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The Effect of Sickness History on Earnings in Sweden

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ABSTRACT

This study examines whether sickness history affects annual earnings and/or hourly wages in Sweden. If poor health makes people less productive, previous sickness is expected to have a negative effect on hourly wages. If poor health reduces people's working capacity, but not their productivity, it is expected to decrease the hours worked, which implies lower annual earnings and no change in their hourly wage. The results indicate that people who are healthy in the current year but have a longer spell of sickness in previous years have lower earnings than persons who have no record of long-term sickness, and that the effect goes through hours of work rather than the wage rate.

1. INTRODUCTION

THIS STUDY ANALYSES whether annual earnings and hourly wages in Sweden are affected by sickness history, defined by relatively recent, but also relatively long spells of sickness, and for specific diagnoses. If poor health makes people less productive, we expect to find a negative effect of health history on current hourly wages, through the wage effect on earnings. If, instead, poor health reduces people's working capacity, but not their productivity, this implies a decrease in hours worked. In this case, health impairment increases the absenteeism rate or reduces hours supplied, or both. By studying both hourly wages and annual earnings we can discern, first, if there is an effect of poor health on earnings and, second, if there is a significant effect, whether it is because people have lower hourly wages than they would have had without the history of long-term sickness. If an effect on earnings is not reflected in a reduced wage rate, the implication is that it is attributable to a change in hours worked. Nonetheless, in spite of unchanged productivity, people with a history of poor health may nevertheless face wage discrimination, which is not analysed here. Additionally, it may happen that persons with lower hourly wages and/or earnings tend to a greater extent to be a selection of persons with poor health who take jobs with more intermittent work schedules. If this is the case, if history of sickness affects the supply of labour, then part of the effect can be a function of this circumstance.

In studies of annual earnings and hourly wages, the most common approach is not to control for health status. When health status has entered studies, two main approaches have been taken. Either health is formulated as a binary exogenous variable, or it is used as a stratification criterion for obtaining samples of 'healthy' and 'unhealthy' men and women, blacks and whites, etc. In this study we analyse the effects of sickness history on earnings and wages for people who have a relatively good health status in the year analysed. This, per se, is almost unique in the literature. We are able to specify health status using information about days of sickness during both the year of analysis and five previous years, and accompanying diagnoses from administrative registers. This means that the measure of health status used in this study does not rely directly on an individual's self-evaluation, and therefore may be a more objective measure of health. Unfortunately, because hours worked are available only for one year, the hypotheses of this study can only be tested in a cross section framework.

The paper is organised as follows. Section 2 outlines the theoretical framework. Section 3 presents the empirical and the institutional framework, while Section 4 presents the data and discusses some methodological issues. The empirical results are presented in Section 5, and conclusions with some policy implications of the results are drawn in Section 6.

2. The theoretical framework

The human capital literature has expanded rapidly since the schooling model was presented in the late 1950s (Mincer, 1958; 1962; Becker, 1962). However, there is little economic research on the effects of health or health investments on earnings compared to the vast literature on the effects of education, and training on earnings. Currie and Madrian (1999) present an overview of the US literature linking health, health insurance, and labour market outcomes, which suggests that poor health reduces the capacity to work and has significant effects on wages, labour force participation and job choice. The Swedish literature on the effects of absenteeism on individual wages has focused mainly on time out of the labour force accompanying childbirth and childcare (e.g., Edin and Nynabb, 1992; Stafford and Sundström, 1996; Albrecht *et al*, 1999). The human capital model assumes that individuals desiring to enhance their human capital will forego current earnings and invest time and money in education or training, thereby augmenting the quality and the value of labour services. Health 'capital' is similar to education and training in the sense that it is a 'stock' that can be enhanced and/or maintained with investment (good nutrition, exercise, etc.) through life, although the normal process of ageing can increase the likelihood of some specific diseases. Health is an investment for which people do not necessarily need skills in order to maintain or increase human capital, but it requires at least their access to information and health consciousness may be positively correlated with education. We consider the investment in health to be the same as the investment in education and/or

training, and view prevention of work absence due to poor health as a maintenance investment, as we have discussed above.

De Leire and Manning (2004) discuss how to measure the labour market costs of illness and suggest that an increase in the health impairment rate is equivalent to an increase in the effective wage rate from the point of view of the employer. If the marginal worker becomes too expensive, this leaves the price-taking employer, at the margin, with two alternatives: 1) to replace him/her with a less expensive worker from the pool of available labour, at the exogenously determined market wage or 2) to negotiate the correct market wage, given the worker's impairment and/or to hold back on future wage increases. In the latter case, if the impairment ceases to be a problem there arises an opportunity for once again increasing the individual's wage up to the level consistent with a non-health-impaired worker.

The individual is assumed to maximise his or her utility from consumption, C, and leisure, l, for a given health status, h, i.e. $U(c, l; h)$, where health impairment is reflected in a change in the health status parameter. The consumer maximises utility given that his or her effort is restrained by the number of hours in the day, and given preferences for consumption of goods and services and leisure.

There are different strategies for the individual that lead to different observed outcomes. The first is to attempt to maintain an unchanged reservation wage, in spite of the impairment. If demand for labour is elastic and if there is an unimpaired worker willing to work at the exogenously determined wage rate, then the optimum policy for the employer is to replace the health-impaired worker with a healthy worker. The optimum for the impaired worker, who cannot or does not want to spend more time away from the workplace, is to reduce his or her reservation wage. This strategy could enable the 'marginal worker' to remain employed. On the other hand, if earnings are replaced by insurance up to the amount that is consistent with the individual's marginal value to the employer, the individual may be indifferent between leisure or work at a reduced wage. The decision on time spent at work will depend, thus, on where in the career profile the individual finds him or herself, the degree of health impairment and individual preferences for leisure. The first two can be quantified, which is the aim of our analysis.

