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# Starting Sick Leave on Part-Time as a Treatment Method?*

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**Abstract**
This paper analyzes the effects of starting the sick leave on part-time compared to full-time on the probability to recover (i.e., return to work with full recovery of lost work capacity). Using a discrete choice one-factor model, we estimate mean treatment parameters and distributional treatment parameters from a common set of structural parameters. Our results indicate that part-time sick leave is not an intensive treatment and should not to be used for all from the very beginning of a case. However, when the output is analyzed for time spans longer than three months, the average probability to recover is higher for those who started on part time sick leave. Besides, the share of individuals who are positive indifferent between the two states is large (above 50%), which suggests that there is potential for increasing the share of people who start their sick leave on part-time as a means to reduce the budget cost.

**Key words**: part-time sick leave, selection, unobserved heterogeneity, treatment effects

**JEL Classification**: I12; J21; J28

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## 1 Introduction

During the second half of the 1990s, several countries changed their policies regarding people with partially-reduced work capacity, and started to focus on what people are able to do rather than on what they are not (OECD, 2003). This involves policy re-orientation from passive compensation to active integration (e.g., changes in medical and vocational assessment toward work orientation and employer involvement). Ideally, people with partially-reduced work capacity should not leave the labor force but instead be supported to remain in, or find, appropriate jobs. Some countries (e.g., Australia, Denmark, Luxembourg, and the Netherlands) have chosen to constrain people with partially-reduced work capacity to fulfill participation or job-search requirements similar to those imposed on recipients of unemployment benefits. Other countries (e.g., Sweden and Finland) have focused on the use of part-time sick leave instead of full-time sick leave, when possible. In Sweden, although it has been possible to be on part-time sick leave of 50% since the beginning of the 1960s (extended to also include 25% and 75% in July 1990), this policy did not receive much attention until the end of the 1990s. Part-time sick leave became a component of the action plan that the Swedish government set out in 2001 to increase health in the working life and to reduce sick leave by 50% by the end of 2008.

Despite the recent focus among policy makers, no previous theoretical or empirical research has evaluated the relative effects of part-time and full-time sick leave.[1] The aim of this paper is therefore to reduce this gap and analyze the effects of starting the sick leave on part-time (compared to full-time) on the probability of recovering (i.e., returning to work with full recovery of lost work capacity). To do this, we follow Aakvik et al. (2005) and estimate a discrete choice one-factor model that evaluates the effect of part-time sick leave when outcomes are discrete and responses to treatment vary among observationally identical persons. Additionally, we use this

[1] Nevertheless, we would like to refer to the results of the two previous studies on Swedish data that are closest to our research. Both estimated the effects of various types of rehabilitation programs on labor market outcomes of long-term sick individuals. Frölich et al. (2004)'s nonparametric matching estimates show that workplace training is superior to the other rehabilitation programs with respect to labor market outcomes, but compared to non-participation no positive effects are found. Heshmati and Engström (2001)'s estimates from a parametric selectivity model show that participation in vocational rehabilitation has positive effects on participants' health status and on their return to work, but they did not observe any evidence of selection on unobservable characteristics.

model to generate both mean and distributional treatment parameters from a common set of parameters.

Our estimates of the effect of the treatment on the treated show that compared to full-time sick leave, part-time sick leave does have a positive impact on the probability to recover, although only for a relatively small share of employees on sick leave (about 25 % within 180 days), and that a relatively larger share (about 33-43%) returned to work with full recovery of lost work capacity regardless of whether they were on part-time or full-time sick leave. Our results show that it is important to control for unobserved heterogeneity, i.e., for the selection into part-time or full-time sick leave.

The study is organized as follows. The next section presents institutional settings of sick leave in Sweden, while Sections 3, 4, and 5 present the empirical specification, data, and the estimated results, respectively. The last section summarizes the paper and draws conclusions.

## 2 Institutional settings of sick leave in the early 2000s

In Sweden, *both* full-time and part-time workers can be on full- or part-time sick leave (since the beginning of the 1960s). Given the institutional framework, it is possible for a person who did not lose more than 75% of his or her work capacity to be on sick leave part-time and work part-time. The right to compensation of income loss due to sickness or disability is based on the medical evaluation of the person's loss of work capacity due to the disease, sickness, or injury. However, it has been observed that physicians often give in to patient demand for sick-listing, even in cases when the physician's own judgment speaks against sick-listing (Englund & Svärdsudd, 2000). The physician therefore seems to mediate between the patient's needs and the formal rules when writing the medical certificate.

Following the physician's evaluation, it is the social insurance office that decides whether an individual is entitled to compensation, and if so what type (i.e., 25%, 50%, 75%, or 100%). In most cases, the social insurance officers accept the recommendation of the physicians as final rather than using their own judgment (Hensing, Timpka, & Alexanderson, 1997). However, there is a clear distinction between these two deciding parties: the certifying physician determines to what extent disease or injury is impairing a patient's ability to perform his or her work, while the case manager at the local social insurance office formally determines whether the patient is entitled to monetary sickness benefits. Nevertheless, the social insurance officers do experience a lack of control over the decision process, as regulations and other stakeholders restrict their work (Ydreborg, Ekberg, & Nilsson, 2007).

Although part-time sick leave can fulfill the goal of keeping in contact with the job, it might also function as replaced leisure. In most cases, people on sick leave lose only a relatively small amount of money.[2]

## 3 Empirical framework

### 3.1 The model and the estimation strategy

The point of departure is an employed individual with a diagnosed health condition and an accompanying reduced work capacity. This implies a choice between part-time and full-time sick leave. The choice of the degree of sick leave is a joint decision made by the individual, the employer, the physician, and the social insurance administrator, but from the previous section, we know that in reality all have a say. However, this implies that there needs to be an agreement among the parties before a final decision can be made, meaning that the selection into part-time or full-time sick leave can be represented by just one indicator.

The common objective of the four parties is to choose the alternative (part-time or full-time sick leave) with the highest likelihood of recovery of the lost work capacity in the shortest amount of time. The relevant outcome is therefore a measure of the propensity to return to work with full recovery of lost work capacity. Therefore, a suitable structure for the empirical framework is a discrete choice switching regression model with an endogenous switch between the two states (Heckman, 1978; 1979), defined by the following equations:

$$Y_1^* = X\beta_1 + U_1, \quad Y_1 = 1 \; if \; Y_1^* \geq 0, \text{and } Y_1 = 0 \text{ elsewhere,} \qquad \text{(Part-time sick leave)} \quad (1)$$

$$Y_0^* = X\beta_0 + U_0, \quad Y_0 = 1 \; if \; Y_0^* \geq 0, \text{and } Y_0 = 0 \text{ elsewhere,} \qquad \text{(Full-time sick leave)} \quad (2)$$

$$D^* = Z\beta_D + U_D, \quad D = 1 \; if \; D^* \geq 0, \text{and } D = 0 \text{ elsewhere,} \qquad \text{(Selection rule)} \quad (3)$$

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[2] In fact, the sickness insurance and the collective agreement replace 90% of the income lost due to sickness or disability. However, an annual income that exceeds 7.5 base amounts (which equaled SEK 297,750 in 2006) is not covered by the social insurance, but is covered by the collective agreement (usually up to a higher ceiling).

with (1) and (2) being equations for the potential outcome in each state and (3) an equation for the single index decision rule of sorting into either of the two states. More specifically, $Y_1^*$ and $Y_0^*$ are two latent measures for the propensity to return to work with full recovery of lost work capacity when starting the sick leave part time and full time, respectively. $D^*$ is a latent measure for the propensity of starting the sick leave part time. Hence, when $D^*$ is large, the propensity to start the sick leave part time is large, which is equivalent to having a small propensity to start the sick leave full time, and vice versa when $D^*$ is small. Each equation has its own stochastic component $(U_j, j = 1, 0 \text{ or } D)$, which allows for heterogeneity among individuals with the same observed characteristics. The decision on the degree of sick leave is endogenous if the stochastic components of the outcome equations $(U_1 \text{ and } U_0)$ are correlated with the stochastic component of the selection equation $(U_D)$.

