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Innovative Work Practices and Sickness Absence: What Does a Nationally Representative Employee Survey Tell?*

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TIIVISTELMÄ

Tutkimuksessa tarkastellaan työpaikkainnovaatioiden vaikutuksia sairauspoissaoloihin ja työtapaturmiin. Työpaikkainnovaatioilla tarkoitetaan itseohjautuvia tiimejä, informaation jakamista, työnantajan tarjoamaa koulutusta sekä kannustinpalkkausta. Tutkimuksessa käytetään Tilastokeskuksen työolotutkimusta vuodelta 2008. Yhden yhtälön mallien perusteella havaitaan, että työpaikkainnovaatiot kasvattavat työntekijöiden ja alempien toimihenkilöiden lyhyitä sairauspoissaoloja. Kahden yhtälön mallien avulla, joissa voidaan huomioida se, että työpaikkainnovaatiot ovat endogeenisia muuttujia päädytään puolestaan siihen, ettei työpaikkainnovaatioilla ole yhteyttä sairauspoissaoloihin eikä työtapaturmiin.

ABSTRACT

The paper examines the effect of innovative work practices on the prevalence of sickness absence and accidents at work. We focus on several different aspects of workplace innovations (self-managed teams, information sharing, employer-provided training and incentive pay) along with the “bundles” of those practices. We use nationally representative individual-level data from the Finnish Quality of Work Life Survey from 2008. Using single equation models, we find that innovative work practices increase short-term sickness absence for blue-collar and lower white-collar employees. In two-equation models that treat innovative workplace practices as endogenous variables we do not find relationship between innovative work practices and sickness absence or accidents at work.

JEL classification: I12, J28

Keywords: innovative work practices, workplace innovation, sickness absence, accidents

1. INTRODUCTION

Innovative work practices such as self-managed teams and incentive pay have become a regular feature of contemporary human resource management. These workplace innovations aim at more flexibility in the work organization, enhanced labor-management cooperation, greater employee involvement in decision making, and financial participation of the employees (Ichniowski *et al.*, 1996). Most studies find that innovative work practices have positive impacts on firm-level performance (see e.g. Ichniowski *et al.*, 1997; Bartel, 2004; Black and Lynch, 2004).[1]

There is a much smaller body of literature on what innovative work practices do to employees, and the findings from it are contradictory. Some authors argue that employers gain at the expense of the employees (Ramsay *et al.*, 2000; Harley, 2005), while others maintain that in the high-performance workplaces both employers and employees end up being better off (Appelbaum *et al.*, 2000; Handel and Levine, 2004).

One part of the literature on the potential drawbacks of innovative work practices on the employee outcomes concerns their effects on employee health. Traditionally, these questions have been approached on a case-study basis, as representative data sets containing information on both participation in innovative work practices and employee health outcomes have been lacking (ILO, 1998). However, this line of research has expanded in a more quantitative direction recently. Askenazy (2001), and Fairris and Brenner (2001) investigate the relationship between innovative work practices and workplace injuries using establishment data originating from Osterman's (1994) survey of U.S. establishments. They find evidence of a positive relationship between innovative work practices and various occupational injuries. Brenner *et al.* (2004) also find a positive relationship between innovative work practices and cumulative trauma disorders in their study using U.S. establishment-level data. Askenazy and Caroli (2010) use individual-level data from a supplement of the French Labor Force Survey from 1998 to examine whether there is a relationship between innovative work practices and mental strain, occupational risks, and occupational injuries. With the help of propensity score matching methods they discover that employees who are involved in innovative work practices are significantly worse off in terms of occupational hazards than those who are not. On the other hand, Askenazy and Caroli (2010) find that information and communication technologies provide employees with a safer workplace. Finally, there are related studies that examine the effects using information on satisfaction. Green and Heywood (2008) observe that performance pay increases job satisfaction. Jones *et al.* (2009) report that satisfaction with employer-provided training reduces absenteeism and Barth *et al.* (2009) find that management innovations lower job satisfaction.

[1] However, Cappelli and Neumark (2001) find more mixed results.

In this paper, we contribute to the literature on the employee outcomes of innovative work practices by studying their effect on sickness absence and accidents at work. While the studies that focus on cumulative disorders and other specific injuries or illnesses are useful, they may not capture the whole effect of innovative work practices. There may thus be effects on other illnesses and the general well-being of employees as well that can be captured by analyzing the prevalence of sickness absence. One advantage of focusing on sickness absence and accidents at work is that they are objective measures of the employee outcomes, unlike job satisfaction. Also, by focusing on sickness absence, we are able to contribute to the literature on the determinants of sickness absence in economics (e.g. Barmby *et al.,* 2004), which has not paid particular attention to the effects of innovative work practices.

We use nationally representative individual-level data from the Finnish Quality of Work Life Survey from 2008, which includes information on participation in innovative work practices as well as information on sickness absence and occupational accidents. The survey contains information on several different aspects of workplace innovations (self-managed teams, information sharing, employer-provided training and incentive pay). We start with straightforward probit models in which we explain sickness absence and treat innovative work practices as an exogenous variable. However, innovative workplace practices are not randomly assigned to firms, but may be determined jointly with sickness absence. For this reason, our preferred estimates are based on the recursive models in which innovative work practices are treated as endogenous variables. Our identification strategy is based on the use of information on foreign ownership. The recursive modeling is also able to take into account otherwise omitted variables. For example, workplaces with extremely competent managers may have both high employer-provided training and fewer accidents.

