LONG-TERM ABSENTEEISM DUE TO SICKNESS: THE SWEDISH EXPERIENCE, 1986-1991*

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Abstract

Long-term absenteeism due to sickness has been increasing in the past two decades. This has raised many questions about causes, financing, and policy measures to prevent further increases. Answering these questions is even more important in a society with an aging population, which is expected to record even more cases. With data from the Swedish National Insurance Board, proportional hazards models for multiple spells are used in this study to account for shared unobserved group-level characteristics (or frailty) associated with long-term sickness. When the spells were grouped by individual, diagnosis or region, there were significant positive random effects. There was "more" heterogeneity among diagnosis-groups and individual-groups than among regions as groups. Both individual and labor market characteristics had significant effects on the length of absence, which suggests policies aimed to prevent and slow down the increasing trend of long-term sickness of those in older age-groups, but also special policies orientated to prevent deterioration of health status of younger employees.

Key words: long-term sickness, absenteeism, multiple spells, unobserved heterogeneity.

JEL classification: J2; J3; J7.

* I would like to thank Edward Palmer, Lennart Flood, Henry Ohlsson and participants at both the Econometrics Days in Göteborg, May 1996, and the Fifth Meeting of Young Economists in Oxford, March 2000, for useful comments on earlier versions of this paper. The usual disclaimer applies.

1 Introduction

The increasing number of cases of long-term sickness registered in Sweden during the 1980s and 1990s has attracted a lot of attention. There have been several changes taken or proposed concerning social insurance in order to combat long-term sickness, specifically with regard to the source of financing the first weeks of each sickness spell, and to a better specification of the skills required for evaluating the working capacity of employees reporting sick.[1] Since 1992 the employer has had the responsibility for providing sick pay during the first weeks of sickness. Before this, from December 1987 social insurance covered the *entire* absence. Prior to that, the compulsory sickness insurance (implemented in 1955) stipulated a *waiting period* of three days and a limit of two years replacement in long-term sickness. In 1967 the waiting period was reduced to the day of calling in sick. In 1985 some administrative changes (for state employees) implied that also the day for calling in sick and weekends were in the records, counted as sickness absence days.

The basic evaluation procedure remains a (simple) medical evaluation and doctor's certification of illness after the first week, and then review at periodic intervals. Improved collaboration between the physician, employer, and social insurance officers has been suggested, with more attention to rehabilitation and consideration of alternative employment.

Even for those who are not working, Sweden's social welfare system provides adequate funds for food, housing and healthcare.[2] Other factors than material deficiency are thus expected to explain the increasing number of long-term absences due to sickness. Many seem to result not from obvious physical causes, but rather from changing social and economic conditions, stress related illnesses, such as back pain, and

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[1] In Sweden the term *sickness cash benefit* is used to make it clear that the "*sick pay*" is usually paid by the social insurance system, rather that the employer. The employer provided sick pay the first 14 days in 1992-1996, and since 1st April 1998, and the first 28 days during the time period January 1, 1997 – March 31, 1998.

[2] Healthcare is actually provided directly "in kind" through a heavily subsidized, mostly publicly owned and managed system; only minimal cash payments are required of patients, including for prescription drugs.

(consequent) psychological problems, such as depression.

It is the goal of this paper to analyze underlying causes for long-term absences due to sickness using frailty models using longitudinal data on sickness. The data are provided by the Swedish National Social Insurance Board. Section 2 summarizes the relevant characteristics of the social insurance system in Sweden, describing the rules today and the main changes made in recent years, and briefly reviewing some statistics on long-term absence due to sickness.[3] Section 3 reviews previous studies relevant for the analysis. Section 4 sets up the theoretical framework and Section 5 presents the data. Sections 6 and 7 present the econometric specification and the results, while Section 8 summarizes and draws conclusions.

2 Social insurance rules and sickness facts in Sweden

2.1 Sickness insurance rules during 1986-1991 and beyond

Everyone in the labor force is covered by *sickness insurance* (i.e., they are eligible for sick pay or/and sickness cash benefit when absent due to sickness). The aim of sickness insurance is to replace the earnings loss due to sickness. Since July 1990, a sickness benefit is available when working capacity is reduced by at least 25%; depending on the extent of working capacity reduction and consequent reduction in working hours, the benefit can be paid at a full, three-quarters, half, or one-quarter rate. Prior to July 1990 there were only two rates, full and 50 percent of full rate. A medical certificate is required after seven days, and a more detailed certificate is required from the 29th day of absence. A sickness benefit can be paid out for an *unlimited* period, is considered taxable income, and counts towards ones pension base.[4] However, for those over 70 or

[3] Other reasons why employees might be absent from their jobs for extended periods (with right of return) include military service, parental leave, education, and trial period of alternative employment. Unless stated otherwise, “absence” herein will refer to absence due to sickness.

[4] The compulsory sickness cash benefit system insurance, implemented in 1955, stipulated a limit of two years replacement for long-term sickness. Except for old-age pensioners, this limit was abolished in 1963.

persons receiving a full old age pension, the period is limited to 180 days. Persons receiving full disability pensions are not entitled to a sickness benefit.

Replacement rates and related rules have changed many times. Under the period studied, there was a uniform replacement rate of 90% of lost income up to March 1991, and after that, until January 1992, only 65% was paid for the first three days, then 80% from the 4th up to the 90th day, and starting with the 91st day of the sickness spell, the previous rate of 90%. However, most workers also received another 10% from negotiated benefit on the top of the 80%.

2.2 Trends in long-term sickness spells[5]

Figures 1 and 2 show the number of ongoing *compensated* spells of sickness at the end of each year, by duration, for men and women, during the period 1974-1999. The changes in the magnitude of sickness benefit absence during the last two decades can be explained by expansive or restrictive reforms regarding *rules* within the sickness insurance system and by the *business cycles*. For example, the long-term sick listed have *decreased* sharply during in the beginning of the 1990s together with a more *restrictive* sickness insurance system and perhaps owing to the deep recession, while since 1997 the long-term sickness absence has started to increase (dramatically), with economic expension.

The reported statistics refer to sickness spells *regardless* if they were full or partial cases. The very similar shapes of the plots for men and women are *partly* explained by the rule-changes over time, since everyone is affected by same rules. It is more difficult to explain differences in levels. The increasing number of women who worked during the last two decades can explain some of the increasing differences in levels between women and men. The *regional unemployment* might explain another part of the difference: Women, who to a great extent work in the public sector, were more exposed to unemployment than men, with a resulting tendency towards sickness, and,

[5] Unless otherwise noted, all data are from the National Social Insurance Board.

hence a sickness benefit instead of an unemployment benefit.

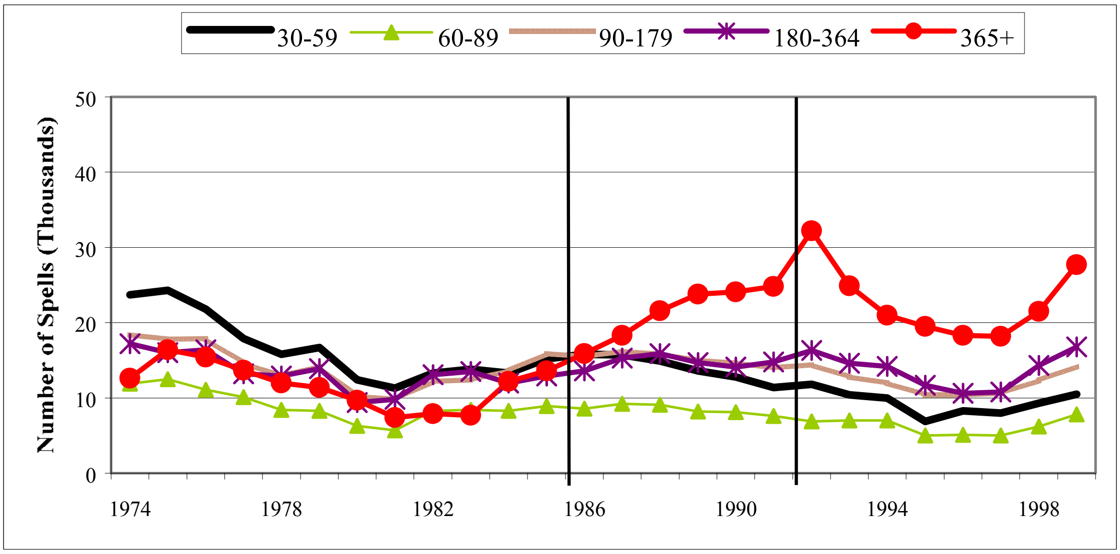

Figure 1 Number of ongoing compensated sickness spells at the end of December, by duration, *men*, 1974-1999