One important extension of the basic model is to control for unobserved heterogeneity. Following Aakvik et al. (2005), this is done using a one-factor structure on the stochastic terms. The one-factor residuals are defined by:

$$U_1 = \theta_1 \xi + \varepsilon_1, \quad (4)$$

$$U_0 = \theta_0 \xi + \varepsilon_0, \quad (5)$$

$$U_D = \theta_D \xi + \varepsilon_D. \quad (6)$$

From a technical point of view, the factor loadings serve the purpose of reducing the dimensionality of the problem. That is, instead of evaluating the covariances of a multivariate distribution, it is enough to integrate over just one dimension in order to estimate the variances and covariances among the residual terms of the main model. This possibility comes with the cost of an orthogonality assumption discussed in the model section. Using the factor loadings we may form product covariances, and since we have a factor loading for each equation, the sign of each covariance is free and governed by the data and the underlying correlation structure. Since the factor loadings can be used to implicitly calculate the covariances among the residuals they are also used as a summarizing measure for the effect from the unobservables that are relevant for each equation and cause a correlation among them. Had there been no correlation among the residuals, the covariances would be zero, and therefore also the factor loadings.

Since we allow the factor loadings to be different in each equation, we will also be able to separate the effect of the unobservables on the selection in to part-time sick leave from the effect on the output. That is, if the unobservables are important for the selection into a specific state but are of no major importance for an individual to recover, it will show up in the significance of the factor loadings in the selection equation and the output equations. This could be the case if the choice of state were a policy variable but the individual propensity to recover were unaffected by this measure on the unobservables.

If the degree of sickness and the propensity to recover differ among individuals with identical observable characteristics, the unobserables will have an important role. The degree of sickness and the propensity to recover within a given point in time would most likely be negatively correlated since the more sick an employee is initially the lower is his/her propensity to recover within a given time span. However, recovery time could also be affected by the degree of sick leave at the beginning of the spell. That is, to be severely sick and be placed on part-time sick leave might extend the sick leave, since working could worsen the sickness. On the other hand, if the employee has a residual work capacity, working part-time might help avoid losing contact with the job and the labor market, which in itself could extend the sick leave. Hence, the degree of sickness and the choice of state are related and should be matched. In the present study, only 10 percent started their sickness spell on part-time leave, so the important question to answer is whether this number could be increased in order to avoid the very long-term trap and therefore decrease the welfare cost in the economy. Since the selection equation is a measure of the propensity to choose part-time sick leave, the unobservables will most likely have a relatively high value for those with a relatively low degree of sickness, while the unobservables will have a relatively low value if the degree of sickness is relatively high. If a high degree of sickness also implies a higher probability of starting the sick-leave on full-time, and the chosen state increases the likelihood to recover within a given time span, we expect the correlation between the selection residual and the outcome equation's residual to be negative.

Within this framework, the covariances among the residuals $(U_1, U_0, U_D)$ are free and will be estimated. The distributional assumption used is multivariate normal i.e., $(\varepsilon_1, \varepsilon_0, \varepsilon_D, \xi) \sim \mathrm{N}(0, I)$, where $I$ is the identity matrix. With the imposed distributional assumption together with an exclusion restriction in the selection equation, we are able to define and identify the full distribution of $(U_1, U_0, U_D) \sim \mathrm{N}(0, \Omega),$ with $\Omega$ being the variance-covariace matrix of the error terms.

In order to define the likelihood function, we need to consider a complication due to the unobserved factor. In order to account for its existence, we have to integrate it out of the equations. Since we have assumed a parametric distribution of the unobserved factor, we integrate over its domain, assuming that $\xi \perp (X, Z).$ Since each equation is conditioned on the unobserved factor that is essential in explaining the selection, $(Y_1, Y_0) \perp (D \mid X, Z, \xi).$ This implies that $\Pr(Y \mid X, D, \xi) = \Pr(Y \mid X, \xi),$ which means that the selection equation and the outcome equations are unconditional probabilities in the likelihood function.[3] The likelihood function for the one-factor model can therefore be written as

$$L = \prod_{i=1}^{N} \int_{-\infty}^{\infty} \Pr(D_i \mid Z_i, \xi_i) \Pr(Y_i \mid X_i, \xi_i) dF(\xi_i), \tag{7}$$

with the probability function being the standard normal cumulative distribution function and *F* an absolutely continuous distribution function, which can be non-normal.

### 3.2 Effects of starting the sick leave part time

Given the model described above, we define the parameters of interest and estimate the effects of starting the sick leave part time compared to full time on the probability of returning to work with full recovery of lost work capacity. One way of evaluating the relative merits of the two states for employees on sick leave is to investigate the mean difference in the probability of recovering (i.e., returning to work with full recovery of lost work capacity) within a given time span. Since we have a structural model, it is possible to estimate both the mean and distributional parameters of part-time sick leave.

#### 3.2.1 Mean treatment parameters

The first basic parameter is the average treatment effect (*ATE*) of starting the sick leave part time compared to full time. The ATE is estimated on the whole group of employees

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[3] This integral is solved using the Gauss-Hermite quadrature with five points and nodes. As a sensitivity test we also estimated the model with 10 points and nodes but found only small changes in the third decimal of the estimates of the treatment parameters.

on sick leave and measures the average potential impact on an individual randomly chosen from the population of employees on sick leave. It measures how much an individual would gain or lose on average in terms of his or her probability of returning to work with full recovery of lost work capacity when starting a part-time instead of a full-time sick leave. In other words, the parameter is a measure of the mean difference in the probability of returning to work with full recovery of lost work capacity, and is defined as:

$$ATE(X) = \int_{-\infty}^{\infty} [\Pr(Y_1 \mid X, \xi) - \Pr(Y_0 \mid X, \xi)] dF(\xi). \tag{8}$$

Another important parameter is the effect of the treatment on the treated (*TT*), which measures the effect of part-time sick leave on those who actually were on part-time sick leave. *TT* describes the difference between the actual state and the counterfactual state, in case the individual had been chosen or sorted into full-time sick leave, and is defined as:

$$TT(X, Z) = \int_{-\infty}^{\infty} [\Pr(Y_1 \mid X, \xi) - \Pr(Y_0 \mid X, \xi)] dF(\xi \mid X, Z, D = 1). \tag{9}$$

### 3.2.2 Distributional treatment parameter

While the mean behavioral effects are informative, more can be learned from analyzing the distribution of the effects related to the parameters of interest (*ATE* and *TT*). What proportion of those who started on part-time sick leave will recover (i.e., return to work with full recovery of lost work capacity) compared to those who started on full-time sick leave, and what proportion will not recover? It is also interesting to know what proportion will be indifferent between the two states in terms of potential outcome.

In this paper, the distributional parameter predicts the probability of four different events: successful, positive indifference, negative indifference, and unsuccessful. These events are identified by an indicator variable *I*, defined as the differences between the observed dependent variables of the outcome equations: $I = Y_1 - Y_0$. The fact that the dependent variables $Y_1$ and $Y_0$ are binary implies that *I* can take only three values (-1, 0, 1). $I = 1$ indicates a successful event (or a positive effect of part-time sick leave), which implies that part-time sick leave would result in recovery within a given time span, while the full-time sick leave would result in no recovery. When $I = 0$, we have an event of indifference (or no effect of part-time sick leave), meaning that the individual would have the same outcome (recovery or not) in both states. This event can be further decomposed into two separate components: (1) positive indifference, which means that the individual will recover within a given time span, regardless of the state; and (2) negative indifference, which means that the individual would not recover regardless of the state. When $I = -1$, we have an unsuccessful event (or a negative effect of part-time sick leave), which implies that part-time sick leave would not result in recovery within a given time span, while full-time sick leave would.

