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Labour Supply Response to Spousal Sickness Absence*

Ruth-Aïda Nahum**

Abstract

This study examines labour supply responses to spousal sickness absence (SSA) using a Swedish longitudinal panel data, from 1996-2002. The overall results present an evidence of a decrease in labour supply in response to spousal sickness absence. The effect on labour supply increases with spousal earnings level. Women react stronger than men, and more often respond to current shorter term SSA, whereas men mostly react to longer term SSA.

Sammanfattning

Studien undersöker individers arbetsutbudsreaktioner till partners sjukskrivning, baserad på LINDA, en svensk individbaserad longitudinell panel data from 1996-2002. Resultaten visar på en minskning i arbetsutbud till följd av partners sjukskrivning. Effekten på arbetsutbud ökar med partners inkomstnivån. Kvinnor reagerar starkare än men, och reagerar oftare till korttids sjukskrivningar, medan män reagerar mest till längre sjukskrivningsperioder.

JEL: I12, J12, J14, J22,

Key words: Sickness absence, labour supply, panel data

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1 Introduction

Does an individual adjust his or her labour supply in response to spousal ill health? If so, how? In this paper we focus on the case where spousal health deterioration has affected the working capacity and has subsequently resulted in sickness-absence. The expected direction of the labour supply response of the healthy spouse to spousal sickness absence (SSA) is however ambiguous. On the one hand, potential household income is reduced as the earnings of the sick spouse decreases given that the sick spouse can devote less time to market activity. The Added Worker Effect literature, which has been developed in the context of unemployment, claims that individuals compensate spousal income loss by increasing their own labour supply. In the context of sickness absence however, it is not obvious that the presumed income loss is the sole driving factor in how the healthy spouse would react. The sick spouse may require nursing care, and a larger share of the household workload may need to be undertaken by the healthy spouse, than would otherwise be the case in the context of an unemployed and/or a healthy spouse. This may raise the value of the healthy spouse's home-time and consequently causes the healthy spouse to spend less time in market activity, possibly offsetting any positive Added Worker Effect.

The literature on ill health has typically focused on labour supply and earnings losses suffered personally by the affected. Yet knowledge of these spousal effects is crucial for constructing sound health care and disability policy since the entire family unit to which a disabled person belongs is affected by the losses from imperfect health. Only a handful of papers have looked at the implications of ill health on the spousal labour supply decision. The majority of these studies have focused on the labour supply of women whose husbands' health worsens. The effects have been found to be very small or insignificant indicating that spouse's labour supply is little affected by the partner's ill health. One of the few studies studying both men and women is that of Charles (1999) who, based on US data, finds significant reactions to spousal bad health. He finds that husbands and wives respond differently to a spouse's illness: men reduce labour supply substantially in response to wife's poor health whereas wives increase theirs. Coile (2004a), also based on US data, finds evidence of a small Added Worker Effect for men, but finds no such effect for women.

This paper fills a gap in the Swedish literature, where this aspect of sickness absence has not been addressed. Given that the institutional context is a potentially important factor, Sweden presents an interesting case with generous sickness absence compensation schemes, which could prove to affect the response behaviour to SSA differently compared to other countries with a limited SA compensation scheme. Moreover, given the increased share of individuals on the labour market who are on longer term sick leave absence the past decade, any externalities of long term sickness absence in terms of spousal labour supply response could potentially be large. Furthermore, the fact that Sweden has among the highest female participation rates in the world, and that the typical Swedish household is a dual earner household, makes it equally interesting to study both men's and women's response behaviour to SSA,

instead of solely focusing on women's response behaviour, which has been common in the literature.

The paper is based on LINDA, a longitudinal register based individual data set, which covers approximately 3 percent of the Swedish population, complemented with information on sickness absence retrieved from the National Security Board registers. We study the period 1996-2002 and rely on two alternative measures of labour supply to get a broader picture of labour supply response to spousal sickness absence: yearly earnings and contracted hours measured as the share of full time employment.

Our main result is that if individuals respond to SSA, they do so by decreasing their labour supply. We also find evidence that the response to SSA increases with the sick spouse's earnings level. There is, however, a difference across gender in several respects. Firstly, women's response to SSA is stronger than that of men. Secondly, women more often respond to current year's SSA whereas men more often show a lag in the response to SSA. Thirdly, women react to shorter term SSA as well, whereas men mostly react to longer term SSA. We find that the share of household earnings, the education level as well as the sector of employment help explain part of the difference in labour supply response across gender.

The remainder of this paper is set out as follows. Section 2 discusses theoretical considerations; section 3 presents a brief overview of the literature. Section 4 presents the data and descriptive statistics. The empirical framework is presented in section 5, followed by the results. The overall results are first discussed followed by an attempt to explain the different labour supply responses across gender. The final section provides a concluding discussion.

