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Workplace Innovations and Employee Outcomes: Evidence from a Representative Employee Survey

Panu Kalmi* and Antti Kauhanen*

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Abstract

In the recent literature on workplace innovations, two competing views stand out: in the high-performance work system (HPWS) literature it is argued that workplace innovations have positive outcomes for employees in the form of increased discretion, improved job security, and enhanced job satisfaction. In turn, the critics of the HPWS view argue that workplace innovations lead into increased job intensity and mental strain, and compromise job security. We address these issues by using a representative data set on individual employees from Finland. On balance our results are more supportive to the HPWS view. The results also show that there are differences between individual practices. Information sharing has consistently positive effects on employees, while the impacts of training and self-managed teams are more varied. Incentive pay has a positive association only with wages.

*Department of Economics, Helsinki School of Economics and HECER. E-mail: panu.kalmi@hkkk.fi and antti.kauhanen@hkkk.fi. Address: PO BOX 1210, FIN-00101.

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Introduction

In recent years researchers have paid considerable attention to workplace innovations. These are work practices that aim at more flexibility in work organization; enhanced labour-management cooperation; greater employee involvement in decision making; and financial participation of the employees (Ichniowski et al. 1996).

The impact of these practices on firm-level outcomes, such as productivity, has been studied extensively. Ichniowski et al. (1997) compare innovative firms with traditional ones in the steel industry, and find that innovative firms are more productive. Bartel (2004) studies the banking sector with similar findings. Black and Lynch (2004) use a large survey, finding that firms with innovative HRM practices are more productive. Appelbaum et. al (2000) study four firms in different industries using a variety of performance measures. Their results are mostly supportive of the hypothesis that performance is positively linked to participation and incentive provision. On the other hand, Cappelli and Neumark (2001) find only weak evidence that "high-performance" work practices are associated with higher productivity. They see that the empirical literature on the performance effects of workplace innovations is suggestive of substantial effects, but that taken as a whole it remains inconclusive. It seems that at least some firms may benefit from these innovations, but how about employees? How are they affected by workplace innovations? Do they share the gains, or are the gains achieved at the expense of employees?

Recently, a small body of literature has emerged to answer these questions. However, there are different views on the impact of workplace innovations on employees. The first strand of the literature suggests that employees will benefit from innovative practices. Appelbaum et al. (2000) suggest that both employers and employees benefit from the adoption of high-performance work systems (HPWS). The benefits for employees may come through more intrinsically rewarding work or in the form of higher wages. Freeman and Kleiner (2000) on the other hand argue that employees and managers are substantial beneficiaries from workplace innovations, and that the benefits for the firms are moderate at best. The second strand of the literature is more critical towards the benefits for employees. Some claim that firms adopt workplace innovations to increase profits and productivity, while employees bear the cost through increased work intensity, increased job strain, and reduced satisfaction (see e.g. Ramsay et al. 2000). Godard (2001) suggests that alternative workplace practices may have conflicting impacts on workers. He hypothesises that increased

discretion may have positive implications for psycho-social variables, but increased work intensification may have negative implications to job strain. Thus employees may both gain and lose, and the net effect is likely to depend on how job innovations are implemented, e.g. how they interact with participation and trust.

The empirical results on the impact of workplace innovations on employee outcomes have been somewhat conflicting, and the literature is far from settled. The HPWS literature has painted a rosy picture on the effects of work innovations, emphasising increased worker discretion, higher wages and improved job satisfaction. On the other hand, the critics of the HPWS view have claimed that work innovations compromise job security, lead to higher job intensity, and to increased mental strain. We study the effects of four different work innovations (self-managed teams, information sharing, incentive pay, and training) on various employee outcomes. The chosen work practices represent the three key dimensions (participation, incentives, and skills) of the high performance work system literature (Appelbaum et al., 2000). In order to sort out the diverse hypothesis, we study the association of various workplace innovations with a relatively broad set of worker outcomes, in order to get a reliable picture of the effects of the changes in organisation of work on employees .

We use a nationally representative employee survey from Finland. This survey has many good features for this kind of study. First, being an employee survey, we have the view of the individuals experiencing the changes in working life. Much of the prior studies on workplace innovations have been confined to use plant- or firm-level data on workplace innovations, such as the WERS98[i]. Second, our data is representative of the Finnish economy, including data from all industries (over one half of the respondents are outside manufacturing). Some of the prior studies have concentrated on a few manufacturing industries or single firms. Third, the data allow us to study multiple outcomes at a time. This is important, since concentrating on only a few outcomes could give misleading results on the overall impact of workplace innovations. To summarize, we are able to study workplace innovations comprehensively and accurately.

Our results are mainly supportive to the HPWS view. Workplace innovations are mainly positively associated with worker outcomes, and few negative relations emerge. Especially information sharing has always a positive association with worker outcomes, while the relationships between training and self-managed teams and worker outcomes are more mixed. Incentive pay has a positive

association only with wages. We do not find significant system effects, i.e. there is no evidence that increasing workplace innovations would have either increasing or decreasing returns.

The article proceeds as follows. The next section introduces the conceptual framework. That section discusses workplace innovations and their impact on employees. After that, prior empirical literature on workplace innovations and employee outcomes is reviewed. The following sections describe the data and the empirical methods. After that, the results of the regression analysis are given. The final section gives the conclusions.

Conceptual framework

High-performance work practices or workplace innovations are work practices that aim at more flexible organization, according to Ichniowski et al. (1996)[ii]. However, they point out that workplace innovations do not have one meaning shared by researchers, and describe the ways in which the term has been used. Firstly, it may be used to refer to employee involvement, for example through teams. Secondly, it may refer to financial participation such as profit-sharing or share schemes. Thirdly, it may mean flexible working arrangements, enhanced communication and dispute resolving mechanisms, etc. Finally, some use the term to describe a general workplace culture that is an outcome of many practices and policies.

It is often seen that workplace innovations should be introduced as a coherent system. Appelbaum et al. (2000) present a framework, which highlights this view. Their premise is that high-performance work systems aim at eliciting discretionary effort from employees. However, discretionary effort does not necessarily mean working harder, but it refers to using creativity and knowledge of the production process in the benefit of the organization. They argue that in order to elicit this kind of discretionary effort, three conditions have to be met. First, the employees need appropriate incentives, which may be explicit incentives such as incentive pay, or implicit such as increased job security. Second, in order to make the effort worthwhile, the employees need to have the appropriate skills. This can be achieved by selection procedures and employer-provided training. Third, the employees need to be able to participate in substantive decisions. Thus, this view emphasizes the complementarities between opportunity to participate, incentives, and skills. However, there is no clear theory on how these practices should be combined, and which combinations are particularly effective.

