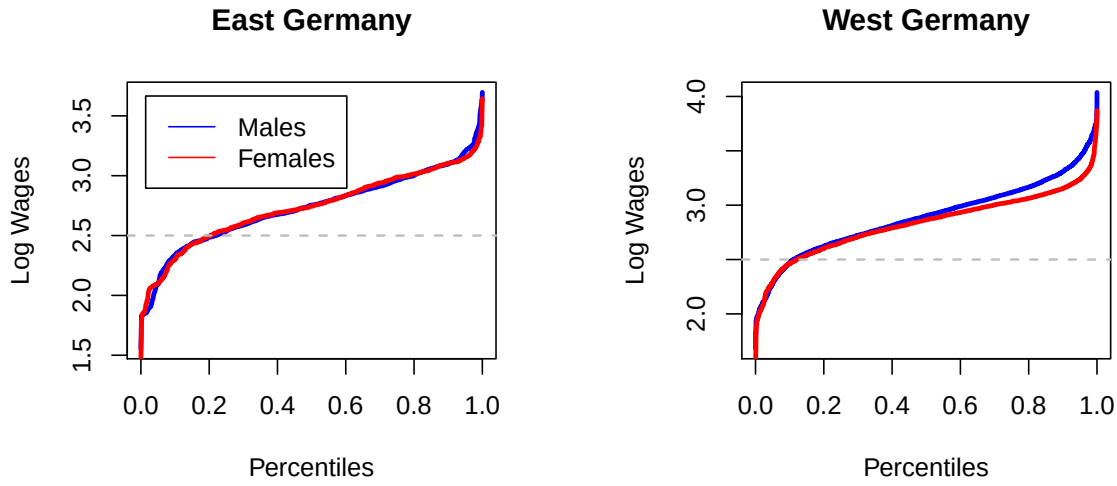


Figure 4: Unconditional Log Wages: Sector and Firm Level Bargaining

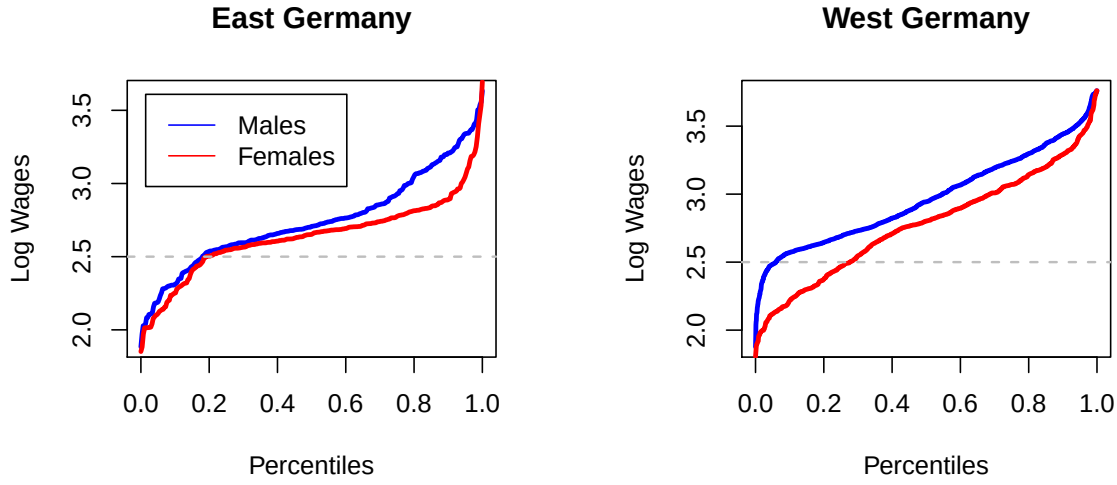


Table 1: Real log wage distributions and gender differentials

	East Germany			West Germany		
Overall						
τ	Male	Female	$\Delta M/F$	Male	Female	$\Delta M/F$
10%	2.08	1.91	0.17	2.41	2.21	0.20
25%	2.29	2.19	0.10	2.61	2.47	0.14
50%	2.56	2.56	0.00	2.87	2.75	0.12
75%	2.84	2.80	0.04	3.16	2.99	0.17
90%	3.14	3.04	0.10	3.45	3.18	0.27
N	4 201	3 472		19 695	9 919	
No Collective Bargaining						
τ	Male	Female	$\Delta M/F$	Male	Female	$\Delta M/F$
10%	2.06	1.81	0.25	2.37	2.01	0.36
25%	2.22	2.01	0.21	2.58	2.34	0.24
50%	2.44	2.31	0.13	2.85	2.61	0.24
75%	2.71	2.61	0.10	3.19	2.91	0.28
90%	3.17	2.86	0.31	3.51	3.20	0.31
N	2 744	1 821		12 328	5 005	
Collective Wage Agreement						
τ	Male	Female	$\Delta M/F$	Male	Female	$\Delta M/F$
10%	2.34	2.30	0.04	2.47	2.46	0.01
25%	2.53	2.55	-0.02	2.67	2.65	0.02
50%	2.75	2.75	0.00	2.90	2.87	0.03
75%	2.96	2.99	-0.03	3.12	3.03	0.09
90%	3.10	3.10	0.00	3.30	3.15	0.15
N	1 158	1 374		5 689	4 023	
Sector and Firm Level Bargaining						
τ	Male	Female	$\Delta M/F$	Male	Female	$\Delta M/F$
10%	2.31	2.25	0.06	2.57	2.22	0.35
25%	2.57	2.54	0.02	2.69	2.47	0.22
50%	2.70	2.65	0.05	2.94	2.80	0.14
75%	2.93	2.76	0.17	3.24	3.07	0.17
90%	3.21	2.89	0.32	3.44	3.30	0.14
N	297	233		1 697	878	

Let us first take a look at the overall unconditional log wage distribution in Figure 1 and in the first panel of Table 1. What we are first interested in is the number of respondents. Here we notice a pattern attested by the work of Adler and Brayfield (1997) and much later by Hanel and Riphahn (2011). That is, the labor market participation of East German women is found to be significantly higher than for West German women. So in Table 1 we see that the proportion of male to female employees is approximately 4:3 in East and 2:1 in West Germany. These different patterns of labor market attachment for women in East and West Germany speak for the relevance of investigating both regions separately. Higher attachment to the labor market has to be connected with better horizontal placement of women in the firm hierarchy. This could be a prerequisite for a lower wage gap in East than in West Germany. Figure 1, as well as the first panel of Table 1, and column 3 and 5 of it, present the differences in the wage distribution between males and females in the both regions. It is evident, that the overall unconditional gender wage gap in East Germany is lower than in West Germany. Of course we cannot relate this phenomenon just to labor market participation. Later in the analytical section we will see also if the discrepancies in the unconditional gender wage gap in both regions still remain unchanged when conditioned on different covariates.

From Figure 1 and the first panel of Table 1 we notice also that wage discrepancies between males and females are at their highest level at the quantiles over and under the mean wage distribution for both East and West Germany. This is an evidence of a "glass-ceiling" as well as of a "glass-floor" (see e.g. de la Rica et al., 2008) or "sticky-floor" (see e.g. Drolet and Mumford, 2009) effect for female employees. This supposes that mostly threatened by those phenomena are highly qualified women at the top of the wage distribution and those at the bottom, characterized by low skilled labor employment. From Figures 1 to 4 we can also see that gender pay discrepancies are overall a bit sharper in West than in East Germany.

Figure 2 and the second panel of Table 1 present the wage distribution differences for respondents, not covered by any collective bargaining regime. These could be active also under individual contract. Wage discrepancies between both genders here are

at their highest level among all the bargaining regimes in the country. The widest raw gender pay gap we observe are at the lowest and highest quantiles of the income distribution with values between 0.25 and 0.36 log wage units per hourly pay in favor of males. Figure 4 and the fourth panel of Table 1 witness similar pattern for employees covered by sector or firm level bargaining regime. However, we can say that this kind of bargaining regime diminishes a bit the sticky floor effects in East Germany. Its value is below the average raw gender pay gap. To a certain extent we observe the same effect in the glass ceiling phenomenon in the western regions of the country. Being active under no type of wage agreement gives a certain freedom to the employee in bargaining about its wage. However we see another interesting pattern. Taking a look at the whole Table 1 we notice that the highest wages among all types of bargaining regimes are payed to males in West Germany. This does not refer to women though. The highest wages for women are found among those active under sectoral or firm-level bargaining regime (see the 4th panel of Table 1). From Figure 4 we see also that firm-level contracts diminish sticky floor effects in East Germany but have no impact on raw gender pay gap for individuals at the top of the income distribution. Quite an opposite pattern we observe in West Germany. Here the wage discrepancies are higher at all points of the wage distribution with strongly persistent sticky-floor effect.

Of particular interest is Figure 3 and the third panel of Table 1 respectively. These describe the impact of collective bargaining regimes on the wage structure of males and females. In the literature there is an overall agreement that collective contracts reduce the wage gap between genders and races (see Card, Lemeieux and Riddell, 2003:9; Kohn and Lembcke 2007:10; Fitzenberger et al., 2008:5). In some countries unions have substantial impact over the political process. By negotiating minimum wage regulations or pay equality regulations unions alter the wage structure in the economy. Collective contracts induce wage compression and therefore reduce the within-firm wage inequality. From Figure 3 we see, that with a slight exception at the last quantile of the income distribution in West Germany, the effects of glass ceiling and sticky floor are not evident. Moreover, wages at the 25th and 75th quantile in East Germany are even in favor of females. Collective contracts

initiated by unions standardize pay not just within establishments and firms, but also across different firms in a common market. Pay standardization within firms happens by replacing managerial decisions about setting the wage level with wage rates corresponding to job classification. Therefore the job and the job characteristics are remunerated rather than the individual itself. Similar wage levels across different firms within an industry means removing competition over higher wages. Namely those features of collective contracts lead to reduced wage dispersion in contrast to the non-member sector, which were discussed above. We can deduce that in Germany collective bargaining regimes have a very strong wage regulatory role. From the third panel of Table 1, as well as from Figure 3 we see that the gender wage gap among workers under collective contracts practically does not exist. Slight exceptions are the last two top distributional quantiles in the western parts of the country. Keeping in mind that Table 1 depicts technically the raw gender wage gap, we can conclude that wage differences between different demographic and skill groups are much lower and even almost non-existent in the sectors covered by collective contracts, rather than in the others.

In the theoretical section, when describing the institutional impact on wages, it was suggested, that women would be more inclined to select themselves into industry sectors covered by collective bargaining regimes. The reason is that work practices here are more family oriented - fully remunerated maternity leave, regulated working hours, etc. Taking a look at the number of respondents in panel 3 of Table 1 just confirms this hypothesis. Having in mind that the proportion of male to female employees is approximately 4:3 in East Germany, we see that female workers under collective wage agreements outnumber males. The pattern is similar for West Germany. Here the proportion is two males to one economically active female. Concerning those with collective wage contracts it is approximately 5:4.

