IZA Journal of Labor Policy
a SpringerOpen Journal

ORIGINAL ARTICLE Open Access

# Worker adaptation and workplace accommodations after the onset of an illness

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**Abstract**

Workers who become work-incapacitated may try to change employer or stay with their current employer in an accommodated job. We study the effect of these strategies on sick-listed workers' employment durations. We use survey and register data of 809 workers. We simultaneously estimate the duration until returning to work and the duration of employment using the timing-of-event approach. We find that workplace accommodations increase employment durations with the current employer. We also find that workers returning to work with a new employer have significantly shorter employment durations than workers returning to work with the current employer (with or without accommodations).

**JEL codes:** I12 ,J21; J28; J64

**Keywords:** Sick leave; Workplace accommodation; Employment duration; Hazard rate model

## 1. Introduction

Illness and work disability warrant great concern among decision makers and researchers because of the negative consequences both at the individual and the societal level. At the societal level, ill health reduces the labour supply (Berkowitz and Johnson 1974) and impounds considerable resources to the financing of social security benefits (Eurostat 2009). As a consequence, decision makers have devoted much energy to finding ways of increasing the labour market attachment of people with ill health.

While some workers acquiring a work-limiting health problem remain in their job without changing job conditions, many workers change job conditions through either workplace accommodations or a job change (Daly and Bound 1996; Campolieti 2009). This paper studies how these two responses influence the labour market attachment of long-term sick-listed workers after they resume work.

As health-related work absenteeism may arise because of a mismatch between the worker's capacities and current job demands (Nagi 1965; Verbrugge and Jette 1994), policies affecting the supply-side or the demand-side may reduce work absenteeism. Supply-side policies include vocational rehabilitation programs with measures like education and job training that may increase the individuals' working capacity for meeting the job demands (e.g. Frölich et al. 2004). Demand-side policies may alter employers' demand for workers with ill health by subsidizing employers or mandating them to hire or accommodate workers with health problems (e.g. Burkhauser et al. 1995). For

example, many European countries have wage subsidy programs for people with disabilities, and the 'Americans with Disabilities Act' in the United States mandates employers to provide reasonable accommodations for disabled workers.

Many economic studies have assessed factors that may affect the labour supply of people with disabilities (for literature surveys, see Bound and Burkhauser 1999; Currie and Madrian 1999). In contrast, few studies have investigated conditions that influence whether workers remain in the workforce after the onset of a health condition (Burkhauser et al. 1995; Butler et al. 1995; Daly and Bound 1996; Campolieti 2005)[1]. These studies have focused on how reductions of job demands may improve the labour market attachment of disabled workers. Daly and Bound (1996) showed that job demands can be lowered through workplace accommodations or a job change. Thus after the onset of a disability the worker may either continue to work for the employer, which provides accommodations that reduce job demands, or change employer. Burkhauser et al. (1995) found that accommodations increase the employment duration of US workers acquiring a disability by a factor of almost three. Butler et al. (1995) found that Canadian workers with permanent partial impairments who returned to work with modified equipment, light workloads or reduced working hours had significantly more stable labour market attachment than workers who did not have their working conditions accommodated. Campolieti (2005), who studied the employment duration of workers with permanent partial impairments who returned to work after a work injury, also found a positive effect of workplace accommodations. However, the size of the accommodation estimates was much smaller than those found by Burkhauser et al. (1995). Campolieti (2005: 497) concludes that this difference suggests that workplace accommodations may be more effective in preventing departures from employment for workers who have not previously left the workforce for health reasons than for workers who are re-entering after an occupational injury.

Only few studies have investigated the consequences of returning to work for the pre-disability employer versus returning to work for a new employer. These studies suggest that the pre-injury employer has a significant impact on disabled worker's subsequent labour market outcomes. For example, Campolieti (2004) found that workers who returned to the pre-injury employer were more likely to receive accommodations than workers who returned to another employer. Campolieti and Krashinsy (2006) found that permanently impaired male workers who returned to the pre-accident employer had significantly higher wages than workers who did not return to the pre-injury employer.

We contribute to the literature by examining the effects of job change and workplace accommodations on the employment duration of long-term sick-listed workers in a novel way. We study whether workers remaining with their employer in an accommodated job after a sick leave have longer employment durations than workers who either change employer or remain with their employer in a non-accommodated job. We use survey and register data of 809 long-term sick-listed workers to estimate a joint proportional mixed hazard rate model with two durations, i.e. the competing risk duration until returning to work (in an accommodated job with the current employer, in a non-accommodated job with the current employer, or in a job with a new employer) and the duration of the subsequent employment.

This study adds to this literature in several ways. First, whereas previous studies estimated the effect of workplace accommodations among people with permanently reduced working capacity, we assess their effect on people who received a temporary working incapacity benefit, i.e. sickness benefit. Compared to work injured workers with permanent impairments, workers receiving temporary working incapacity benefit are a much larger group. Second, we provide new evidence about the effects of workplace accommodations in a European (Scandinavian) context.

Third, as the first study we assess whether changing workplace is a better strategy to cope with a health condition than staying with the pre-sick leave employer in an accommodated job. Thus, we study not only whether workplace accommodations prolong employment spells at the current employer but also whether long-term sick-listed workers who change employer have longer employment spells. The finding of Daly and Bound (1996)–that disabled workers who changed employer more often report a reduction in job demands than workers who remain with their employer–indicates that long-term sick-listed workers changing employer may have longer subsequent employment durations than long-term sick-listed workers who remain with their employer. Yet workers starting to work for a new employer do not know with certainty whether they match the new job, an uncertainty that may reduce the quality of the employer-employee match and hence also reduce the employment duration.