A theoretical model of complementarity between employee involvement and technological innovations has been outlined by Milgrom and Roberts (1995). They show how exogenous changes in the price of flexible manufacturing equipment or computer-aided design tools may lead to, among other changes in production-related variables, a simultaneous increase in employee involvement, training for employees, and use of teams. Ben-Ner and Jones (1995) also emphasize that financial participation and participation in decision-making are complementary. They argue that combinations of these forms of participation may be profitable, but if only one is adopted, the effects on productivity and individual motivation are likely to be small. In a similar vein, Macduffie (1995) and Ichniowski et al. (1997) suggest that the combinations of various workplace innovations are more effective than individual practices. This literature on the 'bundles' of human resource management practices thus suggests that there are increasing returns from adding workplace innovations. In contrast, Godard (2001) has argued that while the adoption of some practices may be beneficial, there are diminishing returns from introducing several innovations.

The workplace innovations we focus on in this study are self-managed teams, information sharing, incentive pay, and training. This corresponds to the framework of Appelbaum et al. (2000), the two first components being measures of participation, the third of incentives, and the last of skills.

Godard (2004, p. 366-370) has pointed out that the results from workplace innovations may also depend on the institutional conditions. He argues that strong unions, co-decision rights, and freedom from short-term performance pressures creates conditions that are supportive for the effective utilisation of workplace innovations, and points out Germany and Sweden as examples (Godard 2001, p. 799-800). He argues that in these co-ordinated market economies, the workplace innovations are more likely to be implemented in a way which benefits the employees when compared to liberal market economies. The Finnish industrial relations system bears many similarities with the Scandinavian model (Payne and Keep, 2003), and thus should provide a supportive institutional environment for workplace innovations. Finnish workforce is highly unionised (Vartiainen 1998), there are co-decision arrangements though they are not as extensive as in other Scandinavian countries, and at least until recently the corporate governance – system has been stakeholder oriented.[iii] However, the Finnish management style has been characterised as more authoritarian than in other Scandinavian countries (Payne 2004, p. 492).

Impact on employees

There are basically two competing views on the impact of workplace innovations on employees. First, workplace innovations have been seen as a way to offer higher income, more interesting work, higher job discretion, and better employment security for less skilled employees (see e.g. Appelbaum and Batt, 1994, 13, and Appelbaum et al. 2000, 26). Second, the critics of this view argue that workplace innovations may lead to negative worker outcomes such as stress and increased workload (for a review, see e.g. Godard 2004, 356-360). For example, Ramsay et al. (2000) adopt the view that workplace innovations are implemented to improve performance, but that better performance may be achieved at the expense of employees. Handel and Levine (2004) refer to this implementation of workplace innovations as "management by stress".

Osterman (2000) claims that the "mutual gains view" has been implicit in much of the discussion on high-performance work systems. He maintains that the reasons why we would expect mutual gains are twofold. Firstly, the practices have improved productivity, so that there is something to be shared, and secondly, the employees have to be given something in response to their extra effort, and the ideas they contribute. However, he notes the possibility that employer power has increased so much that they need not to share the gains.

The impact of workplace innovations on employees may depend on their implementation. Godard (2004) argues that HPWS can be implemented in different ways, two distinct styles being the "intensification" approach and the "involvement" approach. In the intensification approach, positive firm-level outcomes arise from increased workload and cost reductions, while in the involvement approach the outcomes arise from the use of high-commitment employment practices such as selection and training, incentive pay, and job security. He conjectures that the implications of alternative work practices, such as self-managed teams depend on the chosen approach.

The "mutual gains" view implies that workplace innovations affect influence opportunities, job security, wages, and job satisfaction in a positive manner. The critics of this view suggest that innovations affect also job intensity and job strain. Next we will review the predictions of these two views on these variables.

Influence opportunities. There is a broad consensus that workplace innovations are associated with higher levels of discretion. Self-managed teams should bring new responsibilities and more

discretion, at least for workers and clerical employees. Training is expected to lead into broadening of tasks in a given job. Information sharing can be expected to improve influence opportunities, even if it is largely consultative, compared to situation where no information is given to employees. While incentive pay may not increase influence *per se*, its effects are likely to depend on whether it is combined with influence on the job. Therefore the adoption of incentive pay may trigger other changes in the work organisation and indirectly increase influence opportunities.

Job intensity. The impact of innovative practices on job intensity is ambiguous. Appelbaum et al. (2000) see that eliciting discretionary effort is the goal of HPWS. However, as they point out, discretionary effort does not necessarily mean working harder, and this may be interpreted as saying that workload does not necessarily increase (Appelbaum et al. 2000, 26). On the other hand, one can argue that job intensity may increase since the employees are getting more involved. Ramsay et al. (2000) also see that HPWS, while associated with increased discretion, may lead to intensified work. The effects on job intensity are likely to depend on the practices adopted. The intensification of work is often related to on-line involvement practices (such as teams), but off-line involvement (such as information sharing) may not have such negative effects. Information sharing may even reduce work load, if it helps employees to prepare for the forthcoming changes well in advance.

Training may have conflicting effects on job intensity. On the one hand, by enhancing skills it may help employees to perform better in their jobs and thus reduce job intensity. On the other hand, the purpose of the training may often be to prepare employees for more difficult and challenging tasks, in which case training may be associated with increased job intensity. Finally, because incentive pay gives employees more explicit incentives by tying compensation to output, in most cases it will lead to increased work effort and therefore to increased job intensity.

Job security. The relationship between job security and workplace innovations is controversial. Insofar as workplace innovations can be regarded as investments in human resources, it can be argued that they lead into higher job security, because the value of retaining employees has increased. Their value has increased as a result of employer paid training, and new larger responsibilities (see e.g. Batt 2004). Moreover, in teamwork it may be important that team membership is stable, since team members become dependent on each other, thus building relation-specific capital in teams. Incentive pay influences job security by another channel. Since the incentive element makes the total compensation more variable, some of the demand shocks may be absorbed by lower total compensation, rather than by lay-offs.

However, the critics hold that workplace innovations may compromise job security (see e.g. Ramsay et al. 2000, 505). At least two different channels for this effect may be imagined. First, the possible productivity increases from workplace innovations may reduce the demand for labour in the organisation. This of course depends on the product market power of the firm. Second, since workplace innovations are clearly connected with the concept of organisational flexibility, it may be the case that organisations adopting workplace innovations may also be more likely to restructure their production process, thereby endangering the job security of their employees.

Wages. Workplace innovations may affect wages through many channels. First, if innovations do increase productivity more than costs, employees might be able to get their share of the improved profitability. This of course depends on how the rents generated by the employment relation are shared. Secondly, increased skill requirements and training should be reflected in wages, at least if the skills are general and transferable. This is likely to be the case, if the training consists of e.g. teamwork skills. Third, incentive pay might push wages up, if they are introduced on top of the prevailing wages. This is likely to be the case in Finland, since it is difficult to lower base wages when introducing incentive pay schemes. Furthermore, since the wage increases negotiated in the industry level collective bargain are often generally binding[iv], the base wages are likely to increase in the future despite of incentive pay schemes. This means that it is difficult to moderate future wage increases with incentive pay schemes. Fourth, information sharing may improve employee bargaining power and therefore wages (Freeman & Lazear, 1995). Finally, we have argued that innovations should affect many other employee outcomes, which should be reflected in wages according to the theory of compensating differentials. If the HPWS means, on the balance, positive outcomes for employees, they are willing to work for lower pay. However, if the system is disadvantageous for the employees, they will want a premium for working for the firm.