The Finnish case has a broader interest for at least three reasons. First, innovative work practices have gained popularity in Finland rapidly during the past 10 years. A major part of this development has been caused by the foreign-owned firms that have often been among the first to adapt these practices (Tainio and Lilja, 2003). Second, Finland has the highest share of sickness absenteeism in Europe (Gimeno *et al.*, 2004a).[2] Thus, sickness absences cause a substantial reduction in actual working time. Third, according to the arguments in the literature (e.g. Belangér *et al.,* 2002; Godard 2001, 2004), the high unionization rate (~70%) together with deep co-operation between employees and employers in Finland should provide an exceptionally fertile ground for the benefits of innovative work practices to emerge. For this reason, it is interesting to examine whether one is still able to find some negative effects of these practices on the employee outcomes.

[2] The earlier Finnish research on sickness absence (e.g. Kivimäki *et al.,* 2000; Virtanen *et al.,* 2001; Vahtera *et al.,* 2004) have used data from very specific sectors of the labor market, like the municipal sector. It has not considered the effects of innovative work practices.

2. CONCEPTUAL FRAMEWORK

Innovative work practices increase employee discretion and opportunities to participate in decision making, give employees incentives to participate, and provide them with skills needed to participate (e.g. Appelbaum *et al.,* 2000). Increased discretion often follows from participating in self-managed teams, while incentives are usually financial, and sufficient skills are achieved with employer-provided training. Such work practices transform the work of employees, especially in blue-collar occupations.

The impact of innovative work practices on employees has received attention recently. Two views stand out in the literature. The first view argues that innovative work practices make work more rewarding, meaningful and challenging by increasing discretion (e.g. Appelbaum *et al.*, 2000). This view predicts that employees should generally benefit from innovative work practices.[3] According to Karasek's (1979) demands-control model, increased discretion should lead to lower occupational stress. This view does not address the impact of innovative work practices on workload directly, but, for example, in the view of Appelbaum *et al.* (2000) these practices should lead to working smarter, not harder. Thus, according to this view, innovative work practices should affect sickness absence only a little, and mostly through decreased stress.

The second view takes a more critical stance. This strand of literature argues that innovative work practices increase the workload and the pace of work, and in reality increase the control possibilities of employees only a little (Ramsay *et al.*, 2000; Harley 2005). Berggren (1993) argues that while employee discretion may increase in other ways, they potentially lose control, especially over the pace of work. Increased pace of work in turn increases the likelihood of sickness absence and occupational injury. Again, according to Karasek's (1979) model of occupational stress, increased demands at work coupled with no change in discretion should lead to increased stress. Additionally, the new practices, such as self-managed teams, may substitute supervisor control with peer control, which can be more stressful for employees (Barker, 1993). Thus, according to the critical view, innovative work practices increase the incidence of sickness absence and occupational injuries by intensifying work and increasing stress.

Innovative work practices are most likely to transform the work of blue-collar employees. For this reason, it is likely that they have the largest effect on the sickness absence of blue-collar employees. Especially, the arguments about the increasing pace of work are most likely to be relevant for blue-

[3] See e.g. Kalmi and Kauhanen (2008) for more thorough discussion of the different views on the impact of innovative work practices on employees.

collar employees. The case of innovative work practices and stress is more ambiguous: white-collar employees can be substantially affected by, for example, increased peer control also.

Different components of innovative work practices, such as self-managed teams, incentive pay, and training, may have a distinct and even contradictory impact on sickness absence. Incentive pay, especially in blue-collar occupations, may lead to an increased workload and pace of work. The Finnish collective agreements implicitly define different working speeds for the time rates and piece rates, but the apparent heterogeneity of workplaces makes it hard for the collective agreements to take into account all relevant aspects. Self-managed teams, on the one hand, give employees more discretion, but on the other hand they may increase stress, due to peer monitoring. Employer-provided training can also increase peer pressure among employees affected.

Innovative work practices can affect short-term and long-term sickness absence differently. If the critics are correct, and innovative work practices increase the pace of work, they may increase short-term sickness absence more than long-term sickness absence. On the other hand, if the impact comes mainly through stress, it may show up mostly in the prevalence of long-term sickness absence (e.g. Gimeno *et al.*, 2004b).

To sum up, it is *a priori* unclear whether innovative work practices affect sickness absence or not. The potential impact may vary in different employee groups or the practices may affect short-term and long-term absence in different manner.

3. DATA

We use the latest wave of the Quality of Work Life Survey (QWLS) of Statistics Finland (SF) from 2008. QWLS provides a representative sample of Finnish wage and salary earners (i.e. the self-employed are excluded), because the initial sample for QWLS is derived from a monthly Labor Force Survey (LFS) of SF, where a random sample of the working age population is selected for a telephone interview. The fact that QWLS is a representative sample of employees is a great advantage, because many of the earlier studies on the effects of workplace innovations have used data on a few manufacturing industries or single firms. The estimates for certain sectors and firms could be subject to substantial selection bias, if the unobserved factors that determine whether employees choose to work in the sector or firm also influence their absenteeism. Another very useful characteristic of QWLS is that the unit of observation corresponds to the "treatment" unit, because we have both the participation information and outcome measures at the individual level. This is important, because the most natural level of analysis of employee outcomes such as sickness absence is the individual level. Furthermore, Ichniowski *et al*. (1996) point out that establishment and firm surveys such as Workplace Employee Relations Survey in the UK may suffer from serious response bias, because the most successful firms with workplace innovations may be more likely to participate in the surveys.[4] This problem does not prevail in our data.