3. The institutional and theoretical framework

The empirical literature in this area is based largely on US data and institutions. By comparison, our analysis of the relationship of past health to present earnings is set in a typical European environment, with universal social insurance and highly organised collective bargaining. In Sweden, as in many other European countries, workers cannot be laid off solely due to poor health, although they can change jobs on their own initiative. Regardless of whether the worker with a poor health history continues with the same employer or changes jobs, our analysis will capture the overall effect of health on earnings

and will indicate whether and to what extent the effect runs through a reduced wage rate, a reduction in hours worked or both.

We expand the standard model of earnings and wages with variables related to personal characteristics (*X*), history of health and work absenteeism due to sickness (*Z*) to estimate the effect of the health status on hourly wages and annual earnings (ln *y*):

$$\ln y = \beta_0 + \beta_1 SD + \beta_2 age + \beta_3 age^2 + \delta X + \sigma Z + \varepsilon \quad (1)$$

where (SD) are schooling dummies. In the Swedish setting, persons with higher education (i.e., at least college education) would be those where the employer has more degrees of freedom to adjust wages to performance and the likelihood that their wages might be affected by past sickness is greater. The hourly wages of blue-collar workers are on the other hand regulated by labour-management contracts, with little room for variation. Instead, a worker with less than perfect health could compensate by reducing hours supplied, to the extent this is possible. Empirically, the schooling dummies (medium and higher, in comparison with lower) would be expected to pick up these effects. The lower education dummy indicates that the worker has primary education and the medium education dummy indicates that the worker has more than primary education, but less than college education.

The typically observed concave profile for lifetime earnings is captured by the experience and quadratic experience variables, measured by years of work, or approximated by age, with positive and negative expected values of β_2 and β_3, respectively.

In Sweden, during the period studied as well as later, there were centrally-negotiated contracts covering all groups of employed persons. However, individual wage drift above the negotiated percentage increase was the rule, rather than the exception. In addition, for white-collar workers the negotiated percentage increases were frequently viewed as an aggregate restriction for a specific employer, and the employer had the freedom to set individual wages. Only the aggregate constraint was binding. Nevertheless, the fact that close to 90 percent of the labour force was covered by central contracts at the time would mean that an effect of sickness history on the individual's wage would have to come through a job or task change or through a gradual process associated with not getting pay raises. In the Swedish context, it is highly improbable that individual wages would be decreased, other than relatively, through non-pay-rise 'erosion' and the process of erosion might take much more time than we have been able to examine with the database at our disposal.

During the period studied, but also later, around 90 percent (and at the time examined here around 100 percent) of earnings lost during periods of sickness absence from the workplace are/were replaced by a combination of social insurance (80 percent now and 90 percent for the year examined) and

widespread collective agreements (providing an additional 10 percent). There has always been a ceiling on earnings replacement by the public system, which at the time examined in this study was about 1.5 times average earnings. Blue-collar workers were not compensated for earnings over the ceiling, but at the time there were practically no blue-collar workers with earnings at this level. Privately and publicly employed white-collar workers were compensated for earnings above the ceiling through contractual insurance schemes, but compensation was tapered off at high earnings levels.

Given that the immediate opportunity cost of being away from work is so low, the main work-related incentive for maintaining one's health and returning to work as quickly as possible is to maintain good standing and influence future wages. This incentive effect can be expected to be lower for older workers and with generally failing health. Generally speaking, to some extent this must explain the decline in age-earnings profile typically observed for older workers. The latter can also be a work effort effect: reduced willingness to work long and/or inconvenient hours that can give higher remuneration. Nonetheless, it is important to recall that an additional reason why earnings can fall for older workers is that they eventually begin to place a higher value on leisure rather than work time.

Finally, the immediate opportunity cost of sickness absenteeism is close to zero, where earnings replacement rates are close to or are 100 percent, which is the case for Sweden, but also for other European countries with national insurance systems offering high earnings replacement. Given this circumstance, the correlation between compensated days of sickness and earnings could be positive, negative or zero. It would be positive if persons with higher earnings (either higher wages or more hours worked, or both) tend to have more compensated days of sickness in any given year, and negative if the opposite were to be the case.

The behavioural connection between compensated days of sickness in the current year and earnings may, however, be more complicated. Assume that the there is greater intrinsic value, or other indirect opportunity costs for absenteeism, for employees with higher wages. Then, *ceteris paribus*, if the opportunity costs of being away from work were low for persons with lower earnings and high for persons with high earnings, there would be a convex relationship between compensated days and earnings during the *current* year. This is a hypothesis we will test empirically in this study. A ceiling on replaced earnings would imply a maximum effect around the level of the ceiling.

4. The data and methodological issues

The data for our analysis are from the Swedish National Social Insurance Board's LS database,[2] which covers the period January 1, 1983 to December 31, 1991. The database is unique in Sweden because it contains information on days (spells) of absence due to sickness and the associated diagnoses (during 1983-1991), hours worked (in 1988), together with annual earnings (avail-

able for 1980, 1985-1990). The year 1988 is the only year in Sweden for which there is a database (the LS-database) combining all this information. Table A1 in the Appendix presents basic descriptive statistics for men and women, by sickness status, while Table A2 presents descriptive statistics of health variables for men and women, by sickness status.

Hours of work are available for 1988 following a change in the law in 1987 requiring everyone to report to the social insurance office hours worked and changes in hours worked, since earnings replacement from national sickness was based on this information. In this year (1988) alone people were required to report hours worked to maintain their insurance status. For this reason, non-compliance was very low at the outset, and the information reported for 1988 is highly accurate. Hours worked were also updated as a part of the claim process, but there is a risk that the quality of data on hours worked worsened with time from the initial required reporting date. The requirement to report hours worked was relinquished after a couple of years because it proved to be difficult to get people not claiming benefits to report changes in hours worked. As recently as 2007 Sweden still had no reliable register data on diagnoses in conjunction with sickness absenteeism from the workplace, since insurance officers are not required to register them. This means the database used in this study still provides the only possibility of combining information on hourly wages, earnings, spells of sickness and diagnoses.

