Organizational Change and Wages: Evidence from Matched Employer-Employee Data*

Thomas K. Bauer† and Stefan Bender‡

November 2000

FIRST DRAFT - PLEASE DO NOT QUOTE

Abstract – A growing theoretical and empirical literature is concerned with the effects of flexible work systems or High Performance Work Organizations (HPWOs) on wages. Existing theoretical literature suggests that these changes should lead to higher inequality across firms, increased segregation of labor markets and decreased within-firm inequality. This paper makes use of a new employer-employee-linked data set for Germany to examine the labor market effects of flexible work systems. Our empirical results indicate, that average establishment wages are significantly higher in firms that make use of flexible work systems. However, our results do not confirm the hypothesis that organizational change is *skill-biased*. Finally, our empirical results do not confirm the hypothesis that organizational change leads to reduced within-firm inequality.

Keywords: Organizational Change, Skills, Linked-Employer-Employee Data Set, Inequalty

JEL classification: L2, J3, O3

Thomas K. Bauer
Institute for the Study of Labor (IZA)
P.O. Box 7240

D-53072 Bonn
Germany
Tel: +49-228-3894-305
Fax: +49-228-3894-210
E-mail: bauer@iza.org

Stefan Bender
Institut für Arbeitsmarkt- und
Berufsforschung (IAB)
Regensburger Str. 104
90327 Nürnberg
Germany
Tel: +49-911-179-3082
Fax: +49-911-179-3297
E-mail: stefan.bender@iab.de

*Thanks go to Ira Gang, Magnus Lofstrom, Christoph M. Schmidt and Rainer Winkelmann for helpful discussions. Parts of this paper have been written while Stefan Bender was visiting the IZA .

†IZA, Bonn, University of Bonn and CEPR-London.

‡IAB, Nürnberg and IZA-Bonn.

1. Introduction

In the past two decades the labor markets in most developed countries witnessed dramatic changes. Starting in the early 1970s earnings inequality rose, in particular in the US and UK. In the European community, where wage rigidities are more common than in the US and the UK, unemployment rates of unskilled workers rose relative to skilled workers.[1] These developments occurred even though the supply of skilled labor in all of these countries increased, suggesting that the increasing supply of skilled labor could not keep pace with increasing demand. Two prominent hypotheses have been put forward to explain these changes: *(i)* it has been argued that the increase in internationally traded goods and services and international capital flows led developed countries to specialize in the production of skill-intensive goods and services and to import goods and services that are intensive in unskilled labor; *(ii)* it has been hypothesized that improvements in technology, especially developments in information technology, have been "skill-biased". Snower (1999), however, argues these two explanations are not sufficient to explain the observed changes in the labor market, because they leave several empirical observations unexplained, such as for example the observed reduction of the gender wage gap, increasing earnings instability, and rising within-group wage inequality.

Snower (1999) suggests that recent changes in the organization of work might be able to provide important insights for the explanation of rising inequality. At the same time as the inequality of wages in the US and the UK and the relative unemployment of unskilled workers in continental Europe increased, most industrialized economies experience fundamental changes in the organization of work [2] A growing theoretical and empirical literature is concerned with the determinants of this organizational change - often also called "flexible work" systems or High Performance Work Organizations (HPWOs) - and its labor market and productivity effects.[3] Most scholars refer to same broad set of characteristics of these flexible work systems, such as, for example, the introduction or increasing importance of team work and job rotation, decentralization of decision making within firms, a reduction in the number of hierarchical levels, the replacement of vertical by horizontal communication channels, the introduction of employee problem-solving groups or quality circles, Total Quality Management (TQM) and a change from task specialization to task

[1] See Gottschalk and Smeeding (1997) and Snower (1999) for a survey of income inequality in different countries. Wage inequality in Germany has been investigated for example by Abraham and Houseman (1995), Krueger and Pischke (1995), Biewen (1998, 1999), and Becker and Hauser (1995).

[2] See e.g. Lindbeck and Snower (1996, 2000), OECD (1996, 1999), Milgrom an Roberts (1990, 1995), and Snower (1999).

[3] See, for example, Caroli et al. (2000), Egger and Grossmann (2000), Osterman (1994, 2000) and Lindbeck and Snower (1996, 2000). Surveys are given by Aghion et al. (1999) and Snower (1999).

diversification. Betcherman (1997) and OECD (1999) identify the following main characteristics of "flexible" workplace systems: job design involving multi-tasking, use of team working, reduced hierarchy levels and the delegation of responsibilities to individuals and teams.

A small but growing theoretical and empirical literature investigates the labor market effects of organizational change. Several theoretical models suggest that organizational change is "skill-biased" and could add to the explanation of the sources of increasing wage inequality. According to these models the introduction of flexible work practices should lead to increased wage inequality across firms for at least two reasons. First, workers in firms who introduced new forms of work practices are supposed to have higher productivity than workers in firms who do not change their organization of work. Second, organizational change leads to a segregation of the labor market resulting in an increased homogeneity of skills within firms. In such a labor market workers in firms who employ only skilled workers earn more than workers in firms who employ only unskilled workers. The argument that organizational change results in higher inequality across-firm through a segregation of the labor market also leads to the conclusion that within-firm inequality should fall. Hence, it depends on the relative importance of across-firm inequality compared to within-firm inequality whether changes in workplace organization add to the explanation of rising inequality.

Existing empirical evidence on the wage effects of organizational change is scarce and gives no clear picture. With few exceptions these studies analyze only across-firm inequality and most of them are based on cross-section data of establishments. The latter , however, suffer from the problem that they are unable to analyze the impact of organizational change on employment and wages outcomes over several years and to investigate the role of unobserved firm heterogeneity. Furthermore, most of the existing studies are not able to control for the skill-structure of the work force employed in a firm. Theoretical as well as empirical studies show, however, that skills and new work practices are complements.[4] If this is the case, studies do not control for the skill-structure of the work force in a firm might overestimate the effect of flexible work practices on wages.

The present study makes use of a unique employer-employee matched panel data set for Germany with detailed information on the use of flexible work systems and the structure of the workforce of an establishment. This data set allows us to study the effects of flexible work practices on wages and employment of different skill groups of workers with a detailed set of controls for the composition of employees within a firm. Furthermore,

[4]See, for example, Milgrom and Roberts (1990, 1995), Lindbeck and Snower (1996, 2000) and Bresnahan et al. (1999).

the panel structure of the data data set allows us to avoid problems such as unobserved firm heterogeneity which are inherent in studies relying on cross-section data.

The paper proceeds as follows. In the next section we give a short survey of the theoretical and empirical literature on the labor market effects of organizational change. Section 3 describes our data set. Section 4 investigates the impact of organizational change on wages and employment across firms, Section 5 analyzes the effects on within-firm inequality. Section 6 concludes.

