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Abstract

Previous studies find that participation in educational measures does not increase sick-listed employees' chance of returning to work. This is surprising because education is supposed to increase human capital and raise productivity. However, a higher productivity may make the participants raise their reservation wage. Therefore, it is possible that educational measures increase the chance of returning to work in high pay jobs but reduce the chance of returning to work in low pay jobs. To test this hypothesis, we use panel data of 671 long-term sick-listed employees to estimate a random effects hazards rate model, with returning to work in high paid jobs and low-medium paid jobs, respectively, as the two outcomes. Our findings do not support the reservation wage hypothesis. We find that while participation in education significantly increases the probability of returning to work in medium or low paid jobs, it does not affect the probability of resuming work in high paid jobs.

1. Introduction

The number of inactive people receiving a disability related benefit has risen in many countries during the last decades (see e.g. Bound and Burkhauser, 1999; Aarts, Burkhauser and de Jong, 1996). Because of its negative economic consequences, this development has called for attention among politicians and researchers. Since the seminal work of Johnson and Berkowitz (1972) researchers have devoted much energy to explain the increased labour market exit and to find policies that can reverse the negative trend.

Vocational rehabilitation is generally regarded as an effective instrument to reduce work disability. It may affect disabled employees' employment chances positively for at least two reasons. Measures as workplace adaptations, change of job tasks, and wage subsidies may reduce or change job demands to meet the abilities of the disabled individuals. In contrast, educational measures may increase the individuals' human capital and thus increase their work ability.

Empirically evaluations provide mixed evidence about the employment effect of vocational rehabilitation in general (cf. section 2 below). However, the few studies that have investigated the effects of educational measures suggest that these measures have a very limited or even a negative impact on the probability of returning to work (Frölich, Heshmati and Lechner, 2004; Høgelund, 2003; Høgelund and Holm, 2005). Given the anticipated human capital effect, this is surprising. To our knowledge no empiric evidence exists that can explain the ineffectiveness of educational measures for disabled employees.

Search theory might offer an explanation to this puzzle. Human capital theory predicts that educational measures increase the participants' productivity. Search theory suggests that this will raise the job arrival rate and thus increase the chance that the sick-listed employee returns to work. Search theory however also suggests that this effect is counteracted because a higher productivity makes people raise their reservation wage. In broad terms the employment effect of educational measures is transformed to a welfare effect, since participants in educational measures more often than non-participants return to work in high paid jobs. To test this proposition, we use panel data of 671 long-term sick-listed employees to estimate a random effects hazards rate model, with returning to work in high paid jobs and low paid jobs, respectively, as the two outcomes. In contrast to previous studies, we find that educational measures have a positive employment effect. We also find that participation in educational measures do not make the sick-listed employees raise their reservation wage, suggesting that educational measures do not give rise to a welfare effect.

2. Previous studies

Several studies have assessed how vocational rehabilitation affects labour market outcomes for disabled people. An extensive literature has developed around benefit-cost analyses of mainly the US vocational rehabilitation program (e.g. Berkowitz et. al., 1988; Dean and Dolan, 1991; Lewis et. al., 1992; Wood and Morrison, 1997; Dean, Dolan and Schmidt, 1999). These studies suggest that the benefits of vocational rehabilitation in terms of increased labour market earnings clearly exceed program costs. This net effect may be composed of two effects; an employment effect, i.e. the difference between the participants' post-program and pre-program employment degree exceeds that of the non-participants; and an earnings effect, i.e. the difference between the participants' post-program and pre-program earnings exceeds that of the non-participants. It is unclear, therefore, if the aforementioned positive benefit-cost ratios reflect an employment effect, an earnings effect, or both.[1,2] Furthermore, as the benefit-cost studies do not distinguish between education and other vocational rehabilitation measures, it is possible that educational measures yield negative employment effects while other vocational rehabilitation measures yield positive effects. We return to this issue below.

The few European studies that take account of the selection into vocational rehabilitation provide mixed evidence. Heshmati and Engström (2001) studied 8,839 Swedish people sick-listed for 13 weeks or more. The authors found that participation in vocational rehabilitation had a positive effect on the probability of returning to work. In contrast, Aakvik, Heckman and Vytlacil (2005), who studied 1,924 Norwegian long-term sick-listed women that applied for vocational rehabilitation, found that vocational rehabilitation harmed the participants' employment prospects. Thus, when unobserved differences between participants and non- participants were taken into consideration, non-participants returned to work more often than participants. Neither of these studies distinguished between educational measures and other types of vocational rehabilitation.

A Danish study assessed the effect of educational measures in a cohort of 433 long-term sick-listed employees with low back pain (Høgelund and Holm, 2005; Høgelund 2003). Høgelund and Holm

[1] LaLonde (1995) and Heckman, LaLonde and Smith (1999) find that the most of the reported benefit-cost effects are related to an employment effects rather than an earnings effect.

[2] An exception is Gibbs (1990) and Hennessey and Mueller (1995). Gibbs (1990) found that participation in vocational rehabilitation increases the duration of subsequent employment spells and reduces the duration of subsequent unemployment spells. Hennessey and Mueller (1995) found that disability beneficiaries' participation in vocational rehabilitation increases their probability of returning to work. These findings may however be subject to a selection bias problem, since no correction for unobserved differences between the participants and the non-participants was performed, and as concern Gibbs (1990) only partial correction for observed differences between the vocational rehabilitation participants and the non-participants was made.

(2005) found a large significant locking-in effect and a large positive ex-post training effect. However, a positive combined effect was only found for very long durations of returning to work.[3]

Using the same data as Heshmati and Engström (2001), Frölich, Heshmati and Lechner (2004) applied a matching approach to compare the employment effects of five different vocational rehabilitation measures. They found that long-term sick-listed who participated in workplace rehabilitation, the measure found to be most efficient, was just as likely to return to work as those who did not participate in vocational rehabilitation. Furthermore, education was the least efficient measure with a strong and negative employment effect. Sick-listed who participated in education had approximately 20%-points lower probability of returning to work than sick-listed who did not undergo rehabilitation. Frölich, Heshmati and Lechner (2004) propose that the negative effect could be explained by decreased job search activities during participation in education. Furthermore, as participants in educational measures relatively often have been sick-listed prior to the present sick leave spell and thus have a higher probability of becoming sick in future, the authors suggest that stigma effects may make employers refrain from hiring sick-listed who participated in educational measures.