The 2008 QWLS was based on LFS respondents in March and April who were 15-64 years old with a normal weekly working time of at least 10 hours. 6,499 individuals were selected for the QWLS sample and invited to participate in a personal face-to-face interview. Out of this sample 4,392 persons, or around 68%, participated (see Lehto and Sutela, 2009).[5] The average length of the interviews was 66 minutes. Face-to-face interviews ensure reliable answers to almost all questions. Owing to missing information on some variables for some employees, our sample size used with the estimations is about 4,300 observations. This gives us considerable statistical power. QWLS is supplemented with information from LFS and several registers maintained by SF. For example, information about the educational level of employees originates from the Register of Completed Education and Degrees.

Sickness absences are documented as the number of days absent from work because of illness during the past 12 months. (The exact number of days absent is not reported in the survey. Instead, the respondents have reported them by means of categories: the number of absences lasting 1-3 days, 4-9 days and those lasting at least 10 days.) Sickness absences are self-reported, but there is no particular reason to believe that employees gave systematically biased answers, because their identity was not revealed to their employers after the survey.[6] QWLS also contains short sickness absences that are not recorded by the Social Insurance Institution (KELA), which pays out sickness benefits to the employees affected. The reason for this is that short sickness absences do not entitle employees to the payment of sickness benefits, but they obtain normal pay from their employers. This is an important advantage of QWLS, because most of the absences are short.[7] The 2008 QWLS data do not contain information about the duration of individual sickness spells, however. We form an indicator for those who have been absent at least once from work due to illness during the past 12 months. This indicator

[4] Bryson *et al*. (2008) describe the strengths and weaknesses of WERS.

[5] Lehto and Sutela (2009) provide a detailed analysis of response vs. non-response. Their conclusion is that non-response is not undermining the representativeness of the QWLS data.

[6] To check the external validity of the measure of sickness absence, we have compared information from QWLS to the employer survey conducted by the Confederation of Finnish Industries (2007). These two sources give a comparable picture of sickness absence in the private sector. However, it is possible that there is some bias against self-reporting absence due to mental sickness. This could be a problem especially for white-collar workers. We are not able to quantify this potential bias.

[7] Around half of all employees in Finland can be absent from work at least three days without a medical certificate, according to the collective agreements.

constitutes our most important dependent variable. We also use an indicator for those who have been absent over 15 days. (The exact number of days absent is approximated by using the mean points of the above-mentioned categories.) Furthermore, we examine the effects of workplace innovations on the prevalence of accidents at work during the past 12 months.

We capture four different aspects of innovative work practices (i.e. high-performance workplace systems, HPWS). These measures correspond to the central pieces of a high-performance workplace from the point of view of employees, as outlined in Appelbaum *et al.* (2000). Self-managed teams are defined as teams that select their own foremen and decide on the internal division of responsibilities. Information sharing equals one if employees are informed about the changes at work at the planning stage rather than shortly before the change or at its implementation. Training equals one if the employee has participated in employer-provided training during the past 12 months.[8] Incentive pay equals one if the person has performance-related pay and bonuses are based on the employee's own effort. To examine the joint effects of innovative work practices, we identify "bundles". Because there is no single definition for summary measures (e.g. Blasi and Kruse, 2006; Kalmi and Kauhanen, 2008), we follow a simple strategy. "Bundles" are captured by our variable HPWS, which equals one if more than one of the aspects of workplace innovations (self-managed teams, information sharing, employer-provided training or incentive pay) is present.[9] We include a vector of control variables to all models that can be regarded as 'the usual suspects', based on the absenteeism literature (e.g. Brown and Sessions, 1996; Holmlund, 2004; Dionne and Dostie, 2007). The exact definitions including the means and standard deviations of the variables are documented in the Appendix (Table AI).

4. RESULTS

To make it easier to understand the estimates from probit models, they are reported as marginal effects on the probability of being absent (or experiencing an accident at work). For binary variables, these are calculated as differences in the predicted probabilities. The baseline results in Table I (Panel A) reveal that the "bundles" of workplace innovations increase sickness absence, but they are

[8] For comparison, the means for the variables that capture self-managed teams, information sharing and training are very close to the ones reported by Kalmi and Kauhanen (2008) from the 2003 QWLS. Bassanini *et al.* (2005) observe by using various data sources from the 1990s that roughly 50% of all Finnish employees have received some employer-provided training in one year. This share is higher than in most other countries in Europe.

