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Moving between Welfare Payments. The Case of Sickness Insurance for the Unemployed

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Moving between Welfare Payments. The Case of Sickness Insurance for the Unemployed†

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Abstract

This study describes the probability of transition from unemployment with unemployment insurance (UI) to sickness with sickness insurance (SI), using a grouped proportional hazard duration model and 9 years of monthly panel data. The combination of duration-limited UI and the fact that SI rights do not depend on remaining UI, creates an incentive to apply for SI, which is strongest immediately before UI expires. Estimation shows that the sickness hazard increases by around 50% when UI is about to end. Data on the sickness spells reveal that those who were given SI shortly before UI expired, are more likely to fully exploit the maximum of 12 months SI.

JEL Classifications: C41; J64; J65; I18

Keywords: Unemployment insurance, sickness insurance, unemployment duration

1. Introduction

This study describes how the probability that an unemployed person begins an insured sickness spell depends on time until Unemployment Insurance (UI) is exhausted. In Norway, an unemployed person is eligible for Sickness Insurance (SI) if he qualifies for UI and becomes too sick to (search for) work. During 2004 the Norwegian National Insurance Office paid SI to unemployed persons for a total of 1.088 million sickness days. 17271 sickness periods ended during 2004, with an average elapsed duration of 60

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days. During this year the stock of unemployed persons averaged 153300. Figure 1 illustrates the monthly rate of transition from unemployment to sickness over the period 1994-2001. It typically varied between 1.0 and 1.6%.

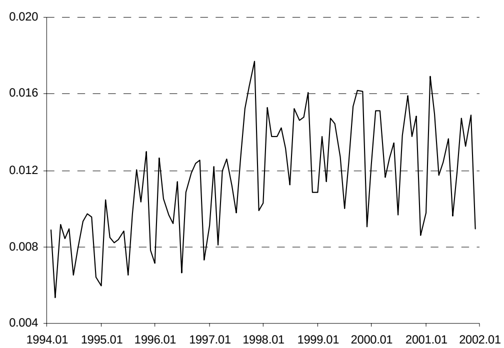

Figure 1. Empirical hazard rate in calendar time for transitions from unemployment to SI. Note that since the first spells start 1994.01, all durations are not represented till 1997.07, and the initial increase is therefore likely to be spurious.

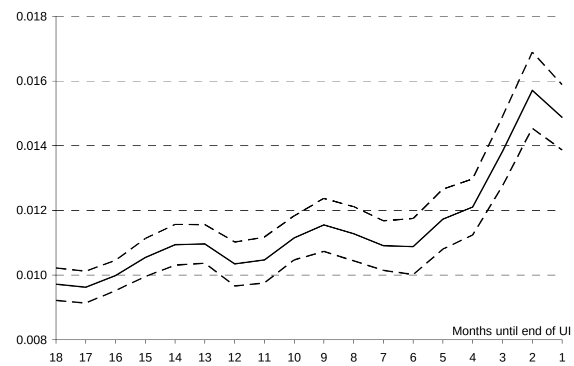

Figure 2. Empirical SB-hazard in terms of time remaining till UI are exhausted. With 95% pointwise confidence interval.

It is a key challenge for comprehensive welfare systems to avoid that users circulate between different income support programmes in a way that is not in line with the original targets of the specific programmes. In particular, the looming increases in public expenditure on pensions and health care in most western countries, have highlighted the importance of adjusting welfare systems to encourage labour force participation. Inactivity such as SI implies longer time until return to employment for the individual, and has external effects on the labour market. It is therefore important that access to SI for the unemployed is limited to the intended users. In Norway, an unemployed person is eligible for SI if he receives UI and is too sick to (search for) work, which must be verified by a doctor. However, the rules for SI and UI combine to give economic incentives to apply for SI. UI is only available for a limited duration, and SI is the same amount as UI and is paid for up to 12 months regardless of remaining UI, which is fixed during sickness. Consequently, one can prolong the total time with transfer income at the level of UI if one can convince a doctor that he should issue a statement of sickness. The data suggest that the probability of beginning a sickness spell with SI increases shortly before UI ends: 8.6% of all transitions from unemployment to sickness occur within three months of UI exhaustion, as compared to 6.9% when 4-6 months of UI remain. In terms of monthly transitions rates, the rate increases from around 1% to around 1.5% over the last six months before UI is exhausted, see Figure 2. Only two empirical studies that I know of have used econometric methods to estimate the rate of transition from unemployment to sickness using similar data. Larsson (2002) uses data for Sweden (where there is a similar SI programme) and finds that the sickness hazard increases as time till the end of UI decreases. For Norway, Røed and Zhang (2005) find a peak in the probability of transition to pooled sickness and disability in the months before UI is exhausted. Unlike these studies, this one takes advantage of a policy reform that changed the maximum duration of UI to separate the effects of remaining UI and elapsed unemployment duration on the probability of transition to insured sickness. Using a grouped proportional hazard duration model with unobserved heterogeneity the analysis arrives at a "pure" estimate of how the probability of transition from unemployment to sickness depends on remaining UI.

I leave a strictly theory-based behavioural interpretation of the results for later work. Still, the theoretical framework outlined below is useful as a background for understanding the patterns in the data. Mortensen (1977) formulated a model for analyzing the similar problem of the rate of transition from unemployment to work. He considered an unemployed person who receives UI for a limited number of periods. After UI is exhausted income is zero. The person receives job offers at stochastic intervals, but can boost the frequency of incoming job offers by putting more effort into job search. A job offer is characterized by a wage, which is strictly larger than UI measured per hour. Each period the person sets his reservation wage (the lowest wage that he will accept) and decides his level of search effort, subject to a cost of job search. The probability of finding work before UI expires decreases as UI is consumed, such that the present discounted value of being unemployed decreases. In turn, this implies that the optimal reservation wage decreases and optimal search effort increases. As a result, the rate of transition to work increases as time until UI expires decreases. It is has been established empirically that the rate of transition from unemployment to work does increase toward the end of the UI period, see Meyer (1990) for US evidence, Røed and Zhang (2003) for Norwegian data.

The increase in the rate of transition from unemployment to sickness can be analyzed within the same framework. As described in Larsson (2002), if the value of leisure relative to job search decreases in health, and health shocks arrive at stochastic intervals, then it is reasonable to think of a reservation level of illness as a parallel to the reservation wage: If health is better than the reservation level, the person will not apply for SI, but if health is worse, he will apply (time on SI is leisure time). Since the relative value of sickness increases in the illness level, the level of illness for which the value of sickness equals the value of unemployment is lower for lower values of unemployment. Therefore, the reservation level of illness will decrease as UI is consumed. If there is a cost of receiving SI, e.g. in terms of moral cost or stigma, and this cost increases with health status, we get the same result.

Like with job search, the search for alternative income sources intensifies as the individual approaches the end of UI. Search for SI consists of a visit to the doctor, and is thus a dichotomous choice. As the end of UI approaches, the probability that application (search) is profitable improves, implying that the probability of applying for SI increases, in excess of the increase due to the drop in reservation sickness. The probability that the expected return from applying for SI exceeds the cost is highest at the very end of the UI period. The day before UI expires the expected value of applying equals the probability of success times the value of beginning a period with 12 months SI with zero UI remaining, less the cost of applying. The value of not applying is the value of being unemployed without income. Since SI is only awarded if a doctor will verify that the applicant is too sick to (search for) work, the probability of an application resulting in SI may be strictly smaller than unity, and may depend (negatively) on health.

The model implies that persons with little alternative income have a higher probability of applying for SI, and perhaps a higher probability of success, if the doctor takes into consideration the impact of loss of UI on the patient when deciding whether to grant SI. I therefore explore how the effect of remaining UI varies with marital status and spouse income, and also explore how the effect of remaining UI depends on potential alternative income. In Norway, the comprehensive system of income support will pick up many of those who exhaust their UI, and some can even obtain higher income after losing UI, depending on their labour market history.

Section 2 and 3 describe the institutional arrangement of UI and SI and the data used in the analysis. In Section 4 I outline the empirical method for the analysis of unemployment durations and present the results in Section 5. Section 6 deals with the sickness spells which follow unemployment. In particular, I test whether the duration of sickness depends on UI remaining at transition to sickness. This is done using a multinomial logit model for estimating the probability of having a “short”, “medium” or “long” sickness spell. Although the estimated difference cannot be tied to any single explanation among a number of candidates, this analysis adds to the description of use of SI among the unemployed. I summarize and conclude on the analyses in Section 7.

