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ABSTRACT

Technological Change, Organizational Change, and Job Turnover*

This paper uses a German employer-employee matched panel data set to investigate the effect of organizational and technological changes on gross job and worker flows. The empirical results indicate that organizational change is skill-biased because it reduces predominantly net employment growth rates of unskilled and medium-skilled workers via higher job destruction and separation rates, whereas the employment patterns of skilled workers are not affected significantly. New information technologies do not have significant effects on gross job and worker flows as soon as establishment fixed-effects are controlled for.

JEL Classification: J63, L23, O33

Keywords: linked-employer-employee data set, information technology, organizational change, job turnover, worker turnover

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1. Introduction

In the past two decades, most advanced industrialized countries have witnessed an increase in the relative demand for skilled labor, as evidenced by rising earnings inequality in the US and the UK and an increase in the relative unemployment rates of unskilled labor in continental Europe.[1] The economic literature focuses on two main phenomena to explain these developments: increased trade with developing countries and skill-biased technological change. More recent literature suggests that changes in the organizational structure of firms, which is characterized by an increasing use of so-called flexible or innovative workplace systems or High Performance Work Organizations (HPWOs), might be another important determinant of the observed labor market developments.[2] Even though the dissemination of HPWOs varies between countries, industries, and firms, the observed reorganization process appears to be of quantitative importance in almost all industrialized economies.[3] Recent empirical studies by Bresnahan, Brynjolfsson and Hitt (1999) for the US, and Caroli and van Reenen (2001) for France and the UK suggest that HPWOs are complementary with skills and hence could add to the explanation of the relative increase in the demand for skilled labor.

Based on a standard static labor demand framework, most empirical studies on the wage and employment effects of technological and organizational change estimate wage or employment share equations for different skill groups. In these equations the estimated coefficient of indicators for technological and organizational change is used to test whether new technologies or flexible workplace practices are complementary to skills. Many theoretical models, however, view technological and organizational

[1] Surveys of the literature are given, among others, by Gottschalk and Smeeding (1997), Katz and Author (1999), Machin and Manning (1999) and Snower (1999).

[2] In the literature, there is no consensus on the definition of HPWOs. Usually, measures such as 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 diversification are subsumed under the term HPWO.

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

change as a process of creative destruction which involves the reallocation of jobs and workers across and within firms (Aghion and Howitt 1992; Kremer and Maskin, 1996; Mortensen and Pissarides, 1998, 1999a; Thesmar and Thoenig, 2000). These models suggest that it is important to analyze the effects of technological and organizational change in a dynamic framework to obtain a more detailed picture of the adjustment processes associated with these changes. It has very different policy implications whether such changes result in an increased destruction of jobs for unskilled workers, a relative decrease in the rate of job creation for unskilled workers or whether jobs that employ the newest technology and flexible workplace systems are only created for skilled workers leaving employment of unskilled workers unaffected. An analysis of employment shares cannot uncover these different processes because it is not able to distinguish different patterns of job creation and job destruction.

Using a standard dynamic labor demand specification by regressing net employment changes on indicators for technological and organizational change, however, might mask important heterogeneity and asymmetry patterns in employment creation and destruction. Mortensen and Pissarides (1998), for example, developed a model in which firms have several options to adjust their workforce when implementing new technologies or new organizational structures.[4] In their model, firms have the possibility to update their technology or organization by paying a fixed renovation cost. These renovation costs subsume the costs of buying new machines as well as internal adjustment costs, such as the costs to train workers to operate in a new technological and organizational environment. If these renovation costs are lower than the costs of creating a new job, firms will adjust internally, i.e. they will update their existing jobs by training their incumbent workers. If the adoption costs are high relative to the job creation costs, firms will destroy the old jobs and and hire new workers with the necessary skills to work with the new technology and/or the new organizational environment.

The model of Mortensen and Pissarides (1998) has important implications for

[4]See also the discussion in Mortensen and Pissarides (1999b) and Aghion and Howitt (1999, chapter 4.)

the empirical investigation of employment adjustment patterns arising from technological and organizational change. First, focusing solely on net employment changes might not provide sufficient insights into the adjustment patterns associated with technological and organizational change because these changes might have significant effects on job and worker reallocation without necessarily affecting net employment. Therefore, it seems to be important to investigate also gross job and worker flows. Second, if firms in an industry or economy rely predominantly on internal adjustment, industry-level studies of net employment changes might erroneously conclude that technological or organizational change is not skill-biased. Since there is no clear relationship between job and worker reallocation across firms on the one hand and technological and organizational change on the other, it is important to take into account flows occurring across different skill groups within firms. If firms rely predominantly on external adjustment, technological and organizational change should lead to higher job and worker turnover across firms. If, however, firms rely predominantly on internal adjustment, technological and organizational change should not affect turnover rates across firms. Hence, if firms rely on internal adjustment, studies of gross job and worker flows at the industry level might come to misleading conclusions regarding the question of whether technological and organizational change is skill-biased. To avoid these problems, one has to rely on firm or establishment data.

Using an employer-employee matched panel data set for Germany, this paper aims at analyzing the employment effects resulting from the introduction of new information technologies and HPWOs. Several issues are addressed. First, we investigate whether technological and organizational changes are skill-biased and whether these changes involve different patterns of job creation and destruction for different skill groups. By looking only at different job flow measures, we might miss important employment adjustment patterns that occur during the process of technological and organizational change. It is possible, for example, that firms replace their incumbent workers without changing the overall employment level and skill-mix. We therefore also analyze worker turnover rates. We focus in particular on the question whether plants that introduced new technologies or HPWOs show higher worker replacement

rates than plants that did not change their technological or organizational structure.

The paper further contributes to the empirical literature on the relationship between flexible workplace systems and establishment outcomes.[5] Several studies on this issue find that HPWOs increase productivity (see for example, Ichniowski et al. 1997, Batt 1999, Appelbaum et al. 2000). Empirical research on the wage effects of HPWOs suggests that these systems also increase wages, indicating that the relationship between HPWOs and profitability is ambiguous (Appelbaum et al. 2000, Capelli and Neumark 2001, Bauer and Bender 2002). Focusing solely on wages, however, this literature does not take into account other important components of total labor costs that might also be affected by HPWOs. It is possible, for example, that flexible workplace systems reduce labor turnover. The resulting reduction in hiring and firing costs might compensate for the increasing wage costs and thereby lead to a reduction of total labor costs. This paper contributes to this literature by providing some evidence on the relationship between flexible workplace practices and labor turnover.

Finally, the paper complements recent work on the relationship between job flows and workers flows using employer-level data.[6] This literature is concerned with the question whether firms increase (reduce) employment by increasing (decreasing) hires or by reducing (increasing) separations. Different from most other studies in this area, our data set allows us to study gross job and worker flows at the skill level rather than the plant or industry level (but see Abowd, Corbell and Kramarz, 1999).

The paper is organized as follows. The next section defines the different job and worker flow measures and describes our empirical approach. Section 3 provides a detailed description of the data set. A descriptive analysis of gross job and worker flows resulting from technological and organizational change is given in Section 4. Section 5 presents the effects of organizational change on worker turnover in a mul-

[5] A recent survey of the literature is given by Capelli and Newark (2001).

[6] See Burgess, Lane and Stevens (2000,2001), Davis, Haltiwanger and Schuh (1996) and Anderson and Meyer (1994) for the US, Hamermesh, Hassink and van Ours (1996) for the Netherlands, Abowd, Corbell and Kramarz (1999) for France, and Albæk and Sørensen (1998) for Denmark. A survey is given by Davis and Haltiwanger (1999).

tivariate setting comparing cross-section results to fixed effects estimates. Section 6 summarizes our analysis.

2. Empirical Approach

2.1. Gross Job and Worker Flows: Definitions

We closely follow the existing literature by defining gross job and worker flows (Burgess, Lane and Stevens, 2000; Davis and Haltiwanger, 1999; and Hamermesh, Hassink and van Ours, 1996). Our definition of a job, however, departs from the standard definition in the literature. Usually, a job is defined as a relationship between a worker and a firm or simply a match. Changes in the number of such matches are viewed as job flows. This definition, however, would not allow us to capture job reallocation between different skill groups within an establishment in an appropriate way. Technological and organizational change might lead firms to reconfigure the skill-mix of the workers in the firm keeping the total number of jobs constant, by replacing jobs of one skill-type with jobs of another skill type. Based on the standard definition of jobs, these changes would be labeled as replacement or churning flows. To be able to study the reallocation of jobs and workers between different skill groups within a plant, we define a job as a set of skills that the employer recognizes as being attached to an employment position. Using this definition, the change of a worker from one skill type to another within a firm through training, for example, is considered as a job flow. Note, by taking within-establishment flows of jobs and workers between different skill groups into account, the measures of job and worker flows reported below should be higher and the calculated churning flows lower than those we would have obtained by using the standard definition of jobs.

Job flows are defined as the change in employment of skill group i in establishment e at time t (ΔE_{iet}), which equals the difference in hirings (H_{iet}) and separations (S_{iet}), i.e. $JF_{iet} = \Delta E_{iet} \equiv H_{iet} - S_{iet}$, where $\Delta E_{iet} = E_{iet} - E_{iet-1}$. In the empirical analysis we differentiate between three skill-groups based on the occupation of an

individual as it has been specified by the employer. A more detailed description of these skill-groups is given in the next section. The level of job reallocation is the absolute value of the corresponding job flows, $JR_{iet} = |JF_{iet}|$; job creation is a positive job flow, $JC_{iet} = JF_{iet}$ if $JF_{iet} \geq 0$ and 0 otherwise; job destruction is a negative job flow, $JD_{iet} = |JF_{iet}|$ if $JF_{iet} < 0$ and 0 otherwise. Worker flows, WF_{iet}, equal the sum of total hires and total separations, which occurred between $t-1$ and t. Following Davis and Haltiwanger (1999), the corresponding rates (JFR_{iet}, JRR_{iet}, JDR_{iet}, JCR_{iet}, HR_{iet}, SR_{iet}, WFR_{iet}) are obtained by dividing the levels with the average of current and past employment, i.e. $Z_{iet} = (E_{iet} + E_{iet-1})/2$. Denoting the plant-level average of current and past employment as $Z_{et} = (E_{et} + E_{et-1})/2$ and defining the employment shares of the different skill groups as $ES_{iet} = Z_{iet}/Z_{et}$, the plant-level job flow, creation, destruction and reallocation rates can be written as the sum of the skill-level rates weighted by the respective employment shares, i.e.

$$JFR_{et} = \sum_i ES_{iet}\, JFR_{iet}, \tag{1}$$

$$JCR_{e,t} = \sum_{i,JF_{iet}\geq 0} ES_{iet}\, JFR_{iet}, \tag{2}$$

$$JDR_{e,t} = \sum_{i,JF_{iet}<0} ES_{iet}\, |JFR_{iet}|, \tag{3}$$

$$JRR_{e,t} = \sum_i ES_{iet}\, |JFR_{iet}|. \tag{4}$$

Based on these measures, we investigate whether technological and organizational changes results in employment changes at different margins, i.e. whether they are associated with different job creation or job destruction patterns. They enable us, for example, not only to investigate whether technological and organizational change is skill-biased, but also whether relative employment changes mainly occur through the destruction of jobs for low-skilled workers or mainly through the creation of jobs for high-skilled workers.

A final question we address in this paper is the issue of worker reallocation. Imagine a firm that introduces a new machine. In this case, it is possible that the firm fires five incumbent skilled workers that do not have the skills to work

with the new machine and hires five new workers with appropriate skills without changing the employment of the other skill groups. Then, net employment change and hence measured establishment job flows would be zero for all skill groups, if one relies only on the concepts defined above. Worker flows can be written as the sum of worker flows due to changes in the employment size of a particular skill group in the establishment and worker flows due to replacements of existing jobs, i.e. $WF_{iet} = JR_{iet} + C_{iet}$, where C_{iet} is often called excess worker flows or churning (Burgess, Lane and Stevens, 2000, 2001; Hamermesh, Hassink and van Ours, 1996).

The churning rate, CR_{iet}, which is obtained by dividing C_{iet} by Z_{iet}, gives an indication of the worker flows in excess of the job flows which are necessary to accomplish an establishment's desired growth or decline in the employment of a particular skill group. Churning flows describe the sum of hirings and separations which are due to the replacement of workers who quit and workers who have been fired by the employer. Assuming that there are no vacancies, replacement hirings equal replacement separations in equilibrium. Based on this assumption, some authors use replacement rates, RR_{iet}, which in equilibrium equal half of the churning rate (see, for example, Albæk and Sørensen, 1998).

2.2. Econometric Specification

To assess the effects of technological and organizational change on job and worker flows, we specify the following model, which is estimated on the plant-level e separately for three skill categories i:

$$Y_{iet} \;=\; \alpha' \, X_{et} + \beta' \, Z_{et} + \gamma' \, I_{et} + \epsilon_{iet} \, . \tag{5}$$

We further estimate equation (5) for all workers in an establishment. As dependent variables we consider the measures for gross job and worker flow rates described above, i.e. JFR_{iet}, JDR_{iet}, JCR_{iet}, HR_{iet}, SR_{iet}, and CR_{iet}.

The vectors I_{et} and Z_{et} consists of variables describing the introduction of new information technologies and flexible workplace practices at establishment e, respectively. These variables will be described in more detail in the next section. As

already discussed above, it is not entirely clear how organizational and technological changes affect the different measures of gross job and worker turnover. If organizational and technological change are skill-biased, one would expect a relative increase in the employment of skilled workers. This relative employment increase could be achieved through various channels. For example, technological change might increase job creation for skilled workers and professionals and engineers if compared to non-qualified workers and increase relative job destruction for the latter. Alternatively, however, technological change might only affect job creation rates of skilled workers, leaving unskilled workers unaffected. New information technologies could also be mainly a substitute for non-qualified labor, increasing job destruction rates for unskilled labor without necessarily affecting job creation and destruction rates of skilled workers.

Similar arguments can be put forward for the effects of organizational change. It has often been argued that innovative work systems raise skill demands, since workers employed in firms relying on HPWOs need to be willing to acquire new skills, to perform multiple tasks, and to care about quality and productivity. Skilled workers are more able to better able to communicate information, they have a relative advantage in multi-tasking, and the costs of training them is lower compared to unskilled workers. Hence, the returns to innovative work practices could be expected to be higher when the skill level of the workforce in an establishment is higher (Caroli and van Reenen, 2001). Similar to the case of a skill-biased technological change, one would expect a relative increase in the employment of skilled workers and professionals and engineers. It is unclear, however, how HPWOs affect the different gross job and worker flow rates for different skill groups.