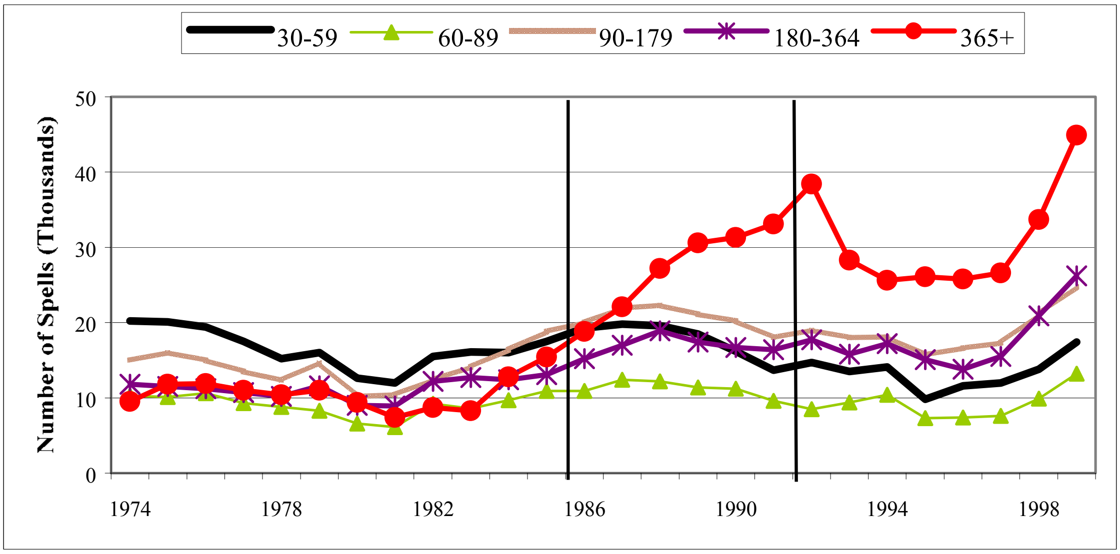

Figure 2 Number of ongoing compensated sickness spells at the end of December, by duration, *women*, 1974-1999

Another factor tending to increase the number of spells for both men and women is the *aging* process: More employees are older, and thus can be expected to have more health problems.

An explanation for the increase in long-term sickness absence in the end of the 1990s can be the very low levels of sickness absence during the recession period (1993-1997), which might "postponed" the absence due to sickness. If this is the case, this is a very good example that the prevention and good care of health is more efficient and less costly than no care or superficial care of any health problem.

Figure 3 shows the average number of compensated sickness days per year (both full *and* partial cases) for women and men during 1974-1999. The greatest difference between men and women was reached during the period analyzed in this study, although the most recent years show diverging (and again, upward) trends.

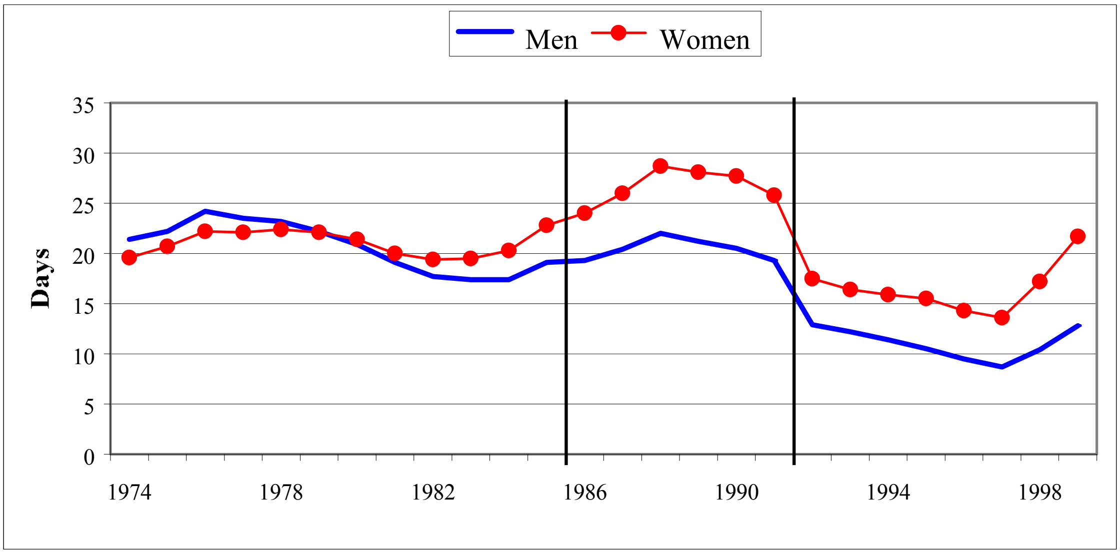

Figure 3 Average annual compensated days of sickness per insured person, men and women, 1974-1999

The plots show substantial changes when rule-changes occurred. Despite the fact that the first day of sickness had been covered by the employer for *some* occupations, the December 1987 elimination of the waiting day before social insurance provided sickness cash benefit seems to have resulted in 1988 peaks for both men and women. On the other hand, the requirement that employers pay the first 14 days of sickness (during 1992-1996, and since April 1998) and the first 28 days (during January 1, 1997 – March 31, 1998) corresponds with a clear fall and declining trend through 1996. As already mentioned, the increase since 1997 can be related to the lower absence rates during 1992-1996. Another characteristic for the end of the 1990s is the increasing number of people in occupations *outside industry* that formed a new group of long-term sick.[6]

2.3 Behind the reported numbers

Figures 1-3 can be misleading since they report on compensated days of sickness without regard to whether absences were *full* or *partial*. There are no statistics showing how many people are absent part-time, but it is well known that in Sweden there are more women than men working part-time[7]. It is also possible to receive a partial benefit even though one is employed full time, for example in conjunction with rehabilitation for persons returning to work after a long-term sickness.

Total compensation figures are equally ambiguous. For example, of about SEK 13.9 billion paid in sickness benefits in 1997, about 50% was paid to women and 50% to men, but *more* women than men were long-term sick; in other words women's average compensation was lower than men's (Table 1). Although in total men had a higher average number of *compensated days of sickness*, the number of days was higher for women than men for the age-groups 35-39, 40-44, 45-49, and 50-54 (see also Figure 4), while the average benefit for all these age-groups was *always* much higher for men (Table 1). But again, these figures have not been adjusted for partial days. Thus the results are not necessarily a result of wage discrimination, but may be mostly explained by hours of work, as well as by differential years of work experience for men and women.

[6] According to the National Social Insurance Board (National Social Insurance Board, *Social Insurance-Annual Review of Budget Year* 1999), the number of teachers, nurses, hospital auxiliaries, and social insurance officers on the sick list rose in 1999.

[7] For example, in 1997 there were about 783,600 women and 159,200 men employed part-time (Table A1 in the Appendix).

Table 1 Sickness benefit in 1997, women and men, by age

Age	Number of recipients		Average number of days		Average benefit over the year, SEK	
	Women	Men	Women	Men	Women	Men
16–19	391	366	34	41	5,215	9,295
20–24	11,971	6,912	51	57	11,191	19,942
25–29	29,382	13,639	61	70	15,393	25,876
30–34	38,059	20,141	74	78	19,177	29,377
35–39	32,523	20,594	93	88	23,566	32,432
40–44	31,099	21,911	109	98	27,531	35,739
45–49	34,073	24,157	120	112	30,544	40,774
50–54	39,645	28,411	129	127	33,019	45,468
55–59	32,294	24,538	138	143	34,036	50,286
60	17,204	15,847	164	169	37,085	54,698
Total	**266,641**	176,516	106	**110**	26,356	**39,171**

Source: National Social Insurance Board (1999), *Social Insurance in Sweden 1999*, page 61.

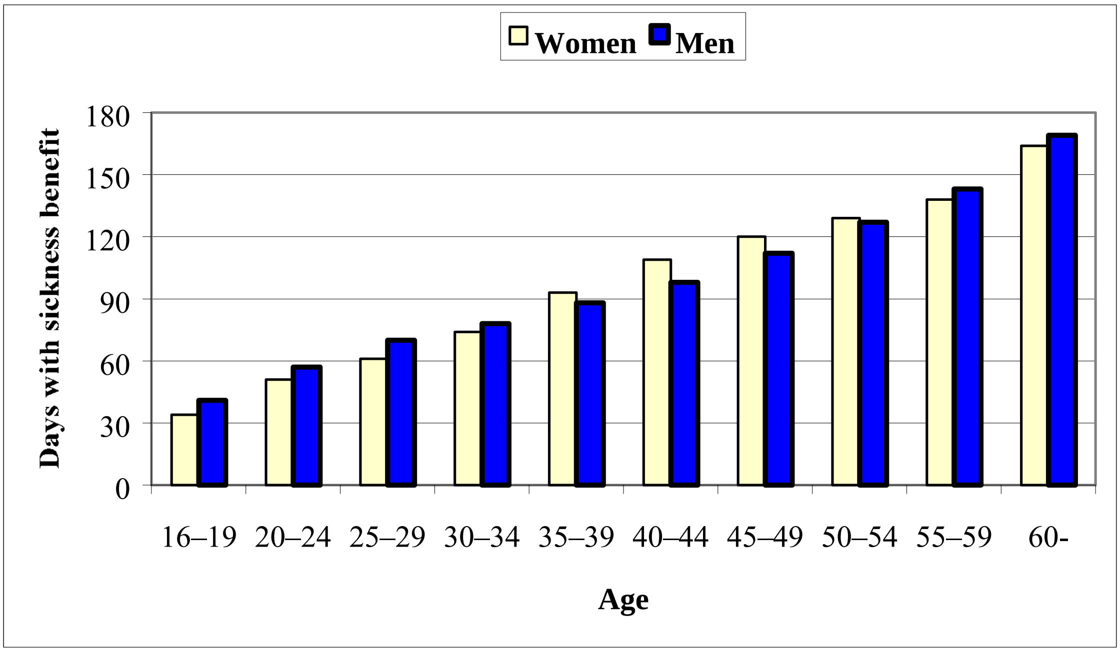

Figure 4 Average annual compensated days of sickness per insured person in 1997, women and men, by age

It is obvious that the official statistics should be more detailed in order to allow adjustment for partial days with compensated sickness, especially since there are such large differences between men and women.