Above was mentioned two of the main possible approaches trough which collective agreements imposed by unions could have impact on wage structure - minimum pay equality regulations or wage regulations. The first was already discussed for the German case. As it is found to be of particular importance for the pay gap between women and men

the latter cannot be left out of discussion. There is no minimum wage in Germany as a whole [1]. There is an initiative and discussions in the government to introduce some form of minimum wages over the coming years, but this proposition is a controversial issue among political parties, industry and unions. Debates are still overwhelmingly ongoing. One problematic point is for instance whether one minimum wage level should be implemented in all sectors, all age groups, all regions (West/East) and for all types of labor relations (seasonal workers, regular employees, etc.). Another point of contention is the admissible wage level itself, as there are still discrepancies between the level of lowest salaries in East and West Germany. Kalina and Weinkopf (2006) explain, that taking a wage of 50 % of the median as the absolute minimum renders a minimum wage of 5.4 Euro in East Germany and 7.4 Euro in West Germany. Minimum wage regulations are often seen as milestones when confronting the issue about of the gender wage gap, as usually female dominated jobs are those with lower wages, such as hair dressing, unskilled jobs in the retail trade, restaurants and cleaning jobs (Ziegler 2005:258). Kalina and Weinkopf demonstrate empirically that the vast majority of low-payed persons in Germany are women. This cannot be confirmed in the dataset we apply to our study. Table 2. in the appendix presents employees with wages on the lowest quantiles of the wage distribution. However in their study both authors use a data base, which includes full-time, part-time and mini-jobbers [2]. This should be considered a more realistic presentation of the social world but not for exploring the conditional wage gap, as mentioned in the data description section. The inequality in the wage distribution is to a great extent connected to the high proportion of women in low paid jobs and still their underrepresentation in highly paid jobs, as well as the aforementioned importance of a minimum wage regulation by collective bargaining regimes. Low wages are concentrated on women and an overall minimum wage would therefore increase the pay level. Furthermore it could contribute to the reduction of gender wage discrepancies.

[1] with some exceptions like the construction industry for instance

[2] mini-jobs in Germany are often performed as part-time jobs and their monthly wage does not exceed 400 Euro. Those also do not require social security contributions

Overall, the descriptive statistics just presented, illuminate the the diverse impacts of bargaining regimes on the wage ditribution in both regions. Most of the outcomes are of particular importance for our research question. We can summarize that females working under no type of collective agreements experience more wage discrimination. Moreover, the raw gender pay gap in East Germany is lower than in the western parts of the country and at all points on the wage distribution. Further, East German women have a higher attachment to the labor market than those in the West. Concerning the overall wage distribution, we find persistent glass-ceiling and sticky floor effects in both regions. Collective contracts are seen to reduce the wage discrepancies between the genders and to a great extent this refers to the case of East and West Germany too. In the eastern parts of the country the raw pay gap does not even exist among all income groups. This type of bargaining regime and the practices which it brings along with it seem to be attractive to women from the old and new federal states. Eastern females employed under collective bargaining agreements even outnumber males. Despite the outcomes of the descriptive statistics up to this point, one should still be aware of the fact that other variables could cause effects on gender wage discrepancies too. This issue will be explored in more detail by the quantile regression approach developed in the next chapter.

4.2 The Crowding Hypothesis

We proceed with the description of the unconditional log wages over occupational organizations with different patterns of sex composition at work. In other words, we will explore the effect of the proportion of males to females at work on the wage distribution for both genders in East and West Germany. In our data set we have an indicator for the percentage of male workers in an organization (see Table 2 in the appendix). In the theoretical section we explained that industries which are densely occupied by women are perceived as "crowded"(Edgeworth 1922; Bergmann 1974). In the descriptive statistics organizations

primarily occupied by women will be defined as such, where males compose less than 30 per cent or 20 per cent of the overall labor power. Taking a look at different patterns of sex composition also allows one to trace the change in the effects of sex composition on wage distribution. In other words we will determine whether if the gap between genders widens or shrinks when fewer males are active in a work organization. Descriptives are done on all firms and types of work organization. Therefore we must keep in mind, that certain types of employments may not follow the general pattern.

Three figures will be build to present the impact of sex composition at work over the wage distribution. Figure 5 presents the overall unconditional distribution of males and females. It is practically a replication of Figure 1 and will be used as a reference group for finding any differences. I want to underline that this figure will not be a presentation of an equal sex division but of the overall pattern. As it was explained in the descriptive section above, the ratio of male to female employees is approximately 4:3 in East and 2:1 in West Germany. Figures 6 and 7 demonstrate the impact of fewer males in a job place than women on the wage distribution of both genders.

Figure 5: Sex Composition at Work: Overall

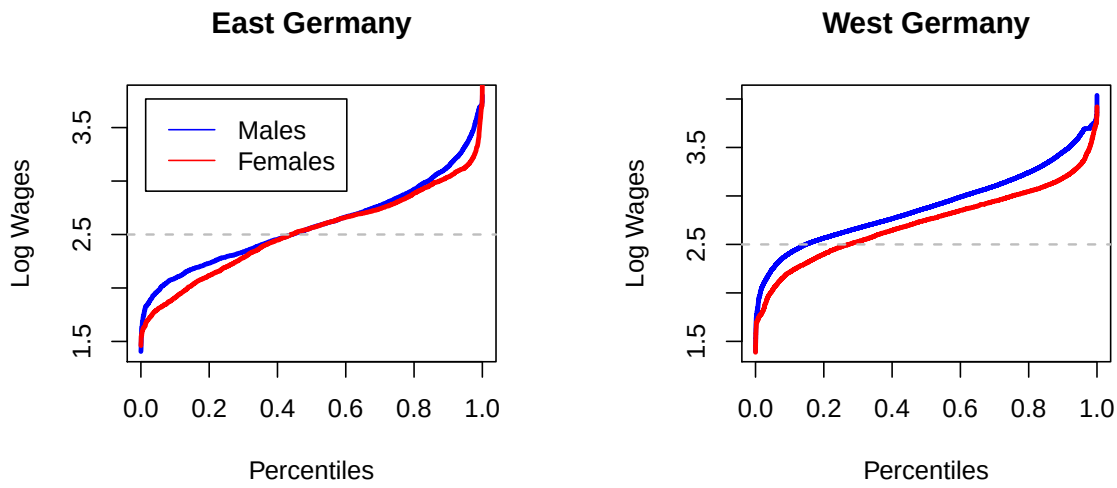


Figure 6: Sex Composition at work: Males less than 30%

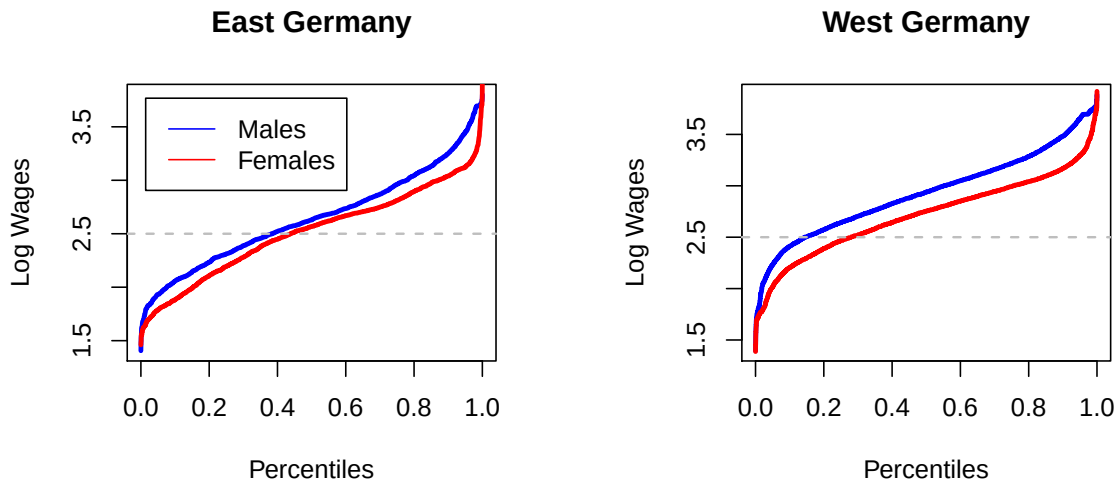
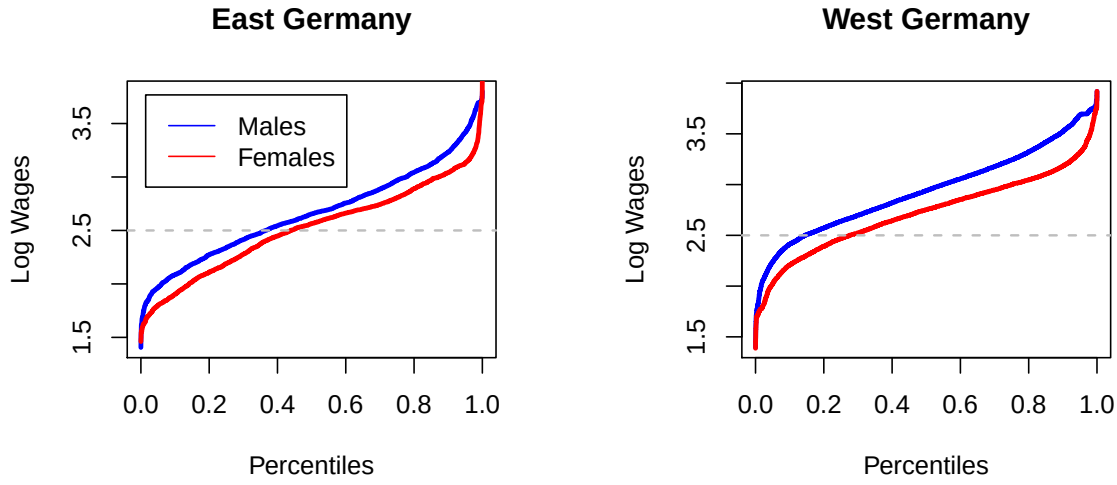


Figure 7: Sex Composition at work: Males less than 20%



The crowding hypothesis and its developments have several main postulates of relevance for our case. Workers, due to personal characteristics like race or gender, are forced to accept certain types of employment. This skews the function of the labor market in sense that it depresses wages in those occupations. Occupational segregation by sex is considered one of the main determinants of wage disparities. The main winners from

the consequences of discrimination are male employers and particularly male employers in organizations, occupied primarily with women. Figures 6 and 7 can be considered as evidences in support of the crowding hypothesis. We see that in firms where males compose less than 30% of the work force, the unconditional gender pay gap is higher than overall. This refers to both East and West Germany. From Figure 6 we also notice that the effect of the widening wage gap with fewer males at work concerns workers with income distribution round the mean quantiles in the both regions. Outcomes depicted in Figure 7 are also supportive of these results. The wage discrepancies between males and females grow inversely to the number of males employed in an organization. This refers to a greater extent to workers in East Germany.

As a whole we can deduce that the explications of the crowding hypothesis have proved its relevance and therefore efficiency for estimation of the wage dispersion in East and West Germany. Sex composition of the work place is an important covariate in exploring income inequalities based on gender differences.

Chapter 5

Methodology

5.1 Quantile Regression

As I already mentioned in the introductory part, in this study, I will try to estimate the more easily to be operationalized legitimate wage gap and hence to receive an approximate statistics for the gender pay gap in each East and West Germany. To analyze effects on the entire wage distribution I will use a set of linear quantile regression estimates. Before proceeding to the composition of our model, without going into details, I will briefly outline the main properties of the method to be applied. For a better understanding I will describe how quantile regression differs from the commonly applied least squares regression.

