Personnel Policy and the Gender Wage Gap within German Firms

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------- Very preliminary version !! ----------

Abstract

The innovation of this research is twofold. First, this paper provides the first approach to assess the impact of organisational changes fostering employee involvement, performance related pay schemes and other relevant trends in personnel policy on the gender wage gap in Germany. Second, our approach is based on the *within-firm* gender wage differentials. To investigate the theoretical hypotheses regarding the effect of selected human resource measures on wage inequality, we calculate a firm-specific gender wage gap accounting for differences in individual characteristics. The results based on the German LIAB data indicate, that innovative human resource management tend to limit the wage differential between men and women.

JEL Classification: J16 and J31

Keywords: gender wage gap; within-firms wage differentials, organizational change, performance-related pay systems.

Non-technical summary

The „unexplained" part of the measured gender wage gap (GWG) is often interpreted as discrimination and taken for granted. This reading ignores, however, that managers and supervisors are no isolated individuals who act detached from their social environment. In contrast, individuals deciding on wage rates are part of an organisation aspiring a specific goal and defining rather strict rules and norms of collaboration. Furthermore, the in-plant culture always operates under the influence of actual social norms and trends. Hence, managing a firm requires an overall concept of how processes should work and how people should interact among each other and within the courses of action. This also implies that firms are no sex-neutral organizations. Looking closely at the design of work and decision processes, pay systems, internal qualification activities and firm philosophy may reveal the firm's image of male and female employees and its attitude towards gender equality.

Although changes in the work organisation during the last decades are diverse and difficult to summarize by a few key concepts, employee involvement and monetary incentive systems tend to be the most pervasive changes in modern personnel management. In this study, we will therefore focus on whether men and women are differently affected by these innovative human resource practices and payment schemes, that is, whether the firm-specific GWG varies between adopters and non-adopters.

The innovation of this research is twofold. First, this paper provides the first approach to assess the impact of organisational changes fostering employee involvement, performance related pay schemes and other relevant trends in personnel policy on the GWG in Germany. Second, our approach is based on the *within-firm* gender wage differentials. Provided that the distribution of women among firms is not random, the results of this approach may differ tremendously from traditional analyses looking at overall wage differentials. To investigate the theoretical hypotheses regarding the effect of selected human resource measures on wage inequality, we calculate a firm-specific GWG under the assumption that male and female employees would have the same characteristics within each firm. Using this measure as dependent variable in the second step, we can determine the impact of selected firm characteristics and personnel policy measures on the wage inequality within firms using regression analyses.

The empirical analysis is based on the German LIAB data, a representative linked employer-employee panel including information on all employees of firms covered by the IAB establishment survey. Consistent with our theoretical arguments, our empirical results

indicate that organisational changes fostering the participation of employees as well as incentive pay schemes limit the wage differences between men and women within the same establishments. Furthermore, we can show that establishments with a high participation rate in vocational training programs exhibit smaller GWGs. This is especially true if the female share among the participants is high.

1. Introduction

The integration of women in labor market is a longsome process. Despite the shrinking difference between men and women with respect to occupational skills, experience and labor market attachment, women still tend to earn lower wages than men. In Germany, the gender wage gap (GWG) is rather stable and amounts to 21%, that is, women earn on average 79% of male gross wage rates (EU Commission 2004). Traditionally, that wage differences between men and women are assigned to either differences in individual characteristics or differences in remuneration. Which part of the raw wage gap can be attributed to the so-called endowment effect strongly depends upon the population under consideration, the available information on labor-market relevant characteristics as well as the econometric approach. The empirical results ranges from 8,6% for labor market entrants (Kunze 2002) to 60%, resulting from a fixed-effects model where the qualification level and the industry sector drop out due to time invariance (Beblo and Wolf 2003).

The „unexplained" part of the measured GWG is often interpreted as discrimination and taken for granted. According to Becker (1957), the disparate remuneration of men and women is driven by an inherent taste for discrimination by employers, be it due to their own preferences or their expectations respectively knowledge of their employee's and customer's preferences. This reading ignores, however, that managers and supervisors are no isolated individuals who act detached from their social environment. In contrast, individuals deciding on wage rates are part of an organisation aspiring a specific goal and defining rather strict rules and norms of collaboration. Furthermore, the in-plant culture always operates under the influence of social norms and trends. Managing a firm requires an overall concept of how processes should work and how people should interact among each other and within the courses of action. While some firms are embossed by authority and limited trust in employees, others tend to allow more scope for decisions and exploit economic behavior (incentives). This also implies that firms are no sex-neutral organizations (see e.g. Baron 1984; Acker 1990, 1992). Looking closely at the design of work and decision processes, pay systems, internal qualification activities and firm philosophy often reveals the firm's image of male and female employees and its attitude towards gender equality. In this study, we will therefore focus on whether men and women are differently affected by selected human resource practices and specific features of firm policy. Apart from Bauer and Bender (2001)

as well as Datta Gupta and Erikkson (2006), we are not aware of any other study looking at the effect of new workplace practices on the distribution of wages within firms.

Although changes in the work organisation during the last decades are diverse and difficult to summarize by a few key concepts, there has emerged an agreement that employee involvement and monetary incentive systems represent the most pervasive changes in modern personnel management (Delery and Doty, 1996; Appelbaum et al., 2000; Godard, 2004). Even if the percentage of workplaces reporting selected management initiatives are somewhat higher in other European countries – especially in Sweden and the United Kingdom – about one third of the establishments with 50 and more employees have flattened the management structures between 1993 und 1996. Team-based work organization and involvement of lower level employees is used by about 20% of the workplaces (OECD 1999). An impressive body of theoretical literature claims that establishments can gain structural competitive advantages and create additional value by increasing employee involvement and offering financial incentives to their employees (Becker and Gerhart, 1996; Huselid, Jackson and Schuler, 1997; Ichniowski, Shaw and Prennushi, 1997; Appelbaum et al., 2000, Black and Lynch 2001, 2004). Considering the importance of these organizational changes, we will extend the existing literature by assessing the effect on the firm-specific GWG in Germany.

The reorganisation of work – away from a task-specialized structure towards a more task-integrated organizational structure – often evokes the need for *additional* vocational training (Black and Lynch 1998). Apart from that, the exigency for *continuous* training permanently increases due to the fast and ongoing technological change. At first, the unremitting depreciation of human capital accumulated during vocational training diminishes initial differences in human capital endowment between male and female employees. Whether women may get the opportunity to adapt to the technological and organisational changes and catch up with their male colleagues depends upon the training program of their firm. Our aim in this paper is to investigate whether in-plant training programs and the share of female participation have a positive effect on the within-firm GWG or whether continuous training is less accessible to women and hence increases gender inequality.

Finally, we state an increasing social and political alertness for the disadvantages of women in the labor market. In Germany, for instance, the government and the central associations of the German industry agreed on a convention to foster equal opportunities of women and men in the private sector („Vereinbarung zu Förderung der Chancengleichheit von Frauen und

Männern in der Privatwirtschaft") in July 2001. This voluntary commitment includes personnel measures to force the professional opportunities of women and facilitate the reconciliation of family and work for mothers and fathers. The offers range from flexible working hours, seminars for employees who are in maternity leave to child care facilities and information centres. Also studies from other countries lead one to suppose that measures to balance work and life become more and more popular (see e.g. Evans 2001 and 2002, OECD 2003 or Fernie and Gray, 2002). In the following study, we will investigate whether the corporate accord on fostering equal opportunities of women and men in the private sector also result in lower wage differentials between men and women.

The innovation of this research is twofold. First, this paper provides the first approach to assess the impact of organisational changes fostering employee involvement, performance related pay schemes and other relevant trends in personnel policy on the GWG in Germany. Second, our approach is based on the *within-firm* gender wage differentials. International evidence shows that women concentrate in low paying jobs, firms and industries (OECD 2002, Dolado et al. 2001, Bayard et al. 2003). As a result, *within-firm* GWGs may exhibit much heterogeneity and differ from the average wage differences among men and women in the labor market. Given that the distribution of women among firms is not random, the results of our approach looking at *intra-firm* wage differences may differ tremendously from traditional analyses. To investigate the theoretical hypotheses regarding the effect of selected human resource measures on wage inequality, we calculate a firm-specific GWG under the assumption that male and female employees would have the same characteristics within each firm. Using this measure as dependent variable in the second step, we can determine the impact of selected firm characteristics and personnel policy measures on the wage inequality within firms using regression analyses.