The vector X_{et} captures other variables that might affect gross job and worker flows. This vector includes the log of total employment in establishment e, the employment share of unskilled and skilled workers, the employment share of females, foreigners, and part-time workers, and the median age of the employees. In addition, we consider two dummy variables indicating whether the revenues of an establishment increased or decreased during the last year as well as two dummy variables

indicating whether the establishment expects rising or falling revenues in the next year. We further include a variable indicating whether a firm uses state-of-the-art production technology, the share of exports on total revenues in the last year, eight industry and seven regional dummies. A detailed description of the variables together with descriptive statistics is given in Appendix Table 1.

Several econometric problems arise when estimating equation (5). First, Z_{et} and I_{et} are likely to be endogenous (Caroli and van Reenen, 2001; Athey and Stern, 1998). A positive demand shock, for example, might enable firms to increase the number of skilled workers, to invest in new technologies, and to experiment with innovative workplace systems. To circumvent this problem, we use lagged values of organizational change when estimating equation (5), i.e. we consider gross job and worker flow rates in the period from 1995 to 1996 and regress these on organizational and technological changes between 1993 and 1995.

Second, even though our data set allows us to control for many characteristics of an establishment and the structure of its workforce, estimates of β and γ based on equation (5) might still suffer from omitted variable bias due to unobserved establishment characteristics. To address this problem, we eliminate all observed and unobserved time-invariant establishment fixed-effects by taking first differences. In particular, we report estimates of the form

$$Y_{iet} - Y_{iet-2} \;=\; \alpha' \left(X_{et} - X_{et-2}\right) + \beta' \, Z_{et-1} + \gamma' \, I_{et-1} + \mu_{iet} \;, \tag{6}$$

where $t-2$ refers to a period before organizational and technological changes are observed, i.e., the period from 1992 to 1993.

Finally, our dependent variables are truncated. The job flow rates, JFR_{iet}, vary between -2 and 2; all other job and worker flow rates between 0 and 2. To take the limited range of our dependent variables into account, we estimated equation (5) using a Tobit model with the respective restrictions. Note that this problem disappeared after taking first differences. Therefore, we estimated equation (6) using OLS.

3. Data

The following analysis of the effects of technological and organizational change on labor turnover is based on a German employer-employee linked data set that was constructed through the combination of the *IAB Establishment Panel* and the *Employment Statistics Register*. The *IAB Establishment Panel* is an annual representative survey of establishments employing at least one employee who pays social security contributions.[7] Starting in 1993, the survey was administered through personal interviews. The second data source, the *Employment Statistics Register*, is an administrative panel data set of individuals based on the integrated notifying procedure for the German health insurance, statutory pension scheme, and unemployment insurance.[8]

Both data sets contain a unique firm identification number, which allows us to merge the information on employees provided by the *Employment Statistics Register* with the information in the *IAB Establishment Panel*. Matching of the data sets occurred in two steps. First, we selected West German firms who participated in the establishment panel between 1993 and 1996, resulting in a sample of 2,579 establishments. In a second step, we used the *Employment Statistics Register* to merge with our sample of establishments the work history information for all employed persons who worked for at least one day in at least one year from 1992 to 1996 in one of the selected establishments. The individual information has been extracted for every 30th of June, the day of reference for the *IAB-establishment panel*.

In our analysis, we differentiate three skill groups: unskilled worker (u), skilled worker (s), and professionals and engineers (h). Our classification of individuals into these three skill-groups follows a scheme proposed by Blossfeld (1995), which

[7] See Bellmann, Kohaut and Kühl (1994), Bellmann (1997) and Kölling (2000) for a detailed description of the *IAB-Establishment Panel*.

[8] Since 1973, employers are obliged to provide information to the social security agencies for those employees registered by the social security system. Employers have to notify the social security agencies about the beginning and ending of any employment relationship. In addition, they have to provide an annual report for each employee covered by social insurance who is employed on the 31st December of each year. This report includes information on the sex, year of birth, nationality, marital status, number of children, occupation, and qualification of the employee. See Bender et al. (1996) and Bender, Haas and Klose (2000) for a detailed description of the data set and the notifying procedure.

is based on the 3-digit occupation of an individual as it was specified by the employers in the notification to the social security agencies. Following this scheme, all blue-collar workers who are classified by the employer into an occupation which is characterized by simple manual tasks and white-collar workers performing simple services are considered to be unskilled; blue-collar workers who practice an occupation which involves complicated tasks, white-collar workers performing qualified tasks, as well as semi-professionals are considered to be skilled workers. The third group consists of engineers, technicians, professionals and managers. Note that the resulting classification of individuals into the three skill-groups based on their occupation is highly correlated with their completed occupational education.[9]

We excluded apprentices, trainees, persons who are temporarily out of the labor force due to child bearing or military service, part-time workers, and individuals older than 65 from our individual sample. Using the firm identifier, the two data sets were matched to a linked employer-employee data set, providing detailed information on the characteristics of all employees in an establishment who are covered by the social security system. Excluding all establishments in the agricultural, mining and non-profit sector, those with missing values for the variables used in the empirical analysis and all establishments that do not employ a single worker in any of the three skill groups in the whole period from 1992 to 1996, a total of 1,305 observations remained for the empirical analysis.[10]

The different measures for gross job and worker flows described above were constructed in the following way. Inter-firm mobility is measured as a change of an individual's firm identifier between two consecutive years. Movements into and out of unemployment or the labor force occur if a person has a gap between two years, which means that the individual is not employed on the 30th of June of a particular year, or if the person does not have a notification at the beginning (1992) or the

[9] About 50% of the individuals classified as being unskilled have no occupational education and another 50% received apprenticeship training. Less than 0.5% of the unskilled workers hold a university degree. Among those classified as being qualified, only 17% do not have any occupational education, 80% have at least received apprenticeship training, and about 3% hold a university degree. Finally, among professionals and engineers, about 30% hold a university degree, another 65% have at least apprenticeship training, and only about 5% do not have any occupational training.

[10] Restricting the analysis to firms with at least one worker in one of the three skill groups reduces our initial sample by about 900 observations.

end (1996) of our observation window. Inflows and outflows of workers for every establishment are obtained by counting inter-firm mobility and movements into and out of unemployment or the labor force for every year and skill group. Intra-firm mobility is defined as a change in the skill classification of an individual that does not change the firm identifier.

In 1995, establishments participating in the *IAB-establishment panel* were asked the following questions: *"Have there been any of the following organizational changes in your establishment over the last 2 years?"* From the possible answers, we created dummy variables indicating whether an establishment *(i)* reduced the number of hierarchy levels, *(ii)* transferred responsibilities to subordinates, and *(iii)* introduced team-work or self-responsible working groups. Note that that these changes cover three out of four practices that were identified by Betcherman (1997) and OECD (1999) as main characteristics of flexible workplace systems.[11] 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. If practices are introduced in clusters, the above-described indicators of organizational change should be highly correlated with each other, making it difficult to identify the separate effects of these indicators. We therefore applied a principal component analysis to the three dummy variables described above to derive an index of decentralization.[12]

Table 1 summarizes the extent of organizational change in our sample. Between 1993 and 1995, about 27% of all establishments reduced the number of hierarchy levels, 42% transferred responsibilities to lower hierarchy levels, and about 31% introduced self-managed teams. Table 1 further shows that these changes are relatively more common in the manufacturing sector, which is in line with the experience of organizational changes in other countries (OECD, 1999).[13]

[11] The fourth characteristic is a job design that involves multi-tasking.

[12] The first principal component accounted for 57% of the variance and had an eigenvalue of 1.720. The second and third principal component have eigenvalues below 1, supporting the aggregation of the information on organizational change into one common factor. The scoring coefficients used for the calculation of the decentralization index are 0.439 for the reduction of hierarchy levels, 0.464 for the delegation of responsibilities, and 0.416 for the introduction of team work.

[13] Since our variables on organizational change are based on retrospective questions, one might be concerned that these variables suffer from measurement error. One of the most serious problems with this kind of questions is "forward telescoping", i.e., respondents report events that occurred

Between 1993 and 1995, the *IAB Establishment Panel* contains detailed information on the type of investments in the last year. We employ this information to create two dummy variables that proxy a technological change between 1993 and 1995. The first dummy variable indicates whether an establishment reported any investments in communication and information technologies either between 1993 and 1994 or between 1994 and 1995. The second variable indicates whether these investments have been the single biggest investment of the establishment in the respective year. According to Table 1, more than 81% of the establishments report investments in IT in 1993 or 1994. Nearly 27% of the establishments indicated that their IT investments were the single biggest investment. Even though the share of establishment with IT investments is slightly higher in the manufacturing sector if compared to the non-manufacturing sector, a higher share of the latter report that these investments have been the single biggest investment.

4. Descriptive Analysis

4.1. Gross Job and Worker Flows in Germany

Table 2 reports job and worker flow rates between 1995 and 1996 for establishments with increasing and decreasing total employment as well as establishment without any employment change. The measures are given for all workers as well as for the three skill groups. In parentheses we further report the job and worker flow measures for the different skill groups divided by the average total employment of the establishment between 1995 and 1996, which show the contribution of the respective skill-level job and worker flows on the establishment-level job and worker flows (see equations (1)-(4)).

The majority of firms in our sample (63%) show negative employment growth rates. Furthermore, the job flow rates in establishments with decreasing employment

outside of the time under consideration, resulting in over-reporting. Note that the questions on organizational change in the *IAB-establishment panel* followed a two-step bounded recall procedure, which can effectively reduce over-reporting in retrospective questions (see, for example, Brennan et al., 1996). A more detailed discussion of this problem is given by Bauer and Bender (2002).

are higher in absolute terms than the respective job flow rates in establishments with increasing employment, indicating that the overall employment level decreased. These numbers reflect that the German economy experienced a downturn in this period. Between 1995 and 1996, overall employment in West Germany decreased by almost 1.3%, and the unemployment rate increased from 8.2% to 8.3%.

Establishments with increasing employment during the period 1995-1996 created on average 7.5 jobs; establishments with decreasing employment destroyed on average 12 jobs per 100 workers. Growing firms hired on average 20 workers and separated from 12 workers, indicating that the creation of one job involves hiring three workers and separating from two workers. Establishments with decreasing employment hired on average one worker and separated from two workers for every job destroyed. Note that these numbers are similar to those reported by Abowd, Corbel and Kramarz (1999) for France. The comparison of hiring and separation rates between establishments with positive and negative employment growth rates shows that the differences in the separation rates between these two types of establishments are smaller than the corresponding differences in the hiring rates. This finding resembles those in other countries (Abowd, Corbel and Kramarz, 1999; Albæk and Sørensen, 1998) and indicates that a reduction of employment is achieved mainly by reducing hirings rather than increasing separations.

Compared to skilled workers and professionals and engineers, the difference between the separation rates of establishments with increasing and those with decreasing employment is higher for unskilled workers, whereas the differences in hiring rates are roughly similar across the three skill groups, indicating that employment adjustment predominantly occurs through adjusting the employment of unskilled workers. This conclusion is confirmed when comparing the respective shares of the three skill groups on the total, establishment-level job flow rates, which could be obtained by dividing the numbers reported in parentheses by the respective job flow rates for all workers. In firms with increasing employment, the average share of unskilled workers on the total establishment-level job flow is about 37%, which is smaller than their respective average employment share of 40%. About 42% of an

employment decrease is obtained by decreasing the employment of unskilled workers, even though the employment of unskilled workers in shrinking establishments constitutes on average only about 40% of total employment.

Table 2 further shows high churning rates for all groups considered, indicating an enormous amount of worker reallocation in excess of the amount which would be necessary to accomplish an establishment's desired change in employment. Churning flows constitute between 48% and 70% of all worker flows (the sum of hiring and separation flows). They are higher in establishments with positive if compared to establishments with negative net employment growth. Worker replacement is relatively more important for unskilled and skilled workers than for professionals and engineers, especially in firms with growing employment. The latter might reflect relatively high turnover costs for professionals and engineers, which in turn gives firms an incentive to put relatively more effort into matching/hiring this group of workers with the consequence of lower churning rates (Burgess, Lane and Stevens, 2000, 2001).

4.2. Organizational Change, Technological Change, and Labor Turnover

Table 3 shows the job and worker flow rates for all firms and for the subset of firms that either introduced one of the flexible workplace systems we consider or reported main investments in IT. On average, establishments in our sample decreased employment by 5.0%, reflecting again the overall development in the German labor market. This employment decrease is largely driven by unskilled workers, who experienced an employment decrease of about 6.6%, and professionals and engineers, who experienced an employment decrease of about 6.7%. Different from these two skill groups, the employment of skilled workers decreased only by 3.7%. Note that almost 46% of the overall decrease in employment was obtained by reducing the employment of unskilled workers, even though they constituted only 40% of total employment in 1995. Overall, establishments in our sample destroyed three jobs for every job created. For every job created, three jobs were destroyed for unskilled

workers, two for skilled workers, and 2.5 for professionals and engineers.

Comparing the sub-samples of firms that experienced an organizational or technological change reveals some interesting patterns. The overall decrease in net employment between 1995 and 1996 is almost three percentage points higher in establishments that reduced the number of hierarchy levels if compared to the average establishment. The ratios of job destruction to job creation rates in establishments that flattened their hierarchy structure are 5.86 for unskilled workers, 3.98 for skilled workers and 2.63 for professionals and engineers. These numbers suggests that the reduction of hierarchy levels is skill-biased in the sense that the difference in the job destruction to job creation ratio between firms that reduced their hierarchy level and the average firm is lower for professionals and engineers than that for unskilled and skilled workers. This conclusion can also be obtained by calculating the shares of the job flows of the different skill groups on the establishment-level job flow rate. Professionals and engineers contribute only 18% and skilled workers an additional 33% to the overall employment reduction of 7.8%, even though they constitute on average 20% and 38% of total employment in these establishments, respectively. The decrease in employment of unskilled workers, which represent 42% of the workers in these establishments, explains about 49% of the overall employment decrease.

Establishments that reduced the number of hierarchy levels show higher separation and lower hiring rates if compared to those of the average establishment, especially for unskilled and skilled workers. Note further that the relative increase in the separation rates and the respective decrease in the hiring rates are very similar for these two groups. Hence, there is almost no difference between the total worker flow rates (the sum of hiring and separation rates) to the average firm for unskilled and skilled workers. The churning rates among establishments that reduced the number of hierarchy levels are also not very different to those of the average establishment. To summarize, a reduction in the number of hierarchy levels appears to be skill-biased in the sense that it reduces the relative employment of unskilled and skilled workers. The reduction in the employment shares of unskilled and skilled workers is achieved mainly through higher job destruction. Assuming that the skill

level of workers is positively correlated with their position in the hierarchy level, these results suggest that a reduction in the number of hierarchy levels is achieved mainly by employees in higher hierarchy levels taking over tasks from lower levels.