The 1988 data on annual earnings, sickness absence and hours worked have been used to compute hourly wage rates in 1988. Two sources of annual earnings are available. These are earnings reported for sickness insurance, from the social insurance register, and taxable earnings from the national tax register. These two sources are used to determine annual earnings from work. If there was a discrepancy, we used taxed earnings.

Given that this study aims to estimate the effect of sickness history on annual earnings and hourly wages, and given that the last output variable is available only for 1988, the variables related to sickness history cover the period 1983-1988. Additionally, we analyse only persons whose main source of income was from employment (not the self-employed) who resided in the country in 1988, who were alive at the end of the year and who were not incarcerated, long-term sick or who did not have a disability pension during the year. Long-term sickness is defined in this study as at least a spell of sickness absenteeism of at least 60 days per year. There were 187 persons who fulfilled the criteria to be classified as long-term sick. The analysed sample contains 1688 individuals in total. We analyse the whole sample and by health status. We create two health status categories: relatively good health (if they had no long-term sick spell during 1983-88) and relatively bad health (otherwise).

Data on hours worked are lacking for around 7 percent of the sample. Correlation of the data with information from the tax register shows, however, that about this percent did not report taxable earnings in 1988. This suggests that the fact that they reported zero hours was instead a result of not working

that year. Even these people are included in the analysis, however, since it is important not to ignore persons with previous work histories who are not working (other than through early retirement) during the period of analysis. Given that annual earnings are zero for about 7 percent of our observations, the linearity assumption should not hold, which means that the least squares method would be inappropriate for estimating the earnings equation. If the dependent variables are limited in their range, Tobit models are the appropriate approach for estimating such regressions. Consequently, the Standard Tobit model is used for estimating the annual earnings equation. Similar to the pioneering work of Tobin (1958), who used data with several zero values for the dependent variable, we use annual earnings as the dependent variable, which has zero values when people neither worked nor were absent from work with compensation due to sickness, and who are assumed to have a reservation wage greater than zero.

When the dependent variable is the hourly wage, we use Heckman's full information maximum likelihood method. If y_1 is the wage offer (or market wage) and y_2 is the reservation wage, we never observe y_2 but we observe y_1 for most of people who work. If $y_1 > y_2$, we observe that the individual is in the labour force. If $y_1 < y_2$, we observe that the individual is not employed, and we do not observe either y_1 or y_2. If we ignore the sample selection problem and regress hourly wages Y on X (the observed characteristics) using the observed Y's only, then an OLS estimate for the effects of the observables will be biased.[3]

5. Results

We estimate equations for annual earnings and hourly wages for 1988. Table 1 presents Tobit estimated coefficients of the annual earnings equation for all individuals together and for different groups: men, women, and workers with relatively good health status and workers with relatively bad health status.[4] Table 2 presents coefficient estimates for the wage equation and Table A4 in the Appendix presents the coefficient estimates for the selection equation.[5] Additionally, we report even the estimates of the (baseline standard) earnings and wage functions (and the selection equation) without the health variables in Tables A3 and A5 in the Appendix.

Generally, our results for the standard labour supply variables are similar to those found in earlier labour supply studies (at least with respect to the sign and statistical significance of the estimated parameters), but add to the picture information about the effect of the health variables (history of sickness absenteeism and diagnoses) on both annual earnings and the hourly wage. The age effect is significantly positive and the effect of the quadratic of age is significantly negative in both the earnings and wage equations, with a much stronger effect in the earnings equation than in the wage equation. The relative strength of the effect of the age variable in the earnings equation suggests age-related decrease in work-time. This can be driven either by a positive

Table 1: Estimated parameters of the earnings equation in 1988*

	Not long-term sick in 1988			
	All		Men	
	PE	SE	PE	SE
Female	-0.613 ***	0.142		
Age	0.412 ***	0.050	0.425 ***	0.071
Age-Squared/100	-0.518 ***	0.058	-0.532 ***	0.083
Citizenship (CG: Swedish born)				
Foreign	-2.003 ***	0.273	-2.320 ***	0.415
Nationalised	-0.596 *	0.332	-0.864 *	0.442
Education (CG: low)				
Medium	0.864 ***	0.167	0.881 ***	0.231
Higher	0.991 ***	0.207	0.635 **	0.311
Married	-0.038	0.172	0.269	0.257
Sickness Cohorts				
Year 1983	-1.969 ***	0.658	-2.509 **	1.008
Year 1984	-1.113 **	0.505	-1.371 *	0.703
Year 1985	-0.132	0.500	0.651	0.755
Year 1986	0.019	0.596	1.548	0.978
Year 1987	-0.451	0.622	-1.607 *	0.971
Sickness Days (86-88)by diagnosis				
Musculoskeletal	0.002 *	0.001	0.005 **	0.002
Cardiovascular	0.001	0.001	0.003	0.003
Respiratory	0.001	0.002	0.001	0.002
Mental	-0.001	0.002	0.002	0.002
Gen. Symptoms	-0.001	0.004	-0.024 **	0.010
Injuries	-0.004 *	0.002	0.000	0.002
Other	-0.001	0.002	0.003	0.004
Compensated days of sickness by year				
1983	0.019 ***	0.005	0.006	0.008
1984	-0.005 **	0.003	0.006	0.004
1985	-0.007 ***	0.002	-0.012 ***	0.003
1986	-0.004	0.003	-0.019 ***	0.005
1987	0.003	0.003	0.013 **	0.006
1988	0.172 ***	0.016	0.161 ***	0.024
1988-squared/100	-0.282 ***	0.035	-0.260 ***	0.052
Intercept	2.512 **	1.004	2.250	1.441
Ancillary parameter	2.845 ***	0.052	2.842 ***	0.074
Left-censored obs.	117		59	
Uncensored obs.	1571		790	
LR chi-squared[a]	440.39		246.11	
Log-likelihood	-4097		-2054	
Pseudo-R^2	0.044		0.051	

