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Interaction of Job Disamenities, Job Satisfaction, and Sickness Absences: Evidence From a Representative Sample of Finnish Workers*

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TIIVISTELMÄ

Tutkimuksessa tarkastellaan epämukavien työolojen vaikutusta sairauspoissaoloihin. Aineistona käytetään Tilastokeskuksen työolotutkimusta, joka on edustava otos suomalaisista palkansaajista. Ko. aineistossa on runsaasti työpaikan epämukavuuksia kuvaavia muuttujia. Tulosten mukaan epämukavat työolot lisäävät selvästi sairauspoissaoloja. Sairauspoissaolot ovat myös vähäisempiä korkean työttömyyden alueilla. Useamman yhtälön mallit paljastavat sen, että epämukavuudet aiheuttavat työtyytymättömyyttä, joka puolestaan lisää sairauspoissaoloja.

ABSTRACT

This paper explores the potential role of adverse working conditions in the determination of workers' sickness absences. Our data contain detailed information on the prevalence of job disamenities at the workplace from a representative sample of Finnish workers. The results from reduced-form models reveal that workers facing adverse working conditions tend to have a greater number of sickness absences. In addition, reduced-form models clearly show that regional labour market conditions are an important determinant of sickness absences. Hence, sickness absences are more common in regions of low unemployment. Recursive models suggest that the prevalence of harms at the workplace is associated with job dissatisfaction and dissatisfaction with workers' sickness absences.

INTRODUCTION

The average proportion of the EU workforce that misses work owing to illness or injury is 14.5% according to the European Survey on Working Conditions (Gimeno *et al.*, 2004). However, this average figure hides a large cross-country variation in absenteeism. The sickness absence rates are lower in Southern European countries compared with Central and Northern European countries;[1] the rates vary from a low of

6.7% in Greece to a high of 24% in Finland.[2] Sickness absences have occupied a central position in the Swedish labour market debate for many years (e.g. Holmlund, 2004). Swedish research has discovered that the level of unemployment is a matter of importance for the prevalence of sickness absences, among other things. In particular, the number of sickness absences tends to increase as there is a decrease in unemployment. Holmlund (2006) points out that pro-cyclical absenteeism reinforces the negative employment effects of adverse shocks to labour demand and it symmetrically reinforces the positive employment effects of favourable shocks. A similar cyclical pattern has been discovered in a number of other countries (e.g. Arai and Thoursie, 2005; Askildsen *et al.*, 2005; Boone and Van Ours, 2006).

Given that Finland has the highest share of employees that miss work because of illness or injury in the European Survey on Working Conditions, it is of interest to examine the determinants of absenteeism there. The debate about the ways to reduce the number of sickness absences has recently arrived in Finland. The number of sickness absences has increased in Finland since the end of the great depression of the early 1990s,[3] but the reasons for this are largely unknown. According to other data, sickness absences as a share of the standard annual working time is still much lower in Finland than in Norway or in Sweden, but higher than in Denmark or in Iceland (Nyman *et al.*, 2002) (Figure 1). In particular, Holmlund (2004) points out that Norway and Sweden have experienced quite substantial changes in the number of sickness absences over the past 15 years. In contrast, the number of sickness absences relative to total working time has been more stable in Finland compared with Sweden. Accordingly, structural factors (including adverse working conditions) are likely to account for much of the total number of sickness absences in Finland.

Figure 1 around here

Sickness absences constitute a substantial loss of actual working time. The latest report on the time use of the private sector workers by the Confederation of Finnish Industries (2006) reveals that Finnish workers spent, on average, eleven days on sickness absences in the year 2005. This figure is around six per cent of the standard annual working time. Sickness absences impose substantial costs on both firms and co-workers, because they require often reorganisation at the workplace in order to facilitate the firm's daily

operations. Indeed, the Confederation of Finnish Industries (2006) has estimated that the total cost of sickness absences is almost 2 billion Euros annually in the private sector alone. In particular, a reduction in the number of sickness absences would provide a considerable increase in the effective labour supply, which will shrink owing to the rapid ageing of the population. Hence, it would help to ease the problems associated with the shortage of labour that are in sight.

There are a number of medical studies that have analysed the factors that have an influence on the prevalence of sickness absences.[4] They typically focus on a rather limited number of risk factors at a time as determinants of sickness absences, and the potential connection between job satisfaction and sickness absences has not been analysed in detail. Further, they almost exclusively (at least among the Finnish studies) use data from very specific sectors of the labour market, like the municipal sector. This makes it rather hard to generalize the results obtained. Importantly, the factors that have a great deal to do with sickness absences are not necessarily the same in the municipal sector vs. the private sector. In particular, the contribution played by job disamenities has sometimes been investigated in an environment that contains a lot of stress factors (for instance, using data from hospitals). This can give them an extravagant role in the overall determination of sickness absences from the perspective of the economy taken as a whole. In this paper, we use data that constitute a representative sample of workers, instead. In addition, employer characteristics (such as plant size) are not usually included among explanatory variables for sickness absences and recursive models for the determination of job satisfaction and sickness absences that are able to reveal interactions between the key variables of interest have not been estimated. For these reasons, there is room for additional empirical studies on this important issue.

Workers' subjective perceptions regarding the prevalence of various job disamenities represent a factor of great importance in the determination of sickness absences. There is earlier international evidence that job dissatisfaction increases the number of sickness absences (e.g. Clegg, 1983; Brown and Sessions, 1996). Accordingly, it is not unreasonable to assume that an unpleasant working environment stimulates the level of workers' dissatisfaction. From the point of view of practical implications, it is important to keep in mind that management always has some influence on the level of job

satisfaction and control over the working environment. This means that employers can, at least in principle, have an influence on the number of sickness absences.

We use Finnish data to analyse workers' sickness absences. Finland has a relatively centralized wage bargaining system, which sets a floor to firm-level pay determination. Although firms can pay their employees more than what the centralized agreement stipulates, the system still leads to wage compression. This may prevent the creation of wage differentials that would compensate for the existence of job disamenities. Accordingly, our earlier empirical evidence points out that perceived working conditions have a very minor role in the determination of individual wages (Böckerman and Ilmakunnas, 2006). In contrast, adverse working conditions substantially increase the level of job dissatisfaction and the perception of unfairness of pay. It is interesting to study whether this dissatisfaction increases the number of sickness absences. Our paper differs from the earlier ones in this field of research, because we have a data set, the Quality of Work Life Survey, that makes it possible to model the relationships between working conditions, satisfaction, and sickness absences.