Fourth, our data and a recent econometric approach enable us to adjust for possible selection effects in a more comprehensive way than previous studies. Burkhauser et al. (1995) and Campolieti (2005) estimated a single spell duration model with individual specific random effects. However, when researchers only have information from one spell distinguishing unobserved heterogeneity from duration dependence is difficult. In a single spell analysis a decreasing hazard rate out of employment over time may reflect either that the hazard rate is indeed decreasing or that some people have unobserved characteristics that make them exit employment quickly. Therefore, the identification of unobserved heterogeneity in single-spell duration models hinges on a misspecification of the functional form of the baseline hazard rate or the functional form of the unobserved heterogeneity (van den Berg 2001). We use information of two interrelated durations (the duration until returning to work and the subsequent employment duration), thereby improving the identification of possible unobserved heterogeneity. With this approach, our econometric model should better than the models used in previous studies mitigate possible selection problems that may lead to bias in the estimated effect of workplace accommodations.

We find that individuals remaining with their employer in an accommodated job have longer subsequent employment durations than both individuals who change employer and those individuals remaining with their employer in a non-accommodated job.

The reminder of the paper is organized as follows. Section 2 provides an overview of the Danish disability policy, and Section 3 describes the data. Section 4 explains our econometric model, and Section 5 presents our findings and the results of robustness checks to our empirical model. Section 6 concludes.

## 2. The Danish disability policy

In Denmark public authorities are largely responsible for the financing of sickness, disability and work injury benefits and for the efforts of integrating working incapacitated people into the labour market. Employers, however, have a relatively modest responsibility (Høgelund 2003).

The public sickness benefit program gives full wage compensation up to a ceiling cap that equals the maximum unemployment benefit. Workers can receive the benefit for up to 52 weeks, but the benefit period may be extended under certain circumstances, e.g. if the worker has an ongoing workers' compensation or disability benefit claim. Employers finance their workers' sickness benefits for the first three weeks, and public authorities finance the remaining period.

The municipality is obligated to perform an assessment of all sickness benefit cases within eight weeks after the first day of sick leave. The primary goal of the assessments is to restore the sick-listed worker's labour market attachment. The assessments must take place in cooperation with the sick-listed worker and other relevant agents, such as the employer and medical experts.

To promote sick-listed workers' return to work, the municipality can establish vocational rehabilitation, including education, wage-subsidized job training, and subsidies to workplace accommodations. If return to ordinary work is impossible because of permanently reduced working capacity, the municipality may refer the sick-listed worker to a '*flexjob*', a wage-subsidized job with job tasks accommodated to the worker's working capacity and usually with reduced working hours. If a person with permanently reduced working capacity is incapable of working in a *flexjob*, the municipality may award a disability benefit, which is financed entirely by public authorities.

In addition to the employers' limited responsibility for the financing of work incapacity benefits, they can fairly easily dismiss workers on sick leave, i.e. in these cases employers are not obliged to reemploy workers when their sick leave ends (Høgelund 2003). Furthermore, until recently employers had no legal obligation to accommodate the working conditions of sick-listed workers. This situation changed in December 2004 when Denmark ratified the European Union directive on equal treatment in employment and occupation (European Union 2000). However, as the sick-listed employees in this study ended their sick leave approximately one year after the Danish parliament decided to ratify the directive, it is unlikely that the directive has had a significant effect on the sick leave spells in our data[2].

In sum, the Danish policy towards people with health problems is characterized by a relatively big public responsibility and a relatively limited responsibility of employers.

## 3. Data and descriptive statistics

### 3.1. Data sources

This paper uses data from a stratified representative sample of workers who were continuously sick-listed for more than eight weeks. The sample comprises 1,393 persons who ended their sick leave between January 1 and July 31, 2006[3]. The data was collected primarily to describe the municipalities' follow-up activities and their effects on the labour market attachment of the long-term sick-listed (Høgelund, et al. 2008). The

study used sick leave cases longer than eight weeks because most case management activities happen after the eighth week of sick leave and because the lion's share of sick leave spells end before the eight week. Thus the sampling procedure ensures a sufficient number of long-lasting sick leave cases where case management activities and employer-established workplace accommodations are present in the data. However, without sick leave cases shorter than nine weeks, our estimates of the effect of workplace accommodations on the subsequent employment duration may not be valid for sick-listed workers with short sick leave durations.

Using a national register of closed sickness benefit cases, we drew the sample in 39 municipalities that resemble the 271 Danish municipalities for size and geographical location. We contacted the sick-listed workers during March–May 2007, on average 19 months after their first day of sick leave (and on average 10 months after payment of sickness benefit ended). We obtained telephone interviews with 987 persons, giving a response rate of 71. We exclude 101 persons who were not wage earners at the beginning of the sick leave, 71 persons with missing information on the dependent variables, and 6 persons with missing information on the covariates. The remaining 809 persons constitute our analytical sample.

We matched the survey data to register information from Statistic Denmark's 'Integrated Database for Labour Market Research' and 'the Database of Health Care Services'. These databases contain information about socio-demographic characteristics, previous labour market attachment, and the number of visits to both general practitioners and specialists before the sick leave.

### 3.2. Dependent variables

Our empirical model comprises two durations. The first duration lasts from the first day of sick leave until returning to work for (1) the current employer with workplace accommodations, (2) the current employer without workplace accommodations, and (3) a new employer. We define 'work' as ordinary work or *flexjob* employment[4]. We treat sick-listed workers entering the disability benefit program as right-censored cases at the moment they are awarded disability benefit[5]. For sick-listed workers resuming work, the second duration lasts from the date of returning to work until the employment ends.

We measure workplace accommodations in four questions. The respondents were asked if (and if so, when) their current employer established (1) reduced working hours, (2) a new job on ordinary conditions, (3) a new job on special and less demanding conditions, and (4) adaptations in terms of special equipment or office remodelling. To assess the effect of workplace accommodations, we estimate two models. The first model includes a dummy variable that measures whether the sick-listed worker returned to accommodated work, i.e. respondents answered yes to at least one of the four questions. The second model comprises dummy variable for each of the four types of accommodations[6].