The two ultimate dependent variables, that is Job strain and Job satisfaction, measure employee well-being at work. We expect workplace innovations to have both a direct impact on these measures, as well as an indirect impact via the other outcomes, job intensity, job influence, job security, and wages. These four variables will also be referred to as "mediating variables".

Job strain. In Karasek's (1979) well-known framework, job strain arises from the combination from high demands and low discretion at workplace. This relatively straightforward framework yields rich predictions for the relationship of HPWS and job strain. Workplace innovations are likely to be

related to job strain via mediating variables. If HPWS increase workload, this may well lead into increased mental strain. In contrast, increased influence over one's job is likely to reduce job strain, especially in more demanding jobs. Job strain is likely to be negatively related to job security. However, no clear prediction on the relationship between mental strain and wages emerges.

Workplace innovations may also have direct effects on job strain. Teamwork makes work more social, which may lead to more conflicts between employees, and also to increased role conflict arising from conflicting or inconsistent demands. On the other hand, teamwork may also make jobs more pleasant. Information sharing may be part of more participatory work practices that are likely to reduce job strain. Skill enhancement through training may also reduce job strain. Finally, the relationship between incentive pay and job strain is ambiguous.

Job satisfaction. The HPWS literature maintains that opportunity to participate in substantive decisions increases intrinsic rewards, that is, it makes the job more challenging, rewarding, and meaningful (see e.g. Appelbaum et al. 2000, 179). Intrinsic rewards in turn increase job satisfaction. Additionally, the extrinsic incentives such as incentive pay and job security should increase job satisfaction. Training (especially selective training) may also increase job satisfaction by signalling the worker employer appreciation and promotion opportunities (Baron & Kreps 1999). However, if the workload increases, as the critics maintain, work may become more stressful and in consequence job satisfaction may decrease.

These conceptual considerations are summarized in Table 1. The HPWS literature predicts mainly positive employee outcomes in the form of increased influence opportunities, increased job security, higher wages, less stressful work, and increased satisfaction. It does not address job intensity directly, so the effect on it is left open. On the other hand, the critics of the mutual gains view see that workplace innovations do not necessarily lead to positive employee outcomes. Despite better influence opportunities, job intensity, insecurity and job strain may increase.

[Table 1 Here]

The discussion also points out that the outcomes are not independent, but they also affect each other. The key employee outcomes are job satisfaction and job strain. Workplace innovations affect these variables directly, and through influence opportunities, job intensity, job security, and wages.

Thus these variables can be seen as mediating the effect of workplace innovations. For similar analysis see e.g. Batt (2004) and Ramsay et al. (2000).

Earlier findings

The empirical literature on the impact of workplace innovations on employee outcomes is still quite thin, and far from settled. Next we review empirical literature concerning the impact of workplace innovations on wages, influence opportunities, job intensity, job security, job satisfaction, and job strain.

There is support for the hypothesis that workplace innovations affect influence opportunities positively. Godard (2001) finds using Canadian data that employees participating in alternative work practices experience higher levels of empowerment. The results of Ramsay et al. (2000) obtained from the British Workplace and Employment Relations Survey (WERS) show that high-performance work practices seem to have positive effects on job discretion. Batt (2004) conducts a case study in a US firm and her results show that the impact of self-managed teams on discretion differs markedly between occupational groups; participation in self-managed teams increases discretion for workers, but diminishes it for supervisors.

The association of job intensity and workplace innovations has received surprisingly little attention. Godard (2001) finds no evidence that alternative work practices are associated with increased work load. On the other hand, Ramsay et al. (2000) find support for the work intensification hypothesis at the establishment level.

The impact of workplace innovations on job security is ambiguous. Ramsay et al. (2000) have mixed results on job security and workplace innovations. Osterman (2000) uses U.S. survey data to show that workplace innovations are associated with reductions in contingent and managerial workforce, which may be viewed as evidence of declining job security. Batt (2004) finds that self-managed teams increase job security for workers, but diminish it for supervisors.

The results on the impact of workplace innovations on wages are mixed, some studies finding small positive effects and some finding no effect. Handel and Gittleman (2004) find little support for higher wages for employees in firms with innovative practices in the U.S. Black et al. (2004) on the other hand find using American data that non-production workers in innovative manufacturing establishments do earn higher wages, but that production workers' wages are unaffected. Their

wage measure is the average wage of a given occupational group in the establishment. Appelbaum et al. (2000, chap 10) find that employees in high-performance workplaces earn higher wages than the ones in more traditional environments in two industries out of the three industries studied.[v] Forth and Millward (2004) find by using WERS that employees in high-involvement workplaces received a premium of 8 per cent compared to the traditional workplaces.

The empirical results on workplace innovations on job strain or stress are mixed. Godard (2001) finds that alternative work practices in general are associated more stressful work. On the other hand, the results also show that the effects depend on the individual practices. Traditional teamwork seems to be associated with lower levels of stressfulness, whereas teams with responsibility for specific products or services are associated with higher levels of stressfulness. Ramsay et al. (2000) find also that HPWS increase job strain. Then again, the results of Appelbaum et al. (2000, 198) show that participatory work organization is not related to working harder, more conflicting demands, or more overtime.

It seems that workplace innovations increase job satisfaction. Positive effects on job satisfaction have been found by Appelbaum et al. (2000, Ch. 9), Godard (2001), and Batt (2004). In Godard's (2001) work, information sharing and traditional teamwork have robust and strong effects on job satisfaction. Ramsay et al. (2000) find that pay satisfaction is increased by HPWS.

Data

The survey

The Quality of Work Life Survey (QWLS) was carried out by Statistics Finland in 2003. The interviewees were selected randomly from the respondents to the monthly Labour Force Survey (LFS). The participants in the LFS represent the whole Finnish population. There were 5 270 individuals sampled to the face-to-face interviews. All individuals interviewed in the LFS who were aged 15-64 and were in paid work for at least five hours during the interview week, were eligible to participate in the QWLS. The survey response rate was 78 %, producing 4 104 interviews. The data are representative of the whole Finnish working population. We concentrate on full-time employees, dropping part-time employees (493 observations).