A slightly different picture emerges for firms that transferred responsibilities to lower hierarchy levels. Again, these firms experienced higher negative employment growth rates if compared to the average firms. The employment reduction in these firms, however, is smaller than in firms that reduced the number of hierarchy levels. Different than the reduction of hierarchy levels, the transfer of responsibilities seems not to be skill-biased - it seems to be rather beneficial for skilled workers, whereas professionals and engineers suffer from this change. The latter contribute more than 28% to the overall employment decrease in these firms, even though they represent only 21% of total employment in these firms. The reduction of the employment of unskilled workers in firms that transferred responsibilities is similar to their employment share in 1995, and skilled workers contribute to less to the overall employment reduction than their employment share in 1995. Again, the differences of the employment development in firms that transferred responsibilities and the average firm can mainly be explained by differences in job destruction and separation rates.

Different than the other two practices, the employment decrease in firms that introduced self-managed teams is lower than in the average firm. The introduction of self-managed teams has similar effects to a transfer of responsibilities in the sense that only skilled workers benefit from this practice. Whereas the job creation and hiring rates are not very different to the average firm, job destruction and separation rates are considerably lower, resulting also in lower worker flow rates. These differences may reflect that the functioning of self-managed teams is in particular dependent on a substantial commitment of employees to their enterprise (Ostermann, 2000).

According to Table 3, a technological change leads to relatively lower employment growth rates for unskilled workers and professionals and engineers and to relatively higher employment growth rates for skilled workers if compared to the average firm. This relative employment development manifests itself in considerably higher job

destruction rates for unskilled workers and the most skilled. Main investments in IT increase the (JDR/JCR)-ratio for unskilled workers and professionals and engineers and decrease the respective ratio for skilled workers. Hence, technological change appears not to be skill-biased. Different than the patterns observed for organizational changes, however, establishments that invest in IT increase both hiring and firing rates. Consequently, churning rates are also higher in these establishments compared to the average establishment. These patterns indicate that a technological change does not only result in a reduction of the relative employment of unskilled and highly skilled labor, but is also associated with a substantial replacement of incumbent workers.

5. Estimation Results

In this section we want to explore whether the results of the descriptive analysis remain the same after controlling for observed characteristics of the establishment. Table 4 presents the estimated coefficients for different indicators of organizational and technological change as well as the main and interactive effects of investments in IT and main investments in IT, which we obtained by estimating equation (5) using a Tobit model.[14]

The estimation results for the effects of introducing HPWOs on job flows largely confirm the results from the descriptive analysis of the last section. Panel A of Table 4 shows that net employment growth rates are about 2.6% lower in establishments that reduced their number of hierarchy levels if compared to firms that did not change their hierarchical structure. Reducing the number of hierarchy levels does not affect job creation and hiring rates but has significant positive effects on job destruction and separations rates. The estimated marginal effects (not reported here) imply that the reduction of hierarchy levels increases the probability of job destruction by 7.5% and, conditional on destroying jobs, increases the de-

[14] A full set of all estimation results is available upon request.

struction rate by 1.7%. Similar to the reduction of the number of hierarchy levels, a transfer of responsibilities between 1993 and 1995 reduces net employment growth rates between 1995 and 1996, whereas the introduction of self-managed teams results in significantly higher growth rates. These effects can mainly be attributed to the significant positive effect of a transfer of responsibilities on the separation rate and the significant negative effects of the introduction of self-managed teams on both job destruction and separation rates. Investments in IT appear to increase net employment growth rates through lower separation rates. The estimated main and interactive effects show, however, that these effects disappear as soon as these investments constitute the single biggest investment.

Panels B - D of Table 4 show the estimation results for the three different skill groups. A reduction in the number of hierarchy levels decreases net employment growth rates for unskilled and skilled workers, even though the effect for the former is statistically significant only at the 10%-level. The job destruction and separation rates of both groups increase significantly through this change. Even though job destruction and separation rates of professionals and engineers are also positively affected by a reduction of hierarchy levels, their net employment growth rate does not seem to change significantly. The delegation of decision rights has a significant effect on net employment growth of skilled workers only. Different from the descriptive analysis above, however, the transfer of responsibilities leads to significantly lower net employment growth rates and significantly higher job destruction and separation rates for skilled workers when establishment characteristics are controlled for.

The introduction of self-managed teams has significantly positive effects on the employment growth rates of unskilled and skilled workers. For both groups, this effect could mainly be explained by the negative impact of teams on job destruction and separation rates. Investments in IT show positive effects on the job flow rates of skilled and unskilled workers. If these investments constitute the biggest single investment in the period from 1993 and 1995, however, this positive effect disappears for skilled workers and becomes significantly negative for unskilled workers. These results indicate that new information technologies are skill-biased in the sense that

a main change in the use of these technologies decreases the employment share of unskilled workers. Note, finally, that professionals and engineers have significantly higher churning rates in firms that reported main investment in IT.

Table 5 shows the estimation results when using the index of decentralization, obtained through a principal component analysis, as indicator of organizational change rather than dummy variables for each practice. Recall that this index increases with an increasing decentralization of the organizational structure between 1993 and 1995. The results confirm those reported in Table 4. The index shows significant negative effects on the total employment growth rate as well as on the employment growth rate of skilled workers. These lower employment growth rates are mainly driven by a significantly higher job destruction and separation rate in both cases. A higher decentralization also increases the job destruction and separation rates for professionals and engineers. Their job flow rate, however, is not significantly affected by the index. The index does not have significant effects on the job flow rate of unskilled workers. However, it significantly decreases the job creation rate and increases the job destruction rate of this group of workers.

Tables 6 and 7 reports the results when removing all observed and unobserved time-invariant establishment fixed effects by taking first differences using information form the period from 1992 to 1993. In most cases, the effects of organizational and technological change are estimated less precisely. The overall picture, however, does not change when taking fixed establishment effects into account. In particular, skilled workers are negatively affected by organizational changes through higher job destruction and separation rates. When using our index for the degree of decentralization, unskilled workers appear to be affected negatively by organizational change as well. This negative effect could again be mainly explained with higher job destruction and separation rates. Different to the results reported in Tables 4 and 5, however, the introduction of self-managed teams and the index of decentralization have a significant positive effect on the churning rates in the specification for all workers as well as for unskilled workers. After controlling for establishment fixed-effects, main investments in IT have only significant effects on the churning

rates for professionals and engineers.

6. Summary

Using a linked employer-employee panel data set for Germany, this paper analyzes the effects of technological and organizational changes on gross job and worker flows. Investigating gross job and worker flows in addition to net employment changes provides important insights into the specific employment adjustment processes associated with technological and organizational changes. Our empirical results indicate that firms that introduce high performance work practices show significantly lower net employment growth rates. We find some support for skill-biased organizational change. Establishments that changed their organizational structure have significantly lower net employment growth rates for unskilled and particularly skilled workers. These negative employment effects can be explained mainly with a relative increase in job destruction and separation rates. Employment patterns of professionals and engineers, however, are not affected significantly by organizational changes. After controlling for establishment fixed-effects, our indicators for technological change do not affect gross job and worker flows significantly. If anything, new information technologies seem to increase churning rates among professionals and engineers. This result, however, might be explained by our vague indicator for technological change.

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Table 1:
Technological and Organizational Change, 1993-1995
(in %)

	All Establishments	Manufacturing	Non-Manufacturing
Reduction of Hierarchy Levels	27.20	37.37	16.51
Transfer of Responsibilities	41.92	46.94	36.64
Introduction of Self-Managed Team	30.65	39.46	21.38
Investments in IT	81.38	82.36	80.35
Main Investments in IT	26.82	19.13	34.91
Observations	1,305	669	636

Table 2:
Mean Job and Worker Flows per 100 Workers
by Employment Growth Categories, 1995-1996

	JFR $\left(\frac{JF_{iet}}{Z_{et}}\right)$	JCR $\left(\frac{JC_{iet}}{Z_{et}}\right)$	JDR $\left(\frac{JD_{iet}}{Z_{et}}\right)$	HR $\left(\frac{H_{iet}}{Z_{et}}\right)$	SR $\left(\frac{S_{iet}}{Z_{et}}\right)$	CR $\left(\frac{C_{iet}}{Z_{et}}\right)$	ES in 1995
Firms with increasing employment (N=421):							
All Workers	7.567	7.567	-	20.075	12.508	23.040	-
Unskilled Workers	5.775	8.306	2.530	19.767	13.992	22.923	0.397
	(2.805)	(3.129)	(0.324)	(8.046)	(5.241)	(9.834)	
Skilled Workers	6.850	8.466	1.617	18.784	11.934	20.635	0.408
	(3.204)	(3.558)	(0.354)	(8.060)	(4.856)	(9.004)	
Professionals and Engineers	3.918	8.584	4.666	17.054	13.136	16.940	0.195
	(1.558)	(1.868)	(0.309)	(3.969)	(2.410)	(4.202)	
Firms with decreasing employment (N=824):							
All Workers	-11.861	-	11.861	9.888	21.749	18.384	-
Unskilled Workers	-12.957	0.955	13.912	9.056	22.013	16.202	0.402
	(-5.040)	(0.180)	(5.220)	(3.396)	(8.436)	(6.431)	
Skilled Workers	-9.496	1.189	10.685	10.595	20.090	18.810	0.369
	(-3.750)	(0.297)	(4.047)	(3.710)	(7.460)	(6.827)	
Professionals and Engineers	-12.272	2.396	14.668	10.492	22.764	16.192	0.229
	(-3.071)	(0.219)	(3.291)	(2.783)	(5.854)	(5.127)	
Firms with stable employment (N=60):							
All Workers	-	-	-	11.972	11.972	19.349	-
Unskilled Workers	-5.448	2.279	7.727	11.113	16.561	17.668	0.391
	(-0.693)	(0.459)	(1.152)	(4.459)	(5.152)	(8.001)	
Skilled Workers	1.474	4.057	2.583	13.385	11.910	18.655	0.398
	(1.008)	(1.351)	(0.343)	(5.140)	(4.133)	(7.579)	
Professionals and Engineers	-5.128	3.777	8.905	8.715	13.843	9.875	0.211
	(-0.315)	(0.487)	(0.802)	(2.372)	(2.687)	(3.770)	

Notes: Observations: 1,305. JFR: Job flow rate; JCR: Job creation rate; JDR: Job destruction rate; HR: Hiring rate; SR: Separation rate; CR: Churning rate; ES: Employment share.

Table 3:

Mean Job and Worker Flows per 100 Workers

by skill group and Organizational and Technological Change, 1995-1996

	JFR $\left(\frac{JF_{iet}}{Z_{et}}\right)$	JCR $\left(\frac{JC_{iet}}{Z_{et}}\right)$	JDR $\left(\frac{JD_{iet}}{Z_{et}}\right)$	HR $\left(\frac{H_{iet}}{Z_{et}}\right)$	SR $\left(\frac{S_{iet}}{Z_{et}}\right)$	CR $\left(\frac{C_{iet}}{Z_{et}}\right)$	ES in 1995
All firms (N=1,305):							
All Workers	-5.048	2.441	7.489	13.270	18.318	19.931	-
Unskilled Workers	-6.569	3.387	9.956	12.606	19.175	18.438	0.400
	(-2.309)	(1.144)	(3.454)	(4.945)	(7.254)	(7.601)	
Skilled Workers	-3.718	3.669	7.387	13.365	17.083	19.392	0.383
	(-1.288)	(1.397)	(2.685)	(5.179)	(6.467)	(7.564)	
Professionals and Engineers	-6.721	4.456	11.176	12.527	19.248	16.143	0.217
	(-1.451)	(0.763)	(2.214)	(3.146)	(4.597)	(4.766)	
Firms that reduced number of hierarchy levels (N=355):							
All Workers	-7.772	1.891	9.663	11.631	19.403	18.061	-
Unskilled Workers	-10.265	2.114	12.380	10.718	20.983	17.207	0.425
	(-3.818)	(0.826)	(4.644)	(4.433)	(8.251)	(7.214)	
Skilled Workers	-7.206	2.417	9.624	11.869	19.075	18.903	0.375
	(-2.589)	(0.884)	(3.473)	(4.531)	(7.119)	(7.293)	
Professionals and Engineers	-7.661	4.681	12.341	12.421	20.081	15.480	0.200
	(-1.365)	(0.890)	(2.256)	(2.667)	(4.033)	(3.554)	
Firms that transferred responsibilities (N=547):							
All Workers	-6.799	2.200	8.999	13.005	19.804	19.821	-
Unskilled Workers	-8.100	3.005	11.105	12.112	20.212	18.214	0.408
	(-2.781)	(1.092)	(3.873)	(4.874)	(7.655)	(7.564)	
Skilled Workers	-5.639	3.429	9.067	13.607	19.246	20.356	0.372
	(-2.096)	(1.234)	(3.330)	(5.042)	(7.138)	(7.617)	
Professionals and Engineers	-7.689	4.228	11.917	12.628	20.318	16.801	0.220
	(-1.922)	(0.770)	(2.691)	(3.090)	(5.011)	(4.640)	
Firms that introduced self-managed teams (N=400):							
All Workers	-4.670	1.807	6.477	12.258	16.928	19.493	-
Unskilled Workers	-5.581	2.185	7.766	11.312	16.893	18.254	0.428
	(-2.281)	(0.876)	(3.157)	(4.864)	(7.146)	(7.977)	
Skilled Workers	-2.826	3.076	5.901	12.974	15.800	19.796	0.365
	(-1.086)	(1.115)	(2.201)	(4.760)	(5.846)	(7.289)	
Professionals and Engineers	-4.448	4.048	8.496	12.401	16.848	16.705	0.207
	(-1.302)	(0.520)	(1.823)	(2.634)	(3.936)	(4.227)	
Firms with main investments in IT (N=350):							
All Workers	-5.518	2.620	8.138	14.467	19.985	21.709	-
Unskilled Workers	-9.836	3.109	12.945	12.805	22.641	19.392	0.305
	(-2.215)	(0.773)	(2.988)	(4.002)	(6.218)	(6.460)	
Skilled Workers	-3.711	4.264	7.974	14.571	18.281	20.614	0.438
	(-1.382)	(1.933)	(3.315)	(6.521)	(7.902)	(9.174)	
Professionals and Engineers	-8.890	4.601	13.490	13.378	22.267	17.554	0.257
	(-1.921)	(0.906)	(2.827)	(3.944)	(5.865)	(6.075)	

Notes: See notes to Table 2.