2. Previous Research

2.1. Theoretical Literature

In recent years, a growing literature analyzes the labor market effects of organizational change. Two main mechanism have been identified by this literature through which organizational change might shift the relative demand for workers towards high-skilled and hence might contribute to the explanation of increasing inequality (see Aghion et al., 1999). First, several models conclude that organizational change is *skill-biased* in itself, i.e. that it increases the relative demand for skilled labor directly. The main argument of these models is based on some central characteristics of the restructuring process of the organization of firms as it is observed in various countries.[5] This restructuring process typically includes the introduction or increasing importance of team work and job rotation, decentralization of decision making within firms, a reduction in the number of hierarchical levels, the replacement of vertical by horizontal communication channels and a change from task specialization to task diversification. These new work practices require a high level of cooperation among workers and workers need to be willing to learn new skills, to perform multiple tasks and to care about quality and productivity. Furthermore, flexible work practices typically reduce the possibilities of firms to monitor their workers. Both implications of organizational change, a high commitment of workers to their firm and the reduced possibility to monitor workers, might lead firms to pay higher efficiency wages. Furthermore, firms who restructured their organization often introduce alternative compensation practices such as bonuses or profit sharing. Hence, if organizational change leads to an increased performance of the firm[6] and if the resulting gains are shared between

[5]Evidence for Europe is given by the European Foundation (1997,1998). See also Osterman (1994, 2000) for the U.S., NUTEK (1996, 1999) for the Nordic countries and Gallie et al. (1998) for the UK. Surveys are given by Snower (1999) and OECD (1999).

[6]There is substantial evidence that the introduction of new work practices improves the productivity of firms. See, for example, Bartel (1995), Ichniowski et al. (1997), Caroli and van Reenen (1999), and McNabb and Whithfield (1999).

the firm and the worker, one might expect higher wages in firms which introduced flexible work practices. Assuming that skilled workers have a relative advantage in multi-tasking, they will receive a wage premium in firms who changed their organizational structure leading to increased inequality across and within firms.

Another line of argument connect increasing across-firm inequality with an increase in skill segregation arising through organizational change.[7] The main idea behind these models is that an increasing supply of skilled labor induces firms to change their organizational structure which in turn leads to a greater homogeneity of the skill structure within firms. The economy moves from an equilibrium where firms employ both, skilled and unskilled labor, towards a segregated equilibrium, where firms employ only skilled or only unskilled workers. This segregation of labor markets by skill groups might lead to increased inequality across firms, if firms who employ only skilled workers are more productive than those who employ only unskilled workers. However, the segregation of the labor market by skill should lead to reduced inequality within firms, because the skill structure inside of firms becomes more homogeneous. Hence, it depends on the relative importance of within-firm compared to across-firm inequality whether overall inequality increases.

There are several arguments which cast some doubts on the above conclusions. First, even if organizational change is associated with productivity gains, workers might not have the bargaining power to force the firm to share these gains. Second, as Aghion et al. (1999) note, the effect of organizational change on wage inequality depends on the type of flexibility chosen by the firm. They differentiate between *external* and *internal* flexibility. In the former, organizational change leads firms to fire unskilled workers and to hire the required type of worker from the outside labor market. This type of flexibility, which is prevalent in the US and the UK, increases wage inequality since it shifts the demand for skills upwards. If firms rely on *internal* flexibility, they chose to train unskilled workers in order to promote them. Hence, organizational change associated with *internal* flexibility might reduce both, across- and within-firm inequality. In Germany and Japan, for example, it can be expected that *internal* flexibility is more important than in the US or UK, since on-the-job training is more prevalent in the former countries.

2.2. Empirical Evidence

Overall, theory gives no clear conclusion about the effect of organizational change on wages. The empirical evidence on the labor market effects of organizational change, how-

[7] See, for example, Acemoglu (1996), Kremer and Maskin (1996) and Thesmar and Thoenig (1999).

ever, is relatively scarce and the results of these studies are mixed. Most existing evidence is based on US data. Capelli (1996), for example, uses the Educational Quality of the Workforce (EQW) National Employers Survey, a representative sample of establishments in the US collected by the U.S. Bureau of the Census, to analyze the effect of Total Quality Management (TQM) and self-managed teams on earnings. His data set allows him to control for the characteristics of the workforce in an establishment, such as average education, percent of employees unionized and the ratio of employees to their supervisors. He finds that TQM and self-managed teams have a positive effect on the wages of production workers. The wages of supervisors are positively affected by the presence of self-managed teams. Capelli (1996), however, could not find any significant effect of his indicators for new work practices on the ratio of the wages of production workers to the wages of supervisors. Hence, according to the results of Capelli (1996), flexible work systems increase across-firm inequality without changing within-firm inequality. Using the same data set as Capelli (1996), Black and Lynch (2000) find that re-engineering a workplace to incorporate more high performance practices and the proportion of workers meeting regurarly in groups is associated with higher wages, in particular for unionized establishments. They control for the characteristics of the workforce in an establishment, such as the proportion of trained employees, females and minority workers, and further employ the panel structure of the data set to control for establishment fixed effects.

Using a sample of 303 U.S. bank branches, Hunter and Lafkas (1999) find that "high-involvement" practices, measured as an index of the authority to perform various tasks and the participation of a branch in a Quality Circle, increase wages. Furthermore, Quality Circels moderate the negative wage effects of new Information Technology designed to automate basic tasks. Osterman (2000) analyzes the employment and wage effects of High Performance Work Organizations (HPWOs), such as quality circles, job rotation, team-work and total quality management, using a survey of U.S. establishments collected in 1992 and 1997. Controlling for an establishment's labor force composition by including variables that measure the fraction of technical and professional, blue-collar and clerical workers as well as the fraction of females, Osterman's (2000) results show that the adoption of HPWOs results in increasing layoff rates whereas it has no or even a negative effect on workers compensation. His results further indicates that the introduction of HPWOs is related to other changes in the organizational structure, in particular with a reduction in the employment of managers and contingent workers. Based on a representative employer-employee-matched data set of non-agricultural private US establishments, Handel and Gittleman (1999) investigate the effects of flexible work practices on wages at the establishment and individual level. Irrespective of the aggregation level of the analysis,

they do not find significant wage effects of flexible work practices. Using cross-section data of establishments in Australia and the US for 1995, the OECD (1999) finds that flexible work practices do not affect earnings in Australia, whereas they increase hourly wages of workers in the US. Note, however, that this conclusion is based on a simple comparison of average wages without controlling for other factors which might be correlated with wages.