The empirical analysis is based on the German LIAB data, a representative linked employer-employee panel including information on all employees of firms covered by the IAB establishment survey. The LIAB merges annual survey data (the IAB-establishment panel) and process generated individual data (the Employment Statistical Register of the IAB, which is based on administrative social security records). Given the rich information on the establishments in our survey, we can control for many firm-specific attributes and features, such as size, wage level, female share or qualification level of the staff as well as the institutional setting, that is, the existence of works councils or collective agreements.

The remainder of the paper is organized as follows. In the next section, we discuss some theoretical considerations regarding the diverse channels through which the GWG may be affected by personnel policy and selected firm-specific characteristics. After a discussion of our empirical approach, we describe the design and source of the data in use. Section 5 provides a rough picture of our selected observations. The estimation results are presented in Section 6. The last section concludes.

2.   How does firm policy effect male and female wages?

Given that the adoption of innovative human resource measures tend to increase productivity (see e.g. Lazear 2000, Appelbaum et al. 2000, Ichniowski, Shaw and Prennushi 1997 or Huselid 1995), it is well accepted that also the wage level corresponds to this firm policy (see e.g. Bauer and Bender 2001). Most studies ignore, however, that the effects on productivity and wages may differ by individuals, for example, by men and women. Although there is no comprehensive theory formalizing the effects of employee involvement and performance pay on the GWG, there exists various links between personnel and organizational policy and the wage structure within establishments. In the following, we will hence expound the interaction between employee involvement, performance related pay systems, vocational training and corporate agreements to foster equal opportunities of women and men in more detail.

The main principle behind all initiatives to increase the involvement of workers is to get the lower level staff more involved in the decision making and work process and to grant these employees greater autonomy and control over job tasks and methods of work (Cappelli and Rogovsky, 1994). Typical measures are teamwork, lean management, or reduced hierarchic levels (Godard, 2004). But how may increased employee involvement affect the wage differentials between men and women? First of all, decentralization gives women a formalized opportunity to play an active part in decision-making of the firm and helps to reveal their competences. Given that the need for recognition is generally more pronounced among men, this institutional speaking tube may be very beneficial for women who are intimidated by dominant male colleagues. Second, participative organisational structure improves women's co-determination with respect to the definition of work conditions and wage setting. Finally, reducing hierarchies may lead to lay-offs of parts of the middle management and functions are taken over by lower level staff. According to experimental studies of psychologists, women are more versed in multitasking, communication and team

playing (see e.g. Rubinstein, Meyer and Evans 2001) and hence may benefit from this task enrichment. In contrast to these positive effects on the position of women within their firms, there exist some evidence that teamwork and flatter hierarchies generally increase inequality among the colleagues, because it is mainly the upper part of the income distribution who benefit from these work practices (see e.g. Bauer and Bender 2001).

The establishment of flatter organisational structures and the adoption of human resource measures fostering employee involvement are usually accompanied by a shift to performance-based pay schemes. Provided that women's wages suffer from discrimination, that is, the GWG does not represent real differences in productivity, they should benefit from performance related pay systems. According to Baker et al. (1988) one can distinguish between objective and subjective performance measures. While objective performance measures, such as sales or profits, rely on quantifiable performance criteria and hence prevent disparate remuneration of men and women, subjective measures generally rely on the evaluation by supervisors and hence still provide some scope for discrimination. Compared to fixed wage rates – bargained secretly between employee and management – incentive pay systems may still limit discretion due to the increased transparency, bureaucratic rules in compensation decisions and the need of vindication by the supervisor (see e.g. Prendergast and Topel 1996). We, therefore, argue that the positive effect on the GWG holds for all incentive pay systems. The degree to which performance-related pay systems decrease the gender-specific wage rate obviously depends upon the importance of actual discrimination and the correlation between the relevant performance indicators and actual productivity. If, for instance, the wage rate is linked to parameters that are subject to factors employees can not control, such as changes in global demand or institutional changes, the gap between productivity and wage rate does not necessarily shrink and hence the GWG does not decrease either.[1] Jirjahn and Stephan (2004) show, for instance, that the GWG among German blue-collar workers is substantially lower if wages rely on piece-rates than in the time-wage regime. Our data provide only rough information on the pay system. In some years, establishments are asked whether employees may receive incentive pay in terms of shared ownership or profit sharing. Unfortunately, we do not know the amount of disbursed compensations. Apart from 2001, the share of employees participating in these pay systems is not available either. Based on the available information, we hence create different dummy variables that equal one if the establishment grants the corresponding benefit.

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[1] Apart from that, performance-related pay systems whose basis for assessment is only loosely linked with individual performance evoke little effect on motivation and future performance (see e.g. Dressler 1999, Kaschube and Rosenstiel 2000)

Despite the increasing equalization of educational degrees among men and women in Germany (see e.g. ????), human capital in terms of works experience does still differ significantly due to the unequal incidence of employment breaks, in particular family related career interruptions (Beblo and Wolf 2002, Kunze 2002). During an employment break different forces are at work that may result in future wage cuts. In principle, one can distinguish between missing experience, human capital decay and additional, productivity-related effects. Productivity-related effects may either reflect an actual drop in productivity or may be attributed to a stigma imposed by the demand side of the labor market. Participation in vocational training programs may not only help to fill the gaps in one's knowledge, but also act as a positive signal to current or future employer. Apart from that, the ongoing technological change increases the demand for continuous training. Hence, access to training activities accomplishes a key role among the human resource measures potentially reducing the GWG. In theory, there exist, however, good arguments to belief that corporate training programs are aligned with the requirements and time schedules of men. Since the firm's benefit of continuous training increases with the employee's number of working hours and his or her solidarity, firms are likely to invest more in male employees who traditionally work more hours and are less mobile (Knoke and Ishio 1998, OECD 2002). Furthermore, it is argued that education and training are complements, which is supported by the evidence that high-educated and high-wage workers are trained more (see the recent surveys of Asplund 2004, Leuven 2005 or Bassanini et al. 2005). This purely economic calculus would generate lower participation rates in training programs among women. According to the official report on training in Germany, the participation rate in vocational training among women raised from 6% in 1979 to 24% in 2003. But still men participate more in vocational training than women. Considering, however, that women are more likely to work reduced hours and that part-time workers exhibit lower participation rates than full-timers (29% vs. 36%), this result reverses if we account for differences in working hours. Among full-time employees, the participation rate in vocational training amounts to 40% for women and only 34% for men (BMBF 2006). These figures hint at the expected result that part-time workers have reduced access to further education, but that managers seem to have good reasons to invest in women – be it because they are more motivated, they generate higher positive external effects because they are more likely to share their knowledge with others or because they feel more committed to their sponsoring employer. In this paper, we will explore whether in-plant training programs and the share of

female participation help to overcome wage differences between male and female employees or not.

Even if the information on the training activities as well as the use of participative work practices and performance related pay systems represent crucial features of internal firm policy, our knowledge on the organizational structure and other human resource projects are very fragmented. It is hence straightforward to look for other observable variables which presumably correlate with firm policy. The effect of firm age is primarily analyzed with respect to gender segregation. Arguments mainly rely on the perception that new founded organizations are strongly driven by structures and practices that correspond to broad, time-specific social understandings about how an organization ought to be run (Baron 1991). Metaphorically speaking, the norms and ideals present at the time of an organization's founding are imprinted on its structure, norms and behaviour and will persist through time (Baron and Newman 1990). Hence, relatively new organizations are supposed to be more likely to integrate women in all hierarchical levels than older organizations that where founded when offering women only bad paying female-jobs was considered business as usual (see e.g. Baron, Mittman and Newman 1991 or Huffman 1999 for segregation in managerial positions). Concerning the wage structure within firms, one could argue the firms founded in times of increasing emancipation and integration of women in the labor market as well as the awareness of substantial and persistent skill gaps are less likely to discriminate against women. We will test this hypothesis by including an indicator whether the establishment is founded before or after 1990.