In this paper, we discover, based on reduced-form models, that workers facing adverse working conditions tend to have a greater number of sickness absences. In addition, regional labour market conditions are an important determinant of sickness absences; the absences are more common in regions of low unemployment. Recursive models suggest that the prevalence of harms at the workplace is associated with job dissatisfaction and dissatisfaction, in turn, is associated with sickness absences.

The paper proceeds as follows. In the next section we describe our modelling approaches and then we provide an overview of the data and variables. The last two sections report the results and conclude the paper.

MODELLING APPROACHES

From the theoretical perspective, Allen (1981) develops an economic model for the determination of the equilibrium number of absences that underlines absences as the outcome of the worker's labour-leisure choice, subject to constraints imposed by the employer. Before Allen (1981), absences were often seen as an indication of employees'

low morale or unqualified management. The basic idea of Allen's theoretical reasoning is that if the contracted working time is greater than the number of the desired hours of work, employees have an incentive to miss work. This situation may arise for some employees, because information in the labour market is not perfect and searching is always costly. Absenteeism is, therefore, viewed as a way to adjust the personal labour supply. In particular, a worker is absent whenever the benefits of not working are greater than the costs. These costs include the potential wage penalties for being absent.

From the perspective of our paper, it is important to point out that the prevalence of adverse working conditions (with the increased likelihood of work-related injuries and diseases) directly decreases employees' total utility from work, making absence more likely, other things being equal. In particular, this is likely to happen when wage does not compensate for the existence of job disamenities. Taken together, Allen's (1981) model gives a clear empirical prediction that the number of sickness absences declines as there is an increase in the wage level, and their number increases while work is being done in adverse working conditions, other things being equal.

In our first set of models, we explain the alternative indicators of sickness absences directly by individual characteristics, firm characteristics, and working conditions. In the second, extended model, we use working conditions, job dissatisfaction, and absenteeism as binary indicators. We explain adverse working conditions by various industry, occupation, and firm variables. This follows the view, familiar from the compensating wage differentials literature, that working conditions may be endogenous (e.g. Daniel and Sofer, 1998). Job dissatisfaction is then explained by these working conditions and the employees' personal characteristics. Finally, sickness absenteeism is explained by job dissatisfaction and some other personal characteristics. This model forms a system of probit models that have endogenous dummy explanatory variables. Since the system is recursive, it can be estimated as a multivariate probit model. This approach is similar to that used by Shields and Price (2002) in the context of workers' intentions to quit. They used only one indicator of working conditions, racial harassment.

Explaining workers' sickness absences by means of job disamenities

We start the analysis with reduced-form models, where we explain the indicators of workers' sickness absences directly by means of adverse working conditions. As explanatory variables we have dummy variables that describe various aspects of job disamenities and various individual and workplace characteristics. Since the number of sickness absences during the past six months is a discrete variable and has a skewed distribution, we start by estimating a Poisson regression as our baseline specification. To relax the assumption of equal mean and variance required in the use of the Poisson model, we also estimate negative binomial models. To check the robustness of our results from the baseline specification further, we estimate the zero-inflated (or zero-altered) Poisson regression model for the number of absences and probit models for reporting a positive number of sickness absences.[5]

In addition to the individual employees' characteristics, we also include, among the explanatory variables, various characteristics of the workplace, such as indicators of high performance work practices (team work), plant size, industry, and the regional unemployment rate. The variables are described in more detail in the data section.

Interaction of disamenities, dissatisfaction and sickness absences

The second model is formed in three steps. In the first step we explain K separate latent disamenities z_j^* by variables X_1. The latent disamenities z_j^* and their discrete observation rule are

$$z_{ji}^* = X_{1i}\beta_{1j} + \varepsilon_{1ji}, \ j=1,\ldots,K$$
$$z_{ji} = \mathbf{1}(z_{ji}^*>0)$$

where $\mathbf{1}(.)$ is an indicator function and $i=1,\ldots,N$ indexes the individuals. In the second stage, latent dissatisfaction d^* is explained by the realized disamenities z and variables X_2:

$$d_i^* = \Sigma_j\gamma_j z_{ji} + X_{2i}\beta_2 + \varepsilon_{2i}$$
$$d_i = \mathbf{1}(d_i^*>0)$$

In the final stage, latent sickness absenteeism q* is explained by realized job dissatisfaction d and variables X_3:

$$q_i^* = \delta d_i + X_{3i}\beta_3 + \varepsilon_{3i}$$
$$q_i = \mathbf{1}(q_i^* > 0)$$

It is assumed that in all stages there are unobserved individual characteristics and, therefore, the error terms of the different stages are correlated. The unobserved individual characteristics can, for example, be attitudinal factors. The K+2 equations form a system of discrete dependent variable models with endogenous dummy explanatory variables. However, the system is recursive, i.e. sickness absences do not explain satisfaction and disamenities, and satisfaction does not explain disamenities. Hence, it is possible to estimate the model as a multivariate probit model (see Greene, 2003). We use the Geweke-Hajivassiliou-Keane (GHK) simulated maximum likelihood estimator implemented to Stata by Cappelari and Jenkins (2003).

No exclusion restrictions are needed for the identification of the model (Wilde, 2000), but it may still be a good practice to include them.[6] We therefore assume that the variables X_1, X_2, and X_3 are not the same. In X_1 we include occupation and industry dummies that do not appear in the other equations, and some characteristics of the workplace, like plant size. In X_2 we include personal characteristics, like the level and field of education. Finally, X_3 comprises variables that are related to the individual. In addition, X_3 includes regional unemployment that has been found to be a matter of importance for sickness absences (Holmlund, 2004), but there is no particular reason to assume that it would matter for job satisfaction or job disamenities.

DATA

The data set that we are using in this paper is the Quality of Work Life Survey (QWLS) of Statistics Finland (SF). It is conducted at irregular intervals. We use the data from the year 1997. QWLS provides a representative sample of Finnish wage and salary earners, because the initial sample for QWLS is derived from a monthly Labour Force Survey (LFS) of SF, where a random sample of the working age population is selected for a telephone interview. The 1997 QWLS was based on LFS respondents in September and

October who were 15-64-old wage and salary earners with a normal weekly working time of at least five hours. 3795 individuals were selected for the QWLS sample and invited to participate in a personal face-to-face interview. Out of this sample, 2978 persons, or around 78%, participated (Lehto and Sutela, 1999). Owing to missing information on some variables for some workers, the sample size used in this study is around 2800 observations.

The QWLS survey contains a number of questions about the subjective views of workers with respect to their working conditions, as well as about the perceived job satisfaction. In addition, QWLS includes information on the respondents' personal characteristics and work experience. SF supplements QWLS with information from the LFS on, for example, working time and exact labour market status. Supplementary information on the industry and location of the employer as well as annual earnings and the level and field of education of the respondents was gathered from various registers maintained by SF. The variables that we are using are described in Appendix (Table A1), and Appendix (Table A2) reports descriptive statistics.