In sum, the reviewed literature provides mixed evidence about the employment effect of vocational rehabilitation measures in general. The few European studies that have assessed the effects of educational measures suggest that these measures may be ineffective. Furthermore, none of the reviewed studies provide concrete knowledge about the underlying mechanism(s) that may explain why educational measures fail to generate positive return to work effects.

3. Human capital, reservation wage and return to work

Econometric studies of vocational rehabilitation programs are normally carried out without explicit considerations about the mechanisms that should make vocational rehabilitation improve the employment chances of disabled people (see e.g. Lewis et al., 1992; Dean, Dolan and Schmidt, 1999; Heshmati and Engström, 2001; Aakvik, Heckman and Vytlacil, 2005; Høgelund and Holm, 2005). We expect that this is related to the fact that the human capital theory is taken for granted.[4] In its

[3] With a more simple methodological approach, Høgelund (2003) found a positive, but insignificant employment effect of participation in educational measures.

[4] Reference to the human capital theory is made more explicit in the literature on the effects of man power programs. In a review of this literature LaLonde (1995:149) writes: “The hope is that public expenditures on these programs will enhance participants’ productive skills and, in turn, increase their future earnings and tax payments and reduce the dependence on social welfare benefits.”

simplest form, the human capital theory states that a person's productivity is positively related to the person's human capital, where human capital comprises abilities in the broadest sense, e.g. skills and health (Becker, 1993). Consequently, vocational rehabilitation in the shape of education should increase disabled employees' productivity. When work disability persists because job demands exceed the work ability of the disabled individual, it directly follows that educational measures should increase employment chances (see e.g. Verbrugge and Jette, 1994; Høgelund, 2003).

The above argument builds indirectly on search theory: the increased productivity that follows from the acquisition of more human capital leads to higher job offer arrival rates, which in turn increases the probability of work resumption. However, search theory also suggests that the increased productivity may imply that the sick-listed employee draws from a wage distribution where higher wage offers are more likely. Consequently, the sick-listed employee will raise his/her reservation wage, reducing the probability of returning to work. In other words, educational measures may result in both a positive and a negative employment effect, making the size of the net effect uncertain. Despite this, it follows that educational measures may have a welfare effect because when work resumption takes place it will relatively often happens to a high wage. This is illustrated below.

Denote the time independent job offer arrival rate with and without treatment as λ_j, $j = 0,1$, where *0* denote no treatment and *1* denotes treatment. Furthermore let wage offers be drawn from normal distributions with equal variance but possible different means for treated and non-treated individuals, where μ_j, $j = 0, 1$ denotes the mean in each of the distributions. Suppose that the allocation into the treatment is outside the control of the sick-listed individuals. Both treated and non-treated individuals have optimal search strategies leading to state specific reservation wages, w_j^r, $j = 0, 1$. If arrival rates for treated and non-treated individuals are identical but the mean wage in the offer distributions is different, such that $\mu_1 > \mu_0$, we find that reservation wages are different with $w_1^r > w_0^r$. As arrival rates are assumed to be equal this leads to higher hazard rates, $h(w_j^r)$, $j = 0, 1$, back to work for non-treated individuals, compared to treated individuals. Hence, in this case, the treatment seems to be counter productive in terms of returning the sick-listed employees to work. If on the other hand, job-arrival rates also differ between treated and non-treated individuals, the relative size of the hazard rates to work becomes ambiguous.

In this study, we measure the return to work wage level relatively to pre-sick leave wage. Our two outcome variables are defined as the time to first returning to work with higher wage and time to first returning to work with the same or a lower wage than the wage prior to the sick leave. To make inference about whether the treatment induces increased wage offers or increased arrival rates, or both, we compare the treated and non-treated individuals with respect to the two outcome variables.

According to the wage reservation theory, it is however problematic to relate the present wage level to the pre-sick leave wage. Given that the sick-listed employees act optimally and want to maximise future earnings, they do not take into account the pre-sick leave wage when determining the current reservation wage. This is so because it only depends on the current arrival rate and the wage distribution. Hence, conditional on the current arrival rate and the wage distribution, the current reservation wage is independent of the pre-sick leave wage rate. In our empirically analysis, it is therefore essential to correct for differences in the pre-sick leave wage level.

To see this, consider the probability of observing return to work at time *t*:

$$P(\text{arrival of job offer}) \times P(w > w^r) = \lambda\left(1 - \Phi\left(z^r\right)\right) \tag{1}$$

where $z^r = \frac{w^r - \mu}{\sigma}$, $\Phi(.)$ is the standard normal distribution function, and μ and σ are the mean and standard deviation of the wage offer distribution. Now, for a given pre-sick leave wage rate, $\tilde{w}$, the fraction of exits to higher wages is:

$$\begin{aligned} &P(\text{arrival of job offer}) \times P(w > w^r) \times P(w > \tilde{w} \mid w > w^r) \\ &= \lambda\left(1 - \Phi\left(z^r\right)\right)\frac{1 - \Phi\left(\tilde{z}\right)}{1 - \Phi\left(z^r\right)} = \lambda\left(1 - \Phi\left(\tilde{z}\right)\right) \end{aligned} \tag{2}$$

where $\tilde{z} = \frac{\tilde{w} - \mu}{\sigma}$. The fraction of exits to lower wages is:

$$\begin{aligned} &P(\text{arrival of job offer}) \times P(w > w^r) \times P(w < \tilde{w} \mid w > w^r) \\ &= \lambda\left(1 - \Phi\left(z^r\right)\right)\frac{\Phi\left(\tilde{z}\right) - \Phi\left(z^r\right)}{1 - \Phi\left(z^r\right)} = \lambda\left(\Phi\left(\tilde{z}\right) - \Phi\left(z^r\right)\right) \end{aligned} \tag{3}$$

Now compare a treated and a non-treated individual. They differ only in terms of the mean of the wage offer distribution, such that the treated individual receives offers from a distribution with higher mean than the non-treated individual. For a given pre-wage we have $\Phi\left(\tilde{z}_0\right) - \Phi\left(z_0^r\right) > \Phi\left(\tilde{z}_1\right) - \Phi\left(z_1^r\right)$ and $\Phi\left(\tilde{z}_0\right) < \Phi\left(\tilde{z}_1\right)$, where subscript *0* and *1* denotes treatment and no treatment, respectively. Hence, as long as arrival rates are identical for treated and non-treated individuals, conditional on the pre-sick leave wage rate, transition rates to work above the previous wage rates are more likely for treated than for non-treated individuals. Conversely, transition rates to work with a wages rate below the pre-sick leave wage rate are more likely for non-treated individuals. In this case educational measures give rise to a welfare effect. Of course, when arrival rates also differ, it becomes ambiguous whether the net effect of the treatment will increase or decrease hazard rates to work.