The most pervasive effect on the wage gap between men and women should, however, be achieved by corporate agreements to foster equal opportunities of women and men. Establishments that commit themselves to the equalization of gender are presumably more aware of discrimination work processes, pay schemes and training conditions. At most, they may draw on professional consulting to reshape their workplace such that it satisfies the requirements of specific certificates (such as the audit "BERUF & FAMILIE" in Germany). The awarding of such an official seal may depend on the working hours policy[2], the opportunity to take sabbaticals, the career opportunities of male and female employees, the (financial) support of child care facilities, the extend of gender segregation within the

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[2] In principle, flexible working hours are an effective means to help women balancing home and work responsibilities. In practice, flextime may, however, imply that employees are supposed to be available all day long. Which of the converse implications dominate, crucially depends upon the initial motive for work time flexibility and the actual implementation in the corresponding establishment. Given our limited information on the exact use of flexible work schedules, we do not analyze this question in our empirical model.

establishment or programs to help mothers or other individuals with career interruptions to integrate into employment. In any case, we expect that firms that decided to equalize the professional opportunities of men and women are more likely to implement some of these human resource measures and hence exhibit smaller wage gaps. Even if our knowledge on these commitments is restricted to two short questions in our data, we will exploit this information to test whether the wage difference between men and women corresponds to this firm policy.

3. Implementing theory in an empirical model

The empirical assessment of all these interactions between personal policy, organizational change or pay systems and the GWG within establishments require a rich data base of linked employer-employee information. To minimize the computational costs, we apply the two-step procedure, which is most suitable to take into account the heterogeneity among firms.

The basic idea of our approach is that we define a firm-specific GWG as dependent variable are regress this measure on explanatory variables derived from the theoretical hypothesis expounded in Section 2. The sources of the observed wage gap within establishments can be manifold. On the one hand male and female employees differ with regard to their human capital endowment and other labor market relevant characteristics. On the other hand the endowments of men and women are remunerated in different ways. Finally, firm policy may effectively determine the size of the GWG. Since we want to assess the effect of personal policy, organizational change or pay systems on wage differences between men and women, our measure of firm-specific GWG should be adjusted by wage difference due to differences in occupational skills, human capital or other observable characteristics:

$$(1) \quad Gap_j = Gap_j^{obs} - \left(\hat{\beta}_j^m \overline{X_{ij}^m} - \hat{\beta}_j^m \overline{X_{ij}^f} \right)$$

Gap_j^{obs} represents the observed wage gap within firm j. Since the wage information in our data set is right-censored (see Section 4 for more details), the observed wage gap defined in equation (1) underestimates the actual raw wage differential. In order to determine the actual observed wage gap we apply a simple Tobit model.[3] By estimating the following equation for each firm, we can directly derive the wage differential between male and female employees:

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[3] Alternatively, we could use imputed wage information which is available in the data. However these wage rates are estimated in a different model. Thus other explanatory variables and a different sample are used to explain the wages.

(2) $\ln w_{ij} = \alpha_j + \gamma_j \, fem_{ij} + \mu_{ij}$,

where the dependent variable w_{ij} denotes the earnings for individual i at firm j. α is an absolute term measuring the average wage rate in firm j, fem is a dummy variable reflecting the gender of individual i and μ_{ij} denotes the error term. The estimated coefficient $\hat{\gamma}_j$ then represents the raw GWG in firm j (Gap_j^{obs}) taking into account that w_{ij} is censored from above.

$\overline{X}_{ij}$ includes mean characteristics of the individuals i at firm j and $\hat{\beta}_j^m$ is a vector of estimated coefficients – derived from wage regressions – of the individual characteristics X_{ij} of male employees in firm j. Hence, Gap reflects the difference in the rewards for individual human capital characteristics, earnings difference due to firm policy and unobserved wage effects between male and female employees within each firm j. The calculation of this measure requires the estimation of wage equations for male employees only. In order to allow for the heterogeneity and complexity of the wage setting process we estimate – as far

(4) $\ln w_{ij}^m = \beta_j^m X_{ij}^m + \varepsilon_{ij}^m$

as possible – a separate wage equation for each firm:

The dependent variable describes the daily log wage rate. We restrict the wage equation to a standard Mincer equation aiming to adjust the observed wage rate by differences in human capital endowments between men and women. Since other possible wage determinants, such as the occupational status and the occupational group are determined by the human capital, we exclude them from our wage equation. Hence, X_{ij}^m includes potential experience (squares), dummy variables for different education levels and job tenure. The right-censoring of the dependent variable again requires the estimation of a Tobit model. In order to make sure that our firm-specific wage estimations are reliable, we only take into account firms with at least hundred male employees. This procedure is most suitable to take into account the heterogeneity among firms. This benefit is, however, only feasible at the expense of the number of considered firms. In order to exploit the information of firms with less than hundred male employees, we run pooled regressions for all establishments with twenty up to ninety-nine male employees:

(5) $\ln w_{ij}^m = \beta^m X_{ij}^m + \varepsilon_{ij}^m$

In contrast to equation (4), where we determine firm-specific coefficients (β_j), we now estimate the average impact of the human capital characteristics in all smaller firms (β). By

applying different strategies for smaller and larger firms, we are able to determine the adjusted wage gap for the vast majority of the establishments in our sample.

Given the results of equation (4) and (5) respectively, we can calculate *Gap* which describes the GWG within firms assuming that men had the same human capital endowment as women within a firm. In other words, *Gap* describes the within-firm GWG adjusted by observed differences in human capital. Note, however, that part of the differences in characteristics may be caused by inequality with respect to access and the encouragement to education, though. Furthermore, there might be a discriminating element in the selection of employees such that observed characteristics of employees as well as estimated coefficients are not distributed randomly across firms.[4]

Using this measure of firm-specific wage differential as dependent variable allows us to analyze the effect of personnel policy, organizational change and pay systems on the wage inequality within firms.

(6) $Gap_j = \delta Z_j + \varepsilon_j.$

The GWG which is adjusted for the difference in human capital characteristics is assumed to depend on the vector Z_j including firm characteristics and information on firm policy of firm j. δ captures the impact of the corresponding explanatory variables, derived from the theories expounded in Section 2. In this second estimation step we can exploit the panel structure of the data by applying a random effects model. As a result, firm specific heterogeneity is captured by the random effect determined by the estimation model. Even if it would be straightforward to apply a random effects Tobit model in the first estimation step, we currently refrain from this approach because of computer time restrictions.

4.   The data source

The effects of firm policy on the wage inequality within firms can best be evaluated with data including linked information on employers and employees. Hence, the data set we use is constructed by merging the IAB-establishment panel and the employment statistic of the German Federal Services based on a unique firm identification number.

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[4] In order to correct for this selection we would have to estimate employment probabilities (Datta Gupta, 1993). Due to the lack of information on the household context and the individual background, it is difficult to implement this procedure which requires convincing exclusion restrictions.

The IAB- establishment panel is an annual survey of German establishments, which started in West-Germany in 1993 and was extended to East Germany in 1996.[5] The data is collected by personal interviews with the owners or senior managers of smaller establishments and personnel managers in larger establishments. It is performed by specially trained professional interviewers from a well-known market research institute. As far as possible, the survey is carried out by the same interviewer and interviewee each year. This procedure ensures a response rate above 70% which is high compared to other non-official German establishment panel studies (Kölling 2000) and helps to reduce panel attrition to less than 20% per year.[6] In order to keep the panel representative and correct for panel mortality, exits, and newly-founded units, additional establishments are drawn each year, yielding an unbalanced panel. These additional establishments are stratified with respect to ten categories of establishment size and 34 economic sectors.

The sample unit is the establishment as the local business unit. Note that firm and establishment are used as synonyms in this paper, though. The establishments asked in the survey are selected from the parent sample of all German establishments that employ at least one employee covered by social security. Thus, self-employed and establishments that employ only people not covered by social security (mineworkers, farmers, artists, journalists, etc.) as well as public employers with solely civil servants do not belong to the original sample. The data set is a representative sample of German establishments employing at least one employee who pays social security contributions. The establishments covered by the survey have been questioned every year about turnover, number of employees, personnel problems, industrial relations, wage policies, apprenticeship training, investments, innovations, and business strategies. From time to time, additional topics, such as training, pay systems and human resource policies, were added to the questionnaire.