	Not long-term sick in 1988					
	Women		Good health 1983-1988		Bad health 1983-1987	
	PE	SE	PE	SE	PE	SE
			-0.628 ***	0.143	-0.375	0.592
	0.411 ***	0.068	0.436 ***	0.051	0.128	0.206
	-0.520 ***	0.081	-0.550 ***	0.060	-0.178	0.235
	-1.834 ***	0.352	-2.058 ***	0.271	-0.722	1.490
	-0.464	0.499	-0.845 **	0.344	1.550	1.166
	0.820 ***	0.233	0.817 ***	0.167	0.968	0.734
	1.214 ***	0.270	0.936 ***	0.205	2.095 *	1.075
	-0.326	0.226	-0.008	0.174	-0.167	0.693
	-0.881	0.868			-1.177	1.396
	-0.982	0.730			-0.742	1.074
	-0.178	0.663			-0.237	1.071
	-0.824	0.750			0.221	1.101
	0.765	0.831				
	-0.001	0.001	0.003	0.003	0.003	0.002
	-0.001	0.001	0.003	0.003	0.001	0.002
	0.002	0.006	0.006	0.006	-0.001	0.003
	-0.008 **	0.003	-0.004	0.009	-0.001	0.002
	0.003	0.004	0.006	0.011	-0.004	0.005
	-0.012 ***	0.004	0.002	0.003	-0.008 **	0.004
	-0.004	0.003	0.001	0.004	-0.001	0.004
	0.018 **	0.007	0.011	0.007	0.013	0.011
	-0.011 ***	0.003	0.003	0.006	-0.009 **	0.004
	-0.003	0.003	0.001	0.006	-0.008 ***	0.003
	0.006 *	0.003	0.000	0.005	-0.004	0.005
	0.002	0.003	0.003	0.006	0.000	0.004
	0.169 ***	0.022	0.136 ***	0.018	0.315 ***	0.059
	-0.274 ***	0.047	-0.231 ***	0.038	-0.506 ***	0.116
	2.079	1.368	2.140 **	1.025	6.764	4.398
	2.734 ***	0.071	2.712 ***	0.052	3.643 ***	0.215
	58		91		26	
	781		1412		159	
	257.96		329.97		91.83	
	-2004		-3589.2		-471.8	
	0.053		0.039		0.072	

* Notes to this table appear on p.22

Table 2: Estimated parameters of the wage equation in 1988

	Not long-term sick in 1988			
	All		Men	
	PE	SE	PE	SE
Female	-0.218 ***	0.017		
Age	0.039 ***	0.006	0.047 ***	0.010
Age-Squared/100	-0.041 ***	0.008	-0.051 ***	0.011
Citizenship (CG: Swedish born)				
Foreign	-0.108 ***	0.036	-0.076	0.059
Nationalised	0.017	0.041	0.033	0.060
Education (CG: low)				
Medium	0.112 ***	0.020	0.196 ***	0.030
Higher	0.246 ***	0.025	0.337 ***	0.041
Married	0.022	0.021	0.072 **	0.033
Sickness Cohorts				
Year 1983	0.077	0.085	0.061	0.154
Year 1984	0.058	0.069	0.043	0.106
Year 1985	-0.086	0.062	-0.048	0.103
Year 1986	0.185 **	0.072	0.169	0.129
Year 1987	-0.025	0.077	-0.047	0.126
Sickness Days (86-88)by diagnosis				
Musculoskeletal	-0.0002	0.0001	-0.0003	0.0003
Cardiovascular	-0.0001	0.0002	0.0002	0.0003
Respiratory	0.0003	0.0002	0.0003	0.0003
Mental	-0.0001	0.0002	0.0000	0.0003
Gen. Symptoms	0.0007	0.0005	0.0013	0.0024
Injuries	0.0000	0.0003	0.0002	0.0004
Other	-0.0003	0.0003	-0.0010 *	0.0005
Compensated days of sickness by year				
1983	-0.0006	0.0007	-0.0017	0.0011
1984	-0.0002	0.0004	-0.0005	0.0006
1985	-0.0003	0.0003	0.0001	0.0007
1986	-0.0004	0.0003	-0.0003	0.0007
1987	-0.0002	0.0004	-0.0002	0.0008
1988	0.0116 ***	0.0020	0.0152 ***	0.0032
1988-squared/100	-0.0239 ***	0.0043	-0.0338 ***	0.0067
Intercept	3.260 ***	0.129	3.003 ***	0.197
rho	-0.280 ***	0.115	-0.108	0.161
sigma	0.338 ***	0.006	0.360 ***	0.009
lambda	-0.095 ***	0.039	-0.039	0.058
Censored obs.	117		59	
Uncensored obs.	1571		790	
Wald chi^2	370.86		174.66	
Log likelihood	-782.34		-438.75	

Women		Not long-term sick in 1988 Good health 1983-1988		Bad health 1983-1987	
PE	SE	PE	SE	PE	SE
		-0.226 ***	0.019	-0.162 ***	0.052
0.034 ***	0.008	0.041 ***	0.007	0.031 *	0.018
-0.037 ***	0.010	-0.043 ***	0.008	-0.036 *	0.021
-0.130 ***	0.042	-0.085 **	0.037	-0.256 **	0.127
-0.006	0.057	0.046	0.046	-0.169 *	0.100
0.020	0.026	0.123 ***	0.021	0.002	0.061
0.164 ***	0.031	0.262 ***	0.026	0.083	0.090
-0.012	0.025	0.019	0.022	0.019	0.058
0.031	0.099				
0.100	0.092				
-0.083	0.077				
0.179 **	0.084				
-0.006	0.096				
-0.0001	0.0002	-0.0004	0.0004	-0.0002	0.0002
-0.0001	0.0002	0.0002	0.0004	-0.0001	0.0002
0.0005	0.0006	0.0000	0.0008	0.0003	0.0002
0.0000	0.0005	-0.0012	0.0012	0.0000	0.0002
0.0007 *	0.0004	0.0026 *	0.0014	0.0008 *	0.0005
-0.0002	0.0006	0.0000	0.0004	-0.0001	0.0005
0.0001	0.0003	-0.0004	0.0005	-0.0003	0.0003
-0.0001	0.0008	-0.0003	0.0009	-0.0005	0.0007
0.0001	0.0005	-0.0003	0.0008	0.0001	0.0004
-0.0004	0.0003	-0.0005	0.0008	-0.0003	0.0003
-0.0004	0.0004	-0.0007	0.0006	-0.0001	0.0004
-0.0005	0.0004	0.0005	0.0008	-0.0005	0.0004
0.0075 ***	0.0026	0.0109 ***	0.0023	0.0092 *	0.0053
-0.0137 **	0.0054	-0.0234 ***	0.0049	-0.0187 *	0.0102
3.254 ***	0.163	3.208 ***	0.138	3.580 ***	0.376
-0.531 ***	0.126	-0.377 ***	0.097	-0.681 ***	0.175
0.303 ***	0.008	0.342 ***	0.007	0.301 ***	0.018
-0.161 ***	0.040	-0.129 ***	0.034	-0.205 ***	0.058
58		91		26	
781		1412		159	
104.49		327.22		50.22	
-271.66		-683.01		-67.01	