The phenomenon that we are interested in explaining is workers' sickness absenteeism. Sickness absences are documented in the QWLS data as absences because of illness (number of times during the past six months). Sickness absences are self-reported, but there is no particular reason to believe that employees give systematically biased answers to this particular question, because their identity is not known to their employers. A major advantage of information recorded in the QWLS data is that it also contains short sickness absences that are not recorded by the Social Insurance Institution (KELA), which pays out sickness benefits to the affected employees.[7] The reason for this is that short sickness absences do not entitle employees to payment of sickness benefits, but they obtain normal pay from the employers. This is important, because most of the sickness absences are presumably short. However, the QWLS data do not contain information about the duration of individual sickness spells.[8]

The distribution for the number of sickness absences during the past six months is shown in Figure 2. Around 40% of all workers in the QWLS report a positive number of sickness absences for the period of the past six months. An overwhelming majority of those who have been absent owing to illness have been absent only once. After that

there is a steep decline, as expected. At first glance, the Poisson distribution seems to approximate the distribution of our dependent variable quite closely. In addition, we form a dummy variable for those that have been absent at least once, which is used with probit models.

Figure 2 around here

Job dissatisfaction in the QWLS data is measured by the five-point Likert scale: 1 (very satisfied; 30.6 per cent of respondents), 2 (quite satisfied; 63.1 per cent), 3 (rather dissatisfied; 5.3 per cent), and 4 (very dissatisfied; 1 per cent). We form a dissatisfaction dummy (*Unsatisfied*) that indicates the two highest dissatisfaction categories 3 and 4 (6.3 per cent of respondents).

The subjective valuations of harms and hazards related to working conditions are measured in the QWLS survey by the use of different categories. Our most important variables for job disamenities describe the prevalence of harms and hazards at the workplace. For perceived harms, there is a five-point Likert scale in which the highest category corresponds to the perception by a worker that a feature of working conditions is 'very much' an adverse factor. For perceived hazards, the highest category among the three possibilities is the one in which the respondent considers a feature at the workplace as 'a distinct hazard'. Responses to the questions about adverse working conditions can be aggregated by forming a dummy variable that equals one if there is at least one clearly adverse factor (*Harm*) and a dummy that equals one if there is at least one distinct hazard (*Hazard*). These variables capture different aspects of the workplace.

We use the following dummy variables as other job disamenities. *Uncertainty* tells us that there is at least one clear insecurity factor at the workplace, *No voice* is a dummy for those that have no control over their work, *Neglect* is a dummy for the existence of at least one aspect where the worker gets no support from superiors; *Atmosphere* tells us that the worker experiences at least one negative aspect in the work atmosphere almost daily; and *Conflicts* is a dummy for experiencing conflicts at the workplace. Additionally, we have dummy variables for physically or mentally very demanding work (*Heavy physically* and *Heavy mentally*, respectively).

Our main interest is in the effect of job disamenities, but we include a large set of control variables, which can be regarded as 'the usual suspects' based on the literature (e.g. Brown and Sessions, 1996; Holmlund, 2004). The logarithm of hourly earnings is classified into quantiles to form wage group indicators (*Wage* with four groups). We include dummy variables for night work (*Night work*), shift work (*Shift work*), temporary contract (*Temporary*), part-time work (*Part-timer*), and for working a high share of time in team work (*Team work*). We incorporate typical human capital variables that are dummies for females (*Female*), age (*Age* with five groups), marital status (*Single*), working spouse (*Spouse working*), the level of education (*Secondary education*, *Polytechnic education*, and *University education*) and the field of education (*Humanities*, *Business*, *Technical*, *Health care*), union membership (*Union member*) and managerial tasks (*Manager*). In addition, we include a work history variable (*Tenure*, with three groups by length). There is also some information available on the health of the worker, self-assessment of work capacity (*Working capacity*, on a scale of 0 to 10). Information on the employer includes dummies for the public sector and foreign private owners (*Public sector*, *Foreign firm*), employer size (*Plant size* with four categories), and dummies for growing employment (*Growing employment*), unstable financial situation (*Unstable firm*) and high share of female employees (*Female share*). Finally, we incorporate the *Regional unemployment* rate for capturing the regional variation, industry dummies (14 industries) and dummies for 10 occupations.[9]

RESULTS

Results from reduced-form models

The results from our baseline specification that is based on Poisson regression reveal that job disamenities are, beyond doubt, important determinants of sickness absences. In particular, experiencing at least one notable harm or hazard or experiencing uncertainty clearly increases the number of sickness absences (Table 2, Columns 1-2). In addition, experiencing conflicts at the workplace positively contributes to the number of sickness absences. In contrast, Broström *et al.* (2004) report that the effect of adverse working conditions on sickness absences is, for the most part, mixed in Sweden, although there is evidence that some indicators of adverse working conditions increase sickness

absences. The fact that experiencing uncertainty increases the prevalence of sickness absences is in line with the earlier Finnish studies that, by using longitudinal data on municipal employees, have documented that organisational downsizing positively contributes to sickness absences (Kivimäki *et al.,* 2000). It is interesting to note that physically strenuous work (captured by our *Heavy physically* variable) does not increase the number of sickness absences. This confirms that psychological factors play an important role in the determination of sickness absences.

Table 1 around here

We summarize the most interesting results regarding the control variables (Table 1, Columns 1-2). The frequency of sickness absences clearly decreases with age. Singles are less often absent. There is some evidence that employees with polytechnic education are less often absent owing to sickness compared with employees with only comprehensive education. In contrast, employees whose education field is health care or social work are more often absent. This emerges to be most likely because those particular jobs contain particular stress factors. Bonato and Lusinyan (2004) observe that permanent workers are more often on sickness absences, but this is not the case in Finland according to our estimation results. On the other hand, Virtanen *et al.* (2001) provide earlier evidence that contingent employees have lower levels of sickness absences compared with permanent employees, by using data from 10 Finnish hospitals. Their result seems to be specific to that very particular labour market, but it does not prevail when using a representative sample of Finnish workers.[10] Heywood and Jirjahn (2004) argue that absences should be lower in team work, because they cause more problems for co-workers. This pattern does not hold in our data. However, there is some evidence that managers are less often absent, which arises most likely because it is more difficult to replace their work contribution. Workers that have been over ten years in the same firm (for a given age) are more often on sickness absences. It is not surprising that high self-assessed working capacity reduces absences.[11] Broström *et al.* (2004) have reported exactly the same result for Sweden.