4. The Danish sick leave policy

The public sickness benefit scheme covers wage earners, self-employed and unemployed persons. No distinction is made between sick leave caused by work related circumstances and non-work related circumstances. The scheme provides full wage compensation up to a ceiling that equals the maximum unemployment benefit. Many employers top-up sickness benefit to the wage level. Sickness benefits can normally be received for a maximum of 52 weeks within a period of 18 months.

Municipalities are obliged to make a follow-up assessment of all cases of sickness benefit within eight weeks after the first day of work inability. Thereafter follow-up assessments should be performed every fourth week (in complicated sickness cases) or every eight week (in uncomplicated cases).[5] The assessment is performed to verify that conditions for continued benefit receipt are met and to improve or retain the sick-listed individual's labour market attachment. The follow-up assessment should be based on updated medical, social, and vocational information. It must take place in cooperation with the sick-listed individual and other relevant agents such as the employer, medical experts, vocational rehabilitation institutions, unions, and labour market experts.

To facilitate return to work, the municipality can apply a broad range of vocational rehabilitation measures and vocational services. These measures include reduced working hours with supplementary sickness benefit, financial support to workplace adaptations and aids, test of work ability, job counselling, job training with a wage subsidy, and educational measures. Educational measures range from courses lasting a few weeks to postsecondary education at the university level.

If return to ordinary employment is unfeasible, the municipality may refer the sick-listed employee to a so-called flexjob with special working conditions, e.g. with reduced working hours and special job tasks. Flexjobs entail a wage subsidy that either equals half or two-thirds of the wage as stipulated in the relevant collective agreement. Individuals with permanently reduced

[5] During the observation period follow-up assessments had to be performed every 13 weeks.

work ability, who despite medical treatment and vocational rehabilitation are unable to work in a flexjob are eligible to a disability benefit.[6]

Municipalities have strong incentives to apply active measures that facilitate labour market reintegration rather than awarding passive benefits. In addition to the sickness benefit scheme, municipalities are responsible for the administration of social assistance, vocational rehabilitation, disability benefit, and a wage subsidy scheme. Municipalities' expenditures on these benefits are partly reimbursed by the state with a higher reimbursement rate for active measures such as vocational rehabilitation and wage subsidies than for passive measures such as sickness benefits and especially disability benefits.[7]

5. Data and descriptive statistics

This study is based on panel data of employees aged 18 to 55 who were fully sick-listed for at least three consecutive months in 1995. The sample was drawn in the 24 largest municipalities in Denmark. The sample consists of two groups, 1,063 persons in total. One group of 619 persons comprises sick-listed employees with low back pain diagnoses. They were interviewed by telephone four times: 5½ months after the first day of work incapacity, 13 months, 25 months, and 57 months after the first day of work incapacity. 529 sick-listed employees participated in the first interview (response rate on 85 percent) and 454 persons in the second interview (response rate on 86 percent). These 454 persons are included in our analyses. The second group consists of 444 persons who were sick-listed with diagnoses other than low back pain. This group was only interviewed twice: 5 months and 25 months after the first day of sick leave. 300 persons participated in the first interview (response rate on 68 percent). The 233 persons who participated in the second interview (response rate on 78 percent) are included in the analytical sample. Altogether the data includes 687 sick-listed employees, 454 persons with low back pain diagnoses and the 233 with other diagnoses. After excluding 16 persons with missing information on the dependent variables (8) or on the covariates (8), the analytical sample consists of 671 persons.

The dependent variables are time to first returning to work with higher wage and time to first returning to work with the same or a lower wage than the wage prior to the sick leave. To

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[6] When this study was conducted it was required that the applicant's earnings ability was permanently reduced with at least 50 percent.

[7] The incentives to apply active measures rather than passive benefit awards were put in place in 1999. Prior to this, during most of the observation period, 50 percent of all municipality benefits were refunded by the state.

measure the overall effect of educational measures, we also estimate a hazard rate model with time to first returning to work with either higher or lower/the same wage. “Work” is defined as employment without public wage subsidies. Of the 352 sick-listed employees who returned to work, 25 percent returned to work with a higher wage and 51 percent returned to work with the same or a lower wage. The remaining 24 percent returned to work, but the wage level is unobserved.[8]

Educational measures include both courses and formal education. In contrast to previous studies, our data allow us to measure participation in up to three educational measures.[9] 20 percent of the sick-listed employees participated in at the least one measure. Among these 135 persons, 22 participated in two measures, while one individual participated in three measures. In average the participants underwent education for 10½ months. It is likely that the employment effect of educational measures is made up of two diverse effects. Job search may decrease during enrolment in a measure, whereas it may increase after the measure has been terminated. To estimate both effects, we code two time varying covariates. One covariate equals 1 during enrolment and 0 during periods without enrolment in courses or education. Another covariate equals 0 until the educational measure has ended, hereafter it equals 1 until the sick-listed employee either returns to work or enrols in a another measure. During participation in a second measure the covariate is equal to 0, and when the measure is terminated the covariate becomes 1 again.

Figure 1 and figure 2 displays Kaplan-Meier hazard rates to participation in an educational measure, to work with a higher wage, and to work with the same or a lower wage.

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[8] The data only includes information about the wage level for persons who were working at interview. Sick-listed employees who returned to work in an unsubsidized job before the interview are included in the analysis as returning to work without knowledge of the wage level. How these individuals are included in the analysis is described in more details in section 6. Sick-listed employees who returned to work in a wage subsidized job are treated as censored at the time when they returned to work in the subsidized job (114 persons).

[9] This is only possible for the sick-listed employees with low back pain diagnosis for whom we have information about participation in educational measures from each of the three panels (after one year, two years, and after five years). For employees with other diagnoses, we have information only about participation in one measure, because the information about participation in education is obtained only from one panel (after two years).