choice for more leisure at higher ages, or a negative effect on work-time through generally poorer health, or both.

Being a woman has a negative effect on annual earnings, but note that in the earnings equation, neither the age nor the gender effects are significant for people with long-term sickness records. This indicates that there may be little age/gender differentiation between the persons with histories of long spells of sickness absenteeism. Instead, the results suggest that persons with histories of poor health differ as a group from those without a sickness history (Tables A1 and A2 in the Appendix).

Being foreign-born has a significant negative effect on both the wage rates and earnings. Once again, this effect is not significant for the earnings equation of people with long-term sickness records. Men born outside Sweden who have become Swedish (nationalised) citizens have lower earnings than native-born Swedes. As with age and gender, there is no citizenship effect for the earnings of persons with a long-term sickness history. Being (non-nationalised) foreign born has a significant negative effect on the wages of women and of people with long-term sickness history, but not men. There is no significant effect of being a nationalised Swede on wages, however. Since the earnings of nationalised Swedes are affected rather than the hourly wage, this indicates fewer hours worked. This could reflect individual choices or it could reflect 'immigrant effects' having to do with any number of things, working on both the supply side, such as language difficulties, or the demand side, such as the openness of the labour market with a tendency to favour native-born workers for full-time contracts.

Higher levels of education have a positive effect on both wages and earnings, although the effect is greater for earnings, suggesting that persons with relatively low education tend to work fewer hours. In the sample with a ong-term sickness history, there is also a significant effect on earnings, but not wages, through the education. This suggests that those with a long-term sickness history are more likely to be persons with higher education whose relatively high earnings are a function of more hours worked.

We examine three measures of work absence due to poor health: the number of compensated days per year, the 'year-cohort' (that is the year of the first spell of 60 days or longer), and the number of compensated days by diagnosis groups during 1986-1988. The estimates support some of our hypotheses. For example, in the earnings equation, the cohort effects are generally negative and are significant in 1983 and 1984. Men appear to drive the significant results, with one exception: women in 1986 (with the wrong sign), there are no significant effects going through the wage rate.

For longer sickness spells mental diagnoses, dominated by depression, constituted at the time the second largest group in Sweden after musculoskeletal diagnoses. According to the wage equation, these diagnoses do not have a significant effect on wages. However, in the earnings equation, a significant negative effect indicates that women with mental (depression) symptoms and injuries, associated with a previous spell of 60 days or more, work less in the following years. This is also the case for men with general symp-

toms. Men with previous musculoskeletal problems work more hours on average, which may simply indicate that going back to and maintaining a normal work status is more likely for this diagnosis.

Continuing with the earnings equation, the lagged variables for compensated days of sickness for the more distant years (1984 and 1985) have a significant negative effect on the 1988 earnings of the whole sample. The significant negative effect indicates that workers with longer (and perhaps more comprehensive) histories are more likely to experience a negative earnings effect of past sickness absence.

The combined effects of compensated days per person and compensated days squared for the current year (1988) confirms our hypothesis that the *current* correlation between sickness and earnings is positive for low earnings and is negative (compensated days squared) and for persons for higher earnings. A similar effect arises in the wage equation, suggesting that the effect is positive for persons with low wages and negative for persons with high wages. This confirms the hypothesis that there can be intrinsic value associated with work. Persons with low earnings (wages) and potentially less intrinsically rewarding jobs have more and persons with high earnings (wages) and potentially more intrinsically rewarding jobs have fewer compensated days of sickness. This is one of the most important results of this study.

In sum, aside from the 'current-year effect' just discussed, the wage equation provides no evidence that previous sickness history, as represented by compensated days of absence from the workplace due to sickness, has a significant negative effect on the wage rate in Sweden. Instead, the effects of sickness go through earnings and, implicitly then, through hours worked.

6. Conclusions and implications for policy

The estimated earnings equations confirm the usual paradigm of a concave profile, first increasing, then tapering off, and eventually declining with age. Age hourly wage profiles are much flatter than annual earnings profiles, which is typical for the Swedish labour market.[6] Nevertheless, there is a premium for education: higher education enhances both earnings and the hourly wage rate, suggesting that the effect on earnings goes mainly through the age-career component of the wage rate. In addition, there is a strong negative effect on the wage rate associated with being a woman, but an even stronger negative effect on earnings, which probably reflects the tendency of more women to work part-time than men.

The estimated earnings equations suggest that long spells of sickness (of 60 days or more) have a negative effect on earnings for the overall sample. There are some significant relationships between annual earnings and compensated days of sickness by diagnosis groups: musculoskeletal, mental disorder and injuries. Generally, the days of sickness associated with specific diagnoses do not play a significant role in determining wage rates. The combined regression results from the earnings and wage equations indicate that for women, the occurrence of more days with a mental disorder (normally depression) or injury,

and for men a general symptoms diagnosis, leads to reduced work-time (given an insignificant wage effect) and consequently reduced earnings.