Five hundred eighty-nine sick-listed workers (73 per cent) returned to work. Table 1 shows that 26 per cent returned to work for the current employer with workplace accommodations, 28 per cent returned to the current employer without workplace accommodations, and 19 percentages points returned to a new employer. In other

**Table 1 Descriptive statistics for dependent variables**

| | Mean | Std. dev. |
|---|---|---|
| Not returning to work | 0.272 | 0.445 |
| Returning to work with current employer in accommodated job | 0.263 | 0.441 |
| Returning to work with current employer without accommodations | 0.279 | 0.449 |
| Returning to work with new employer | 0.185 | 0.389 |
| Duration until returning to work with current employer in accommodated job[a)] | 5.446 | 3.635 |
| Duration until returning to work with current employer without accommodations[b)] | 5.270 | 3.709 |
| Duration until returning to work with new employer[c)] | 9.967 | 6.442 |
| Employment duration[d)] | 4.955 | 4.463 |
| Reduced working hours, current employer[e)] | 0.363 | 0.481 |
| New job, current employer[f)] | 0.167 | 0.373 |
| Light duties, current employer[g)] | 0.150 | 0.358 |
| Adaptations, current employer[g)] | 0.132 | 0.338 |

a): n = 213, b): n = 226, c): n = 150, d): n = 110, e): n = 435, f): n =432 , g): n =433 , h): n = 433.

words, 54 per cent of the sick-listed workers returned to the current employer with or without workplace accommodations, and 46 per cent of the sick-listed workers adapted to the onset of their disability by either changing employer or leaving the labour force.

The most commonly workplace accommodation is reduced working hours. Among those who returned to work with their current employer 36 percentage had their hours reduced. The sick-listed workers less often received workplace accommodations in terms of a new job (17 per cent), a light duty job (15 per cent), or adaptations as special equipment or rebuilding of the office (13 per cent).

### 3.3. Explanatory variables

We include three health measures and eight socio-demographic covariates in the analysis. One health measure is a dummy variable that equals 1 if the worker was sick-listed because of mental health problems, and 0 in all other cases. Another variable measures the number of visits to general practitioners the year preceding the current sick leave[7]. A third variable measures self-rated pain intensity on a scale from 1 (no pain) to 10 (pain as bad as could be). This variable was measured at the interview, i.e. after the sick-listed workers returned to work, which may introduce reverse causality. Therefore, we include pain intensity only in the employment equation. Furthermore, as a robustness check, we re-estimate our model without pain intensity.

The socio-demographic covariates comprise sex, age, cohabitation status, educational attainment, seniority in current job, number of workers in the current company, and a dummy variable that equals 1 if the current company is publicly owned and 0 in all other cases. We measure age in three dummy variables, indicating whether the sick-listed worker was under 45 years, 45 to 55 years, or above 55 years at the beginning of the sick leave.

We also include a measure of previous employment experience (years employed since 1964) in the equation of the employment duration. We assume that previous employment experience is a measure of general labour market skills and, therefore, that the variable significantly increases the employment duration. We do not include previous

employment experience in the return-to-work durations, because it is highly correlated with company-specific seniority and our data do not allow us to estimate the effect of the two variables simultaneously. Similarly, we include previous employment experience in the employment duration, but we do not include seniority. To improve the estimation efficiency of the equation of the employment duration, we exclude highly insignificant variables from this equation.

The variables are as follows: type of health problem, pain intensity, seniority, and number of workers are survey variables, and the other variables are based on register data. Table 2 displays descriptive statistics of the explanatory variables.

### 3.4. Descriptive results

Figures 1 and 2, respectively, show the empirical hazard rates of returning to work and of ending the return-to-work employment. The hazard rate of returning to the current employer is very high at the beginning of the sick leave spell. Thus the hazard rate of returning to both accommodated and non-accommodated work with the current employer is high during three to six months after the first day of work incapacity. From the sixth month, the hazard rate to the current employer decreases gradually until the 12th month, and hereafter it remains on a fairly constant level. The pattern of returning to work for a new employer differs from the pattern of returning to work for the current employer. The hazard rate to a new employer is almost constant throughout

**Table 2 Descriptive statistics explanatory variables**

| | Accommodated, current employer | | Not accommodated, current employer | | New employer | | Not returning to work | |
|---|---|---|---|---|---|---|---|---|
| | *Means* | *Std. dev* | *Means* | *Std. dev* | *Means* | *Std. dev* | *Means* | *Std. dev* |
| Female (yes = 1) | 0.653 | 0.477 | 0.650 | 0.478 | 0.673 | 0.471 | 0.614 | 0.488 |
| Age | 34.911 | 17.985 | 34.580 | 18.997 | 38.313** | 11.679 | 34.968 | 18.449 |
| Living with spouse (yes = 1) | 0.798** | 0.402 | 0.827*** | 0.379 | 0.680 | 0.468 | 0.705 | 0.457 |
| Primary education[a)] (yes = 1) | 0.221*** | 0.416 | 0.265*** | 0.443 | 0.320** | 0.468 | 0.436 | 0.497 |
| Secondary education[a)] (yes = 1) | 0.432 | 0.497 | 0.420 | 0.495 | 0.400 | 0.492 | 0.405 | 0.492 |
| Postsecondary education[a)] (yes = 1) | 0.347*** | 0.477 | 0.314*** | 0.465 | 0.280*** | 0.451 | 0.159 | 0.367 |
| Visits to general practitioner in the year before the sick leave | 8.230 | 7.486 | 8.177 | 7.411 | 9.487 | 7.672 | 9.227 | 8.209 |
| Mental illness (yes = 1) | 0.244 | 0.431 | 0.257 | 0.438 | 0.473*** | 0.501 | 0.291 | 0.455 |
| Previous employment experience since 1964 (years employed) | 20.140** | 9.115 | 21.482*** | 9.935 | 14.204*** | 9.138 | 17.955 | 10.414 |
| Seniority in months[b)] | 153.159* | 116.704 | 157.878** | 141.091 | 72.686*** | 89.626 | 129.312 | 137.173 |
| Company size (number of workers)[c)] | 167.905 | 619.375 | 172.847 | 679.592 | 62.079** | 122.665 | 142.580 | 375.653 |
| Public sector company (yes = 1) | 0.559* | 0.498 | 0.562* | 0.497 | 69.293 | 88.837 | 0.477 | 0.501 |

Note: Calculations based on 213 (accommodated job), 226 (non-accommodated job), 150 (new employer), and 220 individuals (not returning to work). Asterisks mark significant deviation from "Not returning to work" at a 1% level (***), 5% level (**), and 10% level.
a): 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.
b): Excluding 32 observations with missing values. c): Excluding 56 observations with missing values.