Figure 1: Hazard rate to educational measures

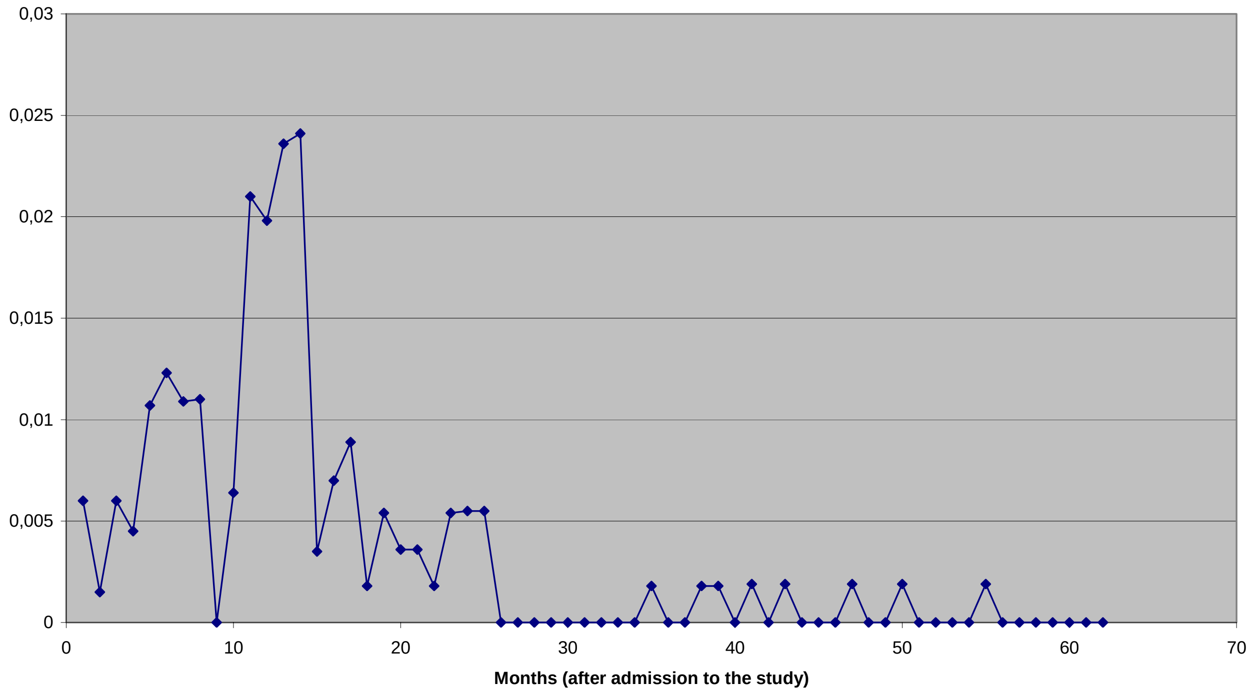
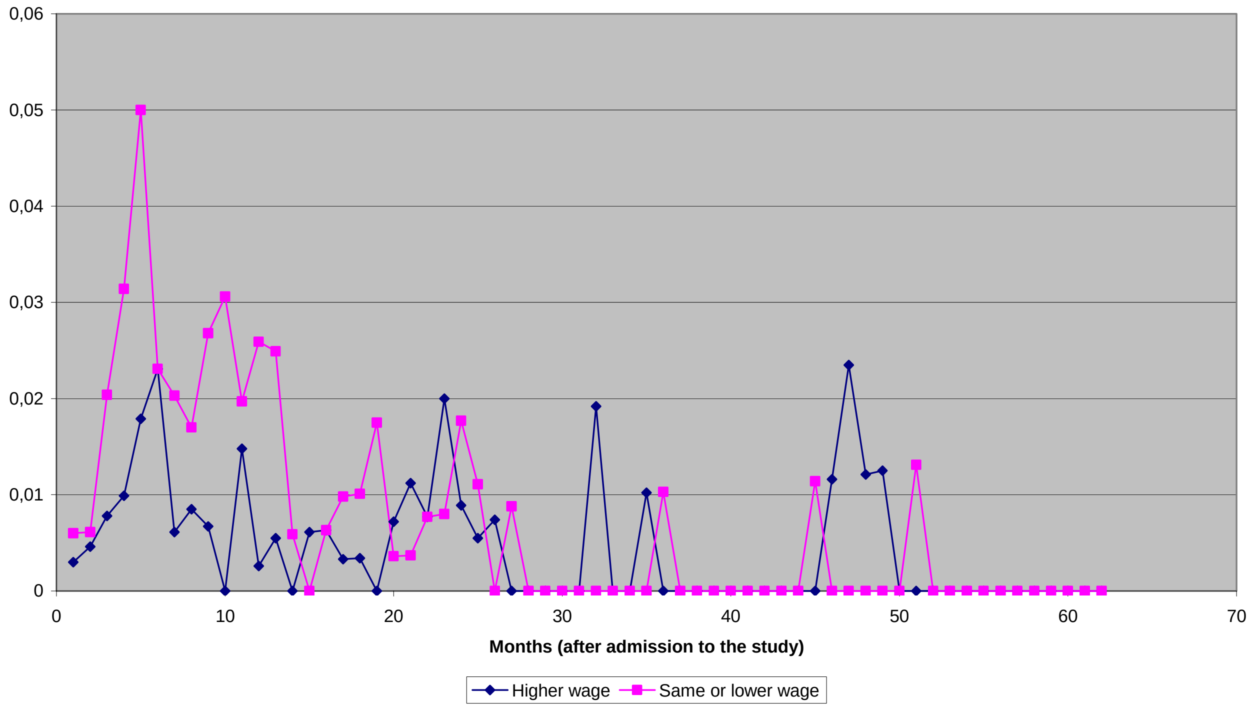


Figure 2: Hazard rate to work with higher wage or same/lower wage



The transition to an educational measure increases fast during the first 14 months; thereafter it decreases in the remaining part of the observation period. Disregarding the fluctuations, the hazard rate to work with higher wages appears to be almost constant during the five-year observation period. In contrast, the hazard rate to work with the same or a lower wage peaks after six months, where it is more than twice the rate to work with a higher wage. After the sixth month transitions to work with the same or a lower wage gradually levels off, and after approximately two years the rate is close to nil. The unadjusted hazard rates give no clear indication of possible effects of participation in educational measures.

The data includes information about the sick-listed employees' socio-demographic characteristics, labour market experience prior to the sick leave, and two health indicators. All the covariates are measured at the first interview. The socio-demographic characteristics comprise gender, age, cohabitation status, educational attainment, and the number of years of work experience prior to the sick leave. As a measure of the sick-listed employees' health status we use a 10 point pain intensity scale, where 1 means "no pain" and 10 means that "pain is as a strong as possible".[10] We also include a dummy indicator of the sick leave diagnosis. It equals 1 for sick-listed employees with low back pain diagnoses and 0 for persons with other diagnoses. Information about the sick leave diagnoses was obtained from the municipalities, which, in turn, collected the information from medical certificates. Table 1 displays mean, standard deviation, and deciles for the covariates.