The QWLS is an excellent dataset for our research for three reasons. Firstly, the unit of observation corresponds to the "treatment" unit. The most natural level of analysis of employee outcomes is the

individual level. Firm or establishment level surveys may suffer from the fact that the some information is available only at the establishment level. We have all the information on participation in innovative practices and the outcomes at the individual level. Some studies have the participation information only at the establishment level, while in others the outcomes are also measured as a plant average. Ichniowski et al. (1996) suggest that establishment or firm surveys may suffer from response bias, because it is likely that firms with above average success with workplace innovations may be more likely to participate in the survey. Having individual level data allows us to measure the participation in innovative practices accurately. Secondly, since the data are representative of the Finnish employees and the response rate is high, it gives a reliable picture of the impact of innovative practices on employees in one country. We are not forced to concentrate on manufacturing or only on some industries. Third, the sample size is quite large, which gives us substantial statistical power.

Table 2 presents the summary statistics concerning the main variables of interest. Self-managed teams are clearly the least common workplace innovation: only around 10 % of respondents participate in self-managed teams. Around a third of the respondents are covered by incentive pay or information sharing schemes, while slightly over one-half of the respondents have received training during the past 12 months. Similarly, around one-half of the respondents are involved in traditional (i.e. non-self-managed) teams.

Empirical methods

Variables

In order to understand how employees are affected by workplace innovations, several dimensions of employee outcomes need to be studied. The "mutual gains" view suggests that workplace innovations should lead to better influence opportunities, better job security, higher wages, lower job strain, and better job satisfaction. The critics of this view suggest that workplace innovations lead to higher job intensity, lower job security, higher job strain, lower job satisfaction, while having no impact on wages. Combining the predictions of the two views, the outcome variables are job strain, job satisfaction, influence opportunities, job intensity, job security, and wages.

The workplace innovations we focus on are participation in self-managed teams, information sharing, employer-provided training, and incentive pay. As argued above, these capture the key

elements of HPWS, as defined by Appelbaum et al. (2000). We also include traditional teams to our analysis, but we do not consider them as an 'innovation', for two reasons. First, the definition of traditional teams in the QWLS is rather loose, and many types of group work may be classified as "teamwork". The proportion of employees participating in traditional teams is correspondingly rather high (51%). Second, according to Baron and Kreps (1999, p. 326), self-managed teams may have much more profound influence on employees and organisations than traditional teams. Next we describe in a more detailed way the dependent variables, the independent variables, and the control variables. For more information on the construction of the dependent and independent variables see the Appendix.

Job intensity is a five item scale describing the need to hurry in work; inability to plan ahead because of urgent tasks; having to stretch workday to manage all work; having tight work schedules; and difficulties to detach from work during time off. The estimated reliability of this scale (Cronbach's α) is 0.73. *Influence* is a six item scale that measures how much the employee feels that he can affect her own work. The estimated reliability of this scale (Cronbach's α) is 0.81. *Job security* is a three item scale measuring the threat of temporary dismissal, threat of dismissal, and threat of unemployment. The estimated reliability of this scale (Cronbach's α) is 0.81.

The *wage* measure is constructed from categorical monthly wage included in the QWLS, having 19 categories. The first category is below €500, and the last category is over € 5 000. We take the logarithm of the midpoint of the interval, and use it as the dependent variable in the wage regressions. The response rate to this question is very high, only 13 persons declined to answer.

Job strain measures several symptoms ranging from headache to feeling that it is all "just too much". These symptoms represent exhaustion and depression, as in Karasek (1979), and other symptoms of stress such as headache, and irregular heartbeat. The variable is a ten-item scale, with estimated reliability of 0.84. *Job satisfaction* is constructed from a direct question that has a four point scale. Although being a single item, it is the most used form of a job satisfaction indicator.

Self-managed teams are here defined as teams, which select their own foremen, and decide about internal division of responsibilities. All other types of team work are classified as *traditional teams*. *Information sharing* equals unity if the employees are informed about changes at work at the planning stage, rather than shortly before the change or at the implementation. This variable can be interpreted also as a measure of participatory management style. Although consultative participation

may be viewed as a rather weak form of participation, it is at least a prerequisite for any meaningful participation.

Skills are measured by the level of education and employee provided training. The level of education is the highest degree that the individual has obtained. The *training* variable equals unity if the respondent has participated in employer-provided training during the last 12 months. *Incentive pay* means here a system characterised by fixed wage and bonus. We exclude pure piece-rates, since they are mostly used in manufacturing in individual work settings.

The data include also individual and establishment control variables. Individual controls include education, gender, age, work experience, computer use, union membership, and fixed-term status. Establishment controls include size, employment change, foreign ownership, public sector indicator, and 11 industry indicators. We do not consider the presence of unions to be a workplace innovation for two reasons. First, the unionisation rate in Finland is comparably high, around 80%, so the unions are rather the norm than exception (Vartiainen, 1998). Second, even if an individual employee is not unionised, it is still likely that the workplace in unionised, and having an impact on the work practices of non-unionised workers. For these reasons it is difficult to say what the union dummy actually measures.

Estimation

In the first set of regressions, we will estimate the impact of individual practices on employee outcomes. As the conceptual framework suggests, different practices may have opposing effects on the employee outcomes. However, it was also argued that introducing a bundle of innovative practices is usually more effective than single practices. For this reason we also estimate the impact of bundles of practices on the outcomes. The third set of regressions we do, we follow the approach of Ramsay et al. (2000) and Batt (2004) in the attempt to differentiate the direct and indirect effects on employee outcomes. Consistent with the earlier discussion, we hypothesise that work innovations, have both direct effect on employee outcomes (job strain, satisfaction) as well as indirect effects via mediating variables (job intensity, job influence, job security, wages).

The models are estimated by OLS. Job intensity, job influence, job security, and job strain are based on scales, i.e. continuous variables, so OLS is definitely the right approach. Monthly wage is measured as a categorical variable with 19 categories. We use OLS also for this variable, but another possibility would be the use of interval regression. Job satisfaction is a z-score of an

ordered variable with four categories. In other words, the original variable has been rescaled so that the variable depicts how many standard errors it deviates from the mean. This transformation allows us to use OLS also for this variable.[vi]

There are some issues in estimation that need to be considered. One concern is selection bias. Although the workplace innovations can be seen as structures set by management, there may be some selection effects in the employee side. On the other hand, it may be that firms which implement some innovative practices are otherwise "better managed" and thus differ systematically from the other firms inducing bias to the estimates. The selection on the employee side can take place in at least two ways. Firstly, it may be the case that workers are not "forced" to participate in innovative practices, but some employees choose to join them. If this selection is driven by factors that are unobservable in statistical analysis, the coefficients will be biased. Secondly, workers may quit a firm if they feel that new work practices are too demanding. In other words, there may be some selection over time. It is difficult to assess how important this is, as the evidence on impact of workplace innovations on voluntary quits is rather mixed (see e.g. Cappelli and Neumark 2004).