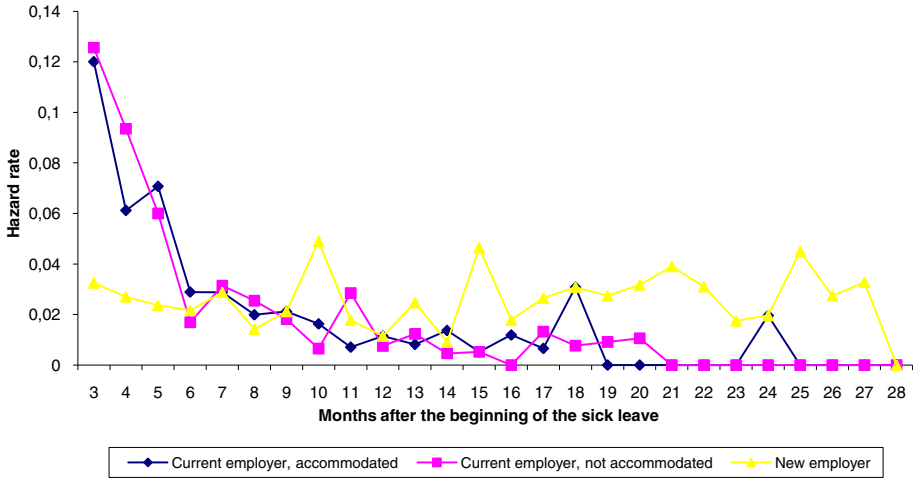


**Figure 1 Hazard rates for returning to work.** Hazard rates separately for returning to work in an accommodated job for the current employer, to work in a non-accommodated job for the current employer, and to work for a new employer.

the observation period, and compared to the hazard rate to the current employer, the hazard rate to a new employer is low during the first months and high after one year. The different return-to-work patterns may mean that the sick-listed workers first try to return to work for the current employer, and only if doing so proves impossible they try finding a new employer.

Figure 2 indicates that workplace accommodations may prolong employment durations. Thus during the first six months after returning to work for the current employer, individuals in accommodated jobs have a lower hazard rate out of employment than individuals in non-accommodated jobs. Furthermore, Figure 2 indicates that sick-listed workers who change working conditions because they change employer have shorter employment durations than sick-listed workers who change working conditions at the current employer.

## 4. The econometric model

Workers returning to work with their current employer in an accommodated job may differ from workers resuming work with their current employer in a job without accommodations. Similarly, workers returning to work with a new employer may differ from workers returning to work with their current employer. If these differences are unobserved and have a bearing on the subsequent employment duration, we cannot immediately identify the causal effect of workplace accommodations and change of employer on the employment duration. To mitigate or correct for possible selection effects, we estimate a distribution of unobserved heterogeneity.

We use a discrete mixed proportional hazard rate model (van den Berg 2001) to simultaneously estimate two events. One equation models the sick-listed workers' hazard of returning to work either with the current employer in an accommodated job, with the current employer in a non-accommodated job, or with a new employer. This equation corresponds to a series of multinomial logit model across time periods of duration[8], with three exit states for each time period. For those returning to work, another


**Figure 2 Hazard rates out of the return-to-work job.** Hazard rates separately for sick-listed workers returning to work for the current employer in accommodated jobs, in non-accommodated jobs, and for sick-listed workers returning to work for a new employer.

equation models the hazard of ending this particular employment spell. This equation corresponds to a binary logit model across time periods of new employment. The unobserved heterogeneity is captured by a discrete distribution with a finite number of mass points. This is a common approach in multivariate duration models (see e.g. Van den Berg et al. 2002). This procedure allows the random effects of the two durations to be dependent without imposing assumptions about the structure of the dependence.

We model two durations. One duration until returning to work, denoted $t_1$, and subsequently one duration of re-employment, denoted $t_2$.

The equation of the hazard of returning to work, $t_1$, is given by:

$$P(D_1(t_1) = d_1(t_1)) = \frac{\sum_{j=1}^{j=3} \exp\left(\delta_{1jt_1} + \beta_{1j}x_{1j} + \varepsilon_{1j}\right)^{1(d_1(t_1)=j)}}{1 + \sum_{j=1}^{j=3} \exp\left(\delta_{1jt_1} + \beta_{1j}x_{1j} + \varepsilon_{1j}\right)} \quad (1)$$

where $t_1$ is the time after the first day of the sick leave measured in months and where:

$$d_1(t_1) = \begin{cases} 1 & \text{if returning to accommodated work with the current employer in period } t_1 \\ 2 & \text{if returning to non-accommodated work with the current employer in period } t_1 \\ 3 & \text{if returning to work with a new employer in period } t_1 \\ 0 & \text{otherwise} \end{cases}$$

and where $1(\cdot)$ is a Boolean operator equalling one when the term inside the brackets is true and zero otherwise. In addition, $x_{1j}$ is a vector of variables affecting the hazard rate of returning to accommodated work *(j =1)*, non-accommodated work *(j = 2)* and to a new employer *(j = 3)*, and $\beta_{1j}; j = 1, 2, 3$ is a corresponding row vector of regression coefficients. The parameter $\delta_{1jt_1}; j = 1, 2, 3$ are time-specific intercept terms measuring duration dependence in the hazard rate to work, and $\varepsilon_{1j}$ are destination specific unobserved random effects. We assume that the unobserved heterogeneity is independent of observed variables and time invariant.