[10] It may be problematic to use self-rated health measures because they may be subject to both endogeneity and measurement errors (see Bound, 1991). We choose to use the self reported health measure for three reasons. First, as endogeneity leads to an underestimation of the impact of health on the labour supply, while measurement errors lead to overestimation, the two types of bias tend to cancel out (Currie and Madrian, 1999). Second, objective measures are apparently not necessarily a better choice as they also are subject to bias (Bound, 1991; Johansen and Skedinger, 2005). Third, when we re-estimate our model (in table 3) without self-rated pain intensity the estimates of the treatment effect remain almost the same.

Table 1. Mean, standard deviation and deciles (n=671).

	Mean	Std.dev	10% decile	90% decile
Female (yes=1)	0.566	0.496	0	1
Age	39.398	9.720	26	52
Living with spouse (yes=1)	0.678	0.468	0	1
Educational attainment				
Primary[1)] (yes=1)	0.420	0.494	0	1
Secondary[1)] (yes=1)	0.349	0.477	0	1
Postsecondary[1)] (yes=1)	0.231	0.422	0	1
Number of years employed prior to the sick leave	17.247	9.670	4	30
Back pain diagnosis (yes=1)	0.662	0.473	0	1
Pain intensity: 1 to 10 (much pain)	4.990	2.607	1	8
Municipalities' vocational rehabilitation tendency[2)]	0.334	1.176	-0.458	1.980
Participation in at least one educational measure (yes=1)	0.201	0.401	0	1
Time to start of (first) educational measure[3)]	13.667	9.494	5	24
Duration of educational measures[4)]	10.481	10.769	2	22

1): Primary education covers the compulsory school period, i.e. nine years of basic school, and other preparatory schooling such as high school. Secondary education includes all 'terminal' educations (preparing the students for entry directly into working life) except university degrees. Postsecondary education includes all types of university degrees.

2): Measured as the extent the sick-listed employees' sick leave municipality in 1996 awarded more or fewer vocational rehabilitation benefits than the national average, see the text for detailed information.

3): Calculation based on the 135 persons who participated in a measure.

4): Calculation based on the 135 persons who participated in a measure. For individuals who had not terminated their educational measure during the observation period the mean is based on censored durations.

To obtain an unbiased estimate of the employment effect of educational measures, it is essential to correct for possible selection problems. Such problems may arise if participants have unobserved characteristics that both affect the probability of attending an educational measure and of returning to work. Previous studies suggest that unobservable individual characteristics may influence the selection to vocational rehabilitation (e.g. Aakvik, Heckman and Vytlacil, 2005; Høgelund and Holm, 2005). We apply two approaches to deal with selection problems. First, we estimate a hazard rate model with random effects. This model allows different groups of sick-listed employees to have different unobserved characteristics that influence the probability of participating in an educational measure and of returning to work with a higher wage and the same or a lower wage, respectively. The random effects model is described below in section 6.

Second, we apply the instrumental variables (IV) approach. We follow the idea put forward by Aakvik, Heckman and Vytlacil (2005) and use information about the municipalities' use of vocational rehabilitation to construct an instrument. We assume that the municipalities' vocational rehabilitation policy influences the selection of sick-listed employees to educational measures. We expect that a sick-listed employee's chance of participating in a measure is high when the municipality often applies vocational rehabilitation, and vice versa. We also assume that the municipal policy does not affect the probability of returning to work, except indirectly through the educational measure.

To measure the municipalities' use of vocational rehabilitation we estimate whether the number of people participating in vocational rehabilitation in each of the 24 municipalities is bigger or smaller than the average of the 275 Danish municipalities. We estimate an OLS regression with the dependent variable defined as the ratio of adult inhabitants in the sick-listed employee's residence municipality who received vocational rehabilitation benefit in 1996. To adjust for structural conditions that may influence the demand for vocational rehabilitation, we include covariates that measure the ratio of inhabitants receiving social assistance[11], the ratio of owned residences, and the ratio of apartments with four rooms.[12] The model yields an R^2-value of 0.24 (results are not shown). The standardized residuals are used to measure the municipalities' use of vocational rehabilitation, cf. table 1 for descriptive statistics of the covariate.

6. Econometric model

In this section we outline a model that allows us to estimate simultaneously the probability of participating in education and exiting into jobs with either a lower or higher wage compared to the pre-sick leave wage.

The model consists of three parts, conditionally on observed explanatory covariates. One component captures the distribution of unobserved effects. Another component, conditionally on unobserved effects, models the duration until entering education. And finally, conditionally on unobserved effects and whether a transition into education has occurred, a component models the competing risk of entering a job with either a higher or lower wage than the pre-sick leave wage.

[11] In addition to people receiving sickness benefit, people on social assistance may enter the vocational rehabilitation scheme.
[12] The regression is based on data from Statistics Denmark (Danmarks Statistiks Databank).

Let $\varepsilon_1, \varepsilon_{21}, \varepsilon_{22}$ denote the unobserved effects in the transition into education and jobs with lower and higher wages than the pre-sick leave wage. Let the distribution of the unobserved effects in the population be denoted as: $\varphi(.,.,.)$. Denote the discrete duration until entering an educational measure as T_1 and the duration until returning to work with either a higher wage or the same/ a lower wage than the pre-sick leave wage as T_2. If we assume both durations to be logistically distributed we arrive at the following individual contribution to the log-likelihood function:

$$\ln L_i = \ln\left[\varphi(\boldsymbol{\varepsilon})\prod_{t=1}^{T_i}\left[\frac{\exp\left(\delta_t + \beta_1 x_1 + \varepsilon_1\right)^{d_1^1(t)}}{1+\exp\left(\delta_t + \beta_1 x_1 + \varepsilon_1\right)}\right]\times \frac{\exp\left(\delta_{21t} + \gamma_{21} d_1^2(t) + \beta_{21} x_{21} + \varepsilon_{21}\right)^{d_{21}(t)} \cdot \exp\left(\delta_{22t} + \gamma_{22} d_1^2(t) + \beta_{22} x_{22} + \varepsilon_{22}\right)^{d_{22}(t)}}{1+\exp\left(\delta_{21t} + \gamma_{21} d_1^2(t) + \beta_{21} x_{21} + \varepsilon_{21}\right) + \exp\left(\delta_{22t} + \gamma_{22} d_1^2(t) + \beta_{22} x_{22} + \varepsilon_{22}\right)}\right] \quad (1)$$

where T_i is the duration of observation for the I'th individual, $\delta_{1t}, \delta_{21t}, \delta_{22t}$ are duration dummy variables, taking the value one, when the duration is t and zero otherwise[13]. Furthermore the state dummy indicator variables are given by:

$$d_1(t) = \begin{cases} 1 & \text{if in education in period } t \\ 0 & \text{othervise} \end{cases}$$

$$d_{21}(t) = \begin{cases} 1 & \text{if exit into lower wage in period } t \\ 0 & \text{othervise} \end{cases}$$

$$d_{22}(t) = \begin{cases} 1 & \text{if exit into higher wage in period } t \\ 0 & \text{othervise} \end{cases}$$