2 Theoretical motivation

A couple's labour supply decision is usually analyzed in terms of the standard unitary model or in terms of a cooperative model. In the unitary model the household is seen as maximizing one household utility function whose arguments are male and female labour supply and consumption. Applying demand analysis one can derive the implications of e.g. changes in wages and benefits on behaviour. However in this model intra household distribution has little meaning. To account for individual behaviour within households, richer models of behaviour i.e. bargaining or cooperative models have been developed. See e.g. Hallberg (2000) and references therein for details and discussion of the differences and similarities of these models.

The theory of spousal labour supply as insurance against negative shocks has been developed in the context of unemployment in Ashenfelter (1980), Heckman and MaCurdy (1980) and Lundberg (1985) and further summarized in Gruber and Cullen (2000). In the case of spousal unemployment there is expected to be an Added Worker Effect (AWE) because the reduction in transitory income following unemployment of the spouse, would raise the labour supply of the unaffected spouse as a means of providing within-family insurance.

In the case of spousal sickness absence however, other mechanisms are at work making the theoretical predictions more ambiguous. Labour supply (LS) can in

this case be seen as a function of the usual variables pertaining to the individual and spousal sickness absence (SSA), which affects labour supply through three main channels: income loss, home production and joint leisure,

$$LS = f(X, SSA),$$
$$SSA = \phi(\text{Income loss},\ \text{Home production},\ \text{Joint leisure}).$$

2.1 Income loss

Given that individuals on sickness absence receive only part of their income in sickness compensation, in line with the AWE theory, the healthy spouse should raise his/her labour supply to protect the family against this income loss.

One would expect the magnitude of AWE to be stronger the larger is the income loss suffered by the household. The extent of the income loss depends on the earnings level of the sick spouse as well as whether the compensation received by the sick spouse is bounded by income insurance ceiling.[2] Furthermore, irrespective of the spouse's earnings level, the sick spouse's initial relative contribution to household earnings could potentially affect the healthy spouse's labour supply response as well. If the sick spouse was the main income earner in the household prior to the sick spell the response of the healthy spouse could be expected to be higher compared to if the sick spouse was not the main income earner.

Several factors may however crowd out the expected increase in the spouse's labour supply. On the one hand, the existence of generous sickness absence compensation schemes limits the income loss incurred. On the other hand, there are monetary gains of not working, such as cutting back on commuting costs as well as lunch costs, which may constitute a relatively large share of earnings, especially for low income earners.

Furthermore, in the context of a life cycle model, as pointed out by Heckman and MaCurdy (1980) in the case of unemployment, the AWE should be small, unless the income loss perceived is large relative to lifetime earnings. Individuals whose spouses face a larger risk of being out of work should increase their labour supply at all times. The same reasoning would naturally apply for ill health. However, even in the context of a life cycle model, liquidity constrained families may not have the resources to smooth consumption, forcing the healthy spouse to work throughout a transitory sick-leave spell.

2.2 Home production

When either one of the spouses is spending more time at home, irrespective of the reason for not supplying labour on the labour market, he/she can spend more time on household work. To the extent that there is substitution in home production, increased non-market time for the spouse would lower the

[2] See Data section for a review of the Swedish sickness absence compensation scheme.

opportunity cost of market-work for the studied individual, further enhancing the AWE. The issue of whether there is substitution or complementarities in household work remains however an unresolved issue in the literature. Nevertheless, it is likely, that when the increase in non-market time is due to sickness absence rather than e.g. unemployment, the underlying negative health shock would, if anything, strengthen any occurrence of complementarities. This is especially the case if the affected spouse requires extra nursing assistance.

2.3 Joint leisure

Synchronous leisure is also a factor which may crowd out any AWE. There is increasing evidence in the empirical literature that spouses tend to synchronize their non-market time.[3] Furthermore, health shocks may change how couples value the time they spend together. Not only may the affected spouse need more assistance, but the sickness may give new information on lifetime prospects that could imply that the affected spouse may have a shortened expected lifespan.

Even though we have disentangled the main mechanisms behind labour supply responses to SSA affects it is not possible to know theoretically which of these opposite effects dominates. The effects can only be assessed empirically.