Selection affects different outcomes in a different way. Let's consider wages first. If the most productive employees choose to participate in innovative practices, and the less productive do not, then we would expect the coefficients of the practices to be biased upwards. Similarly, if the more effort averse employees leave the firm, then innovative practices are associated with less effort averse and thus more productive workers, and we should expect the coefficients to be biased upwards.

In the regressions concerning job strain and job intensity, the coefficients on innovations are biased downwards, if the ones who feel that workplace innovations make work too demanding quit their jobs. In this case, the employees who find the levels of job intensity acceptable are still in the innovative firms, but others have left. On the other hand, if the innovations are adopted in firms which already have good climate and labour relations, the coefficients on innovative practices will reflect this and will most likely be downwards biased. Based on similar arguments, it seems that in the job satisfaction and influence equations the coefficients are likely to be upwards biased.

In principle, the selection issues could be dealt with instrumental variables. Similar endogeneity issues arise with the mediating variables, the system of equations that the above hypotheses create can be consistently estimated only by using instrumental variables. However, it is virtually

impossible to come by with variables that could be used as instruments. Therefore this approach is not feasible, and is not pursued in this study. This is also the standard practice in the literature. When interpreting the results, these issues have to be kept in mind.

Results

In Table 3 we present the results of regressing six outcome variables on workplace innovations and control variables. The first column shows the results for job intensity. Self-managed teams have a positive and significant association with job intensity, as one would expect. This is also consistent with the results of Godard (2001), who finds that employees in teams responsible for certain products or services experience higher workload. The effect of training was expected to be ambiguous, but training has also a positive association with job intensity. A possible interpretation for this finding is that training increases job demands and therefore job intensity. In contrast, information sharing has a negative and significant effect with job intensity. This contrasts the results of Godard (2001), who finds no association. Perhaps surprisingly, incentive pay is not associated with job intensity.

Job influence is affected by the different innovations in a positive manner as hypothesised in the conceptual framework. This relationship is especially strong in regard to information sharing and self-managed teams. Also traditional teamwork has a significant positive association with job influence (contra no teamwork), although the effect is smaller than that of self-managed teams. However, there is no significant relationship between incentive pay and job influence. The results are similar to Godard's (2001) only with respect to traditional team work. He finds no effect for self-managed teams and a positive one for group bonuses.

Job security seems not to be decreased by workplace innovations. Information sharing and training are positively related to job security, and no work practice is significantly negatively related to job security. These findings do not provide support for the hypothesis that workplace innovations are compromising job security. However, the results do not support the expected positive connection between incentive pay and job security. The results on the effect of training are similar to the ones obtained by Batt (2004).

All work innovations have strong association with wages. The associations between incentive pay (an estimated 7 % increase) and training (an estimated 9 % increase) were quite expected, but the strong (though slightly smaller) associations with teamwork (including traditional teamwork) and

information sharing are more surprising. The former may reflect higher compensation due to increased work effort (or compensation for increased job intensity), and the latter better bargaining position of employees. The prior results concerning teamwork and wages have been somewhat conflicting. Handel and Gittleman (2004) find that teamwork is not associated with higher wages. However, in their data the existence of practices is known only at the establishment level, and not at the individual level. They see that this might bias their results downwards (Handel and Gittleman 2004, 91). On the other hand, Appelbaum et al. (2000) find that employees in self-managed teams have slightly higher earnings. However, this result seems to be driven by one of the three industries, namely apparel.

Job strain seems not to be strongly affected by workplace innovations. Only information sharing has a significant (negative) association with job strain. Other variables are not related to job strain, perhaps reflecting conflicting effects via different mediators. However, in relation to job satisfaction, both types of teamwork, information sharing, and training are all significantly and positively related. Only incentive pay does not have a significant relation to either variable.

Mediated effects

In Tables 4 and 5 we study to what extent the effects of workplace innovations are mediated through the mediating variables (job intensity, job influence, job security, wages). Mediation may occur when: 1) the independent variable is correlated with the outcome variable; 2) the independent variable is correlated with the mediating variable; 3) the mediating variable is correlated with the outcome variable when the independent variable is controlled for; 4) the independent variable does not have a significant association with the outcome variable when the mediating variable is included to the regression equation (Baron & Kenny, 1986). We first enter the mediating variables one by one and finally we enter all of them simultaneously. Regarding job strain, the only independent variable meeting the condition (1) is information sharing. Information sharing is also significantly related to all mediating variables, so there is a possibility that the relationship between information sharing and job strain is mediated by other variables. However, when the mediating variables and information sharing are entered simultaneously in the regression equation (Table 4), it is remarkable how little the coefficient of information sharing changes. Perhaps the only visible reduction appears in column 5, where all potential mediators are entered simultaneously. This suggests that the impact of information sharing may be partly mediated jointly by all mediating variables (except wages, which bear no relationship with job strain). However, even in this case the parameter coefficient for information sharing remains highly significant.

In Table 5 we present the results for job satisfaction. Here there are more potential candidates for mediation, since four of the workplace innovations (including traditional teams) had positive relationship with job satisfaction. In column (1), we add job intensity into the regression. In this case the coefficients for self-managed teams actually increase. This is because teamwork and job intensity are positively correlated, and this correlation dampens the otherwise positive correlation between teamwork and job satisfaction. Hence, when job intensity is controlled for, the impact of teamwork rises. Similar remarks apply for training. The parameter coefficient for information sharing remains positive and significant.

In column (2) of Table 5, job influence is entered. Teamwork, information sharing and training were all positively related to job influence, but there is only limited evidence on mediation. The coefficient values drop somewhat, but all remain at the same significance levels than previously. In column (4), training loses its significance when wages are included. On the other hand, the coefficient that was not very significant to start with, falls only slightly. Training remains insignificant when all mediating variables are included simultaneously, but the coefficients of other variables of interest remain highly significant. To summarize, the inclusion of the mediating variables does not change the results notably.

System effects

Much of the HPWS literature is concerned about joint (rather than individual) effects of the workplace innovations. We have reviewed the arguments concerning individual practices. This discussion highlighted the difference between the HPWS view and its critique. Table 1 summarized the predictions of these two views. In addition to the question on the sign of the effects, there is difference in the views on the "returns to scale" of combinations of the practices. The HPWS literature suggests that there are increasing returns while e.g. Godard (2001) has suggested that there might be decreasing returns to scale. Next we test the hypotheses concerning the two conflicting positions by using system level variables.

The identification of "bundles" has been subject to debate (see e.g. Ichniowski et al. 1996), and there is no universally accepted way to identify them. Becker and Huselid (1998, 63) argue that the theoretical framework based on complementarities supports the use of single index to describe the human resource management system. Furthermore, a coherent combination may depend on firm specific factors, which also suggests the use of a single index. We address this issue in a simple way

by constructing two dummy variables: HPWS, that gets the value 1 if the respondent participates in at least 3 workplace innovations and 0 otherwise, and TRAD (for traditional or hierarchical workplace), that gets the value 1 if the respondents participates in none of the four innovations. The omitted category is 1-2 innovations, which includes the majority of the respondents.