2. Institutions

Entitlement to UI is based on previous earnings, defined as the maximum of earnings in the previous calendar year and the average over the past three calendar years. Persons who have earned more than some 7700 Euro (as of 1 May 2005) are entitled to receive UI. The amount of UI is based on an income measure which is somewhat wider than the entitlement base, including e.g. previous UI and SI. UI per year is calculated as 62.4% of the earnings base (0.24% per day for 260 days) up to an earnings threshold. Until 1997 the maximum duration of UI was 80 weeks, followed by 13 weeks quarantine and then a second 80 week period. The quarantine period could be avoided in many cases by applying for exemption, which would be granted on an individual basis according to the applicant’s merits as unemployed, but all unemployed faced the threat of losing UI. From 1997 to 2001 the regime was a straight 156 weeks (78 for those with earning below a certain threshold). In the transition to the second regime some unemployed faced 80+78 weeks UI without the intervening 13 weeks of quarantine. An unemployed person who finds work but then re-enters unemployment within one year may resume his previous UI-spell with the old duration rights, whereas the amount of UI may be re-calculated if the new income base is higher than the original one.

SI may be granted someone who has been employed for at least two consecutive weeks or receives UI, and has some illness or injury that makes him temporarily unable to work (social problems not included). The unemployed person must obtain a verification by a doctor from the first day of sickness, and SI is paid by National Insurance from the first day of sickness and for up to 12 months. The remaining number of weeks with UI is held fixed during sickness such that the person can resume the “old” UI spell. Furthermore, SI is the same amount as UI, and there is therefore no immediate pecuniary incentive to choose SI over UI.

When UI expires some unemployed will be left with the much less generous means-tested social benefits, but some are offered vocational rehabilitation (VR) and receive rehabilitation benefits (RB). Someone who exhausts the 12 months SI would typically transfer to medical rehabilitation (MR) with RB, then to VR if possible, otherwise be granted disability benefits if all options to help the person return to the labour force have been tried and failed. Unlike UI and SI, the amount of RB depends on pension points earned every year since the age of 17 (the average of the 20 best years), on marital status and spouse income, and on other household features. Pension points depend (largely) on earned income up to an upper threshold, and are projected for an assumed career until the age of 66 based on either (a) the average over the last three years, or (b) the average of the best half of the career, whichever is better. This implies that RB exceeds UI for some persons, in particular young workers with no or little previous income, and mature workers whose earnings declined in the past three years.

For those who do not expect to be granted RB or who would potentially receive lower RB than UI, the rules for UI and SI imply a pecuniary incentive to choose SI when UI expires. However, the incentive to transfer to sickness may not materialize, because SI is only granted after being diagnosed with some illness by a doctor. This barrier will depend positively on health, and may also depend on remaining time with UI. In particular, doctors decide whether an otherwise eligible person is sick enough to receive SI, and realizing that this decision has an important impact on the economic and social situation of the patient (and his family), it is likely that such non-medical criteria are part of the doctor’s decision. Westin (1990) confirms this behaviour, and it is reasonable to believe that transitions to sickness, which are not based on purely medical considerations are more common near the end of the UI period than before that.

As mentioned above, it may be costly to apply for and receive SI, in terms of moral considerations and the stigma associated with being labeled and treated as a person with a health problem. Therefore, persons with impaired health may try to delay their application for SI until UI is almost exhausted. However, delaying the transition to sickness is only possible to a limited extent, because UI recipients are obliged to be available for the labour market. If a UI recipient does not meet the requirements for job seekers, the unemployment office can withhold his UI. If health limitations seem to prevent availability for work the unemployment office will require that the person apply for SI. Although this does not rule out that some people delay their entry to sickness, there are important obstacles against doing so.

3. Data

The analyses use data obtained from Statistics Norway, which contain detailed information on all individuals in Norway 1993 to 2001. Data obtained from unemployment offices and social security registers tell us if an individual received any kind of transfers during a given month. Data on unemployment spells are recorded by unemployment offices, with information on benefits rights, amount paid, remaining weeks with UI, etc. The information is recorded at the end of each month, so spells that are shorter than one month and are not active on the "recording day" are not registered (i.e. left-truncated). Transitions to employment are identified using data on all employment spells (excluding self-employment) in both the public and private sector. I restrict unemployment spells to start after at least two months with no registration as either unemployed, recipient of SI, RB or social or disability benefits. I exclude temporarily unemployed on recall (this status is recorded explicitly) and those who enter unemployment from compulsory (draft) military service (the latter may wait to start education, without searching for work).

The analysis that follows models the probability of transition to sickness. Sickness is treated as a single state, even though one might have used the available information on medical diagnosis to split sickness into a number of states according to diagnosis groups. However, I do not do so, because decomposition by diagnosis is not of particular interest here, and because of measurement problems: Empirical research (see Mykletun et al., 2006; Westin, 1990) and anecdotal evidence, suggest that medical diagnosis in many cases does not correspond to the underlying illness. This is especially the case if both mental and physical problems are present.

Many unemployed are registered as a "partially employed" (PE) job seeker in some months during unemployment. The PE registration arises when a person has had paid work for anything between one day and every day during the month, or if he is employed less than full time and is searching for work with more hours (the unemployed reports for every day of the month whether he was in paid work). Since the person remains unemployed, or under-employed, I treat PE as part of the unemployment spell. I do not allow spells to start with a PE period, apart from a solitary first month since PE registrations some times occur when a person becomes unemployed in the middle of a month.

The sample is restricted to those aged 20 to 59 at the beginning of the spell and I end up with 460012 spells of which 26806 end with transition to sickness, see Table 1. Right censoring primarily occurs when the spell has not ended within 42 months at risk of making a transition, has not ended within the observation period, when the individual turns 60, or with transition to disability, education, or social assistance.

4. Empirical model and identification strategy

4.1 Econometric framework

The purpose of this paper is to measure the effect of time remaining with UI on the probability of transition from unemployment to SI. Given the data available, this study is concerned with describing the transition probability, providing a platform for discussing alternative behavioural explanations. This also means that the estimated patterns cannot be interpreted in terms of a particular theoretical framework, and thus cannot be given a specific behavioural interpretation. However, a satisfactory ”structural” approach would probably require information on the interplay between doctors and SI applicants, on health, and on the relative flow value from unemployment versus sickness. To my knowledge, such data are not available, and the goal of this analysis is therefore to measure the effect of interest, leaving theory-based interpretation for future work.

Table 1. Sample description

	Number	Elapsed duration (months at risk of specific transition) Mean	Std. dev.
Number of observations	3527828		
Number of spells	460012		
	Number	Mean	*Std. dev.*
Transitions			
Sickness benefits	26806	8.006	*7.183*
Labour market training programmes	90624	5.943	*5.949*
Partial employment	253538	4.816	*5.317*
Employment	167728	5.209	*5.687*
Right censored	265478	7.088	*7.885*
End of data period	27588		
Duration > 42 months	2682		
Age > 60	2218		
Starts education	26722		
Receives Social Assistance	14925		
Receives Rehabilitation or Disability Benefits	4113		
Person dies	33		
Missing variables or transition inconsistent with eligibility	4973		
Not found in registers within two months after last registration as unemployed	182224		
Distribution of characteristics at spell start		Mean	*Std. dev.*
SI or RB one or more of the 12 months before spell start		0.116	
Unemployed one or more of the 12 months before spell start		0.428	
Woman		0.483	
Age		32.078	*10.026*
Work experience*		0.521	*0.310*
Child in household		0.272	
Non-OECD country of origin		0.056	
Education 8 years or less		0.042	
Education 9-10 years		0.353	
Education 13 years or more		0.175	
Ratio UI/RB		0.834	*0.389*
Pre-unemployment income <= 2G**		0.289	
4G < Pre-unemployment income <= 6G		0.260	
Pre-unemployment income > 6G		0.108	
Married, spouse income <= 2G		0.053	
Married, 2G < spouse income <= 4G		0.052	
Married, 4G < spouse income <= 6G		0.093	
Married, spouse income > 6G		0.087	
Separated, divorced or widow		0.104	*0.302*

* Work experience is based on pension points accumulated since 1967. Measured as percentage of maximum potential experience.

** G is short for "Grunnbeløp" ("base amount"), a number which forms the base for calculating many forms of transfer income. It is adjusted yearly, 2005 it was Nkr 60059, or some 7500 Euro. Income is the amount from which UI is calculated, which is the larger of the average income (largely earned income) in the past three years, and the income in the calendar year before spell start.

The data have the following structure. We have information on employment and unemployment status at the end of each month, and on any payments received during the month. I follow all persons who enter unemployment until they exit, or until the unemployment spell is censored. A spell is defined by the individual, an entry date, and an exit date (or a censoring date). A person exits a spell by making a transition to employment or to sickness. A large number of persons participate in labour market training programmes (”training”) or are registered as PE in some months. Months spent in training or as PE are likely to influence the probability of transition to sickness (and contain information on heterogeneity), and training and PE are used as time-varying explanatory variables of the probabilities of transition out of unemployment. Since those who participate in training or have periods as PE are not a random subsample of all who become unemployed, the probability of participation in training and the probability of going to PE are modelled in the same way as the probability of exit. However, the unemployment spell continues during PE and training, and we do not model the end of training or PE. A person cannot make a transition to training or PE in months when he already occupies the same state. Summing up, we model the probability of transition from unemployment to one of the four destinations ”Employment”, ”Training”, ”PE”, and ”Sickness”. The destinations are indexed by $s = 1, 2, 3, 4$.