3 Literature review

The problem of employee absenteeism has long been an important subject of psychological and economic research and modelling. In both, individuals are often assumed to decide daily on the work or non-work alternative, depending on which gives the highest utility.[8] The conventional labor supply model of absence focuses on the role of contractual arrangement, assuming that the wage rate plays a central role in the decision to work or not work. There are other economic factors that might influence this decision, however, such as the replacement rate, the tax rate, and employee sharing plans (e.g., profit-sharing and/or employee share-ownership). Previous studies have found that economic incentives have a significant impact on absences from work.[9]

There are also some (long-term) longitudinal studies that measure the effects of various past and current factors on the actual absence.[10] Some other studies have analyzed the *duration of sickness* and estimated the hazard of returning to work and the expected duration of work absence.[11] The results showed that as the relative generosity of sick pay (the replacement rate) increased, there was a clear "disincentive" effect, as the duration of illness lengthened. Other significant factors were wages, the type and severity of injury, the physical demand of the job, and the willingness of employers to help the worker return to work.

Using a dynamic stochastic model, Gilleskie (1998) analyzed the medical care consumption and absenteeism decision of employed individuals with acute illness. Policy simulations based on her theoretical model showed substantial responses to

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8 Chelius (1981); Winkler (1980); and Youngblood (1984).

9 Dunn and Youngblood (1986); Chaudhury and Ng (1992, 1994); Dalton and Mesch (1992), Drago and Wooden (1992); Barmby et al. (1991, 1995); Johansson and Palme (1996); Johansson and Brännäs (1998); Gilleskie (1998); Arthur and Jelf (1999); and Brown (1999).

10 Baum and Youngblood (1975); Scott and Markham (1982); Scott et al. (1985); Barmby et al. (1995); David (1996); and Barmby (1998).

11 Fenn (1981); Butler and Worrall (1985); and Johnson and Ondrich (1990).

economic incentives. Generally, medical treatment and work absenteeism appeared to be *substitutes* during an illness episode, while for acute infections and parasitic diseases, and acute respiratory conditions, absences were 50% more common than doctor visits. With policy that restricts access to physicians during the first three days of illness, the average number of both doctor visits and absences fell, while the duration of absences lengthened, suggesting that medical treatment and work absenteeism in this case may be *complements*.

Other studies analyzed long-term sickness and the unemployment,[12] some of them concluding that official unemployment figures do not accurately reflect the true extent of joblessness. Armstrong (1999) found that many men in Northern Ireland registered as long term sick but who, under plausible assumptions, would be available for work.

There are several Swedish studies that analyzed the relationship between unemployment and (long-term) absenteeism due to sickness, and found that people who were or are unemployed face a higher risk of being sick than people without unemployment history.[13] Lidwall (1997) found that older employees, those with lower education and those who worked in a bad physical or social environment had a higher risk of being long-term sick. His results show that not only unemployment itself increased the duration of the absence due to sickness, but also the complex interaction between being unemployed, socialy isolated, and depressed.

Knutsson and Goine (1998) analyzed long-term absence due to sickness among twelve typically male and female occupations in two Swedish counties, and found a strong positive correlation between age and absenteeism. When controlling for age and occupation, they found no relationship between unemployment rates and sickness absences among women. Among men, however, an inverse relationship between unemployment rates and long-term sickness absence was found.

Lidwall and Skogman Thoursie (2000) analyze the development of absences due

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[12] Disney and Webb (1991), Forsythe (1995), Beatty and Fothergill (1996), Gustafsson and Klevmarken (1993), and Bäckman (1998).

[13] Marklund (1995), Hammarström (1996), Marnetoft et al. (1996), Selander et al. (1996a, 1996b), and Marklund and Lidwall (1997).

to sickness and newly granted disability pensions, using official statistics produced by the National Social Insurance Board since 1955. They show that, in the beginning of the 1990s, long-term sickness absence decreased for *all* age groups, but most of all for age groups with weak positions on the labor market such as the youngest, for whom it was harder to get established on the regular labor market and consequently, qualify for a sickness benefit. On the other hand, they explained the increase in long-term sickness since 1997 by the decrease in unemployment rate, but also by the fact that the labor force has gotten older.

4 Theoretical framework

Employees with *bad health status* are defined in this study as persons experiencing a sickness spell of 60 days or more. What is characteristic for them is that they may undergo various transitions, as for example, transitions between the labor market states of employment, unemployment, and nonparticipation. This reflects the *dynamic aspects* of economic behavior. Data on "waiting times" until the transition takes place describe the duration until an event occurs as the outcome of a decision on the optimal moment for doing the transition to another state. With such a design, the question is what economic model is suitable to explain individuals' experiences in various (labor market) states. The theoretical models most frequently used for reduced-form econometric duration analyses are *search model*s.[14]

As suggested by Fenn (1981), conventional search models used in analyzing the behavior of unemployed people could be relevant for analyzing the behavior of sick people *if* their employment contract were terminated, either at their own initiative, or at that of their employer. In Sweden employees are protected against contract termination in the case of sickness. Nevertheless, the conventional search model can be used for analyzing the behavior of sick people, given the fact that they would like to have a job and working conditions that fit better their health status.

[14] *Job search models* have been very popular as explanatory theoretical frameworks for reduced-form econometric duration analysis (see Devine and Kiefer, 1991).

People can often return to work after their sickness spells, although it is not given that it is appropriate for them to return to their current job tasks or place of employment. If no other alternative is offered, it is expected that the duration of the sickness spell would be even longer. Sick employees have the alternative to enter a rehabilitation program, at their own initiative, or at that of the social insurance office together with the company physician. The rehabilitation program can be vocational (directed mainly in getting skills for a new job), medical (directed to medical treatment and/or physical exercises that are expected to recuperate from the loss on working capacity), and social (alcohol programs belong to this group in Sweden). If medical evaluations show that employees have some limitation in doing their previous job, a change of job may be the optimal alternative, even if it requires the acquisition of new skills through a vocational rehabilitation program. If the medical evaluation shows that they have not yet recuperated at least partially, but it is expected that they will in the future, then, if it is not possible to participate in a rehabilitation program, they can "choose" to remain on sickness benefits.[15]

Medical evaluation can also conclude with a recommendation for participating in a rehabilitation program, or with a recommendation for temporary or permanent exit from the labor market with a disability pension, either of which can be either partial or full. If no hope for total or partial or recovery exists, full permanent disability exit will be recommended.

In many cases, people may be able to return to their previous job, doing the same task as before, but some changes in the working conditions may be required (e.g., an ergonomic desk, a better chair, etc). These possibilities are quite realistic, especially in Sweden, where much funding is allocated for improvement of the working conditions and the working environment, for vocational rehabilitation programs, special programs aimed at the employment of the disabled, etc.

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[15] "Being sick" is viewed in a very general way here as not being a choice, but at the margin, choice may still be possible. We will assume that medical evaluations are very well done, showing the true health status of employees. We will also assume that, given a reasonable wage, employees prefer to work, and would choose any work reasonable alternative their health status allows.

If people return to work with a residual disability, it may also be realistic to assume that their wage offer (w) is higher than the disability benefit (b), so that $b < w$. It may also be realistic to assume that their wage offer (w) can be lower than what they had before sickness (w_0), but still higher than their initial reservation wage (w^r), so that $w^r < b < w < w_0$. It implies that the financial alternative of disability benefit can have impact in the decision of return to work. Therefore, a generous social insurance benefit level can decrease the propensity to return to work, which does not necessarily imply that people who leave the labor market with a disability benefit would be better off in the long-run. Additionally, their health and/or financial dependency would require even more support later on than if they would chose to work at least some hours. If working *some* hours is one avenue for better life, then the problem is to find such jobs.