In Table 1 we presented the hypothesis related to the HPWS literature and its critique in one dimension, so collapsing the various workplace practices into a single dimension provides the most straightforward test to discriminate between the two hypotheses. Two dummy variables help also to address the question whether there are increasing or decreasing returns from workplace innovations. In terms of our regression equation, if the first view is correct, then the HPWS dummy should be mostly significant (to the direction that is beneficial to employees), while the TRAD dummy should be mostly insignificant. However, if the latter view is correct, then the HPWS dummy should be mostly insignificant and the TRAD dummy significant (to the unfavourable direction).

The results are reported in Table 6. We present here the results in relation to the four mediating and two outcome variables, but omit the regressions where mediators are used as independent variables. The results strongly support the HPWS view. The adoption of several innovations is associated with increased job influence, increased job security, higher wages, less job strain, and higher job satisfaction than in the case where only one or two practices are adopted. However, also partial adoption of HPWS seems to matter: respondents participating in one or two practices have more job influence, higher job security, higher wages, and higher job satisfaction than the respondents who do not participate in workplace innovations. There is a possibility that higher degree of workplace innovations is associated with higher job intensity, but the differences with the control group are not significant. Thus it would seem that the employees participating innovative practices are better off on almost all the dimensions we consider. However, it has to be remembered that the issue of causality is nor straightforward in this setting.

The results reported in Table 6 do not provide clear support either increasing or decreasing returns from work innovations. It appears that more innovations are clearly better than few innovations, while few innovations are better than no innovations. However, in respect to job strain and job satisfaction, the differences between HPWS and few practices are more pronounced than the differences between few practices and no practices. These results are in contrast with the results of Godard (2001) who finds decreasing returns to scale in the adoption of alternative work practices.

Conclusions

The previous literature on workplace innovations has produced widely diverging predictions on the effect of the innovations on employee outcomes. The HPWS literature has suggested that the impact on employees is mostly positive, leading to increased discretion, improved job security, higher wages, and enhanced job satisfaction. Others have suggested that workplace innovations also lead to increased workload and stress. By using a representative data set on Finnish employees, we have been able to shed new light on these issues. When considering individual practices, our results show that different workplace innovations have somewhat different implications on workers. Information sharing has consistently positive implications on employees. This result suggests that there are positive effects from employee involvement. Self-managed teams and training have mostly positive implications for workers, such as increased job influence, higher wages, increased job satisfaction, and increased job security (training only). On the negative side, both self-managed teams and training are associated with increased job intensity. Incentive pay is significantly associated only with higher wages.

We also test whether the effects of workplace innovations on job strain and job satisfaction are mediated through other employee outcomes, but we find surprisingly little evidence on mediation. In most cases, the impacts of workplace innovations remain significant even when the mediating variables are included into the regressions.

When comparing "traditional workplaces" and "innovative" ones, we find that our results are mostly consistent with the results of Appelbaum et al. (2000). That is, workplace innovations have mostly positive effects on employees, and in general find little evidence for the negative implications outlined in the critique of the HPWS literature. However, we do not find strong support for the existence increasing returns to adoption of innovative practices. All the results seem to suggest that employees may be better off in "innovative" workplaces and that in "traditional" workplaces the employees fare the worst.

These results may reflect the Finnish institutional setting. Godard (2004) argues that the way the workplace innovations are implemented depends on institutions, and that they are more likely to implemented in a way that is beneficial for employees in a co-ordinated market economy when compared to liberal market economies. The differences in institutions and their implications for trust and the costs of implementing the innovations in an "involvement way" rather than

"intensification way" may explain why our results differ from those found by Ramsay et al. (2000) for the UK and Godard (2001) for Canada. Future research should look more deeply in to the employee outcomes in different economies.

The policy implications of the analysis are favourable for the diffusion of workplace innovations. Against this, it is interesting to notice that the practice of information sharing has actually decreased in Finland recently (Kauhanen, 2005). Although workplace innovations are favourably associated with employee satisfaction and health, at least in Finland they also entail a cost in the form of higher wages. Potentially higher costs may limit the use of workplace innovations. It is also possible that firms perceive that information sharing limits their strategic flexibility. Our results provide a relatively comprehensive overview on the impact of workplace innovations on employees. Future research should consider evaluating the impact of these practices to both firms and employees simultaneously.

References

Appelbaum, Eileen, Thomas Bailey, Peter Berg, and Arne L. Kalleberg, 2000. *Manufacturing Advantage: Why High-Performance Work Systems Pay Off*. Ithaca, N.Y: ILR Press.

Appelbaum, Eileen and Rosemary Batt, 1994. *The New American Workplace: Transforming Work Systems in the United States*. Ithaca, N.Y: ILR Press.

Baron, James and David Kreps, 1999. *Strategic Human Resources: Frameworks for General Managers*. New York: Wiley.

Baron, Reuben M. and David Kenny, 1986. "The Moderator-Mediator Variable Distinction in Social Psychological Research", *Journal of Personality and Social Psychology* 51 (6): 1173-1182.

Bartel, Ann, 2004. "Human Resource Management and Organizational Performance: Evidence from Retail Banking", *Industrial and Labor Relations Review* 57 (2): 181-202.

Batt, Rosemary, 2004. "Who Benefits from Teams? Comparing Workers, Supervisors, and Managers", *Industrial Relations* 43 (1): 183-212.

Becker, Brian and Mark Huselid, 1998. "High Performance Work Systems and Firm Performance: A Synthesis of Research and Managerial Implications", *Research in Personnel and Human Resources Management* 16: 53-101.

Ben-Ner, Avner and Derek C. Jones, 1995. "Employee Participation, Ownership and Productivity: A Theoretical Framework", *Industrial Relations* 34 (4): 532-555.

Black, Sandra and Lisa Lynch, 2004. "What's Driving the New Economy: The Benefits of Workplace Innovation", *Economic Journal* 117 (February): F97-F116.

Black , Sandra, Lisa Lynch, Anya Krivelyova, 2004. "How Workers Fare When Employers Innovate", *Industrial Relations* 43 (1): 44-66.

Cappelli, Peter and Neumark David (2001). "Do "High-Performance" Work Practices Improve Establishment-Level Outcomes?", *Industrial and Labor Relations Review* 54 (4): 737-775.

Cappelli, Peter and David Neumark, 2004. "External Churning and Internal Flexibility: Evidence on the Functional Flexibility and Core-Periphery Hypotheses", *Industrial Relations* 43 (1): 148 -182.

Forth, John and Neil Millward, 2004. "High Involvement Management and Pay in Britain" , *Industrial Relations* 43 (1): 98-119.

Freeman, Richard (1978). "Job Satisfaction as an Economic Variable", American Economic Review, 68 (2), 135-141.