The data offer the opportunity to use repeated spells for identification of unobserved heterogeneity. However, this requires that the individual effects are constant across spells, ruling out state dependence and important events between spells. As pointed out by Røed and Raaum (2003), using repeated spells also implies a special selection problem, since the probability of being registered with a second spell depends negatively on how far into the data window the first spell began, and negatively on the length of the first spell. Therefore all spells are treated as independent.

We now derive the likelihood function. Let the destination specific integrated monthly hazard rate be a step function λ_{st} which is constant during month t, the time interval $(t-1, t]$. Since we use time intervals of unit length, the integrated hazard equals the instant (continuous time) hazard rate within the interval, due to the assumption that this is constant within intervals. λ_{st} will depend on observed and unobserved individual characteristics, as well as on elapsed unemployment duration, but we suppress this for the moment. The overall integrated monthly hazard rate is $\lambda_t = \sum_s \lambda_{st}$. We do not observe the exact dates of transitions, only which state is occupied at the end of each month. We know that a spell which was first observed at the end of month t_0 and was observed in state s at the end of month t_1, began at some date $t_0 - 1 + u$ and ended at some date $t_1 - 1 + x$, where $0 < u \leq 1$ and $0 < x \leq 1$. The probability of transition to s at date $t_1 - 1 + x$ given entry at date $t_0 - 1 + u$ is

$$\lambda_{st_1} \exp\left(- \int_{t_0-1+u}^{t_1-1+x} \lambda_\tau d\tau \right) = \lambda_{st_1} \exp\left(-\lambda_{t_0} (1-u) - \sum_{r=t_0+1}^{t_1-1} \lambda_r - \lambda_{t_1} x \right) \tag{1}$$

Since x is not observed, we need to integrate it out, over the interval $(0,1]$. Doing this, (1) becomes

$$\frac{\lambda_{st_1}}{\lambda_{t_1}} \exp\left(-\lambda_{t_0} (1-u) - \sum_{r=t_0+1}^{t_1-1} \lambda_r \right) \left(1 - \exp\left(-\lambda_{t_1} \right) \right) \tag{2}$$

The next step is to eliminate the unobserved u. Assuming that entry to unemployment is uniformly distributed over the month (an interval with length 1) we integrate out u and get

$$\frac{\lambda_{st_1}}{\lambda_{t_1}} \left(1 - \exp\left(-\lambda_{t_1} \right) \right) \exp\left(- \sum_{r=t_0+1}^{t_1-1} \lambda_r \right) \frac{1}{\lambda_{t_0}} \left(1 - \exp\left(-\lambda_{t_0} \right) \right) \tag{3}$$

(3) is the likelihood contribution for a spell that encompassed the end of the entry month. Since we only observe spells that do extend over the end of the entry month, we need to derive the corresponding conditional likelihood, which is (3) divided by the probability that the spell was observed. The probability that a spell is not observed is the probability that the spell ends within the same month as it began, which is

$$\int_0^1 \exp\left(-(1-u) \lambda_{t_0} \right) du = \frac{1}{\lambda_{t_0}} \left(1 - \exp\left(-\lambda_{t_0} \right) \right) \tag{4}$$

Now we introduce heterogeneity and duration dependence. Let the monthly hazard for destination *s* for spell *i* at the beginning of month *t* be

$$\lambda_{sti} = \exp\left(x_{ti} \beta_s + \delta_{rsi} + \gamma_{ds} + \nu_{si} \right) \tag{5}$$

v_{si} is spell- and destination-specific unobserved heterogeneity which is assumed uncorrelated with observed covariates in the inflow, and δ_{rsi} is a function of months remaining until UI expires as of the beginning of month *t*. $\exp\left(\gamma_{ds}\right)$ is the baseline hazard of exit to *s* for month *t*. The complete likelihood function for spell *i*, the probability of the observed duration and transition, conditional on the spell being observed, is now found by taking the expectation of the expressions (3) and (4) over ν with (5) inserted, and dividing (3) by (4):

$$L_i^{comp} = \frac{E_\nu\left[\frac{\lambda_{st_1i}}{\lambda_{t_1i}}\left(1-\exp\left(-\lambda_{t_1i}\right)\right)\exp\left(-\sum_{r=t_0+1}^{t_1-1}\lambda_{ri}\right)\frac{1}{\lambda_{t_0i}}\left(1-\exp\left(-\lambda_{t_0i}\right)\right)\right]}{E_\nu\left[\frac{1}{\lambda_{t_0i}}\left(1-\exp\left(-\lambda_{t_0i}\right)\right)\right]} \quad (6)$$

The likelihood for a spell which is right-censored at date t_2, L_i^{cens}, is obtained in a similar manner, and we get

$$L_i^{cens} = \frac{E_\nu\left[\exp\left(-\sum_{r=t_0+1}^{t_2}\lambda_{ri}\right)\frac{1}{\lambda_{t_0i}}\left(1-\exp\left(-\lambda_{t_0i}\right)\right)\right]}{E_\nu\left[\frac{1}{\lambda_{t_0i}}\left(1-\exp\left(-\lambda_{t_0i}\right)\right)\right]} \quad (7)$$

I approximate the latent distribution of the unobserved elements $\left(v_1,..,v_4\right)$ using a discrete distribution with a priori unrestricted number of points of support. With M support points $\left(v_{11},..,v_{41},..,v_{1M},..,v_{4M}\right)$ we have probabilities $\left(p_1,..,p_M\right)$, which satisfy $\sum_{m=1}^{M}p_m=1$, $0<p_m\leq 1$, such that $E_\nu\left[X\left(\nu\right)\right]=\sum_{m=1}^{M}p_m X\left(\nu_m\right)$. The optimal number $\widetilde{M}$ is found by estimating the model sequentially for increasing M, starting with M=1 and adding one point of support (a vector of 4 elements) until the likelihood (or a related criterion) does not improve. In the final model we estimate $4\widetilde{M}$ support points and $\widetilde{M}-1$ probabilities.

Gaure, Røed and Zhang (2005) carry out simulation studies of the properties of discrete-time proportional hazard duration models with nonparametric specification of both unobserved heterogeneity and duration dependence and two dependent competing risks. They find that identification of the true model parameters depends crucially on allowing the data to decide the optimal number of points of support in the heterogeneity distribution. Furthermore, improvement in the likelihood itself is sometimes a too weak criterion for adding another mass point and may result in upward biased duration dependence. Hence it can be appropriate to apply an optimality criterion in the form of the likelihood adjusted for the extra parameters estimated when adding another mass point. Gaure, Røed and Zhang (2005) conclude that the AIC criterion is an appropriate criterion for deciding the optimal M; $\text{AIC} = L - c$, where L is the likelihood value, $c = (S+1)*M - 1$ is the number of "free" parameters in the distribution of unobserved heterogeneity and S is the number of transitions[1]. I use the AIC[2].

4.2 Identifying duration dependence and unobserved heterogeneity

The key econometric problem is to identify the separate effects of elapsed unemployment duration and of remaining time with UI, on the probability of transition to sickness. To this end we need exogenous variation in the data which drives a wedge between elapsed duration and remaining UI. The data contain three such sources of variation. The primary source is the change in UI regulations 1997, when the maximum UI duration was changed from 80+80 weeks to 156 weeks. For the spells which belong to the first regime we do not distinguish between the first and second 80-week limit - each is treated as the end of UI in the model. The reasons is that the data do not contain information on whether an ongoing spell with 80-week limit is in the first or second period[3]. However, we know that every unemployed person who received UI in the first

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[1] Gaure, Røed and Zhang (2005) also found that the Bayesian Information Criterion (BIC) and Hannan-Quinn Information Criterion (HQIC) often resulted in too few mass points. Baker and Melino (2000) faced a similar problem in their simulation studies of single risk models, and concluded that the BIC or HQIC yielded better fits with the data than the unadjusted likelihood, but did not consider the AIC. These criteria penalize the likelihood for extra parameters, the BIC being somewhat more restrictive than the HQIC, and HQIC being more restrictive than the AIC: $\text{BIC} = L - c\ln(N)/2$, $\text{HQIC} = L - c\ln(\ln(N))$, where N is the total number of person-month observations. Note that BIC and HQIC depend on the number of observations, whereas the AIC does not.

[2] Estimation was feasible using a supercomputer at the University of Oslo and by using a very efficient estimation procedure programmed by Simen Gaure. The maximization algorithm is described in Gaure, Røed and Zhang (2005).

[3] It might be possible to derive this information for some persons, but not for persons who were unemployed the first years of the data period.