Unlike the job search process for "healthy" people that can require considerable time and resources, and where the returns of these investments are uncertain, job search for employees with long-term sickness spell can require less effort if the opportunity at his/her current place of employment are sufficiently varied. In addition, there may be less uncertainty because of programs designed to help the employee back to the same place of employment. For example, there is continuous collaboration between social insurance offices, employers and medical personnel. Thus, in this study we will assume that those with "poor health" aim to maximize the expected present value of their income over their lifetime with a subjective rate of discount, anticipating (or not) that the job offer and its distribution, and compensation for earnings loss due to sickness or disability, may change over time. More precisely, one can return to work with the same wage as before, but there is an alternative to change jobs to a lower (and even higher) wage than before; and to work fewer hours than before. Additionally, the financial alternative (disability benefit) can vary over time, which can also affect the expected value or present value of the income of sick employees.

5 The data

This paper analyses the LSIP sample from the Long-term Sickness (LS) database, from the National Social Insurance Board of Sweden. This sample of 2789 persons represents all residents in Sweden registered with the social insurance office, born during 1926-1966, and who had at least one sickness spell of at least 60 days during the period 1986-1989. The sample is longitudinal and contains all compensated sickness spells during the period January 1, 1983 through December 31, 1991, including exact beginning and ending dates. However, there is no data on possible long-term sickness spells before 1983, and there is no information on diagnosis for spells that started before January 1, 1986 (except for ongoing spells at this date). All people who died or left the country during the observation period were excluded in this study, resulting in final a sample of 2666 persons, who had 4430 spells of long-term (LT) sickness.

Table 2 presents the descriptive statistics, at the beginning of analyzed spells of long-term sickness, by spell. The share of women increases by spell of LT sickness which is consistent with the national statistics, which show that women are generally sick more often and longer the men. The percentage of young women (35 and under) is considerably higher than that of young men, possibly explained by complications related to childbirth, but perhaps also due to less emphasis on the environment in typically female occupations (health care, education, etc.). The opposite is true for the oldest age group (56-65 years). The fact that the first two spells of LT sickness, the percentage of older men is higher than that of older women in this group, may be explained by the fact that, in the 1980s, women who were born in the 1920s and 1930s had, on average, fewer years in the work force and thus perhaps a lower risk of disability.

The proportion of Swedish born people decreased by spell, while the proportions of naturalized Swedes and (other) foreign born persons increased by spell. This may suggest lower human and/or health capital, as well as possible cultural factors.

Table 2 Descriptive statistics, at the beginning of analyzed LT sickness spell, by gender and spell, 1986-1991

	First spell of long-term sickness						**Second spell of long-term sickness**						**Third spell of long-term sickness**					
	All		Men		Women		All		Men		Women		All		Men		Women	
	n = 2666		*n* = 1187		*n* = 1479		*n* = 1089		*n* = 452		*n* = 637		*n* = 415		*n* = 160		*n* = 255	
Variable	Mean	Std	Mean	Std	Mean	Std	Mean	Std	Mean	Std	Mean	Std	Mean	Std	Mean	Std	Mean	Std
Gender (1=Female)	0.56	0.50					0.58	0.49					0.61	0.49				
Age	43.70	11.81	44.72	11.71	42.88	11.84	44.53	11.61	45.38	11.57	43.92	11.60	44.38	10.97	43.98	11.49	44.63	10.65
Age-groups																		
35 and under	0.29	0.46	0.26	0.44	0.32	0.47	0.26	0.44	0.24	0.43	0.28	0.45	0.25	0.44	0.29	0.46	0.23	0.42
36-45 years	0.24	0.43	0.24	0.43	0.24	0.43	0.26	0.44	0.25	0.43	0.27	0.44	0.29	0.45	0.26	0.44	0.31	0.46
46-55 years	0.25	0.43	0.25	0.43	0.24	0.43	0.25	0.43	0.26	0.44	0.24	0.43	0.26	0.44	0.26	0.44	0.27	0.44
56-65 years	0.22	0.41	0.25	0.43	0.19	0.40	0.23	0.42	0.25	0.43	0.22	0.41	0.20	0.40	0.19	0.40	0.20	0.40
Citizenship																		
Swedish born	0.85	0.36	0.84	0.37	0.85	0.35	0.82	0.38	0.82	0.39	0.82	0.38	0.78	0.41	0.81	0.40	0.77	0.42
Foreign born	0.08	0.28	0.09	0.29	0.07	0.26	0.09	0.29	0.10	0.30	0.09	0.29	0.12	0.32	0.13	0.33	0.12	0.32
Nationalized Swede	0.07	0.26	0.07	0.26	0.07	0.26	0.09	0.28	0.08	0.27	0.09	0.28	0.10	0.30	0.07	0.25	0.12	0.32
Educational level																		
Low	0.63	0.48	0.69	0.47	0.59	0.49	0.65	0.48	0.71	0.45	0.61	0.49	0.67	0.47	0.69	0.46	0.65	0.48
Medium	0.28	0.45	0.27	0.44	0.30	0.46	0.29	0.45	0.26	0.44	0.31	0.46	0.28	0.45	0.29	0.45	0.27	0.45
High	0.08	0.28	0.05	0.21	0.11	0.32	0.06	0.24	0.03	0.17	0.08	0.27	0.06	0.23	0.02	0.14	0.08	0.27
Marital status																		
Unmarried	0.27	0.44	0.31	0.46	0.23	0.42	0.25	0.43	0.31	0.46	0.21	0.41	0.24	0.42	0.31	0.47	0.19	0.39
Married	0.55	0.50	0.52	0.50	0.57	0.50	0.53	0.50	0.51	0.50	0.54	0.50	0.49	0.50	0.44	0.50	0.52	0.50
Divorced	0.16	0.37	0.16	0.37	0.17	0.37	0.19	0.39	0.16	0.37	0.21	0.41	0.24	0.43	0.22	0.42	0.25	0.44
Widowed	0.02	0.15	0.01	0.11	0.03	0.18	0.03	0.18	0.02	0.12	0.04	0.21	0.04	0.19	0.03	0.16	0.04	0.20
No. of children (<7 years)	0.17	0.48	0.01	0.09	0.30	0.62	0.20	0.54	0.00	0.05	0.34	0.68	0.15	0.49	0.01	0.08	0.24	0.61
No. of children (7-16 years)	0.17	0.49	0.02	0.16	0.29	0.61	0.21	0.52	0.02	0.14	0.35	0.64	0.21	0.49	0.03	0.21	0.32	0.58
Spell duration (in days)	306.4	371.9	327.8	384.2	289.1	360.8	271.0	282.7	285.0	300.5	261.1	269.1	282.0	261.8	289.5	271.2	277.2	256.1

Variable	First spell of long-term sickness						Second spell of long-term sickness						Third spell of long-term sickness					
	All		Men		Women		All		Men		Women		All		Men		Women	
	n = 2666		n = 1187		n = 1479		n = 1089		n = 452		n = 637		n = 415		n = 160		n = 255	
	Mean	Std	Mean	Std	Mean	Std	Mean	Std	Mean	Std	Mean	Std	Mean	Std	Mean	Std	Mean	Std
No. of spells before spell *i*	5.31	5.96	4.66	5.69	5.84	6.13	10.34	8.79	9.41	8.74	10.99	8.77	13.23	9.45	12.45	9.88	13.72	9.15
No. of ST spells before spell *i*	2.98	4.86	2.42	4.38	3.43	5.18	5.13	6.58	4.31	6.06	5.70	6.86	5.88	6.63	5.02	6.17	6.42	6.86
Diagnosis																		
Musculoskeletal	0.39	0.49	0.38	0.49	0.39	0.49	0.44	0.50	0.41	0.49	0.47	0.50	0.47	0.50	0.43	0.50	0.49	0.50
Cardiovascular	0.07	0.25	0.10	0.30	0.04	0.20	0.06	0.24	0.09	0.28	0.04	0.20	0.03	0.18	0.04	0.21	0.03	0.16
Mental	0.12	0.32	0.12	0.33	0.12	0.32	0.13	0.34	0.17	0.38	0.11	0.31	0.19	0.39	0.26	0.44	0.14	0.35
Respiratory	0.03	0.16	0.03	0.17	0.02	0.15	0.03	0.17	0.03	0.17	0.03	0.18	0.01	0.11	0.03	0.16	0.00	0.06
General Symptoms	0.04	0.20	0.03	0.16	0.05	0.22	0.05	0.22	0.05	0.22	0.06	0.23	0.06	0.23	0.03	0.18	0.07	0.26
Injuries and poisoning	0.13	0.34	0.18	0.39	0.09	0.28	0.07	0.25	0.11	0.31	0.04	0.19	0.06	0.24	0.08	0.27	0.05	0.21
Other	0.23	0.42	0.16	0.37	0.29	0.45	0.21	0.41	0.15	0.35	0.26	0.44	0.19	0.39	0.13	0.34	0.22	0.42
Annual earnings (1000 SEK)*	160.2	76.3	184.8	83.4	140.6	63.7	162.9	61.7	184.6	66.5	147.3	52.9	162.5	61.7	186.7	69.1	147.3	51.1
Unemployment rate**	2.30	1.29	2.40	1.38	2.21	1.21	1.96	1.09	1.96	1.02	1.96	1.13	1.86	1.02	1.77	0.91	1.91	1.08

Note: * *Annual Earnings* of the year when the first LT sickness spell began were inflated to "present" values using the 1997 CPI;
** *Unemployment rate* is reported by quarter, gender and administrative region, and is shown here for the quarter when LT-sickness spell began.