Using this indicator, we can predict the probabilities of a successful event, an unsuccessful event, and the events of indifference, in the following way:

$$ATE_{dist}\left[1(I = i) \mid X\right] = \int_{-\infty}^{\infty} \Pr(Y_1, Y_0 \mid \xi) dF(\xi), \quad i = -1, 0, 1. \tag{10}$$

$$TT_{dist}\left[1(I = i) \mid X, Z, D = 1\right] = \int_{-\infty}^{\infty} \Pr(Y_1, Y_0 \mid \xi) dF(\xi \mid X, Z, D = 1), \quad i = -1, 0, 1. \tag{11}$$

## 4 Data

This study uses the 2002 sample of the RFV-LS database of the Swedish Social Insurance Agency, which includes exact dates when sick leaves began and ended, as well as the states before and after the sickness spells (work, education, unemployment, temporary, or permanent disability, etc.). The database also contains information about the individuals' characteristics (age, marital status, citizenship, etc.), their jobs (type of employer, occupation), the social insurance (local and regional office, the source of money, etc.), and the type of physicians doing the health status evaluation (primary care, specialist, private, company physician and "other"). The sample also contains information about the sickness history in the year before (number of compensated cases and the duration of the longest spell). The 2002 sample includes 5,000 persons and is representative of all residents of Sweden registered with the social insurance office. Additionally, all persons in the sample started their sick leave during 1-16 February 2001 and were 20-64 years old. Given the aim of this paper, i.e., to estimate the effect of part-time sick leave on the probability of returning to work with full recovery of lost work capacity within a given time span, we analyze only people who were employed and who did not receive any partial disability benefit the day before beginning of their sick leave. We also exclude a few special cases where employees ended their sick leave because of incarceration, emigration, or participation in a rehabilitation program. This resulted in a sample of 3,607 employees.

One variable of major importance is the initial degree of sick. Given that the sickness insurance starts covering a sick leave on its 15$^{th}$ day, the initial degree of sick leave actually refers to degree of sick leave at that point, i.e., on the 15$^{th}$ day. This is the only point in time when *all* employees had seen a physician, had contact with the social insurance office, and had received a recommendation about how long to be on sick leave or about when to contact/meet with the social insurance administrator and/or the physician next time. Using this information, we create a part-time sick-leave dummy, which takes the value 1 for all cases that started with 25%, 50%, or 75% sick leave; and the value 0 for all cases that started with 100% sick leave. Although it is common that a person works the remainder of the time (i.e., the uncompensated time), this is not always the case. Unfortunately, the data does not contain any information in this regard. Additionally, we know whether any change in the degree of sick leave took place, but we do not know when. Given that the focus of this paper is on analyzing the effect of the selection in part-time/full-time at the very beginning of the sick leave on recovery, we use this as an explanatory variable in the outcome equations, and interpret its parameter as the impact of the correcting of the initial decision.

Using information about the health and the employment status (employee/unemployed/early-retired/disabled) at the end of a sick leave, we construct our outcome variable, which is a dummy variable that takes the value 1 if the employee returned to work with full recovery of the lost capacity within a given time period; and the value zero otherwise. We believe that the probability to recover within a given time period is a well formulated (and policy relevant) question, which can be answered by comparing this probability for two different groups (that belong to two different states). Instead of choosing only a given time period, we estimate the model for several periods, separated by one-month interval, the usual time between appointments with a general practitioner or a specialist, or with the social insurance officers. This allows us to draw conclusions about the effectiveness of a state (full-time/part-time).

The outcome variable within a given time period (say 60 days) for those who started a part-time sick leave $(Y_{60}^{1})$ takes value the value 1 for those who ended their sick leaves with full recovery of lost work capacity during this 60-day period and who were also recorded as employee at the end of the sick leave; and the value 0 otherwise. In the same way, we construct the outcome variables for each 30-day, up to 300 days for both those who started with part-time $(Y_{30}^{1}, Y_{60}^{1}, Y_{90}^{1}, \ldots, Y_{300}^{1})$, and those who started with full-time $(Y_{30}^{0}, Y_{60}^{0}, Y_{90}^{0}, \ldots, Y_{300}^{0})$.

Table 1 presents the percentage of cases that ended with full recovery during the indicated time span, for both those who started with part-time (column 1), and full-time (column 2). These descriptive statistics suggest that relatively more cases ended with full recovery of lost work capacity among those who started with full time than among those who started with part time, and vice versa (i.e., relatively more cases ended without full recovery among those who started with part time). More descriptive statistics of the outcome variable are presented in Tables A1-A3 in Appendix.

**Table 1** The percentage of cases that ended with full recovery,* by state

| Days since the case began | Part-time (1) | Full-time (2) |
|---|---|---|
| ≤ 30 | 16.53 | 37.00 |
| ≤ 60 | 33.60 | 58.66 |
| ≤ 90 | 45.87 | 68.29 |
| ≤ 120 | 53.33 | 72.90 |
| ≤ 150 | 59.47 | 76.36 |
| ≤ 180 | 62.67 | 77.69 |
| ≤ 210 | 65.87 | 79.73 |
| ≤ 240 | 66.67 | 80.97 |
| ≤ 270 | 68.27 | 81.78 |
| ≤ 300 | 68.80 | 82.12 |

* The difference between the mean values for full-time (2) and part-time (1) is statistically different from zero at the 1% level. The mean value for part-time (full-time) represents the percentage of part-time (full-time) starters who with full recovery at the end of the analyzed period.

The instrumental variable is also of major interest. The choice of instrument is based on the fact that in some cases the employer cannot create a part-time work arrangement for an unknown time period (usually small establishments, but even offices or labs that have only one employee who performs specific tasks). These kinds of jobs simply require full-time attendance for the employees. When this is the case, the employer cannot run his or her business with an employee who can only work part-time (being on part-time sick leave the rest of the contracted work time). Therefore, the employee (with reduced work capacity) is left with the choice between working more than his/her work capacity allows, and being on full-time sick leave with a compensation that covers more than the lost work capacity. Hence, the probabilities of being on part-time and full-time sick leave differ among different employers. While the individuals might be aware of these differences among employers, it should not affect the choice of employer. Therefore, it is plausible to say that some employers have a causal effect on the individuals' propensity to be on part-time or full-time sick leave, while there should be no such direct effect related to the probability of recovering the lost working capacity within a given time span. The comparison group (Professionals) is composed of highly skilled employees who do not have management responsibilities and who usually perform independent tasks, which might allow them to postpone and/or redistribute their work over time, and/or work part time. All other groups of occupations (Legislators, senior officials and managers; Service workers and shop sales workers; Craft and related trades workers; Clerks; Plant and machine operators and assemblers; and Others) seem to have a higher likelihood (compared to the Professionals) of being dependent on work schedules, and therefore have greater difficulties of starting their sick leave on part-time.

## 5 Results

### 5.1 The outcome and selection equations

Since we estimate the parameters of the one factor model for ten different time spans, ranging from 30-300 days, the number of estimates is large. Therefore, we report the estimated parameters from each equation in the Appendix, and discuss the results only briefly but with a focus on the variables that are of special importance, namely the instrument and the factor loadings.

The selection equation for the propensity of starting the sick leave on part-time includes a number of variables that are important for a detailed analysis of the duration of sickness (e.g., diagnosis, the type of the prescribing doctor, and occupation), in addition to the usual socio-economic and demographic variables (e.g., age, gender, education and region,). The estimated coefficients (reported in Table A4 in the Appendix) are stable in level and statistical significance over the different time spans. Except for the time spans of 60 and 120 days, the precision of the coefficients for the occupational type (the instrumental variables in our model) is good all over. The level of the coefficients does not deviate much for those two time spans so the precision deficiency is mainly related to the estimated standard errors. Since the choice of instrument is based on an identifying assumption it is not possible to test whether it is a good instrument. To drop the instrument to investigate whether the result will change will not do the job, since dropping variables with significant coefficients always have some effect on the result in a structural model.

The factor loading is not significant for the time spans shorter than 150 days, which is to say that the unobservables plays a minor role in the selection process when the output is analyzed at spans shorter than 150 days. When the output is analyzed for e time spans between 150 and 240 days, the factor loading is significantly different from zero, which implies that commonly unobserved factor has a behavioral effect on the choice of part-time sick leave in the beginning for those cases that requires more than half year to recuperate.

The factor loadings of both outcome equations are negative for almost all analyzed time spans, but they are statistically significant only for the full-time equation for the time spans up to 90, 270 and 300 days (Tables A5 and A6 in the Appendix). Therefore, we cannot conclude that the unobservables decrease the probability recover for employees in both part-time and full-time sick leave. In contrast, almost all observable characteristics have a statistically significant effect on the probability of recovering for employees who started their sick leave with full-time. The outcome equation for the employees who started on part-time has much less parameters that are statistically significant, but in most of these cases, the parameters have the same direction as in the full-time outcome equation.