The equation of the hazard of ending the employment after returning to work is given by:

$$P\left(D_2(t_2)=d_2^{t_2}\right)=\frac{\exp(\delta_{2t_2}+\gamma_1 1(d_1(t_2)=1)+\gamma_2 1(d_1(t_2)=3)+\beta_2 x_2+\varepsilon_2)^{d_2(t_2)}}{1+\exp(\delta_{2t_2}+\gamma_1 1(d_1(t_2)=1)+\gamma_2 1(d_1(t_2)=3)+\beta_2 x_2+\varepsilon_2)} \tag{2}$$

where:

$$d_2(t_2)=\begin{cases}1 & \text{if ending the employment in period } t_2\\ 0 & \text{otherwise.}\end{cases}$$

and $x_2$ are observed variables with $\beta_2$ as the two corresponding row vectors of regression coefficients. The coefficient $\gamma_1$ measures the effect of having returned to work with the current employer in an accommodated job on the hazard rate out of employment. Similarly, $\gamma_2$ captures the effect of having returned to work with a new employer. The parameter $\delta_{2t_2}$ is a time-specific intercept term measuring duration dependence in the hazard rate out of the employment, and the coefficient $\varepsilon_2$ measures the unobserved effects in the hazard rate.

Following Heckman and Singer (1984) for the univariate case and van den Berg et al. (2002) for the multivariate extension, we assume that $\varepsilon_{11},\varepsilon_{12},\varepsilon_{13},\varepsilon_2$ takes on a finite number of values (mass points), the first being (0,0,0,0) and subsequently $(\bar{\varepsilon}_{111},\bar{\varepsilon}_{121},\bar{\varepsilon}_{131},\bar{\varepsilon}_{12})$, $(\bar{\varepsilon}_{112},\bar{\varepsilon}_{122},\bar{\varepsilon}_{132},\bar{\varepsilon}_{22}),\ldots$. The mass points are distributed with probability $p_{0,0,0,0}\ p_{\bar{\varepsilon}_{111},\bar{\varepsilon}_{121},\bar{\varepsilon}_{131},\bar{\varepsilon}_{12}}, p_{\bar{\varepsilon}_{112},\bar{\varepsilon}_{122},\bar{\varepsilon}_{132},\bar{\varepsilon}_{22}},\ldots$, with $\Sigma_j p_{\bar{e}_{11j},\bar{e}_{12j},\bar{e}_{13j},\bar{e}_{2j}}=1$. Both mass points and probabilities are estimated as parameters in the likelihood function. Assuming a finite number of mass points, see Frühwirt-Schnatter (2006), standard likelihood regularity conditions holds.

Denoting the multivariate discrete duration until returning to regular working hours or censoring as $T_{1i}$ and the subsequent duration of employment, $T_{2i}$ we calculate the individual contribution to the log-likelihood function as:

$$\ln L_i=\ln\left[\sum_{j=1}^{j=J} p_{\bar{e}_{j1},\bar{e}_{j2}}\prod_{t_1=1}^{T_{1i}} P\left(D_1(t)=d_1|\bar{e}_{j1}\right)^{1-d_2^{t_1}}\times\prod_{t_1=1}^{T_{2i}} P\left(D_2(t)=d_2|\bar{e}_{j2}\right)\right] \tag{3}$$

This likelihood is optimized with respect to the regression parameters in the two logit models for the time until returning to work and the time until ending the employment after returning to work, and with respect to the parameters of the discrete mixture distribution of unobserved random effects. By allowing the random effects to be correlated, the model jointly determines the selection to returning to work (with the current employer in an accommodated job and with a new employer) and the selection out of employment after returning to work. Doing so allows us to take into account potential selection effects because we condition upon them in the model, meaning that the estimates of workplace accommodations and new employer have a causal interpretation.

## 5. Findings

Table 3 shows the estimates of the simultaneously estimated hazard rate model of returning to work and of ending the employment after returning to work. In the model, we include a dummy variable measuring whether the workers returning to work for the current employer received an accommodation. A positive coefficient implies a positive effect on the hazard rate and a negative effect on the duration. Column 2, 3 and 4

**Table 3 Hazard rate model of returning to work and of ending employment after returning to work**

| | *Returning to work with:* | | | |
|---|---|---|---|---|
| | **Current employer, accommodated** | **Current employer, not accommodated** | **New employer** | **Employment duration** |
| Female (yes = 1) | −0.061 (0.217) | −0.035 (0.209) | 0.138 (0.278) | ---[d] |
| 45-55 years (yes = 1) | −0.624 (0.267)** | −0.307 (0.245) | −0.710 (0.297)** | −0.096 (0.278) |
| Older than 55 years (yes = 1) | −0.564 (0.327)* | −0.149 (0.312) | −2.311 (0.689)*** | 0.796 (0.342) |
| Living with spouse (yes = 1) | 0.453 (0.235)* | 0.660 (0.245)*** | 0.079 (0.269) | ---[d] |
| Secondary education (yes = 1) | 0.641 (0.255)** | 0.328 (0.224) | 0.372 (0.287) | ---[d] |
| Postsecondary education (yes = 1) | 1.272 (0.355)*** | 0.890 (0.291)*** | 1.065 (0.343)*** | ---[d] |
| Visits to GP before sick leave[a] | −0.166 (0.135) | −0.106 (0.127) | 0.054 (0.166) | −0.109 (0.146) |
| Mental illness (yes = 1) | −0.505 (0.225)** | −0.424 (0.216)** | 0.687 (0.264)*** | ---[d] |
| Pain intensity (1–10) | --- | --- | --- | 0.083 (0.040)** |
| Employment experience | --- | --- | --- | −0.029 (0.013)** |
| Seniority in months[b] | 0.225 (0.084)*** | 0.163 (0.081)** | −0.369 (0.145)** | ---[d] |
| Company size[b] | 0.009 (0.019) | 0.010 (0.018) | −0.240 (0.098)** | ---[d] |
| Public sector company (yes = 1) | 0.217 (0.218) | 0.317 (0.217) | −0.391 (0.275) | −0.322 (0.208) |
| New employer (yes = 1) | --- | --- | --- | 0.592 (0.254)** |
| Accommodation (yes = 1) | --- | --- | --- | −0.527 (0.267)** |
| Baseline, period 2[c] | −0.403 (0.214)* | −0.172 (0.212) | 0.356 (0.304) | −0.090 (0.206) |
| Baseline, period 3[c] | −0.931 (0.362)*** | −0.837 (0.268)*** | 0.988 (0.439)** | --- |
| Baseline, period 4[c] | −1.387 (0.624)** | −1.321 (0.495)*** | 1.718 (0.590)*** | --- |
| Constant | −4.321 (1.012)*** | −4.376 (0.895)*** | −5.206 (0.640)*** | −3.707 (0.497)*** |
| Random effects | 2.342 (0.947)** | 2.325 (0.808)*** | 2.974 (0.597)*** | 0.046 (0.437) |
| Fraction with random effect | 0.541 | 0.541 | 0.541 | 0.541 |