The employment statistic of the German Federal Services, so-called Employment Statistics Register, is an administrative panel data set of all employees in Germany paying social security contributions.[7] The Employment Statistics are collected by the social insurance institutions for their purposes according to a procedure introduced in 1973. These data cover the period between 1975 and 2003, that is, every person who was employed for at least one

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[5] Detailed information on the IAB-establishment panel is given by Kölling (2000).
[6] The establishments are first approached by a letter indicating the goals of the survey. This letter is accompanied by separate letters of recommendation by the president of the Federal Employment Services and the leader of the German employer's association. Some weeks after this announcement letter, the establishment is contacted by telephone in order to arrange an individual appointment for the interview.
[7] Information on the Employment Statistics Register is given by Bender, Haas and Klose (2000).

day from 1975 to 2003 and/or with claims to pension benefits is included.[8] During this time, social security contributions were mandatory for all employees who earned more than a lower earnings limit. Civil servants, self employed and people with marginal jobs, that is, employees whose earnings are below a lower earnings limit or temporary jobs which last 50 working days at most, are not covered by this sample. Altogether, the Employment Statistics Register represents about 80 percent of all West German employees. According to the statutory provisions, employers have to report information for all employed contributor at the beginning and end of their employment spells. In addition an annual report for each employee is compulsory at the end of a year. This report contains information on an employee's occupation, the occupational status, qualification, sex, age, nationality, industry and the size of the employer. Also the available information on daily gross earnings refers to employment spells that employers report to the Federal Employment Service.[9] If the wage rate exceeds the upper earnings limit ("Beitragsbemessungsgrenze"), the daily social security threshold is reported instead.[10] Note that the daily wage rate is therefore censored from above – mostly relevant for men – and truncated from below, which concerns women's wages in particular.

Both data sets contain a unique firm identifier which is used to match information on all employees paying social security contributions with the establishment in the IAB-establishment panel. We restrict our sample to West German establishments of the private sector who participated in the IAB-establishment panel in one year from 1998 to 2003. East German firms are not considered in the analysis, because both the wage level as well as the wage setting process is still very different. Therefore, a common investigation of both regions would not be very meaningful. Furthermore, the GWG is much smaller in East Germany. A separate analysis for East Germany is not possible either, because the number of firms employing at least 100 male employees is too small to derive reliable results. Apart from that, the wage setting process and the resulting GWG in East German establishments is likely to be driven by internal processes, which can not be captured by our data, such as the devaluation of female labor as well as the crowding out of women in the labor market and

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[8] These are people who, as employees, have paid contributions to the pension system or who have been covered by the pension system through contributions by the unemployment insurance or by being a parent (depending on the birth year of the child, a fixed number of years is counted as child caring time during which the non-working parent becomes entitled to receive pension benefits).
[9] To deal with the problem of overlapping spells, we apply a hierarchical order of activities where employment trumps all other activities.
[10] Fitzenberger and Wunderlich (2000) show that this affects particularly the wage rate of high-skilled employees. According to their results, about 50 percent of high-skilled men earn wages above the upper earnings limit. Among high-skilled full-time females, this share amounts to at least 20 percent.

particularly women in occupations which were dominated by females in East Germany before unification. Finally, we exclude firms which employ only women or only men because a GWG is not observable in these organizations.

One innovation of our study is the firm-specific estimation of the wage equations. Based on these results, we can calculate an adjusted wage gap accommodating the firm-specific wage setting process. To guarantee the reliability of our estimation results, we restrict this procedure to larger firms. These are firms employing at least 100 full-time employed German men who are subject to social insurance contributions and are aged between 20 and 60 years. To maximize the number of establishments in the second estimation step, we apply an alternative estimation strategy for smaller firms. The employees of firms employing twenty to ninety-nine full-time employed German men are considered in a pooled wage estimation. Firms with less than 20 employees are excluded from the analysis, because in most cases the calculation of the firm-specific GWGs as well as their regression on the firm characteristics derived in Section 2 is not very meaningful.

5.   A rough picture of selected variables in our sample

Due to our strict selection criterions, it may be argued that our sample represents a very biased picture of entrepreneurship in Germany.

Table 1 hence provides the distributions of firm size and industries in the original LIAB data and our selected sub-sample. The most striking difference between our sample and the representative LIAB data concerns the low share of small establishments. Due to the exclusion of establishments whose full-time employees aged between 20 and 60 years are solely male or female, the share of workplaces with 20 to 49 employees is about three times higher in the original data. As a consequence, larger firms are rather overrepresented in our sample. Differences with respect to the distribution among industries are less pervasive. While the manufacturing sector is more pronounces in our data, we are missing firms in the services sectors and the trade and repair industry. Given that establishments in these sectors are generally not that big, this results is not really surprising. All together we conclude that our sample is biased towards bigger firms to some extend. Keeping these differences in mind, we argue that we can nonetheless derive interesting and new conclusion form our analyses.

Table 1: Firm size and industry distribution in the LIAB data and our sample (2001)

Firm size	Shares . . .		Industry	Shares . . .	
	in the LIAB	in our sample		in the LIAB	in our sample
20 – 49 employees	29.47	9.14	Farming, forestry and mining	2.59	2.31
50 – 99 empl.	20.01	19.05	Manufacturing	36.82	42.45
100 – 199 empl.	15.92	20.65	Construction	6.60	6.29
200 – 499 empl.	17.56	25.09	Trade and repair	13.4	11.63
500 – 999 empl.	9.45	14.23	Communication and information transmission	5.18	4.98
1000 – 4999 empl.	6.93	10.83	Credit and insurance industry	4.65	6.49
5000 – 9999 empl.	0.38	0.60	Firm-related services	10.90	8.42
> 10000 empl.	0.27	0.42	Other services	19.48	14.98
			Lobbies	2.75	1.99

Note: The IABS sample includes all workplaces with 20 and more employees, which do not refer to the public sector (civil services, social security and defense). Our sample further excludes establishments whose full-time employees aged between 20 and 60 years are solely male or female.
Source: LIAB-Data 2001.

Before looking at the estimation results, we want to give more insight into the distribution of our dependent variable. Figure 1 shows the distribution of the calculated GWG in all firms of our sample. *Gap* has a mean of 0.15 and also the standard deviation amounts to 0.16. Selected points of the distribution are presented in Table 2. Furthermore, this table contains the mean gap by year and the corresponding number of observations. While the GWG within firms increased by 1 percentage point between 1998 and 2001, the average wage differences between men and women under the assumption that male employees would have the same characteristics as female employees remained at the level of 15 percent since 2002. In contrast, the observed gender wage gap within firms seemed to decrease by 1 percentage point during the observation period. This implies that the share of "unexplained" pay differentials increased over time.

Figure 1: Kernel estimation of the firm-specific GWG
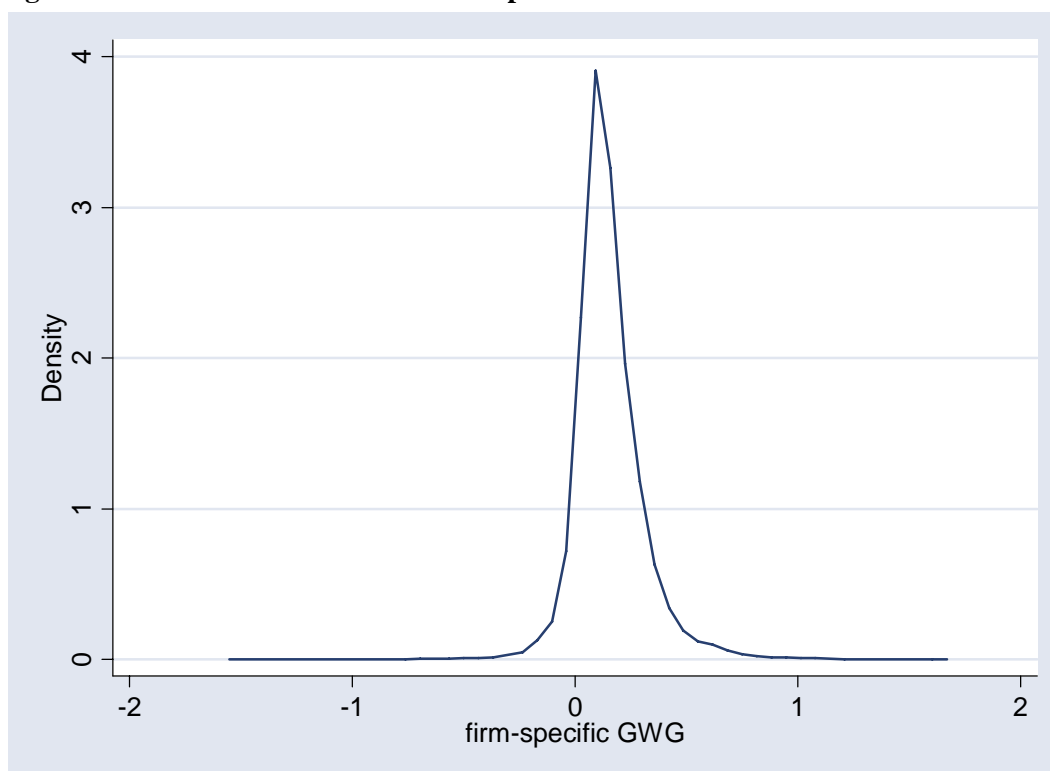
Note: *Gap* describes the gender wage gap under the assumption that male employees would have the same characteristics as female employees. Both measures accommodate the censoring of our wage variable by applying Tobit estimates.
Source: own calculation; LIAB-Data 1998-2003