80-week period had to apply for exemption from the quarantine, and thus faced a real risk of losing UI for 13 weeks. We also know that that the rate of transition out of unemployment does respond to the end of the first 80-week period (Røed and Zhang, 2005). Hence it is reasonable to assume that behaviour responds similarly to the ends of the first and second 80-week periods.

Since the UI reform was applied uniformly to all unemployment entrants there is no contemporaneous control group. Therefore the usefulness of the reform as identifying variation relies on two assumptions: 1) Absence of unobserved differences between spells that started before and after the reform. 2) The proportional change in the hazard rates when UI is about to expire does not depend on elapsed duration. The analysis conditions on the season (month) and the state of the business cycle at entry to unemployment, which is assumed to be enough to satisfy 1). 2) is similar to the assumptions which lie beneath all applications of the proportional hazard model, and is simply assumed to hold. Another source of variation is the right to resume a UI spell up to one year after it ended, implying that a number of spells begin with curtailed UI periods. Since unemployment durations are likely to differ between those who have not been unemployed before and those who begin with curtailed UI, I control for recent unemployment using a dummy variable for having been registered as unemployed at least one month during the 12 months prior to spell start. A third source of gap between elapsed duration and remaining UI comes from periods as PE. When PE the unemployed only consume part of the UI, and therefore the total UI period is extended. Again, this variation is not entirely random, but the model takes this into account, because we estimate the probability of transition to PE, and allow for unobserved elements which may be correlated between destination specific hazards. The variation in remaining UI at spell start is illustrated in Figure 3.

For mixed proportional hazard models with time varying covariates (TVC), Zhang (2003) and Gaure, Røed and Zhang (2005) show that identification of both duration dependence and unobserved heterogeneity is obtained with large samples. TVC ensure identification because individuals who enter uenmployemnt at different dates are exposed to different time effects during their spells (such as business cycle and seasonal patterns), and this provides indirect information on the distribution of unobserved heterogeneity: If a spell "survives" through a time period when the probability of a

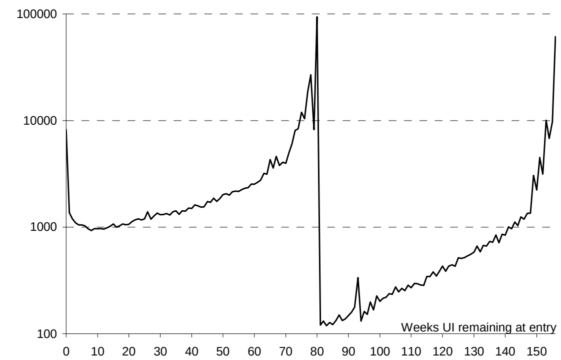

Figure 3. Distribution of remaining UI at spell start (weeks). Vertical axis is number of entrants (logarithmic scale). Peak at zero due to previous registration and small lag in updating of registers at re-entry to unemployment. Peak at 93 due to having completed first 80-week period with UI and re-emtering unemployment.

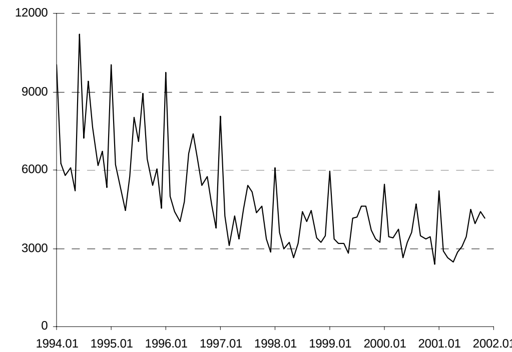

Figure 4. Number of entrants to unemployment each month in the data period.

particular transition is relatively high, then we expect that this spell has unobserved elements which give a low probability of making this transition. Likewise, calendar time provides important variation in the form of lagged explanatory variables, such as the month at entry or the state of the business cycle at the date of entry to unemployment. These variables proxy unobserved fixed effects related to changes in the composition of the inflow to unemployment over seasons and business cycle. In the hazard rate specification I use a dummy variable for each month to capture the effect of time on the outflow. For representing variation in the composition of the inflow to unemployment over time I use 11 season dummies for seasonal variation, together with an indicator of labour market tightness at the time of entry for variation over the business cycle (see Figure A1[5]). Figure 4 shows the distribution of entry dates into unemployment for the sample. The graph shows both variation over the business cycle and seasonal variation, with peaks in January and July, and this variation is used as a proxy for changes in the composition of the inflow over the season.

5. Estimation results for the transition to sickness

Based on the AIC the estimation resulted in 25 mass points in the heterogeneity distribution, improving the likelihood from -1820148.207 to -1797802.533, an

[5] The indicator is described in Gaure and Røed (2003).

improvement of 22346 points. 957 parameters were estimated in the base model. I also estimated a second model, which allows for the effect of remaining UI to depend on certain observed characteristics. This model converged with 29 mass points. Selected parameter estimates for the sickness hazard rate are reported in Table 2, and the distribution of unobserved heterogeneity in Table 3. I will discuss selected parameter estimates for the sickness hazard in this section. Estimates for all hazard rates are presented in Appendix A. The entire set of estimates can be obtained upon request.

5.1 The effect of remaining UI

I use six dummy variables, UI1 to UI6, for the months 1 to 6 before UI expires, to capture the effect of expiring UI, UI(k) equals 1 if (k-1,k] months of UI remain[6]. Looking at columns 1 and 2 of Table 2, the effect is highly non-linear, with significant estimates confined to the last three months. The parameters correspond to an increase in the hazard of 48% ($\left(\exp\left(0.390\right)-1\right)*100\%$) in the last month before UI expires, as compared to the hazard with 7 or more months UI remaining. In terms of the absolute change in the transition rate, it is useful to consider the hazard rate depicted in Figure 5. For a person with level of hazard equal to the observed rate of transition in the first duration month, and with 80 weeks UI entitlement at spell start, the hazard is elevated from around 0.037 to 0.055 as he approaches the end of UI.

There are (at least) three complementary explanations of this pattern. The effects are likely to complement one another, but with the data at hand it is not possible to distinguish between them.

First, the view to lose UI may influence health negatively, via increased anxiety and stress, and therefore cause increased sickness among the unemployed, or cause some unemployed to feel sick and behave as such, explaining part of the increase in the sickness hazard that we observe. In this view, a marginal decrease in the time limit on UI would be costly in terms of driving some unemployed into sickness and out of the labour force.

[6] The information on time with UI is given as the number of weeks used at the end of each month. The intervals are coded as 0-4, 5-8, 9-13, 14-17, 18-22 and 23-26 weeks.

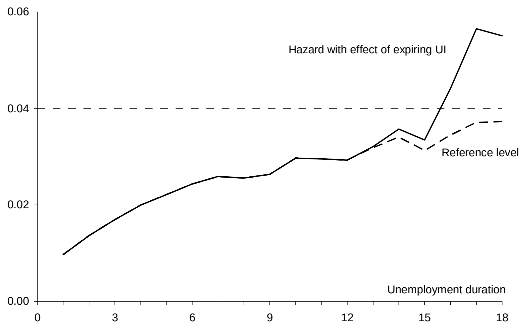

Figure 5. Hazard rate for transition to SI as a function of elapsed duration, with effect of exhausting UI for a person with 18 months UI entitlement. Scaled to match observed rate of transition in first duration month.

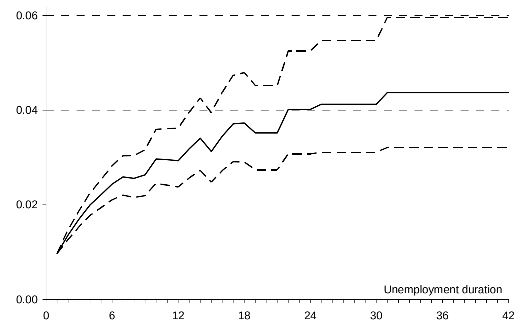

Figure 6. Baseline hazard rate with 95% pointwise confidence interval. Scaled to match observed rate of transition in first duration month.

Second, if there is a (large) non-pecuniary cost associated with applying for or receiving SI, then some whose health would justify SI will delay their application, as compared to when they would have wanted SI in the absence of the cost.

Third, as UI is consumed the relative value of unemployment drops and an increasing share of the unemployed see their reservation level of sickness drop below their sickness level, and the benefit from applying exceeding the cost. Insofar as the level of sickness does not justify SI for purely medical reasons, the part of the increase in the hazard which is due to this effect, can only occur if one of the two conditions is fulfilled: (a) Health is not perfectly verifiable by the doctor, or (b) Doctors lower the threshold for allowing SI when the patient is about to lose UI. In case of (a), part of the peak in the hazard probably represents an excess flow over what is deemed optimal by policy makers, and this is caused by an information problem, non-verifiability of sickness. In case (b), it could be that doctors let their assessment be guided by empathy, and therefore take into consideration the economic and social situation of the patient when deciding whether to grant SI. This is really a problem of excess information, that the doctor knows the impact of her action on the situation of the patient, and assigns greater weight to the immediate situation of the patient than to the potential future benefit to society (and the patient?) from forcing him to stay in the labour force.