Only a few studies exist for European countries. Based on panel data of French firms, Entorf and Kramarz (1998) classify the use of new techniques according to their relation to computers and to the amount of autonomy left by the use of these modern technologies. Different to the studies mentioned above, this classification indicates the autonomy of a worker in organizing his work place rather than a change in the organizational structure of a firm such as the reduction of hierarchy levels or the introduction of team-work. Based on cross-section estimates Entorf and Kramarz (1998) show that workers who use computer-based new technology with high autonomy earn more than workers who use computer-based technology with average or low autonomy in the use of these technologies. Allowing for person fixed-effects, however, Entorf and Kramarz (1998) show that firms select their most able workers for the use of new technologies with high autonomy and workers gain by the introduction of new technologies not by the mere use but rather by acquiring experience of using these new technologies. Using panel data of British and French establishments, Caroli and van Reenen (1999) show that organizational change tends to reduce the demand for unskilled workers in both countries. Estimating standard wage share equations for workers of different skills, they find that the wage share of unskilled workers is significantly lower in firms who introduced organizational changes than in firms who did not change workplace organization.

Bellmann and Schank (2000) use a cross-section of a matched employer-employee data-set for Germany - which is also used in this paper and will be described in detail below - to analyze the effects of product and process information on the demand for different skill types of labor. They examine the effect of a dummy variable indicating whether a firm implemented product or process innovations on conditional labor demand. Note, that this indicator measures not only the way in which work is organized, but also the effect of other practices, such as downsizing and outsourcing, which change the type, quality and pace of work in an establishment. Estimating a generalized Leontief cost function they find that product and process information have a positive impact on the conditional demand for all of the six skill-types of labor they differentiate, except for highly skilled blue collar workers.

Most of the studies discussed above are based on cross-section data. They might suffer from the problem that they are unable to analyze the impact of organizational change on

employment and wage outcomes over several years. In addition, these studies are unable to control for unobserved firm heterogeneity, which might lead to biased coefficients. Furthermore, only a few studies are able to control for the structure of the workforce of the establishments they investigate. Not controlling for these characteristics might lead to biased results if the educational structure of the workforce and the probability to introduce new workplace practices are positively correlated. Finally, with the exception of Capelli (1996) the empirical literature is only concerned with the labor market effects of organizational change across firms and do not investigate the effects of these changes on within-firm inequality. Using a unique employer-employee matched panel data for Germany, this study tries to avoid the above mentioned problems by investigating the effects of flexible work practices on the wage structure across and within firms. Our data set allows us to control for the characteristics of the employees in an establishment. The panel character of our data set further enables us to examine the role of unobserved firm heterogeneity.

3. Econometric Strategy and Data

In our empirical analysis we make use of two representative German datasets. The first data-set, the IAB-establishment panel, is a yearly survey of West-German establishments, administered since 1993 by *Infratest Burke Sozialforschung*.[8] The data set is a representative sample of German establishments employing at least one employee who is subject to the compulsory social security scheme. The data set does not include public service offices who employ only civil servants. The survey was administered through personal interviews and provides general information on the establishment, such as investments, revenues, the size and composition of the workforce, worker turnover, salaries and wages, working time, training, the technological status of the equipment, and changes in the organization of workplaces. Note that we are forced to restrict our analysis to the years 1993 and 1995, since the information on organizational changes in an establishment, which are at the center of interest for this paper and will be described in detail below, can be used only for these two years. In 1993, the response rate was 71% leading to a sample of 4,356 establishments. Of these establishments, 3,404 answered the questionnaire in 1995.

The second data set, the so-called *Employment Statistics Register* (historic file of the IAB), is an administrative panel data set of individuals which provides exact information on wages, skill-levels and other socioeconomic characteristics of all employees in Germany

[8]Detailed information on the IAB-establishment panel is given by Bellmann et al. (1994, 1995) and Bellmann (1997a, 1997b).

who pay social-security contributions.[9] The basis of the *Employment Statistics Register* is the integrated notifying procedure for health insurance, statutory pension scheme and unemployment insurance, which has been introduced in 1973. The procedure requires that employers report all information of their employees registered by the social security system to the social security agencies. Notifications are prescribed for the beginning and ending of any employment relationship. In addition, employers are obliged to give an annual report for each employee covered by social insurance who is employed on the 31st December of the year. The notification includes information on the sex, the year of birth, nationality, marital status, number of children, occupation, and qualification of the employee. Information is also available on the industry and the size of the establishment an individual is employed in. To investigate whether organizational and technological change is *skill-biased*, we differentiate five skill groups using a classification of occupations, where blue-collar are stratified into non-qualified and qualified, and white-collar workers into those performing simple-services and those performing qualified services. The fifth skill group includes technicians, engineers and (semi-)professionals/managers.[10]

In addition to this information, the gross annual income of the employees subject to social insurance contribution is given for each notification. In our empirical analysis, we used the gross annual income to calculate real daily wages. The income information is censored from above by the upper limit of the contribution assessment ceiling for insurance. This upper limit has been a daily wage of 238 DM in 1993 and of 257,80 DM in 1995. In the sample we used for our empirical analysis 0.2% of the individuals fall above the upper limit in 1993 and 0.1% in 1995. Among the individuals with censored wages, 56% are engineers and professionals and another 22% skilled white-collar workers in 1993. In 1995, 59% of the individuals with censored income are engineers and professionals and 19% skilled white-collar workers. Note that, if anything, the censoring of wages should bias the estimated coefficients on our variables indicating organizational and technological change towards zero, especially for engineers and professionals and skilled white collar-workers.

Both data sets contain a unique firm identification number, which allows us to match information on all employees obliged to social-security to the establishments in the IAB-establishment panel. Matching of the two data sets occurred in two steps. In a first step we selected West-German firms who participated in the establishment panel in 1993 and 1995.[11]We excluded firms in the agricultural and mining sector as well as all firms

[9]Information on the *Employment Statistics Register* is given by Bender et al. (1996, 2000).

[10]See Bellmann and Schank (2000) and Bellmann, Bender and Schank (1999) for a more detailed definition of the skill groups.

[11]The selection is based on the balanced linked employer-employee IAB-dataset (Balanced LIAB: Vers.

with missing values to one of the variables used in the empirical analysis. In a second step, we used the *Employment Statistics Register* to get information on the work history for the period from the first January 1993 to the 31st December 1995 for all full-time employed person, who worked at least one day in one of the firms mentioned above. We excluded apprentices, trainees, persons who are temporarily out of the labor force because of e.g. child bearing or military service, and individuals older than 65 from our individual sample. Using the firm identifier, the two data sets have been matched to a linked employer-employee data set, providing information on the total population of employees in a particular firm, who are covered by the social security system. After eliminating all firms with less than two employees in one of the five skill groups, a sample of 466 establishments remained for the empirical analysis. In these establishments, more than 405 thousand workers were employed in 1993 and nearly 390 thousand in 1995.