3 Previous literature

The main conclusion from the empirical literature, mostly based on US data, is that there is little labour supply response to spousal ill health. Cross section studies by Parsons (1977) and Berger (1983) find that wives of husbands in poor health work more hours than wives whose husbands are healthy. Berger and Fleisher (1984) look at the labour supply of wives using longitudinal data and find evidence of very small increases in labour supply among wives whose husband's health worsens and no effect on participation for the same women. Haurin (1989) finds no statistically significant effect on labour supply for women whose husbands' health worsens. Coile (2004a) and Charles (1999) are some of the few studies focusing on both men and women. They both study couples who are near retirement based on US data from the Health and Retirement Study (HRS). In contrast to most of the studies Charles (1999) finds evidence of a significant reaction to spousal bad health. He finds that men reduce their labour supply by substantial amounts in response to their partner's poor health whereas wives of ill husbands significantly increase theirs. He explains the results saying that differences in labour force participation rates across genders indicate that there is a significant level of specialisation in the family: husbands are the principal bread winners and women the principal home and care-takers. When poor health strikes the spouse, women work more hours and husbands cut back on work to help around the home. Coile (2004a) finds evidence of a small Added Worker Effect for men and a decrease in labour supply for women in response to spousal ill health. The decrease in labour supply among women is stronger in the presence of disability insurance

[3] Most studies have found complementarity of leisure to be an important determinant of early retirement decision. See Coile (2004b).

benefit for the ill spouse, suggesting that the disability insurance benefit crowds out potential spousal labour supply increase – at least among women.

Two related studies based on the same data set used in this paper shed light on intra-household adjustments to sickness absence and unemployment. Arslanogullari (2000) investigates the labour supply response to spousal unemployment, the so called added worker effect. He finds no clear effect for men, but finds that Swedish women, increase their earnings in response to their spouses' unemployment. Even though the effect is small in magnitude it is found to be linked to the level of unemployment benefits the husband receives. Hesselius (2004) finds that spousal retirement has a positive impact on the sickness absence rate. He finds women to be more affected than men, and finds disability retirement to have a stronger effect compared to old-age retirement.

Sweden offers an interesting context with its generous sickness absence compensation schemes, which could prove to affect the response behaviour to SSA differently compared to other countries with a limited compensation scheme. Furthermore, as Sweden has the highest female participation rates in the world, and as the typical Swedish household is a dual earner household, makes it equally interesting to study both men and women's response behaviour to SSA and might shed some light on the different response behaviour across gender found in the literature.

4 Data

We use a subset of LINDA, which is a register based longitudinal individual data set drawn from income registers and population censuses. [4] The database consists of a large panel of individuals, about 300,000 individuals annually, or approximately 3.35 percent of the Swedish population, representative of the overall population from 1960 to 2000. The LINDA panel database contains corresponding information on the individual's household members as well.

We restrict our study to the period 1996-2002, corresponding to the period for which sickness-absence information is available. The individuals in our study are either married or have children and are cohabiting during the period studied. We restrict the study to those who have been cohabiting with the same partner throughout the period studied.

Further we limit the sample to households where both spouses are between the ages of 30 and 58, thus setting the maximum age difference between couples to 23 years. The lower age limit is also an attempt to exclude individuals in the beginning of their working life, where labour supply can fluctuate, and a way of restricting the sample to spouses who have been cohabiting or married a longer period. The upper age limit is chosen so as to omit individuals who are on age related retirement schemes and whose labour supply decision can be affected by retirement considerations.

A number of households have been omitted from the sample either based on characteristics of the LINDA individual or the spouse. Since labour income is

[4] Information from income register, tax return data, unemployment spell data, education level data, sick-absence spell from the National Security Board register etc are included in the database. For a detailed description of LINDA see Edin and Fredriksson (2000).

not an adequate measurement of hours worked for self-employed and given that the data on sickness absence does not adequately cover self-employed we choose to omit from the study households in which any of the spouses are self-employed. As compensated sick leave in Sweden can only be claimed by individuals holding a job or receiving unemployment benefits, we restrict our sample to individuals whose spouses are in the labour market. We thus omit the individuals whose spouses do not have a labour income or who receive student grants. We however include the individuals whose spouses are on disability pension, since a majority of individuals on long-term sickness absence transfer into disability pension schemes.

Given that we are interested in the labour supply outcome, we restrict our analysis to individuals who are in the labour market and thus omit individuals who are retired, are on disability pension or receive student grants.

Based on both the individual and the spouse, we limit our analysis to individuals and their spouses who have a minimum yearly earnings of 30 000 SEK, in order to avoid unnecessary noise, and limit the analysis to individuals who are attached to the labour market. [5]

Our sample results in a total of 33 891 women and 34 193 men, about whom we have information on their spouses. We thus end up with a total of 68 084 households which we can follow an average of 4,5 years.

Since we lack data on work hours and wages for the whole sample, we assume that work hours can be approximated fairly well by labour income. Wages are assumed to be fixed, and the variation in earnings is thus assumed to come from variation in hours worked. Fixed effect specifications with age and year dummies would pick up any aggregate yearly income increase. Our measure of yearly labour earnings does not include any social insurance such as unemployment benefit or sickness absence compensation.

