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RESEARCH DEPARTMENT OF EMPLOYMENT AND LABOUR MARKET ISSUES

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Employers' Importance for the Return to Work of Sick-Listed Workers

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The study

Using matched survey-register panel data about 419 long-term sick-listed workers and their sick leave employer, this paper assesses how sick-listed workers react to employers' threat of dismissal. We simultaneously estimate the duration until the sick-listed worker either separate from the pre-sick leave employer or returns to work for this employer, and, for individuals who separate, the duration until the sick-listed worker returns to work for new employer. To capture the effect of the threat of dismissal, we use a structurally-dependent-competing-risks model, allowing the risk of separation to affect the risk of returning to work. Controlling for unobserved heterogeneity, we cannot identify that employers' dismissal threat affects the sick-listed workers' chance of returning to work.

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Contents

1. Introduction

Researchers generally accept that the employer is one of the most important agents influencing the labour market attachment of sick-listed workers. Despite this, limited empirical evidence exists about how important employers are, and how they influence the return to work process. So far research has mainly focused on the influence of individual characteristics as health and socio-demographic characteristics, and of economic incentives, vocational rehabilitation, medical treatment, and job characteristics as occupation and job demands (for reviews see Krause, et al., 2001; Høgelund, 2003). Studies of company characteristics and employer behaviour are sparse, yield contradictory findings, and often they provide no clue as to the causal mechanisms between employer conditions and the return to work of sick-listed workers (Krause, et al., 2001). This paper aims to cast additional light on the importance that employers have for the return to work of sick-listed workers.

The employer's decision to either dismiss or retain a sick-listed worker may influence a sick-listed worker's future labour market attachment. Cleary, dismissal may reduce sick-listed workers' probability of returning to work for the pre-sick leave employer. On the other hand, this effect may be spurious, meaning that only sick-listed workers with a negligible return-to-work potential are dismissed. Furthermore, dismissal may increase sick-listed workers' chance of returning to work for a new employer, because protection against dismissal may reduce the sick-listed workers search for a new job. The sparse empirical findings are inconclusive. While an American study suggests that dismissals reduce injured workers' probability of returning to work (Galizzi and Boden, 2003), a Danish study found that separation had no effect on long-term sick-listed workers' probability of returning to work for the pre-sick leave employer, and a weak positive effect on the probability of returning to work for a new employer (Høgelund and Holm, 2005).

We argue that the possible impact of dismissals on disabled workers' future labour market attachment only makes up half of the story. Apparently, previous research has not considered how employers' threat of dismissal affects sick-listed workers' behaviour. That is, does the risk of dismissal promote the return to work of long-term sick-listed workers?

To test the existence of such a threatening effect and of other employer-related variables, we use combined survey and register panel data of 419 long-term sick-listed workers. Controlling for observed and unobserved heterogeneity, we cannot identify that employers' dismissal threat affects the sick-listed workers' chance of returning to work. We also find that sick-listed workers' risk of separation from the pre-sick leave company increases with company size and that

those workers from companies with an increasing work force are more likely to return to work than sick-listed workers from stagnating companies.

2. Employer characteristics and return to work

An overwhelming number of studies have investigated how individual characteristics influence sick-listed workers chance of returning to work (for recent reviews see Krause et al., 2001; Høgelund, 2003). Much fewer studies have assessed the importance of company policies, dismissals and employer characteristics.

Characteristics related to companies' organisational structure in the shape of company ownership and sizes have been found to influence the likelihood of returning to work. Several studies found that private ownership reduces the time off work (e.g. Cheadle et al., 1994; Galizzi and Boden, 1996; Infante-Rivard and Lortie, 1996). The findings about company size are contradictory. While some studies found that sick-listed workers return to work more quickly when company size is large (Aarts and Jong, 1992; Hunt and Habeck, 1993; Cheadle et al., 1994; Oleinick, Gluck, Guire, 1996; Galizzi and Boden, 1996), other studies found the opposite effect (Dasinger et al., 2000, Krause et al., 2001). We follow this line of research by studying the importance of company ownership, company size, and changes in company size.

Some studies have investigated whether companies' sick leave and personnel policies influence the time off work (Hunt and Habeck, 1993; Nassau, 1999; Amick III et al., 2000; Lund and Csonka, 2003). These studies suggest that the existence of company policies reduce sick leave durations. However, these studies fail to take account of selection problems: the effect of company policies might be spurious because healthy persons tend to work in companies with good sick leave and personnel policies. Aarts and de Jong (1992) used two-stage estimation to take account of selection problems. Their findings support the importance of 'consultancy policies' providing the workers with opportunities to influence the planning and organisation of every day work activities. Companies with consultancy policies had lower rates of workers enrolled in the disability benefit programme, which in turn increased the long-term sick-listed workers' likelihood of returning to work. However, the study does not support the influence of medical guidance and job adaptation policies.