To examine the impact of new workplace practices and IT technology on wages, we estimate equations of the form

$$Y_{it} = \alpha_i + X_{it}\beta + Z_{it}\gamma + \epsilon_{it}, \quad (1)$$

where Y_{it} is the average log wage in establishment i at time t, α_i is a establishment fixed effect, X_{it} is a vector of the characteristics of an establishment, Z_{it} is vector of variables indicating the use of flexible workplace practices and new IT-technologies, and ϵ_{it} is an error term. Since we have two years worth of data, we eliminated all observed and unobserved time invariant establishment fixed-effects by taking first differences, leading to the following equation

$$\Delta Y_i = \Delta X_i\beta + \Delta Z_i\gamma + u_i, \quad (2)$$

where Δ indicates the differences of the respective variables between 1995 and 1993.

In all estimations the vector X_{it} includes log real revenues per employee, log of total employment, and a dummy variable indicating whether the firm sponsors training of their employees. In 1993 and 1995, the establishments have been further asked to rank the technological standard of their production technology relative to other establishments in the sector on a scale from 1 to 5, where 1 indicates that the machines used by the establishments are obsolete and 5 indicates that the machines are state-of-the-art. We used this information to create a variable indicating the age of the capital used by an establishment. Finally, using the employer-employee linked data set, we calculated for every establishment in our sample the mean age of the employees, and the employment share of females, non-Germans, workers with an occupational education, and the share

00). See Bellmann, Bender, and Kölling (2000).

of workers with an university degree. Descriptive statistics of all variables used in the empirical analysis are given in the Appendix.

The vector Z_{it} includes different variables indicating organizational and technological change. In 1995, the IAB-establishment panel contains several questions on changes in the organization of work. In this year, the establishment have been asked the following question: *"In the last 2 years, have there been any of the following organizational changes in your establishment?"*. Among the possible answers, we use the answer to the following possibilities to define indicators describing the importance of "flexible" work systems by an establishment:

- Reduction of the number of hierarchy levels.
- Transfer of responsibilities downward.
- Introduction of team-work or self-responsible working groups.

Using this information, we calculated different indicators of the use of flexible workplace practices. First, we created dummy variables indicating whether there has been one of the above organizational changes between 1993 and 1995.

The work of Milgrom and Roberts (1990, 1995) indicates that only the introduction of a cluster of new practices allows firms to reach a new optimal organization that produces high performance. If practices are introduced in clusters the above indicators of organizational change should be highly correlated with each other. If this is the case, it might be hard to identify the separate effects of these indicators in an empirical investigation of the effects of organizational changes on wages. We therefore constructed two variables indicating the degree of decentralization. First, we created a variable measuring the number of organizational changes between 1993 and 1995. Second, we applied a principal component analysis to the three dummy-variables described above to derive an index of decentralization. The first principal component accounted for 57% of the variance and had an eigenvalue of 1.713. The scoring coefficients used for the calculation of the decentralization index are 0.448 for the reduction of hierarchy levels, 0.468 for the delegation of responsibilities, and 0.404 for the introduction of team work.

Table 1 shows some descriptive statistics on the incidence of organizational change in our sample. Between 1993 and 1995, 32% of the establishment introduced none of the flexible work practices we consider, 27% at least one, around 21% two, and nearly 20% introduced all three of them. These numbers are slightly lower than those found in the US. Using a representative survey of US plants, Osterman (2000, Table 2) reports that in 1997

about 15% introduced none out of four flexible workplace practices[12], 14% introduced one practice, 32% introduced two practices 39% introduced three or four practices. It appears further that in the manufacturing and construction industry flexible workplace practices are more common than in other sectors, which is line with the experience on organizational change in other countries (see OECD, 1999). The most common organizational change in our sample is the delayering of responsibilities; every second establishment in our sample transferred responsibilities to lower hierarchy levels. Introducing self-responsible team is the second most common change followed closely by a reduction of the number of hierarchy levels. For all three types of changes in the organization of workplaces the numbers are higher in the manufacturing and construction industry than in the other sectors.

Many empirical studies on the determinants of rising inequality used information on the proportion of workers using personal-computers or micro-electronic technologies. Unfortunately, the IAB-establishment panel does not provide this kind of information. In 1994 and 1995, however, the IAB-establishment panel contains detailed information on the type of investments in the last year. We use this information to define a dummy variable which takes the value 1 if the biggest single investment of an establishment was in communication and information technology in 1993 or 1994, and 0 otherwise. Around 20% of the establishments in our sample reported that they have had main investments in IT-technology in 1993 or 1994. We interpret this variable as an indicator of technological change in the period between 1993 and 1995.

4. Empirical Results

4.1. Wage effects

Table 2 gives a first description of the wage effects of organizational and technological change on wages. The Table reports the log of average establishment daily wages for all workers as well as the workers in the five skill groups according to different types of flexible work practices used in an establishment and the number of new work practices introduced between 1993 and 1995. Several patterns emerge from Table 2. First, establishments which use flexible work practices pay on average higher wages. Establishment who reduced the number of hierarchy levels, for example, pay on average 5.3% higher ages than those who did not change their hierarchy structure. The transfer of responsibilities or the use self-responsible teams is associated with a wage gain of about 4%. The work of Milgrom

[12]Ostermann (2000) considers the introduction of Quality Circles, job rotation, self-managed teams and Total Quality Management.

and Roberts (1990, 1995) suggests that the wage gains should be highest in firms which use a cluster of flexible work practices. This hypothesis is conformed by the descriptive statistics in Table 2. Firms who introduced all three of the flexible work practices we consider pay on average significant higher wages than firms who introduced only one or two of them.

Second, the numbers reported in Table 2 give no clear answer with regard to the question whether organizational change is *skill-biased*. Compared to the other skill groups, skilled white-collar workers appear to gain most from the use of flexible work practices, whereas unskilled white-collar workers have the lowest wage gains. The differences among the other skill-groups, however, is is less clear. For example, the wage differential between firms who do not use any of the new work systems and firms who introduced all of them is about 10% for both, unskilled blue-collar workers and professional and engineers. Blue-collar workers benefit in particular from the introduction of self-responsible teams, whereas white-collar workers and professionals and engineers gain most through a reduction of hierarchy levels. Third, Table 2 indicates that within-firm wage inequality is lower in firms who use flexible work practices, especially in firms who introduced all three of the work practices we consider. Note also that this pattern holds for all five skill groups. The last two rows of Table 2 finally show that bigger firms have a higher probability to use flexible work practices, which is in line with existing evidence from other countries (see OECD, 1999). Changes in the IT-technology used by a firm, however, seem not to be correlated with changes in the organization of work.