The proportion of persons with lower education increased by spell, which might be explained by the characteristics of the job and/or working environment, perhaps in combination with the selection of persons with lower education to specific tasks.

The proportion of married people decreased by spell, perhaps because married people cannot afford the income loss; on the other hand, marriage might be a healthier state. It could also happen that "poor health" might make marriage less likely, or make the transition from married to divorced more likely.

Third spells were, on average, shorter than first spells, but longer than second spells. The average number of short-term sickness spells (i.e., spells of seven days or less) preceding the LT sickness increased by spell, from about 3 before the first LT spell, to over 5 before the second, and almost 6 before the third.

The proportion of spells with muskoloskeletal, mental, and general diagnoses increased by spell, while the proportion of injuries and poisoning decreased by spell, as did cardiovascular and "other" diagnosis. The fact that injuries and poisoning decrease relatively makes sense since these are usually *not conditional* on whether a person has previously had an event of this kind. On the other hand, the other diagnoses are more likely, although not necessarily so.

The annual earnings of the year when the first LT sickness spell began, "adjusted" for the loss due to sickness, changed very little by spell. The average regional unemployment rate at the beginning of the LT sickness spell decreased by spell, but there is no gender specific tendency.

Table 3 shows descriptive statistics of sickness variables (days and spells) by individual. The average person in the sample was sick 582 days during the analyzed period, with 1.7 spells of long-term sickness, and 8.9 spells of short-term sickness.

Table 3 Descriptive statistics by individual during 1986-1991 (N=2666)

Variable	Min	Max	Mean	Std Dev
Days of Long-Term Sickness	60	3153	483.38	447.25
Days of Short-Term Sickness	0	1106	99.39	110.95
Total Days of Sickness	60	3346	582.78	466.78
Number of Long-Term Sickness Spells	1	10	1.66	1.02
Number of Short-Term Sickness Spells	0	101	8.89	10.41

Table 4 presents descriptive statistics regarding the duration of the LT sickness, by spell. Mean duration generally decreases with the number of spells, that is, there is a shorter "waiting time" before exit. This can be due to a combination of factors, including a quicker process for the transition into disability. Less than half of the sample (1088 persons, or about 41%) had more than one spell of LT sickness, while 16% had at least three spells, and about 6% had at least four.

Table 4 Descriptive statistics for the duration (in days) of all long-term sickness spells

Long-term sickness	**N**	**Median**	**Mean**	**Std. Dev.**	**Min****	**Max**
Spell 1	2666	146	306.42	371.91	60	3096
Spell 2	1088	136	271.02	282.61	60	1904
Spell 3	413	175	282.01	261.77	60	1620
Spell 4	158	148	230.33	214.62	60	1196
Spell 5	65	153	235.94	193.90	62	994
Spell 6	28	138	241.89	293.16	63	1276
Spell 7	8	118.5	148.38	103.04	60	395
Spell 8	2	140.5	140.50	82.73	82	199
All spells*	4430	143	290.90	335.30	60	3096

Note: *There was one person with nine spells and one with ten;
** Long-term sickness is defined as 60 or more days, which account in many cases for the minimum value.

6 Econometric modeling

Sickness duration can be modeled by specifying a hazard function, which can be viewed as the product of the probability of recuperation (of the loss of working capacity) and the probability of wanting to return to work. The lack of economic theory about the relationship between the hazard rate at any time and elapsed duration of sickness at that point, can lead to incorrect assumptions about the form of the baseline hazard, which can potentially bias the estimated effects.

Let us explain this. We might specify a model in which a sick employee has each day the same probability of becoming healthy (i.e., to return to work); that is, conditional on being sick through yesterday, the probability of becoming healthy today is h, which means that the sequence of conditional probabilities would be a constant.

But this assumption would not seem to represent the data used here, which contain spells of long-term sickness, for which it might be more appropriate to assume that the "conditional probability" of becoming healthy $h(t)$, *decreases* with the length of spell.[16] The random variable, D, which represents duration of sickness is expressed as the number of days and the hazard function for this random variable, and is defined in terms of the cumulative distribution function $F(t)$ and the probability density function $f(t)$ by

$$\textbf{(1)} \qquad h_D(t) = \frac{f(t)}{1 - F(t)}$$

which, considering that $1 - F(t) = S_D(t)$, can be rewritten as:

$$\textbf{(2)} \qquad h_D(t) = -\frac{d \log S_D(t)}{dt}$$

where $S_D(t)$ is the survival function, or the probability that the sickness spell did not end prior to time t.

The evolution of the hazard function in time gives information about the duration dependence of an underlying stochastic process. If $h(t)/t > 0$, then the process exhibits positive duration dependence, which in our case would mean that the hazard of ending sickness any given day increased over time. If $h(t)/t < 0$, then the process exhibits negative duration dependence, which in our case would mean that the hazard of ending sickness decreased over time.

The proportional hazards model developed by Cox (1972) assumes that the hazard falls or rises over time at the same rate for all individuals, differing only according to the individual's vector of personal characteristics, x. Following Cox's model, we assume that the hazard function can be thus factored into a function of time and a function of variables related to spell and to individual. A corresponding model for the hazard of ending sickness is

[16] The hazard rate (also called hazard function, risk function, intensity rate, failure rate, transition rate, or mortality rate), expresses the instantaneous risk of ending sickness at time t, given that this event did not occur before time t. It is not a probability, because $h(t)$ is a positive number that can be greater than 1.

(3) $h(t; x_i) = h_0(t)\exp(\beta x_i)$,

where β are the coefficients to be estimated, and $h_0(t)$ is an unknown function of time. The expression $h_0(t)$ gives the hazard function for the "standard" set of conditions, $x = 0$. This model and its special cases, most notably the proportional hazards (PH) model, have been used in hundreds of empirical studies (see Devine and Kiefer, 1991, for references in micro labor economics). A *flexible* specification of the baseline hazard rate allows for non-monotonic variation with duration, and therefore a wider range of possible effects of duration on the hazard rate are captured.

A problem, associated in the literature with Heckman and Singer (1985), is that the presence of unobserved heterogeneity tends to produce estimated hazard functions that decline with time even when the hazard is not declining for any individual in the sample. This occurs when "high hazard" individuals are "exiting" more rapidly at *all* points in time, leaving in time a risk set that is made up *only* of "low hazard" people. This problem could lead to errors in computing and interpreting the hazard functions and the coefficients for the covariates. Additionally, with longitudinal data with multiple spells, another problem is whether, given the observed explanatory variables, the various durations are independently distributed or not.[17] Current econometric research often involves the simultaneous analysis of multiple observed spells, of either the same type or of different types of duration for a given individual.

In trying to learn more about factors affecting long-term sickness spells, we will here consider "families" of spells, i.e., groups of spells by individual, by diagnosis, and by region. Thus we can consider the impact of unobserved group-level heterogeneity on sickness duration. We will assume that spells in the same group share a common set of time-invariant, generalized, unmeasured characteristics that can be captured by an unobserved variable representing the group's propensity to exit from LT sickness.

[17] Van den Berg (2000) examines various types of relations between duration variables, as motivated by economic theory, and how they can be incorporated into multivariate extensions of the mixed proportional hazards model. One of his main conclusions regarding multiple-duration models is that, in micro-econometric research involving self-selection, duration data are much more informative than binary data.

Groups with identical observed characteristics can have different absence behavior due to long-term sickness. Given otherwise similar characteristics, spells in one group might be longer than spells in another partly as a result of genetics, but also because of different nutrition, living conditions and access to healthcare at different times in life. These factors are here considered to be part of an unmeasured group-level component (or random effect) that contributes to the risk of exit from LT sickness. Other factors (that unfortunately we cannot observe here) are working conditions, social contacts, job satisfaction and cultural background. Similarly, the other "families" of spells (groups of spells by diagnosis, and groups of spells by regions) share (other) common characteristics.