In this paper we use a random effects hazard rate model to adjust for possible endogeneity of company policies. We exploit company-based register data to construct various measures of

companies' hiring and firing policies, which in turn enables us to investigate how these policies influence long-term sick-listed workers' return-to-work chances.

To shed light on the importance of employers' behaviour, researchers have also studied how employers' dismissal of sick-listed workers affects their chance of returning to work (Veerman and Palmer, 2001; Høgelund, 2002; 2003; Galizzi and Boden, 2003; Høgelund and Holm, 2005). Three of the studies controlled for unobserved differences between dismissed workers and workers who were not dismissed (Høgelund, 2003; Galizzi and Boden, 2003; Høgelund and Holm, 2005). These studies yield contradictory findings. For example, Høgelund and Holm (2005) found that separation had no effect on Danish long-term sick-listed workers' probability of returning to work with the pre-sick leave employer, and a weak positive effect on the chance of returning to work for a new employer. In contrast, Galizzi and Boden (2003), who studied American workers injured longer than one month, found that those who returned to work for a new employer had lower return-to-work rates than those who returned to work for the pre-injury employer.[1]

While previous studies have investigated how the observed dismissal of a sick-listed worker affects the worker's subsequent labour market pattern, we also study how the threat of dismissal influences sick-listed worker's probability of returning to work. In other words, do employers indirectly – through the potential dismissal of the sick-listed worker – increase the speed at which the sick-listed worker resumes work? To study this aspect we use a simultaneously estimated hazard rate model, using the estimated hazard rate of separation as a time-varying covariate in the estimation of the sick-listed workers' hazard rate of returning to work for the pre-sick leave employer.

[1] In contrast to Høgelund and Holm (2005), the studies of Galizzi and Boden (2003) and Høgelund (2003) may be plagued by selection problems. Both studies used the instrumental variables approach and a two-stage estimation: the predicted probability of separation from the pre-injury employer was used as an explanatory covariate in a hazard rate model of returning to work. This approach may be problematic. Unless separation takes place at the very beginning of the sick leave spell workers who separate from the pre-injury employer are *par see* unable to have short return-to-work durations. In other words, the predicted probability of separation is not exogenous to returning to work.

3. The Danish sick leave policy

The public sickness benefit program covers wage earners, the self-employed and unemployed persons. The program covers sick leave resulting from both work-related circumstances and non-work-related circumstances. The benefit equals the pre-sick leave wage with a maximum amount corresponding to the maximum unemployment benefit. Many employers continue to pay wage during sick leave, i.e. they pay the difference between the wage and the sickness benefit. Workers can normally receive sickness benefits for up to 12 months within a period of 18 months.

Municipalities are obliged to assess all cases of sickness benefits within eight weeks after the first day of the sick leave. Thereafter they must make follow-up assessments every fourth week in complicated sickness cases and every eighth week in uncomplicated cases.[2] At follow-up the municipal case worker must verify that the sick-listed individual is entitled to receive the benefit, i.e. suffers from a medical condition, and, if necessary, establish activities to improve or retain the sick-listed worker's labour market attachment. The assessment must rely on updated medical, social, and vocational information, and it should take place in cooperation with the sick-listed worker, the employer, medical experts, vocational rehabilitation institutions, and other relevant agents.

To promote a swift return to work, the municipal case worker can initiate various vocational rehabilitation measures and vocational services. These measures include reduced working hours with supplementary sickness benefits, financial support for workplace adaptations and aids, testing of work ability, job counselling, wage-subsidised job training, and educational measures.

If the sick-listed worker – despite medical treatment and vocational rehabilitation – cannot return to ordinary employment, the municipality may refer the sick-listed individual to a wage-subsidised job. These wage-subsidised jobs are tailored to the sick-listed individual's working capacity. Sick-listed workers with permanently reduced working ability who are unable to work in a wage-subsidised job are eligible to disability benefits.[3]

Municipalities have strong incentives to apply active measures that facilitate labour market reintegration. In addition to the sickness benefit program, municipalities are responsible for the administration of social assistance, vocational rehabilitation, disability benefit, and a wage subsidy program. Municipalities receive partial state reimbursement for these benefits with a higher

[2] During the observation period, municipalities had to perform follow-up assessments every 13 weeks.
[3] At the time of this study the law required that the applicant's earnings ability had to be permanently reduced by at least 50 percent for him or her to receive disability benefit.

reimbursement rate for active measures such as vocational rehabilitation and wage subsidies than for passive measures such as sickness benefits and, in particular, disability benefits.[4]