The conclusions drawn from Table 2 are based on a comparison of means without controlling for other factors which might affect wages. Table 3 indicates that the use of flexible work practices is associated with higher wages even after controlling for the characteristics the establishment, the characteristics of its workforce and unobserved establishment heterogeneity. The wage effects of organizational change are, however, relatively small. Panel A of Table 3 shows the estimated coefficients of the three different types of flexible workplace practices. Overall, the wage gains associated with a reduction of hierarchy levels amount to about 0.9%. Differentiating between different skill levels shows that unskilled blue- and white-collar workers as well as professionals and engineers gain through a reduction of hierarchy levels, whereas average establishment wages of skilled blue- and white-collar workers are not affected on a significant level. For most workers, the transfer of responsibilities shows no significant effect on wages. Professionals and engineers, however, suffer from a delayering of responsibilities. With the exception of skilled white-collar workers, the introduction of self-managed teams increases wages significantly, especially for blue-collar workers and professionals and engineers. The wage differential between

firms who use self-managed teams and those who do not rely on team-work is about 1.6% for professionals and engineers, 1.3% for unskilled blue-collar workers and 0.8% for skilled blue-collar workers. Note that our results are overall in line with those obtained by Capelli (1996) and Black and Lynch (2000) for the US.

Panel B of Table 3 shows the estimation results for the two indices of the degree of decentralization in an establishment. The estimated coefficients are significantly positive for both variables and for all skill groups, indicating that a higher degree of decentralization is associated with higher wages. Comparing the different skill groups, gives no clear answer to the question of whether the decentralization of work favors high-skilled workers. Overall, the wage gains from higher decentralization are biggest for unskilled workers and lowest for professionals and engineers. Among blue-collar workers, a higher decentralization favors unskilled workers more than skilled workers. Among white-collar workers the reverse pattern emerges. Note, however, that the relatively small effect of decentralization on the wages of professionals and engineers might be due to the censoring of wages which we already discussed above. Our results are again in line with those obtained by Capelli (1996) and Black and Lynch (2000) for the US. However, they do not coincide with those of Caroli and Van Reenen (1999), who find evidence that organizational change in the UK and France is *skill-biased*.

Finally, main investments in IT-technology do not show any significant effect on wages for all specifications shown in Table 3. This finding is in line with recent empirical evidence which stresses the importance to control for unobserved individual or establishment heterogeneity when investing the wage effects of IT-technology (see, for example, DiNardo and Pischke, 1997, Entorf and Kramarz, 1998, and Haisken-DeNew and Schmidt, 1999). Entorf and Kramarz (1998) show for France that cross-sectional results do indeed demonstrate that computer usage is associated with higher wages. When using panel data, however, the premia for using a computer are rendered insignificant. Using the German Socio-Economic Panel, a panel dataset from 1984 to the present consisting of some 13,500 individuals living in Germany, Haisken-DeNew and Schmidt (1999) show that the computer wage premium is around 7% when relying on cross-section data for 1997. Controlling for unobserved heterogeneity by using panel estimators for 1984-1997, this wage premium reduces to 1% and is barely significant. Based on a panel data set of US establishments, Dohms et al. (1997) show that the positive wage effects of new technologies found in a cross-section analysis disappear as soon as the structure of the workforce in an establishment or unobserved heterogeneity is taken into account. A similar results has been obtained by Black and Lynch (2000).

4.2. Within-firm inequality

One of the hypotheses of the theoretical literature on the wage effects of organizational change is that new work practices should decrease within-firm inequality. To test this hypothesis we decompose the variability in log average establishments wages in 1995 into within- and between-establishment components according to the number of organizational changes occurred between 1993 and 1995 using the formula

$$\sigma^2 \quad = \sum_i P_i \sigma_i^2 + \sum_i P_i (\mu_i - \mu)^2, \tag{3}$$

where σ^2 is the total variance of log average establishment wages, σ_i^2 is the variance of log average establishment wages for group i, μ_i is the mean average establishment wage for group i, μ is the overall mean of the mean wages, and p_i is the fraction of establishments in group i. Table 4 reports the results of this decomposition. The overall variance in log average establishment wages in Germany is 0.021. Table 4 shows that the contribution of establishments with a high degree of decentralization to the total variance is smaller than the respective contribution of establishments with the lowest degree of decentralization, indicating that within-firm inequality is lower in firms which use flexible work practices. For example, establishments which introduced none of the flexible work practices contribute 26% of the total variance, establishments which introduced all three flexible work practices contribute only 17%.

This conclusion, however, disappears when controlling for the characteristics of the establishment and unobserved heterogeneity. Table 5 shows the results when estimating equation (2) using the change of the standard deviation of the log average establishment wages as dependent variable. Referring to all workers, the estimated coefficients on our indicators for organizational change are negative, indicating that the introduction of flexible work practices decrease within-firm inequality. However, the estimated coefficients lack significance on every conventional level. The results for the different skill groups show, that the introduction of new forms of work organization increases the within-firm inequality of unskilled blue-collar and of white-collar workers, and decreases within-firm inequality of skilled blue-collar workers and professionals and engineers. In most cases these effects are statistically insignificant. Only among the group of skilled white-collar workers we find a statistically significant effect of our variables describing the degree of decentralization. Differentiating between different types of organizational change shows that the significant effect for skilled white-collar workers is mainly due to the introduction of self-responsible teams. For professionals and engineers we find that self-responsible teams reduces within-firm inequality on a significant level. Overall these results are in line

with Capelli (1996), who also cannot support the hypothesis that organizational change leads to lower within-firm inequality.

5. Summary and Conclusions

A growing theoretical and empirical literature is concerned with the effects of flexible work systems or High Performance Work Organizations (HPWOs) on wages. These flexible work systems are characterized by the introduction or increasing importance of self-managed teams, the reduction of the number of hierarchy levels, a decentralization of decision making within firms, and the replacement of vertical by horizontal communication channels. The existing theoretical literature suggests that workers in firms using a holistic organization of work should earn higher wages than workers in firms who are organized in a traditional "Tayloristic" way. It has been further hypothesized that changes in the organization of work should lead to a segregated labor market, where holistic firms employ only skilled and "Tayloristic" firms employ only unskilled workers. This segregation further leads to decreased within-firm inequality. So far, empirical evidence on the wage effects of organizational change is rather scarce and the results are mixed.

This paper makes use of a new employer-employee-linked data set for Germany to examine whether flexible work systems are associated with higher wages. Our empirical results indicate, that average establishment wages are significantly higher in firms that make use of flexible work systems if compared to firms that did not change their organization of work. However, our results do not confirm the hypothesis that organizational change is *skill-biased*. We rather find that the wage differential associated with the use of flexible work systems is highest for unskilled workers and lowest for professionals and engineers, even though the difference between the two groups is small. This results indicate that German firms rely on *internal* flexibility, i.e. organizational change leads firms to train unskilled workers in order to promote them. Finally, our empirical results do not confirm the hypothesis that organizational change leads to reduced within-firm inequality. Empirical estimations show that the lower variability of wages in firms who use flexible work systems, which appears in the data, cannot be explained by our indicators of organizational change.