As contrasted with the standard linear regression, quantile regression provides estimates in change in all parts of the distribution of a response variable (Koenker and Basset 1978). A linear regression renders the average relationship between the dependent variable and a set of explanatory variables, based on the conditional mean function $E(y|x)$. However, this does not provide a complete view of the whole relationship. A more extensive illustration would give us information about the relationship between the dependent variable y and the regressors x at various points of the conditional distribution of x. Quantile regression is a statistical method to illustrate this relation. Percentiles and quantiles are synonyms - the 0.05 quantile is the 5th percentile. The median is the middle value of a set

of ranked data. Therefore the sample median is an estimator of the population median. If ordinary least squares conditions on the mean function, quantile regression conditions on chosen points of the distribution. Let e_i denote the model prediction error. Then ordinary least squares (OLS) minimizes $\sum_i e_i$; median regression minimizes $\sum_i |e_i|$; and quantile regression minimizes a sum which gives the asymmetric penalties $(1-q)|e_i|$ for overprediction and $q|e_i|$ for underprediction. Because of the penalty functions imposed in its definition the objective function of the quantile estimator is not differentiable. The computation is therefore different - the usual gradient optimization methods cannot be applied. However via linear programming [1] the calculation renders an estimator with well-established asymptotic properties. The quantile regression estimator is asymptotically normal under general conditions (see Cameron and Trivedi 2005:88).

Quantile regressions are considered attractive because of several features. Median regression, also called least absolute-deviations regression (Rogers 2001:820; Cameron and Trivedi 2009:205) is more robust to outliers than is mean regression. OLS is sensitive to the presence of outliers and can be inefficient when the outcome variable has a highly nonnormal distribution. Overall, the QR estimator is considered to be more efficient than the OLS. QR estimates are more robust. Secondly, as we already have mentioned, quantile regression allows us to study the impact of one or more covariates on the full distribution or any particular point of it, rather than just the conditional mean (Koenker and Machado 1999). Further, unlike ordinary least squares, quantile regression estimates do not require the existence of the conditional mean to be consistent. Also, QR is equivariant to monotonic transformations, which is of particular importance for its application to our case. That is for example, that the quantiles of a transformed variable y, let it be denoted as $h(y)$, where $h(.)$ is a monotonic function, equal the transformations of the quantiles of y, so $Q_q[h(y)] = h[Q_q(y)]$. Hence, if the quantile model is expressed as $h(y)$, which refers to our case, where we will have $\ln y$. Then one can use the inverse transformation to translate the results back to y. This is not possible for the mean, because $E[h(y)] \neq h[E(y)]$. In other words, if the model is correctly specified, the equivariance property will continue to hold

[1] Here the simplex method is applied and it yields a solution in a finite number of simplex iterations

in a regression framework. Last, the estimates are semiparametric in the sense that no parametric distributional form (eg. normal, Poisson, etc.) is assumed for the random error part of the model e, although a parametric form is assumed for the deterministic portion of the model ($X'\beta$). Therefore quantile regression is advantageous in modeling heterogeneous variation in response distribution, as no specification of how variance changes are linked to the mean is required. These features make quantile regression very suitable for analysis of heteroskedastic data.

In our function parameters vary with τ due to effects of the τ-th quantile of the unknown error distribution e. Here we aim to obtain estimates for several quantiles using bootstrap standard errors based on 20 replications. We specify the τ-th quantile of log hourly wages conditional on a dummy variable for the gender and the set of covariates X as:

$$\ln \text{wage}(\tau|Y_i) = \beta_0(\tau)+\beta_1(\tau)female_i+X'\beta(\tau), \quad for \quad \tau = 0.1, 0.25, 0.5, 0.75, 0.9$$

The set of covariates $X[Z;V]$ on which the quantiles of the log hourly wage Y are regressed includes individual worker characteristics Z and a vector of union variables V. Z stands for the following variables:

EDU - Education

EXP - Experience

TEN - Tenure

Under tenure I is considered the year into which one has entered his/her current occupation subtracted from the year the study was conducted - 2006. Age of the respondent is converted into experience by subtracting the years spent in education + 6 pre-school years.

There are the following three regimes of bargaining coverage (dummies):

IC - Individual contract negotiated between employee and employer (no collective bargaining). This is the reference group.

CC - Collective contract negotiated between an employers' association and a union.

FC - Firm-level agreement negotiated between a firm and a union or a work council.

The relevant information on the wage gap for each quantile holding all other factors fixed will be captured by defining a binary variable for gender. Hence I define female to be a dummy variable taking on the value one for females and the value zero for males. This should provide a statistics about the gap measured as the difference in pay that women would have faced at the τ^{th} quantile if their labor market characteristics had been rewarded as men's are. As remarked above the quantile regression function will be performed simultaneously for the $10^{th}, 25^{th}, 50^{th}, 75^{th}$ and the 90^{th} percentiles. Hence a benchmark specification writes:

$$(\tau) \ln WAGE_i = \beta_0 + \beta_1 female_i + \beta_2 EDU_i + \beta_3 EXP_i + \beta_4 TEN_i + \beta_5 CC_i + \beta_6 FC_i + \beta_1 SCmen_i$$

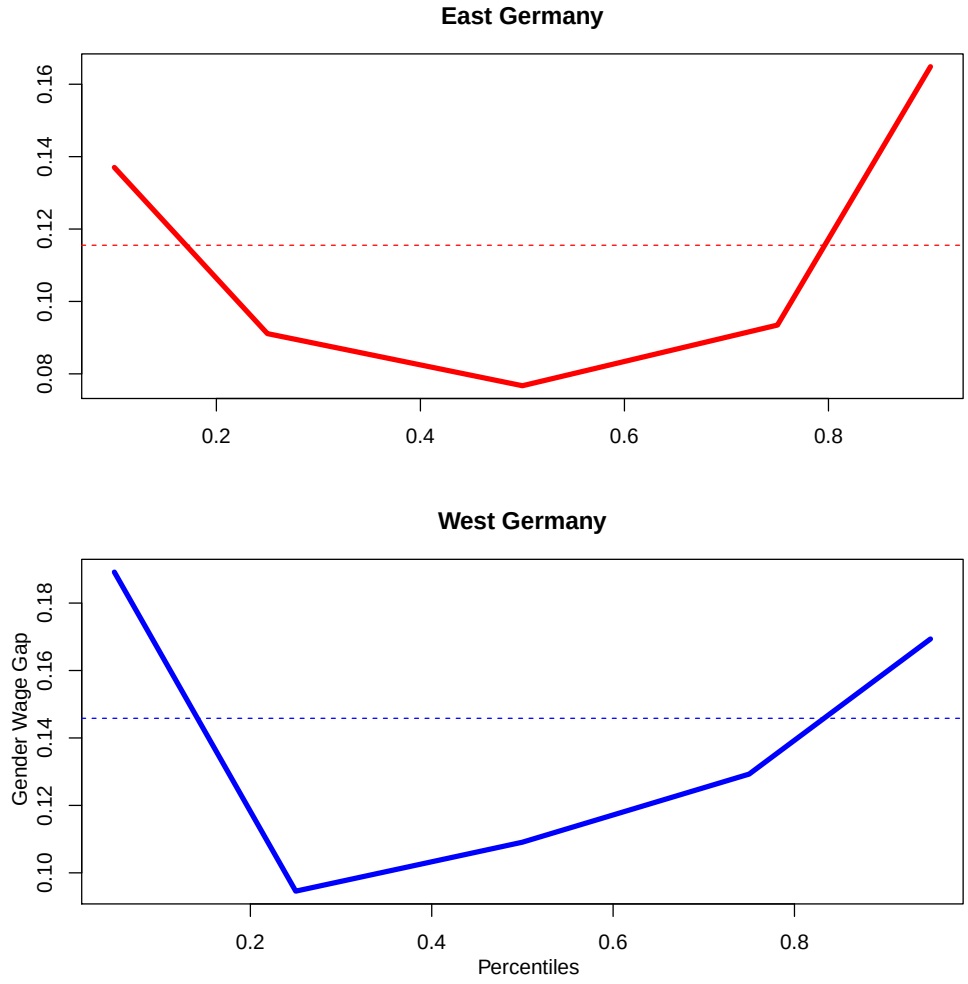
In Table 3 below results from the quantile regressions are presented. For the sake of clarity the conditional gender wage gap in East and West Germany at different quantiles is plotted in Figure 8 right after the table.

Table 3: Wage Regressions: Quantile Regression

Percentile	10th		25th		50th		75th		90th	
Description	East	West	East	West	East	West	East	West	East	West
Female	-0.137***	-0.143***	-0.091***	-0.094***	-0.076***	-0.109***	-0.093***	-0.129***	-0.164***	-0.153***
	(0.014)	(0.000)	(0.000)	(0.005)	(0.009)	(0.006)	(0.013)	(0.007)	(0.016)	(0.009)
Education	0.065***	0.054***	0.057***	0.055***	0.054***	0.054***	0.057***	0.051***	0.054***	0.048***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tenure	0.014***	0.012***	0.013***	0.010***	0.011***	0.007***	0.010***	0.003***	0.010***	0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Experience	-0.003***	0.002**	-0.002***	0.002***	-0.001	0.006***	-0.001	0.009***	0.004***	0.010***
	(0.000)	(0.008)	(0.000)	(0.000)	(0.051)	(0.000)	(0.530)	(0.000)	(0.000)	(0.000)
Collective	0.237***	0.088***	0.240***	0.045***	0.172***	-0.021***	0.108***	-0.101***	-0.012	-0.101***
Contract	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.189)	(0.000)
Firm-Level	0.218***	0.062***	0.206***	0.051***	0.179***	0.068***	0.166***	0.050***	0.077	0.050***
Agreement	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.018)	(0.000)
Sex.Comp.	0.001*	0.001***	0.001***	0.001***	0.001	0.001***	0.001***	0.001***	0.001	0.001***
"%males"	(0.010)	(0.000)	(0.000)	(0.000)	(0.055)	(0.000)	(0.000)	(0.000)	(0.212)	(0.000)
Constant	0.790***	1.211***	1.080***	1.356***	1.339***	1.579***	1.490***	1.878***	1.792***	2.203***
	(0.051)	(0.036)	(0.036)	(0.016)	(0.034)	(0.020)	(0.040)	(0.027)	(0.039)	(0.020)
Pseudo R^2	0.257	0.178	0.282	0.189	0.271	0.169	0.232	0.148	0.160	0.163
N	7 673	29 524	7 673	29 524	7 673	29 524	7 673	29 524	7 673	29 524

Bootstrap standard errors in parentheses: *<0.05, **<0.01, ***p<0.001

Figure 8: Conditional Gender Wage Gap



Before taking a look at the results, we should note that our benchmark equation has a semi-elastic form. That is due to the logarithmic form of our dependent variable - the hourly wage rate. Therefore the coefficients of all independent variables have a percentage interpretation in relation to their impact on the outcome variable. Having the results from the returns of different characteristics to the log hourly wages at different quantiles, we practically achieved the main goal of this work - to estimate the gender wage gap in East and West Germany.

The first interesting point to note from Table 3 is that estimated coefficients for the dummy variable indicating a respondent is a female are at all quantiles negative. For

instance at the 10^{th} percentile in East Germany we have a value of minus 0.137. That is, when other characteristics (education, bargaining regime, etc.) are hold fixed, an individual would come up with an approx. 14% lower hourly wage rate, if his gender is female. So the first row shows, that if we assume females had identical distributions of characteristics to men, there is a gender pay gap across the wage distributions at all quantiles. So the female dummy represents the gender wage gap which is not due to a difference in characteristics. This is what was called an illegitimate pay gap or wage discrimination. For the sake of better clarity, Figure 8 plots the inverse of this dummy. The distribution is presented over all points of the income distribution. Thus it delivers a slightly better reflection of the gender pay gap especially in reference to the lowest and the highest percentiles of the wage distribution.