### 5.2 The treatment effects

Using the estimates form the main model we are able to calculate the relative effects of part-time sick leave versus full-time sick leave, using the treatment parameters discussed in section 3.2.1 and 3.2.2.

### 5.2.1 The mean treatment effects

Table 2 reports the estimates for the *ATE* and *TT* parameters for different cut-off points. Except for 180 and 210 days respectively (when it was positive, but almost zero), the *ATE* parameter is negative, suggesting a negative effect of part-time sick leave for a randomly chosen individual from the population. That is, if part-time sick listing would have been a general rule for the population of employees on sick leave, the sickness cases would have been longer. That is, individuals with sickness cases up to 120 days would under those conditions extend their sick leave due to the sick listing policy. Hence, part time sick listing should not be imposed on individuals unrestricted.

**Table 2** Mean treatment effects

| | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 |
|---|---|---|---|---|---|---|---|---|---|---|
| ATE | -0.1948 | -0.1761 | -0.0290 | -0.1305 | -0.0028 | 0.0040 | 0.0378 | -0.0279 | -0.0897 | -0.0479 |
| TT | -0.3924 | -0.1470 | -0.0739 | -0.0852 | 0.0791 | 0.0905 | 0.1928 | 0.0663 | 0.1215 | 0.1307 |
| TT-ATE | -0.1976 | 0.0290 | -0.0449 | 0.0453 | 0.0819 | 0.0865 | 0.1550 | 0.0942 | 0.2112 | 0.1786 |
| Correlations | | | | | | | | | | |
| $C(U_1,U_D)$ | -0.0141 | -0.1100 | -0.2899 | -0.0781 | -0.2643 | -0.2746 | -0.3139 | -0.2063 | -0.0526 | -0.1268 |
| $C(U_0,U_D)$ | 0.3682 | -0.1202 | -0.2008 | -0.1419 | -0.3436 | -0.3476 | -0.4740 | -0.3244 | -0.3870 | -0.3960 |
| $C(U_1,U_0)$ | -0.0370 | 0.0234 | 0.3055 | 0.0278 | 0.1202 | 0.1272 | 0.1949 | 0.0920 | 0.1051 | 0.2480 |

Turning to the second parameter of interest, namely the measure for those that actually were sorted into part-time at the beginning of their sick leave, we found a somewhat different picture. The estimated value of the TT parameter show negative values up to 120 days, but positive effects for 150 days and above, suggesting that for some cases, starting the sick leave on part-time actually increases the likelihood of full recovery. Hence a selective judgement should be used when sorting people into part-time sick leave. There are of course several reasons for this result. One reason could be that maintaining the contact with the job helps the individual to return to the job on full time. Being away from the work place could isolate and with a deteriorating self esteem as a result, which will make it harder to return. Related to the inactivity is the resulting reduction in job specific human capital that is an effect of being disconnected with the work.

Table 2 also presents a measure for the size that comes from the effect of selecting the appropriate individual into part-time sick leave which is represented by the difference between TT and ATE. The selection effect is negative up to 120 days, and is positive for 150 days and above. This is reasonable, since some individuals with severe illness will not recover unless they stay at home or at the hospital at full time, which implies that forcing them to stay at work partially would worsen their health situation and prolong their sick leave. Hence, unobserved factors play an important role for short cases as well as long sickness cases.

The positive selection effect for longer sickness cases suggest that part-time sick leave helps some employees, particularly those with observed and unobserved characteristics that make them the least likely to return to work if they would lose contact with their work (employees on full-time sick leave). However, in 2001 the actors involved in the selection process (physician, the administrator at the social insurance office, the employer), only infrequently select such individuals into part-time sick leave, which leave room for improvements on efficiency.

### 5.2.2 The distributional effects

Table 3 presents the estimates for the distributional treatment effects with respect to the ATE and TT. We report four measures of the part-time sick leave effectiveness in the table, but only two for each parameter in the figures, to make the visual representation easier. We aggregated the positive effect and the positive indifference into a positive component, and the negative effect and the negative indifference into a negative component. Both ATE and TT results show that there is a relatively high negative effect from part-time sick leave at the cut-off point of 30 days (31% and 46%, respectively). After 60 days, the ATE results show that from all employees who started their sick leave on part-time, 13-17% gained from it, while 13-22% lost from it, and more than half (52-70%) had no effect from part-time sick leave. This means that the larger group of employees on sick leave would have the same outcome (recovery or not) in both states. However, the share of employees with positive indifference (i.e., recovered indifferent of state) is increasing in time, from 8% at 30 days to about 60% after half of year, while the share of employees with negative indifference (i.e., not recovered indifferent of state) is decreasing in time (from about 50% at 30 days to about 8% after half of year). Except for 30 days, the TT values are always a little bit higher than the ATE values for both the positive and the negative effects, and negative indifference, but they are much smaller than the values of positive indifference.

It is interesting to observe that the share of those with negative effect is about the same when the selection is random (the ATE parameters) as when the selection is restrictive (the TT parameters). This means that the share of those that would recover with full time sick leave but not recover with part time sick leave within a given time span is the same independent of whether selection is random or restrictive. The difference being instead that the share with no effect is somewhat larger when the selection is random, and the share with positive effect is somewhat larger when the selection is restrictive. This suggests that there is potential for increasing the share of people on part-time as a mean to reduce the budget cost and that that some cases should be on sick leave on full time.

**Table 3** Distributional treatment effects on part-time sick leave

| | ATE | | | | TT | | | |
|---|---|---|---|---|---|---|---|---|
| | Positive | Indifference | | Negative | Positive | Indifference | | Negative |
| Days | Effect | Positive | Negative | effect | effect | Positive | Negative | effect |
| ≤ 30 | 0.1161 | 0.0847 | 0.4882 | 0.3109 | 0.0681 | 0.1120 | 0.3595 | 0.4605 |
| ≤ 60 | 0.1485 | 0.2565 | 0.2705 | 0.3245 | 0.1603 | 0.1870 | 0.3476 | 0.3073 |
| ≤ 90 | 0.1612 | 0.4778 | 0.1709 | 0.1902 | 0.1637 | 0.2962 | 0.3027 | 0.2375 |
| ≤ 120 | 0.1451 | 0.4417 | 0.1376 | 0.2756 | 0.1829 | 0.3535 | 0.1958 | 0.2681 |
| ≤ 150 | 0.1687 | 0.5649 | 0.0950 | 0.1714 | 0.2667 | 0.3452 | 0.2185 | 0.1876 |
| ≤ 180 | 0.1665 | 0.5869 | 0.0840 | 0.1626 | 0.2703 | 0.3649 | 0.2022 | 0.1798 |
| ≤ 210 | 0.1688 | 0.6287 | 0.0716 | 0.1310 | 0.3316 | 0.3382 | 0.2116 | 0.1387 |
| ≤ 240 | 0.1468 | 0.6102 | 0.0683 | 0.1747 | 0.2491 | 0.4246 | 0.1572 | 0.1827 |
| ≤ 270 | 0.1293 | 0.5680 | 0.0837 | 0.2190 | 0.2719 | 0.4084 | 0.1693 | 0.1504 |
| ≤ 300 | 0.1252 | 0.6168 | 0.0850 | 0.1731 | 0.2615 | 0.4266 | 0.1810 | 0.1308 |

### 5.2.3 Sensitivity analysis

Unobserved heterogeneity is an important component in the one-factor control function model. It is therefore important to investigate how sensitive the results are to the assumptions imposed by the one-factor structure. In order to assess its influence on the results, we compare the estimates of our main model with the results from a number of alternative specifications for *TT* (Table 4). The first alternative estimator relaxes the distributional assumption made on the unobserved factor. We replace the normal factor assumption with a non-parametric distribution using a discrete factor approximation (Heckman and Singer, 1984).[4] The first two columns in Table 4 present the results for the two specifications. It can be seen that the distributional assumption of normality does generate results that are (almost) in line with those of the non-parametric distribution up to the 90-day cut-off point. For the remaining cut-off points the

[4] The estimates based on the discrete factor approximation presented in Table 4 use two discrete mass points. As an alternative, we used three discrete mass points, and the results were basically the same.

estimates using the non-parametric approach increase drastically, while the estimates of the parametric case remain stable. One important reason for the large deviation could be that the distribution of the commonly unobserved factor deviates extensively from the normal distribution after the 150 day cut-off point. Nevertheless, both approaches indicate that full-time sick leave is better than part-time in short-time (e.g., at cut-off points within three months), but afterwards part-time sick leave increase the likelihood to recover.