Table 4:

Organizational Change, Technological Change and Job and Worker Turnover:

Tobit Estimations

	JFR	JCR	JDR	HR	SR	CR
Panel A: All Workers:						
Reduction of Hierarchy Levels	-2.650*	-1.459	4.727**	0.419	3.047**	0.073
	(1.535)	(1.399)	(1.984)	(0.745)	(1.375)	(0.807)
Transfer of Responsibilities	-3.260**	-0.350	2.921	-0.080	3.176**	-0.214
	(1.376)	(1.240)	(1.789)	(0.668)	(1.233)	(0.722)
Self-Managed Teams	2.569*	0.099	-3.127*	0.053	-2.505*	0.820
	(1.433)	(1.303)	(1.852)	(0.695)	(1.284)	(0.752)
Investments in IT	3.287**	0.336	-2.672	0.457	-2.767*	-0.330
	(1.638)	(1.470)	(2.131)	(0.795)	(1.468)	(0.860)
Main Investments in IT	-2.462*	0.136	1.927	0.345	2.888**	1.457*
	(1.457)	(1.291)	(1.906)	(0.707)	(1.305)	(0.765)
Main + Interactive Effects	0.826	0.472	-0.745	0.802	0.121	1.127
	(1.182)	(1.602)	(2.384)	(0.883)	(1.629)	(0.955)
Panel B: Unskilled Workers:						
Reduction of Hierarchy Levels	-3.930*	-3.269	6.418**	-0.745	3.721*	-0.536
	(2.091)	(2.185)	(2.810)	(1.117)	(1.966)	(1.384)
Transfer of Responsibilities	-2.199	-0.796	3.230	-0.007	1.794	-0.600
	(1.874)	(1.892)	(2.567)	(0.998)	(1.767)	(1.239)
Self-Managed Teams	3.231*	-1.489	-4.497*	-0.586	-3.948**	0.515
	(1.952)	(1.993)	(2.659)	(1.039)	(1.837)	(1.288)
Investments in IT	4.650**	0.476	-4.372	1.050	-3.777*	0.758
	(2.232)	(2.236)	(3.067)	(1.195)	(2.107)	(1.484)
Main Investments in IT	-6.679***	-2.002	5.325*	-1.312	5.763***	0.981
	(1.985)	(1.991)	(2.743)	(1.061)	(1.874)	(1.317)
Main + Interactive Effects	-2.030*	-1.527	0.952	-0.262	1.986	1.215
	(2.475)	(2.478)	(3.431)	(1.333)	(2.345)	(1.818)
Panel C: Skilled Workers:						
Reduction of Hierarchy Levels	-3.991**	-2.761*	6.811**	-0.519	3.364**	0.003
	(1.773)	(1.560)	(2.670)	(0.936)	(1.647)	(1.060)
Transfer of Responsibilities	-3.776**	0.690	4.312*	0.963	4.989***	1.688*
	(1.589)	(1.376)	(2.425)	(0.838)	(1.479)	(0.950)
Self-Managed Teams	3.619**	0.279	-4.698*	0.324	-3.444**	0.104
	(1.656)	(1.431)	(2.533)	(0.872)	(1.539)	(0.988)
Investments in IT	3.969**	1.224	-4.165	1.445	-2.688	1.016
	(1.892)	(1.651)	(2.897)	(1.003)	(1.768)	(1.139)
Main Investments in IT	-1.584	0.432	3.157	0.898	2.472	0.985
	(1.683)	(1.445)	(2.581)	(0.888)	(1.569)	(1.008)
Main + Interactive Effects	2.386	1.655	-1.008	2.343**	-0.216	1.602
	(2.099)	(1.821)	(3.221)	(1.113)	(1.966)	(1.322)

Table 4: continued

Organizational Change, Technological Change and Job and Worker Turnover: Tobit Estimations

	JFR	JCR	JDR	HR	SR	CR
Panel D: Professionals and Engineers:						
Reduction of Hierarchy Levels	-3.413	1.361	9.895**	2.195	6.201**	0.134
	(2.477)	(2.551)	(3.921)	(1.440)	(2.603)	(1.740)
Transfer of Responsibilities	-2.821	-1.178	3.316	-0.265	3.157	0.756
	(2.220)	(2.318)	(3.541)	(1.301)	(2.358)	(1.576)
Self-Managed Teams	3.190	0.670	-4.285	1.216	-1.816	2.389
	(2.312)	(2.404)	(3.680)	(1.344)	(2.436)	(1.619)
Investments in IT	3.098	3.163	-4.144	3.123**	-0.154	4.455**
	(2.644)	(2.792)	(4.260)	(1.578)	(2.844)	(1.931)
Main Investments in IT	-2.305	-0.245	3.973	0.289	2.835	0.642
	(2.351)	(2.442)	(3.760)	(1.378)	(2.495)	(1.667)
Main + Interactive Effects	0.793	2.918	-0.171	3.412*	2.680	5.096**
	(2.932)	(3.075)	(4.741)	(1.751)	(3.153)	(2.142)

Notes: Observations: 1,305. JFR: Job flow rate; JCR: Job creation rate; JDR: Job destruction rate; HR: Hiring rate; SR: Separation rate; CR: Churning rate. *: Significant at the 90% confidence level. **: Significant at the 95% confidence level. ***: Significant at the 99% confidence level. Regressions include the log of employment of the respective groups in 1995, the share of unskilled workers, the share of skilled workers, the share of females, the share of foreigners, the share of part-time workers, the median age of the employees in the establishment, two dummy variables indicating the development of an establishment's revenues between 1994 and 1995, two dummy variables indicating the expected development of the revenues from 1996 to 1997, the change in the share of exports on total revenues between 1994 and 1995, a variable indicating whether the establishment uses state-of-the-art technology, 8 industry and 7 regional dummies.

Table 5:
Index of Decentralization and Job and Worker Turnover:
Tobit Estimations

	JFR	JCR	JDR	HR	SR	CR
Panel A: All Workers:						
Index of Decentralization	-1.385**	-0.585	1.738**	0.120	1.500**	0.199
	(0.654)	(0.589)	(0.849)	(0.316)	(0.586)	(0.342)
Investments in IT	3.139*	0.336	-2.539	0.451	-2.627*	-0.357
	(1.642)	(1.467)	(2.140)	(0.795)	(1.473)	(0.860)
Main Investments in IT	-2.381	0.160	1.841	0.337	2.801**	1.468*
	(1.461)	(1.289)	(1.915)	(0.707)	(1.310)	(0.765)
Main + Interactive Effects	0.758	0.496	-0.698	0.788	0.173	1.111
	(1.821)	(1.600)	(2.392)	(0.882)	(1.635)	(0.955)
Panel B: Unskilled Workers:						
Index of Decentralization	-1.149	-1.847**	2.030*	-0.433	0.683	-0.256
	(0.890)	(0.907)	(1.216)	(0.474)	(0.838)	(0.587)
Investments in IT	4.526**	0.514	-4.172	1.068	-3.645*	0.733
	(2.235)	(2.234)	(3.078)	(1.194)	(2.113)	(1.484)
Main Investments in IT	-6.560***	-1.980	5.079*	-1.306	5.631***	0.994
	(1.989)	(1.990)	(2.753)	(1.060)	(1.879)	(1.317)
Main + Interactive Effects	-2.034	-1.466	0.908	-0.237	1.986	1.727
	(2.479)	(2.475)	(3.444)	(1.332)	(2.352)	(1.657)
Panel C: Skilled Workers:						
Index of Decentralization	-1.697**	-0.491	2.555**	0.334	2.050***	0.733
	(0.757)	(0.657)	(1.149)	(0.397)	(0.704)	(0.449)
Investments in IT	3.787**	1.263	-3.921	1.469	-2.465	1.064
	(1.899)	(1.651)	(2.913)	(1.003)	(1.777)	(1.138)
Main Investments in IT	-1.463	0.501	3.035	0.919	2.375	0.996
	(1.690)	(1.444)	(2.596)	(0.888)	(1.577)	(1.007)
Main + Interactive Effects	2.324	1.764	-0.855	2.388**	-0.089	2.060*
	(2.107)	(1.820)	(3.238)	(1.112)	(1.976)	(1.263)
Panel D: Professionals and Engineers:						
Index of Decentralization	-1.252	0.187	3.226*	0.998	2.750**	1.128
	(1.054)	(1.092)	(1.666)	(0.611)	(1.107)	(0.736)
Investments in IT	2.953	3.076	-3.939	3.072*	-0.054	4.437**
	(2.646)	(2.790)	(4.276)	(1.578)	(2.849)	(1.930)
Main Investments in IT	-2.198	-0.243	3.760	0.256	2.676	0.691
	(2.354)	(2.442)	(3.772)	(1.378)	(2.500)	(1.666)
Main + Interactive Effects	0.755	2.834	-0.179	3.328*	2.622	5.128**
	(2.935)	(3.074)	(4.757)	(1.750)	(3.158)	(2.140)

Notes: See notes to Table 4.

Table 6:
Organizational Change, Technological Change and Job and Worker Turnover:
First Differences

	JFR	JCR	JDR	HR	SR	CR
Panel A: All Workers:						
Reduction of Hierarchy Levels	-2.292	0.240	2.532	0.645	2.937	1.253
	(2.088)	(0.627)	(1.912)	(0.831)	(1.836)	(0.896)
Transfer of Responsibilities	-3.078*	-0.385	2.694*	-0.281	2.797*	-0.455
	(1.725)	(0.463)	(1.597)	(0.670)	(1.528)	(0.799)
Self-Managed Teams	0.637	-0.581	-1.218	0.266	-0.371	1.935**
	(1.624)	(0.497)	(1.481)	(0.672)	(1.414)	(0.774)
Investments in IT	-0.775	0.023	0.798	-0.394	0.381	-0.796
	(2.141)	(0.634)	(1.963)	(0.837)	(1.929)	(1.037)
Main Investments in IT	-2.854*	-0.393	2.460*	0.079	2.932**	1.243
	(1.641)	(0.505)	(1.487)	(0.733)	(1.459)	(0.836)
Main + Interactive Effects	-3.629	-0.371	3.259	-0.316	3.314	0.448
	(2.431)	(0.633)	(2.252)	(0.933)	(2.208)	(1.181)
Panel B: Unskilled Workers:						
Reduction of Hierarchy Levels	-3.544	-0.536	3.008	-0.344	3.199	0.383
	(2.439)	(0.759)	(2.192)	(1.074)	(2.132)	(1.384)
Transfer of Responsibilities	-2.555	0.222	2.777	0.476	3.031	0.508
	(2.209)	(0.738)	(1.928)	(1.012)	(1.957)	(1.390)
Self-Managed Teams	0.678	-0.972	-1.650	0.884	0.206	3.712***
	(2.038)	(0.739)	(1.743)	(0.959)	(1.720)	(1.189)
Investments in IT	1.464	0.808	-0.657	0.766	-0.699	-0.084
	(2.765)	(1.097)	(2.388)	(1.334)	(2.463)	(2.032)
Main Investments in IT	-6.154**	-1.019	5.135**	-1.702	4.452**	-1.366
	(2.466)	(0.803)	(2.072)	(1.217)	(2.113)	(1.699)
Main + Interactive Effects	-4.690	-0.211	4.478	-0.936	3.754	-1.450
	(3.327)	(1.198)	(2.859)	(1.605)	(2.945)	(2.498)
Panel C: Skilled Workers:						
Reduction of Hierarchy Levels	-4.813**	-1.405**	3.408*	-0.920	3.893**	0.971
	(2.238)	(0.705)	(1.953)	(0.935)	(1.933)	(1.163)
Transfer of Responsibilities	-3.437*	-0.231	3.206*	0.106	3.543**	0.674
	(2.067)	(0.693)	(1.767)	(0.924)	(1.750)	(1.087)
Self-Managed Teams	1.512	-0.461	-1.972	-0.814	-2.326	-0.707
	(1.813)	(0.639)	(1.569)	(0.817)	(1.533)	(0.997)
Investments in IT	2.323	1.159	-1.164	0.843	-1.480	-0.632
	(2.656)	(0.853)	(2.370)	(1.119)	(2.451)	(1.551)
Main Investments in IT	-2.570	-0.594	1.976	0.002	2.571	1.191
	(1.836)	(0.721)	(1.548)	(0.952)	(1.575)	(1.215)
Main + Interactive Effects	-0.247	0.565	0.812	0.845	1.092	0.559
	(2.945)	(0.925)	(2.637)	(1.272)	(2.744)	(1.821)

Table 6: continued

Organizational Change, Technological Change and Job and Worker Turnover: First Differences

	JFR	JCR	JDR	HR	SR	CR
Panel D: Professionals and Engineers:						
Reduction of Hierarchy Levels	-2.006	1.417	3.423	2.683**	4.690**	2.532
	(2.704)	(1.087)	(2.245)	(1.330)	(2.221)	(1.587)
Transfer of Responsibilities	-3.322	-0.051	3.271	0.239	3.561	0.580
	(2.410)	(0.794)	(2.115)	(1.067)	(2.171)	(1.546)
Self-Managed Teams	2.078	-0.274	-2.353	-0.109	-2.188	0.330
	(2.309)	(0.899)	(1.956)	(1.180)	(2.003)	(1.558)
Investments in IT	2.098	-0.202	-2.300	1.717	-0.381	3.838
	(3.676)	(1.264)	(3.197)	(1.805)	(3.320)	(2.585)
Main Investments in IT	-3.060	-0.101	2.959	0.461	3.522	1.126
	(2.668)	(0.944)	(2.306)	(1.248)	(2.393)	(1.581)
Main + Interactive Effects	-0.962	-0.303	0.659	2.178	3.140	4.963*
	(4.075)	(1.352)	(3.611)	(1.915)	(3.748)	(2.665)

Notes: Observations: 1,305. JFR: Job flow rate; JCR: Job creation rate; JDR: Job destruction rate; HR: Hiring rate; SR: Separation rate; CR: Churning rate. *: Significant at the 90% confidence level. **: Significant at the 95% confidence level. ***: Significant at the 99% confidence level. Regressions include the log of employment of the respective groups, the share of unskilled workers, the share of skilled workers, the share of females, the share of foreigners, the share of part-time workers, the median age of the employees in the establishment, two dummy variables indicating the development of an establishment's revenues, two dummy variables indicating the expected development of the revenues, the change in the share of exports on total revenues, a variable indicating whether the establishment uses state-of-the-art technology. All variables are measured in first differences.