Employers' responsibility for sick-listed workers is relatively limited (Høgelund, 2003). Thus, employers are only responsible for the financing of sickness benefits for the first two weeks of a sick leave, while sick leave exceeding two weeks and disability benefits are financed by public authorities.[5] As the Danish protection against dismissals during sick leave is relatively limited, employers can relatively easily dismiss people on sick leave. A comparative study of private sector workers sick-listed for at least 3 months found that 50 percent of the Danish workers were dismissed compared to only 11 percent of the Dutch workers (Høgelund, 2003). It was especially easy for employers to dismiss white-collar workers during the study period: if specified in the employment contract, employers could dismiss a worker with a one-month's notice when the worker had been sick-listed for 120 days within one year.

4. Data and descriptive statistics

The data consists of a five-year panel of 419 long-term sick-listed workers combined with register data about the sick leave employers. The panel comprises information about workers who in the fourth quarter of 1995 had been continuously sick-listed for 90-120 days with low back pain, were fully work incapacitated, and between 18 and 55 years. The sample was draw from 24 municipalities in Denmark. Data has been collected on four occasions: approximately 5½ months after the first day of work incapacity, 13 months, 25 months and 56 months after the first day of work incapacity. 604 workers were approached and 514 participated in the first interview (85 percent), and 445 persons participated in the second interview (87 percent). These 445 persons, minus 26 persons with missing information on the dependent variables and covariates, constitute the sample used in the analyses.

[4] The municipalities' incentives for applying active measures rather than passive benefit awards were put in place in 1999. Before 1999, during most of the observation period, the state refunded 50 percent of all municipality benefit expenditures.

[5] During the study period, public employers were responsible for the financing of sickness benefits for the entire sick leave period.

In our analytical model, we divide the return-to-work process in two parts. The first part lasts from the onset of the sick leave until the sick-listed worker is either separated from the pre-sick leave employer or returns to work for this employer. For individuals who are separated, the second part lasts from separation until the sick-listed worker returns to work for a new employer.[6] Following this model, the competing risk duration until separation or returning to work for the pre-sick leave employer and the single risk duration until returning to work for a new employer are the two outcome durations in our analysis.

Seventy three percent of the respondents were separated from their pre-sick leave employer during the sick leave. Of these 308 persons, 84 percent were dismissed after on average 5.1 months, while 16 percent quitted themselves after on average 5.0 months. To limit the number of estimated coefficients, we do not distinguish between dismissals and quits.

In total 58 percent of the sick-listed workers returned to ordinary work (without public wage subsidies). In the first stage of the model, 26.5 percent returned to work for their pre-sick leave employer after on average 9.1 months off work. In the second stage 43.2 percent returned to work after on average 17.5 months of unemployment.[7]

The data includes information about the sick-listed workers' socio-demographic characteristics, labour market experience before the sick leave, and two health indicators. All the covariates are measured at the first interview. The socio-demographic characteristics comprise gender, age, educational attainment, and seniority with the pre-sick leave employer. One health indicator is a 10-point pain intensity scale, where 1 means "no pain" and 10 means that pain is as a strong as possible. Another health measure comprises the number of weeks sick-listed during the twelve-month preceding the present sick leave spell.[8]

[6] For the first part of our model, we only use data from the first three panels, i.e. for the first two years, because information about separations only was gathered during this period. For the second part, we use data from the complete observation period of five years.

[7] Among these 133 persons, 23 returned to work for the pre-sick leave employer and 110 returned to work for a new employer. To simplify the analysis, we do not distinguish between turning to work for the pre-sick leave employer and a new employer (both exit states are called returning to work for a new employer).

[8] We include this covariate as an instrumental variable that affects the probability of separation but not the probability of returning to work. Thus, a person who were sick-listed for many weeks during the 12 months preceding the present sick leave should have a relatively high risk of dismissal, because the Danish job-protection stipulations in many cases allowed employers to dismiss sick-listed workers when they had had 120 days of sick leave within a year, see section 3. At the same time these job-protection stipulations should not influence a sick-listed worker's probability of returning to work, except indirectly through dismissal. However, our analyses show that sick leave in the preceding year does not influence on the probability of separation, see section 6.