Freeman, Richard and Morris Kleiner, 2000. "Who Benefits Most from Employee Involvement: Firms or Workers", *American Economic Review* 90 (2): 219-223.

Freeman, Richard and Lazear, Edward, 1995. "An Economic Analysis of Works Councils", in *Works Councils: Consultation, Representation, and Cooperation in Industrial Relations*, edited by J. Rogers and W. Streeck, pp. 27-50. Chicago: University of Chicago Press and NBER.

Godard, John, 2004 "A Critical Assessment of the High-Performance Paradigm", *British Journal of Industrial Relations* 42 (2): 349-378.

Godard, John, 2001. "High Performance and the Transformation of Work? The Implications of Alternative Work Practices for the Experience and Outcome of Work", *Industrial and Labor Relations Review* 54 (4): 776-805.

Handel, Michael and Maury Gittleman, 2004. "Is There a Wage Payoff to Innovative Work Practices?", *Industrial Relations* 43 (1):67-96.

Handel, Michael and David I. Levine, 2004. "Editors' Introduction: The Effects of New Work Practices on Workers", *Industrial Relations* 43 (1): 1-43.

Ichniowski, Casey, Thomas Kochan, David Levine, Craig Olson and George Strauss, 1996, "What Works at Work: Overview and Assessment", *Industrial Relations* 35 (3): 299-333.

Ichniowski, Casey, Kathryn Shaw, and Giovanna Prennushi, 1997. "The Effects of Human Resource Management on Productivity", *American Economic Review* 87 (3): 291-313.

Karasek, Robert, 1979. "Job Demands, Job Decision Latitude, and Mental Strain; Implications for Job Redesign", *Administrative Science Quarterly* 24 (2): 285-308.

Kauhanen, Antti, 2005. "Workplace Innovations in Finland 1997-2003", Unpublished manuscript. Helsinki: Helsinki School of Economics.

MacDuffie, John, 1995. "Human resource bundles and manufacturing performance: organizational logic and flexible production systems in the world auto industry", *Industrial and Labor Relations Review* 48 (2): 197-221.

Milgrom, Paul and John Roberts, 1995. "Complementarities and Fit: Strategy, Structure, and Organizational Change in Manufacturing", *Journal of Accounting and Economics* 19 (2-3): 179-208.

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

Parks, Susan, 1995. "Improving Workplace Performance: Historical and Theoretical Contexts", *Monthly Labor Review* 118 (May): 18-28.

Payne, Jonathan, 2004. "Re-Evaluating the Finnish Workplace Development Programme: Evidence from Two Projects in the Municipal Sector", *Economic and Industrial Democracy* 25 (4): 485 – 524.

Payne, Jonathan and Ewart Keep, 2003. "Revisiting the Nordic Approaches to Work Re-organization and Job Redesign: Lessons for UK Skills Policy", *Policy Studies* 24(4): 205 – 225.

Pil, Frits K., and John P. MacDuffie, 1996. "The Adoption of High-Involvement Work Practices", *Industrial Relations* 35 (3): 423-455.

Ramsay, Harvey, Dora Scholarios, and Bill Harley, 2000. "Employees and High-Performance Work Systems: Testing inside the Black Box", *British Journal of Industrial Relations* 38 (4): 501-531.

Vartiainen, Juhana, 1998. *The Labour Market in Finland - Institutions and Outcomes*, Prime Minister's Office, Helsinki. Available at www.vnk.fi/resource/fi/2096.pdf.

Appendix

Independent variables

Self-managed team: Constructed from the following questions. How well do the following statements describe your group work.
 a) The group selects its own leader
 b) The group decides about its internal division of responsibilities
The answer possibilities are: Totally true; True to some extent; Only slightly true; Totally untrue. If the respondent has replied in both questions that the statements are totally true or true to some extent the Self-managed team dummy equals unity, and zero otherwise.

Traditional teamwork: Equals unity if responded positively to the question "Do you do work in a permanent group or team that has a common goal and can at least partly plan its own work?? (Yes/No)", and does not participate in a self-managed team.

Information sharing: Equals unity if the respondent gets information about changes relating to his work at the planning stage.

PRP: Equals unity if pay consists of a fixed wage and some kind of bonus.

Training: Equals unity if the respondent has attended courses paid by the employer during the last 12 months, and zero otherwise.

Computer: Equals unity if the respondent uses computer in work, and zero otherwise.

Dependent variables

All the scales have been formed by summing the individual standardized components and dividing by the number of components.

Job influence: This is a seven item scale constructed from the following questions. Are you able to influence a lot, quite a lot, a little, or not at all:

the contents of your tasks

the order in which you do your tasks

the pace of your work

your working methods

the division of tasks between employees

choice of your working partners

Job intensity: This is a five item scale constructed from the following questions:

I think of and do things related to my work also during my free time, because my work is so interesting

My work contains tight schedules

I have to stretch my workday often in order to manage all the work

I can not plan my work properly because of urgent tasks needing to be done

I do not have time to do my work as well and conscientiously as I would like to

The answer possibilities are: Totally true, about true, not very true, totally untrue. All the items are reversed, so that higher values higher job intensity.

Job security: This is a three item scale constructed from the following questions. Does your work carry any of the following insecurity factors?

Threat of temporary dismissal

Threat of dismissal

Threat of unemployment

Each of the variables is a dummy variable that equals unity if the respondent feels that insecurity is present, and zero otherwise.

Job satisfaction: Z-score (the mean has been subtracted from each value, and the result has been divided by the standard deviation) of the following question. How satisfied are you with your current job? (Very satisfied, Quite satisfied, Rather dissatisfied, Very dissatisfied)

Job strain: This is a ten-item scale consisting of the following symptoms:

Headache

Fatigue, apathy, or lack of energy

Difficulties in falling asleep, or recurrent awakenings at night

Palpitations or irregular heartbeat

Feeling of dizziness

Depression

Heartburn, acidity, stomach pains, or diarrhoea

Over exhaustion

Tenseness, nervousness, or irritability

Feeling that it is just "all too much"

Monthly wage: Based on interval coded data, having 19 intervals the first being below €500 and the last above €5000. We use the logarithm of the midpoint of the interval as the wage measure.

Tables

Table 1. Predictions of different views

Outcome	HPWS view	Critique of HPWS
Job intensity	?	+
Job influence	+	+
Job security	+	-
Wages	+	0
Job strain	-	+
Job satisfaction	+	?