Taken together, the employer characteristics included (beyond the unreported industry dummies and a positive coefficient for the plant size category 50-499) are largely not statistically significant. This is in sharp contrast to findings by Arai and Thoursie (2004)

for Sweden, because they report substantial employer effects. Bonato and Lusinyan (2004) argue that sickness absences tend to be more common in the public sector in Europe, which accounts for some of the differences in the number of sickness absences across countries. Our *Public sector* variable is not significant, but the variable for education in the field of health care obtains a significantly positive coefficient. Since most health care workers are in the public sector, this supports the view that absenteeism is high at least in some public sector activities. It is interesting to note that sickness absences are not concentrated in the smallest plants, where there are perhaps fewer financial opportunities to improve the working environment.

As expected, sickness absences are clearly less common in the regions with high unemployment. The macroeconomic correlation between unemployment and sickness absences has been found in other empirical studies from the Nordic countries (e.g. Holmlund, 2004). In Finland, unemployment is at a substantially higher level in the eastern and northern parts of the country. Therefore, sickness absences are more common in Southern Finland. Virtanen *et al.* (2005) have earlier reported that high local unemployment decreases the level of short-term sickness absences among public sector workers in Finland. There are two explanations for this finding (e.g. Askildsen *et al.,* 2005). High unemployment may discipline workers and there may be compositional effects over the business cycle. The latter refers to a situation in which marginal workers (for instance, workers with poor health) that are more prone to be absent from work are hired during economic upswings. Because labour market regulations that have an influence on sickness absences are similar in all regions, the regional variation in sickness absences most likely reflects the discipline effect of unemployment. The unreported indicators for industries reveal that sickness absences are more frequent in manufacturing than in other sectors. This pattern is in line with that reported by the Confederation of Finnish Industries (2006, p. 8).

The results that stem from the negative binomial model (Table 1, Column 2) are very similar to those from Poisson regression. In addition, we estimated the zero-inflated (or zero-altered) Poisson regression model in order to account for the prevalence of zero counts in the dependent variable (Cameron and Trivedi, 1998). The results regarding the effects of harms and hazards remain the same. (The results not reported in the tables.)

The probit model for reporting a positive number of sickness absences reveals some interesting additional patterns (Table 1, Column 3). To make it easier to read the results from the probit models, they are reported as marginal effects. Experiencing at least one notable hazard or experiencing uncertainty clearly increases the likelihood of reporting a positive number of sickness absences. However, *Harm* is no longer significant. The estimated marginal effects are quite large. To illustrate this, according to the point estimates, those who have at least one clear hazard at the workplace have a 7 per cent higher probability of reporting a positive number of sickness absences.

The control variables included show that employees who are located in the second or the third highest wage category are more likely to have sickness absences than employees located in the lowest wage category, other things being equal. This observation is in conflict with the theory that predicts that the number of (sickness) absences should decline as there is an increase in the wage level (e.g. Allen, 1981; Brown and Sessions, 1996). In particular, the non-monotonic effect of wage on the existence of sickness absences means that it is more difficult for firms to decrease absences by increasing the employees' wage level than by reducing job disamenities. Females are more likely to report a positive number of sickness absences. The magnitude of the estimated marginal effect is substantial, because females are around 7% more likely to report a positive number of sickness absences compared with males. Indeed, Holmlund (2004) notes that it has become a stylized fact of the literature that women have higher sickness absence rates than males.[12] In addition, the age effect appears to be large. Hence, employees that are under 24 years are 14% more likely to report a positive number of sickness absences compared with employees aged 35-44. It is quite possible that older employees have longer sickness absence spells in contrast to the more frequent sickness absences among younger workers.[13] It is less likely that union members report a positive number of sickness absences. In addition, there is some evidence that part-timers are less likely to have sickness absences. One reason for this is that full-time workers may constitute the firm insiders that are not afraid of losing their jobs because of spending time on sickness absences.

Among the other variables, the impact of marital status, health care education, tenure, working capacity, plant size and regional unemployment have significant effects with the same signs as in the Poisson model.[14] Overall, the results regarding the control

variables vary somewhat across the models. However, the influence of adverse working conditions and regional labour market conditions on the prevalence of sickness absences is more consistent across the models than the impact of specific worker or firm characteristics.[15]

Results from recursive models

The estimation of reduced-form models with job satisfaction as one of the explanatory variables for sickness absences reveals that the level of job (dis)satisfaction (*Unsatisfied*) does not directly contribute to the number of absences during the past six months. (The results are not reported.)[16] This provides one motivation to use recursive models. The idea in the recursive structure is that firm characteristics and occupation determine the disamenities, that disamenities together with personal characteristics and wage determine job dissatisfaction, and that dissatisfaction together with personal characteristics, health, and regional unemployment determine absenteeism. As disamenities, we focus on the *Harm*, *Hazard*, and *Uncertainty* variables, because they had the most significant effect on sickness absences based on reduced-form models (Table 1, Columns 1-3). The explanatory variables for each disamenity (*Harm*, *Hazard*, or *Uncertainty*) are *Public sector*, *Foreign firm*, *Plant size*, *Unstable firm*, industry dummies and occupation dummies. The variables in the equation for job dissatisfaction are the three disamenities, *Wage* categories, *Temporary*, *Part-timer, Female*, *Age* categories, the indicators for the level and field of education, *Manager* and *Tenure* categories. Finally, having a positive number of sickness absences is explained by *Unsatisfied*, *Temporary*, *Part-timer, Female*, *age* categories, the indicators for the level and field of education, *Tenure* categories, *Working capacity* and *Regional unemployment*.

The results are summarised in Table 2. We estimate the recursive model by including equations for all three job disamenity variables at the same time. Hence, the recursive model contains five equations (i.e. K=3 in the equations above). The first column of the table reports the coefficient of *Unsatisfied* from the equation for sickness absences and the second column reports the coefficients of job disamenities from the equation for job dissatisfaction. We report only the main coefficients of interest. (The coefficients of other explanatory variables included are not reported in the table in order to save space.)

Note that the figures in the table are the estimated coefficients, not the marginal effects, which would vary between different combinations of outcomes. For the binary dependent variables, the recursive models reveal that the prevalence of harms at the workplace is associated with workers' level of job dissatisfaction (Table 2, Column 2) and dissatisfaction, in turn, is associated with having sickness absences (Table 3, Column 1).[17] There are statistically significant correlations between the error terms of the equations. The correlations arise from the prevalence of unobserved individual characteristics such as attitudinal factors that are not included among the explanatory variables. Hence, the investigation of interaction between job disamenities, job satisfaction and sickness absences requires the use of recursive models that are able to take into account these correlations.[18]

Table 2 around here

CONCLUSIONS

We have explored the potential role of adverse working conditions at the workplace in the determination of workers' sickness absences. Our paper differs from the earlier ones in this field of research, because we have a data set, the Finnish Quality of Work Life Survey, that makes it possible to model the relationships between working conditions, satisfaction, and sickness absences. The QWLS data contain a wide range of risk factors. In addition, it constitutes a representative sample of workers. Based on our results, this is important, because some of the earlier findings (e.g. that permanent workers are more often on sickness absences) do not prevail when one is using a representative sample instead of focusing on some very specific sectors of the labour market.