Table 7:
Index of Decentralization and Job and Worker Turnover:
First Differences

	JFR	JCR	JDR	HR	SR	CR
Panel A: All Workers:						
Index of Decentralization	-1.779**	-0.268	1.511**	0.186	1.966***	0.868**
	(0.741)	(0.269)	(0.658)	(0.349)	(0.648)	(0.379)
Investments in IT	-0.822	0.034	0.856	-0.391	0.431	-0.813
	(2.140)	(0.633)	(1.962)	(0.835)	(1.928)	(1.034)
Main Investments in IT	-2.887*	-0.406	2.481*	0.057	2.944**	1.199
	(1.638)	(0.505)	(1.485)	(0.729)	(1.457)	(0.830)
Main + Interactive Effects	-3.709	-0.372	3.338	-0.334	3.375	0.386
	(2.427)	(0.633)	(2.249)	(0.922)	(2.206)	(1.177)
Panel B: Unskilled Workers:						
Index of Decentralization	-1.966**	-0.408	1.558*	0.371	2.337***	1.557**
	(0.945)	(0.324)	(0.813)	(0.463)	(0.819)	(0.626)
Investments in IT	1.403	0.818	-0.585	0.748	-0.655	-0.138
	(2.762)	(1.096)	(2.385)	(1.333)	(2.460)	(2.029)
Main Investments in IT	-6.149**	-0.999	5.151**	-1.687	4.463**	-1.376
	(2.462)	(0.806)	(2.070)	(1.212)	(2.109)	(1.687)
Main + Interactive Effects	-4.746	-0.181	4.565	-0.938	3.808	-1.514
	(3.323)	(1.201)	(2.856)	(1.604)	(2.942)	(2.493)
Panel C: Skilled Workers:						
Index of Decentralization	-2.461***	-0.706**	1.755**	-0.528	1.933***	0.356
	(0.795)	(0.315)	(0.683)	(0.398)	(0.702)	(0.523)
Investments in IT	2.230	1.149	-1.081	0.846	-1.385	-0.607
	(2.653)	(0.852)	(2.366)	(1.119)	(2.449)	(1.553)
Main Investments in IT	-2.564	-0.569	1.995	0.026	2.591	1.191
	(1.835)	(0.718)	(1.550)	(0.948)	(1.579)	(1.210)
Main + Interactive Effects	-0.334	0.580	0.914	0.872	1.206	0.584
	(2.933)	(0.936)	(2.625)	(1.271)	(2.735)	(1.819)
Panel D: Professionals and Engineers:						
Index of Decentralization	-1.307	0.354	1.661*	0.940	2.247**	1.173
	(1.183)	(0.498)	(0.958)	(0.647)	(0.969)	(0.717)
Investments in IT	2.031	-0.180	-2.211	1.752	-0.279	3.865
	(3.673)	(1.264)	(3.193)	(1.805)	(3.320)	(2.581)
Main Investments in IT	-3.111	-0.130	2.981	0.414	3.525	1.088
	(2.663)	(0.943)	(2.305)	(1.247)	(2.394)	(1.573)
Main + Interactive Effects	-1.080	-0.311	0.770	2.166	3.246	4.952*
	(4.071)	(1.353)	(3.607)	(1.918)	(3.752)	(2.666)

Notes: See notes to Table 6.

Appendix Table 1:

Variable Description and Descriptive Statistics

	Variable Description	1992/1993 Mean	1992/1993 S.D.	1995/1996 Mean	1995/1996 S.D.
JFR	Job flow rate of all workers (in %)	-9.020	15.288	-5.048	21.456
JFR_U	Job flow rate of unskilled workers (in %)	-11.580	20.948	-6.569	29.129
JFR_S	Job flow rate of skilled workers (in %)	-7.268	20.349	-3.718	24.737
JFR_H	Job flow rate of professionals and engineers (in %)	-7.060	26.541	-6.721	33.882
JCR	Job creation rate of all workers (in %)	1.357	4.661	2.441	7.475
JCR_U	Job creation rate of unskilled workers (in %)	1.967	7.802	3.387	10.620
JCR_S	Job creation rate of skilled workers (in %)	2.855	9.752	3.669	9.894
JCR_H	Job creation rate of professionals and engineers (in %)	3.250	10.262	4.456	12.879
JDR	Job destruction rate of all workers (in %)	10.377	13.558	7.489	19.181
JDR_U	Job destruction rate of unskilled workers (in %)	13.547	18.017	9.956	25.850
JDR_S	Job destruction rate of skilled workers (in %)	10.123	16.158	7.387	21.443
JDR_H	Job destruction rate of professionals and engineers (in %)	10.309	23.066	11.176	29.706
HR	Hiring rate of all workers (in %)	13.597	9.608	13.270	11.204
HR_U	Hiring of unskilled workers (in %)	12.741	14.315	12.606	14.251
HR_S	Hiring of skilled workers (in %)	14.619	13.430	13.365	12.760
HR_H	Hiring of professionals and engineers (in %)	12.995	15.315	12.527	16.520
SR	Separation rate of all workers (in %)	22.617	14.078	18.318	19.465
SR_U	Separation of unskilled workers (in %)	24.321	19.339	19.175	25.948
SR_S	Separation of skilled workers (in %)	21.887	17.166	17.083	21.979
SR_H	Separation of professionals and engineers (in %)	20.054	24.675	19.248	30.197
CR	Churning rate of all workers (in %)	22.993	13.605	19.931	12.494
CR_U	Churning of unskilled workers (in %)	21.547	21.282	18.438	17.277
CR_S	Churning of skilled workers (in %)	23.527	17.489	19.392	13.962
CR_H	Churning of professionals and engineers (in %)	19.490	22.445	16.143	19.076
Reduction of Hierarchy Levels	Dummy variable that equals 1 if establishment reduced number of hierarchy levels between 1993 and 1995, 0 otherwise.	0.272	0.445	0.272	0.445
Transfer of Responsibilities	Dummy variable that equals 1 if establishment transfered responsibilities to lower hierarchy levels between 1993 and 1995, 0 otherwise.	0.419	0.494	0.419	0.494
Self-Managed Teams	Dummy variable that equals 1 if establishment introduced self-managed teams between 1993 and 1995, 0 otherwise.	0.307	0.461	0.307	0.461
Investments in IT	Dummy variable that equals 1 if establishment invested in IT between 1993 and 1995, 0 otherwise.	0.268	0.443	0.268	0.443
Main Investments in IT	Dummy variable that equals 1 if investments in IT are single biggest investment between 1993 and 1995, 0 otherwise	0.814	0.389	0.814	0.389

Appendix Table 1 continued:

Variable Description and Descriptive Statistics

	Variable Description	1992/1993 Mean	1992/1993 S.D.	1995/1996 Mean	1995/1996 S.D.
log(Employment)	Logarithm of total establishment employment in 1992/1995	5.827	1.578	5.719	1.553
Employment Share of Unskilled Workers	Share of unskilled workers in 1992/1995	0.413	0.247	39.968	24.763
Employment Share of Skilled Workers	Share of skilled workers in 1992/1995	0.380	0.217	38.317	21.684
Share of Females	Share of females in 1992/1995	37.752	26.610	37.031	26.419
Share of Foreigners	Share if foreigners in 1992/1995	8.676	9.801	8.956	9.865
Median Age of Employees	Median age of employees in 1992/1995	37.359	4.861	38.452	4.402
Share of Part-Time Workers	Share of part-time workers in 1992/1995	15.114	14.869	15.152	15.613
Revenues increased	Dummy variable that equals 1 if revenue increased during 1991-1992 or 1994-1995, respectively, 0 otherwise.	0.555	0.497	0.507	0.500
Revenues decreased	Dummy variable that equals 1 if revenue decreased during 1991-1992 or 1994-1995, respectively, 0 otherwise.	0.209	0.407	0.212	0.409
Expected Revenues increase	Dummy variable that equals 1 if establishment expects an increasing revenue during 1993-1994 or 1996-1997, respectively, 0 otherwise.	0.507	0.500	1.117	1.507
Expected Revenues decrease	Dummy variable that equals 1 if establishment expects a decreasing revenue during 1993-1994 or 1996-1997, respectively, 0 otherwise.	0.212	0.409	0.947	1.566
Share of Export	Share of exports on total revenues in 1991-1992/1994-1995	11.256	20.232	14.369	22.552
State-of-the-Art Technology	Categorical variable indicating whether the establishment uses newest technology compared to other establishment in the industry.	4.027	0.771	3.892	0.754

Notes: Observations: 1,305.

Appendix Table 2 (not intended for publication):

Organizational Change, Technological Change and Job Turnover: Tobit Estimates

	All Workers			Unskilled Workers			Skilled Workers			Professionals and Engineers		
	JFR	JCR	JDR	JFR	JCR	JDR	JFR	JCR	JDR	JFR	JCR	JDR
Reduction of Hierarchy Levels	-2.650*	-1.459	4.727**	-3.930*	-3.269	6.418**	-3.991**	-2.761*	6.811**	-3.413	1.361	9.895**
	(1.535)	(1.399)	(1.984)	(2.091)	(2.185)	(2.810)	(1.773)	(1.560)	(2.670)	(2.477)	(2.551)	(3.921)
Transfer of Responsibilities	-3.260**	-0.350	2.921	-2.199	-0.796	3.230	-3.776**	0.690	4.312*	-2.821	-1.178	3.316
	(1.376)	(1.240)	(1.789)	(1.874)	(1.892)	(2.567)	(1.589)	(1.376)	(2.425)	(2.220)	(2.318)	(3.541)
Introduction of Self-Managed Teams	2.569*	0.099	-3.127*	3.231*	-1.489	-4.497*	3.619**	0.279	-4.698*	3.190	0.670	-4.285
	(1.433)	(1.303)	(1.852)	(1.952)	(1.993)	(2.659)	(1.656)	(1.431)	(2.533)	(2.312)	(2.404)	(3.680)
Investments in IT	3.287**	0.336	-2.672	4.650**	0.476	-4.372	3.969**	1.224	-4.165	3.098	3.163	-4.144
	(1.638)	(1.470)	(2.131)	(2.232)	(2.236)	(3.067)	(1.892)	(1.651)	(2.897)	(2.644)	(2.792)	(4.260)
Main Investments in IT	-2.462*	0.136	1.927	-6.679***	-2.002	5.325*	-1.584	0.432	3.157	-2.305	-0.245	3.973
	(1.457)	(1.291)	(1.906)	(1.985)	(1.991)	(2.743)	(1.683)	(1.445)	(2.581)	(2.351)	(2.442)	(3.760)
log(Employment)	-1.210**	-1.990***	1.663***	-1.164*	-1.837***	2.203**	-1.089**	-1.739***	2.393***	0.492	-1.164	3.432***
	(0.476)	(0.426)	(0.627)	(0.648)	(0.661)	(0.902)	(0.550)	(0.477)	(0.863)	(0.768)	(0.799)	(1.265)
Employment Share of Unskilled Workers	0.097**	0.038	-0.148**	0.236***	0.048	-0.273***	0.161***	0.056	-0.244***	0.087	0.151**	-0.214*
	(0.043)	(0.037)	(0.058)	(0.059)	(0.059)	(0.082)	(0.050)	(0.043)	(0.080)	(0.070)	(0.071)	(0.113)
Employment Share of Skilled Workers	0.086*	0.070*	-0.120*	0.200***	0.103	-0.211**	0.060	-0.044	-0.038	0.123	0.229***	-0.207
	(0.049)	(0.042)	(0.066)	(0.066)	(0.066)	(0.094)	(0.056)	(0.048)	(0.089)	(0.079)	(0.080)	(0.129)
Share of Females	-0.039	-0.020	0.047	-0.041	-0.015	0.065	-0.101**	-0.053	0.128*	-0.003	0.053	0.059
	(0.038)	(0.033)	(0.049)	(0.051)	(0.051)	(0.072)	(0.043)	(0.038)	(0.068)	(0.061)	(0.062)	(0.098)
Share of Foreigners	-0.049	-0.034	0.146*	-0.024	0.048	0.096	-0.214***	-0.030	0.307**	0.009	0.189*	0.060
	(0.069)	(0.063)	(0.088)	(0.094)	(0.095)	(0.127)	(0.079)	(0.069)	(0.121)	(0.111)	(0.111)	(0.182)
Median Age of Employees	-0.436***	-0.577***	0.572***	-0.429**	-0.780***	0.714***	-0.045	-0.433***	0.191	-0.328	-0.593**	0.634*
	(0.140)	(0.123)	(0.185)	(0.190)	(0.193)	(0.268)	(0.161)	(0.140)	(0.251)	(0.225)	(0.230)	(0.371)
Share of Part-Time Workers	0.049	0.101**	-0.011	0.119	0.068	-0.182*	0.088	0.151***	-0.080	0.073	0.227***	0.016
	(0.054)	(0.045)	(0.073)	(0.074)	(0.072)	(0.106)	(0.063)	(0.052)	(0.102)	(0.088)	(0.085)	(0.145)
Revenues increased	1.719	2.488**	-3.959**	-0.373	0.970	-1.800	1.257	1.588	-4.985**	0.912	-1.165	-3.649
	(1.411)	(1.266)	(1.837)	(1.922)	(1.940)	(2.646)	(1.630)	(1.400)	(2.509)	(2.277)	(2.322)	(3.651)
Revenues decreased	-2.808	-4.456***	4.304**	-4.311*	-2.776	6.917**	-3.830*	-5.875***	7.028**	-3.551	-10.556***	5.119
	(1.710)	(1.656)	(2.178)	(2.329)	(2.450)	(3.141)	(1.975)	(1.819)	(2.937)	(2.758)	(3.006)	(4.369)
Expected Revenues increase	1.868*	1.831**	-1.735	0.126	-0.248	-0.382	1.168	1.747*	-1.439	3.029*	3.666**	-4.770*
	(0.974)	(0.889)	(1.263)	(1.327)	(1.332)	(1.825)	(1.125)	(0.973)	(1.737)	(1.571)	(1.655)	(2.494)
Expected Revenues decrease	-1.385	-1.438*	1.275	-0.320	-0.368	0.358	-1.450	-1.355	2.254	-1.925	-2.595	3.310
	(0.947)	(0.855)	(1.230)	(1.290)	(1.295)	(1.770)	(1.094)	(0.942)	(1.691)	(1.527)	(1.594)	(2.430)
Share of Export	0.083**	0.084***	-0.109**	0.109**	0.090**	-0.132**	0.102***	0.084**	-0.172***	0.011	0.079	-0.029
	(0.033)	(0.029)	(0.043)	(0.045)	(0.046)	(0.061)	(0.038)	(0.033)	(0.058)	(0.053)	(0.053)	(0.085)
State-of-the-Art Technology	0.000	0.108	-0.457	-0.857	-0.690	0.318	-0.487	0.389	0.411	-0.796	-0.098	0.195
	(0.788)	(0.712)	(1.022)	(1.074)	(1.081)	(1.475)	(0.910)	(0.787)	(1.397)	(1.272)	(1.353)	(2.009)

Notes: See notes to Table 4.