References

Abraham, Katharine G. and Susan N. Houseman (1995): "Earnings Inequality in Germany," in: Richard B. Freeman and Lawrence F. Katz (eds.), *Differences and Changes in Wage Structures*. Chicago: University of Chicago Press, 371-403.

Acemoglu, Daron (1999): "Changes in Unemployment and Wage Inequality: An Alternative Theory and Some Evidence," *American Economic Review*, **89**, 1259-1278.

Bartel, Ann (1995): "Training, Wage Growth, and Job Performance: Evidence from a Company Database," *Journal of Labor Economics*, **13** (3), 401-425.

Becker, Irene, and Richard Hauser (1995): "Die Entwicklung der Einkommensverteilung in der Bundesrepublik Deutschland in den siebziger und achtziger Jahren," *Konjunkturpolitik*, **41**(4), 308-344.

Bellmann, Lutz (1997a): "Das IAB-Betriebspanel," *Sonderhefte des Allgemeinen Statistischen Archivs*, **80**, 169-182.

Bellmann, Lutz (1997b): "The IAB-Establishment Panel with an Exemplary Analysis of Employment Expectations," *IAB-Topics No. 20*, IAB, Nürnberg.

Bellmann, L., S. Kohaut, and J. Kühl (1994): "Enterprise Panels and the Labour Market: Using Enterprise Panels to Meet the Needs of the White Paper," in: E. Ojo (ed.), *Enterprise Panels and the European Commission's White Paper*. Luxembourg: Eurostat, 57-74.

Bellmann, L., S. Kohaut, and J. Kühl (1994): "The Establishment Panel of the German Institute for Employment Research," *Proceedings of the First Eurostat International Workshop on Techniques of Enterprise Panels*. Luxembourg: Eurostat, 146-162.

Bellmann, Lutz, and Thorsten Schank (2000): "Innovations, Wages and Demand for Heterogeneous Labor: New Evidence from a Matched Employer-Employee Data Set," *IZA Discussion Paper No. 112*, IZA, Bonn.

Bender, S., A. Haas and C. Klose (2000): "IAB Employment Subsample 1975-1995. Opportunities for Analysis Provided by the Anonymised Subsample," *IZA Discussion Paper No. 117*, IZA, Bonn.

Bender, S., J. Hilzendegen, G. Rohwer, and H. Rudolf (1996): "Die IAB-Beschäftigtenstichprobe 1975-1990. Eine praktische Einführung," *Beiträge zur Arebitsmarkt- und Berufsforschung*, **197**.

Betcherman, G. (1997): *Changing Workplace Strategies: Acieving Better Outcomes for Enterprises, Workers and Society*. Government of Canada and OECD.

Biewen, Martin (1998): "The Effects of Unemployment, Retirement and Female Labor Market Participation on Income Inequality: Evidence from West and East Germany," *Discussion Paper No. 276*, Universität Heidelberg.

Biewen, Martin (1999): "Measuring the Effects of Socio-Economic Variables on the Income Distribution: An Application to the East German Transition Process," *Discussion Paper No. 295*, Universität Heidelberg, forthcoming in: *Review of Economics and Statistics*.

Black, Sandra E., and Lisa M. Lynch (2000): "What's Driving the New Economy: The Benefits of Workplace Innovation," *NBER Working Paper No. 7479*, NBER, Cambridge.

Bresnahan, Timothy F., Erik Brynjolfsson, and Lorin M. Hitt (1999): "Information Technology, Workplace Organization and the Demand for Skilled Labor: Firm-level Evidence," *NBER Working Paper No. 7136*, NBER, Cambridge.

Capelli, Peter (1996): "Technology and Skill Requirements: Implications for Establishment Wage Structures," *New England Economic Review*, May/June, 138-154.

Caroli, Eve, and John Van Reenen (1999): "Skill Biased Organizational Change? Evidence from a Panel of British and French Establishments," *CEPREMAP Discussion Paper No. 9917*, CEPREMAP, Paris.

Caroli, Eve, Nathalie Greenan, and Dominique Guelle (2000): "Organizational Change and Skill Accumulation," mimeo, CEPREMAP, Paris.

DiNardo, John E., and Jörn-Steffen Pischke (1997): "The Returns to Computer Use Revisited: Have Pencils Changed the Wage Structure Too?," *Quarterly Journal of Economics*, **112**(1), 291-303.

Dohms, John E., Timothy Dunne, and Kenneth R. Troske (1997): "Workers, Wages, and Technology," *Quarterly Journal of Economics*, **112**(1), 235-290.

Entorf, Horst and Francis Kramarz (1998): "The Impact of New Technologies on Wages: Lessons from Matching Panles on Employees and on Their Firms," *Economics of Innovation and New Technology*, **5**, 464-491.

Egger, Hartmut, and Volker Grossmann (2000): "Empowerment, Reorganization of Work, and Wage Inequality," mimeo., University of Zürich.

European Foundation for the Improvement of Living and Working Conditions (1997): *New Forms of Work Organization: Can Europe Realize Its Potential?*, Dublin.

European Foundation for the Improvement of Living and Working Conditions (1998): *Direct Participation and Organizational Change*, Dublin.

Gallie, Duncan, Michael White, Yuan Chen, and Marc Tomlinson (1998): *Restructuring the Employment Relationship*, Oxford: Clarendon Press.

Gottschalk, Peter, and Tomothy M. Smeeding (1997): "Cross-National Comparisons of Earnings and Income Inequality," *Journal of Economic Literature*, **35**(2), 633-687.

Haisken-DeNew, John P., and Cristoph M. Schmidt (1999): "Money for Nothing and Your Chips for Free? The Anatomy of the PC Wage Differential," *IZA Discussion Paper No. 86*, IZA, Bonn.

Hunter, Larry W., and John J. Lafkas (1999): "Opening the Box: Information technology, Work Practices, and Wages," *Wharton School Working Paper No. 98-02-C*, University of Pennsylvania.

Ichniowski, Casey, Kathryn Shaw, and Giovanna Prennushi (1999): "The Effects of Human Resource Management Practices on Productivity: A Study of Steel Finishing Lines," *American Economic Review*, **87**(3), 291-313.

Kremer, M., and E. Maskin (1996): "Wage Inequality and Segregation by Skill," *NBER Working Paper No. 5718*, NBER, Cambridge, MA.