Table 1: Sickness absence compensation levels in Sweden 1996-2002, as percentage of the normal wage.

	Jan 1996 – Dec 1996		Jan 1997 – Dec 1997		Jan 1998 – Mar 1998		Apr 1998 –	
Day of Sick leave	Sick pay	Sickness benefit	Sick pay	Sickness benefit	Sick pay	Sickness benefit	Sick pay	Sickness benefit
1	0	0	0	0	0	0	0	0
2-3	75	0	75	0	80	0	80	0
4-14	75	0	75	0	80	0	80	0
15-28	(10)	80	75	0	80	0	(10)	80
29-90	(10)	80	(10)	80	(10)	80	(10)	80
91-365	0	75	0	75	(10)*	80	(10)*	80
366-	0	75	0	75	0	80	0	80

Note: Sick pay is the sickness absence compensation paid by the employer , whereas sickness benefit refers to government provided sick-leave insurance. Numbers in parentheses denote employer provided additional sickness absence compensation due to collective agreements.

[5] Including individuals where the spouse and (or) the LINDA individual has an income of less than 30 000 SEK decreases R-sq, but has shown to have little effect on the coefficients of interest. The results are robust to setting the minimum yearly earnings to 100 000 SEK.

Throughout this period, sick leave of 8 days or longer require a physician's certificate. There is a ceiling in the sickness absence compensation where the coverage in the public system has been capped for approx. 10 percent of the wage-earners. * denotes that based on collective agreements, an additional 10 percent of sickness absence compensation can be paid by the employer for blue-collar workers in private sector and local government employees.
Source: Hesselius (2004)

For a sub-sample of the population, we have individual information on contracted hours, measured in percentages of full time employment. [6] For those already working full time, this variable does not capture any additional increase in hours worked. Contracted hours do not capture temporary increases or decreases in work-time. Despite the drawbacks of this variable, it is interesting to see if the SSA effects based on yearly earnings can be found even in contracted hours. The information on sickness absence is retrieved from The National Security Board registers. However, the data only includes sick spells covered by the sickness insurance, i.e. sick spells longer than or exempted from the sick-pay period covered by the employer.[7]
There have been two main changes in the sick leave compensation scheme from 1996-2002. An overview is presented in Table 1. During this period the first 14 days of sickness insurance is covered by the employer, except for the period January 1997 to April 1998, where the sick pay period covered by the employer was extended to 28 days.[8] For reasons of consistency across the period we focus in this study on sickness absence exceeding 28 days. In January 1998 the compensation level of income loss during sickness absence increased from 75 to 80 percent of the normal wage up to a given ceiling, corresponding to 7,5 Swedish base amounts. Approximately 10 percent of women and 20 percent of men in Sweden have a wage exceeding this amount.

Much of the literature assessing labour supply response to spousal ill health is based on self assessed health measures, and is often limited to a particular aspect of health being studied. Even though such measures have their advantages respondents may make errors when reporting their health, or may report poor health for various reasons, such as to justify non-work. By restricting our study to sickness absence spells exceeding 28 days we avoid some of the measurement problems usually encountered in the literature, as sickness absence exceeding a minimum number of days (typically 8 days) requires a medical certificate

Given that our information on earnings is that of yearly earnings, our measurement on sickness absence refers to the total sum of sickness absence days per year for each individual, excluding the first 14 or 28 days of each sickness absence spell which is covered by the employer. Even though sickness absence periods could typically overlap the year boundaries, aggregating yearly sickness absence days helps us differentiate between the current and previous

[6] The information on contracted hours does not cover the entire population. Data availability is restricted to the entire public sector, and a sample of the private sector covering approximately 50 percent of the private sector employees. Large firms have a higher probability of being sampled, whereas only 3 percent of firms of less than 10 employees are sampled. See Gustavsson (2004) for an overview of the sampling process. The information is based on a month of measurement typically April, May, September or November. Contracted hours show less variation over time than earnings.
[7] The annual number of sickness absence days is provided in terms of full time, ¾ time, half time and ¼ time sickness absence, where a part time sickness absent worker is assumed to attend work during the remaining time. We aggregate sickness absence days in terms of full time absence.
[8] There are however a number of exceptions. If the sick spell is for example due to a recurrent disease, it can be compensated by the sickness insurance from day one.

year's sickness absence spells. Including a dummy for whether the sickness spell is overlapping the year boundary has shown to be insignificant and does not affect the results.

Table 2: Summary Statistics.