Based on the theoretical considerations we expect that persons with little additional income (e.g. spouse income) and alternative income (e.g. RB) are more likely to get SI when they risk losing UI: First, the stress from risking a period without UI might be more

Table 2. Selected results of duration analysis for transition from unemployment to sickness

Heterogeneity in effect of remaining UI	No		Yes	
Log likelihood		-1797802.533		-1797771.454
Number of parameters		957		983
Number of mass points in heterogeneity distribution		25		29
Selected parameter estimates	Coefficient	*t-value*	Coefficient	*t-value*
Dummies for remaining UI (months)				
UI1	0.390	*9.60*	0.256	*4.73*
UI2	0.420	*9.26*	0.283	*4.96*
UI3	0.248	*5.86*	0.104	*1.86*
UI4	0.069	*1.42*	0.068	*1.39*
UI5	0.048	*1.14*	0.048	*1.12*
UI6	0.008	*0.18*	0.006	*0.13*
log(UI/RB)	0.164	*6.42*	0.196	*6.74*
Interactions with UI13				
log(UI/RB)			-0.081	*1.51*
Married, spouse income < 2G			0.366	*3.45*
Married, 2G < spouse income < 4G			0.126	*1.16*
Married, 4G < spouse income < 6G			0.177	*2.32*
Married, spouse income > 6G			0.233	*2.87*
Separated, divorced or widow			0.232	*3.07*
Woman	1.085	*15.91*	1.192	*15.03*
Age	-0.022	*2.37*	-0.019	*1.95*
Age squared/100	0.040	*3.46*	0.039	*3.06*
Work experience	0.715	*9.48*	0.772	*9.20*
Work experience and woman	-0.751	*8.69*	-0.832	*8.66*
Education 8 years or less	0.310	*5.94*	0.330	*5.82*
Education 9-10 years	0.245	*9.10*	0.274	*9.17*
Education 13 years or more	-0.442	*10.69*	-0.478	*10.34*
Pre-unemployment income <= 2G	-0.068	*1.57*	-0.065	*1.39*
4G < Pre-unemployment income <= 6G	-0.055	*1.97*	-0.061	*2.04*
Pre-unemployment income > 6G	-0.256	*5.42*	-0.289	*5.56*
Married, spouse income <= 2G	0.354	*7.25*	0.334	*6.16*
Married, 2G < spouse income <= 4G	0.181	*3.86*	0.188	*3.63*
Married, 4G < spouse income <= 6G	0.165	*4.57*	0.161	*4.04*
Married, spouse income > 6G	-0.002	*0.05*	-0.024	*0.56*
Separated, divorced or widow	0.417	*10.58*	0.425	*9.58*
Child in household	-0.019	*0.49*	-0.021	*0.52*
Child in household and woman	0.074	*1.60*	0.080	*1.60*
Non-OECD country of origin	-0.101	*1.87*	-0.110	*1.88*
SI or RB one or more months during 12 months before spell start	1.184	*24.33*	1.286	*21.41*
Unemployed one or more months during 12 months before spell start	0.186	*7.69*	0.198	*7.46*
Labour market tightness at spell start	0.409	*2.81*	0.456	*2.93*

Other explanatory variables used in each hazard rate: 11 dummies for month of spell start, 94 dummies for current month, 18 dummies for county, 19 dummies for accumulated months with PE status, 11 dummies for the elapsed duration of ongoing training spells, and 11 dummies for months since latest training spell.

outspoken for a person with little additional and alternative income, who might be more likely to become sick. Second, the ratio of the value of insured sickness to the value of uninsured unemployment is higher the lower the additional income, provided the marginal utility of income decreases in income, and persons with low additional income are therefore more likely to apply for SI. Third, doctors might set a lower threshold of sickness for granting SI for a person with little additional and alternative income. I therefore estimate a second model where we allow for observed heterogeneity in the effect of remaining UI by interacting certain variables with UI13 = UI1 + UI2 + UI3, a dummy variable for 1-3 months UI remaining. I use dummy variables for marital status, combined with the income level for the spouse, if married, and the variable log(UI/RB).

Results of estimating the model with these interactions are given in columns 3 and 4 of Table 2. As expected, the effect of expiring UI is larger for those who have a spouse with income in the lowest interval, than for someone with a spouse with higher income. Still, the effect of expiring UI is U-shaped in spouse income, which does not fit the hypothesis that the chance of getting SI when UI ends decreases monotonically in alternative income. The hazard is elevated above the reference level by 86% when the spouse has income up to 2G, and by 63% when the spouse has income above 6G, as compared to 29% for a single-never married person. The effect is also larger for previously married persons[7]. This pattern might arise if previously married persons and persons with high-income spouses tend to have relatively high fixed expenditure levels (e.g. housing).

The variable log(UI/RB) measures differences in the incentive to choose SI over RB, such that persons with a higher ratio have a stronger incentive to apply for SI. Contrary to the expected, the associated coefficient is negative, although not significantly different from zero. Perhaps people do not know their potential RB income, or they are unsure of whether they can obtain RB after losing UI. Another potential explanation is that the RB is measured with error: Capital income enters the RB base but is not observed, there is error in the variable for marital status because it is only observed at the beginning of each year, and a number of supplementary amounts cannot be calculated using the available data.

[7] The results are robust to including age interacted with UI13, which becomes insignificant.

It was suggested above that some people with reduced health postpone their application for SI until shortly before UI ends because of non-pecuniary costs of applying for and receiving SI. If this explains part of the increase in the hazard before UI ends, then this increase would be larger for persons with poor health at entry to unemployment. I therefore estimate another model where I include UI13 interacted with the dummy for having received SI in some month during the 12 months before starting the unemployment spell, which works as a proxy of health problems (the fact that only persons who have worked recently qualify for SI, implies that I do not use information on more distant past SI spells). The interaction coefficient is small and insignificant, and with the remaining coefficients being almost unaffected. Although prior SI is a crude proxy of health problems, this does suggest that postponed registration of existing health problems is not a major source of the observed increase in the sickness hazard before UI exhaustion.

5.2 Duration dependence

The estimated baseline hazard function for sickness transitions is shown in Figure 6. Apart from minor variation the hazard increases throughout the unemployment spell. This is consistent with workers becoming discouraged over the spell of unemployment; unemployment gradually breaks down self-confidence and raises the risk of developing mental and physical illnesses (Feather, 1990; Goldsmith, Veum and Darity, 1996; Warr, 1987). Even though being allowed SI is a crude measure of health, the estimated pattern does suggest that the observed zero or positive cross-section correlation between elapsed unemployment duration and measures of mental well-being (see surveys by Warr, Jackson and Banks, 1988, or Dooley, Fielding and Levi, 1996) is really spurious. Hence such a correlation might be explained with selection out of unemployment by those who suffer more from it, as confirmed in studies on panel data for Germany and the UK (Clark, Georgellis and Sanfey, 2001; Clark, 2003).

5.3 Observed heterogeneity

I will add a few comments to the coefficients on selected other explanatory variables presented in Table 2.

We would expect that the average ability to keep and find work among entrants to unemployment decreases when labour market conditions improve, and the positive coefficient on the indicator of labour market tightness at spell start echoes the expectation. The interpretation is that the tighter the labour market at entry to unemployment, the worse the expected health and the higher the probability of transition into sickness, given other variables. Hence the time variation in the composition of the inflow to unemployment helps account for unobserved fixed effects.

The log of the ratio UI/RB does enter with a significant and positive coefficient in the level of the SI hazard rate as expected. The coefficient of 0.164 is also the elasticity of the hazard with respect to the UI/RB "replacement" ratio. RB may be seen as the best non-employment alternative to UI. People who have received SI in some month during the year prior to becoming unemployed have three times the hazard of those with no prior SI. This probably reflects the persistence of health problems over time, or that these individuals are more prone to develop new illness. However, it is also possible that it is easier to get SI if you have received it before, for a given level of health. The hazard decreases with education level, reflecting the general positive correlation between health and educational attainment. Likewise, the positive correlation of transitions with recent unemployment probably arises from a negative correlation between labour market status and health. Persons with recent income in the highest category are less likely to go to SI, as compared to persons with income in the middle category. The negative coefficient on the indicator for the lowest income group may be due to persons being only partially in the labour force, e.g. in combined education and work, before becoming unemployed. We also note that, compared to single-never married, the hazard is some 40% higher for those with low-income spouses, and 53% higher for previously married persons, than for the reference group single never married. These coefficient reflect that health and sivil status are correlated.