Table 2: Distribution and evolution of the firm-specific GWG

Percentil	Gap	Year	Mean(*Gap*)	Mean(observed GWG)	observations
5%	-0.0385	1998	0.1466	0.2196	1774
10%	0.0059	1999	0.1480	0.2150	1831
25%	0.0673	2000	0.1562	0.2154	2998
50%	0.1317	2001	0.1546	0.2132	3397
75%	0.2164	2002	0.1501	0.2089	3168
95%	0.4126	2003	0.1519	0.2093	3229
mean	0.1519				

Note: *Gap* describes the gender wage gap under the assumption that male employees would have the same characteristics as female employees. The observed GWG describes the raw difference between male and female wages within firms.
Source: own calculation; LIAB-Data 1998-2003

The distribution of the adjusted GWG reveals that more than 5 % of the establishments exhibit negative gaps, implying that men with the same characteristics as women would earn lower wage rates.

Table 3: Selected characteristics of firms with positive and negative *GAP*

------ to be completed --------

Finally, we want to allow you more insight into the nature of innovative firm policy by comparing firm characteristics of "adopters" and "non-adopters" of the human resource measures and firm characteristics presumably affecting the firm-specific GWG. Along the way, we expound the exact definition of our human resource variables. Table 3 reveals that about half of the establishment in our sample enforced organisational changes until the year 2000. The exact wording of the underlying question is: "Have there been one or more of the following organizational changes in your establishment during the last two years?" Possible answers are: "Shift of responsibility and decisions to lower levels of hierarchy", "Introduction of team work/self-responsible teams", and "Introduction of units with own cost/result determination". This question is asked in the years 2002, 2000, 1998 and 1995. Our indicator for the use of these human resource practices fostering employee involvement is set to one if the establishment answered yes to one of the alternatives in the years 2002, 2000 or 1998. The resulting variable tells us if one of these measures has been introduced until the end of 2002. Establishments with and without movements towards participative organisation structures differ especially with respect to firm size (measured by the number of employees). Since adopting firms are about twice as large as establishments that did not adopt any of the selected human resource measures within our observation period, they are more likely to have works councils and follow collective agreements. Finally, we can see that both the adjusted GWG – that is, the dependent variable in our empirical analysis – as well as the observed GWG is larger in non-adopting firms.

Incentive pay schemes are less prevalent than organisational changes. This information is based on questions in the years 1998, 2000 and 2001. In 2000 and 2001 the wording of the underlying question is: "Which additional financial incentives do you offer to employees in your establishment?" Possible answers are: "Profit sharing" and "Employee share owner ship". In 1998, the question is more general, that is we can not distinguish between profit sharing and employee share ownership. As we do not know the date when these measures were implemented, we base our analysis on differences between establishments that

introduced these human resource practices until 2001 and those that did not. About one third of the establishments in our data either provide profit sharing or employee share owner ship programs. Again, adopters and non-adopters differ primarily in terms of firm size. Apart from that, the female share in establishments offering incentive pay systems is somewhat lower. Furthermore, the average wage rate as well as the technical state of the art is higher in adopting firms. Despite these diverse differences between adopters and non-adopters of performance related pay systems, it is interesting to note that the differences in the GWG are less dominant than in the case of organisational changes.

Table 4: Firm characteristics of "adopters" and "non-adopters" of selected human resource measures in 2001

	OC		Incentive pay		Formation before 1990		Training		Equal opportunities [a]	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Share of firms	53.4	46.6	34.4	65.6	13.4	86.6	88.1	11.9	29.5	70.5
Share of women	.330	.323	.301	.340	.270	.335	.339	.238	.391	.296
Share of women with fix-term contracts (in%)	6.88	5.97	5.04	7.12	9.22	6.04	6.57	5.57	7.52	5.65
Firm size	709	355	797	412	474	557	601	135	1008	349
Working hours	37.6	38.0	37.5	37.9	38.0	37.8	37.8	38.2	37.7	37.8
Works council	.822	.759	.821	.777	.685	.810	.822	.569	.913	.743
Coll. agreement	.815	.770	.792	.794	.660	.816	.806	.703	.896	.746
Wage rate	4.89	4.86	5.29	4.66	5.00	4.87	4.94	4.44	5.18	5.09
State of the art	2.89	2.91	2.96	2.87	2.93	2.89	2.92	2.75	2.91	2.87
Adjusted GWG	.144	.168	.147	.160	.124	.160	.148	.206	.118	.164
Observed GWG	.204	.224	.207	.218	.169	.220	.210	.234	.191	.216

Note: [a] The information on equal opportunity programs refer to the year 2002.
Source: LIAB-Data 2001 and 2002.

Whether an establishment is founded before or after 1990 can not be denoted as an adopted human resource measure in the strict sense, it may capture, however, important information on the corporate approach and the management style. In our data, about 13 percent of all firms were founded after the German Unification. Not surprisingly, younger firms employ less staff than long-established firms. The difference is, however, not that pronounced. In this regard it is conceivable that firms founded after 1990 are less subject to collective agreements and are less likely to have works councils. A rather striking difference is that newly founded firms employ fewer women and pay higher wage rates. Furthermore, the share of fixed-term contracts among the female employees is about 3 percentage points higher. Given that between 1995 and 2002 more than half of the newly founded firms refer

to the consumption-related services this finding is even more surprising. Note, however, that the share of company formations in the knowledge-based service sector – which are paying relatively high wage rates – increased from 12% in 1995 to 15% in the year 2000 (Rammer 2004). Differences with respect to the average number of working hours and the state of the art are ignorable. Compared to the other human resource measures, the "impact" on the observed and adjusted GWG seems to be more important. For instance, the observed firm-specific GWG is about 5 percentage points larger in establishments founded before 1990.

The support for vocational training is very widespread among German workplaces. More than 88 percent either directly pay for training or provide special (day-)releases from work. Differences between training and non-training firms are substantial, though. First of all, establishments offering their employees opportunities to invest in their human capital are more than four time larger than the rest of our sample. Consequently, the share of firms covered by collective agreements or works councils is higher. Also differences with respect to the female share, the average wage rate and the state-of-the-art are more pronounced compared to the adopters and non-adopters of other human resource practices. Establishments with training activities employ more women, pay higher wage rates (presumably because they make their employees more productive) and are better technically equipped (which may require more training). Consistent with our theoretical reflections, the support of training activities is negatively correlated with the observed and adjusted GWG.