Note: N = 809. The hazard rate models are estimated simultaneously. See Table 2 for more information about the variables. S.E. between brackets. Significance levels: ***1%, **5%, *10%. All equations include a dummy variable (not shown) that equal 1 when information about company size (56 persons) is missing. The return-to-work equations also include a dummy variables (not shown) that equal 1 when information about seniority (32 persons) is missing. a): Multiplied with 100. b): Multiplied with 10. c): Baseline hazard periods, accommodated work: period 1: 3 months, period 2: 4–5 months, period 3: 6–8 months, period 4: >9 months. d): The variable was excluded from the model because it was highly insignificant. Baseline hazard periods, non-accommodated work: period 1: 3 months, period 2: 4 months, period 3: 5–7 months, period 4: >8 months. Baseline hazard periods, new employer: period 1: 3–5 months, period 2: 6–9 months, period 3: 10–14 months, period 4: >15 months. Baseline hazard periods, employment duration: period 1: 1–7 months, period 2: >8 months.

contain the estimates of the hazard rate model of returning to work either with the current employer in an accommodated job, the current employer in a non-accommodated job, or a new employer. Column 5 depicts the estimates of the hazard rate model of ending the employment, after the sick-listed workers have resumed work.

### 5.1. The selection to work

The findings suggest a strong selection of sick-listed workers into work. The selection is influenced by both observed and unobserved variables. First, overall, workers under

the age of 45, those with a secondary education, and (particularly) those with a postsecondary education, have a high hazard rate to all three types of work.

Second, age and education appear to be more important for returning to work both with the current employer in an accommodated job and with a new employer than for returning to work with the current employer in a job without accommodations. For example, the coefficient of age over 55 years is −0.564 in the equations of returning to work with the current employer in an accommodated job and −2.311 in the equations of returning to work with a new employer, whereas the coefficient is −0.149 in the equation of returning to work with the current employer without accommodations.

Third, some variables have a different effect on the hazard to work for a new employer and on the hazard to work with the current employer. Thus seniority increases the hazard to work with the current employer but reduces the hazard to work with a new employer. This finding supports company-specific human capital (long seniority) being valuable to the current employer increasing the chance that a sick-listed worker stays with the current employer. In contrast, company specific human capital may not have the same value to a new employer. Therefore, the sick-listed worker's reservation wage may exceed the wage offer from a new employer, reducing the sick-listed worker's chance of returning to work with a new employer. While mental health problems have a significant and positive effect on the hazard rate to work with a new employer, it has a negative impact on the hazard rate to work with the current employer. Compared to a sick-listed worker without mental health problems, a worker with mental health problems has approximately 37 per cent lower probability of returning to the current employer during each month of the observation period and a 99 per cent higher ability of returning to a new employer. This marked difference could mean that the causes of the mental health problems are often related to the current employer, e.g. a poor working environment or a personal conflict. In such cases, returning to a new employer may be more feasible than returning to the current employer.

Fourth, the model's unobserved heterogeneity components suggest that unobserved characteristics affect the hazard of returning to work. As mentioned in the previous section, we capture unobserved heterogeneity through a discrete multivariate discrete distribution with a finite number of mass points. As is often the case in multivariate duration models, in our estimations we identify only one mass point in addition to the reference mass point (0,0,0,0), cf. van den Berg et al. (2002). The estimated additional mass point has positive values for all four durations in the model. The additional multivariate mass point is positive, large and statistically significant for the three return to work durations. It is also positive but small and insignificant for the employment duration. The estimated mass point has a probability of fifty-four per cent, leaving the reference mass point with forty six per cent. This means that a little more than half of the sick-listed workers have unobserved characteristics that significantly increase the probability of returning to work with both the current employer (with or without accommodations) and with a new employer, because the estimated mass point is significant and positive for the three return to work hazard rates compared to the group of workers represented by the reference mass point. The effects are strong, e.g. the coefficient of returning to work with a new employer is 2.974 (with a p-value of 0.000). However, the unobserved characteristics that affect the selection into work do not affect the subsequent employment duration, as the coefficient of the random effects of the employment

duration is close to zero (0.046) and completely insignificant (p-value on 0.916). The small size and insignificance of the additional mass point for the employment duration means that there are almost no differences in the effect of unobservables on the employment duration between the those workers that have a higher versus a lower hazard rate of returning to work. Consequently, the estimations of the employment duration would have yielded almost the same results had we used a single-spell hazard rate model without random effects instead of a simultaneously estimated hazard rate model with random effects. This result may seem surprising and we return to the credibility of our estimated mass point for the employment duration in the robust checks below.

### 5.2. The employment duration

Table 3 also shows that sick-listed workers returning to work with their current employer in an accommodated job have a significantly lower hazard rate out of employment than workers returning to work with their current employer in a job without accommodations. Thus the coefficient of workplace accommodations is negative (−0.527) and significant at a 5 per cent level (p-value of 0.049), meaning that the workers in an accommodated job have a 41 per cent lower probability each month of ending their employment than workers without accommodations.

Furthermore, those returning to work with their current employer in an accommodated job on average also have significantly lower exit rates than those returning to work with a new employer. Indeed, workers returning to their current employer *without* accommodations also have a significantly lower exit rate than those returning to a new employer; i.e., the coefficient of the variable of new employer (0.592) is significant at a 5 per cent level. Put differently, the sick-listed workers returning to work with a new employer terminate their employment much more quickly than those returning to work with their current employer. This finding supports the hypothesis that the job match between workers with a new employer is of poorer quality than the match between workers remaining with their current employer.

Table 4 shows the coefficients of a model with a dummy variable for each of the four types of workplace accommodations the workers may receive, i.e. reduced working hours, a new job, light duties, and adaptations in terms of equipment or office remodelling.