The correlation with work experience, being positive for men and close to zero for women, is rather peculiar. Experience is measured as the ratio of actual to potential work experience over the 25 years before spell start. Actual experience is calculated as the number of years since the age of 17 when income (largely earned income, UI and SI) surpassed a threshold of 2G, with half weight to years with income between 1G and 2G. Potential experience is min(age-17,25). Holding other variables constant, a 10%-points higher ratio of actual to potential experience generates a 7.4% higher hazard rate for men. One might expect a negative coefficient, assuming people with stable employment also tend to have better health. However, a positive coefficient could arise if experience is positively correlated with "latent commitment to work" (see Warr, Jackson and Banks, 1988), supposing that those who feel a stronger intrinsic desire to work suffer more psychological distress from being unemployed. A complementary effect is the "habituation" effect of past unemployment on the ability to cope with present unemployment (Clark, Georgellis and Sanfey, 2001). The wear on the body from many years of work could also contribute to a positive correlation between experience and the risk of sickness.

Table 3. Estimated distribution of unobserved heterogeneity in base model

Number of mass points	25		
Distribution of the 1-exp(-exp(.)) masspoint distribution			
		Expectation	*Variance*
Labour market training		0.0469	*0.0032*
Sickness benefits		0.0048	*0.0008*
Partial employment		0.5051	*0.0861*
Employment		0.2819	*0.0229*
Correlation coefficients	Labour market training	Sickness benefits	Partial employment
Sickness benefits	-0.06		
Partial employment	-0.17	0.01	
Employment	-0.28	-0.21	-0.11

Note: The statistical properties of the distribution of unobserved heterogeneity are unknown.

5.4 Unobserved heterogeneity

The estimated correlations of unobserved heterogeneity across exit states should be interpreted with caution because the standard errors of the estimates are unknown. I note the conclusion by Gaure, Røed and Zhang (2005) that the position and size of the mass point of the heterogeneity distribution cannot be interpreted in terms of different types of spells and their relative frequency, because different combinations of mass point locations and probabilities create observationally equivalent unobserved heterogeneity distributions in interval censored data. The first and second order moments were found to be estimated consistently in their simulations, though. The estimated distribution of unobserved heterogeneity (more precisely, the distribution of $1-\exp\left(-\exp\left(v\right)\right)$) is shown in Table 3. Those whose unobserved attributes suggest a high probability of transition to SI also have a higher probability of finding work, which might be due to unosberved health status.

6. Analysis of sickness durations

We have seen that the rate of transition to sickness is a decreasing function of remaining UI. We now consider the duration of sickness. The key issue here is whether sickness durations differ according to remaining UI at entry to sickness. If the increase in the transition rate to sickness in the last months before UI expires is due to an economic incentive to apply for SI, then we might expect that late entrants to sickness are more likely to fully exploit the maximum of 12 months of SI. SI recipients do go through a thorough examination after 8 weeks, which might eliminate some healthy late entrants. But if doctors cannot accurately verify illness, or if they lower the threshold for SI shortly before the end of UI, this follow-up may not form an important obstacle to maintaining SI for the maximum 12 months when UI is not an option.

In order to explore this further, we compare the duration of sickness spells between late entrants, defined as having 3 months or less UI remaining, and entrants to sickness who have more than 3 months UI remaining. Figure 7 depicts the distribution of completed spell durations, separately for late entrants (N = 2174) and for other entrants to SI (N = 22619). The distributions are rather similar, but with a larger share of late entrants using the full 12 months SI, and a correspondingly lower share with durations of only one month. Of course, heterogeneity might create this pattern, and I therefore turn to econometric methods. One might suggest using duration analysis to estimate the duration dependence patterns of transition out of SI, comparing late entrants to other entrants. However, some illnesses (and treatments) probably have a priori determined durations, and it would therefore be inappropriate to model the risk of exit within a duration analysis framework under an assumption of proportional hazards with a common

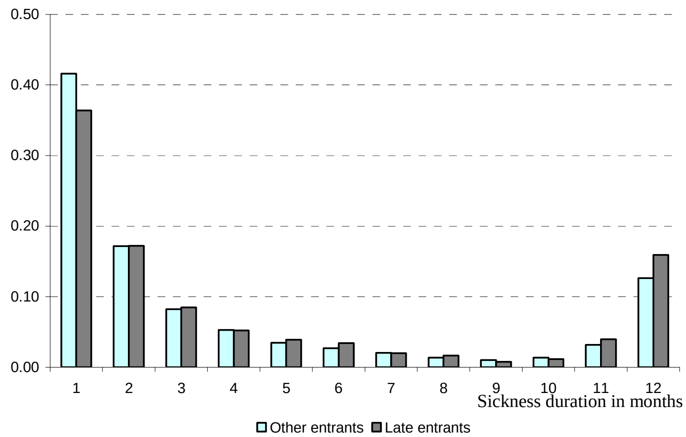

Figure 7. Distribution of duration of sickness spells. Share by duration at exit in months. N=24793. Late entrants defined as having 1-3 months UI remaining at entry to SI.

baseline. Hence, I group the outcome into three mutually exclusive categories for durations 1-2 month ($Y_i = 1$), 3-11 months ($Y_i = 2$), and 12 months ($Y_i = 3$), and estimate a multinomial logit model for the three outcomes[8]. The probability of having a sickness spell with duration in interval j is

$$P\left(Y_i = j \mid z_i\right) = \frac{\exp\left(z_i \alpha_j\right)}{1 + \sum_{j=1}^{3} \exp\left(z_i \alpha_j\right)},$$

for $j = 1, 2, 3$. α_j is a vector of parameters and z_i is a vector of explanatory variables measured at entry to sickness (or at entry to the preceding unemployment spell). The key variables in z_i are UI1-UI6. The coefficients on UI1-UI6 describe the difference in expected sickness durations as compared to those who were granted SI with 7 or more months UI remaining. The estimated coefficients only measure a correlation, because those who are unemployed long enough to face the UI exhaustion will have unobserved characteristics which give long unemployment spells, and which are correlated with the latent duration of sickness spells. In addition, being unemployed for a long period may have a causal effect on health. To accommodate these effects I include in z_i a number of dummy variables for elapsed unemployment duration at the month of transition to SI, although this does not ensure a causal interpretation of the coefficients on UI1 - UI6. The

[8] An ordered response model was ruled out because strategic behaviour implies that there is no underlying ordered outcome (such as health) beneath the observed duration.

Table 4. Selected results of multinomial logit model for duration of sickness spells

Reference category is 1-2 months. t-values are for associated coefficients

	3-11 months		12 months	
	PE(z)	*t-value*	PE(z)	*t-value*
Dummies for remaining UI (months)				
UI1	0.032	*2.46*	0.025	*2.79*
UI2	0.050	*3.47*	0.042	*3.99*
UI3	0.003	*0.66*	0.025	*2.13*
UI4	0.012	*0.91*	0.021	*1.63*
UI5	-0.011	*0.22*	0.020	*1.42*
UI6	0.020	*1.21*	0.011	*1.06*
Log(UI/RB)	-0.007	*0.35*	0.014	*2.26*
Unemployment duration (months)				
4-6	-0.009	*0.14*	0.025	*4.06*
7-9	-0.014	*0.33*	0.035	*4.82*
10-12	0.004	*0.82*	0.014	*1.93*
13-18	0.001	*0.60*	0.016	*2.18*
19 or more	-0.009	*0.43*	0.041	*4.98*
Woman	0.080	*3.88*	-0.057	*3.68*
Age	-0.008	*2.52*	0.006	*3.04*
Age squared/100	0.010	*2.99*	-0.002	*0.14*
Work experience	0.137	*6.41*	-0.034	*0.93*
Work experience and woman	-0.091	*3.58*	0.031	*1.07*
Education 8 years or less	-0.005	*0.40*	0.030	*3.65*
Education 9-10 years	-0.002	*0.50*	0.015	*3.27*
Education 13 years or more	0.037	*3.27*	-0.008	*0.23*
Pre-unemployment income <= 2G	0.009	*1.27*	0.017	*2.19*
4G < Pre-unemployment income <= 6G	-0.013	*2.34*	-0.014	*3.27*
Pre-unemployment income > 6G	-0.021	*2.26*	-0.022	*3.33*
Married, spouse income <= 2G	0.006	*0.90*	0.010	*1.54*
Married, 2G < spouse income <= 4G	0.007	*0.80*	0.015	*1.70*
Married, 4G < spouse income <= 6G	0.033	*2.66*	0.017	*2.36*
Married, spouse income > 6G	0.011	*1.32*	0.013	*1.91*
Separated, divorced or widow	-0.003	*0.40*	-0.002	*0.36*
Child in household	0.006	*0.15*	-0.023	*3.30*
Child in household and woman	0.010	*1.13*	0.013	*1.75*
Non-OECD country of origin	0.009	*0.09*	-0.030	*3.19*
SI or RB one or more months during 12 months before spell start	0.035	*6.44*	0.027	*7.06*
Unemployed one or more months during 12 months before spell start	-0.003	*2.65*	-0.001	*1.73*
Labour market tightness at spell start	0.128	*8.15*	0.114	*10.21*
Log likelihood	-22469.131			
Number of observations	24793			

Other explanatory variables included: 11 dummies for month of spell start, 18 dummies for county, and a constant term.

result of the estimation, partial effects evaluated at the sample mean, are presented in Table 4[9]. The sample is limited to spells which ended with transition to SI 13 months or more before the end of the data period, so as to avoid censoring.