The results from reduced-form models in which sickness absences are explained directly by means of job disamenities reveal that workers facing adverse working conditions tend to have a higher number of sickness absences. In particular, the non-monotonic effect of wage on sickness absences means that it is more difficult for firms to decrease absences by increasing the workers' wage level than by reducing the prevalence of job disamenities. In addition, reduced-form models clearly show that regional labour market conditions are an important determinant of sickness absences.

Hence, sickness absences are more common in regions of low unemployment. The regional variation in sickness absences most likely reflects the discipline effect of unemployment.

Accordingly, our results suggest that the decline in aggregate unemployment in the late 1990s may explain part of the increase in the prevalence of sickness absences in Finland after the great depression of the early 1990s. In addition, the overall worsening of working conditions could explain some proportion of the increase in sickness absences. Siltala (2004), among others, has claimed that there has been an incessant deterioration of working conditions in Finland. However, the empirical evidence on the overall worsening of working conditions during the 1990s is, for the most part, mixed (e.g. Lehto and Sutela, 2004). Hence, some aspects of working conditions have worsened, while others have improved. For this reason, it is difficult to say what part the changes in working conditions may have played in the increase of sickness absences over time.

Our most important finding that stems from the recursive models is that the prevalence of harms at the workplace is related with the workers' level of job dissatisfaction and dissatisfaction with having sickness absences. Taken together, the results from a representative sample of workers clearly demonstrate that the improvement of working conditions must be an integral part of any policy scheme that is aimed at decreasing the number of sickness absences in the coming era of labour shortage caused by the rapid ageing of the population.

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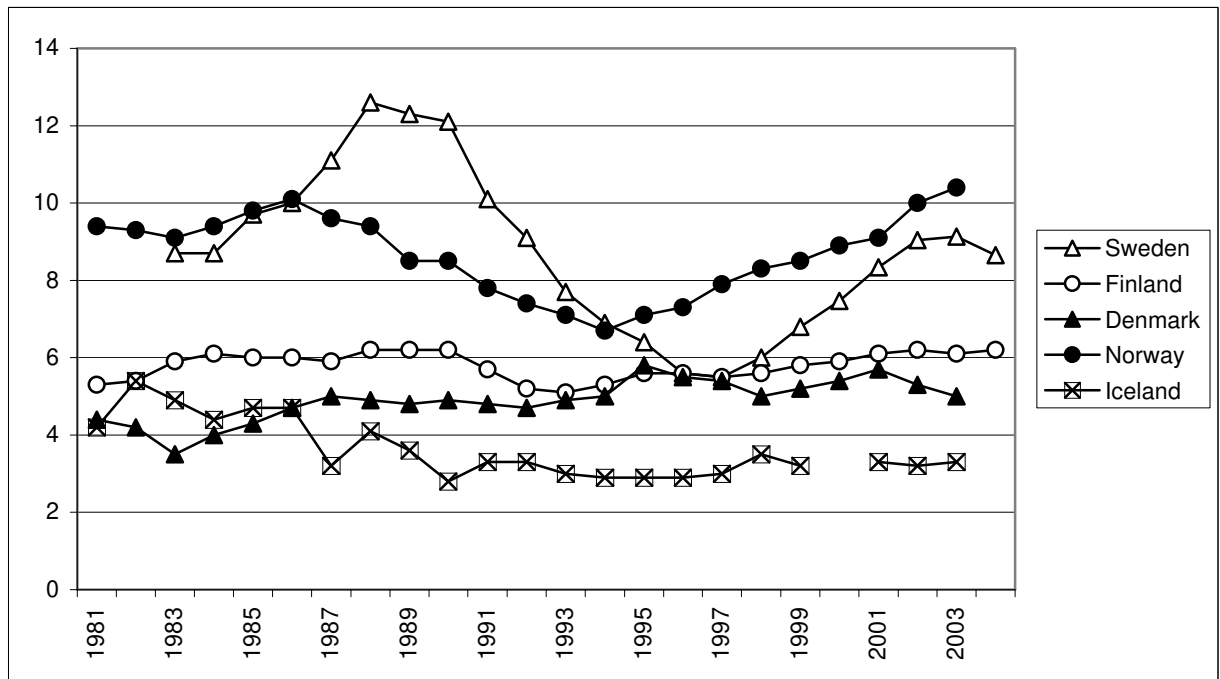
Appendix:

Table A1. Definition of variables.