[9] We do not use bigger "bundles" of workplace innovations, because they are relatively rare in the data. For example, only 11% of all employees are affected by more than two different aspects of innovative workplace practices.

unrelated to long-term sickness absence and accidents at work. The estimated marginal effect in the sickness absence equation is considerable. To illustrate this, according to the point estimate, those who participate in HPWS have roughly a 4 percent higher probability of reporting a positive number of absences during the past 12 months, other things being equal. For comparison, the results from the same model in the Appendix, Table AII, reveal that females are approximately 5 percent more likely to report a positive number of absences and it is one of the stylized facts of the literature that females have higher sickness absence rates (e.g. Holmlund, 2004; Ichino and Moretti, 2009). Regarding the control variables (the Appendix, Table AII), the role of adverse working conditions as a determinant of sickness absence is particularly important, which is in accordance with the results of a study on the 1997 QWLS (Böckerman and Ilmakunnas, 2008).

Table I here

Table I (Panel B) reports the results for different aspects of HPWS. The positive effect is not present for self-managed teams, information sharing and incentive pay, but it prevails for employer-provided training. Furthermore, there is a positive effect of incentive pay on the probability of being absent over 15 days during the past 12 months (Table I, Panel B). Otherwise, there are no statistically significant results for long-term sickness absence or accidents at work.

We estimate models separately for employees with a different socio-economic status, because the evidence shows that employees in more complex (white-collar) jobs are more likely to participate in a HPWS (e.g. Kauhanen, 2009), and because, as argued earlier, the effects of innovative work practices on sickness absence may differ between socio-economic groups. The average of our HPWS variable is 0.25 and 0.57 for blue-collar employees and upper white-collar employees, respectively. Firms allocate authority to employees in uncertain, more complex settings that typically involve white-collar employees, because the employees have a better idea of the correct actions to take in these settings (Prendergast, 2002). We do not present separate estimates for accidents among upper white-collar employees, because the incidence of accidents at work is very low among them. (The average of our Accident variable is 0.016 for upper white-collar employees.)

The estimates in Table II (Panels A and B) reveal that the positive effects of the “bundles” of workplace innovations on sickness absence are particularly pronounced for blue-collar and lower white-collar employees. This supports the argument that innovative work practices transform especially the work of blue-collar employees and thus affect their sickness absence most. Thus, there are no influences on the outcomes for upper white-collar employees (Table II, Panel C). We also find that long-term sickness absence and accidents at work are not affected by the “bundles”. The results in Table III confirm the earlier pattern in Table I according to which employer-provided training is the most important separate aspect of HPWS that has an influence on sickness absence. There are also the statistically significant effects of incentive pay for long-term sickness absence among blue-collar and lower white-collar employees.

Tables II-III here

Next we turn to the recursive models to study the robustness of the baseline results, because the most serious concern of the reduced-form estimates is that innovative work practices may be endogenous in the sense that employees, for example, working in certain types of firms are more likely to be exposed to innovative work practices. The recursive models are formed by means of two equations that are estimated jointly. In the first equation we explain the binary indicators of workplace innovations, by the variables X_1 in a probit model. X_1 includes individual and workplace characteristics. In the second equation, a binary indicator of sickness absence (or the prevalence of accidents at work) is explained in another probit model by workplace innovations and the variables X_2, which includes individual and workplace characteristics.

The model forms a system of probit models that has an endogenous dummy explanatory variable.[10] We assume that there are unobserved characteristics and, therefore, the error terms of the probit models are correlated. The unobserved characteristics can, for example, be unobservable individual health characteristics that influence sickness absence. For this reason, the results from the recursive models may differ from the ones based on the reduced-form models. The system is recursive, because the prevalence of sickness absence does not explain workplace innovations. This is a reasonable assumption, because innovative work practices are introduced by the management and they are thus predetermined for employees. It is possible to estimate the model as a multivariate probit model (see Greene, 2003). We use the Geweke-Hajivassiliou-Keane simulated maximum likelihood estimator implemented to Stata by Cappelari and Jenkins (2003). No exclusion restrictions are needed for the identification of the parameters, because the model is non-linear (Wilde, 2000). However, using the exclusion restrictions improves the validity of tests of exogeneity of the endogenous dummy explanatory variable (essentially, a test of whether the correlation of the error terms of the probit models is zero) (Monfardini and Radice, 2008). Thus, we assume that the variables X_1 and X_2 are not exactly the same.

[10] Böckerman and Ilmakunnas (2009) use similar recursive models to examine the connection between employees' quit intentions and actual separations.

The identification assumption of the recursive structure is that foreign ownership increases the probability to adopt workplace innovations, but it does not have an influence on the prevalence of sickness absence (and accidents at work).[11] Thus, foreign ownership appears in the first probit model for workplace innovations, but it is not included in the second probit model in which sickness absence (or accidents at work) is used as a dependent variable. Otherwise, the explanatory variables X_1 and X_2 of the two probit models are the same, as listed in the Appendix (Table AI).

The results in Tables IV-V validate our approach for the exclusion of foreign ownership from the second probit model. The effect of foreign ownership on the "bundles" of workplace innovations is statistically and economically significant. The "bundles" are roughly 9 percent more likely to appear in foreign-owned firms, other things being equal (Table IV, Column 1). This result is in accordance with the descriptive account of the dispersion of workplace innovations to Finland in Tainio and Lilja (2003), and the econometric estimates in Kauhanen (2009), based on the 2003 QWLS. In contrast, foreign ownership is clearly unrelated to the prevalence of sickness absence and accidents at work during the past 12 months (Table IV, Columns 2-3).[12] Regarding the effects on sickness absence, this confirms the pattern reported in Böckerman and Ilmakunnas (2008). Employer-provided training and incentive pay are the separate aspects of innovative work practices that are positively affected by foreign ownership (Table V, Columns 3-4). This is consistent with Tainio and Lilja (2003), who argue that the increase in the popularity of incentive pay in Finland during the past 10 years has been especially driven by foreign-owned firms. Based on these patterns, we focus on the "bundles" along with employer-provided training and incentive pay in the following.