The coefficients on UI1-UI6 show that late entrants are more likely to have SI spells of intermediate length, and the probability of staying on SI for 12 months is 2.5 percentage points higher. This could be due to the economic incentive to choose transition to SI when UI expires, and to maintain SI for as long as possible. However, this might also arise as a correlation if late entrants tend to be sick workers who were reluctant to apply for SI and who have health problems which imply long sickness spells. As expected, and in accordance with the "economic incentive interpretation", the probability of 12 months duration increases in the log UI/RB ratio.

I control for elapsed unemployment duration at entry to sickness, and the probability of staying on SI for 12 months is higher for those who entered SI after more than 3 months unemployment than others. The difference is larger for those with 4-9 months unemployment, and 19 months or more. The coefficients on long durations could be due to average health being poorer among the long-term unemployed, or it could be that some who become long-term unemployed do so because they have a desire to retain UI and SI for as long as possible. In comparison, sickness spells begun after 1-3 months unemployment may contain more cases of true short-term sickness. The probability of a long spell is higher for people with short education and decreases in recent earnings. The indicator of labour market tightness at entry to unemployment is estimated very precisely, revealing strong composition effects in entry to unemployment: The better the labour market conditions at entry to unemployment, the poorer your expected labour market characteristics, and the higher the probability of a long SI spell.

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[9] In the multinomial logit model we are interested in the partial effect $PE_j\left(z_{ki}\right)$ of an explanatory variable z_{ki}, which is $PE_j\left(z_{ki}\right) \equiv \partial P\left(y_i = j \mid z_i\right) / \partial z_{ki}$ for a continuous z_{ki}, and $PE_j\left(z_{ki}\right) \equiv P\left(y_i = j \mid z_{-ki}, z_k = 1\right) - P\left(y_i = j \mid z_{-ki}, z_{ki} = 0\right)$ for a dichotomous z_{ki}. Remember that the $PE_j\left(z_{ki}\right)$ does not necessarily have the same sign as α_{kj}, due to the simultaneous effect of each variable on all probabilities. Partial effects averaged over the sample are very similar.

7. Summary and conclusion

Disincentive effects in welfare institutions are of major concern in designing a welfare state. In this paper I investigate the impact of the combined rules for UI and SI on transitions from unemployment out of the labour market. The focus is on SI, because sickness is a major road to nonparticipation, and because many unemployed face a substantial economic incentive to apply for SI shortly before UI expires. Using a flexible econometric specification, I estimate the effect of time remaining until UI expires on the risk of transition to sickness with SI. The data period spans a reform which changed the maximum length of UI, making it possible to separate duration dependence from time until UI exhaustion. Results show that the hazard rate for transition to sickness rises in the last three months before exhaustion, with an estimated increase of some 50% in the last months before UI expires. Three complementary explanations for this pattern are presented; that people become sick as a result of risking to lose UI, that sickness is costly and application for SI therefore postponed until the last chance of applying, or that the economic incentive induces healthy unemployed persons to apply for SI shortly before UI expires. The latter explanation would require that doctors either cannot verify health accurately, or that they lower the threshold for granting SI for persons who are about to lose UI. The results also show that the sickness hazard depends on RB, which many uninsured long-term unemployed could hope to obtain. The estimated elasticity of the sickness hazard with respect to the UI/RB compensation ratio is 0.16. However, the ratio is not a significant predictor of the size of the peak in the hazard rate before UI exhaustion, and thus does not support the hypothesis that an economic incentive drives the peak in the hazard.

The probability of transition to sickness with SI is only one of two aspects of the use of SI among the unemployed. The other is the duration of sickness, which is analyzed using a multinomial logit model. The analysis focuses on the difference in sickness durations between those who were given SI shortly before UI expired and other unemployed SI recipients. The former are more likely to have intermediate and long SI spells. Again, the data do not allow a firm conclusion on the reason for this pattern, as the result is consistent with both the interpretation that economic incentives drive the peak in the hazard for transitions from UI to SI before UI exhaustion, and with the hypothesis that some of those who enter SI shortly before UI expires had already effectively stepped into nonparticipation. However, the findings in this study may serve as a point of departure for further studies, which might support a discussion of the combined rules for UI and SI, e.g. the usefulness of a maximum total duration of SI and UI. Such analyses would benefit from data on the interplay between doctors and patients, and more detailed information on the health of the unemployed.

Appendix A

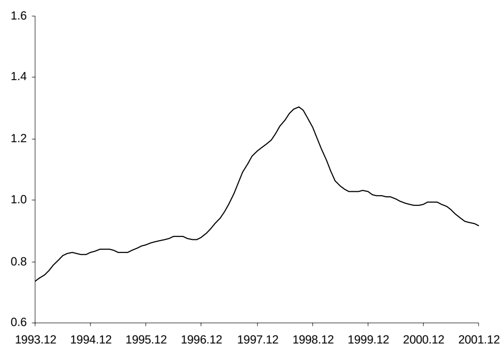

Figure A1. Labour market tightness indicator. Source: Gaure and Røed 2003

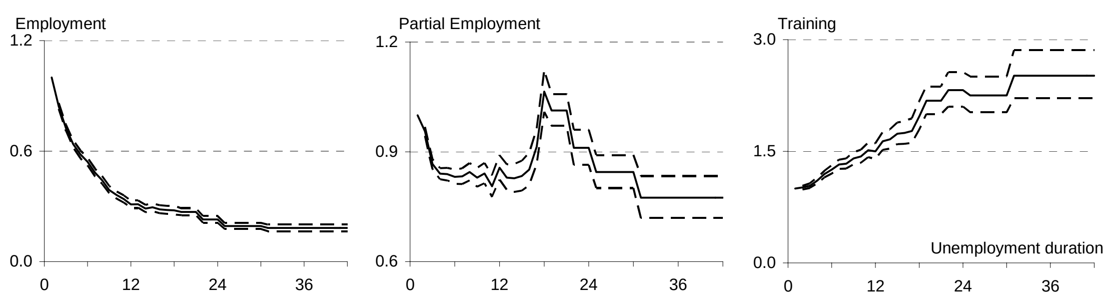

Figure A2. Baseline hazard rate, normalized to 1 at first duration month, with 95% pointwise confidence interval. The scales differ between the graphs.

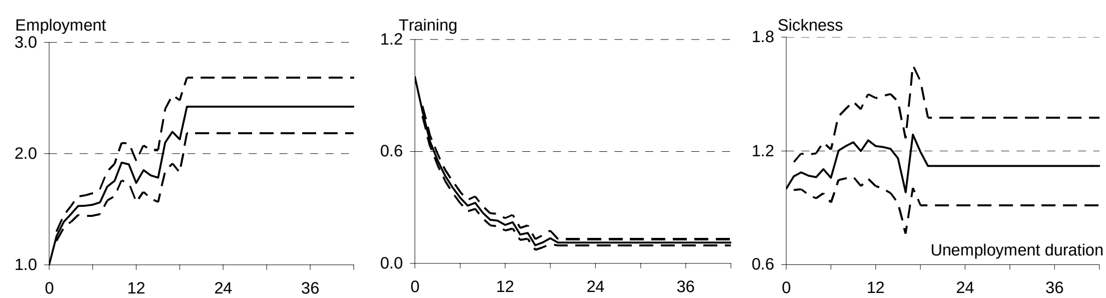

Figure A3. Proportional effect on hazard of accumulated PE months, with 95% pointwise confidence interval. The scales differ between the graphs.

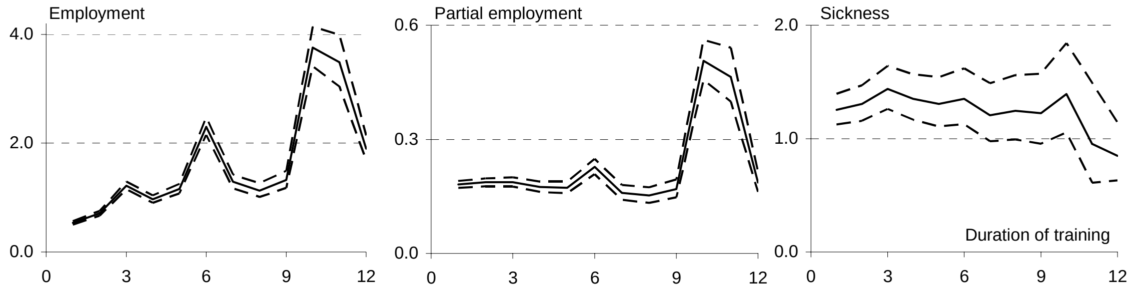

Figure A4. Proportional effect on hazard of ongoing training, as a function of elapsed duration of training in months, with 95% pointwise confidence interval. The scales differ between the graphs.