Variable	Definition/measurement
Sickness absences:	
Number of absences	The number of times person has been absent from work due to illness during the past six months (Figure 2)
Positive number of absences	Positive number of absences = 1, otherwise = 0
Job satisfaction:	
Unsatisfied	Job dissatisfaction is measured by means of alternatives 1 (very satisfied), 2 (quite satisfied), 3 (rather dissatisfied), and 4 (very dissatisfied). The Unsatisfied variable gets value one for the two highest dissatisfaction categories 3 and 4, otherwise = 0
Adverse working conditions:	
Harm	At least one adverse factor that affects work 'very much' (includes heat, cold, vibration, draught, noise, smoke, gas and fumes, humidity, dry indoor air, 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	At least one factor is experienced as 'a distinct hazard' (includes accident risk, becoming subject to physical violence, hazards caused by chemical substances, radiation hazard, major catastrophe hazard, hazard of infectious diseases, hazard of skin diseases, cancer risk, 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	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) = 1, otherwise = 0
No voice	'Not at all' able to influence at least one factor in work (includes contents of tasks, order in which tasks are done, pace of work, working methods, division of tasks between employees, choice of working partners, equipment purchases) = 1, otherwise = 0
Neglect	At least one supportive factor 'never' experienced in work (includes advice or help, support and encouragement from superiors, support and encouragement from co-workers, feel of being a valued member of work community, opportunity to plan work, opportunity to apply own ideas in work, feel of own work as productive and useful) = 1, otherwise = 0
Atmosphere	Experiences at least one negative aspect of work atmosphere 'daily or almost daily' or positive aspect 'never' (includes negative aspects conflicts or argument with someone else in work community or with a customer, being subject or threatened by physical violence, use of unfriendly words or gestures by co-workers or superiors, and positive aspects praise for work from co-workers or customers, opportunities for learning new things and developing in one's occupation) = 1, otherwise = 0
Conflicts	At least one type of conflict appears in work unit 'a lot' (includes competitive spirit, conflicts between superiors and subordinates, conflicts between employees, conflicts between employee groups) = 1, otherwise = 0
Heavy physically	Current tasks physically 'very demanding' = 1, otherwise = 0
Heavy mentally	Current tasks mentally 'very demanding' = 1, otherwise = 0
Wage:	
Wage (1st quantile)	Logarithm of hourly annual earnings (FIM; obtained from tax registers) divided by regular weekly hours (from LFS), first quantile =1, otherwise = 0 (reference)
Wage (2nd quantile)	Logarithm of hourly annual earnings, second quantile = 1, otherwise = 0
Wage (3rd quantile)	Logarithm of hourly annual earnings, third quantile = 1, otherwise = 0
Wage (4th quantile)	Logarithm of hourly annual earnings, fourth quantile = 1, otherwise = 0
Working time:	
Night work	Night work = 1, otherwise = 0
Shift work	Uninterrupted 3-shift work = 1, otherwise = 0
Temporary	Fixed-term employment relationship = 1, otherwise = 0
Part-timer	Part-time work = 1, otherwise = 0
Team work:	
Team work	Works in teams 'almost all the time' or 'about three quarters of the time' = 1, otherwise = 0
Human capital variables:	
Female	1 = female, 0 = male
Age <=24	Age <= 24 = 1, otherwise = 0
Age 25-34	Age 25-34 = 1, otherwise = 0
Age 35-44	Age 35-44 = 1, otherwise = 0 (reference)
Age 45-54	Age 45-54 = 1, otherwise = 0
Age 55-64	Age 55-64 = 1, otherwise = 0
Single	Not married=1, otherwise=0
Spouse working	Spouse is working = 1, otherwise = 0
Comprehensive	Comprehensive education = 1, otherwise = 0 (reference)
Secondary education	Upper secondary or vocational education = 1, otherwise = 0
Polytechnic education	Polytechnic or lower university degree = 1, otherwise = 0
University education	Higher university degree = 1, otherwise = 0
Humanities	Field of education is humanities or teachers' education = 1, otherwise = 0

Business	Field of education is business, law or social science = 1, otherwise = 0
Technical	Field of education is technical, natural science or computer science = 1, otherwise = 0
Health care	Field of education is health care, social work, etc. = 1, otherwise = 0
Union member	Member of trade union = 1, otherwise = 0
Manager	Tasks involve supervision of work of others or delegation of tasks = 1, otherwise = 0

Work history:

Tenure <=5	Tenure <=5 years, otherwise 0
Tenure 6-10	Tenure 6-10 years otherwise 0 (reference)
Tenure >10	Tenure > 10 years, otherwise 0

Self-assessed health:

| Working capacity | Self-assessment of working capacity. The variable is scaled from 0 (total inability to work) to 10 (top condition) |

Information about employer:

Public sector	Employer is state or municipality = 1, otherwise = 0
Foreign firm	Employer is private, mainly foreign-owned enterprise = 1, otherwise = 0
Plant size <10	Size of plant under 10 employees = 1, otherwise = 0 (reference)
Plant size 10-49	Size of plant 10-49 employees = 1, otherwise = 0
Plant size 50-499	Size of plant 50-499 employees = 1, otherwise = 0
Plant size > 499	Size of plant over 499 employees = 1, otherwise = 0
Growing employment	The number of employees has increased in the plant during the past three years = 1, otherwise = 0
Unstable firm	Financial situation is 'unstable' = 1, otherwise = 0
Female share	Share of females in the company is 'high' = 1, otherwise = 0

Regional variable:

| Regional unemployment | The regional unemployment rate based on 12 NUTS3 -regions (Source: LFS by Statistics Finland). |

Indicators for industries and occupations:

| Industries | 14 dummies based on Standard Industry Classification |
| Occupations | 10 dummies based on the classification of occupations by SF |

Table A2. Descriptive statistics.

	Mean	Sd.	Min	Max
Number of absences	0.65	1.17	0	17
Positive number of absences	0.39	0.49	0	1
Unsatisfied	0.06	0.24	0	1
Harm	0.29	0.45	0	1
Hazard	0.34	0.47	0	1
Uncertainty	0.58	0.49	0	1
No voice	0.68	0.47	0	1
Neglect	0.23	0.42	0	1
Atmosphere	0.11	0.31	0	1
Conflicts	0.06	0.24	0	1
Heavy physically	0.05	0.22	0	1
Heavy mentally	0.06	0.25	0	1
Wage (1st quantile)	0.25	0.43	0	1
Wage (2nd quantile)	0.25	0.43	0	1
Wage (3rd quantile)	0.25	0.43	0	1
Wage (4th quantile)	0.25	0.43	0	1
Night work	0.01	0.10	0	1
Shift work	0.04	0.20	0	1
Temporary	0.18	0.38	0	1
Part-timer	0.10	0.30	0	1
Team work	0.32	0.46	0	1
Female	0.53	0.50	0	1
Age <=24	0.08	0.28	0	1
Age 25-34	0.25	0.43	0	1
Age 35-44	0.30	0.46	0	1
Age 45-54	0.29	0.45	0	1
Age 55-64	0.08	0.26	0	1
Single	0.18	0.38	0	1
Spouse working	0.56	0.50	0	1
Comprehensive	0.24	0.43	0	1
Secondary education	0.56	0.50	0	1
Polytechnic education	0.12	0.32	0	1
University education	0.09	0.28	0	1
Humanities	0.06	0.24	0	1
Business	0.16	0.37	0	1
Technical	0.27	0.44	0	1
Health care	0.10	0.30	0	1
Union member	0.79	0.41	0	1
Manager	0.32	0.47	0	1
Tenure <=5	0.43	0.50	0	1
Tenure 6-10	0.17	0.38	0	1
Tenure >10	0.36	0.48	0	1
Working capacity	8.62	1.37	0	10
Public sector	0.34	0.47	0	1
Foreign firm	0.07	0.26	0	1
Plant size <10	0.28	0.45	0	1
Plant size 10-49	0.36	0.48	0	1
Plant size 50-499	0.28	0.45	0	1
Plant size > 499	0.08	0.27	0	1
Growing employment	0.11	0.31	0	1
Unstable firm	0.16	0.37	0	1
Female share	0.41	0.49	0	1
Regional unemployment	17.07	4.74	11.8	29.3

Figure 1. Sickness absences reported as a share of the standard annual working time in the Nordic countries.

Note: The figures refer to manual manufacturing workers in Finland and to employees of employers associations' member companies in the other Nordic countries. Information is not available for Iceland from the year 2000. (Source: The Confederation of Finnish Industries, 2006).