Appendix Table 3 (not intended for publication):

Decentralization, Technological Change and Job Turnover: Tobit Estimates

	All Workers			Unskilled Workers			Skilled Workers			Professionals and Engineers		
	JFR	JCR	JDR	JFR	JCR	JDR	JFR	JCR	JDR	JFR	JCR	JDR
Index of Decentralization	-1.385**	-0.585	1.738**	-1.149	-1.847**	2.030*	-1.697**	-0.491	2.555**	-1.252	0.187	3.226*
	(0.654)	(0.589)	(0.849)	(0.890)	(0.907)	(1.216)	(0.757)	(0.657)	(1.149)	(1.054)	(1.092)	(1.666)
Investments in IT	3.139*	0.336	-2.539	4.526**	0.514	-4.172	3.787**	1.263	-3.921	2.953	3.076	-3.939
	(1.642)	(1.467)	(2.140)	(2.235)	(2.234)	(3.078)	(1.899)	(1.651)	(2.913)	(2.646)	(2.790)	(4.276)
Main Investments in IT	-2.381	0.160	1.841	-6.560***	-1.980	5.079*	-1.463	0.501	3.035	-2.198	-0.243	3.760
	(1.461)	(1.289)	(1.915)	(1.989)	(1.990)	(2.753)	(1.690)	(1.444)	(2.596)	(2.354)	(2.442)	(3.772)
log(Employment)	-1.146**	-1.994***	1.649***	-1.139*	-1.882***	2.190**	-1.022*	-1.790***	2.342***	0.540	-1.116	3.460***
	(0.475)	(0.423)	(0.627)	(0.646)	(0.656)	(0.901)	(0.549)	(0.475)	(0.864)	(0.765)	(0.796)	(1.264)
Employment Share of Unskilled Workers	0.105**	0.040	-0.161***	0.246***	0.050	-0.289***	0.173***	0.059	-0.263***	0.097	0.151**	-0.237**
	(0.043)	(0.037)	(0.058)	(0.059)	(0.059)	(0.083)	(0.050)	(0.043)	(0.080)	(0.070)	(0.071)	(0.113)
Employment Share of Skilled Workers	0.095*	0.070*	-0.134**	0.210***	0.104	-0.225**	0.071	-0.042	-0.056	0.133*	0.230***	-0.230*
	(0.049)	(0.042)	(0.066)	(0.066)	(0.066)	(0.094)	(0.056)	(0.048)	(0.089)	(0.079)	(0.080)	(0.129)
Share of Females	-0.038	-0.021	0.050	-0.043	-0.016	0.069	-0.101**	-0.056	0.130*	-0.003	0.055	0.067
	(0.038)	(0.033)	(0.050)	(0.051)	(0.051)	(0.072)	(0.044)	(0.038)	(0.068)	(0.061)	(0.062)	(0.099)
Share of Foreigners	-0.044	-0.033	0.139	-0.017	0.050	0.083	-0.207***	-0.029	0.295**	0.015	0.189*	0.045
	(0.069)	(0.063)	(0.089)	(0.094)	(0.094)	(0.127)	(0.080)	(0.069)	(0.121)	(0.111)	(0.111)	(0.183)
Median Age of Employees	-0.447***	-0.584***	0.608***	-0.455**	-0.794***	0.764***	-0.066	-0.454***	0.247	-0.348	-0.581**	0.709*
	(0.139)	(0.122)	(0.185)	(0.190)	(0.193)	(0.267)	(0.161)	(0.140)	(0.251)	(0.224)	(0.229)	(0.371)
Share of Part-Time Workers	0.051	0.101**	-0.016	0.122*	0.068	-0.186*	0.091	0.151***	-0.086	0.075	0.227***	0.005
	(0.055)	(0.045)	(0.074)	(0.074)	(0.072)	(0.106)	(0.063)	(0.053)	(0.103)	(0.088)	(0.085)	(0.146)
Revenues increased	1.748	2.484**	-3.980**	-0.371	0.961	-1.776	1.284	1.548	-4.982**	0.929	-1.136	-3.621
	(1.415)	(1.265)	(1.845)	(1.927)	(1.939)	(2.656)	(1.637)	(1.399)	(2.524)	(2.280)	(2.324)	(3.665)
Revenues decreased	-2.900*	-4.479***	4.469**	-4.451*	-2.828	7.172**	-3.970**	-5.969***	7.214**	-3.674	-10.542***	5.467
	(1.714)	(1.654)	(2.187)	(2.334)	(2.448)	(3.153)	(1.983)	(1.819)	(2.955)	(2.762)	(3.008)	(4.384)
Expected Revenues increase	1.732*	1.830**	-1.650	0.038	-0.200	-0.314	1.012	1.796*	-1.364	2.910*	3.588**	-4.719*
	(0.974)	(0.885)	(1.265)	(1.326)	(1.327)	(1.827)	(1.127)	(0.969)	(1.742)	(1.569)	(1.651)	(2.496)
Expected Revenues decrease	-1.278	-1.443*	1.232	-0.268	-0.420	0.352	-1.334	-1.416	2.255	-1.840	-2.512	3.325
	(0.947)	(0.851)	(1.232)	(1.289)	(1.290)	(1.772)	(1.095)	(0.938)	(1.696)	(1.525)	(1.590)	(2.433)
Share of Export	0.083**	0.083***	-0.109**	0.108**	0.089*	-0.130**	0.101***	0.081**	-0.173***	0.010	0.080	-0.026
	(0.033)	(0.029)	(0.043)	(0.045)	(0.046)	(0.061)	(0.038)	(0.033)	(0.058)	(0.053)	(0.053)	(0.086)
State-of-the-Art Technology	0.213	0.137	-0.723	-0.622	-0.676	-0.024	-0.202	0.429	0.046	-0.557	-0.067	-0.161
	(0.787)	(0.709)	(1.022)	(1.072)	(1.077)	(1.475)	(0.911)	(0.783)	(1.400)	(1.268)	(1.348)	(2.009)

Notes: See notes to Table 4.

Appendix Table 4 (not intended for publication):

Organizational Change, Technological Change and Worker Turnover: Tobit Estimates

	All Workers			Unskilled Workers			Skilled Workers			Professionals and Engineers		
	HR	SR	CR	HR	SR	CR	HR	SR	CR	HR	SR	CR
Reduction of Hierarchy Levels	0.419	3.047**	0.073	-0.745	3.721*	-0.536	-0.519	3.364**	0.003	2.195	6.201**	0.134
	(0.745)	(1.375)	(0.807)	(1.117)	(1.966)	(1.384)	(0.936)	(1.647)	(1.060)	(1.440)	(2.603)	(1.740)
Transfer of Responsibilities	-0.080	3.176**	-0.214	-0.007	1.794	-0.600	0.963	4.989***	1.688*	-0.265	3.157	0.756
	(0.668)	(1.233)	(0.722)	(0.998)	(1.767)	(1.239)	(0.838)	(1.479)	(0.950)	(1.301)	(2.358)	(1.576)
Introduction of Self-Managed Teams	0.053	-2.505*	0.820	-0.586	-3.948**	0.515	0.324	-3.444**	0.104	1.216	-1.816	2.389
	(0.695)	(1.284)	(0.752)	(1.039)	(1.837)	(1.288)	(0.872)	(1.539)	(0.988)	(1.344)	(2.436)	(1.619)
Investments in IT	0.457	-2.767*	-0.330	1.050	-3.777*	0.758	1.445	-2.688	1.016	3.123**	-0.154	4.455**
	(0.795)	(1.468)	(0.860)	(1.195)	(2.107)	(1.484)	(1.003)	(1.768)	(1.139)	(1.578)	(2.844)	(1.931)
Main Investments in IT	0.345	2.888**	1.457*	-1.312	5.763***	0.981	0.898	2.472	0.985	0.289	2.835	0.642
	(0.707)	(1.305)	(0.765)	(1.061)	(1.874)	(1.317)	(0.888)	(1.569)	(1.008)	(1.378)	(2.495)	(1.667)
log(Employment)	-0.976***	0.305	0.376	-0.534	0.997	1.196***	-0.665**	0.903*	1.164***	1.701***	2.376***	4.677***
	(0.231)	(0.428)	(0.251)	(0.350)	(0.619)	(0.437)	(0.293)	(0.519)	(0.334)	(0.463)	(0.835)	(0.572)
Employment Share of Unskilled Workers	-0.001	-0.098**	-0.002	0.071**	-0.168***	0.152***	0.063**	-0.104**	0.074**	-0.060	-0.220***	-0.282***
	(0.021)	(0.039)	(0.023)	(0.032)	(0.056)	(0.040)	(0.027)	(0.047)	(0.030)	(0.041)	(0.074)	(0.049)
Employment Share of Skilled Workers	0.033	-0.053	0.010	0.082**	-0.134**	0.072	0.063**	0.028	0.172***	0.026	-0.193**	-0.227***
	(0.024)	(0.044)	(0.026)	(0.036)	(0.064)	(0.045)	(0.030)	(0.053)	(0.034)	(0.046)	(0.084)	(0.056)
Share of Females	0.027	0.068**	0.068***	0.014	0.055	0.030	-0.001	0.108***	0.063**	0.076**	0.120*	0.156***
	(0.018)	(0.034)	(0.020)	(0.028)	(0.049)	(0.034)	(0.023)	(0.041)	(0.026)	(0.036)	(0.065)	(0.044)
Share of Foreigners	0.121***	0.165***	0.171***	0.139***	0.167*	0.208***	0.033	0.257***	0.091*	0.112*	0.095	-0.010
	(0.033)	(0.062)	(0.036)	(0.050)	(0.088)	(0.062)	(0.042)	(0.074)	(0.048)	(0.066)	(0.120)	(0.080)
Median Age of Employees	-0.568***	-0.132	-0.706***	-0.484***	-0.023	-0.516***	-0.443***	-0.438***	-0.657***	-0.364***	-0.006	-0.320*
	(0.068)	(0.125)	(0.074)	(0.103)	(0.181)	(0.128)	(0.086)	(0.151)	(0.097)	(0.135)	(0.245)	(0.167)
Share of Part-Time Workers	0.119***	0.064	0.102***	0.097**	-0.036	0.134***	0.119***	0.005	0.028	0.171***	0.077	0.001
	(0.026)	(0.049)	(0.029)	(0.040)	(0.071)	(0.050)	(0.033)	(0.060)	(0.038)	(0.052)	(0.094)	(0.064)
Revenues increased	0.348	-1.321	0.246	0.317	0.857	1.508	0.278	-1.006	0.434	-1.121	-2.005	-1.197
	(0.685)	(1.265)	(0.741)	(1.027)	(1.815)	(1.275)	(0.862)	(1.522)	(0.978)	(1.331)	(2.417)	(1.613)
Revenues decreased	-1.141	1.719	-0.191	-0.458	4.376**	-0.053	-1.158	2.811	0.679	-4.602***	-0.044	-2.780
	(0.830)	(1.533)	(0.898)	(1.246)	(2.196)	(1.546)	(1.045)	(1.844)	(1.187)	(1.636)	(2.949)	(1.987)
Expected Revenues increase	0.849*	-1.054	0.559	0.608	0.704	1.825**	1.139*	0.010	0.872	0.293	-3.322**	-1.713
	(0.473)	(0.872)	(0.511)	(0.707)	(1.251)	(0.878)	(0.594)	(1.050)	(0.674)	(0.920)	(1.663)	(1.110)
Expected Revenues decrease	-0.709	0.744	-0.539	-1.013	-0.757	-1.868**	-1.056*	0.412	-1.081*	0.400	2.778*	1.880*
	(0.459)	(0.848)	(0.497)	(0.687)	(1.216)	(0.853)	(0.578)	(1.020)	(0.655)	(0.894)	(1.616)	(1.080)
Share of Export	0.006	-0.081***	-0.036**	0.007	-0.117***	-0.049*	0.019	-0.090**	-0.022	-0.020	-0.027	-0.058
	(0.016)	(0.029)	(0.017)	(0.024)	(0.042)	(0.030)	(0.020)	(0.035)	(0.023)	(0.031)	(0.056)	(0.037)
State-of-the-Art Technology	-0.401	-0.407	-0.571	-0.774	0.075	-0.736	-0.400	-0.080	-1.045*	-0.516	0.423	-0.090
	(0.382)	(0.706)	(0.414)	(0.574)	(1.013)	(0.713)	(0.481)	(0.850)	(0.546)	(0.750)	(1.350)	(0.909)

Notes: See notes to Table 4.

Appendix Table 5 (not intended for publication):