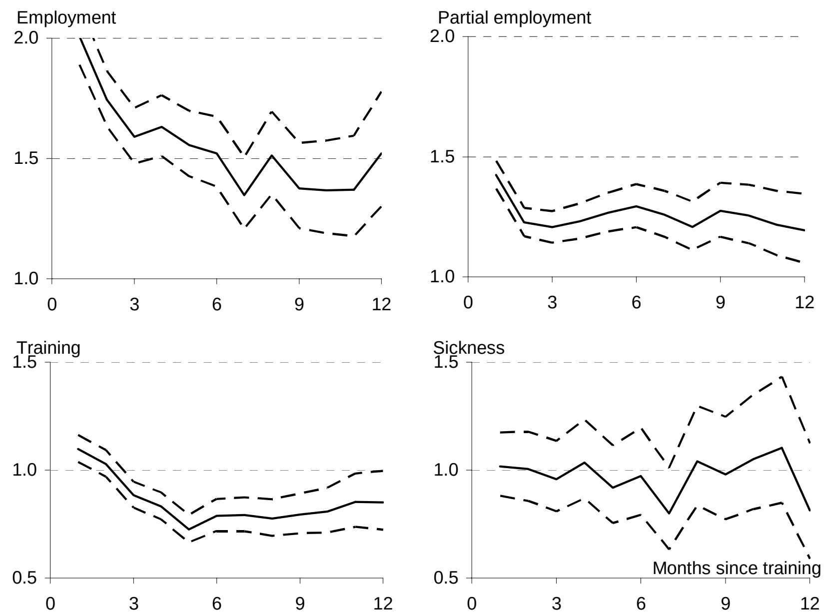

Figure A5. Proportional effect on hazard of completed training, as a function of elapsed months since training, with 95% pointwise confidence interval. The scales differ between the graphs.

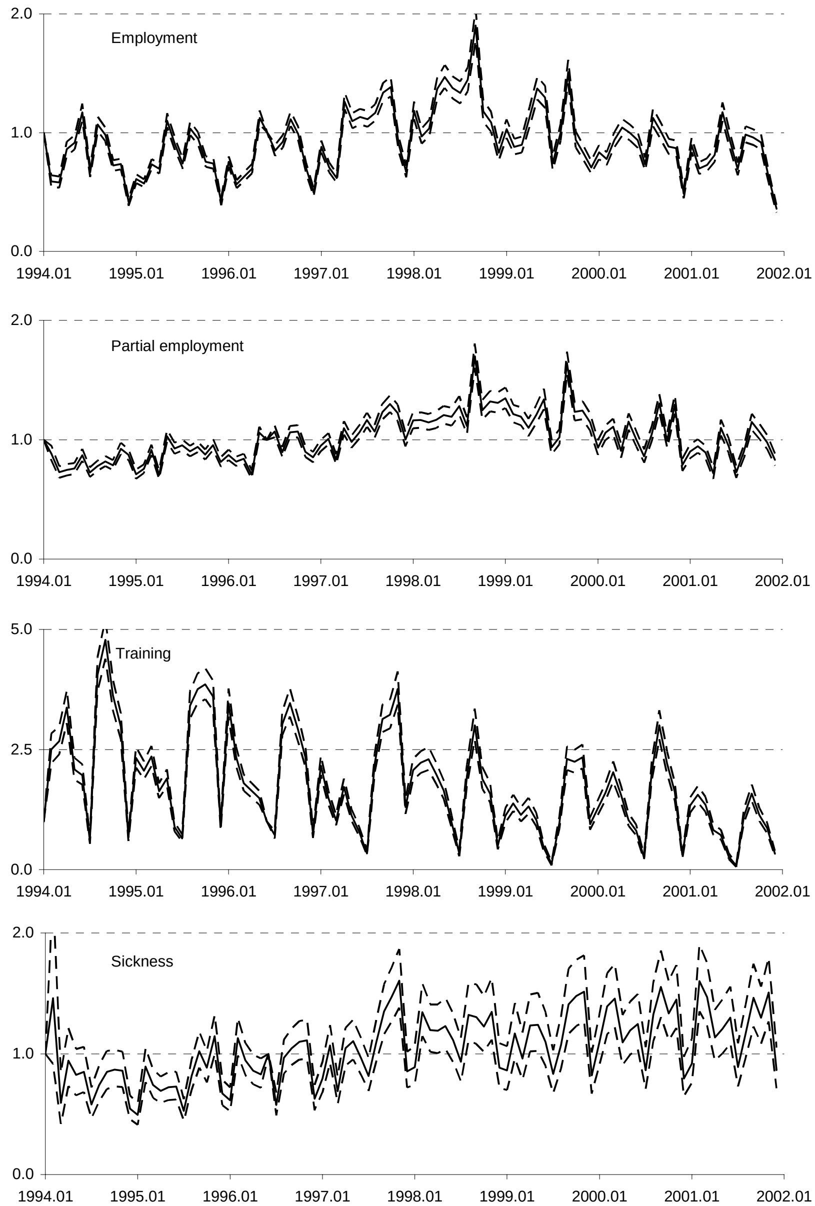

Figure A6. Proportional effect on hazard of time, with 95% pointwise confidence interval. Normalized to 1 in 1996.06. The scales differ between the graphs.

Table A1. Selected results of duration analysis for transition out of unemployment

Destination	Employment		Partial employment		Training	
Selected paramter estimates	Coefficient	*t-value*	Coefficient	*t-value*	Coefficient	*t-value*
Dummies for remaining UI (months)						
UI1	0.520	*29.54*	1.033	*82.61*	0.635	*29.99*
UI2	0.031	*1.26*	0.230	*12.30*	0.350	*12.78*
UI3	-0.074	*3.33*	-0.024	*1.33*	0.153	*6.02*
UI4	-0.106	*4.37*	0.006	*0.30*	-0.011	*0.36*
UI5	-0.075	*3.61*	0.001	*0.05*	-0.040	*1.53*
UI6	-0.088	*3.93*	0.008	*0.47*	-0.072	*2.62*
log(UI/RB)	0.236	*36.61*	0.417	*66.85*	-0.189	*29.76*
Woman	-0.344	*25.43*	0.153	*10.23*	0.265	*16.41*
Age	-0.029	*11.72*	-0.027	*9.95*	-0.028	*7.94*
Age squared/100	0.010	*3.01*	0.028	*7.85*	0.015	*3.15*
Work experience	0.248	*14.33*	-0.429	*21.15*	-0.068	*2.70*
Work experience and woman	-0.019	*0.91*	0.441	*18.49*	-0.326	*11.26*
Education 8 years or less	-0.013	*0.83*	-0.087	*4.94*	-0.750	*26.95*
Education 9-10 years	-0.189	*27.10*	-0.174	*22.12*	-0.031	*3.23*
Education 13 years or more	0.137	*15.82*	-0.087	*8.62*	-0.182	*13.66*
Pre-unemployment income <= 2G	-0.018	*1.66*	-0.070	*5.88*	0.304	*21.08*
4G < Pre-unemployment income <= 6G	0.136	*17.64*	-0.052	*5.99*	-0.039	*3.19*
Pre-unemployment income > 6G	0.235	*20.98*	-0.159	*12.14*	-0.186	*9.66*
Married, spouse income <= 2G	0.033	*2.39*	0.072	*4.76*	0.019	*0.94*
Married, 2G < spouse income <= 4G	0.042	*3.18*	0.159	*11.01*	0.093	*4.55*
Married, 4G < spouse income <= 6G	0.006	*0.56*	0.139	*11.90*	0.040	*2.43*
Married, spouse income > 6G	0.026	*2.13*	0.062	*4.94*	0.098	*5.63*
Separated, divorced or widow	-0.016	*1.47*	-0.051	*4.09*	0.069	*4.20*
Child in household	0.122	*12.92*	0.069	*6.37*	0.006	*0.39*
Child in household and woman	-0.293	*22.71*	-0.091	*6.82*	-0.339	*17.60*
Non-OECD country of origin	-0.370	*24.16*	-0.641	*39.47*	0.531	*29.05*
SI or RB one or more months during 12 months before spell start	-0.275	*27.87*	-0.183	*17.65*	-0.071	*5.00*
Unemployed one or more months during 12 months before spell start	0.281	*43.05*	-0.045	*6.33*	0.019	*2.07*
Labour market tightness at spell start	-0.209	*4.14*	-0.826	*18.22*	-0.311	*4.38*

Other explanatory variables included 11 dummies for month of spell start, 94 dummies for current month, 18 dummies for county, 19 dummies for accumulated months with PE status (not in PE hazard), 11 dummies for the elapsed duration of ongoing training spells (not in training hazard), and 11 dummies for months since latest training spell.

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