In both East and West Germany we observe the so called sticky floor and glass ceiling effects in the wage differentiation. Sticky floors have higher rates in East Germany and glass ceilings in the western parts of the country. The wage discrimination slope for West Germany follows a rather rectilinear trend after the 25^{th} percentile of the wage distribution. Exceptions are the lowest quantiles. The sticky floor effect at the 5^{th} percentile is higher by almost 8% than at the 25^{th} percentile pay gap. The conditional gender wage gap in West Germany is higher at all quantiles than in East Germany. This does not refer just to workers at the top of the income distribution. Gender based wage discrimination in East Germany is 4% lower than in West Germany on average. Interpretation of coefficients of the individuals' characteristics do not have a direct relation to the gender pay discrimination in this equation. Here they describe the change in the overall wage level. Despite this the meaning of some must not escape attention, as these have causal effects on gender differences in earnings in both regions. So we see that the collective bargaining regime has a positive impact on workers' wages in East Germany, whereas it plays a negative role for western workers receiving income at and above the mean. The base category for the interpretation is a variable which consists of two summmands - individuals working under individual contracts and those under no contracts [2]. Firm-level bargaining follows a similar

[2]hence claiming a bargaining regime has a negative impact on worker's wage we mean he would earn

pattern. It renders 10% to 15% lower income growth in West Germany compared to East Germany. Bargaining regimes are a stronger wage determinant in the latter. For a better comparison and interpretation of the impact of characteristics on women's wages in both regions a new quantile regression has been constructed, this time considering just females. The benchmark equation changes just in the sense that the female dummy is dropped. Results of this are presented in Table 4 below.

Table 4: Wage Regressions: Quantile Regression for Females

Percentile	10th		25th		50th		75th		90th	
Description	East	West	East	West	East	West	East	West	East	West
Education	0.065***	0.036***	0.052***	0.043***	0.045***	0.034***	0.040***	0.028***	0.030***	0.033***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Tenure	0.016***	0.013***	0.016***	0.011***	0.014***	0.010***	0.013***	0.007***	0.012***	0.003*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.014)
Experience	-0.004*	0.002	-0.005***	0.001	-0.001***	0.001*	-0.001	0.004***	-0.002	0.007***
	(0.032)	(0.071)	(0.000)	(0.582)	(0.000)	(0.038)	(0.240)	(0.000)	(0.110)	(0.000)
Collective	0.307***	0.258***	0.290***	0.174***	0.205***	0.115***	0.160***	0.027*	0.077**	-0.091***
Contract	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Firm-Level	0.264***	- 0.064	0.266***	0.070***	0.272***	0.159***	0.194***	0.111***	0.090	0.045***
Agreement	(0.000)	(0.886)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.018)	(0.000)
Sex.Comp.	-0.001	0.001***	0.001	0.001***	0.001*	0.001***	0.001***	0.003***	0.003	0.003***
"%males"	(0.090)	(0.000)	(0.375)	(0.000)	(0.035)	(0.000)	(0.000)	(0.000)	(0.212)	(0.000)
Constant	0.674***	1.289***	1.118***	1.426***	1.436***	1.772***	1.652***	2.101***	2.039***	2.187***
	(0.071)	(0.054)	(0.048)	(0.027)	(0.047)	(0.026)	(0.043)	(0.029)	(0.044)	(0.033)
Pseudo R^2	0.311	0.178	0.343	0.189	0.313	0.169	0.271	0.148	0.181	0.163
N	3 472	9 883	3 472	9 883	3 472	9 883	3 472	9 883	3 472	9 883

Bootstrap standard errors in parentheses: *<0.05, **<0.01, ***p<0.001

more if he was under no contract

In Table 4 the estimated coefficients are the returns to the mean log hourly wages of females in East and West Germany. The first notable difference is in the estimates of the impact of educational level on women's wages. We see that education has more positive impact over earnings in East Germany than in West Germany and this over all quantiles of the income distribution. Other discrepancies worthy to be mentioned refer to the types of bargaining regimes. Firstly, women at the lowest quantiles in both regions experience up to 30 % higher wages if covered by collective agreement. However moving to groups of higher income in West Germany we see that its influence diminishes at the 75^{th} quantile and goes to negative at the 90^{th}. Female workers with a similar earnings level from East Germany would be favored of the impact of a collective agreement. That would bring them 16% and 8% wage increase respectively. Notable distinctions we find also in reference to the impact of firm-level agreements. If covered by firm-level agreement women below the mean income distribution from East Germany would add approx. 27% to their wage level, whereas females at the 10^{th} percentile in West Germany would have a loss of 6% in their wage rate and those at the 10^{th} would experience just a 7% wage gain.

Results from the quantile regressions provide us several hints in determining and explaining the gender wage gap in East and West Germany. First we were able to specify the amount of wage discrimination in both regions and we saw that it is higher in the western parts of the country. Education is of higher importance for women's wage level in East Germany than in West. The same refers to both types of collective bargaining regimes included in the model. However we shall not forget that the proportion of male to female employees in our sample is approximately 4:3 for East and 2:1 for West Germany. This shows that women in West Germany work (or have to work) less on average. Those two points - the higher wages and fewer working women in West compared to East Germany could have causal effects on the higher gender wage gap in the west parts of the country found in this study. So for instance, women in West Germany could be less inclined to bargain about their wages or to invest in education. Of course a hypothesis like this require further investigation and as mentioned in the beginning these suppositions are not bound up with any generality. In the next section of this chapter we will try to shed more light

over the causes for wage differentials between genders in Germany.

5.2 Blinder-Oaxaca Decomposition

The Blinder-Oaxaca counterfactual decomposition can be applied to provide a better understanding of the reasons for earnings inequalities between genders. The method stems from the works of Blinder(1973) and Oaxaca(1973) and has played an important role in studying race or wage discrimination since its development. The basic idea is that differences in wages can be decomposed into a part, explained by differences in characteristics, such as education, experience, etc. and into a part explained by differences in OLS coefficients. When first developed the Blinder-Oaxaca decomposition was dividing the wage differential between two groups (males and females for instance) into a part, that was explained namely by differences in characteristics and into an unexplained - residual part. The latter is usually treated as discrimination. However it also captures all potential effects of differences in unobserved variables. This technique is known as a two-fold decomposition.

In this paper we will apply the three-fold decomposition proposed and described by Ben Jann (2008). The basic assumption in this approach is that wages are tied to productivity. If there were no discrimination, than differences in wage would be due to differences in productivity between both genders. Hence, the gender discrimination is evident, when workers are payed different wage rates for the same productivity (Gardeazabal 2005). It is namely this difference that is one of the decomposition parts in our case, as shall be demonstrated. In the three-fold decomposition method the gender wage gap is computed for males and females and split up into differences in characteristics (the "endowments effect"), differences in coefficients and interaction effects.

The aim of the method is to decompose differences in mean wages, μ, across two groups. Here I will briefly describe how it works, when applied to our example. Hence we have two groups - males m and females f. The outcome variable Y is the logarithm of the hourly pay and X is the vector of individuals' characteristics - education, tenure, experience, type of collective bargaining regime and share of men at work, that explain

the wage levels. The estimators β_m and β_f contain the slope parameters and the intercept and are the returns of the workers characteristics. So, now the question is how much of the mean outcome difference

$$R = E(Y_m) - E(Y_f)$$

where $E(Y)$ remains for the expected value of the dependent variable is due to gender differences in the predictors. According to the mothodology of Oaxaca(1973) and Blinder (1973) the decomposition equation can be written as:

$$R = [E(X_m) - E(X_f)]'\beta_f + E(X_m)'(\beta_m - \beta_f) + [E(X_m) - E(X_f)]'(\beta_m - \beta_f)$$

This is a three-fold decomposition. This means that the outcome differences are divided into three parts:

$$R = E + C + I$$

The first term

$$E = [E(X_m) - E(X_f)]'\beta_f$$

represents the part of the log-wage differential that is due to employee characteristics (education, bargaining regime etc.). These are the differences between genders in the predictors - the endowments effect. The second summand

$$C = E(X_m)'(\beta_m - \beta_f)$$

reflects the contribution of differences in the coefficients (including differences in the intercept), which accounts for the differences in the estimated returns to men's and women's characteristics. And the third component

$$I = [E(X_m) - E(X_f)]'(\beta_m - \beta_f)$$

is an interaction term, which allows to account for the fact, that differences in endowments and coefficients between men and women exist simultaneously. If male and women receive equal returns for their characteristics, than the second and the third part will be zero and wage discrepancies between genders will be explained just by the difference in endowments.

The decomposition technique presented above is formulated from the viewpoint of females. That is it is based on the prevailing wages of women. Hence differences in endowments and coefficients are weighted by the wage coefficients of women. Of course, this equation can also be expressed from the viewpoint of males. The findings of the three-fold Blinder-Oaxaca counterfactual decomposition are presented in Table 5 below.

Table 5 : Oaxaca-Blinder counterfactual decomposition

Description	East Germany	West Germany
	Means	Means
Male wages	2.587***	2.895***
	(0.006)	(0.000)
Female wages	2.515***	2.723***
	(.007)	(0.000)
Difference	0.072***	0.172***
	(0.009)	(0.000)
Endowments		
Education	-0.002	-0.002*
	(0.002)	(0.086)
Tenure	-0.045***	-0.002
	(0.003)	(0.069)
Experience	0.003***	0.002***
	(0.001)	(0.000)
Collective	-0.023***	-0.014***
Contract	(0.002)	(0.000)
Firm-Level	-0.001	-0.001
Agreement	(0.001)	(0.189)
Sex.Comp.	0.044***	0.070***
"%males"	(0.007)	(0.000)
Total	-0.025***	0.054***
	(0.009)	(0.000)
Coefficients		
Education	0.420***	0.442***
	(0.052)	(0.000)
Tenure	-0.060***	-0.037***
	(0.012)	(0.000)
Experience	0.105***	0.101***
	(0.025)	(0.000)
Collective	-0.154***	-0.280***
Contract	(0.024)	(0.000)
Firm-Level	-0.090***	-0.066***
Agreement	(0.031)	(0.000)
Sex.Comp.	-0.056***	-0.104***
"%males"	(0.011)	(0.000)
Constant	-0.033	0.099*
	(0.071)	(0.021)
Total	0.130***	0.154***
	(0.010)	(0.000)
Interaction		
Education	-0.001	-0.002
	(0.350)	(0.087)
Tenure	0.0149***	0.001
	(0.000)	(0.082)
Experience	-0.005***	0.003***
	(0.000)	(0.000)
Collective	0.013***	0.023***
Contract	(0.000)	(0.000)
Firm-Level	0.001	0.001
Agreement	(0.205)	(0.207)
Sex.Comp.	-0.054***	-0.062***
"%males"	(0.000)	(0.000)
Total	-0.032**	-0.037***
	(0.003)	(0.000)
N	7673	29 524

In Table 5 the results from two decompositions are presented - one for each of the two regions. The first panel reports the mean predictions for males and females and their difference. The mean for the log wages for men in East Germany is 2.59 and for women 2.52. This yields an average wage gap of 7%. The wage gap in West Germany is 17%. That is, women here receive 17% less than men. In the next three panels the wage gap in Germany is divided into three parts. The first part represents the mean increase in the wages of females, if they had the same characteristics as men. This constitutes the "explained" part of the gender wage gap. In the case of East Germany we see that the total of all endowment coefficients has a negative sign. Hence, if women had the same characteristics as men, the wage gap would have been larger. The interpretation of the impact of the personal characteristics of education, tenure and experience is as follows: East-German women do not have lower levels of education and experience than males. The number of years which they spent at the current place of employment is even larger than that of males. The same pattern refers to West German women. An exception is tenure, which does not differ than its level for males. The total for endowments amounts to approx. 5%. Therefore, of the 17% raw gender wage gap in West Germany, the Blinder-Oaxaca decomposition revealed that 5 percentage points are attributable to difference in characteristics.