The control function estimator with no unobserved heterogeneity is very close to the results generated by the matching estimator. The results show the importance of controlling for unobserved heterogeneity (the correlation among the residuals) when the number of observed covariates is small. They also indicates that the propensity score estimator generates biased estimates, when it does not include all observed factors relevant for the selection. Finally, the results should be compared with observed mean differences in the probability to recover from sickness. As can be seen, the no-factor model, the propensity score estimator and the simple mean difference in probability do not deviate too much, and it appears that unobserved factors are important and increase the effect of part-time sick leave for long-term cases. That is, controlling for the existing correlation between the residual terms has an important effect on the estimated value of the parameters of interest.

**Table 4** TT effects from alternative model specifications

| | Factor model estimates | | | | |
|---|---|---|---|---|---|
| Days | Normal factor (1) | Discrete factor approximation (2) | No factor (3) | Propensity score Matching (4) | Observed Mean difference (5) |
| ≤ 30 | -0.3924 | -0.3266 | -0.1826 | -0.1653 | -0.1994 |
| ≤ 60 | -0.1470 | -0.2047 | -0.2277 | -0.2106 | -0.2446 |
| ≤ 90 | -0.0739 | -0.0636 | -0.2025 | -0.1840 | -0.2233 |
| ≤ 120 | -0.0852 | 0.0688 | -0.1717 | -0.1413 | -0.1915 |
| ≤ 150 | 0.0791 | 0.1451 | -0.1419 | -0.1147 | -0.1613 |
| ≤ 180 | 0.0905 | 0.5894 | -0.1301 | -0.1013 | -0.1509 |
| ≤ 210 | 0.1928 | 0.7138 | -0.1183 | -0.0907 | -0.1390 |
| ≤ 240 | 0.0663 | 0.7070 | -0.1239 | -0.0987 | -0.1430 |
| ≤ 270 | 0.1215 | 0.7076 | -0.1164 | -0.0827 | -0.1351 |
| ≤ 300 | 0.1307 | 0.1938 | -0.1122 | -0.0747 | -0.1305 |

## 6 Summary and conclusions

Part-time sick leave is one of the “inventions” that the Swedish government hoped would not only decrease the sickness absenteeism rates, but also help people not lose contact with their work place. Data from the National Agency of Social Insurance were used to assess the effect of part-time sick leave on the probability to return to work with full recovery of lost work capacity. The estimates of a discrete choice one-factor model, which takes into account the selection into the degree of sickness (part-time and full-time) show that the mean treatment effect on random assignment is negative, but that a selected group would gain from part-time sick leave on medium-term (starting with the cut-off point at 120 days). The estimated *TT* parameter shows negative values up to 120 days, but is positive at 150 days and above. The picture is similar to the one for the *ATE* parameter, but here part-time sick listing actually increases the likelihood of full recovery. This might suggest that maintaining contact with the work place helps the individual return to the job full time.

In a second step, we also estimated distributional effects based on the parameters of interest to investigate how many would gain from part-time sick leave and how many would lose. A majority of the employees who were on sick leave would have had the same outcome (recovery or not) in both states. The good news is that starting with the cut-off point at 90-day, the group with positive indifference is the largest (45-60% of all employees on sick leave, for *ATE*), and the group with negative indifference is much smaller (almost always less than 20% for *TT*, but less than 10% for *ATE*).

From a policy perspective, our results suggest that part-time sick leave is an effective mean for longer cases but one should be more restrictive for shorter cases. Therefore, it is expected that the overall recovery effect of part-time sick leave can be improved if the selection into part-time succeeds to recruit those who will gain the most from it rather than choosing less healthy persons (who are at a higher risk to leave the labor market permanently). Even so, above 50 percent of employees who returned to work with full recovery of lost work capacity were indifferent between states, which suggest that there is some room for budget savings.

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# Appendix

**Table A1** Mean values* by degree of sick leave in the beginning of the sick leave and health status at the end

| | Degree in beginning | | Recovered | | Not recovered | |
|---|---|---|---|---|---|---|
| | Part-time | Full-time | Part-time | Full-time | Part-time | Full-time |
| Men | 0.229 | 0.384 | 0.201 | 0.386 | 0.302 | 0.374 |
| Women | 0.771 | 0.616 | 0.799 | 0.614 | 0.698 | 0.626 |
| SGI-income in 100 kr # | 2.109 | 2.020 | 2.123 | 2.015 | 2.073 | 2.044 |
| | (0.493) | (0.510) | (0.506) | (0.511) | (0.461) | (0.501) |
| Income from employment | 2.099 | 2.005 | 2.110 | 2.001 | 2.071 | 2.021 |
| (A-inkomst) in 100 kr | (0.518) | (0.539) | (0.537) | (0.539) | (0.468) | (0.537) |
| Age | 45.104 | 43.744 | 43.071 | 43.037 | 50.264 | 47.349 |
| | (11.519) | (11.425) | (11.331) | (11.478) | (10.364) | (10.441) |
| Age-dummies | | | | | | |
| Age 16 – 25 | 0.029 | 0.066 | 0.041 | 0.075 | 0.000 | 0.019 |
| Age 26 – 35 | 0.253 | 0.204 | 0.297 | 0.217 | 0.142 | 0.142 |
| Age 36 – 45 | 0.197 | 0.265 | 0.212 | 0.268 | 0.160 | 0.247 |
| Age 46 – 55 | 0.296 | 0.275 | 0.297 | 0.269 | 0.292 | 0.308 |
| Age 56 – 64 | 0.224 | 0.190 | 0.152 | 0.171 | 0.406 | 0.285 |
| Married | 0.451 | 0.490 | 0.420 | 0.481 | 0.528 | 0.536 |
| Born in Sweden | 0.925 | 0.863 | 0.926 | 0.867 | 0.925 | 0.843 |
| NUTS regions | | | | | | |
| Stockholm | 0.205 | 0.220 | 0.249 | 0.227 | 0.094 | 0.183 |
| East Central | 0.176 | 0.160 | 0.182 | 0.155 | 0.160 | 0.185 |
| Småland plus islands | 0.096 | 0.087 | 0.093 | 0.088 | 0.104 | 0.081 |
| South | 0.115 | 0.132 | 0.097 | 0.133 | 0.160 | 0.128 |
| West | 0.184 | 0.187 | 0.186 | 0.186 | 0.179 | 0.192 |
| North central | 0.099 | 0.107 | 0.093 | 0.107 | 0.113 | 0.108 |
| Central north | 0.056 | 0.045 | 0.045 | 0.046 | 0.085 | 0.045 |
| Far north | 0.069 | 0.062 | 0.056 | 0.059 | 0.104 | 0.077 |
| Occupation with very small or not requirement of the level of education | 0.061 | 0.084 | 0.063 | 0.081 | 0.057 | 0.098 |
| Employer | | | | | | |
| Private | 0.413 | 0.511 | 0.409 | 0.515 | 0.425 | 0.489 |
| Municipality | 0.309 | 0.298 | 0.297 | 0.295 | 0.340 | 0.315 |
| Occupation | | | | | | |
| Legislators, senior officials and managers | 0.040 | 0.032 | 0.037 | 0.033 | 0.047 | 0.028 |
| Professionals | 0.237 | 0.118 | 0.260 | 0.118 | 0.179 | 0.121 |
| Clarks | 0.123 | 0.109 | 0.138 | 0.110 | 0.085 | 0.100 |
| Service and shop sales workers | 0.179 | 0.262 | 0.164 | 0.264 | 0.217 | 0.249 |
| Craft and related trades workers | 0.067 | 0.118 | 0.056 | 0.119 | 0.094 | 0.111 |
| Plant/machine operators & assemblers | 0.051 | 0.125 | 0.048 | 0.125 | 0.057 | 0.126 |
| Others | 0.296 | 0.227 | 0.294 | 0.223 | 0.302 | 0.245 |
| At least one previous sick leave | 0.301 | 0.218 | 0.275 | 0.212 | 0.368 | 0.251 |
| Diagnosis | | | | | | |
| Mental disorder | 0.211 | 0.170 | 0.227 | 0.154 | 0.170 | 0.249 |
| Circulatory organs | 0.024 | 0.038 | 0.011 | 0.035 | 0.057 | 0.053 |
| Musculoskeletal | 0.371 | 0.319 | 0.323 | 0.305 | 0.491 | 0.389 |
| Pregnancy and given birth complications | 0.075 | 0.028 | 0.093 | 0.032 | 0.028 | 0.006 |
| Injuries and poisoning | 0.053 | 0.095 | 0.059 | 0.101 | 0.038 | 0.064 |
| Other | 0.261 | 0.345 | 0.283 | 0.366 | 0.208 | 0.238 |
| Physician | | | | | | |
| Primary care | 0.485 | 0.467 | 0.502 | 0.477 | 0.443 | 0.413 |
| Company | 0.163 | 0.095 | 0.160 | 0.078 | 0.170 | 0.179 |
| Private | 0.128 | 0.125 | 0.123 | 0.123 | 0.142 | 0.138 |
| Specialist (at the hospital) | 0.224 | 0.313 | 0.216 | 0.322 | 0.245 | 0.270 |
| Changed the sickness degree | 0.184 | 0.201 | 0.171 | 0.183 | 0.217 | 0.294 |
| Interactions | | | | | | |
| Private x Primary-care | 0.203 | 0.219 | 0.204 | 0.225 | 0.198 | 0.189 |
| Musculoskeletal x Company physician | 0.080 | 0.038 | 0.063 | 0.029 | 0.123 | 0.087 |
| Mental disorder x Specialist | 0.027 | 0.027 | 0.026 | 0.021 | 0.028 | 0.055 |
| Number observations | 375 | 3232 | 269 | 2702 | 106 | 530 |