	Men		Women	
	Mean	Std. Dev. within (between)	Mean	Std. Dev. within (between)
Labour force variables				
Log yearly earnings	12.467	.211	12.015	.227
Yearly earnings	289305.6	58154.57	187273.9	39473.38
Log contracted hours	4.575	.110 (.175)	4.424	.185 (.296)
Contracted hours, in % of full time employment	98.01	6 (9.294)	85.762	10.809 (18.567)
Spousal sickness absence (SSA)				
1-3 months	.058		.031	
3-6 months	.019		.01	
6-12 months	.012		.007	
Spousal disability pension (SDP)	.163		.152	
Spousal unemployment (SU)				
1-3 months	.029		.022	
3-6 months	.012		.009	
6-12 months	.006		.006	
Demographics				
# of children aged under 18	1.25		1.27	
# of children aged under 6	.3		.31	
Age	45.35		43.05	
Migration	.020		.021	
Employer				
Municipal	.176		.463	
Government	.149		.106	
Privat	.675		.430	
Education				
Level 1	.191		.121	
Level 2	.469		.493	
Level 3	.350		.386	
Number of observations	156154		153284	
Number of households	34193		33891	

Note: Income variables are set in 1999 year price level. The number of observations and individuals with observation on contracted hours is smaller, amounting to a total of 114374 observations for 29805 women and a total of 96286 observations for 28193 men. The means of SSA, SDP and SU refer to the share, in percentage, of individuals whose spouses are on SSA, SDP or SU. SSA is limited to sickness absence of more than 28 days. Migration is a dummy variable which takes the value 1 if the individuals has changed municipality of residence between two time periods. About 2 percent of our sample has changed municipality of residence. Education level 1 -3 refers to less than high school, high school and post high school education respectively. The means of these dummy variables refer to the percentage share of individuals in the respective groups.

5 Empirical specification

Our basic regression framework for analysing the effect of spousal sickness absence is:

$$LS_{it} = \beta_0 + \beta_1 X_{it} + \sum_{s=1}^{3} \beta_{2s} SSA_{sit} + \sum_{s=1}^{3} \beta_{3s} SSA_{sit-1} + \alpha_i + \gamma_t + \varepsilon_{it} \quad (1)$$

LS_{it} is a measure of an individual's labour supply behaviour at time *t*; X_{it} is a vector of time varying determinants of the labour supply; SSA_{sit} is a dummy variable for spousal sickness absence at time *t* and *s* denotes different lengths of sickness absence corresponding to less than 3 months, 3-6 months and 6-12 months of length, which we refer to as short middle and longer term sickness absence spells. The reference group is that of no sickness absence or sickness absence of less than 28 days. We choose to have a dummy variable referring to periods of various length of spousal sickness absence instead of a continuous variable so as not to impose a linear relationship. We thus allow the effect of spousal sickness absence to vary freely across various lengths of spousal sickness absence. The individual fixed effect α_i can also be viewed as a household fixed effect, γ_t is a year dummy and ε_{it} is an error term. We find it relevant to control for time-invariant individual and household specific characteristics when estimating individual labour supply response behaviour to spousal sickness absence. The fixed effects specification enables us to control for the household's overall health status, overall preference in leisure and labour supply including permanent patterns in labour supply due to assortative mating.

The time varying variables included in the X vector are age, a dummy for migration, and the number of children under the age of 6 and 18 living in the household. Due to the fixed effect specification and the relatively short time period studied, any hump-shaped effect on earnings is not expected, so age squared is not included in the specification. The migration dummy is included so as to control for changes in earnings resulting from moving. A better job offer elsewhere for the prime earner in the household might induce the whole family to move. This would affect the prime earner as well as the spouse who might have to leave his or her job. This dummy variable is set equal to one in year t if the family has moved between t-1 and t, and 0 otherwise. Spousal unemployment is included both as a control and as a means of having a comparison for the effect of SSA. As in the case of SSA, spousal unemployment is entered as dummy variables corresponding to less than 3 months, 3-6 months and 6-12 months of length.

5.1 The issue of exogeneity of sickness absence

Sickness absence and especially sickness absence spells exceeding a minimum of 8 days can be regarded as exogenous to the extent that sickness absence is the result of ill health and requires a medical certificate. Given that sickness absence is exogenous it is natural to include both own sickness absence and spousal sickness absence in our set of control variables.

Recent literature has however pointed out a number of factors, besides ill health, which affect the decision of calling in sick or being on sickness absence. The sickness absence compensation level, in turn depending on ones earnings level, the sector of employment, the size of the working place etc have been shown to play a role in the decision to call in sick. This puts in question the exogeneity of own sickness absence with regard to earnings. Including spousal sickness absence is not problematic in this respect as the spouse's sickness absence can be viewed to be exogenous with respect to the earnings of the LINDA individual.

Moreover, sickness absence can also be regarded as a means of adjusting ones labour supply, for example in response to spousal sickness absence. For a given level of ill health, individuals may be more inclined to seek sickness absence if the spouse is on sickness absence and requires more assistance at home. In this sense both the individuals and the spouses sickness absence can be seen as a response to one another's sickness absence.