Finally, we consider crucial characteristics of firms with agreements to foster equal opportunities of women and men. While the corresponding question in 2002 distinguishes between corporate agreements, commitments resulting from collective agreements and purely voluntary arrangements, the questionnaire for 1998 only includes a general question on equal opportunity agreements. Comparable information of the other years is missing. In 2002, almost 30 percent of all establishments in our sample report that they are subject to any type of equal opportunity agreement. Four years before, the corresponding share amounts to 20 percent only. In accordance with all other human resource measures, adopting firms employ more workers and hence the share of establishments with works councils or collective agreements is higher. Also not surprisingly, the female share is much higher in workplaces looking at equal opportunities. This result is consistent with the idea that either women select into firms that provide the best conditions to realize their career plans or establishments employing many women are more likely to be open-minded about equal opportunity programs. The number of working hours, the average wage rate as well as the state of the art do not really vary among adopters and non-adopters is this case. The

difference with respect to the observed and adjusted GWG implies that firms whose firm policy includes measures to equalize the carrier opportunities of men and women actually exhibit smaller GWGs. All in all, we conclude that workplaces adopting specific human resource measures also tend to be "different" in many other respects. We will now examine how these variables affect the firm-specific GWG in a multivariate analysis.

6. Estimation results

5.1 First estimation step: wage regression

To calculate the within-firm GWG under the assumption that male employees had the same characteristics as female employees within each firm, we first have to determine wage estimates for all establishments in our sample. For firms with at least 100 male employees, we estimate 2576 wage equations with a Tobit model in order to account for the censoring. The estimated firm-specific wage coefficients are used to determine our dependent variable according to equation (1). We do not apply this estimation strategy to firms with fewer employees, because the within-firm estimation would yield no reliable results. In this case, we estimate a pooled wage equation across all firms. Our wage equation is a Mincer-type specification, hence we suppose that the individual wage rate is determined by age, age squared, job tenure and the education level.

Since the estimated coefficients from the 2576 large firms can not be displayed in detail, we present a summary of the firm-specific estimation results in larger firms in Table 5.

Table 5: Coefficients of the wage estimations in a Tobit model (firms ≥ 100 male employees)

Coefficients	No. of Obs. (1)	Mean of the coeff. (2)	Mean of the t-value (3)	Share of significant coeff. (4)	Mean Standard deviation of coeff. (5)	Quotient (5)/(2)
Age	2576	0.040	6.321	0.833	0.008	
$(Age)^2/100$	2576	-0.041	-5.368	???	0.010	
Job tenure (in days)	2576	0.106	6.234	0.804	0.029	
Low education without vocational training	2099	1.945	16.924	0.949	0.135	
Vocational training	2560	1.815	16.779	0.868	0.122	

Secondary school (with and without vocational training)	1805	2.584	23.562	0.916	0.149
College of higher education or university	2238	2.420	23.927	0.899	0.135

Note: Coefficients result from wage regressions in firms with at least 100 male employees. The first column contains the number of different estimated coefficients. The next two columns present the means of the estimated coefficients and t-values. The 4th column shows the share of estimated coefficients which are significant at the 5%-level. The 5th column contains the standard deviation of the estimated coefficients from the mean coefficient of all firms. The last column includes a quotient between the mean of the coefficients and the corresponding standard deviation as absolute values.
Source: own calculation; LIAB-Data 1998-2003.

Column 1 describes the number of estimated coefficients for each characteristic. Note that some characteristics are missing in some firms, such that specific coefficients can not be determined in every firm. The second column presents the mean of the estimated coefficients of the firm-specific wage estimations and column 3 shows the corresponding mean of the estimated t-values. Note that the table contains coefficients for all possible education levels because the left-out category differs from firm to firm. The means of the estimated coefficients show that the variables have the expected effect on the wage rate. That is, the wage rate increases with the education level and potential experience on average. In order to receive a more exact impression of the significance of the estimated coefficient, column 4 shows the shares of the estimated coefficients which are significant at the 5%-level. We can see that about 80 to 90 percent of the estimated coefficients are statistically different from zero. Furthermore, the table includes the mean standard deviation of the estimated coefficients to illustrate the heterogeneity of the wage regressions across firms (see column 5). The last column includes a quotient of the standard deviation of the coefficients and the absolute value of the corresponding means. Hence, this figure illustrates the standardized variation of coefficients across the firms. High values of this quotient indicate that the variation of firm-specific coefficients is high, supporting our supposition that the wage setting process differs tremendously across firms. Small values are signaling moderate heterogeneity of wage returns to the corresponding characteristics. The results in Table 5 point out, for example, that the remuneration of job tenure varies much more across firms than the coefficients for age. In consideration of the varying coefficients, the wage estimation in each firm seems to be advantageously to determine the correct remuneration of the characteristics.

Table 6 presents the estimation result of the pooled wage regression for firms with less than 100 male employees.

Table 6: Coefficients of the pooled wage estimations in a Tobit model (firms with 20 to 99 male employees)

	Coefficients	Standard deviation of coefficients	t-value
Age	0.0509	0.0004	134.54
Age^2/100	-0.0005	0.0000	-113.78
Job tenure (in days)	0.0642	0.0006	113.88
Low education without vocational training	-0.2812	0.0015	-193.35
Vocational training (reference group)	-	-	-
Secondary school (with and without vocational training)	0.1837	0.0021	89.23
College of higher education or university	0.4388	0.0015	283.89
No. of observations	379,770		
Log likelihood	-95,523.57		

Note: The regression includes male employees from firms with 20 to 99 male employees.
Source: own calculation; LIAB-Data 1997-2001

5.2 Second estimation step: explaining the firm-specific gender wage gap

Once the firm-specific GWG is calculated based on the wage estimates presented above, we can assess the effect of personnel policy and other firm characteristics on the within wage differences between male and female employees. In the second estimation step, we therefore regress selected firm-level and industry-level variables on the adjusted firm-specific wage gaps.

Table 7 presents the estimation results of three alternative specifications of the random effects model. Model 1 represents the baseline model including the central information on the actual personnel policy. Model 2 further exploits the available information on corporate training activities. Note, however, that the corresponding questions are missing in the years 1998, 2000 and 2002 such that the number of observations is significantly lower in this specification. The number of observations varies between 9722 and 5043 establishments. On average, we observe each establishment 2.6 times.

Consistent with our theoretical arguments, organisational changes fostering the participation of employees limit the wage differences between men and women within the same establishment in both models. This negative and significant effect may be driven by the fact that women benefit more from formalized opportunities to take part in decision-making and the change towards more integrated tasks. Also incentive pay schemes are relatively more

favourable for women than for men. The estimation results of Model 1 and 2 support our hypothesis that establishments offering profit sharing or shared ownership programs exhibit lower GWGs than firms with fixed pay schemes. Since the effect of these two types of incentive pay systems do not differ significantly, we decide to use a single dummy variable capturing both performance related pay systems (see Table A?? in the Appendix). Given that our information on the corporate culture and the personnel policy is fragmented and hence imperfect, we further add a dummy variable that indicates whether the establishment was founded before or after 1990 capturing the social norms and trends during the foundation period. We can show that establishment founded before 1990 differentiate much more between men and women than younger firms. This result may imply that the perception and situation of women in the society – which changed towards a more egalitarian role association of men and women – affects the collaboration and division of labor within firms.

Model 2 is augmented by information on the training activities. Both the training indicator as well as the female share among training participants reduces the wage difference between men and women within the same firm. If we control for training only, the effect is even stronger (see Table ?? in the Appendix). This implies that part of the GWG is caused by differences in job-related human capital. Presumably, these differences are caused by the fact that women stay less time within the same firm and provide a higher probability of job changes.

Table 7: Estimation results

	Model 1		Model 2	
Variables	Coeff.	z-value	Coeff.	z-value
Constant	-0.0132	-0.32	0.2181	16.23
Employees (in 1000)	-0.0124	-5.08	-0.0166	-5.12
Employees^2 (in 1000)	0.0003	3.50	0.0005	3.49
Share of women	0.0474	4.64	0.0341	2.70
Share of female with fix-term contracts	0.0011	0.10	-0.0158	-0.98
Working hours	0.0058	5.35	-	-
State of the art	0.0013	0.85	0.0031	1.32
Works council	-0.0297	-6.26	-0.0359	-6.05
Collective agreement	-0.0078	-2.01	-0.0276	-5.09
Average wage rate	0.0011	1.56	0.0027	2.23
Wage rate > collective agreement	0.0039	1.46	0.0122	3.11
Founded before 1990	-0.0191	-3.57	-0.0234	-3.45
Organisational change	-0.0116	-3.58	-0.0147	-3.36
Incentive pay	-0.0063	-2.30	-0.0071	-1.63

Vocational training	-0.0151	-2.60
Female share of all training participants	-0.0186	-2.16
No. of observations	9722	5043
No. of groups	3780	3340
Wald Test	$\chi^2(35) = 486.90$	$\chi^2(34) = 376.81$
Roh	0.799	0.813

Note: Model 1 and 2 are estimated with a sample covering the years 1998 to 2002. Model 3 is based on observations from 1999, 2001 and 2003 (note that the variable working hours is not available in 2003). All models also include control variables for the year, the region and the industry sector.