Based on the various groups of spells, let T_{i1}, …. T_{iJ} denote the J "waiting times" (or, durations) before exit from long-term sickness in the "family" i. Let x_{ij} denote the fixed and time-varying covariate vector associated with the j^{th} individual in the i^{th} group. A group-level random effect, or frailty term, (w_i) can be introduced to account for the dependence of "waiting times" before exits from LT sickness within the groups. Conditional on this unobserved "characteristic", event times within groups are mutually independent with the conditional (on heterogeneity) hazard function

(4) $$h(t_{ij} \mid w_i) = h_0(t_{ij}) \exp(x'_{ij}\beta) w_i \,,$$

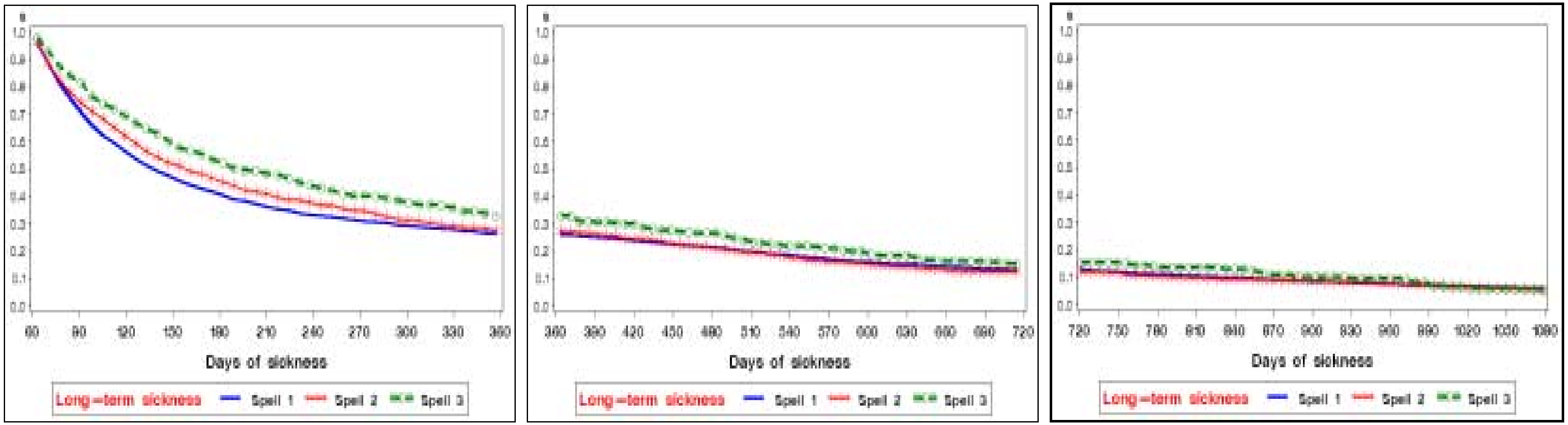
where β is a vector of fixed and time-varying effects, and $h_0(t_{ij})$ denotes the baseline hazard. The group-level random effect, w_i, acts multiplicatively on the group i risk of exit from LT sickness so that all spells' risks of ending in a particular group are multiplied by this common factor. We will assume that the frailty term follows a gamma distribution with density function, $g(w_i) = \alpha^{\alpha} w_i^{\alpha\text{-}1}\exp(\text{-}\alpha w_i)/\Gamma(\alpha)$, where the distribution is normalized to have a unit mean and a variance of σ. When $\sigma = 0$, the observations are mutually independent and the equation reduces to the standard proportional hazards model for individual-spell data (3). The estimate of σ can be interpreted in terms of the relative risk of exit from a hypothetical spell of long-term sickness.

Considering a group (i) of J spells, the ratio of the conditional hazard for a long-term sickness spell on day t_1, given that all other spells in the group ended at day t_2, t_3, …t_J, to the conditional hazard of exiting a long-term sickness spell at day t_1, given that a specific subset of spells had *not* ended at those times is ($1+\sigma$) times the number of spells hypothesized to have had ended at the specified times. The intra-group rank correlation coefficient (or Kendall's tau) can be interpreted as the percentage of total variation in the risk of exiting sickness that is between-group variation. The Expectation Maximization (EM) algorithm is used to fit this model. Given the data, the algorithm finds a frailty estimate for each group. The frailty distribution parameter, α, is estimated in one step, and is then used to estimate each group's frailty (w_i). The estimated frailty ($\hat{w}_i$) is substituted for w_i, and this process is repeated until the difference in successive estimates of α is negligible.

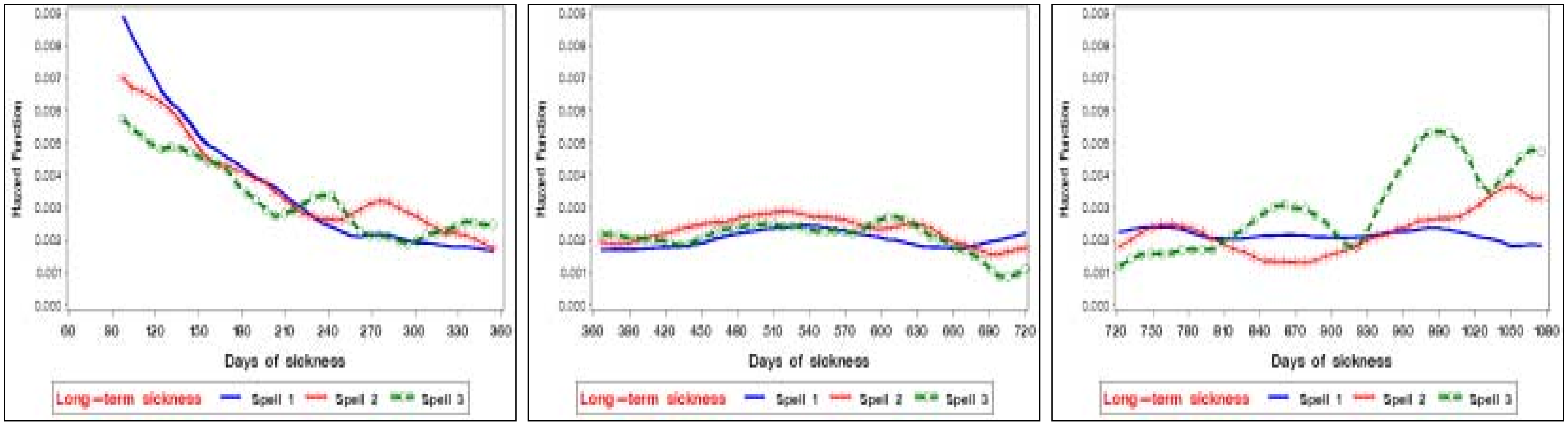
7 Results

7.1 Nonparametric survival analysis

Figures 5a and 5b show the survival and hazard functions for first, second, and third spells of long-term sickness, estimated by the life-table method. In order to have a (more) detailed graphical representation, the plots were “truncated” for the first, second, and third years of sickness. Spell durations were also “truncated” into intervals of seven days, so the results can depend to some extent on these arbitrarily defined intervals. In addition, there are relatively large numbers of cases for the first and second spells of LT sickness (2021 and 1080, respectively), and relatively few (413) for the third, which means that the method gives relatively better approximations for the first two spells of long-term sickness.



a) Survival estimates (s) during I) first year, II) second year, III) third year of long-term sickness



b) (Smoothed) hazards during I) first year, II) second year, III) third year of long-term sickness

Figure 5 Survival and hazard functions of absenteeism due to long-term sickness, by spell, 1986-1991.

The plots of the survival function (Figure 5a) show estimates of the proportions of sick people who have not yet become better (finished their sickness spell) up to a specific duration calculated from the *first* day of sickness (even though all spells are of at least 60 days). Most notable, the estimated proportion of people remaining sick fell rapidly during the first four months, and then slowed considerably. After one year about 30% of all analyzed people were still recorded as being long-term sick, while about 70% have already exited.

Table A2 (in the Appendix) shows results of tests of whether spells 1, 2 and 3 can be considered “equal”. They cannot, which means we cannot pool all spells and treat them as single spells without affecting the parameter estimates and their standard errors. The great variety in the number of spells per individual (Table 4) also suggested that the analyzed sample is quite heterogeneous. As discussed above, neglected or unobserved heterogeneity across observations can lead to apparent time-dependence and wrong conclusions. Therefore, an unobservable multiplicative random effect shared by spells within a group is considered, and the model is estimated now using *all* spells of LT sickness (not only the first three), grouped by individual, diagnosis, and region.

7.2 Multivariate analysis

Table 5 shows the estimation results for the conditional hazard function (4) for spells grouped by spells by individual, spells by diagnosis, and spells by regions. In general the hazard of ending LT sickness was (18-46%) higher for women than men during 1986-1991. The hazard of ending LT sickness was lower for older people: For people aged 36 to 45 it was about 77-81% of the hazard of those aged 35 or younger, while for those aged 46 to 55 it was about 66-74%, and for those aged 56 to 65 it was 55-64%.