The evidence in our sample also points in that direction, where the likelihood of being on sickness absence is higher for individuals whose spouses are on sickness absence. This could of course be due to assortative mating, or that couples are affected by each others physical or psychological illness.

To handle – or at least limit - the extent of "endogenity" in sickness absence we use the information on the starting and ending dates of each sick spell for both spouses. We limit the sample to the households where the sickness absence of the spouse can be considered exogenous or at least predetermined compared to that of the LINDA individual. We thus focus on the LINDA individuals who are not on sickness absence and on those who are on sickness absence simultaneously with their spouse, but whose sickness absence spell started after that of the spouse.[9] Spousal sickness absence is thus not a reaction of the sickness absence of the LINDA individual as it is predetermined compared to that of the LINDA individual. By not controlling for own sickness absence in our specification, own sickness absence is seen as a means of adjusting ones labour supply.

[9] By excluding the observations where the LINDA individual's sickness absence starts prior to that of the spouse's sickness absence spell, our sample size decreases by a total of 7259 observations and 499 individuals for the men , and 13002 observations and 999 individuals for women. The overall results point in the same direction but are stronger and more significant when including these observations.

6 Results

6.1 Initial results – the population as a whole

Table 3 presents fixed effect estimations of equation (1) for men and women respectively. The dependent variable is the log of annual earnings. Random effects specifications are typically rejected by the Hausman test, in favour of fixed effects. The coefficients relating to spousal sickness absence are larger in magnitude in the random effects specification compared to the fixed effects specification, suggesting that time invariant household specific effects captured by the fixed effects are important to control for.

For reason of clarity of exposition, the coefficients of the control variables are suppressed in Table 3. [10] The control variables generally have the expected signs, and are for the most part significant at least at the 10 percent level. Earnings increase with age. Both men's and women's labour supply is affected negatively if they have children aged under 6. Female labour supply decreases with the number of children under the age of 18 living in the household, whereas men's labour supply increase or remain unaffected. Although not always significant, the migration dummy is for the most part positive, suggesting higher earnings the year after migration. The coefficients of the control variables as well as their significance level are unaffected even if we limit our sample to LINDA individuals who are not on sick leave.

[10] The full estimation of equation (1) is presented in Appendix A

Table 3: Fixed effects estimation. Dependent variable: log earnings

	Women	Men
Spousal sickness absence		
In period t		
< 3 months	-0.008	-0.002
	(0.005)	(0.003)
3-6 months	-0.024**	-0.001
	(0.009)	(0.005)
6-12 months	-0.035**	-0.017*
	(0.011)	(0.007)
In period t-1		
< 3 months	0.004	-0.017**
	(0.010)	(0.005)
3-6 months	-0.022	-0.017*
	(0.014)	(0.008)
6-12 months	-0.021	-0.018*
	(0.015)	(0.008)
Spousal disability pension		
In period t	-0.032*	-0.014+
	(0.015)	(0.008)
In period t-1	-0.007	-0.007
	(0.019)	(0.009)
Spousal unemployment		
In period t		
< 3 months	-0.010	-0.000
	(0.007)	(0.005)
3-6 months	0.004	-0.007
	(0.011)	(0.008)
6-12 months	-0.017	-0.011
	(0.015)	(0.011)
In period t-1		
< 3 months	-0.005	-0.010*
	(0.007)	(0.004)
3-6 months	0.000	-0.021**
	(0.010)	(0.006)
6-12 months	-0.014	0.007
	(0.012)	(0.008)
Observations	111312	118454
# households	29125	29881
R-squared	0.14	0.08

Note: Standard errors in parentheses;+ significant at 10 percent;* significant at 5 percent; **significant at 1 percent. Control variables are suppressed.

Irrespective of gender, the current year's SSA has a negative effect on the healthy spouse's labour supply. Compared to individuals whose spouses are not on sick leave, men affected by SSA decrease their labour supply by 1.7 percent in response to SSA of more than 6 months. Women decrease their labour supply by 3.5 percent in reaction to SSA exceeding 6 months, and by around 2.4 percent in reaction to SSA of 3-6 months. Women whose spouse is on disability pension decrease their labour supply by 3.2 percent, whereas the corresponding effect for men is 1.4 percent but the latter is significant only at the 10% level.

Even though our analysis is based on yearly earnings and yearly sickness absence information, there is reason to believe that it may take time to increase or decrease labour supply due to a certain rigidity on the labour market, or simply due to the fact that it may take time until the individual makes the decision to alter his or her labour supply. When controlling for spousal variables of the previous year the effects on current SSA remain stable. Men decrease their labour supply by approximately 1.7 percent in response to the

previous year's SSA, irrespective of the length of SSA, whereas women remain unaffected by the previous year's SSA.