The combined effects of compensated days per person and compensated days squared for the current year confirms our hypothesis that, for relatively healthy workers, negative intrinsic values associated with work lead to more compensated days of sickness for persons with low earnings and positive intrinsic values lead to fewer compensated days for persons with higher earnings. This result is directly relevant for the design of (national) sickness insurance schemes. First, it may indicate that persons with lower earnings are more restrained in returning to work in conjunction with illness due to less flexibility or tolerance on the part of employers. Second, however, this may also signal a greater risk of moral hazard among persons with lower earnings.

Both these tendencies can be ameliorated by working more closely with the employer in the process of adjusting claims, that is, by maintaining close contact between the worker, a representative of the work place and the insurance agent. In fact, there is evidence that countries with more sophisticated claims adjustment processes (e.g. Finland and Germany), which would include routines for considering workplace alternatives to absenteeism, have considerably lower rates of employee sickness absenteeism from the workplace (Palmer, 2003). This also supports the long-term interests of the employee by helping to find solutions to situations that lead to stress and absenteeism. This can also constitute a step in the right direction in making it easier for women whose sickness has been related to stress to avoid reducing their supply of hours worked, that is by reducing the stress factor. Generally speaking, the insurance provider can be active in promoting job flexibility at the workplace for persons with sickness history and working with prevention of the factors that lie behind the two most frequent diagnoses behind longer absenteeism, back pain and depression.

To curb moral hazard, the insurer has the options of replacing a smaller percentage of earnings, perhaps 65 percent instead of 90-100 percent or tightening the claims adjustment process. Swedish sickness absenteeism reached a peak during the time of this study, in 1988-89, then declined with a deep economic recession in the first half of the 1990s. Thereafter insurance claims surged once again to even greater heights (per capita) through 2002. Since then, rather than reducing earnings replacement, the government has instructed Sweden's national insurance administration to move in the direction of sharpening claims adjustment procedures, including working more closely with the medical profession, a strategy for which the trend in aggregate data provide some (short-term) evidence of success (SSIA, 2006).[7]

In sum, the effects of *past* sickness on *actual* earnings and wages are mixed: previous days of sickness have an effect on the annual earnings of both men and women, but there is no significant effect on hourly wages. Of course, it would be interesting to examine a large number of years to see whether the results obtained here are resilient, or perhaps even amplified by a even longer history of health problems. A final conclusion of this study is that both annu-

al earnings and the hourly wage need to be analysed in order to explain the effect of (past) sickness on earnings.

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APPENDIX

Table A1 Mean values of individual characteristics by gender and sickness status 1983-1988

	Not long-term (LT) sick in 1988						T-test of mean differences between good and bad health groups, by gender	
	All		Good health 1983-87		Bad health 1983-87			
	Men	Women	Men	Women	Men	Women	Men	Women
Age	41.09	40.8	40.62	40.45	45.43	43.34	-3.53	-2.24
	(11.2)	(11.3)	(11.1)	(11.1)	(11.9)	(12.4)		
Age-groups								
22-30 years	0.22	0.22	0.23	0.23	0.13	0.19	2.48	0.96
31-45 years	0.42	0.42	0.43	0.43	0.37	0.35	1.06	1.57
46-50 years	0.11	0.12	0.11	0.12	0.08	0.1	0.91	0.63
51-55 years	0.10	0.11	0.10	0.11	0.11	0.14	-0.28	-0.82
56-62 years	0.14	0.13	0.12	0.12	0.30	0.23	-3.47	-2.54
Citizenship								
Swedish born	0.88	0.88	0.89	0.87	0.84	0.94	1.18	-2.61
Foreign born	0.06	0.09	0.06	0.09	0.05	0.03	0.39	3.01
Nationalised	0.05	0.04	0.05	0.04	0.11	0.03	-1.72	0.54
Education								
Lower	0.51	0.47	0.49	0.45	0.69	0.62	-3.66	-3.28
Medium	0.35	0.34	0.36	0.35	0.27	0.26	1.75	1.91
Higher	0.14	0.2	0.15	0.21	0.05	0.13	3.67	2.18
Marital status								
Unmarried	0.41	0.34	0.42	0.34	0.33	0.3	1.65	0.82
Married	0.54	0.55	0.54	0.55	0.58	0.58	-0.69	-0.57
Divorced	0.04	0.10	0.04	0.10	0.10	0.09	-1.78	0.33
Widower	0.01	0.01	0.01	0.01	0	0.03	3.08	-1.16
Zero earnings	0.07	0.07	0.06	0.06	0.17	0.12	-2.58	-1.82
Annual hours work	1591	1287	1628	1324	1247	1025	3.43	3.27
	(837)	(849)	(812)	(838)	(977)	(870)		
Hourly wage-SEK	68	54	70	55	55	51	3.35	1.37
	(36)	(25)	(36)	(25)	(39)	(28)		
Annual earnings*	142	94	145	96	118	83	2.68	2.54
	(80)	(51)	(78)	(51)	(88)	(48)	-1.03	0.69
Number observations	849	839	766	737	83	102		

Note: *Italics indicates dummy variables. Standard deviations are not reported for these variables, but they are reported (between parentheses) for the continuous variables **Earnings are expressed in thousand Swedish krona (SEK).

Table A2: Mean values of sickness variables by gender and sickness status 1983-1988