The third panel of the table includes the estimates of the second part of the sequential decomposition - the differences in coefficients. These are the returns to the characteristics and imply unequal treatment of productivity characteristics in the labor market. In other words, differences in coefficients quantify the change in earnings of women when men's coefficients are applied to the characteristics of females. Results show that East-German and West-German women's and men's personal characteristics are equally recognized by employers, but those characteristics are less valued for women than for men. So for instance women in East and West Germany have the same educational level as men, but they receive lower returns for it than their male counterparts. In this sense we can also assume that education for males has a 42% in East and 44% in West Germany higher market value than that for females. Other components of the overall effect of coefficients over the

mean log wage difference between genders that describe an interesting pattern are those of tenure and experience. We see that the coefficients of tenure for women in both East and West Germany are in favor of women. The time spent at the same organization is better evaluated by employers for women than for men. Nevertheless the coefficient for overall experience signifies that tenure for men is approx. double more value than for women and that is valid for both regions. To clarify, when evaluating the actual applied cost of a male and a female having the same human capital characteristics, a potential employer would for instance appreciate the period that a women spends in the same firm, but not her overall experience [3] accumulated over the years. Men's experience would be more advantageous. Thus, if we apply men's coefficients for tenure to the women's characteristics that would cause a negative change in women's wages, but if we apply males' coefficients for experience onto female's characteristics that would have a positive effect over wages of females. The applies to both regions. Further interpretation requires supplementary research, but we will not resist the temptation to elaborate on possible reasons this situation, based on our data of course. This could be due to the fact that women are more "loyal" to their employer on average. Women from West Germany have nearly the same tenure as their male counterparts. In contrast, women in East Germany spend on average 3 years more at the same company than males (see Table 2 in the Appendix). This explains also the higher tenure endowments of East-German females compared to males. Coefficients of the former are also higher than those of the latter. Therefore we can deduce that women in East and West Germany spend more time at the same company than men, which is favored on the labor market, but their overall training on the job and potentially acquired skills are highly underestimated compared to those of men. However, the reader should not forget that in our work we use a proxy variable to define work experience. Data on the actual number of years of work experience is generally unavailable. So we defined the potential experience to be equal to the age of an individual from which we subtract the number of completed years of schooling and six preschool years (Table 2). Thes the

[3] under experience one should consider the training on the job which includes human capital as skills, additional schooling and etc.

potential experience coincides with the actual experience if it has been acquired without interruption and its accumulation has started after the completion of formal schooling. However, this usually overstates women's experience. The common reason for this is the maternity leave of women that they had in the past. As was mentioned in the theoretical part, the potential departure of a female out of the labor force to carry out her household and childbearing activities has a twofold consequence. On the one hand is the time lost in experience when being out of the workforce. On the other is the depreciation of skills during her absence from the labor force. It is reasonable to expect that the estimated coefficient $\widehat{\beta}_{exp}$ would be biased downwards if examining its returns to the mean income as in Tables 3 and 4. Nevertheless it is not clear what its effect would be on our estimates of discrimination provided by the Blinder-Oaxaca decomposition.

The last panel of the table accounts for the fact that differences in endowments and coefficients exist simultaneously between both sexes. In our case the total of the interactions is negative for both East and West Germany, so it could be interpreted as a 3% and 4% decrease in women's wages in East and West Germany respectively. In the last line of the third panel above, the total of the coefficients effect is given. It quantifies how much of the wage gap is explained by the variables(including the intercept), which it encompasses. As we already mentioned, this component is generally referred to as the discrimination component. In general the Oaxaca-Blinder composition sheds light over the contribution of different coefficients to the gender wage gap. So we realize that there are no or minor differences exist in the characteristics between the sexes, however the returns to those characteristics for women are much lower than for men.

Chapter 6

Main Findings and Conclusions

With the move of industrial structure to the service sector it is considered that we live in a "female society" because jobs in the service sector require primarily female capabilities. In accord with this process the gender wage gap tends to shrink over time in most countries. Nevertheless, a significant pay differential between men and women still cannot be fully explained by differences in individual characteristics. The presented work provided us with an eloquent description about the size of the gender wage gap in East and West Germany and effects contributing to it. All the conclusions are based on data of the German Structure of Earnings Survey. In the following, I briefly discuss the main findings from the analytical sections of the study.

First we applied a quantile regression framework to estimate the gender differentials along the wage distribution, controlling for personal characteristics, type of collective contract and sex composition at work. Results were that the gender wage gap is remarkably persistent in Germany. In West Germany the average discrepancies in earning of males and females 14.7% and in East Germany 11.5% in favor of males. In the both regions we find also the presence of sticky floors and glass ceilings. Wage discrepancies between sexes at the bottom of the income distribution have higher levels in East Germany and those at the top - in West Germany.

Further we applied a counterfactual decomposition technique to understand

better the wage differences between males and females. Into my opinion this rendered "highly intriguing" results. Women from East and West Germany have the same level of or even higher endowments than men but they receive lower returns for those endowments in comparison to their male counterparts. This refers to education and experience. Tenure is more favored at the labor market for women than for men. An important role in the explanation of the gender pay gap play also institutional characteristics like the type of collective bargaining regime for instance. We revealed that presence of a collective contract in firms has positive impact on wages for people with lower than the average income. Referring just to females, it has a positive impact over all quantiles of the wage distribution. Therefore we can deduce that women are found to profit most of being employed under collective agreement. The decomposition technique gave us also a clue about the the relationship between the share of female employees in all establishments and the wages of men and women. The empirical results show that the wage differentials between sexes are higher for respondents working in female dominated firms.

As we mentioned in the theoretical part, a few aspects are interwoven in the topic of female labor discrimination and not all of them can be measured empirically. In the introductory chapter we commented that we will try to estimate the illegitimate gender wage gap. These are wage differentials which are evident despite the wage legislation and bargaining regimes. As it was explained in the introduction, there is a division between female and male working capacities at the labor market nowadays. On the other hand there are different societal appraisals of female and male work, which have developed historically and it is difficult to be changed. Namely at this point is the importance of bargaining regimes as a wage regulator. Women profit more if they are covered by collective bargaining regimes, but issues as vertical segregation are not covered there. The structure of a corporate organization and human resource development have different effects over the gender specific career opportunities within company. It is argued that women in Germany meet difficulties to come back to the labor market after a maternity leave (see Achatz et al. 2002). Bischoff (1999) argues that women have not just to bargain more intense about their wages than men, but also to plan their career path much earlier. Collective

contracts could also contain gaps which could lead to an indirect discrimination against women. According to empirical findings in this study employers and unions play central role in preserving the rule "Equal pay for equal work" and could contribute to the reduce of gender discrepancies in earnings. Therefore, companies have also the responsibility to remunerate their employees in a way that does not cause gender specific differences in salaries.

By and large I consider this thesis gave some answers of the topic about unequal treatment of men and women at the workplace. It differs from the works cited in the literature review in the sense that I first applied a quantile regression to provide a valuable prediction of the conditional wage gap rather just to rely on the mere log wage mean difference, estimated by the Oaxaca-Blinder decomposition. Further the counterfactual decomposition was explored in details. Thus we gained deeper insight into reasons for the wage differences between genders in East and West Germany. Of course this work does not have the claim for an extensive research over this issue. One could explore the variance of characteristics within establishments and also occupations and observe how the gender wage gap varies among them. Similarly the correlation between wages levels of women and their share withing particular establishments could be researched also on a firm level. Career paths within organizations are also a possible topic of research. Besides wages opportunities to promotion are also a potential source of inequality.

To sum up, I hope this study was able not just to provide new insides into the causes for gender inequality in East and West Germany but also raises new questions and ideas for further research.

Acknowledgements

I am very grateful to my supervisor Prof. Dieter Ohr, Ph.D. for all his support and critical remarks, and encouragement. I had very fruitful discussions with Prof. Ulrich Rendtel,

Ph.D. about the different applications of quantile regression and with Tobias Koch, Ph.D. about the sense of applying multilevel analysis. Those helped me to clarify the general methodological path followed in this work. I would like also to thank to Anne Popiel, Ph.D. for her valuable suggestions in academic writing and the proofreading of this thesis, which significantly improved its quality.

Last but not least, I would like to thank my family and best friends, whose support was rather indirect but not less valuable. Thank you Maria, Anna, Erika, Valo, Asen, Johannes, Arash, Arkadi and Yordan

References

Acahtz, J., Fuchs, S., Stebut, N., & Wimbauer, C. (2002). Zur Beschäftigung hochqualifizierter Frauen. *Oranisationssoziologie. Kölner Zeitschrift für Soziologie und Sozialpsychologie*, *42*, 284–318.

Achatz, J., Gartner, H., & Glück, T. (2004). Bonus oder Bias? Mechanismen geschlechtsspezifischer Entlohnung. *IAB discussion paper No. 2*.

Addison, J. T., & Schnabel, C. (Eds.). (2003). *International Handbook of Trade Unions*. Edward Elgar, Cheltenham.

Adler, M., & Brayfield, A. (1997). Women's work values in unified Germany: Regional differences as remnants of the past. *Work and Occupations*, *24(2)*, 245–265.

Albrecht, J., Bjorklund, A., & Vroman, S. (2003). Is There a Glass Ceiling in Sweden? *Journal of Labor Economics*, *21(1)*(21), 145–177.

Antonczyk, D., Fitzenberger, B., & Sommerfeld, K. (2010). Rising Wage Inequality, the Decline of Collective Bargaining, and the Gender Wage Gap. *IZA Discussion Papers 4911, Institute for the Study of Labor (IZA*.

Arulampalam, W., Booth, A. L., & Bryan, M. L. (2007). Is There a Glass Ceiling over Europe? Exploring the Gender Pay Gap across the Wage Distribution. *Industrial and Labor Relations Review*, *60*, 163–186.

Baron, J. D., & Cobb-Clark, D. A. (2009). Occupational Segregation and the Gender Wage Gap in Private- and Public-Sector Employment: A Distributional Analysis. *The economic record*, *86*, 227-246.

Beblo, M., & Wolf, E. (2003). Sind es die Erwerbsunterbrechungen? Ein Erklärungsbeitrag zum Lohnunterschied zwischen Frauen und Männern in Deutschland. *Mitteilungen aus der Arbeitsmarkt- und Berufsforschung*, *4*, 560-572.

Becker, G. (1971). *Economics of Discrimination*. Chicago: University Press.

Becker, G. S. (1985). Human Capital, Effort, and the Sexual Division of Labor. *Journal of Labor Economics*, *3*, 33-58.

Berger, P. L. (1986). *The capitalist revolution: fifty propositions about prosperity, equality, and liberty*. Basic Books.