Table 5 Estimations results for 4430 spells grouped by individual, diagnosis, and region

Variables	Individuals (J = 2666)			Diagnosis (J = 346)			Region (J =25)		
	Estim.	S.E.	HR	Estim.	S.E.	HR	Estim.	S.E.	HR
Frailty	**0.31**	0.03	1.36	**0.32**	0.04	1.37	**0.01**	0.01	1.01
Female (CG[a]: Male)	**0.38**	0.05	1.46	**0.21**	0.04	1.23	**0.16**	0.03	1.18
Age (CG: < 36 years)									
36-45 years	**-0.26**	0.06	0.77	**-0.21**	0.05	0.81	**-0.25**	0.05	0.78
46-55 years	**-0.42**	0.07	0.66	**-0.30**	0.05	0.74	**-0.35**	0.05	0.70
56-65 years	**-0.59**	0.07	0.55	**-0.45**	0.06	0.64	**-0.47**	0.05	0.63
Citizenship (CG: Swedish Born)									
Naturalized Swede	-0.12	0.08	0.89	**-0.12**	0.06	0.88	**-0.10**	0.06	0.90
Foreign born	0.04	0.08	1.04	0.04	0.06	1.04	-0.02	0.06	0.98
Marital status (CG: Married)									
Unmarried	-0.09	0.06	0.91	-0.07	0.05	0.94	**-0.14**	0.04	0.87
Divorced	-0.06	0.06	0.94	-0.04	0.05	0.96	-0.02	0.04	0.98
Widowed	0.06	0.13	1.07	0.09	0.11	1.10	0.08	0.10	1.08
Educational level (CG: low)									
Medium	-0.02	0.05	0.98	-0.03	0.04	0.97	0.01	0.04	1.01
High	**-0.26**	0.09	0.77	**-0.17**	0.07	0.84	-0.04	0.06	0.96
Quarter (CG: Winter)									
Spring	-0.06	0.06	0.94	-0.04	0.05	0.96	-0.06	0.05	0.94
Summer	**-0.30**	0.05	0.74	**-0.24**	0.05	0.78	**-0.23**	0.04	0.79
Autumn	**-0.15**	0.05	0.86	**-0.15**	0.05	0.86	**-0.14**	0.05	0.87
Year (CG: ≤ 1986)									
1987	**0.12**	0.06	1.13	**0.14**	0.05	1.14	0.17	0.05	1.18
1988	-0.06	0.07	0.95	-0.03	0.06	0.97	0.02	0.06	1.02
1989	-0.13	0.08	0.88	-0.07	0.07	0.93	0.02	0.06	1.02
1990	**-0.22**	0.10	0.80	-0.14	0.08	0.87	-0.05	0.08	0.95
1991	**-0.87**	0.13	0.42	**-0.75**	0.12	0.47	**-0.65**	0.12	0.52
Diagnosis (CG: respiratory)									
Musculoskeletal	-0.12	0.12	0.88				-0.04	0.10	0.96
Cardiovascular	-0.16	0.14	0.85				-0.06	0.12	0.94
Mental	0.00	0.13	1.00				0.03	0.11	1.03
General symptoms	0.17	0.15	1.19				0.13	0.13	1.14
Injuries & poisoning	**0.39**	0.14	1.48				**0.32**	0.11	1.38
Other	**0.24**	0.13	1.27				**0.24**	0.10	1.27
Previous cases [b]	0.00	0.00	*-0.29*	0.00	0.00	*0.10*	0.00	0.00	*0.16*
Daily loss[c] (100 SEK)	**0.03**	0.00	*3.16*	**0.02**	0.00	*2.20*	**0.01**	0.00	*1.22*
Unemployment rate	**-0.07**	0.03	*-6.68*	**-0.06**	0.02	*-5.95*	**-0.05**	0.02	*-4.72*
Region (CG: Göteborg)									
Kronoberg	**0.36**	0.19	1.43	**0.25**	0.15	1.29			
Bohuslän	**-0.30**	0.15	0.74	**-0.29**	0.11	0.75			
Varmland	**0.35**	0.14	1.41	**0.27**	0.11	1.31			
Kendall's TAU	**0.13**			**0.14**			**0.006**		
-2 Log Likelihood	48550	48323	227	48628	48340	288.1	48621	48603	17.5

Note: **Bolds** are significant at the 10%-level; *Italics* for hazard ratio (HR) indicate that for the continuous variables it had been recomputed as $phr = 100*(hr-1)$; [a] CG is the comparison group; [b] Previous cases of sickness before the analyzed spell, and starting with January 1983, regardless of their duration; [c] Daily earnings loss due to sickness.

The hazard of naturalized Swedes to exit LT-sickness was 88-90% of the hazard for Swedish born people.

The hazard to exit LT-sickness for those with higher education was lower (about 77-84%) than the hazard for people with lower education. This result can be explained by several characteristics of the two groups, such us: income, work environment and working conditions, and health capital. Especially in Sweden, where medical insurance is universal, it is possible that the individuals' care for their health is an important factor driving this difference. People with higher education may be more careful with their health, and more receptive to all information related to health issues than less educated people.

People whose spells started in winter showed the highest hazard of exiting from LT sickness. For those whose spells started in a summer quarter, the hazard of exiting from LT sickness was 74-79% of the hazard of those whose spells started during the winter quarter, while for those whose spells started in a autumn quarter it was about 86-87%.

The hazard for exiting from LT sickness was (13-18%) higher for spells that started in 1987 compared to those that started in 1986 or before (i.e., 1983-1986), while for those started in 1991 it was only 42-52% as high. These were the only years with several highly significant results, and they happen to coincide with two reforms of the social insurance, which occurred under two very different macro trends: the relatively good period of the end of the 1980s, and the beginning of the recession period in the early 1990s. This can be an explanation of the different sign of the estimated coefficients for years 1987 and 1991.

The hazard of exit from LT sickness was (38-48%) higher for those with injuries or poisoning diagnosis, than for those with a respiratory diagnosis; and those with "other" diagnosis were 27% higher.

The daily loss of earnings had a significant impact on the duration of absence due to sickness: For each 100 Swedish crowns daily earnings loss, the hazard of exit from LT sickness went up by 1.2-3.2%. The regional unemployment rate also had a significant effect: Each additional percentage point was associated with a 4.7-6.0% decrease in the hazard of exit from LT sickness.

There are also geographical differences. The hazard of exit from LT sickness was

(29-43%) higher for those living in Kronoberg and Värmland compared to those living in Göteborg, while for those living in Bohuslän it was only about 75% of the hazard of those living in Göteborg. Parameter estimates and hazard ratios for the other regions that were not significant at the 10%-level are shown in Table A3 in the Appendix.

Judging by Kendall's tau, the intra-group correlation was about 0.13 for spells grouped by individual and by diagnosis, and less than 0.01 for spells grouped by region. Thus there was a relatively low association in the risk of exit from LT sickness among individuals and diagnoses, and almost no association among regions.

8 Summary and conclusions

This paper presented new evidence on the determinants of the duration of long-term sickness for employed individuals in Sweden from mid-1980s through beginning of the 1990s, using longitudinal data from a representative subset of the insured population. The probability of exiting long-term sickness declined considerably after about four months (Figure 5), which suggests that policies aimed at helping the long term sick return to work should focus on helping employees with health problems before this period. Regarding this, prevention methods directed towards improving working conditions and evaluating job tasks should be considered more often.

During the period of the study, women had a higher hazard to exit from LT sickness than men (Table 5), much of which might be explained by the fact that women exited into disability more often than men. The older people were, the lower was the hazard of exit from LT sickness, which indicates that little is done to help older workers back to the work place. This suggests that policy initiative to improve health status, speed up the recovery and encourage work should also be targeted towards those in older age groups. On the other hand, to prevent or slow down the increasing trend of LT sickness, besides helping these people, special policies should be oriented to prevent deterioration of the heath status of younger employees. These policies should relate both to working conditions and to health problems related to work. One such policy would be greater flexibility in working time. In this context the consequence of overtime work and the burden of both paid careers and house work (usually) for women needs to be analyzed in a long-term perspective as well, since over use work capacity today might cause health problems in the future.

The hazard of exit from LT sickness was lower for naturalized Swedes than the Swedish born. There was labor migration to Sweden during 1960s and early 1970s, often to jobs requiring hard physical effort and/or with a less amenable working environment (there was less competition from Swedes for these jobs). Many may have worked many overtime hours as well, hoping to return home “wealthy”. If they did not then return home, and they belong to the group of naturalized Swedes, it would not be surprising that their LT sickness might last longer. This indicates that it is important to pay more attention both to physical working conditions and to hours of work. Generally, improving working conditions and designing the tasks of each job so as to prevent a misuse of individuals’ working capacity should be priorities for employers. In this sense the involvement of employers in payment of their employees’ sick pay (during the first 2, or even 4, weeks of each spell) is well motivated, not only as an instrument for “disciplining” employees’ absenteeism, but also as an indicator telling employers something about the working conditions in their organizations. Under these considerations, the employers’ contributions to the social insurance should also be redesigned.