Apart from these variables describing the firm-specific personnel policy, we add a set of firm characteristics to control for heterogeneity. Our results indicate that bigger firms – measured by the number of employees – tend to pay relatively higher wage rates to women compared to men. However, the positive coefficient of the quadratic term points to the fact that the negative impact of the number of employees decreases at a certain firm size. This finding is consistent with the hypothesis that large firms are more in the focus of the public and hence evoke much civil commotion by discretionary decisions to the disadvantage of women. Alternatively it may be argued that male and female employees in large firms are more likely to work in comparable job positions (unless jobs are not fully segregated) which limits the potential of discrimination (see also Heinze and Wolf 2006).

Firms with a high share of female employees exhibit higher GWGs than less segregated organizations. These results are not surprising and in line with the comprehensive literature on the wage effects of segregation within firms (see e.g. Jurajda 2005, INTERNATIONALE LITERATUR??). Whether female employees have limited contracts or not does not seem to affect the earnings differential between men and women, though. It is interesting to note that establishments with longer contractual weekly working hours are more prone to wage differences between male and female employees. Given that we also control for industry sectors, collective agreements and firm size, this effect can not only be driven by differences in the industrial relations and the occupational structure. We, therefore, argue that longer working hours may be interpreted as an indicator for a human resource policy aligned with the time schedule of traditional bread-winners, that is, men. Hence, firms whose work time policy is geared to the employment behaviour of male employees – which are more likely to shift child care responsibilities to their wives or partners and accept longer weekly working hours – distinguish more between men and women.

Since in Germany, the wage setting process is not just the result of free negotiations between the individual and its employer, we also control for the way how the right of co-

determination is implemented and put into practice and whether firms are subject to collective wage agreements or not. In accordance with earlier studies, our results indicate that both works councils and collective agreements are in favor of women's relative wages (Gartner and Stephan 2004, Achatz, Gartner and Glück 2005 and Heinze and Wolf 2006). The negative union effect may explained by the reduced wage dispersion among employees covered by the same collective bargaining agreement (see e.g. Freeman and Medoff 1984, Fitzenberger and Kohn 2005) and the reduced arbitrariness in the wage setting process (Elvira and Saporta 2001). Also international evidence hint at limited wage dispersion in those countries with centralized collective bargaining in countries, which is – to a great part – caused by a more compressed inter-firm wage dispersion (Blau and Kahn 1999, 2000). The impact of works councils seems to be much more important, though. Works councils in German firms provide an extensive framework for establishment-level negotiations on wages, working hours and other working conditions and hence play an important role in the wage setting process. Their implementation is formally designated by law, but depends upon the activity of the employees. According to Baron (1984), work councils often act as *equalizing agents* by looking at the compliance of corporate or legal principals claiming equal opportunity and avoiding discrimination. Accepting the hypothesis that employees' representations follow up the aim of reducing inequality among employees within firms, this finding is not surprising.

High wage level per se does not necessarily imply that the within GWG is small. In contrast, the positive coefficients of the wage bill per employee exposes that the GWG is larger in high wage firms. Even if this effect is not significant at the 5%-significance level, it is consistent with the so-called glass ceiling effect. According to this phenomenon, the wage rate of women is capped at a certain threshold, partly because women do not reach the top positions in most firms. Finally we control for differences with respect to the technical state-of-the-art assuming that well equipped establishments are more likely to implement innovative work practices which make their investment even more productive. In the course of these technological and organisational changes the division of labor must be revised and may become obsolete. Hence, the chance of a more egalitarian collaboration among men and women increases. The empirical result is however not on line with this train of thoughts. The effect of the technical equipment on the firm-specific GWG is positive and insignificant.

---- results on the effects of equal opportunity agreements are to be completed   -----

7. Conclusions

I think it is too early to conclude !!!

8. Literature

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9.   Appendix

Ergänzende Schätzergebnisse:
. * mit Incentive-Variablen (PA_kapitalbet PA_gewinnbet nur für die Jahre 2000
> und 2001)

```
Random-effects GLS regression              Number of obs      =       4812
Group variable (i): idnum                  Number of groups   =       3094

R-sq:  within  = 0.0030                     Obs per group: min =          1
       between = 0.1388                                    avg =        1.6
       overall = 0.1306                                    max =          2

Random effects u_i ~ Gaussian              Wald chi2(32)      =     493.40
corr(u_i, X)        = 0 (assumed)          Prob > chi2        =     0.0000

------------------------------------------------------------------------------
        gap2 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         j01 |   .0018205   .0020125     0.90   0.366    -.0021239    .0057649
       besch |  -.0127059    .003304    -3.85   0.000    -.0191816   -.0062301
      besch2 |   .0003193   .0001255     2.54   0.011     .0000732    .0005653
     lohn_ma |   .0028453   .0012012     2.37   0.018      .000491    .0051995
    frauen_q |   .0528372   .0130667     4.04   0.000      .027227    .0784474
     frist_fq|  -.0103909   .0155759    -0.67   0.505    -.0409191    .0201374
      betrat |  -.0537808   .0070936    -7.58   0.000     -.067684   -.0398776
       tarif |  -.0086627   .0054204    -1.60   0.110    -.0192865    .0019611
     stunden |   .0089018   .0016328     5.45   0.000     .0057015    .0121021
      technik|   .0029113   .0022384     1.30   0.193    -.0014759    .0072985
        orga |  -.0111177    .004273    -2.60   0.009    -.0194926   -.0027429
    gr_nach_90| -.0324318   .0079488    -4.08   0.000     -.048011   -.0168525
  PA_kapital~t| -.0108894   .0062636    -1.74   0.082    -.0231659    .0013871
  PA_gewinnbet| -.0068991   .0037987    -1.82   0.069    -.0143443    .0005462
    industry1 | -.0278702   .0162606    -1.71   0.087    -.0597405        .004
    industry2 | -.0407705   .0081578    -5.00   0.000    -.0567595   -.0247815
    industry4 | -.0001783   .0122241    -0.01   0.988    -.0241371    .0237805
    industry5 |  .0105693    .009992     1.06   0.290    -.0090147    .0301532
    industry6 | -.0204699   .0132093    -1.55   0.121    -.0463596    .0054197
    industry7 | -.0394829   .0122809    -3.21   0.001     -.063553   -.0154127
    industry8 | -.0633253   .0114534    -5.53   0.000    -.0857736   -.0408771
    industry9 | -.0891374   .0170506    -5.23   0.000     -.122556   -.0557189
   industry10 | -.0944735   .0098649    -9.58   0.000    -.1138084   -.0751387
        bula0 | -.0769468   .0129812    -5.93   0.000    -.1023895    -.051504
        bula1 | -.0252143   .0215602    -1.17   0.242    -.0674715    .0170429
        bula2 |  -.038696   .0104706    -3.70   0.000     -.059218    -.018174
        bula3 |  .0051923   .0088701     0.59   0.558    -.0121928    .0225774
        bula4 |  -.017806   .0129306    -1.38   0.169    -.0431495    .0075376
        bula6 | -.0092981   .0093461    -0.99   0.320    -.0276161    .0090198
        bula7 |  .0262589   .0111845     2.35   0.019     .0043377    .0481802
        bula8 |  .0153529   .0086337     1.78   0.075    -.0015688    .0322747
        bula9 | -.0184008   .0088285    -2.08   0.037    -.0357042   -.0010973
        _cons |  -.114842   .0626034    -1.83   0.067    -.2375424    .0078584
-------------+----------------------------------------------------------------
     sigma_u |  .13127467
     sigma_e |  .05854044
         rho |   .8341249   (fraction of variance due to u_i)
------------------------------------------------------------------------------
r; t=4.57 10:33:55
```