We also include a time-varying dummy indicator of the sick-listed worker's enrolment in vocational rehabilitation in the form of education. Thus, previous studies show that sick-listed workers' probability of returning to work decreases significantly during enrolment in education (Høgelund and Holm, 2005; 2006). To avoid the possible bias arising from such a lock-in effect, we include a time-varying dummy indicator that equals one during enrolment in education and zero otherwise. Before separation 5 percent participated in education during their sick leave, whereas after separation 37 percent participated in education during their sick leave. On average they started education 14.5 months after the first day of their sick leave and ended it 6.5 months later

In addition to individual characteristics, we use information about characteristics of the pre-sick leave employer, i.e. the plant. For each sick-listed worker we gathered information about the sick leave employer from Statistic Denmark's 'Integrated Database for Labour Market Research' (IDA). IDA covers all plants and individuals living in Denmark. All workers who are attached to a plant on the 30th of November are recorded each year. To obtain information about the composition of the employees of the sick leave plants we add data about monthly receipt of sickness benefit, unemployment insurance benefit and social assistance from Statistic Denmark's register of 'Recipient of Income Compensating Benefits'.

We calculate four covariates of the plants' hiring and firing policies. These covariates include two job-turnover measures: the number of new workers as percentages of the plant's total number workers, and the number of workers who left the plant as percentages of the plant's total number of workers. We also calculate the fraction of workers recruited from social security benefits and the fraction of workers entering a social security program after having left the plant. Both covariates concern the period between 1989 and 1994. We expect that employers who often hire workers from social security benefits are more socially responsible and therefore more inclined to retain sick-listed workers than to employers hiring already employed workers. Similarly, we assume that employers relatively often retain their sick-listed workers when the rate of separated workers entering social security programs is low.

In our final analyses we only use one of the hiring and firing covariates, because initial analyses showed that the four hiring and firing covariates are strongly correlated. Furthermore, none of the 'hiring and firing' covariates are strongly correlated with the two outcome variables, i.e. separation from the pre-sick leaves employer and returning to work for this employer. Consequently, as the fraction of workers recruited from social security benefits showed the strongest association with the two outcome variables, we include this covariate in our analysis.

In addition to the measure of the fraction of workers recruited from social security benefits, we include three company characteristics: plant ownership (publicly versus privately), the number of workers, and the growth in the number of workers (between the sick-leave year and one year before).

Information about the sick leave plants was obtained for 83 percent of the 419 individuals in the sample.[9] To limit the number of missing observations in the analyses we code a dummy variable that equals one when information about the sick leave plant is missing and zero otherwise. With this indicator variable we can test whether observations with missing information about plant characteristics behave differently from observations with plant information, while maximizing the number of observations used in the estimations.

Finally, in the estimation of the return to work of sick-listed workers who separate from the pre-sick leave employer, we include a time-varying covariate of the unemployment rate, because it is likely that the local unemployment level affects the sick-listed individuals' chances of returning to work.

Table 1 shows descriptive statistics for individual variables and plant level variables.

Table 1. Descriptive statistics

Variables	Mean	Standard deviation	Minimum	Maximum
In the estimation of separation and returning to work for pre-sick leave employer (n=419)				
Returning to work for pre-sick leave employer	0.236	0.425	0.000	1.000
Separated from pre-sick leave employer	0.735	0.195	0.000	1.000
Months until separation	3.497	3.661	1.000	24.000
Sex (female=1)	0.573	0.495	0.000	1.000
Age	39.298	9.507	18.000	55.000
Primary education[1)]	0.067	0.250	0.000	1.000
Secondary education[1)]	0.737	0.441	0.000	1.000
Tertiary education[1)]	0.196	0.397	0.000	1.000
Seniority	83.117	89.707	0.000	406.875
Ownership (public=1)	0.317	0.466	0.000	1.000
Pain intensity 1-10	5.597	2.322	1.000	10.000
Weeks sick-listed the year before the present sick leave	3.766	7.633	0.000	51.000
Yearly mean for proportion of hired workers coming from social security benefits	0.530	0.180	0.000	1.000
Number of employees (divided by 100)	2.619	7.740	0.000	67.170
Growth in number of employees[2)]	0.070	0.244	-0.333	2.083
Plant information missing	0.169	0.376	0.000	1.000
Participated in an educational measure during sick leave	0.053	0.050	0.000	1.000

[9] The attrition was caused by two circumstances. In Denmark all companies are identified through a unique company code. This code was missing or incorrect in 8 percent of our data. Furthermore, IDA is unable to properly identify certain municipal plants, e.g. homecare and childcare institutions. This problem caused 8 percent missing values.

In the estimation of returning to work after separation (n=308)				
Returning to work after separation	0.432	0.245	0.000	1.000
Sex (female=1)	0.591	0.492	0.000	1.000
Age	39.594	9.944	18.000	55.000
Primary education[1)]	0.081	0.274	0.000	1.000
Secondary education[1)]	0.744	0.437	0.000	1.000
Tertiary education[1)]	0.175	0.381	0.000	1.000
Seniority (months, divided by 100)	0.783	0.872	0.000	3.933
Pain intensity 1-10	5.916	2.215	1.000	10.000
County unemployment rate in percent	10.851	2.316	7.300	16.199
Participated in an educational measure during sick leave	0.373	0.234	0.000	1.000

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): Percentage increase between year t-1 and t (beginning of sick leave).