Bergmann, B. R. (1971). The Effect on White Incomes of Discrimination in Employment. *Journal of Political Economy*, *79 (2)*, 294–313.

Bergmann, B. R. (1974). Occupational Segregation, Wages and Profits When Employers Discriminate by Race or Sex. *Eastern Economic Journal*, *1*(2), 103–110.

Blinder, A. S. (1973). Wage Discrimination: Reduced Form and Structural Estimates. *The Journal of Human Resources*, *8*(4), 436.

Bonke, J., Datta Gupta, N., & Smith, N. (2005). Timing and Flexibility of Housework and Men and Women's Wages [IZA Discussion Papers]. *Contributions to Economic Analysis*, *271*, 43–78.

Booth, A. L. (1985). The Free Rider Problem and a Social Custom Model of Trade Union Membership. *Quarterly Journal of Economics*, *100(1)*, 253–261.

Bryan, M., & Sevilla-Sanz, A. (2010). Does housework lower wages? Evidence for Britain. *Oxford Economic Papers*, *63(1)*, 187–210.

Cameron, C., & Trivedi, P. (2005). *Micoroeconometrics: Methods and Applications*. Cambridge University Press, New York.

Cameron, C., & Trivedi, P. (2009). *Microeconometrics using STATA*. Stata Press, College Station, Texas.

Chatterji, M., Mumford, K., & Smith, P. N. (2007). *The Public-Private Sector Gender Wage Differential: Evidence from Matched Employee-Workplace Data* (IZA Discussion Paper No. 3158). Institute for the Study of Labor (IZA).

De Jong Gierveld, J., & Van Tilburg, T. (2010). The De Jong Gierveld short scales for emotional and social loneliness: tested on data from 7 countries in the UN generations and gender surveys. *European Journal of Ageing*, *7*, 121–130.

Drolet, M., & Mumford, K. (2009). The Gender Pay Gap for Private Sector Employees in Canada and Britain. *IZA Discussion Paper, 3957.*.

Edgeworth, F. Y. (1922). Equal Pay to Men and Women for Equal Work. *Economic Journal*, *32 (128)*, 431–457.

Fitzenberger, K. K., B., & Lembcke, A. C. (2008). Union Density and Varieties of Coverage: The Anatomy of Union Wage Effects in Germany. *ZEW Discussion Paper*, 8–12.

Gardeazabal, J. (2005). Gender wage discrimination at quantiles. *Journal of Population Economics*.

Gartner, H., & Stepahan, G. (2004). How Collective Contracts and Works Councils reduce the Gender Wage Gap. *IAB discussion paper, No. 7*.

Gernandt, J., & Preiffer, F. (2007). Rising wage inequality in Germany. *Journal of Economics and Statistics*, *227*, 358-380.

Hanel, B., & Riphahn, R. (2011). The Employment of Mothers: Recent Developments and Their Determinants in East and West Germany. *IZA Discussion Paper No. 5752, Bonn*.

Hardin, J. W., & Hilbe, J. (2007). *Generalized linear models and extensions*. Stata Press.

Hersch, J. (2009). Home production and wages: evidence from the American Time Use Survey. *Review of Economics of the Household*, *7*, 159-178.

Hersch, J., & Stratton, L. (1994). Housework, wages, and the division of housework time for employed spouses. *American Economic Review (Papers and Proceedings)*, *84(2)*, 120–125.

Hersch, J., & Stratton, L. (2002). Housework and wages. *Journal of Human Resources*, *37(1)*, 217–229.

Hirsch, B., & Konietzko, T. (2011). *The effect of housework on wages in Germany: No impact at all* (Tech. Rep.). Friedrich-Alexander-University Erlangen-Nuremberg, Chair of Labour and Regional Economics, Discussion Paper No. 74.

Inglehart, R., & Welzel, C. (2005). *Modernization, Cultural Change, And Democracy: The Human Development Sequence*. Cambridge University Press.

Jan, B. (2008). The Blinder-Oaxaca decomposition for linear regression models. *The Stata Journal*, *8(4)*, 453-479.

Jolly, R. D. (1975). Mannosidosis of Angus Cattle: a prototype control program for some genetic diseases. *Advances in Veterinary Science and Comparative Medicine*, *19*, 1–21.

Jose A. F. Machado, R. K. (1999). Goodness of Fit and Related Inference Processes for Quantile Regression. , *94*(448), 1296–1310.

Kalina, T., & Weinkopf, C. (2006). Mindestens sechs Millionen Niedriglohnbeschäftigte in Deutschland – welche Rolle spielen Teilzeitbeschäftigung und Minijobs. *IAT Report 2006-03, Gelsenkirchen 2006*.

Keith, K., & Malone, P. (2005). Housework and the wages of young, middleaged, and older workers. *Contemporary Economic Policy*, *23(2)*, 224–241.

Koenker, R. (2005). *Quantile regression*. Cambridge University Press.

Koenker, R., & Bassett., G. (1978). Regression Quantiles. *Econometrica*, *46*, 33-50.

Koenker, R., & Machado, J. (1999). Goodness of fit and related inference processes for qantile regression. *Journal of the American Statistical Association*, *94*, 1296–1310.

Kohn, K., & Lembcke, C., A. (2007). Wage Distributions by Bargaining Regime: Linked Employer-Employee Data Evidence from Germany. *IZA Discussion Paper No. 2849*.

Kulmiz, L. v. (1999). *Die geringere Entlohnung weiblicher Arbeitnehmer, Lohndifferenzierung oder Lohndiskriminierung?* Shaker.

Lesthaeghe, R., & Neels, K. (2002). From the First to the Second Demographic Transition: An Interpretation of the Spatial Continuity of Demographic Innovation in France, Belgium and Switzerland. *European Journal of Population*, *18*, 325–360.

Lorenz, W. (1988). *Geschlechtsspezifische Einkommensdifferenzen und Diskriminierung*. Hannover UniversitÃt.

McLennan, M. (2000). Does household labour impact market wages? *Applied Economics*, *32(12)*, 1541–1557.

Melly, B. (2007). *Rqdeco: a Stata module to decompose differences in distribution* (Tech. Rep.). University St. Gallen.

Mincer, J., & Ofek, H. (1982). Interrupted Work Careers: Depreciation and Restoration of Human Capital. *Journal of Human Resources*, *17*(1), 3–24.

Moris, T. (2011). The Gender Wage Gap among recent European Graduates. *AlmaLaurea Working Papers*, *32*.

Oaxaca, R. (1973). Male-Female Wage Differentials in Urban Labor Markets. *International Economic Review*, *14*(3), 693–709.

Phelps, E. S. (1972). The Statistical Theory of Racism and Sexism. *American Economic Review*, *62*(4), 659–61.

Reich, M. (1981). *Racial Inequality: A Political-Economic Analysis*. Princeton University Press.

Rogers, A. (2001). Least Absolute Deviations Regression under Nonstandard Conditions. *Econometric Theory*, *17(4)*, 820–852.

Schnabel, C., & Wagner, J. (2007). The Persistent Decline in Unionization in Western and Eastern Germany, 1980-2004: What Can We Learn from a Decomposition Analysis? *Industrielle Beziehungen*, *49*, 118–132.

Schnabel, Z. S., C., & Kohaut, S. (2005). Collective bargaining structure and its determinants. An empirical analysis with British and German establishment data. *IAB discussion paper, No. 2005,16*.

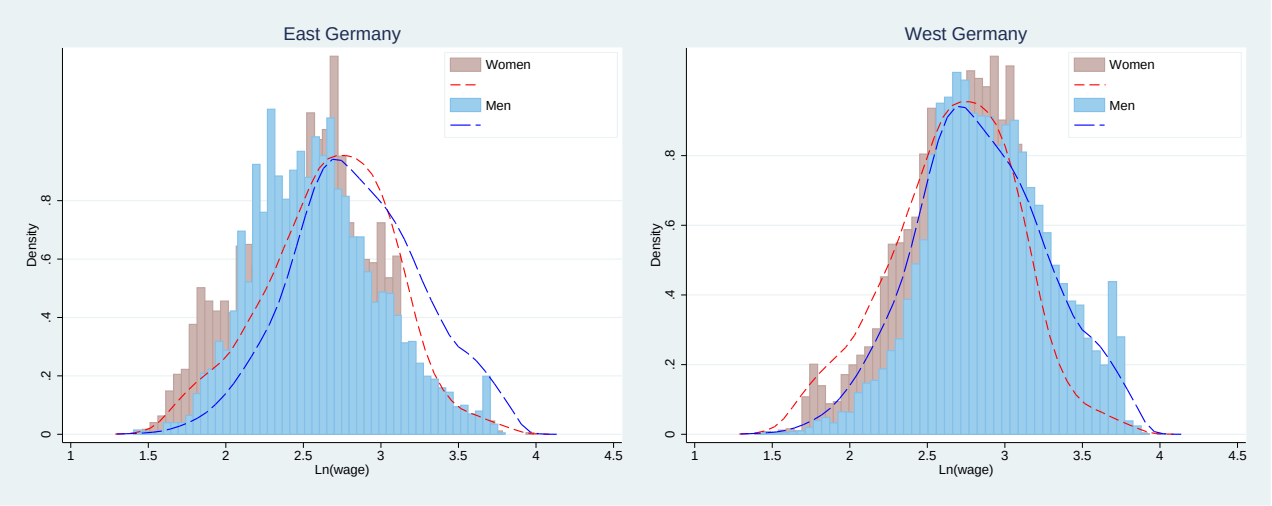
Wooldridge, J. M. (2002). *Econometric analysis of cross section and panel data*. MIT Press.

Ziegler, A. (2005). Handbuch zur wirtschaftlichen und sozialen Situation von Frauen. In S. Bothfeld, U. Klammer, C. Klenner, S. Leiber, A. Thiel, & A. Ziegler (Eds.), (pp. 241–306). Hans Bökler Stiftung, edition sigma, Berlin.