Ohne Frauenanteil der Weiterbildung

```
Random-effects GLS regression              Number of obs      =      7765
Group variable (i): idnum                  Number of groups   =      3909

R-sq:  within  = 0.0009                     Obs per group: min =         1
       between = 0.1189                                    avg =       2.0
       overall = 0.1135                                    max =         4

Random effects u_i ~ Gaussian              Wald chi2(33)      =    412.18
corr(u_i, X)      = 0 (assumed)            Prob > chi2        =    0.0000
```

```
------------------------------------------------------------------------------
        gap2 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         j01 |   .0021928   .0018284     1.20   0.230    -.0013908    .0057764
         j03 |  -.0070202   .0035996    -1.95   0.051    -.0140753    .0000349
       besch |  -.0154176   .0026606    -5.79   0.000    -.0206322    -.010203
      besch2 |   .0003779   .0001035     3.65   0.000     .0001751    .0005807
     lohn_ma |   .0026988   .0008868     3.04   0.002     .0009606     .004437
    frauen_q |   .0182048   .0093874     1.94   0.052    -.0001941    .0366037
     frist_fq |  -.007411   .0118494    -0.63   0.532    -.0306353    .0158133
      betrat |  -.0348474   .0050573    -6.89   0.000    -.0447596   -.0249352
       tarif |  -.0172176   .0041175    -4.18   0.000    -.0252877   -.0091475
      technik |  .0028046   .0016617     1.69   0.091    -.0004522    .0060614
        orga |  -.0114851   .0033866    -3.39   0.001    -.0181227   -.0048475
   gr_nach_90 | -.0174582   .0057796    -3.02   0.003    -.0287861   -.0061304
 PA_incentive | -.0022725   .0028669    -0.79   0.428    -.0078915    .0033466
  bez_ue_tarif |  .0053226   .0028765     1.85   0.064    -.0003153    .0109604
          wb |  -.0169639   .0036387    -4.66   0.000    -.0240956   -.0098322
   industry1 |  -.0112417   .0099158    -1.13   0.257    -.0306762    .0081929
   industry2 |  -.0117065   .0052716    -2.22   0.026    -.0220387   -.0013743
   industry4 |   -.001096   .0082431    -0.13   0.894    -.0172522    .0150602
   industry5 |   .0189618   .0063995     2.96   0.003     .0064189    .0315046
   industry6 |   .0048308   .0091868     0.53   0.599     -.013175    .0228367
   industry7 |  -.0124374   .0073961    -1.68   0.093    -.0269335    .0020588
   industry8 |  -.0298559   .0076352    -3.91   0.000    -.0448206   -.0148911
   industry9 |  -.0355211   .0110714    -3.21   0.001    -.0572207   -.0138215
  industry10 |  -.0337522    .005375    -6.28   0.000     -.044287   -.0232173
       bula0 |  -.0708429   .0114215    -6.20   0.000    -.0932287   -.0484571
       bula1 |  -.0223017     .01861    -1.20   0.231    -.0587766    .0141732
       bula2 |  -.0355244   .0089684    -3.96   0.000    -.0531021   -.0179466
       bula3 |   .0081968   .0077372     1.06   0.289    -.0069679    .0233614
       bula4 |  -.0144819   .0112108    -1.29   0.196    -.0364547    .0074908
       bula6 |   -.014546   .0082529    -1.76   0.078    -.0307213    .0016293
       bula7 |   .0238911   .0089454     2.67   0.008     .0063585    .0414238
       bula8 |   .0172806   .0076161     2.27   0.023     .0023533    .0322078
       bula9 |  -.0156713   .0078778    -1.99   0.047    -.0311115    -.000231
       _cons |   .2096413   .0104667    20.03   0.000     .1891269    .2301556
-------------+----------------------------------------------------------------
     sigma_u |   .1304117
     sigma_e |  .05945538
         rho |  .82791763   (fraction of variance due to u_i)
------------------------------------------------------------------------------
r; t=6.81 13:18:55
```

```
Model 3 mit stunden1
. xtreg gap2 j01 j03 besch besch2 lohn_ma frauen_q frist_fq betrat tarif stunde
> n1 technik orga gr_nach_90 PA_incentive bez_ue_tarif wb wb_ant_f industry1 in
> dustry2 industry4 industry5 industry6 industry7 industry8 industry9 industry1
> 0 bula0 bula1 bula2 bula3 bula4 bula6 bula7 bula8 bula9, re

Random-effects GLS regression                   Number of obs      =      4845
Group variable (i): idnum                       Number of groups   =      3184

R-sq:  within  = 0.0005                          Obs per group: min =         1
       between = 0.1376                                         avg =       1.5
       overall = 0.1272                                         max =         3

Random effects u_i ~ Gaussian                    Wald chi2(35)      =    386.58
corr(u_i, X)       = 0 (assumed)                 Prob > chi2        =    0.0000

------------------------------------------------------------------------------
        gap2 |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         j01 |   .0025151   .0031053     0.81   0.418    -.0035712    .0086014
         j03 |  -.0086657   .0049097    -1.76   0.078    -.0182886    .0009572
       besch |  -.0159323   .0033377    -4.77   0.000    -.0224741   -.0093905
      besch2 |   .0004185   .0001364     3.07   0.002     .0001512    .0006858
     lohn_ma |   .0026937   .0012562     2.14   0.032     .0002317    .0051558
    frauen_q |   .0328512   .0129949     2.53   0.011     .0073818    .0583207
     frist_fq |  -.0170446     .01641    -1.04   0.299    -.0492077    .0151184
      betrat |  -.0299344   .0061088    -4.90   0.000    -.0419075   -.0179614
       tarif |  -.0210119   .0055979    -3.75   0.000    -.0319836   -.0100403
    stunden1 |   .0069898   .0013812     5.06   0.000     .0042827    .0096969
      technik |    .002623    .002369     1.11   0.268    -.0020202    .0072662
        orga |  -.0142111   .0044761    -3.17   0.001    -.0229842   -.0054381
   gr_nach_90 |  -.0240263   .0068648    -3.50   0.000     -.037481   -.0105715
 PA_incentive |  -.0083952   .0043902    -1.91   0.056    -.0169999    .0002095
 bez_ue_tarif |   .0129639   .0040518     3.20   0.001     .0050225    .0209053
          wb |  -.0140044   .0058999    -2.37   0.018     -.025568   -.0024409
     wb_ant_f |  -.0179097   .0087673    -2.04   0.041    -.0350933   -.0007262
    industry1 |  -.0008648   .0117985    -0.07   0.942    -.0239893    .0222598
    industry2 |  -.0152133   .0064241    -2.37   0.018    -.0278043   -.0026222
    industry4 |  -.0111406   .0097682    -1.14   0.254    -.0302859    .0080047
    industry5 |   .0147399   .0076134     1.94   0.053    -.0001822    .0296619
    industry6 |  -.0070335   .0112952    -0.62   0.533    -.0291717    .0151047
    industry7 |  -.0147826   .0089813    -1.65   0.100    -.0323856    .0028205
    industry8 |   -.035842    .008985    -3.99   0.000    -.0534524   -.0182317
    industry9 |   -.038625   .0132623    -2.91   0.004    -.0646186   -.0126314
   industry10 |  -.0419454   .0066199    -6.34   0.000    -.0549202   -.0289706
        bula0 |  -.0722624   .0126651    -5.71   0.000    -.0970855   -.0474393
        bula1 |  -.0256396   .0213834    -1.20   0.231    -.0675503    .0162711
        bula2 |  -.0390151   .0106679    -3.66   0.000    -.0599238   -.0181065
        bula3 |   .0077129   .0088226     0.87   0.382    -.0095791    .0250049
        bula4 |  -.0125382   .0134045    -0.94   0.350    -.0388105    .0137342
        bula6 |  -.0179382    .009258    -1.94   0.053    -.0360835    .0002071
        bula7 |   .0261908   .0106798     2.45   0.014     .0052589    .0471228
        bula8 |   .0153742    .008704     1.77   0.077    -.0016853    .0324337
        bula9 |  -.0190518   .0087763    -2.17   0.030     -.036253   -.0018507
        _cons |  -.0495319    .054309    -0.91   0.362    -.1559756    .0569118
-------------+----------------------------------------------------------------
     sigma_u |  .13061557
     sigma_e |  .06265259
         rho |  .81295201   (fraction of variance due to u_i)
------------------------------------------------------------------------------
r; t=4.99 13:18:48
```