	Good health 1983-87		Bad health 1983-87		T-test of mean differences between good and bad health groups, by gender	
	Men	Women	Men	Women	Men	Women
Compensated days of sickness per year						
Year 1983	5.13	6.75	20.65	23.96	-4.28	-4.36
Year 1984	5.26	6.75	40.75	51.45	-4.45	-4.85
Year 1985	5.85	7.69	68.48	47.54	-4.20	-4.13
Year 1986	5.80	8.58	69.72	84.45	-5.68	-7.19
Year 1987	6.40	8.71	42.11	68.11	-4.81	-6.37
Year 1983	6.71	8.80	13.77	13.77	-3.63	-3.12
*Sickness cohorts**						
Year 1983			0.17	0.23		
Year 1984			0.31	0.22		
Year 1985			0.23	0.23		
Year 1986			0.13	0.20		
Year 1987			0.16	0.14		
Sickness spells by diagnosis, 1986-88						
Musculoskeletal	0.42	0.46	0.92	1.03	-2.65	-3.16
Cardiovascular	0.03	0.06	0.06	0.07	-0.75	-0.32
Respiratory	1.57	2.17	1.75	2.31	-0.59	-0.41
Mental	0.04	0.06	0.23	0.19	-2.14	-1.82
General symptoms	0.33	0.57	0.61	0.68	-2.34	-0.72
Injuries etc.	0.23	0.16	0.58	0.36	-3.27	-2.70
Other	0.64	1.20	1.11	1.75	-2.34	-2.21
Compensated days of sickness by diagnosis, 1986-88						
Musculoskeletal	5.46	5.39	77.48	101.0	-3.09	-3.74
Cardiovascular	1.69	0.61	9.51	37.7	-1.12	-1.63
Respiratory	7.44	10.07	27.24	14.7	-1.19	-1.15
Mental	0.74	1.30	41.63	21.4	-1.85	-2.10
Gen. symptoms	1.67	2.74	6.10	13.7	-1.21	-1.59
Injuries	3.92	1.88	28.53	18.8	-2.38	-2.09
Other	4.13	8.74	26.52	40.6	-2.39	-4.00
LT sickness by diagnosis, 1986-87						
Musculoskeletal			0.17	0.23		
Cardiovascular			0.02	0.01		
Respiratory			0.07	0.06		
Mental			0.01	0.05		
General symptoms			0.15	0.07		
Injuries etc.			0.10	0.21		
Other			0.10	0.21		

Note: *Italics indicates dummy variables.

Table A3: Estimated parameters of the earnings equation without sickness variables

	Not long-term sick in 1988									
	All		Men		Women		Bad health 1983-1988		Good health 1983-1987	
	PE	SE	PE	SE	PE	SE	PE	SE	PE	SE
Female	-0.415 ***	0.149					-0.435 ***	0.147	0.134	0.681
Age	0.449 ***	0.052	0.419 ***	0.076	0.470 ***	0.072	0.442 ***	0.052	0.283	0.241
Age-Squared/100	-0.569 ***	0.061	-0.534 ***	0.088	-0.598 ***	0.085	-0.561 ***	0.061	-0.358	0.274
Citizenship (CG: Swedish born)				***						
Foreign	-2.099 ***	0.290	-2.248 **	0.448	-2.015 ***	0.376	-2.228 ***	0.279	-0.184	1.751
Nationalised	-0.557	0.353	-0.974	0.474	-0.124	0.531	-0.719 **	0.356	1.101	1.372
Education (CG: low)										
Medium	1.038 ***	0.177	1.082 ***	0.249	0.991 ***	0.250	0.860 ***	0.174	2.372 ***	0.830
Higher	0.955 ***	0.219	0.610 *	0.334	1.202 ***	0.288	0.762 ***	0.213	2.459 **	1.185
Married	-0.020	0.180	0.332	0.273	-0.342	0.240	0.003	0.179	-0.495	0.763
Intercept	2.486 **	1.063	2.922 *	1.540	1.825	1.453	2.829 ***	1.053	3.929	5.038
Ancillary parameter	3.041 ***	0.056	3.096 ***	0.080	2.965 ***	0.077	2.829 ***	0.055	4.441 ***	0.263

Table A4: Estimated parameters of the selection equation

	Not long-term (LT) sick in 1988			
	All		Men	
	PE	SE	PE	SE
Female	-0.093	0.123		
Age	0.210 ***	0.055	0.248 ***	0.085
Age-Squared/100	-0.274 ***	0.071	-0.321 ***	0.110
Citizenship (CG: Swedish born)				
Foreign	-0.910 ***	0.179	-1.107 ***	0.269
Nationalised	-0.221	0.262	-0.663 **	0.336
Education (CG: low)				
Medium	0.666 ***	0.171	0.778 ***	0.271
High	0.679 ***	0.204	0.292	0.265
Married	0.212	0.205	0.548 *	0.303
Sickness Cohorts				
Year 1983	-0.858 *	0.512	-1.382 **	0.661
Year 1984	-0.989 ***	0.377	-1.063 *	0.543
Year 1985	0.090	0.535	2.028	1.317
Year 1986	-0.304	0.553		
Year 1987	0.286	0.611	-9.385 ***	3.152
Sickness Days (86-88)by diagnosis				
Musculoskeletal	0.002 *	0.001	0.002	0.004
Cardiovascular	0.002	0.002		
Respiratory	0.055 ***	0.013	0.064 ***	0.022
Mental	0.000	0.001	0.005	0.018
Gen. Symptoms	-0.002	0.002	0.024 *	0.012
Injuries	-0.003 ***	0.001	0.011 ***	0.004
Other	0.002	0.002	0.023 **	0.009
Compensated days of sickness by year				
1983	0.013 **	0.005	-0.002	0.008
1984	-0.002	0.002	0.015 ***	0.005
1985	-0.001	0.001	-0.004 **	0.002
1986	-0.002	0.002	-0.033 ***	0.010
1987	-0.002	0.002	0.145 ***	0.041
1988	0.101 ***	0.018		
'55 plus'	-0.006	0.306	-0.145	0.458