Krueger, Alan B. and Jörn-Steffen Pischke (1995): "A Comparative Analysis of East and West German Labor Markets: Before and After Unification," in: Richard B. Freeman and Lawrence F. Katz (eds.), *Differences and Changes in Wage Structures*. Chicago: University of Chicago Press, 405-445.

Lindbeck, A., and D. J. Snower (1996): "Reorganization of Firms and Labor Market Inequality," *American Economic Review*, **86**(2), 315-321.

Lindbeck, A., and D. J. Snower (2000): "Multi-Tasking and the Reorganization of Work: From Tayloristic to Holistic Organization," *Journal of Labor Economics*, **18**(3), 353-376.

McNabb, Robert, and Keith Whitfield (1999): "New Work Practices, Compensation Systems and Performance in UK Workplaces," mimeo., Cardiff University.

Milgrom, Paul, and John Roberts (1990): "The Economics of Modern Manufacturing: Technology, Strategy and Organization," *American Economic Review*, **80**(3), 511-528.

Milgrom, Paul, and John Roberts (1995): "Complementarities and Fit: Strategy, Structure and Organizational Change in Manufacturing," *Journal of Accounting and Economics*, **19**, 179-208.

NUTEK (1996): *Towards Flexible Organisations*, Stockholm: Swedish National Board for Industrial and Technical Development.

NUTEK (1999): *Flexibility Matters: Flexible Enterprises in the Nordic Countries*, Stockholm: Swedish National Board for Industrial and Technical Development.

OECD (1996): *Employment Outlook*, Paris: OECD.

OECD (1999): *Employment Outlook*, Paris: OECD.

Osterman, Paul (1994): "How Common is Workplace Transformation and Who Adopts It?," *Industrial and Labor Relations Review*, **47**(2), 173-189.

Osterman, Paul (2000): "Work Reorganization in an Era of Restructuring: Trends in Diffusion and Effects on Employee Welfare," *Industrial and Labor Relations Review*, **53**(2), 179-196.

Snower, Dennis J. (1999): "Causes of Changing Earnings Inequality," *IZA Discussion Paper No. 29*, IZA, Bonn.

Thesmar, D., and M. Thoenig (1999): "Creative Destruction and Firm Organization Choice: A New Look into the Growth-Inequality Relationship" *Quarterly Journal of Economics*, forthcoming.

Table 1:
Descriptive Statistics on Organizational Change in Germany, 1995

	All Firms	Manufacturing and Construction	Trade, Banking, Insurance and Services
Number of Organizational Changes:			
0	32.19	26.15	46.10
1	26.82	22.15	28.37
2	21.46	22.46	19.15
3	19.53	25.23	6.38
Mean Number of Organizational Changes	1.283 (1.114)	1.468 (1.132)	0.858 (0.946)
Reduction of Hierarchy Levels	37.34	45.85	17.73
Transfer of Responsibilities	51.07	54.46	43.26
Introduction of Self-Managed Teams	39.91	46.46	24.82
Observations	466	325	141

Notes: (..): standard deviations.

Table 2:
New Work Practices, Wages and Employment: Descriptive Statistics, 1995

Variable	All Firms	Reduction of Hierarchy Levels		Delegation of Responsibilities		Introduction of Team-Work		Number of New Work Practices			
		No	Yes	No	Yes	No	Yes	0	1	2	3
log(Average Establishment Wage) of:											
All Workers	5.122	5.102	5.155	5.099	5.143	5.105	5.147	5.089	5.110	5.137	5.173
	(0.144)	(0.140)	(0.146)	(0.145)	(0.140)	(0.143)	(0.142)	(0.138)	(0.148)	(0.145)	(0.135)
			[0.053]‡		[0.045]‡		[0.043]‡		[0.021]	[0.047]‡	[0.084]‡
Unskilled Blue-collar Workers	5.003	4.985	5.032	4.977	5.027	4.980	5.037	4.960	5.006	5.012	5.059
	(0.171)	(0.172)	(0.165)	(0.178)	(0.160)	(0.175)	(0.158)	(0.176)	(0.170)	(0.171)	(0.145)
			[0.048]‡		[0.051]‡		[0.057]‡		[0.046]‡	[0.052]†	[0.099]‡
Skilled Blue-Collar Workers	5.092	5.070	5.129	5.072	5.112	5.073	5.121	5.049	5.104	5.095	5.145
	(0.130)	(0.135)	(0.113)	(0.134)	(0.123)	(0.132)	(0.121)	(0.138)	(0.125)	(0.119)	(0.114)
			[0.059]‡		[0.040]‡		[0.048]‡		[0.055]‡	[0.046]‡	[0.096]‡
Unskilled White-Collar Workers	5.022	5.003	5.053	4.999	5.044	5.008	5.042	4.984	5.030	5.028	5.066
	(0.178)	(0.189)	(0.154)	(0.186)	(0.167)	(0.189)	(0.161)	(0.201)	(0.165)	(0.170)	(0.152)
			[0.050]‡		[0.044]‡		[0.034]‡		[0.045]‡	[0.044]†	[0.082]‡
Skilled White-Collar Workers	5.187	5.147	5.255	5.147	5.225	5.160	5.227	5.121	5.181	5.215	5.274
	(0.164)	(0.163)	(0.142)	(0.163)	(0.156)	(0.166)	(0.152)	(0.165)	(0.153)	(0.160)	(0.134)
			[0.109]‡		[0.078]‡		[0.068]‡		[0.059]‡	[0.094]‡	[0.153]‡
Professionals and Engineers	5.358	5.332	5.400	5.335	5.379	5.334	5.394	5.318	5.341	5.385	5.415
	(0.130)	(0.139)	(0.102)	(0.138)	(0.119)	(0.141)	(0.103)	(0.140)	(0.144)	(0.107)	(0.082)
			[0.068]†		[0.044]‡		[0.060]‡		[0.023]	[0.067]‡	[0.097]†
Total Number of Employees (in 1,000)	0.836	0.624	1.191	0.656	1.008	0.562	1.247	0.481	0.816	0.689	1.610
	(1.437)	(0.837)	(2.042)	(0.861)	(1.811)	(0.624)	(2.079)	(0.498)	(1.122)	(0.637)	(2.690)
			[0.568]‡		[0.351]‡		[0.685]‡		[0.335]‡	[0.208]‡	[1.129]‡
Main Investment in IT in 1993 or 1994	0.193	0.223	0.144‡	0.189	0.197	0.204	0.177	0.207	0.200	0.220	0.132
			[-0.079]		[0.009]		[-0.026]		[-0.007]	[0.013]	[-0.075]
Observations	466	292	174	228	238	280	186	150	125	100	91

Notes: (..): standard deviations. [..]: difference to no change in organization. ‡: difference to no change in organization is statistically significant at least at the 5%-level. †: difference to no change in organization is statistically significant at least at the 10%-level.