*Standard deviations are also reported within parentheses for continuous variables. NUTS stands for the Nomenclature of Territorial Units for Statistics. #The amount of benefit is based on a theoretical income, *sjukpenninggrundande inkomst* (SGI), which is calculated based on current or earlier earnings. The lowest possible SGI is 24 percent of a base amount that is set every year by the government. The highest possible SGI is 7.5 times the base amount.

**Table A2** Descriptive statistics by the degree of sick leave in the beginning and the "recovery" status at the end of the sick leave

| Sick leave in the beginning | Status at the end | Total | Failed | Censored | Censored (%) |
|---|---|---|---|---|---|
| Full-time | Not full recovery or censored | 530 | 196 | 334 | 63.02 |
| Full-time | Full recovery | 2702 | 2690 | 12 | 0.44 |
| Part-time | Not full recovery or censored | 106 | 40 | 66 | 62.26 |
| Part-time | Full recovery | 269 | 262 | 7 | 2.60 |
| Total | | 3607 | 3188 | 419 | 11.62 |

**Table A3** The percentage of cases that ended without full recovery*

| Days since the beginning of the sick leave | Part-time (1) | Full-time (2) |
|---|---|---|
| ≤ 30 | 2.67 | 1.24 |
| ≤ 60 | 4.53 | 2.60 |
| ≤ 90 | 4.80 | 2.94 |
| ≤ 120 | 4.80 | 3.22 |
| ≤ 150 | 5.60 | 3.47 |
| ≤ 180 | 5.87 | 3.74 |
| ≤ 210 | 6.13 | 3.99 |
| ≤ 240 | 6.40 | 4.02 |
| ≤ 270 | 6.93 | 4.73 |
| ≤ 300 | 8.27 | 5.01 |

*The difference between the mean values for part-time (1) and full-time (2) is statistically different from zero at the 1% level. The mean value for part-time (full-time) represents the percentage of part-time (full-time) starters who with full recovery at the end of the analyzed period. There are also censored spells at the end of all analyzed periods.

**Table A4** The estimated parameters of the selection equation for different cut points

| | ≤ 30 days | ≤ 60 days | ≤ 90 days | ≤ 120 days | ≤ 150 days | ≤ 180 days | ≤ 210 days | ≤ 240 days | ≤ 270 days | ≤ 300 days |
|---|---|---|---|---|---|---|---|---|---|---|
| Factor loading | 0.4046 | 1.1412 | 0.4853 | 0.8130 | 1.7582 *** | 1.7355 *** | 1.7968 *** | 1.6327 ** | 0.4902 | 0.5038 |
| Men (CG: Women) | -0.4068 *** | -0.5872 | -0.4305 *** | -0.4962 | -0.7989 *** | -0.7933 *** | -0.8153 *** | -0.7473 ** | -0.4229 *** | -0.4252 *** |
| Swedish born | 0.0075 | 0.0169 | 0.0125 | 0.0139 | 0.0360 | 0.0338 | 0.0367 | 0.0273 | 0.0096 | 0.0090 |
| Age-groups (CG: 16-24 years) | | | | | | | | | | |
| 25-34 | -0.1095 | -0.1813 | -0.1548 | -0.1636 | -0.3655 | -0.3724 | -0.4566 | -0.3383 | -0.1849 | -0.1913 |
| 35-44 | -0.3935 *** | -0.5753 | -0.4488 *** | -0.5032 | -0.8379 ** | -0.8533 ** | -0.9499 *** | -0.8108 ** | -0.4806 *** | -0.4898 *** |
| 45-54 | -0.2350 * | -0.3306 | -0.2673 ** | -0.2977 | -0.4920 * | -0.5052 * | -0.5766 * | -0.4827 | -0.2946 * | -0.3017 * |
| 55-64 | -0.0995 | -0.1619 | -0.1433 | -0.1492 * | -0.2931 | -0.3040 | -0.3919 | -0.2912 | -0.1707 | -0.1780 |
| Married | -0.1610 ** | -0.2297 | -0.1672 *** | -0.1953 | -0.2826 ** | -0.2800 ** | -0.2740 ** | -0.2700 ** | -0.1630 ** | -0.1629 ** |
| Stockholm | -0.2195 *** | -0.2925 | -0.2114 *** | -0.2437 | -0.3501 ** | -0.3503 ** | -0.3415 ** | -0.3395 ** | -0.2068 ** | -0.2082 ** |
| Income# (in Thousands kronor) | -0.1046 * | -0.1430 | -0.0980 * | -0.1189 | -0.1881 | -0.1797 | -0.1702 | -0.1741 | -0.0961 | -0.0950 |
| Sick leave previous year | 0.2371 *** | 0.3322 | 0.2404 *** | 0.2800 | 0.4488 ** | 0.4410 ** | 0.4517 ** | 0.4217 ** | 0.2356 *** | 0.2378 *** |
| Diagnosis | | | | | | | | | | |
| Mental disorder | 0.0133 | 0.0187 | 0.0155 | 0.0157 | 0.0436 | 0.0429 | 0.0483 | 0.0358 | 0.0157 | 0.0188 |
| Musculoskeletal | 0.1323 * | 0.1742 | 0.1261 * | 0.1483 | 0.2463 | 0.2443 | 0.2525 | 0.2331 | 0.1324 | 0.1344 |
| Physician (CG: primary care) | | | | | | | | | | |
| Company | -0.0267 | -0.0404 | -0.0354 | -0.0316 | -0.0635 | -0.0646 | -0.0651 | -0.0545 | -0.0281 | -0.0291 |
| Private | -0.1456 | -0.2167 | -0.1590 | -0.1800 | -0.2872 | -0.2838 | -0.2919 | -0.2679 | -0.1571 | -0.1564 |
| Specialist | -0.3495 *** | -0.4925 | -0.3646 *** | -0.4194 | -0.6262 *** | -0.6258 *** | -0.6317 *** | -0.5938 ** | -0.3533 *** | -0.3545 *** |
| Occupation (CG: Professionals) | | | | | | | | | | |
| Legislators, senior officials | -0.2938 | -0.4456 | -0.3098 * | -0.3662 | -0.6320 | -0.6159 | -0.6156 | -0.5385 | -0.2674 | -0.2756 |
| Clarks | -0.6492 *** | -0.8640 * | -0.6034 *** | -0.7251 | -1.1022 *** | -1.0863 *** | -1.0906 *** | -1.0476 ** | -0.6068 *** | -0.6047 *** |
| Service and shop sales work | -0.9481 *** | -1.3215 | -0.9523 *** | -1.1144 | -1.8005 *** | -1.7678 *** | -1.7779 *** | -1.6732 ** | -0.9310 *** | -0.9349 *** |
| Craft and related trades | -0.7515 *** | -1.0197 | -0.7310 *** | -0.8643 | -1.3568 *** | -1.3217 *** | -1.3415 *** | -1.2826 ** | -0.7394 *** | -0.7438 *** |
| Plant/machine operators | -1.0310 *** | -1.4431 * | -1.0409 *** | -1.2197 | -1.8696 *** | -1.8459 *** | -1.8711 *** | -1.7759 *** | -1.0286 *** | -1.0289 *** |
| Elementary occupations | -0.4978 *** | -0.6961 | -0.4960 *** | -0.5871 | -0.9585 ** | -0.9366 *** | -0.9533 *** | -0.8921 ** | -0.4930 *** | -0.4961 *** |
| Municipality sector | -0.2023 ** | -0.2977 | -0.2199 *** | -0.2439 | -0.3570 ** | -0.3553 ** | -0.3545 ** | -0.3368 * | -0.2026 ** | -0.2034 ** |
| Interactions | | | | | | | | | | |
| Private*Primary-care | -0.1785 * | -0.2469 | -0.1868 ** | -0.2088 | -0.2812 | -0.2827 | -0.2795 | -0.2712 | -0.1737 | -0.1744 |
| Musculoskeletal*Company | 0.3457 * | 0.4975 | 0.3666 ** | 0.4165 | 0.6837 | 0.6774 | 0.7096 * | 0.6469 | 0.3616 * | 0.3646 * |
| Mental disorder*Specialist | 0.2305 | 0.3154 | 0.2332 | 0.2718 | 0.3898 | 0.3912 | 0.3853 | 0.3851 | 0.2414 | 0.2359 |
| Log-likelihood | -3133.3 | -3244.3 | -3162.3 | -3077.2 | -2987.6 | -2940.5 | -2857.1 | -2807.4 | -2764.0 | -2744.4 |