In essence, (4) is a mixture model with a logit model of entering education, and a multinomial model of returning to work with either a higher wage or the same/ a lower wage, compared to the pre-sick leave wage. The parameters of interest are γ_{21} and γ_{22} which captures the effect of the educational measure on the probability of entering either a job with the same/ a lower wage or a job with a higher wage.

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[13] For some individuals we have no information on whether they exit into employment with higher or lower wages, we only know that they exit into employment. Hence, their contribution to the part of the likelihood function at the time when they exit into employment is: $\frac{\exp\left(\delta_{21t} + \gamma_{21} d_1^2(t) + \beta_{21} x_{21} + \varepsilon_{21}\right) + \exp\left(\delta_{22t} + \gamma_{22} d_1^2(t) + \beta_{22} x_{22} + \varepsilon_{22}\right)}{1+\exp\left(\delta_{21t} + \gamma_{21} d_1^2(t) + \beta_{21} x_{21} + \varepsilon_{21}\right) + \exp\left(\delta_{22t} + \gamma_{22} d_1^2(t) + \beta_{22} x_{22} + \varepsilon_{22}\right)}$ if they make the exit at time *t*.

In order to use (4) for estimating the parameters of the model, we need to integrate out the distribution of the unobserved effects. We achieve this by approximating the unknown distribution of random effects by a discrete distribution with a finite number of mass points, according to Heckman and Singer (1984), and sum over the number of mass-points during the estimation.

7. Results

Table 2 presents the estimates of a simultaneously estimated random effects hazard rate model of participation in an educational measure and of returning to work. A similar model without correction for unobserved heterogeneity is displayed in table A1 in appendix A.

Table 2. Random effects hazard rate model of participation in an educational measure and returning to work (n=671).

	Participation in an educational measure		Returning to work	
Municipalities' vocational rehabilitation tendency	0.293	(0.030)***		
Enrolment in an educational measure (yes=1)			-0.504	(0.365)
Completed an educational measure (yes=1)			0.756	(0.226)***
Female (yes=1)	-0.137	(0.093)	-0.239	(0.120)**
Age	-0.009	(0.010)	-0.061	(0.015)***
Living with spouse (yes=1)	-0.399	(0.095)***	0.080	(0.121)
Educational attainment				
Secondary (yes=1)	0.265	(0.102)***	0.215	(0.133)
Postsecondary (yes=1)	-0.621	(0.115)***	0.562	(0.145)***
Number of years employed prior to the sick leave	-0.007	(0.011)	0.038	(0.015)**
Back pain diagnosis (yes=1)	-0.159	(0.114)	0.356	(0.135)***
Pain intensity: 1 to 10 (much pain)	-0.096	(0.020)***	-0.199	(0.025)***
Baseline, 8-12 months	1.290	(0.145)***	0.052	(0.142)
Baseline, 13-18 months	2.620	(0.141)***	-0.558	(0.189)***
Baseline, 19 months and more	2.052	(0.126)***	-0.876	(0.174)***
Constant	-0.796	(0.300)***	-1.615	(0.439)***
Random effects	-4.380	(0.136)***	0.799	(0.222)***
Fraction of observations with random effect	0.816		0.816	

Note: the hazard rate models are estimated simultaneously. See table 1 for further information about the covariates. Standard errors between brackets. Significance levels: *** significant at 1%, ** significant at 5%, * significant at 10%.

The analysis suggests that individuals with 'medium' employment prospects often are selected to participate in educational measures. First, the negative sign of pain intensity indicates that participation in a measure necessitates a relatively good health conditions. This makes sense because educational activities, in the same manner as labour market activities, often require a minimum of functional capacity. Second, individuals with characteristics associated with poor or medium labour market chances are relatively often enrolled in an educational measure. Sick-listed employees living alone and with primary or secondary educational attainment have an above average chance of participating in a measure. Finally, the random effects component suggests there is a group of sick-listed employees with a very high probability of participating in an educational measure and a below average probability of returning to work.

Our instrument, the municipalities' tendency to use vocational rehabilitation, is highly correlated with participation in education. Sick-listed employees living in municipalities that often apply vocational rehabilitation are often selected to participate in an educational measure, and vice versa.

It appears to be very important to control for unobservable characteristics. The hazard rate model without correction for unobserved heterogeneity, where participation in an educational measure is treated as an endogenous covariate, suggests that educational measures reduce the probability of returning to work, cf. table A1 in appendix A. That is, being enrolled in education significantly reduces the probability of returning to work, i.e. the coefficient is -1.152 with a p-value on 0.000. At the same time, the effect of having completed an educational measure is only slightly positive, the coefficient is 0.394 with a p-value of 0.059. When we correct for unobserved differences, the treatment effect becomes positive. The coefficient of being enrolled in education is now insignificant with a coefficient on -0.504 and a p-value on 0.167, whereas the effect of having completed an educational measure increases and becomes highly significant, with a coefficient on 0.756 and a p-value on 0.001, see table 2. In short, the analysis supports that educational measures enhance the labour market attachment of sick-listed employees. This finding is different from the findings of previous studies, cf. section 2.

In addition to the positive employment effect, educational measures may also have a welfare effect. Following the reservation wage theory individuals participating in education should raise their reservation wage if the treatment increases the participants' human capital. Participants should therefore return to work in high paid jobs more often than non-participants. To test this proposition we estimate a competing risk random effects hazard rate model of returning to work with a higher wage and the same or a lower wage, respectively. The results of this model are shown in table 3 (see table A2 in appendix A for estimation results of a similar model without correction for unobserved heterogeneity).

Table 3. Random effects hazard rate model of participation in an educational measure and returning to work with a higher wage and with the same or a lower wage (n=671).