Figure 2. Distribution of the number of sickness absences during the past six months.
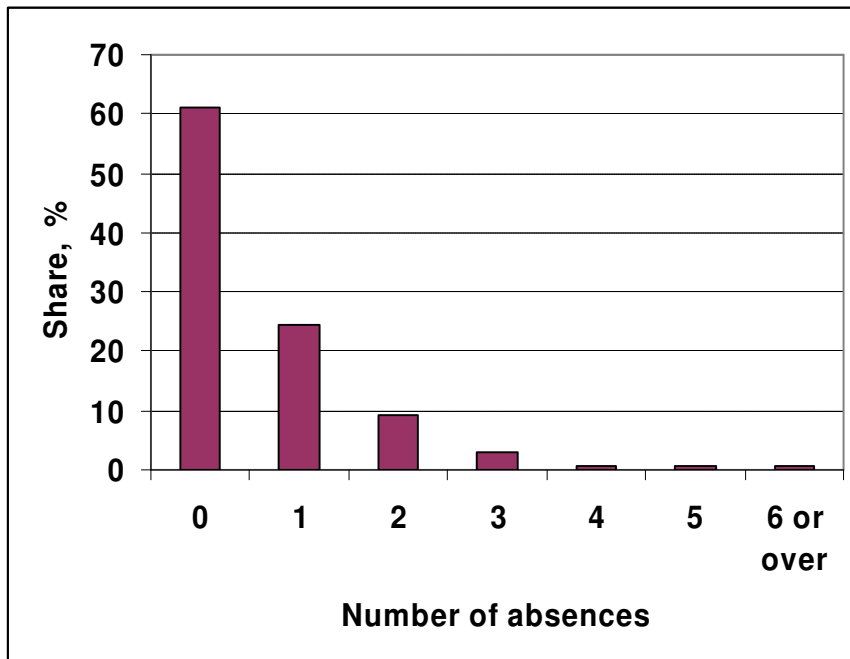
Table 1. Results from reduced-form models for sickness absences.

	Poisson regression, (Number of absences)	Negative binomial, (Number of absences)	Probit, (Positive number of absences)
Adverse working conditions:			
Harm	0.151	0.145	0.023
	(2.04)**	(2.04)**	(1.00)
Hazard	0.267	0.275	0.068
	(3.45)***	(3.79)***	(3.07)***
Uncertainty	0.166	0.174	0.081
	(2.32)**	(2.47)**	(3.94)***
No voice	0.101	0.097	0.016
	(1.31)	(1.28)	(0.71)
Neglect	0.057	0.029	-0.004
	(0.73)	(0.38)	(0.16)
Atmosphere	0.092	0.040	-0.023
	(0.85)	(0.39)	(0.72)
Conflicts	0.228	0.225	0.057
	(2.07)**	(2.05)**	(1.41)
Heavy physically	0.053	0.044	0.071
	(0.45)	(0.39)	(1.48)
Heavy mental	0.022	0.028	0.028
	(0.18)	(0.23)	(0.69)
Controls:			
Wage (2nd quantile)	0.141	0.143	0.088
	(1.17)	(1.31)	(2.84)***
Wage (3rd quantile)	0.122	0.127	0.108
	(0.93)	(1.08)	(3.32)***
Wage (4th quantile)	-0.109	-0.120	0.028
	(0.70)	(0.88)	(0.79)
Night work	0.209	0.227	0.172
	(1.03)	(1.12)	(1.76)*
Shift work	-0.030	-0.040	0.042
	(0.24)	(0.32)	(0.84)
Temporary	-0.105	-0.097	-0.004
	(1.05)	(1.00)	(0.11)
Part-timer	-0.129	-0.131	-0.064
	(0.98)	(1.01)	(1.92)*
Team work	0.041	0.043	-0.018
	(0.54)	(0.60)	(0.83)
Female	0.057	0.091	0.068
	(0.59)	(0.98)	(2.47)**
Age <=24	0.403	0.419	0.146
	(3.05)***	(3.24)***	(3.27)***
Age 25-34	0.209	0.222	0.059
	(2.46)**	(2.69)***	(2.14)**
Age 45-54	-0.202	-0.197	-0.093
	(2.23)**	(2.22)**	(3.68)***
Age 55-64	-0.303	-0.299	-0.098
	(2.23)**	(2.27)**	(2.47)**
Single	-0.225	-0.204	-0.068
	(2.23)**	(2.10)**	(2.23)**
Spouse working	-0.125	-0.098	-0.022

	(1.54)	(1.29)	(0.95)
Secondary education	-0.143	-0.140	-0.015
	(1.35)	(1.37)	(0.46)
Polytechnic education	-0.258	-0.276	-0.061
	(1.74)*	(1.90)*	(1.34)
University education	0.045	0.003	-0.021
	(0.21)	(0.02)	(0.39)
Humanities	0.160	0.144	0.012
	(0.85)	(0.81)	(0.22)
Business	0.117	0.124	-0.014
	(1.01)	(1.09)	(0.41)
Technical	0.142	0.159	0.031
	(1.39)	(1.55)	(0.92)
Health care	0.276	0.296	0.119
	(2.17)**	(2.32)**	(2.57)**
Union member	-0.154	-0.159	-0.058
	(1.75)*	(1.88)*	(2.17)**
Manager	-0.144	-0.135	-0.032
	(1.90)*	(1.83)*	(1.38)
Tenure <=5	0.162	0.158	0.038
	(1.69)*	(1.70)*	(1.34)
Tenure >10	0.271	0.251	0.052
	(2.64)***	(2.63)***	(1.84)*
Working capacity	-0.154	-0.163	-0.063
	(8.92)***	(8.46)***	(8.57)***
Public sector	-0.052	-0.048	-0.030
	(0.43)	(0.43)	(0.84)
Foreign firm	-0.065	-0.085	0.009
	(0.54)	(0.75)	(0.23)
Plant size 10-49	0.002	0.002	0.018
	(0.02)	(0.03)	(0.73)
Plant size 50-499	0.220	0.214	0.065
	(2.15)**	(2.26)**	(2.25)**
Plant size >499	0.126	0.129	0.044
	(0.94)	(0.96)	(1.03)
Growing employment	0.045	0.054	-0.013
	(0.41)	(0.50)	(0.41)
Unstable firm	-0.016	-0.020	0.005
	(0.19)	(0.24)	(0.17)
Female share	0.011	-0.021	-0.011
	(0.13)	(0.24)	(0.40)
Regional unemployment	-0.032	-0.034	-0.009
	(4.03)***	(4.12)***	(3.64)***
Industry dummies	Yes	Yes	Yes
Number of observations	2815	2815	2815

Note: Robust z statistics in parentheses (clustering by region)
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 2. Results from recursive models.