5. Econometric model

In this section we propose an econometric model that will allow us to investigate the effect of employer behaviour and characteristics on Sick-listed workers' probability of returning to work.

We divide the return-to-work process in two. With the first part lasting from the beginning of the sickness spell until the sick-listed worker is either separated from the pre-sick leave employer or returns to work for this employer. Individuals who return to work for the pre-sick leave employer leave our analysis when they return to work. For individuals who are separated, the second part lasts from separation until the disabled individual returns to work for a new employer.

As a novelty we allow the risk of returning to work for the pre-sick leave employer and separation to be inter-related, i.e. the risk of separation affects the risk of returning to work. This is known in the econometrics literature as structurally dependent competing risks (Rosholm and Svarre, 2002, Yu, 2006). In our context, the idea of this approach is to capture the potential tendency of workers to return faster to work for their pre-sick leave employer the higher the probability of separation. In other words, separation might induce an incentive to return to work.

Our econometric model must then capture three hazard rates: two competing and interdependent hazards rates of returning to work for the pre sick leave employer and of separation from this employer and a third hazard rate of finding a new job, conditional on separation for the pre-sick leave employer.

Basically, we extend the proportional competing risk hazard rate model by including the hazard rate of separation as an argument in the hazard rate of returning to the pre-sick leave employer (e.g. van den Berg, 2001).

We define the hazard rate of separation from the pre-sick leave employer as:

$$\lambda_s(t) = \lambda_s^0(t)\exp\left(\beta_s' x + v_s\right)$$

Where $\lambda_s^0(.)$ is a duration dependent function, capturing duration dependent features of the hazard rate. The model furthermore allows for duration independent covariates, *x*, and a random effect v_s capturing the effect of unobserved covariates.

In a similar vein, we define the hazard rate to the pre-sick leave employer:

$$\lambda_p(t) = \lambda_p^0(t)\exp\left(\beta_p' x + \varphi\lambda_s(t) + v_p\right)$$

where the arguments are defined similarly to the hazard rate of separation, except that the hazard rate of separation now enters as an argument in the duration-dependent component of the hazard rate of returning to work for the pre-sick leave employer.

We now determine the survivor function of the sick leave duration from the pre-sick leave employer. This duration might end either by separation or returning to work for the pre-sick leave employer:

$$S_1(t) = P(T \geq t \mid x, v_s, v_p) = \exp\left[-\int_0^t \sum_{j=s,p} \lambda_j(s)ds\right]$$

Next we define the hazard rate of returning to work for a new employer, conditional on separation from the pre-sick leave employer:

$$\lambda_n(t) = \lambda_n^0(t)\exp\left(\beta_n' x + \gamma_n' z(t) + v_n\right)$$

where definitions are similar to the two other hazard rates expect that the hazard rate of returning to work for a new employer also depends on a duration-dependent covariate, *z(t)*. This covariate captures a possible lock-in effect from participation in vocational rehabilitation programs (Richardson and van den Berg, 2006). Vocational rehabilitation in the shape of education is predominantly offered to long-term sick-listed workers to redirect them to new occupations. While we do not study the effect of these programmes (see Høgelund and Holm, 2006), we need to take their potential effect into account. This is necessary because almost only sick-listed workers who separate from the pre-sick leave employer participate in educational measures, cf. Table 1. Hence, a lock-in effect may potentially explain observed differences in the hazard rates of returning to work between separated and non-separated workers.

The presence of time-varying covariates makes it more complicated to derive the survivor function of the duration until returning to work for a new employer, because we also have to

incorporate the history of the time-varying covariate. Therefore, the survivor function of the duration until returning to work for a new employer is:

$$S_2(t) = P(T \geq t \mid x, Z(0,t), v_n) = \exp\left[-\int_0^t \lambda_n(s)ds \right],$$

where *Z(0,t)* is the time path of the time varying covariate *z(t)* from time *0* to *t*, see Lancaster (1990).

To capture potential duration dependence from the duration until separation we include this duration as a covariate in the hazard rate of returning to work for a new employer. This covariate could be relevant if potentially new employers use the sick leave duration and the fact that the individual was separated from the pre-sick leave employer as a screening device. However, it is not clear what effect we should expect, because long durations until separation signals that it is worthwhile to wait for the sick-listed worker compared to individuals who are separated earlier. On the other hand, long sick leave durations may also indicate that the sick-listed individual lacks work-motivation. Note also, that by allowing the unobserved heterogeneity in the different hazard rates to be correlated, we also take into account a potential selection effect from unobservable in the analysis of returning to work for a new employer.