Appendix

A Graphs

Graph 1: Kernel density for wages



B Tables

Table 2: Respondents under the lowest quantiles of the income distribution

	East Germany		West Germany	
τ	Male	Female	Male	Female
10%	2.08	1.91	2.41	2.21
N	419	350	1974	978
25%	2.29	2.19	2.61	2.47
N	1041	852	4784	2448

Table 2: Definition of Variables and Descriptive statistics

		East Germany				West Germany			
		Males		Females		Males		Females	
Variable Indicator	Definition	μ	σ	μ	σ	μ	σ	μ	σ
wage	monthly gross pay (ef21) additional payments (ef22+ef23) divided by the working hours in October (ef19) + overtime (ef20)	14.51	6.59	13.47	5.66	19.61	8.14	16.41	6.40
lnwage	log of the wage variable	2.59	0.41	2.52	0.42	2.89	0.40	2.72	0.39
ten	working period at the current employer (2006-ef12u2)	9.72	9.39	12.87	9.85	11.54	9.42	11.74	9.53
exp	(age-educ)	22.65	8.58	23.91	7.92	22.59	8.44	21.95	9.56
age	(2006 - ef11)	41.55	8.13	42.87	7.57	41.42	7.75	40.87	8.53
educ	years of schooling (ef16u2) + 7	18.89	3.03	18.96	3.02	18.82	3.47	18.90	3.60
scmen	% of males at the working place (bef11)	70.60	23.24	35.88	24.84	70.19	21.32	43.97	22.59
N of observations		4 201		3 472		19 695		9 919	

C Syntax Files

```
        R 2.15.0
        getwd()
setwd("C:/Users/george.adamov/Desktop/R/workingdir")

        install.packages("quantreg")
install.packages("prettyR")
install.packages("fitdistrplus")
install.packages("psych")
install.packages("CTT")
install.packages("xtable")
install.packages("likelihood")

        load("GSES.RData")
attach(GSES)
options(digits=4)
na.strings=c(".", "9", "99")

        library(prettyR)
library(car)
library(lme4)
library(quantreg)
library(fitdistrplus)
library(psych)
library(CTT)
library(xtable)
library(foreign)

        GSES1<-GSES[c(-49)]

        keeping just employees
attach(GSES)
GSES<-subset(GSES, !(ef17==3 | ef17==4 | ef17==5))
attach(GSES)
GSES<-subset(GSES, !(ef11<=1950 | ef11>=1981))
attach(GSES)
GSES<-subset(GSES, !(ef18<30))
attach(GSES)
GSES<-subset(GSES, !(ef19>300))
attach(GSES)

        femalesave
female <-ifelsse(ef10==2,1,0)
female<-factor(female)

        lnwage
```

```
wage <-((ef21+ef22+ef23)/(ef19+ef20))
wage<-subset(wage, (!(wage<4)))
attach(GSES)
lnwage<-log(wage)

                education edu
install.packages("car")
library("car")
edu <-recode(ef16u2, "1=9; 2=11; 3=13;4=15; 5=16; 6=19")
educ <-(edu+7)
edu<-factor(educ)

                age + exp + ten
age <-(2006 - ef11)
exp <-(age-educ)
ten<-(2006-ef12u2)
ten<-recode(ten, "-1=0")

                tarifart - dummies
library("car")
tarif<-recode(tarifart, "9=0")
cc<-ifelse(tar==1,1,0)
cc<-factor(cc)
fc<-ifelse(tar==2,1,0)
fc<-factor(fc)

                crowding
scmen<-b.ef11

                GSES<-data.frame(GSES,lnwage,wage,female,ten,exp,age,educ,cc,fc,tarif)
GSES<-data.frame(GSES,scmen)
save.image("GSES.RData")

                Tables

                descriptive statistics
EASTfemalemaleWESTfemalemale
GSESEf<-subset(GSES, !(region==1 | female==0))
GSESEm<-subset(GSES, !(region==1 | female==1))
GSESWf<-subset(GSES, !(region==2 | female==0))
GSESWm<-subset(GSES, !(region==2 | female==1))

                x<-rbind(describe(GSESEm[,c(35,34,37,38,39,40,43)])[,c(3,4)],
describe(GSESEf[,c(35,34,37,38,39,40,43)])[,c(3,4)],
describe(GSESWm[,c(35,34,37,38,39,40,43)])[,c(3,4)],
describe(GSESWf[,c(35,34,37,38,39,40,43)])[,c(3,4)])
xtable(x)

                GSESEm<-subset(GSES, !(region==1 | female==0))

                WEST
```

describequantile for all
quantile(mlnwage)
describie(mlnwage)
mlnwagee<-subset(lnwage, female==0region==2)
flnwagee<-subset(lnwage, female==1region==2)
mlnwagew<-subset(lnwage, female==0region==1)
flnwagew<-subset(lnwage, female==1region==1)
x<-quantile(mlnwage$_e$, c(.1, .25)).5, .75, .90))
$cdescribe(quantile(mlnwage_e, c(.1, .25)))$

m0lnwagee<-subset(lnwage, female==0region==2tarif==0)
f0lnwagee<-subset(lnwage, female==1region==2tarif==0)
m0lnwagew<-subset(lnwage, female==0region==1tarif==0)
f0lnwagew<-subset(lnwage, female==1region==1tarif==0)

m1lnwagee<-subset(lnwage, female==0region==2tarif==1)
f1lnwagee<-subset(lnwage, female==1region==2tarif==1)
m1lnwagew<-subset(lnwage, female==0region==1tarif==1)
f1lnwagew<-subset(lnwage, female==1region==1tarif==1)

m2lnwagee<-subset(lnwage, female==0region==2tarif==2)
f2lnwagee<-subset(lnwage, female==1region==2tarif==2)
m2lnwagew<-subset(lnwage, female==0region==1tarif==2)
f2lnwagew<-subset(lnwage, female==1region==1tarif==2)

Table Appendix low income
q1me<-subset(mlnwage$_e$, !($mlnwagee > 2.089$))
$describe(q1me)$
$q1fe < -subset(flnwagee, !(flnwagee > 1.91))$
$q1mw < -subset(mlnwagew, !(mlnwagew > 2.41))$
$q1fw < -subset(flnwagew, !(flnwagew > 2.21))$

q2me<-subset(mlnwagee, !(mlnwagee > 2.29))
q2fe<-subset(flnwagee, !(flnwagee > 2.19))
q2mw<-subset(mlnwagew, !(mlnwagew > 2.61))
q2fw<-subset(flnwagew, !(flnwagew > 2.47))

Crowding
mlnwageec<-subset(lnwage, female==0region==2crow<=70)
flnwageec<-subset(lnwage, female==1region==2crow<=70)
mlnwagewc<-subset(lnwage, female==0region==1crow<=70)
flnwagewc<-subset(lnwage, female==1region==1crow<=70)

pdf(file="crowd300.pdf", width=8, height=4.0)
opar<-par(no.readonly=TRUE)
par(pin=c(2.4,1.8), mfrow=c(1,2))
n=length(mlnwageec)
plot((1:n-1)/(n-1),sort(mlnwageec),type="l", lwd=3,col="blue",
main="East Germany",xlab="Percentiles", ylab="Log Wages")
s=length(flnwageec)

```
lines((1:s-1)/(s-1),sort(flnwageec),type="l", lwd=3,col="red")
abline(h=c(2.5), lwd=1.5, lty=2, col="gray")
legend("topleft",inset=0.05, lty=c(1,1), c("Males", "Females"), col=c("blue", "red"))

                n=length(mlnwagewc)
plot((1:n-1)/(n-1),sort(mlnwagewc),type="l", lwd=3,col="blue",
main="West Germany",xlab="Percentiles", ylab="Log Wages")
s=length(flnwagewc)
lines((1:s-1)/(s-1),sort(flnwagewc),type="l", lwd=3,col="red")
abline(h=c(2.5), lwd=1.5, lty=2, col="gray")
dev.off()

                GRAPHS
                pdf(file="1uncond.pdf", width=8, height=4.0)
opar<-par(no.readonly=TRUE)
par(pin=c(2.4,1.8), mfrow=c(1,2))
n=length(mlnwagee)
plot((1:n-1)/(n-1),sort(mlnwagee),type="l", lwd=3,col="blue",
main="East Germany",xlab="Percentiles", ylab="Log Wages")
s=length(flnwagee)
lines((1:s-1)/(s-1),sort(flnwagee),type="l", lwd=3,col="red")
abline(h=c(2.5), lwd=1.5, lty=2, col="gray")
legend("topleft",inset=0.05, lty=c(1,1), c("Males", "Females"), col=c("blue", "red"))
                n=length(mlnwagew)
plot((1:n-1)/(n-1),sort(mlnwagew),type="l", lwd=3,col="blue",
main="West Germany",xlab="Percentiles", ylab="Log Wages")
s=length(flnwagew)
lines((1:s-1)/(s-1),sort(flnwagew),type="l", lwd=3,col="red")
abline(h=c(2.5), lwd=1.5, lty=2, col="gray")
dev.off()

                nobarg
pdf(file="2uncondnobarg.pdf", width=8, height=4.0)
opar<-par(no.readonly=TRUE)
par(pin=c(2.4,1.8), mfrow=c(1,2))
n=length(m0lnwagee)
plot((1:n-1)/(n-1),sort(m0lnwagee),type="l", lwd=3,col="blue",
main="East Germany",xlab="Percentiles", ylab="Log Wages")
s=length(f0lnwagee)
lines((1:s-1)/(s-1),sort(f0lnwagee),type="l", lwd=3,col="red")
abline(h=c(2.5), lwd=1.5, lty=2, col="gray")
legend("topleft",inset=0.05, lty=c(1,1), c("Males", "Females"), col=c("blue", "red"))

                n=length(m0lnwagew)
plot((1:n-1)/(n-1),sort(m0lnwagew),type="l", lwd=3,col="blue",
main="West Germany",xlab="Percentiles", ylab="Log Wages")
s=length(f0lnwagew)
lines((1:s-1)/(s-1),sort(f0lnwagew),type="l", lwd=3,col="red")
abline(h=c(2.5), lwd=1.5, lty=2, col="gray")
dev.off()
```

```
                colbarg
pdf(file="3uncondcolbarg.pdf", width=8, height=4.0)
opar<-par(no.readonly=TRUE)
par(pin=c(2.4,1.8), mfrow=c(1,2))
n=length(m1lnwagee)
plot((1:n-1)/(n-1),sort(m1lnwagee),type="l", lwd=3,col="blue",
main="East Germany",xlab="Percentiles", ylab="Log Wages")
s=length(f1lnwagee)
lines((1:s-1)/(s-1),sort(f1lnwagee),type="l", lwd=3,col="red")
abline(h=c(2.5), lwd=1.5, lty=2, col="gray")
legend("topleft",inset=0.05, lty=c(1,1), c("Males", "Females"), col=c("blue", "red"))

                n=length(m1lnwagew)
plot((1:n-1)/(n-1),sort(m1lnwagew),type="l", lwd=3,col="blue",
main="West Germany",xlab="Percentiles", ylab="Log Wages")
s=length(f1lnwagew)
lines((1:s-1)/(s-1),sort(f1lnwagew),type="l", lwd=3,col="red")
abline(h=c(2.5), lwd=1.5, lty=2, col="gray")
dev.off()

                sectorbarg
pdf(file="sectorbarg.pdf", width=8, height=4.0)
opar<-par(no.readonly=TRUE)
par(pin=c(2.4,1.8), mfrow=c(1,2))
n=length(m2lnwagee)
plot((1:n-1)/(n-1),sort(m2lnwagee),type="l", lwd=3,col="blue",
main="East Germany",xlab="Percentiles", ylab="Log Wages")
s=length(f2lnwagee)
lines((1:s-1)/(s-1),sort(f2lnwagee),type="l", lwd=3,col="red")
abline(h=c(2.5), lwd=1.5, lty=2, col="gray")
legend("topleft",inset=0.05, lty=c(1,1), c("Males", "Females"), col=c("blue", "red"))

                n=length(m2lnwagew)
plot((1:n-1)/(n-1),sort(m2lnwagew),type="l", lwd=3,col="blue",
main="West Germany",xlab="Percentiles", ylab="Log Wages")
s=length(f2lnwagew)
lines((1:s-1)/(s-1),sort(f2lnwagew),type="l", lwd=3,col="red")
abline(h=c(2.5), lwd=1.5, lty=2, col="gray")
dev.off()

                pdf(file="graph.pdf", width=8, height=4.0)
par(pin=c(3,2),mfrow=c(1,2))
plot(EWQ,mfrow=c(1,1), pch=15, lty=1, lwd=4,col="grey")
plot(WWQ,mfrow=c(1,1), pch=17, lty=2, lwd=4,col="black")
dev.off

                opar<-par(no.readonly=TRUE)
plot(EQR,mfrow=c(1,1), pch=17, lty=2, lwd=4,col="black")

                malee<-subset(male, (!(region==1)))
```