Tables IV-V here

The results from the recursive models are summarized in Tables VI-VII. We estimate separate models for the "bundles" (Table VI) and different aspects of HPWS (Table VII). We report the estimates for the measures of innovative work practices from the second probit equation for sickness absence or accidents at work. (The coefficients of other explanatory variables included are not reported in order to save space, but they are available upon request.) Note that the figures in Tables VI-VII are the estimated coefficients, not the marginal effects, which would vary between different combinations of outcomes.[13] The results reveal that the "bundles" of workplace innovations are not statistically significant determinants of sickness absence in the recursive models even though most of the point

[11] The data do not allow us to identify specific foreign ownership. However, almost all foreign ownership in Finland originates from Western Europe.

[12] However, there is some evidence (not shown in Table IV) that long-term sickness absence is related to foreign ownership. For this reason, it is not studied in the context of the recursive models.

[13] The number of random draws used in the estimations was 70. The exception is the model for accidents among lower white-collar employees in which we used 50 draws due to the convergence problems in the procedure.

estimates are positive (Table VI). Interestingly, there is some indication that the "bundles" decrease accidents at work for blue-collar employees. (In this specification the correlation between the error terms of the probit equations is 0.5058 with the *z*-value of 1.69. The correlation emerges from unobserved characteristics.) Thus, in these respects, the results from the recursive models differ from the reduced-form models. On the other hand, we find that employer-provided training has qualitatively similar effect to the ones in the reduced-form models (Table VII, Panels A and D). In the model for upper white-collar employees the correlation between the error terms of the probit equations is -0.6142 with the *z*-value of -2.15. In addition, there is evidence that incentive pay reduces accidents at work among blue-collar employees. (The correlation between the error terms of the probit equations is 0.6464 with the *z*-value of 2.32.)

Tables VI-VII here

Why employer-provided training seems to increase sickness absence? One apparent explanation for this pattern is that workplace innovations reduce various forms of slack time at workplaces. This raises the pace of work and stress considerably, which positively contributes to the prevalence of sickness absence, as outlined in our conceptual framework. To test the existence of this channel of influence, we estimated a simple probit model in which the dependent variable equals one when an employee feels he or she is under the pressure of heavy work almost all the time or roughly ¾ of the time. (The average of the variable is 19%.) The results reveal that employer-provided training obtains a marginal value of 0.0483 with the *z*-value of 3.97. Thus, those employees that have received any form training provided and paid for by the employer during the past 12 months are some 5% more likely to work under the pressure of heavy work, according to their own assessment. This correlation is in accordance with the view that takes a critical stance on innovative work practices. In particular, it supports the thinking that innovative work practices may sometimes induce employees to deliver "too much" effort in the sense that they are forced to take unintended breaks from the job. These effects could be particularly pronounced for upper white-collar employees, because their work involves more opportunities for discretion than the more standardized work conducted by blue-collar employees at the factory floor.

5. CONCLUSIONS

Prior research has shown that the introduction of innovative work practices most likely has a beneficial effect on firm-level performance. Here we look at the impact on employees in terms of sickness absence and accidents at work. Conceptual framework suggests that the impact of innovative work practices on sickness absence may differ between employee groups and absence measures (any absence, long-term absence, accidents at work).

In single equation models we find that participation in a HPWS increases short-term sickness absence for blue-collar and lower white-collar employees. We do not find any effects on longer sickness absence or accidents at work. In the case of upper white-collar employees we find no evidence that HPWS are related to sickness absence. In recursive two-equation models that take into account the potential endogeneity of HPWS, we do not find any evidence that HPWS affects sickness absence. This holds irrespective of the employee group or the outcome considered. To sum up, the only evidence of positive link between absence and HPWS that we find pertain to short-term absence for blue-collar and lower white-collar employees when using single equation models. Our results are contrary to the ones in the earlier literature, which has shown a positive relationship between sickness absence and HPWS. However, our outcome measures are broader than the ones considered previously, which has mainly considered cumulative disorders and other specific injuries. Thus our results point to the conclusion that in general HPWS have little impact on the health of employees.

That our results are somewhat more positive from the employee point of view when compared to the few existing studies may also be partly due to the Finnish institutions. Concerning other employee outcomes, including job satisfaction, Kalmi and Kauhanen (2008) find using Finnish data that HPWS have mainly positive effects for employees whereas in other literature the findings have been much more mixed. They hypothesize that the Finnish labor market institutions may affect these results. Co-operation between employees and employers seems to support the benefits of innovative work practices.

Perhaps somewhat surprisingly, the effects that we do find seem to go through on-the-job training. Those who have received employer-provided training are more likely to report that they work under heavy pressure, and are also absent from work more often due to sickness. Thus, in the design of innovative workplace practices and incentive systems, firms should pay particular attention to the pace of work and its potential consequences for sickness absence. Otherwise, firms cannot reap the full benefits of these practices and there is a danger that firms' costs will increase.