	Participation in an educational measure		Returning to work For higher wage		Returning to work for same/ lower wage	
Municipalities' vocational rehabilitation tendency	0.293	(0.030)***				
Enrolment in an educational measure (yes=1)			-0.025	(0.523)	-1.422	(0.946)
Completed an educational measure (yes=1)			0.234	(0.397)	1.105	(0.296)***
Female (yes=1)	-0.136	(0.093)	-0.118	(0.225)	-0.299	(0.155)*
Age	-0.009	(0.010)	-0.094	(0.030)***	-0.045	(0.018)**
Living with spouse (yes=1)	-0.401	(0.094)***	-0.176	(0.215)	0.226	(0.161)
Educational attainment						
Secondary (yes=1)	0.263	(0.102)***	0.263	(0.249)	0.182	(0.171)
Postsecondary (yes=1)	-0.622	(0.115)***	0.571	(0.267)**	0.568	(0.188)***
Number of years employed prior to the sick leave	-0.007	(0.011)	0.043	(0.030)	0.035	(0.018)**
Back pain diagnosis (yes=1)	-0.161	(0.113)	-0.152	(0.242)	0.633	(0.178)***
Pain intensity: 1 to 10 (much pain)	-0.095	(0.020)***	-0.135	(0.045)***	-0.234	(0.032)***
Baseline, 8-12 months	1.290	(0.145)***	-0.335	(0.306)	0.198	(0.169)
Baseline, 13-18 months	2.620	(0.14 1)***	-0.550	(0.364)	-0.556	(0.240)**
Baseline, 19 months and more	2.052	(0.126)***	-0.041	(0.283)	-1.494	(0.274)***
Constant	-0.797	(0.300)***	-1.476	(0.810)*	-2.738	(0.559)***
Random effects	-4.382	(0.135)***	0.728	(0.385)*	0.842	(0.294)***
Fraction of observations with random effect	0.598		0.598		0.598	

Note: the hazard rate models are estimated simultaneously. See table 1 for further information about the covariates. Standard errors between brackets. Significance levels: *** significant at 1%, ** significant at 5%, * significant at 10%.

The analysis does not support the existence of a welfare effect. Participation in an educational measure has no effect on the chance of returning to work with a higher wage than the pre-sick leave wage; the coefficients of both educational covariates are insignificant, with p-values on 0.962 and 0.556, respectively. In contrast, education is positively correlated to returning to work with the same or a lower wage than the pre-sick leave wage. The coefficient of having terminated an educational measure is 1.105 and highly significant, while the coefficient of being enrolled in a measure, the locking-in effect is -1.422 and insignificant with a p-value on 0.133.

In contrast to the predictions of the reservation wage theory, the analysis does not support that the sick-listed employees raise their reservation wage when they participate in an educational measure. Rather, it suggests that educational measures increase the participants' human capital, which raises the job offer arrival rate and the probability of returning to work.

The fact that our dependent variables are defined relatively to the wage level before the sick leave could bias our estimates of the treatment effect if the covariates in our model do not fully adjust for differences in the pre-sick leave wages. According to the reservation wage theory, the current reservation wage only depends on the current job offer arrival rate and the wage distribution, meaning that the sick–listed employees' job search is not influenced by the pre-sick leave wage level. To get an impression about the magnitude of this potential bias, we re-estimate the hazard rate model in table 3 with the pre-sick leave wage included in all three equations. This model is shown in table A3 in appendix A. The pre-sick leave wage is an endogenous covariate and the results should therefore be interpreted with caution. The analysis suggests that the covariates included in the analysis in table 3 to a large extent already capture the effect of the pre-sick leave wage. The estimate of the treatment effect remains almost unaffected when the pre-sick leave wage is included in the model.

8. Conclusion

Previous studies show that educational measures fail to return disabled employees to work. It might therefore be tempting to conclude that this type of vocational rehabilitation leads to a welfare loss and therefore should be abandoned or at least restricted to the segment of disabled people where it has a positive employment effect.

Despite the apparent lack of a positive employment effect, we argue that educational measures may result in other positive welfare effects. Following the human capital theory educational measures will increase the participants' productivity. According to search theory this may result in two effects. First, it may raise the job offer arrival rate and thus increase the chance that disabled employees return to work. Second, a higher productivity makes the sick-listed employees raise their reservation wage, reducing the chance of returning to work. If these two effects cancel out, educational measures will have no visible employment effect. However, as a higher reservation wage makes the sick-listed employees return to high paid jobs, educational measures may have a welfare effect.

To test this proposition we use panel data of 671 long-term sick-listed employees to estimate two random effects hazards rate models. In the first model, we study if participation in educational measures affects the probability of returning to work. In contrast to previous studies, we find that the treatment increases the chance of returning to work. In the second model, we study if the treatment affects the probability of returning to work with a higher wage and the same/ a lower wage than the wage prior to the sick leave. We find that while the treatment significantly increases the probability of returning to work with the same or a lower wage, it does not affect the probability of resuming work with a higher wage. In other words, the findings do neither support that educational measures give rise to a welfare effect nor that the reservation wage theory is capable of explaining the behaviour of disabled employees.

The findings of this study are subject to at least two qualifying remarks. First, the finding of a positive employment effect is not a strong result. It hinges on the fact that the coefficient of the covariate of enrolment in education - the locking-in effect - is insignificant. With a p-value on 0.167, it is possible that the covariate would be significant in a larger data set. In that case, the net effect of participating in an educational measure might not necessarily be positive. Second, the study suffers to some degree from data limitations; cf. for example the high number of cases with missing information on the wage level. This seems to call for similar studies on better data. It also appears relevant to conduct similar studies on populations of for example workers compensation beneficiaries.

If a welfare effect cannot explain the rather limited employment effect of educational measures what might then be the explanation? As proposed by Frölich, Heshmati and Lechner (2004) a locking-in effect and a stigma effect could be at stake. As a consequence of the matching approach used by Frölich, Heshmati and Lechner (2004) they cannot isolate the locking-in effect from other effects. The findings of this study and of Høgelund and Holm (2005) clearly support the presence of a locking-in effect. It remains to be verified if it is a stigma effect that reduces the employment effect of educational measures for disabled people. Like other studies that seek to measure the employment effect of educational measures, this study has not been designed to shed light on this aspect. However, our findings are not inconsistent with a stigma effect. Stigma effects could be the reason why sick-listed employees who participate in educational measures do not raise their reservation wage. That is, a reduction of the reservation wage might be a strategy to overcome the reduced employment chance that follows from stigmatisation.