We specify a very flexible duration dependence of all three hazard rates in terms of the piece-wise constant hazard rate model, see van den Berg (2001). This means that within, says *M*, pre-specified intervals, the hazard rate remains constant and only shifts between intervals. More formally, we have that:

$$\lambda_{jm}^0(t) = \exp\left(\tau_{jm}\right); c_{m-1} \leq t \leq c_m$$

with

$$d_m(t) = \begin{cases} 1 & \text{if } c_{m-1} \leq t \leq c_m; m = 1, 2, ..., M \\ 0 & \text{otherwise} \end{cases}$$

We can now write the survivor function of separation or returning to work for the pre-sick leave employer as:

$$\begin{aligned} S_1(t) &= \exp\left[-\int_0^t \sum_{m=1}^{m=M} d_m(t)\left(\exp\left(\tau_{sm}\right)\exp\left(\beta_s' x + v_s\right) + \exp\left(\tau_{pm}\right)\exp\left(\beta_p' x + \varphi\lambda_s(t) + v_p\right)\right)ds \right] \\ &= \exp\left[\sum_{m=1}^{m=M} \Delta_m \delta_m(t)\left(\exp\left(\tau_{sm}\right)\exp\left(\beta_s' x + v_s\right) + \exp\left(\tau_{pm}\right)\exp\left(\beta_p' x + \varphi e^{\exp\left(\beta_s' x + v_s\right)} e^{\exp\left(\tau_{sm}\right)} + v_p \right)\right)\right] \end{aligned}$$

(1)

where

$$\Delta_m = \begin{cases} c_m - c_{m-1} \text{ if } t > c_m \\ t - c_{m-1} \text{ if } t < c_m \end{cases}$$

and $\delta_m = \sum_{m=1}^{m=m^*} d_m$, $m^* = \max_{c_m<t}(m)$ and where the survivor function of returning to work for a new employer is defined in the same way as the survivor functions of separation and of returning to work for the pre-sick leave employer.

From (1) we find that the identification of the parameter φ, capturing the effect of the risk of separation on the hazard rate of returning to work for the pre-sick leave employer is obtained through the functional form and differences in baseline hazard rates between separation and returning to work for the pre-sick leave employer see Rosholm and Svarre (2002).[10]

Our survivor functions and hazard rates developed so far are conditional on the values of the unobserved heterogeneity. For estimation purposes we need to obtain unconditional survivor functions and hazard rates. To obtain these functions and rates, we use the method suggested by Heckman and singer (1984) and approximate the unknown distribution of unobserved heterogeneity by a multivariate discrete distribution and integrate out the unobserved heterogeneity by summing over all combinations of the discrete values of unobserved heterogeneity. This approach is also outlined in van den Berg (2001) and successfully applied in e.g. van den Berg et al. (2002). More specifically, we assume that each discrete outcome $u_l = \left[u_{\mathrm{s},l}, u_{\mathrm{p},l}, u_{\mathrm{n},l} \right]$ has probability p_l , $l = 1,\ldots,L$.

From this we arrive at the following log-likelihood of simultaneously observing a sick leave spell ending with either separation or returning to work for the pre-sick leave employer, and, conditional on separation, a sick leave spell ending with either returning to work for a new employer or right censoring:

$$\ln L = \sum_i \ln \sum_l \left[\lambda_n(t)^{d_n} S_2(t) \right]^{d_s + d_p} \lambda_s(t)^{d_s} \lambda_p(t)^{d_p} S_1(t) p(u_l) ,$$

where d_j, $j = s, p, n$ are dummy indicator measuring whether a return to work for the pre-sick leave employer (j=p) or separation (j=s) has occurred, and d_n is a dummy indicator measuring if a separated worker returns to work for a new employer.

[10] Further identification would be possible by exclusion restrictions and access to panel data. Unfortunately none of these options are available in this study.

6. Results

Table 2 presents the estimates of a simultaneously estimated random effects hazard rate model of separation and of returning to work for the pre-sick leave employer and of returning to work for a new employer.

From Table 2 we see that that the employer's threat of dismissal does not affect the sick-listed worker's probability of returning to work for the pre-sick leave employer, i.e. the estimated hazard rate of separation has a weak and insignificant effect.

However, as our attempt to use previous sick leave as an instrument fail, cf. that our measure of 'the number of weeks sick-listed in the year before the present sick leave' does not affect separation; the insignificant effect of separation may reflect that it is endogenous to returning to work. Thus, if our random effects do not fully account for unobserved differences between sick-listed workers who are separated and workers who are not separated, our finding may reflect that workers with a high dismissal risk have unobserved characteristics that are associated with a low return-to-work potential. Consequently, we may underestimate the effect of the dismissal threat.