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Table I. The effect of innovative work practices on sickness absence and accidents

Panel A: "Bundles"			
	Sickness absence positive	Sickness absence > 15	Accident positive
HPWS	0.0415**	0.0027	-0.0027
	(0.0163)	(0.0115)	(0.0055)
N	4290	4291	4291
Panel B: Different aspects of HPWS			
	Sickness absence positive	Sickness absence > 15	Accident positive
Self-managed teams	-0.0114	-0.0116	0.0058
	(0.0264)	(0.0186)	(0.0097)
Information sharing	-0.0076	0.0023	-0.0016
	(0.0165)	(0.0117)	(0.0055)
Training	0.0725***	-0.0018	-0.0025
	(0.0171)	(0.0120)	(0.0054)
Incentive pay	0.0268	0.0400***	0.0113
	(0.0189)	(0.0144)	(0.0068)
N	4290	4291	4291

Notes: Marginal effects reported. The (unreported) control variables are listed in the Appendix (Table AI). Both Panel A and Panel B report the results from three different specifications. The estimation results for the control variables from the first model in Panel A are reported in the Appendix (Table AII). Robust standard errors in parentheses: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table II. The effect of HPWS on sickness absence and accidents.

Panel A: Blue-collar employees			
	Sickness absence positive	Sickness absence > 15	Accident positive
HPWS	0.0649**	0.0361	-0.0166
	(0.0322)	(0.0265)	(0.0180)
N	1303	1299	1303
Panel B: Lower white-collar employees			
	Sickness absence positive	Sickness absence > 15	Accident positive
HPWS	0.0520**	0.0078	0.0048
	(0.0249)	(0.0176)	(0.0068)
N	1723	1724	1709
Panel C: Upper white-collar employees			
	Sickness absence positive	Sickness absence > 15	Accident positive
HPWS	0.0058	-0.0156	..
	(0.0302)	(0.0158)	
N	1251	1243	

Notes: Marginal effects reported. The control variables are listed in the Appendix (Table AI). Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table III. The effect of different aspects of HPWS on sickness absence and accidents.

Panel A: Blue-collar employees			
	Sickness absence positive	Sickness absence > 15	Accident positive
Self-managed teams	-0.0098	-0.0559	0.0170
	(0.0569)	(0.0365)	(0.0350)
Information sharing	0.0219	0.0127	-0.0127
	(0.0335)	(0.0266)	(0.0186)
Training	0.0836***	0.0307	-0.0053
	(0.0292)	(0.0233)	(0.0170)
Incentive pay	0.0272	0.0879***	0.0207
	(0.0338)	(0.0291)	(0.0207)
N	1303	1299	1303
Panel B: Lower white-collar employees			
	Sickness absence positive	Sickness absence > 15	Accident positive
Self-managed teams	0.0045	0.0119	0.0085
	(0.0415)	(0.0331)	(0.0134)
Information sharing	-0.0112	0.0080	0.0087
	(0.0258)	(0.0182)	(0.0071)
Training	0.0593**	-0.0204	-0.0046
	(0.0275)	(0.0196)	(0.0068)
Incentive pay	0.0492	0.0402*	0.0111
	(0.0307)	(0.0244)	(0.0099)
N	1723	1724	1709
Panel C: Upper white-collar employees			
	Sickness absence positive	Sickness absence > 15	Accident positive
Self-managed teams	-0.0413	0.0057	..
	(0.0436)	(0.0244)	
Information sharing	-0.0183	0.0021	
	(0.0297)	(0.0154)	
Training	0.0910***	-0.0131	
	(0.0350)	(0.0188)	
Incentive pay	-0.0209	-0.0126	
	(0.0364)	(0.0181)	
N	1251	1243	

Notes: Marginal effects reported. The control variables are listed in the Appendix (Table AI). Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table IV. The effect of foreign ownership on HPWS, sickness absence and accidents.

	HPWS	Sickness absence positive	Accident positive
Foreign firm	0.0887***	0.0198	0.0016
	(0.0264)	(0.0240)	(0.0087)
N	4291	4290	4291

Notes: Marginal effects reported. The control variables are listed in the Appendix (Table AI). Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table V. The effect of foreign ownership on different aspects of HPWS.

	Self-managed teams	Information sharing	Training	Incentive pay
Foreign firm	-0.0087	-0.0297	0.1028***	0.0633***
	(0.0137)	(0.0243)	(0.0243)	(0.0220)
N	4291	4291	4291	4291

Notes: Marginal effects reported. The control variables are listed in the Appendix (Table AI). Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table VI. The effect of HPWS on sickness absence and accidents from recursive models.

Panel A: All employees		
	Sickness absence positive	Accident positive
HPWS	0.0058 (0.3930)	-0.5873 (0.4413)
Panel B: Blue-collar employees		
	Sickness absence positive	Accident positive
HPWS	-0.4483 (0.5109)	-0.9024* (0.4708)
Panel C: Lower white-collar employees		
	Sickness absence positive	Accident positive
HPWS	0.1300 (0.5297)	-0.3718 (0.6888)
Panel D: Upper white-collar employees		
	Sickness absence positive	Accident positive
HPWS	0.3964 (0.6701)	..

Notes: Each entry of the table reports the key coefficient of interest from different specifications of the multivariate probit model. Only dependent variable 2 (Sickness absence positive, Accident positive) differs between the estimations. Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.