Women			Not long-term (LT) sick in 1988 Good health 1983-87		Bad health 1983-87	
PE		SE	PE	SE	PE	SE
			-0.199	0.149	0.135	0.358
0.239	***	0.085	0.218	*** 0.050	0.069	0.149
-0.331	***	0.106	-0.289	*** 0.056	-0.102	0.161
-1.001	***	0.281	-0.813	*** 0.206	0.089	0.867
-0.430		0.501	-0.412	0.316	0.565	0.775
0.633	**	0.262	0.794	*** 0.205	0.745	0.627
1.212	***	0.394	0.660	*** 0.232		
0.195		0.344	0.377	0.330	0.278	0.535
3.711	**	1.706				
-0.222		0.812				
1.354		1.107				
-1.470		0.958				
2.400	*	1.224				
-0.007	***	0.002	0.002	0.008	0.001	0.001
-0.004	***	0.001			0.001	0.002
0.071	***	0.022	0.016	0.017	0.083	** 0.039
-0.013	**	0.006	0.016	0.029	0.000	0.001
0.113	*	0.059	0.077	0.049	-0.007	0.007
-0.018	***	0.004	0.042	0.026	-0.006	** 0.003
-0.007	**	0.003	0.052	0.035	0.000	0.002
					0.000	0.006
0.059	***	0.022	0.028	* 0.016	-0.004	*** 0.001
-0.013	***	0.005	0.004	0.013	-0.002	* 0.001
-0.004		0.003	0.006	0.010	-0.002	0.003
0.019	***	0.007	-0.015	0.011	0.002	0.003
-0.002		0.003	0.001	0.017	0.056	** 0.025
0.157	***	0.041				
0.342		0.443				

Table A5: Estimated parameters of the wage and selection equations without sickness variables

	Not long-term (LT) sick in 1988			
	All		Men	
	PE	SE	PE	SE
Wage equation				
Female	-0.212 ***	0.018		
Age	0.045 ***	0.007	0.047 ***	0.010
Age-Squared/100	-0.051 ***	0.009	-0.052 ***	0.012
Citizenship (CG: Swedish born)				
Foreign	-0.153 ***	0.040	-0.109 *	0.062
Nationalised	-0.005	0.042	-0.021	0.061
Education (CG: low)				
Medium	0.130 ***	0.023	0.216 ***	0.032
Higher	0.257 ***	0.027	0.338 ***	0.041
Married	0.030	0.021	0.087 ***	0.033
Selection equation				
Female	-0.015	0.109		
Age	0.171 ***	0.046	0.125 *	0.068
Age-Squared/100	-0.212 ***	0.059	-0.150 *	0.088
Citizenship				
Foreign	-0.878 ***	0.153	-0.891 ***	0.225
Nationalised	-0.304	0.218	-0.511 *	0.268
Education (CG: low)				
Medium	0.760 ***	0.150	0.848 ***	0.222
Higher	0.561 ***	0.179	0.277	0.230
Married	0.043	0.144	0.291	0.217
55 plus	-0.289	0.254	-0.632 *	0.383
Intercept	-1.706 *	0.878	-0.964	1.276
rho	0.200	0.246	0.182	0.226
sigma	0.346 ***	0.007	0.372 ***	0.010
lambda	0.069	0.086	0.068	0.085

Not long-term (LT) sick in 1988						
Women			Good health 1983-87		Bad health 1983-87	
PE		SE	PE	SE	PE	SE
			-0.219 ***	0.019	-0.133 **	0.058
0.035	***	0.009	0.044 ***	0.008	0.048 **	0.020
-0.039	***	0.010	-0.048 ***	0.009	-0.060 ***	0.023
-0.147	***	0.044	-0.140 ***	0.042	-0.250 *	0.148
0.007		0.057	0.034	0.046	-0.145	0.114
0.014		0.028	0.137 ***	0.023	0.115 *	0.070
0.157	***	0.032	0.265 ***	0.027	0.239 **	0.098
-0.012		0.026	0.031	0.022	-0.006	0.064
			-0.022	0.120	-0.012	0.247
0.231	***	0.067	0.213 ***	0.051	-0.072	0.113
-0.293	***	0.084	-0.271 ***	0.066	0.123	0.138
-0.881	***	0.215	-0.995 ***	0.161	-0.035	0.588
-0.100		0.404	-0.419 *	0.239	0.023	0.496
0.689	***	0.204	0.671 ***	0.163	0.716 *	0.408
1.016	***	0.319	0.425 **	0.186	4.981	
-0.248		0.192	0.047	0.162	0.101	0.295
0.118		0.355	-0.110	0.280	-1.351 **	0.549
-2.622	**	1.247	-2.266 **	0.962	1.778	2.286
-0.354	*	0.197	0.187 ***	0.227	0.904 ***	0.069
0.312	***	0.009	0.346	0.007	0.364 ***	0.024
-0.110	*	0.063	0.065	0.079	0.329 ***	0.041

ENDNOTES

1. Andrén: Department of Economics, Göteborg University, Box 640, 405 30 Göteborg, Sweden. E-mail: Daniela.Andren@economics.gu.se. Palmer: The Swedish Social Insurance Agency and Uppsala University, Sweden. We gratefully acknowledge valuable comments on earlier versions of the paper from Thomas Andrén, Lennart Flood, Donald Storrie, Roger Wahlberg, two anonymous referees and from seminar participants at Göteborg University. The authors also thank the Swedish Council for Working Life and Social Research (FAS) for financial support.

2. In January 2005, the Swedish National Social Insurance Board (RFV) became the head office for the social insurance administration, including all the regional and local offices. This new organisation is called The Swedish Social Insurance Agency (SSIA).

3.See Andrén and Palmer (2001) for a presentation of these two models.

4. Because about seven percent of observations had zero annual earnings, it is not surprising that the Tobit estimates are almost the same in size, sign, and significance as the OLS estimates reported by Andrén and Palmer (2001).

5. Sample selection appears in this case because the wages for some individuals are unobserved. Excluding them would leave us with a sample that is non-random and possibly skewed in relation to the population. Unless we take account of those missing people we cannot obtain consistent estimates of the population parameters. One way of doing this is to calculate the probability of being in the sample (i.e. having an observation on the wage) and using this information to control for possible selection bias.

6. See Andrén and Palmer (2001).

7. Table 1.3 on page 20 of this official publication shows that sickness payments decreased by about 30 percent between 2003 and 2006 without compensating increases in disability.

Notes to table 1: [a]Prob >chi-squared = 0.000 for all samples. PE indicates the parameter estimate in the semi-log annual earnings equation and SE indicates its standard error; ***, ** , and * indicate significance at less than 1%-, 5%- and 10%-level; Italics indicate dummy variables. CG is the comparison group. These notes also apply to Tables 2 and A3.

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