Put differently, without proper identification it is very difficult to disentangle the effect of the dismissal threat (indirect effect of the observed explanatory variables) from the direct effect of the explanatory variables. Furthermore, as the random effects are identified through the failure of the model without random effect to yield a good fit to the data, given the observed explanatory variables, it eventually becomes too difficult to fit all this with the data at hand. Thus, we would expect with better data (i.e. more and/or better instruments) that we could both fit the effect of the random effects and obtain a significant effect of the threat of dismissal.

Table 2. Random effects hazard rate model of separation, of returning to work for pre-sick leave employer, and of returning to work for a new employer.

		Separation	**Returning to work, Pre-sick employer**		**Returning work, new employer**	
Female (yes=1)	0,075	0,140	-0,560	0,265**	-0,513	0,184***
Age	0,154	0,946	-2,969	1,559*	-3,810	1,106***
Educational background						
Secondary education	0,069	0,319	1,008	0,756	0,831	0,597
Tertiary education	-0,067	0,377	1,316	0,792*	1,083	0,620*
Seniority (number of months divided by 100)	-0,561	0,126***	0,484	0,154***	-0,332	0,166
Ownership (public=1)	0,008	0,173	-0,363	0,310		
Pain intensity 1-10 (divided by 10)	0,427	0,323	-3,152	0,535***	-2,143	0,427***
Proportion of hired workers from social security benefits	0,212	0,421	0,723	0,680		
Number of employees (divided by 100)	0,019	0,009**	0,002	0,017		
Growth in number of employees	0,124	0,171	0,460	0,170***		
Plant information missing (yes=1)	0,281	0,301	0,045	0,528		
Participating in education	-0,906	0,804	-0,313	0,756	2,524	0,718***
Estimated dismissal risk			0,230	1,432		
Number of weeks sick-listed in the year before the present sick leave	0,906	0,848				
Duration until separation					2,414	4,138
Unemployment level					-0,288	0,406
Baseline, 0-6 months	-5,158	1,002***	-1,649	1,139	-2,539	1,937
Baseline, 7-12 months	-4,397	0,901***	-1,102	1,128	-2,230	1,944
Baseline, 13-18 months	-3,788	0,690***	-1,987	1,178*	-2,297	1,941
Baseline, 19 months and more	-5,533	0,788***	-3,470	1,253***	-2,789	1,916
Random effects[1)]	3,764	0,658***	-1.000		1,115	1,681
Fraction of observations with random effects	0.766		0.766		0.766	

Note: N=419 in the model of separation and returning to work for pre-sick leave employer, and n=308 in the model of returning to work for a new employer. The hazard rate models are estimated simultaneously. See table 1 for further information about the covariates. Significance levels: *** significant at 1%, ** significant at 5%, * significant at 10%.
1): Due to difficulties of optimizing the log-likelihood, the mass-point with respect to return to the previous employer was fixed to -1. Grid search over possible values suggested that this is an optimal choice.

Our analysis suggests that employers' dismissal of sick-listed workers affects the sick-listed workers' subsequent labour market attachment negatively. The employers' decision to either dismiss or retain a sick-listed worker is captured in our model as we allow the hazard rate of returning to work

to dependent on whether the sick-listed individual is separated from the pre-sick leave employer. Thus, for an individual with given characteristics, the baseline hazard rate of returning to work for the pre-sick leave employer measures the probability of returning to work for sick-listed workers who are not separated from their employer. Similarly, for an individual with given characteristics, the baseline hazard rate of returning to work for a new employer measures the probability of returning to work for sick-listed workers who are separated from the pre-sick leave employer. Therefore, a comparison of the two baseline hazard rates depicts the effect of separation. Figure 1 illustrates the effect of separations on a 'standard sick-listed worker' who is separated from the pre-sick leave employer after 5 months (with all other covariates set equal to the reference category).