Table VII. The effect of different aspects of HPWS on sickness absence and accidents from recursive models.

Panel A: All employees		
	Sickness absence positive	Accident positive
Training	0.7948** (0.2943)	-0.6121* (0.3306)
Incentive pay	0.4091 (0.2797)	-0.1215 (0.6328)
Panel B: Blue-collar employees		
	Sickness absence positive	Accident positive
Training	-0.5506 (0.4381)	-0.3366 (0.4469)
Incentive pay	0.0455 (0.8641)	-0.9419** (0.4614)
Panel C: Lower white-collar employees		
	Sickness absence positive	Accident positive
Training	0.1718 (0.8759)	-1.7527 (1.2575)
Incentive pay	0.0233 (0.4683)	-0.5505 (0.4675)
Panel D: Upper white-collar employees		
	Sickness absence positive	Accident positive
Training	1.2481** (0.4696)	..
Incentive pay	-0.4519 (0.4778)	..

Notes: Each entry of the table reports the key coefficient of interest from different specifications of the multivariate probit model. Robust standard errors in parentheses : *** p<0.01, ** p<0.05, * p<0.1.

APPENDIX

Table AI. Definition of variables and descriptive statistics.

Variable	Mean (standard deviation)	Definition/measurement
Dependent variables		
Sickness absence		
Sickness absence positive	0.650 (0.477)	Person has been absent at least once from work due to illness during the past 12 months = 1, otherwise = 0
Sickness absence > 15	0.155 (0.362)	Person has been absent over 15 days from work due to illness during the past 12 months = 1, otherwise = 0
Accidents		
Accident positive	0.053 (0.224)	Person has had an accident at work during the past 12 months = 1, otherwise = 0
Independent variables		
Innovative work practices		
Self-managed teams	0.090 (0.287)	Person participates in teams that select their own foremen and decide on the internal division of responsibilities = 1, otherwise = 0
Information sharing	0.351 (0.477)	Employees are informed about the changes at work at the planning stage rather than shortly before the change or at the implementation = 1, otherwise = 0
Training	0.601 (0.490)	Employee has participated in training provided and paid for by the employer during the past 12 months = 1, otherwise = 0
Incentive pay	0.269 (0.443)	Person has performance-related pay and bonuses are based on employee's own effort = 1, otherwise = 0
HPWS	0.407 (0.491)	More than one of the aspects (self-managed teams, information sharing, training or incentive pay) is present = 1, otherwise = 0
Wage		
Wage (1st group)	0.085 (0.278)	Gross monthly wage (excluding overtime bonuses) =< 1300€ = 1, otherwise = 0 (reference)
Wage (2nd group)	0.414 (0.493)	1301€ =< monthly wage =< 2300€ = 1, otherwise = 0
Wage (3rd group)	0.310 (0.463)	2301€ =< monthly wage =< 3300€ = 1, otherwise = 0
Wage (4th group)	0.095 (0.294)	3301€ =< monthly wage =< 4000€ = 1, otherwise = 0
Wage (5th group)	0.097 (0.295)	Monthly wage >= 4001€ = 1, otherwise = 0
Working conditions		
Harm	0.252 (0.434)	At least one adverse factor that affects work 'very much' (includes heat, cold, vibration, draught, noise, smoke, gas and fumes, humidity, inadequate air conditioning, dust, dirtiness of work environment, poor or glaring lighting, irritating or corrosive substances, restless work environment, repetitive, monotonous movements, difficult or uncomfortable working positions, time pressure and tight time schedules, heavy lifting, lack of space, mildew in buildings) = 1, otherwise = 0
Hazard	0.380 (0.486)	At least one factor is experienced as 'a distinct hazard' (includes accident risk, becoming subject to physical violence, hazards caused by chemical substances, hazard of infectious