The quarter when a LT sickness spell started also had an impact on the hazard of exiting the spell: Starting during the summer implied the lowest hazard of exiting compared to winter. These findings may suggest an effect of weather. During the colder and darker months, persons with rheumatic or psychological problems may be affected more.

Loss of earnings due to sickness decreased the length of the spell. On the other hand, the presence of high unemployment increased the length of the spells, perhaps, due to the uncertainty about the outcome if people return to work.

The medical examination is clearly a very important element in this whole process, but even more so regarding the future of employed individuals. Having a well-done evaluation, and flexible programs connected to it, can help the individual’s health and wealth, and the society too. Nevertheless, being active in a “well-balanced” way is considered to have a positive impact on health, especially in the long run.

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Appendix

Table A1 Employed part-time (in 100), by gender and age groups.

	Age-groups							Total
	16-19	**20-24**	**25-34**	**35-44**	**45-54**	**55-59**	**60-64**	
Women								
1987	570	680	2120	2790	1836	839	677	9512
1988	552	669	2105	2700	1835	813	688	9362
1989	578	634	2080	2700	1839	780	650	9261
1990	581	599	2099	2582	1907	765	685	9218
1991	558	585	2028	2521	2004	742	699	9137
1992	469	577	1920	2420	2011	732	701	8830
1993	385	585	1830	2312	1971	727	636	8446
1994	354	680	1811	2231	1921	735	555	8287
1995	389	690	1804	2166	1915	727	573	8264
1996	354	684	1741	2079	1867	741	546	8012
1997	343	664	1663	2089	1830	762	485	7836
1998	383	664	1677	2010	1795	783	455	7767
1999	425	637	1632	1990	1783	763	470	7700
Men								
1987	271	167	240	174	141	64	271	1328
1988	283	177	219	187	136	79	336	1417
1989	320	186	237	201	120	83	360	1507
1990	339	164	263	215	128	95	329	1533
1991	309	175	264	194	138	86	348	1514
1992	253	190	273	190	153	105	367	1531
1993	206	204	276	207	175	90	377	1535
1994	212	234	307	231	196	101	348	1629
1995	203	244	307	218	207	116	313	1608
1996	214	251	320	213	214	119	275	1606
1997	213	271	317	240	230	116	205	1592
1998	233	264	297	263	239	129	173	1598
1999	267	297	332	241	231	139	179	1686

Source: Statistics Sweden, Anställda (AKU) efter kön, ålder, hel/deltid och veckoarbetstid. År 1987-1999

Table A2 Test of equality over strata

Test	Chi-Square	DF
Log-Rank	**12.05**	2
Wilcoxon	**24.70**	2
-2Log(LR)	<u>4.69</u>	2

Note: **Bold** =significant at less than 1%, and <u>underline</u> = significant at the 10% level.

Table A3 Estimates for region dummies (control = Göteborg)

Region	Individuals (J =2666)			Diagnoses (J =346)		
	Estimate	Std. Error	Hazard ratio	Estimate	Std. Error	Hazard ratio
Blekinge	-0.01	0.18	0.99	-0.01	0.14	0.99
Bohuslän	-0.30	0.15	0.74	-0.29	0.11	0.75
Gotland	0.21	0.25	1.24	0.18	0.19	1.20
Gävleborg	-0.12	0.14	0.89	-0.14	0.11	0.87
Halland	0.02	0.17	1.02	-0.05	0.13	0.95
Jämtland	0.04	0.17	1.04	-0.01	0.14	0.99
Jönköping	-0.03	0.15	0.97	-0.06	0.12	0.94
Kalmar	0.05	0.15	1.05	0.01	0.12	1.01
Kopparberg	-0.03	0.15	0.97	-0.04	0.11	0.96
Kristianstad	0.13	0.14	1.14	0.15	0.11	1.16
Kronoberg	0.36	0.19	1.43	0.25	0.15	1.29
Malmöhus	0.07	0.13	1.08	0.01	0.10	1.01
Norrbotten	0.13	0.14	1.14	0.07	0.11	1.07
Skaraborg	0.29	0.17	1.34	0.19	0.13	1.21
Stockholm	0.05	0.12	1.05	0.00	0.09	1.00
Södermanland	-0.11	0.16	0.90	-0.14	0.12	0.87
Uppsala	-0.06	0.15	0.94	-0.10	0.12	0.91
Värmland	0.35	0.14	1.41	0.27	0.11	1.31
Västerbotten	-0.05	0.15	0.95	-0.05	0.12	0.95
Västernorrland	-0.18	0.15	0.83	-0.12	0.12	0.89
Västmanland	-0.17	0.14	0.84	-0.16	0.11	0.86
Älvsborg	0.06	0.14	1.06	0.05	0.11	1.05
Örebro	0.03	0.15	1.03	0.00	0.12	1.00
Östergötland	-0.08	0.14	0.92	-0.09	0.11	0.91

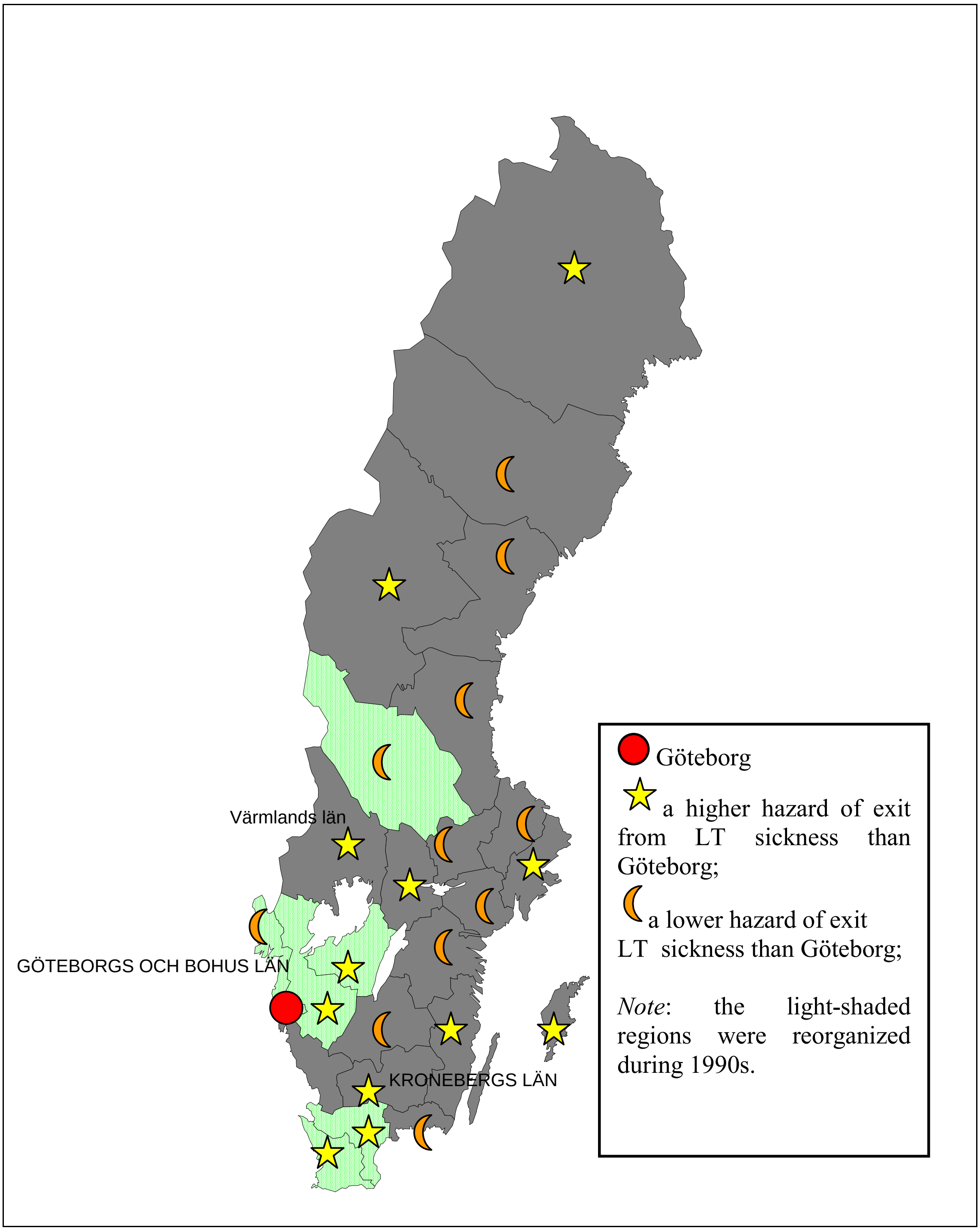

Figure A1 The hazard of ending sickness of Sweden's administrative regions, compared to Göteborg, 1986-1991.