QUANTILE REGRESSION RESULTS PLOTS

malee<-subset(male, (!(region==1))
EQR<-rq(lnwage educ++exp+ten+cc+fc+scmen+malee, tau = c(0.05, 0.25, 0.5, 0.75, 0.95)
,data=EGSES)

pdf(file="eastgap.pdf", width=8, height=4)
plot(eastg,mfrow=c(1,1), type="l", lty=2, lwd=4, col="red", main="East Germany")
title(sub="Percentiles", ylab="Gender Wage Gap")
dev.off()

malew<-subset(male, (!(region==2)))
WQR<-rq(lnwage educ++exp+ten+cc+fc+b.ef12+malew, tau = c(0.05, 0.25, 0.5, 0.75, 0.95)
,data=WGSES)

pdf(file="eastwagegap.pdf", width=8, height=4)
plot(east,mfrow=c(1,1), type="l", lty=2, lwd=4, col="blue", main="West Germany")
title(sub="Percentiles", ylab="Gender Wage Gap")
dev.off()

models
modelQuant<-summary(rq(lnwage female+educ++exp+ten+cc+fc+b.ef12, tau = c(0.1,
0.25, 0.5, 0.75, 0.9)))

modelQuantE<-summary(rq(lnwage female+educ+ten+exp+cc+fc+scmen, tau = c(0.1,
0.25, 0.5, 0.75, 0.90)),data=GSES, region==1)
modelQuantW<-summary(rq(lnwage female+educ+ten+exp+cc+fc+scmen, tau = c(0.1, 0.25, 0.5, 0.75,
0.90)),data=GSES, region==2)

model<-lnwage female+educ+exp+ten+cc+fc+scmen
model1<-lnwage male + educ+ten+exp+cc+fc+scmen

install.packages("likelihood")

iquant<-vgam(eq, family=amlpoisson(w.aml=c(0.1,0.25,0.5,0.75,0.9)), data=GSES, trace=T)

male
female2 <-ifelse(ef10==1,1,0)
female2<-factor(female2)

rq(model, tau = c(0.1, 0.25, 0.5, 0.75, 0.9), data=GSES, region==2)

just females
eastg<-rq(model1, tau = c(0.1, 0.25, 0.5, 0.75, 0.90), data=GSES, region==2)
west<-rq(model1, tau = c(0.1, 0.25, 0.5, 0.75, 0.90), data=GSES, region==1,ef10==2)

vspace1.5cm
STATA 12.1

eststo: sqreg lnwage female educ ten exp cc fc scmen if region==2, q(.1 .25 .50 .75 .90) reps(20)

```
        esttab, b(a3) p(3) r2(3)
eststo clear

        oaxaca lnwage educ ten exp cc fc if region==1, by(female) noisily

        *****FEMALE*****
generate female1 = ef10
recode female1 (1=0) (2=1)

        cdeco lnwage educ ten exp cc fc scmen if region==2, by(female1) q(.1 .25 .50 .75 .90) vce(b)
reps(20)

        graph twoway (histogram lnwage if female1==1, bin(50) lcolor(erose)
fi(inten80) fcolor(erose) ) (histogram lnwage if female1==0, bin(50)
lcolor(eltblue) fi(inten80) fcolor(eltblue) ) (connected densf1 evalf1,
m(i) lp(dash) lw(medium) lc(red) ) (connected densm1 evalm1, m(i)
lp(longdash) lw(medium) lc(blue) ) , ytitle("Density")
ylabel(0.0 0.2 0.4 0.6 0.8) xlabel(1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5)
xtitle("Log(wage)") legend(ring(0) pos(2) col(1) lab(1 "Women")
lab(2 "Men") lab(3 " ") lab(4 " ") order(1 3 2 4) region(lstyle(none))
symxsize(8) keygap(1) textwidth(25) )
```

D Questionnaire

Anhang : Merkmalsliste des Campus-Files

Merkmal	*Inhalt*	*Bemerkung*
REGION	Region	1 = alte Bundesländer (mit Berlin) 2 = neue Bundesländer (ohne Berlin)
BETR_ID	Nummer für Betrieb	systemfrei
BES_ID	Nummer für Beschäftigten	Fortlaufend je Betrieb
WZGRUPPE	Wirtschaftsgruppe, in der Haupttätigkeitsbereich des Betriebes liegt	1 = Ernährungsgewerbe und Tabakverarbeitung; Textil- und Bekleidungsgewerbe; Ledergewerbe 2 = Verarbeitendes Gewerbe ohne Ernährungsgewerbe, Tabakverarbeitung, Textil- und Bekleidungsgewerbe, Ledergewerbe 3 = Energie- und Wasserversorgung 4 = Baugewerbe 5 = Handelsvermittlung und Großhandel; Einzelhandel; Reparatur von Gebrauchsgütern; Kraftfahrzeughandel; Instandhaltung und Reparatur von Kraftfahrzeugen; Tankstellen 6 = Gastgewerbe 7 = Verkehr; Nachrichtenübermittlung 8 = Kreditgewerbe; Versicherungsgewerbe; Mit dem Kredit- und Versicherungsgewerbe verbundene Tätigkeiten 9 = Grundstücks- und Wohnungswesen; Vermietung beweglicher Sachen ohne Bedienungspersonal; Erbringung von sonstigen Dienstleistungen überwiegend für Unternehmen; Gesundheits- und Veterinärwesen; Sozialwesen; Abwasser- und Abfallbeseitigung und sonstige Entsorgung; Interessenvertretungen sowie kirchliche und sonstige Vereinigungen; Kultur, Sport und Unterhaltung; Erbringung von sonstigen Dienstleistungen 10 = Erziehung und Unterricht
EF9	Leistungsgruppe	0 = keine Angabe 1 = Leitende Arbeitnehmer 2 = angelernter Arbeiter 3 = Arbeitnehmer mit besonderen Erfahrungen 4 = Arbeitnehmer ohne eigene Entscheidungsbefugnis

		5 = Arbeitnehmer in einfacher Tätigkeit
EF10	Geschlecht	1 = männlich 2 = weiblich
EF11	Geburtsjahr	1989 = 1989 und später 1946 = 1946 und früher
EF12U2	Jahr des Eintritts in das Unternehmen	1960 = 1960 und früher
BERUF	Berufsgruppe	1 = Pflanzenbauer, Tierzüchter, Fischereiberufe (KdB 01 – 06) 2 = Bergleute, Mineralgewinner; Herstellung und Verarbeitung von Stein, Baustoff, Keramik, Glas, Kunststoff, Papier, Holz und Metall (KdB 07 – 24) 3 = Schlosser, Mechaniker, Montierer, Elektriker, Maschinisten (KdB 25 – 32 + 54) 4 = Textil- und Ernährungsberufe (KdB 33 – 43) 5 = Bau- und Raumausstattungsberufe (KdB 44 – 50) 6 = Warenprüfer, Versandfertigmacher; Lager- und Transportarbeiter (KdB 52 + 74) 7 = Ingenieure / Naturwissenschaftler (KdB 60 + 61) 8 = Techniker / Technische Sonderfachkräfte (KdB 62 + 63) 9 = Warenkaufleute (KdB 68) 10 = Dienstleistungskaufleute (KdB 69 + 70) 11 = Berufe des Verkehrs und Nachrichtenwesens (KdB 71 + 73) 12 = Unternehmer, Abgeordnete u. ä. (KdB 75 + 76) 13 = Rechnungskaufleute; Datenverarbeitungsfachleute (KdB 77) 14 = Bürokräfte (KdB 78) 15 = Ordnungs-/Sicherheitsberufe (KdB 79-81) 16 = Publizisten, Künstler u. ä. (KdB 82 + 83) 17 = Gesundheitsdienstberufe; Sozial- und Erziehungsberufe (KdB 84 – 87) 18 = Sonstige geistes- und naturwissenschaftliche Berufe (KdB 88) 19 = Allgemeine Dienstleistungsberufe

		(KdB 90 – 93) 20 = Sonstige Berufe (KdB 53, 89, 97 – 99)
EF16U1	Stellung im Beruf	0 = Auszubildende 1 = Arbeiter, nicht als Facharbeiter tätig 2 = Facharbeiter 3 = Meister, Polier 4 = Angestellter 5 = Beamter in Vollzeit 6 = Beamter in Teilzeit 7 = Heimarbeiter 8 = Teilzeit mit weniger als 18 Wochenstunden 9 = Teilzeit mit mindesten 18 Wochenstunden
EF16U2	Ausbildung	1 = Volks-/Hauptschule, mittlere Reife ohne abgeschlossene Berufsausbildung 2 = Volks-/Hauptschule, mittlere Reife mit abgeschlossener Berufsausbildung 3 = Abitur ohne abgeschlossene Berufsausbildung 4 = Abitur mit abgeschlossener Berufsausbildung 5 = Abschluss einer Fachhochschule 6 = Hochschulabschluss 7 = unbekannt, Angabe nicht möglich
EF17	Art des Arbeitsvertrages	1 = unbefristet 2 = befristet ohne Auszubildende und Praktikanten 3 = Ausbildungsvertrag 4 = Altersteilzeit 5 = geringfügig Beschäftigte 6 = Beamte
EF18	Arbeitsvertraglich vereinbarte wöchentliche Arbeitszeit	
EF19	Bezahlte Stunden Insgesamt	
EF20	Bezahlte Mehrarbeitsstunden	
EF21	Bruttoverdienst Insgesamt im Berichtsmonat in Euro	7000 = 7000 Euro und mehr
EF22	Verdienst aus Mehrarbeitszeit in Prozent von EF21	
EF23	In Monatsverdienst enthaltene Zulagen für Schicht- / Nacht- und Sonntagsarbeit in Prozent von EF21.	
EF24	Lohnsteuer incl. Solidaritäts-	

	zuschlag ohne Kirchensteuer in Prozent von EF21	
EF25	Beiträge der Arbeitnehmer zur Sozialversicherung in Prozent von EF21	
EF26	Sozialversicherungspflichtige Arbeitstage im Berichtsjahr	
EF27	Bruttojahresverdienst Insgesamt in Euro	84000 = 84000 Euro und mehr
EF28	Sonderzahlungen für das ganze Jahr in Prozent von EF27	
EF29	Urlaubsanspruch für das Berichtsjahr	
EF36	Grundlage der Urlaubstageberechnung	4 = 4-Tage-Woche 5 = 5-Tage-Woche 6 = 6-Tage-Woche 7 = 7-Tage-Woche
EF44	Nettomonatsverdienst in Prozent von EF21	
TARIFART	Art des Tarifvertrages	0 = kein Tarifvertrag 1 = Kollektivtarifvertrag 2 = Firmentarifvertrag oder Betriebsvereinbarung 9 = unbekannt oder keine Angabe
B_EF13	Beschäftigtengrößenklassen des Betriebes	1 = 0 bis 19 2 = 20 bis 49 3 = 50 bis 99 4 = 100 bis 249 5 = 250 bis 499 (West) 6 = 500 und mehr (West) 56 = 250 und mehr (Ost)
B_EF11	Anteil der männlichen Beschäftigten des Betriebes in Prozent	
B_EF12	Anteil der weiblichen Beschäftigten des Betriebes in Prozent	
B_EF30	Hochrechnungsfaktor der Betriebe	Neuberechnung
B_EF31	Hochrechnungsfaktor der Arbeitsnehmer	Neuberechnung