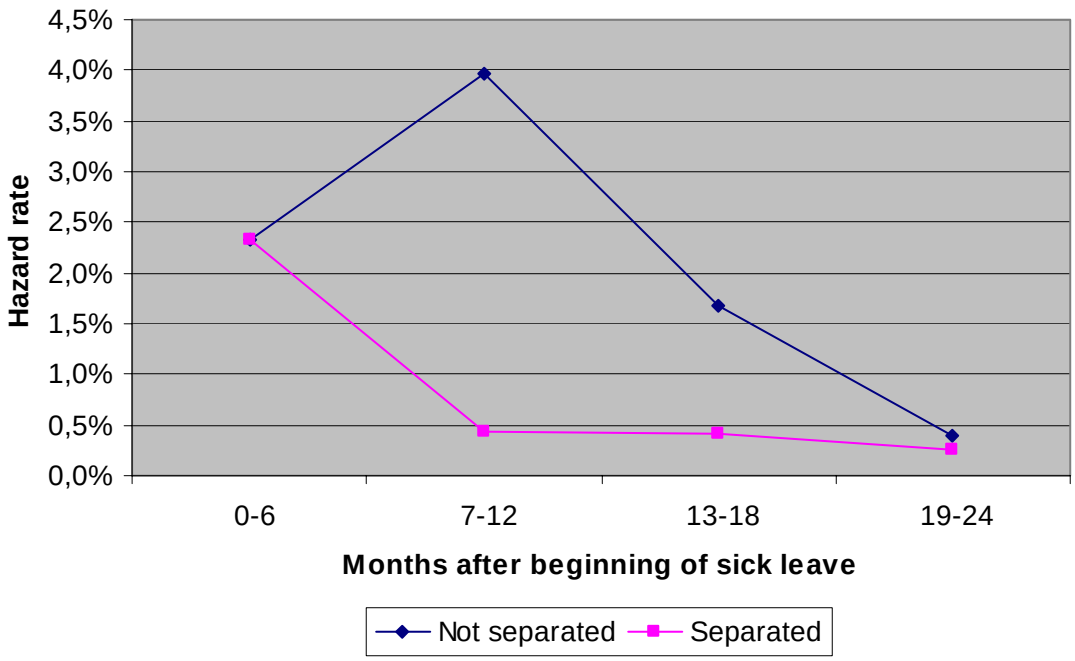

Figure 1: Illustration of the effect of separations on the hazard rate of returning to work.

From Figure 1 we see that a sick-listed worker who is not separated from the pre-sick leave employer has a higher probability of returning to work than a worker who separates from the pre-sick leave employer.

Table 2 suggests that plant size (number of employees) and plant growth (growth in the number of employees) have a bearing on the sick-listed workers' labour market attachment. Thus, sick-listed workers from big companies have a higher risk of separation than sick-listed

workers from small companies. Furthermore, the probability of returning to work for the pre-sick the employer increases with company growth, which may reflect that the possibility of returning to a new and less demanding job is better in expanding companies than in downsizing companies.

In contrast to plant size and plant growth, the other plant characteristics, ownership and the fraction of workers recruited from social security benefits, have no effect on the employer's decision to dismiss or retain the sick-listed worker. The latter finding does not support the hypothesis that some employers take on a bigger responsibility for vulnerable individuals than other employers.

Our analysis suggests that the sick-listed workers' human capital is important for their labour market prospects. Seniority has a positive effect on the probability of returning to work for the pre-sick leave employer and a negative effect on the probability of separation, indicating that experienced workers have an easier way back to work for their pre-sick leave employer than less experiences workers. However, after separation experienced workers have a lower probability of returning to work for a new employer then their less experienced peers. This may indicate that the experience of sick-listed workers is largely firm specific and of little use in the search for new employment, or in other words, the sick-listed workers' firm specific human capital seems to deteriorate when they are separated from the pre-sick leave employer. The negative effect of seniority may also indicate that experienced workers have a higher reservation wage than less experienced workers.

In contrast to firm specific human capital, general human capital in terms of educational qualifications seems to increase the sick-listed worker's chance of returning not only to work for the pre-sick leave employer but also for a new employer. Concluding on experience and educations, it seems that firm specific human capital is lost after separation, while general human capital keeps its value.

As expected we find that a high level of pain intensity reduces the sick-listed worker's chance of returning to the pre-sick leave employer. Furthermore, after separation, individuals with high levels of pain intensity have a relatively little chance of returning to a new employer.

7. Conclusion

Using matched survey and register data about 419 long-term sick-listed workers, this paper assessed how the pre-sick leave employer influences sick-listed workers' probability of returning to work. In

contrast to previous return-to-work studies, we study how the threat of dismissal influences sick-listed worker's probability of returning to work. To study this aspect we use a simultaneously estimated hazard rate model, using the estimated hazard rate of separation as a time-varying covariate in the estimation of the sick-listed workers' hazard rate of returning to work for the pre-sick leave employer.

Controlling for observed and unobserved heterogeneity, we are unable to identify that employers' dismissal threat affects the sick-listed workers' chance of returning to work. We also find that sick-listed workers' risk of separation from the pre-sick leave company increases with company size and that those workers from companies with an increasing work force are more likely to return to work than sick-listed workers from stagnating companies.

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