Notes: CG stands for comparison group, and # the income refers to the income qualifying for sickness allowance (SGI). The estimate is significant at the 10% level (*), at the 5% level (**), and at the 1% level (***). More descriptive of the variables names are reported in the Table A1 in the Appendix. These notes hold for all tables of estimates.

**Table A5** The estimated parameters of the full-time equation

| | ≤ 30 days | ≤ 60 days | ≤ 90 days | ≤ 120 days | ≤ 150 days | ≤ 180 days | ≤ 210 days | ≤ 240 days | ≤ 270 days | ≤ 300 days |
|---|---|---|---|---|---|---|---|---|---|---|
| Factor loading | 5.1401 | -0.1691 | -0.5181 *** | -0.2308 | -0.4304 | -0.4380 | -0.6458 | -0.4114 | -1.8446 *** | -1.8541 *** |
| Men (CG: Women) | 0.0830 | 0.1251 * | 0.1040 | 0.0689 | 0.0757 | 0.1036 | 0.1599 | 0.1274 | 0.2578 | 0.2734 |
| Swedish born | 0.2184 | 0.1864 *** | 0.2098 *** | 0.2302 *** | 0.1882 ** | 0.1304 | 0.1756 ** | 0.2027 ** | 0.4064 ** | 0.4253 ** |
| Age/10 | -0.3568 * | 0.1807 ** | 0.3374 *** | 0.3271 *** | 0.3887 *** | 0.4282 *** | 0.5363 *** | 0.5059 *** | 1.0498 *** | 1.0561 *** |
| Age-squared/100 | 0.0281 | -0.0281 *** | -0.0509 *** | -0.0506 *** | -0.0590 *** | -0.0645 *** | -0.0792 *** | -0.0749 *** | -0.1569 *** | -0.1593 *** |
| Married | 0.0547 | -0.0097 | 0.0123 | 0.0092 | 0.0174 | 0.0274 | 0.0285 | -0.0003 | 0.0067 | 0.0190 |
| Income# (in Thousands kronor) | 0.1792 | 0.0151 | 0.0439 | 0.0360 | 0.0404 | 0.0373 | -0.0198 | 0.0059 | -0.0194 | -0.0234 |
| NUTS-regions (CG: Far north) | | | | | | | | | | |
| Stockholm | -0.0383 | 0.2260 ** | 0.2345 ** | 0.3446 *** | 0.3706 *** | 0.3506 *** | 0.3584 ** | 0.3704 *** | 0.8599 ** | 0.9056 *** |
| East central | 0.2568 | 0.1992 * | 0.1380 | 0.2126 * | 0.2378 * | 0.2402 * | 0.2074 | 0.1738 | 0.3943 | 0.4927 |
| Småland plus islands | 0.4090 | 0.2735 ** | 0.2276 * | 0.2517 ** | 0.3120 ** | 0.3265 ** | 0.3276 ** | 0.3264 ** | 0.6594 * | 0.7029 ** |
| South | 0.4831 * | 0.2718 ** | 0.3103 *** | 0.4851 *** | 0.4563 *** | 0.4412 *** | 0.3563 ** | 0.3523 *** | 0.7701 ** | 0.7920 ** |
| West | 0.2296 | 0.2112 * | 0.1880 | 0.2943 *** | 0.3073 ** | 0.2796 ** | 0.2576 * | 0.2520 ** | 0.5682 * | 0.5681 * |
| North central | 0.3014 | 0.1027 | 0.1857 | 0.2694 ** | 0.3380 ** | 0.3266 ** | 0.3370 ** | 0.3356 ** | 0.7333 ** | 0.7407 ** |
| Central north | 0.5039 | 0.1682 | 0.2225 | 0.3555 ** | 0.3869 ** | 0.3498 ** | 0.3729 ** | 0.3644 ** | 0.8149 * | 0.8208 * |
| Sick leave previous year | 0.0208 | -0.0951 | -0.1549 ** | -0.1439 ** | -0.1658 ** | -0.1635 ** | -0.1789 ** | -0.1390 * | -0.3175 ** | -0.2997 * |
| Diagnosis (CG: Injuries & poisoning) | | | | | | | | | | |
| Mental disorder | -0.2110 | -0.4265 *** | -0.5143 *** | -0.4831 *** | -0.4378 *** | -0.4351 *** | -0.4107 *** | -0.3499 *** | -0.7700 ** | -0.7941 ** |
| Circulatory organs | 1.0168 *** | -0.0851 | -0.2262 | -0.2877 * | -0.3347 ** | -0.3103 * | -0.3335 * | -0.3776 ** | -0.8445 ** | -0.8824 ** |
| Musculoskeletal | 0.2710 | -0.1053 | -0.1746 | -0.1698 * | -0.2053 * | -0.1579 | -0.1595 | -0.1789 | -0.4044 | -0.4283 |
| Pregnancy complications | -0.3958 | 0.0541 | 0.1000 | 0.1826 | 0.2463 | 0.3067 | 0.4475 * | 0.6102 ** | 0.9722 * | 0.9244 * |
| Other | 1.2651 *** | 0.2929 *** | 0.2273 *** | 0.1011 | 0.0629 | 0.0880 | 0.1131 | 0.0640 | 0.1042 | 0.1196 |
| Physician (CG: primary care) | | | | | | | | | | |
| Company | -1.7217 *** | -0.5836 *** | -0.5254 *** | -0.4504 *** | -0.5093 *** | -0.4301 *** | -0.4524 *** | -0.4304 *** | -0.8137 *** | -0.7876 ** |
| Private | -0.6503 *** | -0.1766 * | -0.1283 | -0.1098 | -0.1183 | -0.0946 | -0.0782 | -0.1214 | -0.3072 | -0.2276 |
| Specialist | -1.1477 *** | -0.2814 *** | -0.1472 * | -0.0545 | 0.0099 | 0.0521 | 0.0836 | 0.0496 | 0.1160 | 0.1417 |
| Private sector | 0.0340 | -0.0708 | -0.0178 | 0.0029 | -0.0062 | -0.0490 | -0.0049 | 0.0337 | 0.0529 | -0.0094 |
| Occupation with small or no requirement of education's level | 0.1223 | -0.0442 | 0.1126 | 0.0869 | 0.0241 | 0.0085 | -0.0834 | -0.0388 | -0.0971 | -0.1192 |
| Changed degree of sick leave | -6.9965 | -1.0889 *** | -0.9046 *** | -0.6507 *** | -0.5166 *** | -0.4634 *** | -0.4947 *** | -0.3932 *** | -0.7546 *** | -0.7380 *** |
| Interactions | | | | | | | | | | |
| Private*Primary-care | -0.1875 | 0.0900 | 0.0170 | 0.0089 | -0.0009 | 0.0437 | -0.0133 | -0.0760 | -0.1628 | -0.1023 |
| Musculoskeletal*Company | 0.9175 ** | 0.1475 | -0.0461 | -0.1432 | -0.1765 | -0.2784 | -0.3601 * | -0.3171 * | -0.5296 | -0.5424 |
| Mental disorder*Specialist | 0.0189 | -0.1079 | -0.4505 ** | -0.2967 * | -0.5103 *** | -0.5312 *** | -0.5730 *** | -0.5712 *** | -1.1316 *** | -1.0818 *** |