As mentioned earlier, spousal unemployment (SU) is entered in the regression as a control and as a means of comparing the magnitude of the labour supply response to SSA to that of SU.[11] The coefficients on spousal unemployment (SU) are not significant for women, both on current and previous year's spousal unemployment. Men, however, react negatively to spousal unemployment in the previous year in about the same magnitude as SSA.

6.2 Income loss

The literature on the Added Worker Effect suggests that the income loss incurred by the household in connection with sickness absence is one reason for the spouse to adjust his/her labour supply. Individuals are compensated by 80% of their income up to a ceiling. However, in addition to the compulsory national sickness insurance, most Swedish workers are covered by negotiated sickness insurance programs regulated in agreements between the labour union and the employer confederations, in general these insurances replace about 10 % of forgone earnings. Since we do not have the means of knowing which insurance is assigned to each individual in the sample and thus do not know the exact income loss incurred by the sick spouse, we try to shed light on the income effect by running separate regressions on different income level groups based on own and spousal earnings level.

6.2.1 Does the effect of SSA vary across spousal income groups?

Table 4 presents the estimations of equation (1) across income groups. We divide the sample in three income groups which we refer to as low middle and high income groups, based on the spouse's median income level during the period studied. The low income group refers to yearly labour earning of less than 170 000 SEK in 1999 year price level, and the high income group refer to yearly labour earnings exceeding the ceiling in the sickness benefit system, amounting to 7.5 times the Swedish base amount. High income earners are bound by the compensation ceiling and bear a relatively larger income loss when on sickness absence compared to those who are not bound by the compensation ceiling.

In line with the AWE literature, we would expect individuals whose spouses are high income earners to increase their labour supply more than those whose spouse is not bound by the benefit ceiling.

On the other hand, we do not have any information of the extent of sickness of the sick spouse – how much he or she can contribute to household work or is in need of nursing assistance at home. Johansson and Palme (1996) find empirical evidence of a negative effect on work absence of the direct cost of being absent. The income loss of low income earners is relatively low compared to that of high income earners given that high income individuals are bounded by

[11] Own unemployment is not controlled for here, given that it could be a means of adjusting ones labour supply in response to SSA. When controlling for own unemployment the coefficients on SU typically drop in magnitude or turn insignificant.

the income insurance ceiling. This would suggest that for a given level of ill health, high income earners are more inclined to abstain from sickness absence. Thus, from a strict loss of income point of view high income earners who are on sickness absence may be more likely to be in need of nursing assistance at home than low income earners who are on sickness absence.

Table 4: Fixed effects estimation, by spousal income groups Dependent variable: log earnings

	Women			Men		
	Spouse low income	Spouse middle income	Spouse high income	Spouse low income	Spouse middle income	Spouse high income
Spousal sickness absence						
In period t						
< 3 months	-0.020	-0.007	0.000	-0.002	-0.003	0.000
	(0.014)	(0.007)	(0.011)	(0.004)	(0.005)	(0.014)
3-6 months	-0.018	-0.017	-0.071**	0.000	-0.000	-0.031
	(0.020)	(0.012)	(0.022)	(0.007)	(0.009)	(0.030)
6-12 months	-0.007	-0.051**	-0.066*	-0.011	-0.018	-0.092*
	(0.022)	(0.016)	(0.031)	(0.008)	(0.012)	(0.039)
In period t-1						
< 3 months	-0.002	0.001	0.013	-0.019**	-0.013	-0.033
	(0.023)	(0.013)	(0.025)	(0.007)	(0.009)	(0.029)
3-6 months	-0.029	-0.000	-0.089*	-0.024**	-0.004	0.039
	(0.026)	(0.020)	(0.038)	(0.009)	(0.014)	(0.052)
6-12 months	-0.003	-0.036	-0.038	-0.009	-0.036*	0.009
	(0.026)	(0.022)	(0.046)	(0.010)	(0.017)	(0.055)
Spousal disability pension						
In period t	-0.024	-0.072*	0.019	-0.009	-0.043+	0.057
	(0.021)	(0.033)	(0.054)	(0.008)	(0.022)	(0.120)
In period t-1	-0.009	0.009	0.018	-0.005	-0.016	-0.242
	(0.023)	(0.049)	(0.090)	(0.010)	(0.028)	(0.177)
Observations	10076	53815	46634	52745	52866	10984
# households	3357	14499	11599	14234	12228	2526
R-squared	0.11	0.14	0.15	0.08	0.08	0.08

Note: Standard errors in parentheses;+ significant at 10 percent;* significant at 5 percent; **significant at 1 percent.