In contrast to previous studies that have estimated the employment effects of vocational rehabilitation, this study also attempts to model if sick-listed employees raise their reservation wage following participation in an educational measure. In this sense, it is attempts to unveil the mechanisms that make educational measures affect the labour market attachment of disabled employees. It might be fruitful to apply and develop this approach in future studies. For example, vocational rehabilitation may affect not only the chance of returning to work, and the wage level, but also the labour market attachment after returning to work.

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Appendix A

Table A1. Hazard rate model of participation in an educational measure and returning to work (n=771).

	Participation in an educational measure		Returning to work	
Municipalities' vocational rehabilitation tendency	0.064	(0.022)***		
Enrolment in an educational measure (yes=1)			-1.152	(0.317)***
Completed an educational measure (yes=1)			0.394	(0.209)*
Female (yes=1)	0.121	(0.067)*	-0.242	(0.120)**
Age	-0.051	(0.008)***	-0.061	(0.015)***
Living with spouse (yes=1)	-0.080	(0.067)	0.037	(0.119)
Educational attainment				
Secondary (yes=1)	0.672	(0.069)***	0.191	(0.133)
Postsecondary (yes=1)	-0.239	(0.092)***	0.505	(0.144)***
Number of years employed prior to the sick leave	-0.020	(0.008)***	0.040	(0.015)***
Back pain diagnosis (yes=1)	0.612	(0.088)***	0.336	(0.134)**
Pain intensity: 1 to 10 (much pain)	-0.101	(0.014)***	-0.205	(0.025)***
Baseline, 8-12 months	1.375	(0.130)***	0.057	(0.142)
Baseline, 13-18 months	2.501	(0.119)***	-0.518	(0.189)***
Baseline, 19 months and more	2.311	(0.111)***	-0.826	(0.175)***
Constant	-1.808	(0.220)***	-0.896	(0.390)**

Note: the hazard rate models are estimated simultaneously. See table 1 for further information about the covariates. Standard errors between brackets. Significance levels: *** significant at 1%, ** significant at 5%, * significant at 10%.

Table A2. Hazard rate model of participation in an educational measure and returning to work with a higher wage and with the same or a lower wage (n=671).

	Participation in an Educational measure		Returning to work for higher wage		Returning to work for same/ lower wage	
Municipalities' vocational rehabilitation tendency	0.064	(0.022)***				
Enrolment in an educational measure (yes=1)			-0.628	(0.434)	-2.087	(0.924)**
Completed an educational measure (yes=1)			-0.141	(0.366)	0.757	(0.280)***
Female (yes=1)	0.121	(0.067)*	-0.117	(0.223)	- 0.307	(0.154)**
Age	-0.051	(0.008)***	-0.094	(0.031)***	-0.043	(0.019)**
Living with spouse (yes=1)	-0.080	(0.067)	-0.227	(0.212)	0.189	(0.160)
Educational attainment						
Secondary (yes=1)	0.672	(0.069)***	0.248	(0.250)	0.150	(0.171)
Postsecondary (yes=1)	-0.239	(0.092)***	0.542	(0.267)**	0.499	(0.187)***
Number of years employed prior to the sick leave	-0.020	(0.008)***	0.046	(0.030)	0.037	(0.018)**
Back pain diagnosis (yes=1)	0.612	(0.088)***	-0.162	(0.242)	0.609	(0.177)***
Pain intensity: 1 to 10 (much pain)	-0.101	(0.014)***	-0.142	(0.045)***	-0.239	(0.033)***
Baseline, 8-12 months	1.375	(0.130)***	-0.328	(0.305)	0.200	(0.169)
Baseline, 13-18 months	2.501	(0.119)***	-0.504	(0.363)	-0.524	(0.241)**
Baseline, 19 months and more	2.311	(0.111)***	0.020	(0.283)	-1.460	(0.278)***
Constant	-1.808	(0.220)***	-0.825	(0.740)	-1.980	(0.493)***

Note: the hazard rate models are estimated simultaneously. See table 1 for further information about the covariates. Standard errors between brackets. Significance levels: *** significant at 1%, ** significant at 5%, * significant at 10%.

Table A3. Random effects hazard rate model of participation in an educational measure and returning to work with a higher wage and with the same or a lower wage. With pre-sick leave wage included in all equations (n=663).

	Participation in an educational measure		Returning to work for higher wage		Returning to work for same/ lower wage	
Municipalities' vocational rehabilitation tendency	0.302	(0.034)***				
Enrolment in an educational measure (yes=1)			-0.310	(0.580)	-1.508	(0.947)
Completed an educational measure (yes=1)			0.232	(0.398)	1.066	(0.297)***
Female (yes=1)	0.067	(0.099)	-0.084	(0.241)	-0.121	(0.170)
Age	-0.010	(0.011)	-0.099	(0.031)***	-0.045	(0.019)**
Living with spouse (yes=1)	-0.247	(0.096)***	-0.211	(0.216)	0.220	(0.163)
Educational attainment						
Secondary (yes=1)	0.260	(0.105)**	0.229	(0.251)	0.187	(0.172)
Postsecondary (yes=1)	-0.787	(0.123)***	0.576	(0.274)**	0.496	(0.195)**
Number of years employed prior to the sick leave	-0.012	(0.012)	0.041	(0.031)	0.034	(0.019)*
Pre-sick leave wage (after tax in DKK)[1)]	0.007	(0.001)***	0.004	(0.004)	0.008	(0.003)***
Back pain diagnosis (yes=1)	-0.235	(0.114)**	-0.168	(0.247)	0.632	(0.181)***
Pain intensity: 1 to 10 (much pain)	-0.092	(0.019)***	-0.128	(0.045)***	-0.239	(0.033)***
Baseline, 8-12 months	1.294	(0.14 7)***	-0.323	(0.307)	0.259	(0.171)
Baseline, 13-18 months	2.643	(0.142)***	-0.503	(0.363)	-0.523	(0.245)**
Baseline, 19 months and more	2.004	(0.128)***	-0.045	(0.292)	-1.425	(0.279)***
Constant	-1.531	(0.349)***	-1.660	(0.892)*	-3.540	(0.648)***
Random effects	-4.339	(0.130)***	0.725	(0.388)*	0.804	(0.293)***
Fraction of observations with random effect	0.821		0.821		0.821	

Note: the hazard rate models are estimated simultaneously. See table 1 for further information about the covariates. Standard errors between brackets. Significance levels: *** significant at 1%, ** significant at 5%, * significant at 10%.
1): Multiplied with 100.