Decentralization, Technological Change and Worker Turnover: Tobit Estimates

	All Workers			Unskilled Workers			Skilled Workers			Professionals and Engineers		
	HR	SR	CR	HR	SR	CR	HR	SR	CR	HR	SR	CR
Index of Decentralization	0.120	1.500**	0.199	-0.433	0.683	-0.256	0.334	2.050***	0.733	0.998	2.750**	1.128
	(0.316)	(0.586)	(0.342)	(0.474)	(0.838)	(0.587)	(0.397)	(0.704)	(0.449)	(0.611)	(1.107)	(0.736)
Investments in IT	0.451	-2.627*	-0.357	1.068	-3.645*	0.733	1.469	-2.465	1.064	3.072*	-0.054	4.437**
	(0.795)	(1.473)	(0.860)	(1.194)	(2.113)	(1.484)	(1.003)	(1.777)	(1.138)	(1.578)	(2.849)	(1.930)
Main Investments in IT	0.337	2.801**	1.468*	-1.306	5.631***	0.994	0.919	2.375	0.996	0.256	2.676	0.691
	(0.707)	(1.310)	(0.765)	(1.060)	(1.879)	(1.317)	(0.888)	(1.577)	(1.007)	(1.378)	(2.500)	(1.666)
log(Employment)	-0.968***	0.251	0.390	-0.551	0.978	1.208***	-0.695**	0.797	1.121***	1.753***	2.384***	4.677***
	(0.230)	(0.427)	(0.250)	(0.348)	(0.617)	(0.434)	(0.291)	(0.519)	(0.332)	(0.461)	(0.833)	(0.569)
Employment Share of Unskilled Workers	-0.001	-0.107***	-0.001	0.070**	-0.180***	0.154***	0.063**	-0.116**	0.073**	-0.060	-0.232***	-0.279***
	(0.021)	(0.039)	(0.023)	(0.032)	(0.056)	(0.040)	(0.027)	(0.047)	(0.030)	(0.041)	(0.074)	(0.049)
Employment Share of Skilled Workers	0.033	-0.061	0.011	0.081**	-0.145**	0.074	0.063**	0.016	0.170***	0.027	-0.203**	-0.224***
	(0.024)	(0.044)	(0.026)	(0.036)	(0.064)	(0.045)	(0.030)	(0.053)	(0.034)	(0.046)	(0.084)	(0.056)
Share of Females	0.028	0.068**	0.068***	0.013	0.056	0.030	-0.002	0.105**	0.061**	0.078**	0.122*	0.155***
	(0.018)	(0.034)	(0.020)	(0.028)	(0.049)	(0.034)	(0.023)	(0.041)	(0.026)	(0.036)	(0.065)	(0.044)
Share of Foreigners	0.120***	0.160***	0.171***	0.139***	0.160*	0.209***	0.034	0.251***	0.091*	0.111*	0.086	-0.007
	(0.033)	(0.062)	(0.036)	(0.050)	(0.088)	(0.062)	(0.042)	(0.075)	(0.048)	(0.066)	(0.120)	(0.080)
Median Age of Employees	-0.565***	-0.118	-0.707***	-0.488***	0.005	-0.518***	-0.452***	-0.427***	-0.665***	-0.351***	0.030	-0.330**
	(0.068)	(0.125)	(0.073)	(0.103)	(0.181)	(0.128)	(0.085)	(0.151)	(0.097)	(0.134)	(0.244)	(0.166)
Share of Part-Time Workers	0.119***	0.062	0.103***	0.097**	-0.039	0.134***	0.119***	0.002	0.028	0.171***	0.074	0.002
	(0.026)	(0.049)	(0.029)	(0.040)	(0.071)	(0.050)	(0.033)	(0.060)	(0.038)	(0.052)	(0.094)	(0.064)
Revenues increased	0.354	-1.342	0.252	0.307	0.862	1.513	0.260	-1.043	0.410	-1.093	-1.958	-1.209
	(0.685)	(1.270)	(0.741)	(1.027)	(1.821)	(1.275)	(0.862)	(1.530)	(0.978)	(1.331)	(2.422)	(1.613)
Revenues decreased	-1.132	1.819	-0.205	-0.463	4.520**	-0.071	-1.182	2.930	0.668	-4.572***	0.136	-2.831
	(0.830)	(1.539)	(0.898)	(1.246)	(2.203)	(1.546)	(1.045)	(1.854)	(1.187)	(1.636)	(2.955)	(1.986)
Expected Revenues increase	0.838*	-0.931	0.532	0.633	0.797	1.798**	1.177**	0.219	0.934	0.221	-3.256*	-1.743
	(0.471)	(0.873)	(0.510)	(0.705)	(1.251)	(0.875)	(0.593)	(1.052)	(0.673)	(0.917)	(1.662)	(1.107)
Expected Revenues decrease	-0.697	0.650	-0.516	-1.037	-0.811	-1.848**	-1.096*	0.240	-1.142*	0.474	2.750*	1.898*
	(0.458)	(0.849)	(0.495)	(0.685)	(1.216)	(0.851)	(0.576)	(1.023)	(0.653)	(0.891)	(1.615)	(1.077)
Share of Export	0.006	-0.081***	-0.036**	0.007	-0.115***	-0.049*	0.018	-0.090**	-0.023	-0.019	-0.025	-0.059
	(0.016)	(0.030)	(0.017)	(0.024)	(0.042)	(0.030)	(0.020)	(0.035)	(0.023)	(0.031)	(0.056)	(0.037)
State-of-the-Art Technology	-0.404	-0.622	-0.535	-0.786	-0.176	-0.694	-0.401	-0.373	-1.078**	-0.496	0.188	-0.009
	(0.381)	(0.706)	(0.412)	(0.572)	(1.012)	(0.710)	(0.479)	(0.851)	(0.544)	(0.747)	(1.348)	(0.905)

Notes: See notes to Table 4.

Appendix Table 6 (not intended for publication):

Organizational Change, Technological Change and Job Turnover: First Differences

	All Workers			Unskilled Workers			Skilled Workers			Professionals and Engineers		
	JFR	JCR	JDR	JFR	JCR	JDR	JFR	JCR	JDR	JFR	JCR	JDR
Reduction of Hierarchy Levels	-2.292	0.240	2.532	-3.544	-0.536	3.008	-4.813**	-1.405**	3.408*	-2.006	1.417	3.423
	(2.088)	(0.627)	(1.912)	(2.439)	(0.759)	(2.192)	(2.238)	(0.705)	(1.953)	(2.704)	(1.087)	(2.245)
Transfer of Responsibilities	-3.078*	-0.385	2.694*	-2.555	0.222	2.777	-3.437*	-0.231	3.206*	-3.322	-0.051	3.271
	(1.725)	(0.463)	(1.597)	(2.209)	(0.738)	(1.928)	(2.067)	(0.693)	(1.767)	(2.410)	(0.794)	(2.115)
Introduction of Self-Managed Teams	0.637	-0.581	-1.218	0.678	-0.972	-1.650	1.512	-0.461	-1.972	2.078	-0.274	-2.353
	(1.624)	(0.497)	(1.481)	(2.038)	(0.739)	(1.743)	(1.813)	(0.639)	(1.569)	(2.309)	(0.899)	(1.956)
Investments in IT	-0.775	0.023	0.798	1.464	0.808	-0.657	2.323	1.159	-1.164	2.098	-0.202	-2.300
	(2.141)	(0.634)	(1.963)	(2.765)	(1.097)	(2.388)	(2.656)	(0.853)	(2.370)	(3.676)	(1.264)	(3.197)
Main Investments in IT	-2.854*	-0.393	2.460*	-6.154**	-1.019	5.135**	-2.570	-0.594	1.976	-3.060	-0.101	2.959
	(1.641)	(0.505)	(1.487)	(2.466)	(0.803)	(2.072)	(1.836)	(0.721)	(1.548)	(2.668)	(0.944)	(2.306)
log(Employment)	-9.748	-3.305*	6.442	-7.356	-2.890	4.466	-12.953*	-6.321**	6.631	-16.685***	-6.518***	10.167**
	(6.695)	(1.947)	(5.926)	(6.932)	(1.879)	(6.231)	(7.174)	(2.539)	(5.645)	(5.390)	(2.132)	(4.607)
Employment Share of Unskilled Workers	-0.347	-0.063	0.284	-0.978*	-0.442***	0.536	0.018	-0.034	-0.052	1.375***	0.681***	-0.694**
	(0.425)	(0.092)	(0.389)	(0.529)	(0.136)	(0.497)	(0.499)	(0.158)	(0.392)	(0.405)	(0.178)	(0.348)
Employment Share of Skilled Workers	-0.133	-0.064	0.069	0.273	-0.180	-0.453	-0.928**	-0.702***	0.226	1.088**	0.623***	-0.465
	(0.279)	(0.097)	(0.248)	(0.518)	(0.132)	(0.480)	(0.402)	(0.175)	(0.300)	(0.442)	(0.191)	(0.386)
Share of Females	0.007	0.097	0.090	-0.430	0.181	0.611**	0.011	-0.056	-0.067	0.565*	0.356**	-0.208
	(0.244)	(0.097)	(0.194)	(0.359)	(0.164)	(0.275)	(0.284)	(0.112)	(0.222)	(0.322)	(0.162)	(0.246)
Share of Foreigners	0.281	0.132	-0.149	0.441	0.296**	-0.146	0.148	-0.168	-0.316	0.531	0.489**	-0.042
	(0.285)	(0.107)	(0.251)	(0.353)	(0.148)	(0.287)	(0.421)	(0.149)	(0.360)	(0.503)	(0.246)	(0.399)
Median Age of Employees	0.654	0.082	-0.572	0.565	0.140	-0.424	0.367	-0.166	-0.533	-0.414	-0.236	0.178
	(0.427)	(0.117)	(0.397)	(0.558)	(0.195)	(0.490)	(0.512)	(0.194)	(0.436)	(0.612)	(0.250)	(0.535)
Share of Part-Time Workers	-0.366	-0.056	0.310	0.226	0.092	-0.133	-0.174	0.044	0.218	-0.162	0.049	0.210
	(0.279)	(0.097)	(0.242)	(0.333)	(0.114)	(0.296)	(0.321)	(0.126)	(0.244)	(0.285)	(0.129)	(0.238)
Revenues increased	2.826**	0.281	-2.545**	2.788	-0.077	-2.866**	1.560	0.194	-1.367	0.818	-0.350	-1.168
	(1.192)	(0.429)	(1.055)	(1.752)	(0.668)	(1.450)	(1.363)	(0.478)	(1.198)	(1.967)	(0.830)	(1.605)
Revenues decreased	-1.961	-0.289	1.673	-3.252*	-0.778	2.474	-1.837	-0.820	1.017	-2.484	-1.409	1.074
	(1.496)	(0.523)	(1.331)	(1.907)	(0.704)	(1.623)	(1.746)	(0.593)	(1.511)	(2.755)	(0.937)	(2.341)
Expected Revenues increase	2.122**	0.650**	-1.472*	0.355	-0.040	-0.396	0.504	0.235	-0.268	0.494	-0.506	-0.999
	(0.951)	(0.256)	(0.877)	(1.218)	(0.409)	(1.069)	(1.052)	(0.391)	(0.902)	(1.395)	(0.540)	(1.204)
Expected Revenues decrease	-1.196	-0.401	0.794	-0.138	-0.129	0.009	-0.444	0.146	0.590	0.988	0.876	-0.112
	(0.870)	(0.260)	(0.797)	(1.124)	(0.415)	(0.967)	(0.983)	(0.361)	(0.843)	(1.353)	(0.560)	(1.151)
Share of Export	0.047	0.012	-0.035	0.070	0.023	-0.047	0.049	0.013	-0.036	0.028	-0.035*	-0.062
	(0.045)	(0.014)	(0.041)	(0.053)	(0.019)	(0.048)	(0.048)	(0.018)	(0.041)	(0.056)	(0.019)	(0.048)
State-of-the-Art Technology	0.014	-0.031	-0.044	-1.011	0.126	1.137	-0.957	-0.506	0.450	2.176	0.120	-2.057*
	(0.807)	(0.236)	(0.722)	(1.084)	(0.486)	(0.863)	(0.976)	(0.382)	(0.793)	(1.434)	(0.582)	(1.164)
Constant	3.962*	0.726	-3.236*	3.214	0.392	-2.822	3.119	0.092	-3.027	0.441	1.413	0.972
	(2.028)	(0.593)	(1.839)	(2.858)	(1.235)	(2.389)	(2.563)	(0.865)	(2.231)	(3.712)	(1.237)	(3.260)
R^2	0.06	0.03	0.05	0.07	0.04	0.06	0.06	0.13	0.03	0.04	0.07	0.03

Notes: See notes to Table 6.

Appendix Table 7 (not intended for publication):

Decentralization, Technological Change and Job Turnover: First Differences

	All Workers			Unskilled Workers			Skilled Workers			Professionals and Engineers		
	JFR	JCR	JDR	JFR	JCR	JDR	JFR	JCR	JDR	JFR	JCR	JDR
Index of Decentralization	-1.779**	-0.268	1.511**	-1.966**	-0.408	1.558*	-2.461***	-0.706**	1.755**	-1.307	0.354	1.661*
	(0.741)	(0.269)	(0.658)	(0.945)	(0.324)	(0.813)	(0.795)	(0.315)	(0.683)	(1.183)	(0.498)	(0.958)
Investments in IT	-0.822	0.034	0.856	1.403	0.818	-0.585	2.230	1.149	-1.081	2.031	-0.180	-2.211
	(2.140)	(0.633)	(1.962)	(2.762)	(1.096)	(2.385)	(2.653)	(0.852)	(2.366)	(3.673)	(1.264)	(3.193)
Main Investments in IT	-2.887*	-0.406	2.481*	-6.149**	-0.999	5.151**	-2.564	-0.569	1.995	-3.111	-0.130	2.981
	(1.638)	(0.505)	(1.485)	(2.462)	(0.806)	(2.070)	(1.835)	(0.718)	(1.550)	(2.663)	(0.943)	(2.305)
log(Employment)	-9.663	-3.421*	6.243	-7.017	-2.845	4.172	-12.450*	-6.153**	6.297	-16.578***	-6.765***	9.812**
	(6.552)	(1.918)	(5.792)	(6.752)	(1.844)	(6.072)	(6.975)	(2.486)	(5.501)	(5.308)	(2.113)	(4.538)
Employment Share of Unskilled Workers	-0.345	-0.061	0.284	-0.981*	-0.444***	0.537	0.014	-0.037	-0.051	1.378***	0.685***	-0.693**
	(0.423)	(0.092)	(0.386)	(0.526)	(0.136)	(0.493)	(0.494)	(0.157)	(0.388)	(0.404)	(0.177)	(0.348)
Employment Share of Skilled Workers	-0.129	-0.064	0.065	0.275	-0.181	-0.457	-0.924**	-0.703***	0.221	1.095**	0.624***	-0.471
	(0.278)	(0.097)	(0.246)	(0.516)	(0.131)	(0.477)	(0.401)	(0.175)	(0.298)	(0.441)	(0.191)	(0.385)
Share of Females	0.001	0.095	0.094	-0.430	0.184	0.614**	0.011	-0.053	-0.064	0.557*	0.352**	-0.204
	(0.243)	(0.097)	(0.194)	(0.357)	(0.165)	(0.273)	(0.283)	(0.112)	(0.222)	(0.319)	(0.161)	(0.244)
Share of Foreigners	0.272	0.131	-0.141	0.437	0.300**	-0.137	0.141	-0.165	-0.306	0.517	0.487**	-0.031
	(0.285)	(0.107)	(0.251)	(0.353)	(0.148)	(0.288)	(0.423)	(0.149)	(0.361)	(0.502)	(0.246)	(0.399)
Median Age of Employees	0.647	0.083	-0.564	0.558	0.142	-0.416	0.357	-0.166	-0.523	-0.424	-0.235	0.188
	(0.426)	(0.118)	(0.395)	(0.556)	(0.195)	(0.489)	(0.510)	(0.194)	(0.436)	(0.612)	(0.250)	(0.535)
Share of Part-Time Workers	-0.364	-0.056	0.308	0.228	0.092	-0.137	-0.170	0.044	0.214	-0.158	0.048	0.206
	(0.278)	(0.097)	(0.240)	(0.331)	(0.114)	(0.294)	(0.318)	(0.125)	(0.242)	(0.284)	(0.129)	(0.237)
Revenues increased	2.892**	0.290	-2.601**	2.813	-0.108	-2.921**	1.600	0.168	-1.433	0.917	-0.324	-1.241
	(1.187)	(0.429)	(1.053)	(1.753)	(0.664)	(1.453)	(1.365)	(0.477)	(1.200)	(1.955)	(0.829)	(1.600)
Revenues decreased	-1.977	-0.287	1.690	-3.268*	-0.774	2.494	-1.862	-0.821	1.041	-2.506	-1.406	1.100
	(1.493)	(0.521)	(1.328)	(1.904)	(0.704)	(1.619)	(1.742)	(0.593)	(1.507)	(2.755)	(0.934)	(2.342)
Expected Revenues increase	2.056**	0.659***	-1.397	0.286	-0.022	-0.307	0.397	0.232	-0.166	0.397	-0.491	-0.888
	(0.956)	(0.254)	(0.883)	(1.218)	(0.409)	(1.069)	(1.059)	(0.392)	(0.905)	(1.397)	(0.536)	(1.211)
Expected Revenues decrease	-1.151	-0.406	0.745	-0.093	-0.143	-0.049	-0.377	0.146	0.523	1.054	0.869	-0.185
	(0.875)	(0.260)	(0.801)	(1.125)	(0.415)	(0.968)	(0.988)	(0.364)	(0.844)	(1.356)	(0.558)	(1.157)
Share of Export	0.050	0.013	-0.038	0.072	0.022	-0.050	0.051	0.012	-0.039	0.032	-0.034*	-0.066
	(0.045)	(0.014)	(0.041)	(0.053)	(0.018)	(0.048)	(0.048)	(0.018)	(0.041)	(0.056)	(0.019)	(0.048)
State-of-the-Art Technology	0.033	-0.032	-0.065	-0.993	0.120	1.113	-0.929	-0.506	0.422	2.204	0.117	-2.087*
	(0.806)	(0.235)	(0.722)	(1.083)	(0.486)	(0.863)	(0.978)	(0.382)	(0.796)	(1.436)	(0.581)	(1.167)
Constant	2.320	0.430	-1.890	1.495	0.027	-1.468	0.996	-0.506	-1.503	-0.750	1.650	2.400
	(2.171)	(0.652)	(1.972)	(2.844)	(1.155)	(2.426)	(2.609)	(0.852)	(2.309)	(3.612)	(1.147)	(3.205)
R^2	0.06	0.03	0.05	0.06	0.04	0.06	0.06	0.13	0.02	0.04	0.07	0.02

Notes: See notes to Table 6.