	Sickness absences	Unsatisfied	Disamenities (Harm, Hazard, Uncertainty)
Harm	..	0.437 (2.28)**	..
Hazard	..	0.330 (1.58)	..
Uncertainty	..	0.327 (1.51)	..
Unsatisfied	0.301 (1.95)*	..	..
Controls:			
Wage	No	Yes	No
Temporary	Yes	Yes	No
Part-timer	Yes	Yes	No
Female	Yes	Yes	No
Age	Yes	Yes	No
The level of education	Yes	Yes	No
The field of education	Yes	Yes	No
Manager	No	Yes	No
Tenure	Yes	Yes	No
Working capacity	Yes	No	No
Public sector	No	No	Yes
Foreign firm	No	No	Yes
Plant size	No	No	Yes
Unstable firm	No	No	Yes
Regional unemployment	Yes	No	No
Industry dummies	No	No	Yes
Occupation dummies	No	No	Yes

Note: Robust z statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

[1] Barmby *et al.* (2002) report a similar pattern by using labour force surveys.

[2] These figures refer to the proportion of the workforce that has been absent at least one day in the past 12 months by an accident at work, by health problems caused by the work, or by other health problems (Gimeno *et al.*, 2004).

[3] The unemployment rate in Finland rose in a few years from 3 to 17 at the beginning of the 1990s.

[4] Those that deal with Finland include e.g. Vahtera *et al.* (1997); Kivimäki *et al.* (2000); Vahtera *et al.* (2000); Vahtera *et al.* (2001); Virtanen *et al.* (2001); Ala-Mursula *et al.* (2002); Arola *et al.* (2003); Väänänen *et al.* (2003); Vahtera *et al.* (2004); Väänänen *et al.* (2004); Virtanen *et al.* (2005); Väänänen (2005).

[5] See, for example, Cameron and Trivedi (1998) for a description of the Poisson and negative binomial models.

[6] Using the restrictions also improves the validity of tests of exogeneity of the potentially endogenous explanatory dummy variables (essentially, tests of whether the correlations of the errors of the probit models are zero) when the distributional assumptions are misspecified (see Monfardini and Radice, 2006).

[7] Broadly speaking, the system of sickness benefits in Finland is similar to that in Sweden or in the other Nordic countries. There is a compulsory sickness insurance scheme for all the inhabitants, which is based on residency. It contains earnings-related benefits and means-tested benefits. Kangas (2004) reports that the replacement rate (% of wage) of sickness insurance is around 80% in Finland, which is about the same level as in Sweden. It has been agreed in many collective labour agreements that for sickness absences up to three days employees may complete their own certificates. In fact, the QWLS data from the year 2003 reveal that around 50% of wage and salary earners belong to this particular category (Ylitalo 2006, p. 299). In contrast, medical certificates are always required for sickness absences that last for more than three days. Accordingly, adverse working conditions that do not ruin workers' physical health in a way that should be verified by physicians may especially increase the number of short sickness absences.

[8] The QWLS data from the year 2003 contain information on the duration of sickness absence spells during the past year. Based on those data it is possible to calculate the average number of days that employees have been absent from work because of sickness. This turns out to be 8.4 days. We use the QWLS data from the year 1997, because the data from the year 2003 do not contain an identifier for the geographical location of the employer and we want to include the regional unemployment rate among the explanatory variables owing to the fact that unemployment has been discovered to be an important factor in the determination of sickness absences in the earlier studies from the Nordic countries (e.g. Holmlund, 2004). Having said that, we have done experiments with the QWLS data from the year 2003. Using information on the number of days that workers have been absent from work during the past year, the results confirm that job disamenities tend to raise the number of sickness absences. In addition to the QWLS data, it is possible to analyse the determination of (sickness) absences in Finland for a representative sample of workers through the use of the European Community Household Panel (ECHP) that is available over the period 1996-2001. The fundamental problem with the ECHP data is that they contain information on absences from work because of illness or other reasons during the past four weeks (question PE038). The quantitative magnitude of 'other reasons' is not recorded. Another problem is that the ECHP data do not contain detailed information on job disamenities. We have also made some experiments with the ECHP data. The results reveal that the level of job (dis)satisfaction does not directly contribute to the number of absences during the past four weeks. In that respect, the result is exactly the same as the one from the QWLS data for the year 1997 in the reduced form models.

[9] In the calculation of standard errors we have taken into account the fact that observations are clustered by regions. Otherwise, standard errors on *Regional unemployment* would be biased downwards, which might lead to the wrong conclusions about the statistical significance of the estimated effects (Moulton, 1990).

[10] In this respect, it is notable that in Finland nowadays temporary contracts are much more common in the public sector than in the private sector. Hence, according to the QWLS data the share of employees with temporary contracts is 18% in the Finnish economy (Appendix, Table A2), but for the public sector their share is 27%.

[11] It is not clear that *Working capacity* should be included in the model, because it can be regarded as endogenous. For this reason, we have estimated the reduced-form models also without it. The basic results regarding the effects of job disamenities remain the same. A major difference is that, when *Working capacity* is excluded, experiencing harms turns out to be statistically significant (and positive) in the probit model.

[12] Broström *et al.* (2004) show that the gender difference can be attributed in Sweden to more frequent, rather than longer, sickness absence spells for females. Ichino and Moretti (2006) have recently analysed the gender differences in the number of absences in detail.

[13] Our calculations using the QWLS data from the year 2003 support this conclusion.

[14] To illustrate the quantitative effect of regional unemployment in the determination of sickness absences, we included an indicator for regions with unemployment over 17% instead of using *Regional unemployment* as a continuous variable in the probit model. (17% is the unweighted mean level of *Regional Unemployment* reported in Appendix, Table A2). The results show that it is around 4% less likely that a positive number of sickness absences is reported in the regions with unemployment over 17%.

[15] As a robustness check, we estimated the models that are reported in Table 1 by including occupational indicators (not reported). Taken together, the results remain the same. One small difference is that after including the occupational indicators, *No Voice* is statistically significant (and positive) in the negative binomial model.

[16] For instance, the z-value of *Unsatisfied* is 0.45 when it is included as one of the explanatory variables for the Poisson regression model.

[17] The fact that disamenities raise workers' job dissatisfaction is in line with our earlier results reported in Böckerman and Ilmakunnas (2006).

[18] As a robustness check, we estimated the recursive models by including equations for one (and two) of the job disamenity variables at the same time (not reported). In this case, we had to estimate three (four) probit models as a recursive system. The conclusions are robust with respect to these changes in the basic model.