		diseases, hazard of skin diseases, risk of strain injuries, risk of succumbing to mental disturbance, risk of grave work exhaustion, risk of causing serious injury to others, risk of causing serious damage to valuable equipment or product) = 1, otherwise = 0
Uncertainty	0.685 (0.465)	Work carries at least one insecurity factor (includes transfer to other duties, threat of temporary dismissal, threat of permanent dismissal, threat of unemployment, threat of becoming incapable of work, unforeseen changes, threat of increase in workload) = 1, otherwise = 0
Discrimination	0.377 (0.485)	Person has fallen subject to at least one type of unequal treatment or discrimination in current workplace (includes time of hiring, remuneration, gain of respect, career advancement opportunities, allocation of work shifts, access to training provided by employer, receiving information, access to work-related benefits, attitudes of co-workers or superiors) = 1, otherwise = 0
Heavy physically	0.042 (0.200)	Current tasks physically 'very demanding' = 1, otherwise = 0
Working time		
Temporary	0.122 (0.327)	Fixed-term employment relationship = 1, otherwise = 0
Part-timer	0.107 (0.309)	Part-time work = 1, otherwise = 0
Human capital variables		
Female	0.543 (0.498)	1 = female, 0 = male
Age <=24	0.082 (0.274)	Age <= 24 = 1, otherwise = 0
Age 25-34	0.213 (0.410)	Age 25-34 = 1, otherwise = 0
Age 35-44	0.253 (0.435)	Age 35-44 = 1, otherwise = 0 (reference)
Age 45-54	0.268 (0.443)	Age 45-54 = 1, otherwise = 0
Age 55-64	0.184 (0.387)	Age 55-64 = 1, otherwise = 0
Married	0.731 (0.444)	Married = 1, otherwise = 0
Children	0.837 (1.134)	The number of children under 18 living at home
Comprehensive	0.141 (0.348)	Comprehensive education = 1, otherwise = 0 (reference)
Secondary education	0.447 (0.497)	Upper secondary or vocational education = 1, otherwise = 0
Polytechnic education	0.290 (0.454)	Polytechnic or lower university degree = 1, otherwise = 0
University education	0.122 (0.328)	Higher university degree = 1, otherwise = 0
Humanities	0.070 (0.255)	Field of education is humanities or teachers' education = 1, otherwise = 0
Business	0.171 (0.377)	Field of education is business, law or social science = 1, otherwise = 0
Technical	0.275 (0.447)	Field of education is technical, natural science or computer science = 1, otherwise = 0
Health care	0.133 (0.339)	Field of education is health care, social work, etc. = 1, otherwise = 0
Blue-collar employee	0.305 (0.461)	Blue-collar employee (hourly waged worker who is most likely low-skilled, without a post-secondary education; includes non-managerial, non-supervisory workers from agriculture, manufacturing and services) =1, otherwise = 0 (reference)
Lower white-collar employee	0.400 (0.490)	Salaried lower white-collar employee (clerical employee) =1, otherwise = 0
Upper white-collar employee	0.290 (0.454)	Salaried upper white-collar employee (supervisor or manager) =1, otherwise = 0
Tenure 0-2	0.337 (0.473)	Number of years at the current firm 0-2, otherwise 0 (reference)
Tenure 3-12	0.340 (0.474)	Number of years at the current firm 3-12, otherwise 0

Tenure 13-27	0.234 (0.424)	Number of years at the current firm 13-27, otherwise 0
Tenure > 27	0.089 (0.284)	Number of years at the current firm over 27 years, otherwise 0
Self-assessed health		
Working capacity	8.500 (1.385)	Self-assessment of working capacity. The variable is scaled from 0 (total inability to work) to 10 (top condition)
Employer characteristics		
Public sector	0.346 (0.476)	Employer is state or municipality = 1, otherwise = 0
Foreign firm	0.130 (0.335)	Employer is private, foreign-owned enterprise = 1, otherwise = 0
Plant size <10	0.238 (0.426)	Size of plant under 10 employees = 1, otherwise = 0 (reference)
Plant size 10-49	0.399 (0.490)	Size of plant 10-49 employees = 1, otherwise = 0
Plant size 50-249	0.227 (0.419)	Size of plant 50-249 employees = 1, otherwise = 0
Plant size 250-999	0.095 (0.293)	Size of plant 250-999 employees = 1, otherwise = 0
Plant size > 1000	0.042 (0.201)	Size of plant over 1000 employees = 1, otherwise = 0
Indicators for industries and occupations		
Industries		14 dummies based on Standard Industry Classification
Regions		6 dummies based on the classification of NUTS2 regions by SF

Table AII. The estimates for the controls.

	Sickness absence positive
HPWS	0.0415**
	(0.0163)
Wage (2nd group)	0.0510
	(0.0333)
Wage (3rd group)	0.0276
	(0.0373)
Wage (4th group)	0.0136
	(0.0444)
Wage (5th group)	-0.0187
	(0.0497)
Harm	0.0467**
	(0.0188)
Hazard	0.0423**
	(0.0172)
Uncertainty	0.0249
	(0.0171)
Discrimination	0.0360**
	(0.0161)
Heavy physically	0.0762**
	(0.0367)
Temporary	-0.0768***
	(0.0276)
Part-timer	-0.0458
	(0.0304)
Female	0.0532***
	(0.0198)
Age <=24	0.0315
	(0.0348)
Age 25-34	0.0544**
	(0.0235)
Age 45-54	-0.157***
	(0.0233)
Age 55-64	-0.242***
	(0.0291)
Married	0.0351*
	(0.0183)
Children	-0.00926
	(0.00783)
Secondary education	-0.0308
	(0.0268)
Polytechnic education	-0.0752**
	(0.0354)
University education	-0.0758*
	(0.0455)
Humanities	0.0511

	(0.0370)
Business	0.00396
	(0.0279)
Technical	0.0288
	(0.0240)
Health care	0.0345
	(0.0320)
Lower white-collar employee	0.0213
	(0.0233)
Upper white-collar employee	0.0440
	(0.0280)
Tenure 3-12	0.0228
	(0.0202)
Tenure 13-27	-0.0130
	(0.0247)
Tenure > 27	0.0353
	(0.0326)
Working capacity	-0.0583***
	(0.00640)
Public sector	0.0249
	(0.0250)
Foreign firm	0.0162
	(0.0241)
Plant size 10-49	0.0609***
	(0.0193)
Plant size 50-249	0.0891***
	(0.0215)
Plant size 250-999	0.134***
	(0.0262)
Plant size > 1000	0.0948***
	(0.0364)
N	4290

Notes: The table reports the estimates for all included explanatory variables (excluding the indicators for industries and regions) from the first model in Panel A of Table I. Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1.