Appendix Table 8 (not intended for publication):

Organizational Change, Technological Change and Worker Turnover: First Differences

	All Workers			Unskilled Workers			Skilled Workers			Professionals and Engineers		
	HR	SR	CR	HR	SR	CR	HR	SR	CR	HR	SR	CR
Reduction of Hierarchy Levels	0.645	2.937	1.253	-0.344	3.199	0.383	-0.920	3.893**	0.971	2.683**	4.690**	2.532
	(0.831)	(1.836)	(0.896)	(1.074)	(2.132)	(1.384)	(0.935)	(1.933)	(1.163)	(1.330)	(2.221)	(1.587)
Transfer of Responsibilities	-0.281	2.797*	-0.455	0.476	3.031	0.508	0.106	3.543**	0.674	0.239	3.561	0.580
	(0.670)	(1.528)	(0.799)	(1.012)	(1.957)	(1.390)	(0.924)	(1.750)	(1.087)	(1.067)	(2.171)	(1.546)
Introduction of Self-Managed Teams	0.266	-0.371	1.935**	0.884	0.206	3.712***	-0.814	-2.326	-0.707	-0.109	-2.188	0.330
	(0.672)	(1.414)	(0.774)	(0.959)	(1.720)	(1.189)	(0.817)	(1.533)	(0.997)	(1.180)	(2.003)	(1.558)
Investments in IT	-0.394	0.381	-0.796	0.766	-0.699	-0.084	0.843	-1.480	-0.632	1.717	-0.381	3.838
	(0.837)	(1.929)	(1.037)	(1.334)	(2.463)	(2.032)	(1.119)	(2.451)	(1.551)	(1.805)	(3.320)	(2.585)
Main Investments in IT	0.079	2.932**	1.243	-1.702	4.452**	-1.366	0.002	2.571	1.191	0.461	3.522	1.126
	(0.733)	(1.459)	(0.836)	(1.217)	(2.113)	(1.699)	(0.952)	(1.575)	(1.215)	(1.248)	(2.393)	(1.581)
log(Employment)	-7.038***	2.710	-5.462***	-6.962**	0.393	-8.146**	-10.628***	2.325	-8.612***	-6.520**	10.165**	-0.004
	(2.530)	(5.658)	(1.858)	(2.751)	(5.473)	(3.326)	(3.003)	(6.039)	(2.778)	(2.787)	(4.501)	(3.493)
Employment Share of Unskilled Workers	-0.375**	-0.028	-0.553***	-0.835***	0.144	-0.785***	-0.157	-0.174	-0.244	0.464**	-0.912**	-0.436*
	(0.163)	(0.389)	(0.172)	(0.191)	(0.483)	(0.267)	(0.190)	(0.430)	(0.221)	(0.214)	(0.354)	(0.257)
Employment Share of Skilled Workers	-0.533***	-0.400	-0.643***	-0.529**	-0.802	-0.699**	-1.019***	-0.091	-0.634***	0.476**	-0.613	-0.296
	(0.202)	(0.271)	(0.211)	(0.210)	(0.503)	(0.314)	(0.245)	(0.319)	(0.235)	(0.225)	(0.390)	(0.304)
Share of Females	0.159	0.152	0.043	0.239	0.669**	0.115	0.119	0.108	0.350	0.400*	-0.164	0.087
	(0.143)	(0.191)	(0.144)	(0.187)	(0.282)	(0.221)	(0.207)	(0.276)	(0.350)	(0.236)	(0.267)	(0.280)
Share of Foreigners	0.172	-0.109	0.007	0.173	-0.268	-0.245	-0.067	-0.215	0.202	0.314	-0.217	-0.350
	(0.161)	(0.252)	(0.197)	(0.243)	(0.344)	(0.389)	(0.207)	(0.379)	(0.292)	(0.271)	(0.440)	(0.390)
Median Age of Employees	-0.233	-0.887**	-0.680***	-0.191	-0.755	-0.662	-0.694**	-1.061**	-1.056**	-0.276	0.138	-0.079
	(0.189)	(0.398)	(0.236)	(0.270)	(0.500)	(0.411)	(0.287)	(0.476)	(0.419)	(0.338)	(0.554)	(0.459)
Share of Part-Time Workers	-0.016	0.350	0.032	0.329**	0.103	0.473**	0.001	0.175	-0.085	0.018	0.180	-0.060
	(0.110)	(0.240)	(0.098)	(0.153)	(0.289)	(0.221)	(0.147)	(0.268)	(0.164)	(0.147)	(0.246)	(0.172)
Revenues increased	1.060*	-1.765*	1.327**	0.975	-1.814	2.104*	0.962	-0.598	1.537*	-0.165	-0.983	0.370
	(0.564)	(1.068)	(0.617)	(0.844)	(1.492)	(1.102)	(0.681)	(1.266)	(0.905)	(1.075)	(1.691)	(1.480)
Revenues decreased	-0.807	1.155	-0.614	-1.583*	1.669	-1.609	-0.290	1.548	1.061	-1.421	1.062	-0.024
	(0.706)	(1.286)	(0.775)	(0.959)	(1.607)	(1.265)	(0.847)	(1.516)	(1.097)	(1.304)	(2.436)	(1.595)
Expected Revenues increase	0.544	-1.578*	0.034	0.386	0.030	0.852	0.001	-0.503	-0.469	-0.858	-1.352	-0.705
	(0.373)	(0.850)	(0.431)	(0.556)	(1.078)	(0.762)	(0.520)	(0.894)	(0.593)	(0.706)	(1.251)	(0.902)
Expected Revenues decrease	-0.413	0.782	-0.335	-0.610	-0.472	-0.962	-0.116	0.328	-0.524	1.391*	0.403	1.030
	(0.376)	(0.769)	(0.418)	(0.543)	(0.975)	(0.742)	(0.491)	(0.836)	(0.585)	(0.733)	(1.202)	(0.872)
Share of Export	0.015	-0.032	0.008	0.030	-0.040	0.013	0.021	-0.027	0.017	-0.031	-0.058	0.008
	(0.016)	(0.040)	(0.016)	(0.023)	(0.044)	(0.023)	(0.020)	(0.041)	(0.022)	(0.025)	(0.046)	(0.029)
State-of-the-Art Technology	0.172	0.158	0.504	-0.262	0.749	-0.776	-0.110	0.846	0.792	0.336	-1.841	0.431
	(0.374)	(0.717)	(0.485)	(0.616)	(0.897)	(0.799)	(0.526)	(0.822)	(0.749)	(0.798)	(1.202)	(1.033)
Constant	-1.025	-4.986***	-3.535***	-2.137	-5.350**	-5.057**	-1.392	-4.511*	-2.968	-2.756	-3.196	-8.337***
	(0.827)	(1.811)	(1.048)	(1.397)	(2.484)	(2.200)	(1.215)	(2.366)	(1.805)	(1.791)	(3.422)	(2.656)
R^2	0.09	0.05	0.09	0.08	0.06	0.07	0.14	0.03	0.07	0.04	0.03	0.02

Notes: See notes to Table 6.

Appendix Table 9 (not intended for publication):

Decentralization, Technological Change and Worker Turnover: First Differences

	All Workers			Unskilled Workers			Skilled Workers			Professionals and Engineers		
	HR	SR	CR	HR	SR	CR	HR	SR	CR	HR	SR	CR
Index of Decentralization	0.186	1.966***	0.868**	0.371	2.337***	1.557**	-0.528	1.933***	0.356	0.940	2.247**	1.173
	(0.349)	(0.648)	(0.379)	(0.463)	(0.819)	(0.626)	(0.398)	(0.702)	(0.523)	(0.647)	(0.969)	(0.717)
Investments in IT	-0.391	0.431	-0.813	0.748	-0.655	-0.138	0.846	-1.385	-0.607	1.752	-0.279	3.865
	(0.835)	(1.928)	(1.034)	(1.333)	(2.460)	(2.029)	(1.119)	(2.449)	(1.553)	(1.805)	(3.320)	(2.581)
Main Investments in IT	0.057	2.944**	1.199	-1.687	4.463**	-1.376	0.026	2.591	1.191	0.414	3.525	1.088
	(0.729)	(1.457)	(0.830)	(1.212)	(2.109)	(1.687)	(0.948)	(1.579)	(1.210)	(1.247)	(2.394)	(1.573)
log(Employment)	-7.152***	2.512	-5.582***	-6.801**	0.215	-7.913**	-10.524***	1.926	-8.742***	-6.927**	9.651**	-0.323
	(2.489)	(5.530)	(1.829)	(2.687)	(5.351)	(3.247)	(2.953)	(5.874)	(2.729)	(2.737)	(4.424)	(3.426)
Employment Share of Unskilled Workers	-0.373**	-0.028	-0.549***	-0.836***	0.144	-0.786***	-0.159	-0.173	-0.243	0.469**	-0.909**	-0.432*
	(0.163)	(0.386)	(0.172)	(0.191)	(0.479)	(0.268)	(0.190)	(0.425)	(0.220)	(0.213)	(0.353)	(0.256)
Employment Share of Skilled Workers	-0.532***	-0.403	-0.640***	-0.530**	-0.805	-0.696**	-1.021***	-0.097	-0.635***	0.477**	-0.618	-0.295
	(0.202)	(0.269)	(0.211)	(0.211)	(0.500)	(0.316)	(0.245)	(0.317)	(0.235)	(0.225)	(0.389)	(0.304)
Share of Females	0.156	0.154	0.036	0.241	0.671**	0.113	0.122	0.111	0.350	0.394*	-0.163	0.082
	(0.143)	(0.191)	(0.144)	(0.187)	(0.280)	(0.222)	(0.207)	(0.276)	(0.349)	(0.236)	(0.266)	(0.280)
Share of Foreigners	0.169	-0.102	-0.001	0.174	-0.262	-0.251	-0.063	-0.204	0.204	0.310	-0.207	-0.353
	(0.161)	(0.252)	(0.198)	(0.242)	(0.345)	(0.389)	(0.207)	(0.381)	(0.292)	(0.270)	(0.439)	(0.391)
Median Age of Employees	-0.233	-0.881**	-0.684***	-0.192	-0.750	-0.668	-0.692**	-1.050**	-1.054**	-0.274	0.149	-0.078
	(0.189)	(0.397)	(0.236)	(0.270)	(0.499)	(0.411)	(0.287)	(0.476)	(0.419)	(0.339)	(0.554)	(0.459)
Share of Part-Time Workers	-0.016	0.347	0.033	0.329**	0.101	0.475**	0.001	0.170	-0.087	0.017	0.175	-0.061
	(0.110)	(0.239)	(0.098)	(0.152)	(0.288)	(0.221)	(0.147)	(0.266)	(0.164)	(0.147)	(0.245)	(0.172)
Revenues increased	1.086*	-1.806*	1.392**	0.964	-1.849	2.144*	0.930	-0.671	1.524*	-0.121	-1.038	0.405
	(0.561)	(1.066)	(0.618)	(0.839)	(1.497)	(1.097)	(0.679)	(1.266)	(0.902)	(1.070)	(1.688)	(1.472)
Revenues decreased	-0.808	1.169	-0.622	-1.586*	1.682	-1.625	-0.287	1.575	1.068	-1.416	1.090	-0.020
	(0.704)	(1.283)	(0.775)	(0.958)	(1.604)	(1.264)	(0.845)	(1.510)	(1.095)	(1.303)	(2.438)	(1.595)
Expected Revenues increase	0.540	-1.516*	-0.002	0.371	0.085	0.786	0.012	-0.385	-0.439	-0.834	-1.231	-0.687
	(0.372)	(0.853)	(0.432)	(0.555)	(1.075)	(0.758)	(0.522)	(0.898)	(0.593)	(0.702)	(1.255)	(0.900)
Expected Revenues decrease	-0.409	0.742	-0.309	-0.602	-0.508	-0.918	-0.126	0.251	-0.543	1.380*	0.326	1.022
	(0.376)	(0.771)	(0.419)	(0.544)	(0.973)	(0.742)	(0.493)	(0.837)	(0.585)	(0.730)	(1.205)	(0.870)
Share of Export	0.016	-0.034	0.011	0.030	-0.042	0.015	0.020	-0.031	0.016	-0.029	-0.061	0.009
	(0.016)	(0.040)	(0.016)	(0.023)	(0.044)	(0.024)	(0.020)	(0.041)	(0.022)	(0.024)	(0.045)	(0.029)
State-of-the-Art Technology	0.174	0.141	0.516	-0.259	0.734	-0.758	-0.114	0.814	0.784	0.331	-1.873	0.428
	(0.373)	(0.717)	(0.486)	(0.616)	(0.896)	(0.802)	(0.526)	(0.826)	(0.749)	(0.795)	(1.204)	(1.028)
Constant	-0.894	-3.214*	-2.768***	-1.727	-3.222	-3.508*	-1.847	-2.844	-2.682	-2.029	-1.278	-7.358***
	(0.867)	(1.931)	(1.002)	(1.330)	(2.490)	(2.040)	(1.211)	(2.433)	(1.774)	(1.718)	(3.338)	(2.612)
R^2	0.09	0.05	0.09	0.08	0.06	0.06	0.14	0.02	0.07	0.04	0.03	0.02

Notes: See notes to Table 6.

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