Table 3:
The Effect of Organizational and Technological Change on Wages: Fixed-Effects Estimates
Dependent Variable: log(Average Establishment Wages)

	All Workers	Unskilled Blue-Collar	Skilled Blue-Collar	Unskilled White-Collar	Skilled White-Collar	Professionals and Engineers
Panel A: Types of Organizational Change						
Reduction of Hierarchy Levels/100	0.890‡	1.192‡	0.711	1.596‡	0.317	0.926†
	(0.336)	(0.705)	(0.517)	(0.510)	(0.512)	(0.492)
Transfer of Responsibilities/100	0.003	0.072	0.448	-0.510	0.899	-0.983‡
	(0.301)	(0.594)	(0.469)	(0.520)	(0.548)	(0.499)
Introduction of Self-Managed Teams/100	0.997‡	1.268‡	0.839†	0.502‡	0.597	1.561‡
	(0.312)	(0.668)	(0.483)	(0.485)	(0.547)	(0.448)
Main Investments in IT/100	-0.247	-0.229	0.048	0.601	0.513	-0.500
	(0.318)	(0.705)	(0.563)	(0.644)	(0.533)	(0.529)
Panel B: Degree of Decentralization						
Number of Organizational Changes/100	0.609‡	0.818‡	0.659‡	0.495‡	0.614‡	0.451‡
	(0.132)	(0.210)	(0.191)	(0.192)	(0.198)	(0.173)
Main Investments in IT/100	-0.293	-0.289	0.036	0.473	0.548	-0.594
	(0.311)	(0.716)	(0.561)	(0.641)	(0.531)	(0.541)
Index of Decentralization/100	0.671‡	0.902‡	0.730‡	0.551‡	0.684‡	0.481‡
	(0.146)	(0.237)	(0.212)	(0.213)	(0.221)	(0.191)
Main Investments in IT/100	-0.294	-0.290	0.036	0.473	0.548	-0.598
	(0.312)	(0.716)	(0.561)	(0.641)	(0.531)	(0.541)

Notes: Standard errors in parentheses. 466 observations. Estimated equations also include a constant term, the log of total establishment employment, the log of real per capita investments, the log of real per capita revenues, a variable indicating the age of the capital, a dummy variable indicating whether the firm sponsors training, the share of female employees, the share of non-German employees, the share of workers with occupational education, the share of workers with an university degree, and the mean age of the workers employed in the firm, ‡: statistically significant at least at the 5%-level. †: statistically significant at least at the 10%-level.

Table 4:
Variance Decomposition for Change in log(Average Establishment Wages), 1995

	Total Change	Within-Establishments (%)				Between-Establishments (%)			
Number of Organizational Changes		0	1	2	3	0	1	2	3
All Workers	0.021	26.4	28.0	21.6	16.9	1.5	0.1	0.2	2.5
Unskilled Blue-Collar Workers	0.029	34.2	26.5	21.6	14.0	2.0	0.0	0.1	2.0
Skilled Blue-Collar Workers	0.017	35.9	24.6	17.9	14.9	3.5	0.2	0.0	3.2
Unskilled White-Collar Workers	0.032	41.1	23.0	19.5	14.1	1.4	0.0	0.0	1.2
Skilled White-Collar Workers	0.027	32.6	23.2	20.3	13.0	5.1	0.0	0.6	5.4
Professional and Engineers	0.017	37.1	32.8	14.5	7.8	2.9	0.4	0.9	3.8

Notes: 446 observations.

Table 5:
The Effect of Organizational and Technological Change on Wages: Fixed-Effects Estimates
Dependent Variable: Standard Deviation of log(Average Establishment Wages)

	All Workers	Unskilled Blue-Collar	Skilled Blue-Collar	Unskilled White-Collar	Skilled White-Collar	Professionals and Engineers
Panel A: Types of Organizational Change						
Reduction of Hierarchy Levels/100	-0.202	1.700	-0.750	0.726	-0.062	-0.243
	(0.536)	(1.048)	(1.091)	(0.727)	(0.877)	(0.577)
Transfer of Responsibilities/100	-0.056	0.374	-0.655	-0.266	-0.178	0.704
	(0.469)	(0.976)	(0.777)	(0.733)	(0.818)	(0.603)
Introduction of Self-Managed Teams/100	0.020	-0.824	0.666	-0.420	2.452‡	-1.553‡
	(0.546)	(0.935)	(1.206)	(0.623)	(0.852)	(0.576)
Main Investments in IT/100	0.056	-1.008	-0.042	-0.564	1.902	-0.675
	(0.466)	(0.910)	(0.611)	(0.651)	(1.269)	(0.628)
Panel B: Degree of Decentralization						
Number of Organizational Changes/100	-0.079	0.093	-0.262	0.004	0.706‡	-0.327
	(0.163)	(0.349)	(0.247)	(0.248)	(0.299)	(0.219)
Main Investments in IT/100	0.066	-1.050	-0.025	-0.632	1.932	-0.637
	(0.474)	(0.944)	(0.617)	(0.650)	(1.349)	(0.619)
Index of Decentralization/100	-0.089	0.121	-0.309	0.012	0.752‡	-0.340
	(0.185)	(0.391)	(0.285)	(0.276)	(0.329)	(0.244)
Main Investments in IT/100	0.066	-1.048	-0.028	-0.631	1.927	-0.633
	(0.474)	(0.944)	(0.614)	(0.649)	(1.349)	(0.619)

Notes: See Table (3)

Appendix-Table 1: Descriptive Statistics

Δ *Wages of:*	
All workers	0.116 (0.032)
Unskilled blue-collar workers	0.115 (0.060)
Skilled blue-collar workers	0.113 (0.046)
Unskilled white-collar workers	0.111 (0.050)
Skilled white-collar workers	0.112 (0.050)
Professional and engineers	0.114 (0.044)
Reduction of hierarchy levels	0.373 (0.484)
Transfer of Responsibilities	0.511 (0.500)
Introduction of Self-Managed Teams	0.399 (0.490)
Number of Organizational Changes	1.283 (1.114)
Index of Decentralization	1.153 (1.000)
Main Investments in IT	0.193 (0.395)
Δ Age of Used Technology	-0.159 (0.757)
Δ log(Total number of Employees)	-0.037 (0.156)
Δ Training	0.024 (0.330)
Δ log(Revenue per Employee)	0.111 (0.383)
Δ Mean Age of Employees	0.653 (1.072)
Δ Share of Females	-0.005 (0.037)
Δ Share of non-Germans	-0.002 (0.028)
Δ Share of Employees with Occupational Education	0.011 (0.033)
Δ Share of Employees with University Degree	0.004 (0.013)
Observations	466