Among the four types of workplace accommodations, a reduction in the working hours and special equipment or office remodelling have the biggest effects on the employment duration. Both of these variables reduce the hazard rate of ending employment with 38 per cent. However, both variables are insignificant at a 10 per cent level (p-value of 0.130 and 0.328, respectively). The other types of accommodations (a new job and light duties) are insignificant, with p-values of 0.960 (new job) and 0.555 (light duty).

Our finding that accommodations increase employment durations, cf. Table 3, is in line with previous studies (Burkhauser et al. 1995; Campolieti 2005). In contrast, the effects of several of the other covariates differ from the effect found in previous studies. For example, Campolieti (2005) finds that sex, cohabitation status, and educational attainment have a significant impact on the employment duration. These covariates are completely insignificant in our analyses (and, therefore, we exclude them from our final specification).

**Table 4 Hazard rate model of returning to work with four types of workplace accommodations and of ending employment after returning to work**

| | *Returning to work with:* | | | |
|---|---|---|---|---|
| | **Current employer, accommodated** | **Current employer, not accommodated** | **New employer** | **Employment duration** |
| Female (yes = 1) | −0.061 (0.217) | −0.035 (0.210) | 0.138 (0.278) | ---[d] |
| 45-55 years (yes = 1) | −0.624 (0.267)** | −0.307 (0.245) | −0.710 (0.297)** | −0.113 (0.280) |
| Older than 55 years (yes = 1) | −0.564 (0.327)* | −0.149 (0.312) | −2.311 (0.689)*** | −0786 (0.342)** |
| Living with spouse (yes = 1) | 0.453 (0.236)* | 0.660 (0.245)*** | 0.079 (0.269) | ---[d] |
| Secondary education (yes = 1) | 0.641 (0.255)** | 0.328 (0.224) | 0.372 (0.287) | ---[d] |
| Postsecondary education (yes = 1) | 1.273 (0.355)*** | 0.889 (0.291)*** | 1.065 (0.343)*** | ---[d] |
| Visits to GP before sick leave[a] | −0.166 (0.135) | −0.106 (0.127) | 0.054 (0.166) | −0.100 (0.146) |
| Mental illness (yes = 1) | −0.505 (0.225)** | −0.423 (0.216)** | 0.687 (0.264)*** | ---[d] |
| Pain intensity (1–10) | --- | --- | --- | 0.092 (0.040)** |
| Employment experience | --- | --- | --- | −0.030 (0.013)** |
| Seniority in months[b] | 0.225 (0.083)*** | 0.163 (0.081)** | −0.370 (0.145)** | ---[d] |
| Company size[b] | 0.009 (0.019) | 0.010 (0.018) | −0.240 (0.098)** | ---[d] |
| Public sector company (yes = 1) | 0.217 (0.218) | 0.317 (0.217) | −0.391 (0.275) | −0.329 (0.210) |
| New employer (yes = 1) | --- | --- | --- | 0.573 (0.251)** |
| Reduced working hours (yes = 1) | --- | --- | --- | −0.476 (0.314) |
| New job (yes = 1) | --- | --- | --- | 0.021 (0.424) |
| Light duties (yes = 1) | --- | --- | --- | −0.273 (0.463) |
| Other adaptations (yes = 1) | --- | --- | --- | −0.471 (0.481) |
| Baseline, period 2[c] | −0.403 (0.214)* | −0.172 (0.212) | 0.356 (0.304) | −0.086 (0.206) |
| Baseline, period 3[c] | −0.931 (0.362)*** | −0.837 (0.268)*** | 0.988 (0.439)** | --- |
| Baseline, period 4[c] | −1.387 (0.623)** | −1.322 (0.496)*** | 1.718 (0.590)*** | --- |
| Constant | −4.322 (1.012)*** | −4.375 (0.896)*** | −5.206 (0.640)*** | −3.720 (0.498)*** |
| Random effects | 2.343 (0.946)** | 2.324 (0.809)*** | 2.974 (0.596)*** | 0.046 (0.441) |
| Fraction with random effect | 0.541 | 0.541 | 0.541 | 0.541 |

Note: N = 779 The hazard rate models are estimated simultaneously. See Table 2 for more information about the variables. S.E. between brackets. Significance levels: ***1%, **5%, *10%. All equations include a dummy variable (not shown) that equal 1 when information about company size (56 persons) is missing. The return-to-work equations also include a dummy variables (not shown) that equal 1 when information about seniority (32 persons) is missing. a): Multiplied with 100. b): Multiplied with 10. c): Baseline hazard periods, accommodated work: period 1: 3 months, period 2: 4–5 months, period 3: 6–8 months, period 4: >9 months. d): The variable was excluded from the model because it was highly insignificant. Baseline hazard periods, non-accommodated work: period 1: 3 months, period 2: 4 months, period 3: 5–7 months, period 4: >8 months. Baseline hazard periods, new employer: period 1: 3–5 months, period 2: 6–9 months, period 3: 10–14 months, period 4: >15 months. Baseline hazard periods, employment duration: period 1: 1–7 months, period 2: >8 months.

### 5.3. Robustness checks

We included self-rated pain intensity in our model, which may introduce reverse causality. To get an impression of whether self-rated pain intensity bias the estimated effect of workplace accommodations, we re-estimate the model in Table 3 without pain intensity. When we exclude pain intensity from the model, the coefficient of workplace accommodations decreases only slightly (from −0.527 to −0.500), indicating that the possible endogeneity of pain intensity has a very limited impact on the estimate of workplace accommodations.