**Table A6** The estimated parameters of the part-time equation

| | ≤ 30 days | ≤ 60 days | ≤ 90 days | ≤ 120 days | ≤ 150 days | ≤ 180 days | ≤ 210 days | ≤ 240 days | ≤ 270 days | ≤ 300 days |
|---|---|---|---|---|---|---|---|---|---|---|
| Factor loading | -0.0377 | -0.1478 | -0.8880 | -0.1247 | -0.3192 | -0.3342 | -0.3849 | -0.2493 | -0.1204 | -0.2937 |
| Men (CG: Women) | -0.1839 | -0.3370 | 0.0617 | -0.0356 | -0.2468 | -0.2814 | -0.2714 | -0.3634 * | -0.2799 | -0.2320 |
| Swedish born | 0.3660 | 0.0347 | 0.2221 | 0.1477 | 0.2109 | 0.1279 | 0.1688 | 0.1909 | 0.2700 | 0.3185 |
| Age/10 | -0.0509 | 0.1767 | 0.5057 *** | 0.3707 | 0.3677 | 0.3543 | 0.5112 | 0.4161 | 0.3638 | 0.5109 |
| Age-squared/100 | -0.0051 | -0.0365 | -0.0993 | -0.0809 * | -0.0759 | -0.0743 | -0.0903 * | -0.0794 | -0.0761 | -0.0957 |
| Married | -0.0187 | 0.0028 | -0.0193 | -0.0729 | 0.0177 | -0.0176 | -0.0483 | -0.0266 | -0.0787 | -0.0428 |
| Income# (in Thousands kronor) | 0.0206 | 0.1216 | 0.2186 | 0.1407 | 0.2215 | 0.2523 | 0.1704 | 0.1680 | 0.1741 | 0.2145 |
| NUTS-regions (CG: Far north) | | | | | | | | | | |
| Stockholm | 0.2052 | 0.6080 * | 0.8091 | 0.8635 *** | 1.1070 *** | 1.1358 *** | 0.9455 *** | 0.9020 *** | 1.0700 *** | 1.0029 ** |
| East central | -0.0070 | 0.4883 | 0.7883 | 0.6429 ** | 0.7086 ** | 0.6570 ** | 0.5845 * | 0.5620 * | 0.6722 ** | 0.5421 |
| Småland plus islands | -0.1354 | 0.2868 | 0.6635 | 0.4141 | 0.5051 | 0.4600 | 0.2312 | 0.3778 | 0.5460 | 0.4352 |
| South | -0.1824 | 0.1926 | 0.2594 | 0.4035 | 0.3860 | 0.4881 | 0.3710 | 0.3472 | 0.3895 | 0.2367 |
| West | 0.3051 | 0.5041 | 0.7980 | 0.6688 ** | 0.6549 ** | 0.6674 ** | 0.5136 | 0.4979 | 0.5765 * | 0.5215 |
| North central | -0.4178 | 0.3140 | 0.2763 | 0.2237 | 0.3442 | 0.5436 | 0.2848 | 0.3368 | 0.4721 | 0.4508 |
| Central north | -0.0945 | 0.1854 | 0.5828 | 0.4461 | 0.4012 | 0.3042 | 0.2652 | 0.2234 | 0.2829 | 0.1890 |
| Sick leave previous year | -0.0734 | -0.1426 | -0.3153 | -0.1510 | -0.2643 | -0.2088 | -0.2191 | -0.2325 | -0.2344 | -0.2290 |
| Diagnosis (CG: Injuries & poisoning) | | | | | | | | | | |
| Mental disorder | -0.7645 ** | -0.4455 | -0.2398 | -0.1529 | -0.1034 | 0.0063 | -0.0181 | -0.0283 | -0.1589 | -0.3630 |
| Circulatory organs | -0.9483 | -0.7420 | -0.3329 | -0.4405 | -0.3788 | -0.4109 | -0.5508 | -0.5514 | -0.6701 | -0.8641 |
| Musculoskeletal | -0.8702 ** | -0.7221 ** | -0.6871 | -0.5406 * | -0.4168 | -0.3219 | -0.3465 | -0.3300 | -0.4511 | -0.6293 * |
| Pregnancy complications | -0.8280 * | -0.2250 | -0.4381 *** | -0.2876 | -0.1997 | 0.2202 | 0.2168 | 0.1679 | 0.0133 | -0.1696 |
| Other | -0.8354 ** | -0.6431 ** | -0.5813 | -0.3304 | -0.0441 | 0.0284 | -0.0213 | -0.0134 | -0.2039 | -0.3550 |
| Physician (CG: primary care) | | | | | | | | | | |
| Company | -0.7897 * | -0.5496 * | -0.3727 *** | -0.2641 | 0.0094 | -0.0467 | 0.1280 | 0.1380 | 0.2816 | 0.4270 |
| Private | -0.3839 | -0.4838 * | -0.4923 | -0.0962 | -0.1129 | -0.2133 | -0.1229 | -0.1327 | -0.2408 | -0.2306 |
| Specialist | 0.0328 | -0.3125 | -0.3661 | -0.0863 | -0.2670 | -0.2673 | -0.1564 | -0.1710 | -0.3146 | -0.2710 |
| Private sector | 0.3494 | 0.4159 * | 0.1788 | -0.1140 | 0.0247 | 0.0426 | 0.0473 | 0.0889 | 0.0091 | 0.0147 |
| Occupation with small or no requirement of education's level | -0.1852 | 0.0244 | -0.0019 | -0.2345 | 0.3593 | 0.2758 | 0.2376 | 0.1848 | 0.1434 | 0.1664 |
| Changed degree of sick leave | -0.9718 *** | -0.7279 *** | -0.7547 | -0.5640 *** | -0.5437 *** | -0.4308 ** | -0.2300 | -0.2485 | -0.2544 | -0.3122 |
| Interactions | | | | | | | | | | |
| Private*Primary-care | -0.2362 | -0.4852 | -0.2081 | 0.0604 | -0.1270 | -0.1338 | -0.0229 | -0.0290 | -0.0682 | -0.0729 |
| Musculoskeletal*Company | 0.6546 | 0.2530 | -0.1978 | 0.0802 | -0.4488 | -0.3420 | -0.3328 | -0.2346 | -0.4654 | -0.6106 |
| Mental disorder*Specialist | -0.2377 | -0.6813 | -0.5589 ** | -0.7446 | -0.6330 | -0.4345 | -0.0562 | -0.0338 | -0.0554 | 0.2359 |