Note: Key to the symbols: + a positive effect; 0 no effect: - a negative effect; ? no clear prediction

Table 2. Summary statistics of workplace innovations (N=4,104)

	Percentage of workforce participating
Self-managed teams	10.3%
Information sharing	34.1%
Incentive pay	31.5%
Training	53.2%
Traditional teams	50.6%

Table 3. The impact of workplace innovations on worker outcomes (OLS estimates)

	(1) Job intensity	(2) Job influence	(3) Job security	(4) Wage (in log)	(5) Job strain	(6) Job satisfaction
Self-managed team	0.121 (3.23)**	0.295 (7.63)**	0.039 (0.87)	0.056 (3.52)**	-0.038 (0.99)	0.300 (5.46)**
Information sharing	-0.088 (3.85)**	0.320 (13.10)**	0.216 (7.73)**	0.038 (3.97)**	-0.135 (6.08)**	0.324 (9.46)**
Incentive pay	-0.029 (1.08)	0.041 (1.52)	-0.032 (0.88)	0.070 (6.35)**	-0.010 (0.37)	0.000 (0.00)
Training	0.129 (5.41)**	0.048 (1.96)*	0.124 (3.96)**	0.086 (8.44)**	0.023 (0.95)	0.088 (2.41)*
Traditional team	0.043 (1.82)	0.139 (5.74)**	-0.009 (0.29)	0.049 (4.90)**	-0.021 (0.90)	0.153 (4.18)**
Observations	3578	3580	3580	3555	3579	3580
R-squared	0.21	0.17	0.12	0.53	0.05	0.07

Notes: * significant at 5%; ** significant at 1%. Robust t statistics in parentheses.
Additional controls include computer use, occupational positions (3), gender, union status, public ownership, foreign ownership, educational levels (4), age, tenure, fixed-term employment contract, plant size, and industry.

Table 4. Workplace innovations and job strain: estimations with mediating variables (OLS estimates)

	(1) Job strain	(2) Job strain	(3) Job strain	(4) Job strain	(5) Job strain
Self-managed team	-0.069 (1.87)	-0.019 (0.50)	-0.035 (0.91)	-0.040 (1.03)	-0.049 (1.32)
Information sharing	-0.112 (5.23)**	-0.115 (4.98)**	-0.117 (5.24)**	-0.134 (6.02)**	-0.079 (3.50)**
Incentive pay	-0.004 (0.15)	-0.007 (0.27)	-0.012 (0.46)	-0.006 (0.22)	0.004 (0.17)
Training	-0.010 (0.42)	0.026 (1.08)	0.033 (1.39)	0.025 (1.05)	0.009 (0.39)
Traditional team	-0.033 (1.43)	-0.013 (0.53)	-0.022 (0.95)	-0.022 (0.92)	-0.024 (1.05)
Job intensity	0.250 (14.10)**				0.250 (13.96)**
Job influence		-0.063 (3.63)**			-0.052 (3.10)**
Job security			-0.083 (5.93)**		-0.069 (5.07)**
Wage (in logs)				-0.023 (0.56)	-0.076 (1.89)
Observations	3577	3579	3579	3554	3552
R-squared	0.11	0.05	0.06	0.05	0.12

Notes: * significant at 5%; ** significant at 1%. Robust t statistics in parentheses.
Additional controls include educational levels (4), age, tenure, fixed-term employment contract, plant size, industry, computer use, occupational status, gender, union membership, public ownership, and foreign ownership.

Table 5. Workplace innovations and job satisfaction: estimations with mediating variables (OLS estimates)

	(1) Job satisfaction	(2) Job satisfaction	(3) Job satisfaction	(4) Job satisfaction	(5) Job satisfaction
Self-managed team	0.316 (5.78)**	0.228 (4.18)**	0.295 (5.38)**	0.292 (5.28)**	0.237 (4.34)**
Information sharing	0.313 (9.15)**	0.246 (7.15)**	0.299 (8.76)**	0.319 (9.31)**	0.216 (6.25)**
Incentive pay	-0.001 (0.02)	-0.010 (0.24)	0.004 (0.09)	-0.018 (0.43)	-0.023 (0.57)
Training	0.102 (2.81)**	0.076 (2.10)*	0.074 (2.03)*	0.068 (1.84)	0.063 (1.74)
Traditional team	0.160 (4.36)**	0.119 (3.29)**	0.154 (4.22)**	0.146 (3.94)**	0.121 (3.32)**
Job intensity	-0.116 (4.38)**				-0.122 (4.58)**
Job influence		0.242 (9.72)**			0.230 (9.26)**
Job security			0.114 (5.72)**		0.094 (4.69)**
Wage (in logs)				0.194 (3.00)**	0.174 (2.73)**
Constant	-0.345 (2.21)*	-0.200 (1.31)	-0.280 (1.82)	-1.614 (3.36)**	-1.554 (3.28)**
Observations	3578	3580	3580	3555	3553
R-squared	0.08	0.10	0.08	0.08	0.11

Notes:* significant at 5%; ** significant at 1%. Robust t statistics in parentheses.
Additional controls include educational levels (4), age, tenure, fixed-term employment contract,
plant size, industry, computer use, occupational status, gender, union membership, public ownership,
and foreign ownership.

Table 6. Workplace innovation systems and employee outcomes (OLS estimates)

	(1) Job intensity	(2) Job influence	(3) Job security	(4) Wage (in logs)	(5) Job strain	(6) Job satisfaction
HPWS	0.044	0.285	0.165	0.079	-0.104	0.277
	(1.36)	(8.17)**	(4.06)**	(5.41)**	(3.33)**	(5.71)**
TRAD	-0.019	-0.198	-0.162	-0.106	0.019	-0.150
	(0.65)	(6.82)**	(4.23)**	(8.59)**	(0.70)	(3.40)**
Observations	3578	3580	3580	3555	3579	3580
R-squared	0.19	0.14	0.11	0.52	0.04	0.05

Notes:* significant at 5%; ** significant at 1%. Robust t statistics in parentheses.
Additional controls include educational levels (4), age, tenure, fixed-term employment contract,
plant size, industry, computer use, occupational status, gender, union membership, public ownership,
and foreign ownership.

Notes

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[i] Workplace Employment Relations Survey carried out in the UK.

[ii] Not all see the term "innovations" as appropriate. Some find that most of these practices have a long history (see e.g. Parks 1995) and thus the term innovations may not be appropriate. Others refer to the set of these practices as defining a "transformed" workplace, some talk about "high-performance work systems" (HPWS) (see e.g. Appelbaum et al. 2000). Emphasizing the way these have changed the role of front line employees, some refer to these practices as "high-involvement" (Pil & MacDuffie 1996). We will use the terms workplace innovations and HPWS interchangeably.

[iii] Tainio and Lilja (2004) suggest that the system has become more owner oriented due to the increase of foreign ownership in listed companies.

[iv] "Generally binding" means that the contract is extended to cover all the firms in a given industry, so that it applies also in firms which do not belong to the employers union which negotiated the bargain.

[v] Their sample consists of 40 plants in three industries in U.S. manufacturing. There are around 4000 non-supervisory employees in the sample.

[vi] The results are not substantially affected if ordered probit is used in job satisfaction equations using the original four point scale. (results are available from the authors upon request). We prefer to use OLS for the sake of consistency with other regressions. The z-score approach has been used also in Freeman (1978).