The random effects in our mixed proportional hazard rate model mitigate or correct for unobserved heterogeneity. The insignificant coefficient of the random effects of the employment duration suggests that the unobserved heterogeneity is negligible. As a test of the validity of this assumption, we re-estimate the model in Table 3, adding covariates of pre-disability labour market outcomes (cf. Heckman et al. 1999). If our model does not fully account for unobserved differences, we should expect that the past labour market outcomes have a significant impact on the employment duration after returning to work. We include four covariates. One dummy variable measures whether the worker previously (i.e. before the present sick leave) was sick-listed for at least two months. Another dummy variable measures whether the worker was unemployed at any time during the 24 months preceding the present sick leave. We also include the number of pre-sick leave working hours and the duration from the beginning of the present sick leave until returning to work. We expect that individuals with previous periods of long-term sick leave, previous periods of unemployment, few working hours, and long return-to-work durations have a relatively limited employment capacity, for example, because they have limited human capital or suffer from relatively serious health problems. All four covariates are insignificant, with p-values between 0.182 and 0.838 (see Table 5), supporting the assumption of no significant unobserved heterogeneity in the equation of the employment duration. However, ultimately, we cannot be sure that our model takes all unobserved heterogeneity into account, so interpretation should be cautious.

## 6. Conclusion

Previous research shows that workers who acquire a work disability may either change employer or stay with their current employer in an accommodated job. Previous research also shows that workplace accommodations increase the employment duration of disabled workers and that change of employer reduces wages and the probability of

**Table 5 Selected results from four hazard rate models of ending employment after returning to work. Each model includes one additional measure of past labour market outcomes**

| | Employment duration |
|---|---|
| **Model 1** | |
| Accommodation (yes = 1) | −0.541(0.257)** |
| Previously sick-listed 2 months or more (yes = 1) | −0.235(0.230) |
| **Model 2** | |
| Accommodation (yes = 1) | −0.549(0.256)** |
| Unemployed during the 24 months preceding the present sick leave (yes = 1) | −0.096(0.470) |
| **Model 3** | |
| Accommodation (yes = 1) | −0.543(0.256)** |
| Pre-sick leave working hours | 0.019(0.014) |
| **Model 4** | |
| Accommodation (yes = 1) | −0.554 (0.262)** |
| Duration until returning to work | −0.012 (0.046) |

Note: N = 809. Same models as in Table 3, except for 'return-to-work duration'. S.E. between brackets. Significance levels: *** 1%, ** 5%, * 10%.

receiving accommodations. This paper builds on these findings but focuses on how job changes affect the employment duration of long-term sick-listed workers.

We use combined survey and register data about of 809 workers who were continuously sick-listed more than eight weeks. Using a joint proportional mixed hazard rate model, we simultaneously estimate two durations. The first duration concerns the time until returning to work in either an accommodated job with the current employer, a non-accommodated job with the current employer, or a job with a new employer. The second duration comprises the duration of the employment after returning to work.

Providing new evidence about labour market outcomes following a return to work with a new employer, we find that sick-listed workers returning to work with a new employer have shorter employment durations than those returning to work with the current employer. This finding is in line with previous studies suggesting that a change of employer reduces wages (Campolieti and Krashinsy 2006) thus supporting the hypothesis that the job match between a (previously) sick-listed employee and a new employer relatively often is suboptimal, leading to separation.

Consistent with previous studies, we find that workplace accommodations increase the subsequent employment duration. In other words, this study suggests that a reduction of job demands increases subsequent employment durations.

### 6.1. Highlights

- We study sick-listed workers' employment durations after they have returned to work
- Workplace accommodations increase the employment duration with current employer
- Sick-listed workers changing workplace have relatively short employment durations

## Endnotes

[1]Several epidemiologists have studied how workplace-based interventions affect disabled workers' probability of returning to work, for literature reviews, see van Oostrom et al. (2009) and Palmer et al. (2012). In contrast to our study, these studies do not assess the labour market attachment of disabled workers after they return to work. Furthermore, the majority of these studies concern specially designed interventions designed by medical or occupational experts, who instruct trained professionals in how to implement the specific program, and, therefore, the results may not be generalizable.

[2]This assumption is supported by the fact that the first court decision about the European Union directive on equal treatment in employment and occupation was made in October 2007, almost three years after the ratification.

[3]Using such a sampling window may lead to under-sampling of very long sick leave cases, because it is less likely that long-lasting cases end during the seven-month window than cases with a short duration end during this period. This potential bias is apparently limited. Using the same sampling scheme, when Høgelund et al. (2003) compared the distribution of the sick leave duration in the sample with the distribution in the population of all Danish sick leave cases ending during a one-year period, they found that the two distributions were similar.

[4]Ideally, we would like to estimate a model with *flexjob* as a separate exit state. However, with only fifty-six sick-listed workers in our sample returning to work in a *flexjob*, we cannot identify the random effects distribution.

[5]As receipt of a disability benefit is an absorbing exit state preventing people from returning to work at a later point, we should estimate a random effects competing risk model with disability benefit as a fourth exit state. Unfortunately, we were unable to identify the random effect distribution for this model.

[6]Thirty persons did not answer all four accommodation questions. We include these persons in the analysis of the overall effect of workplace accommodations but exclude them from the analysis of the effect of each of the four accommodations.

[7]We included a similar measure, the number of visits to medical specialists the year before and the current sick leave, in preliminary versions of our model. As the variable did not significantly contribute to the estimation of the outcome variables, we excluded the variable from the estimations.

[8]In principle, when discrete durations represent underlying latent continuous durations, the discrete observed durations should follow a c-log-log distribution; see Høgelund et al. (2010). However, with many discrete time points the difference between the c-log-log and the logit becomes immaterial.

**Competing interests**
The IZA Journal of Labor Policy is committed to the IZA Guiding Principles of Research Integrity. The authors declare that they have observed these principles.

**Acknowledgements**
The authors wish to thank Dean Lillard, participants at the seminars held by Aarhus Business School (March 10, 2009), the Danish National Centre for Social Research (May 11-12, 2009), the University of Southern Denmark (September 9, 2009), and participants at the session 'Impact of unstable employment' at the 8th European Conference on Health Economics in Helsinki (7-10 July 2010) for helpful comments. We also thank Natalie Reid for editorial assistance. This research was supported by the Danish Ministry of Employment.

Responsible editor: Juan F. Jimeno

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Received: 23 December 2013 Accepted: 30 April 2014
Published: 07 Aug 2014

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10.1186/2193-9004-3-17
**Cite this article as:** Høgelund and Holm: **Worker adaptation and workplace accommodations after the onset of an illness.** *IZA Journal of Labor Policy* 2014, 3:17