Table 4 presents the estimation results by spousal income levels for women and men separately. For men, only those whose spouses are high income earners react to current year's SSA, whereas those married to low and middle income spouses react to last year's SSA.

Women whose spouses are high income earners react to both shorter and longer term SSA spells the current year as well as middle term SSA the previous year, whereas women whose spouses are middle income earners react only to long term SSA the current year. Women married to low income earners however do not respond to SSA. The response in the latter category is likely to be driven by liquidity constraints as men are typically the main bread winners in a household.

Irrespective of gender, the magnitude of the response to SSA increases with spousal income level. Low income households may not have the financial security to decrease labour supply in response to spousal sickness spell, whereas higher income households potentially have a larger possibility to do so or decrease consumption. Moreover, individuals whose spouses are high income earners may be more eager to invest in the quick recovery of the ill spouse so as to limit the income loss brought about by the sickness absence spell. Furthermore, given that high income individuals with incomes exceeding the compensation ceiling suffer a larger financial loss from sickness absence this could indicate, as discussed above, that they are on average more sick and thus in more need of nursing assistance from their spouses – than their lower income counterparts.

6.2.2 Does the effect of SSA vary across own income groups?

The results based on own income groups are presented in Table 5. Irrespective of gender, middle and high income individuals respond to current long term SSA by decreasing their labour supply. The magnitude of the effect is 3.4 % and 8% for middle and high income women respectively and 1.9% and 2.7% for men. The estimation results in Table 6 also point out that women only respond to current year's SSA, whereas low and high income men respond to last year's SSA as well.

The fact that the labour supply response increases with own income level can be attributed to the reasons mentioned above. Low income individuals are financially constrained and do not have the possibility to decrease their labour supply. Moreover assortative mating leads to low income individuals marrying each other, which further strengthens this effect. In fact, when further dividing the sample in terms of both own and spousal income level (estimation results not presented), we actually find evidence of an increase in labour supply in response to SSA for men, in households where both spouses are low income earners, in line with the AWE.[12]

[12] The effect is not significant for women. However it is to be noted that the sample size is small and the estimates need to be interpreted with caution.

Table 5: Fixed effects estimation for women and men, by own income groups. Dependent variable: log earnings

	Women			Men		
	low income	middle income	high income	low income	middle income	high income
Spousal sickness absence						
In period t						
< 3 months	-0.007	-0.008	0.001	0.026	-0.006	-0.004
	(0.010)	(0.006)	(0.016)	(0.023)	(0.004)	(0.004)
3-6 months	-0.032+	-0.018+	0.009	0.013	-0.007	0.000
	(0.016)	(0.011)	(0.030)	(0.037)	(0.006)	(0.007)
6-12 months	-0.021	-0.034**	-0.080*	0.047	-0.019*	-0.027**
	(0.022)	(0.013)	(0.035)	(0.045)	(0.008)	(0.010)
In period t-1						
< 3 months	-0.016	0.016	-0.017	-0.077*	-0.010	-0.015+
	(0.018)	(0.012)	(0.033)	(0.039)	(0.006)	(0.007)
3-6 months	-0.027	-0.016	-0.062	-0.034	-0.008	-0.028**
	(0.025)	(0.017)	(0.049)	(0.051)	(0.009)	(0.011)
6-12 months	-0.019	-0.016	-0.021	-0.044	-0.013	-0.021+
	(0.029)	(0.017)	(0.051)	(0.057)	(0.010)	(0.012)
Spousal disability pension						
In period t	-0.033	-0.035*	-0.013	-0.062	-0.010	-0.009
	(0.028)	(0.017)	(0.051)	(0.053)	(0.009)	(0.011)
In period t-1	-0.001	-0.014	0.003	-0.075	-0.004	0.001
	(0.033)	(0.021)	(0.060)	(0.067)	(0.010)	(0.013)
Observations	47928	51856	10878	9591	57967	50696
# households	14114	12323	2515	3466	15166	11999
R-squared	0.13	0.16	0.24	0.07	0.08	0.10

Note: Standard errors in parentheses;+ significant at 10 percent;* significant at 5 percent; **significant at 1 percent.

6.3 What could explain gender differences?

Up to now, our main results are that if individuals respond to SSA, they do so by decreasing they labour supply. There is however a difference in gender in several respects. Women's response to SSA is stronger than that of men, and they respond more often to current year's SSA whereas men more often show a lag in the response to SSA. We have also found some evidence that women react to shorter term SSA as well as longer term SSA spells, whereas men mostly react to longer term SSA.

These differences in gender are interesting given that the same labour market rules and rights apply to men and women. However men and women differ from each other in several respects regarding labour market characteristics. Sector affiliation, difference in education level and the traditional unequal division of household work going hand in hand with one spouse being the main income earners in the family are some aspects which have shown to differ across gender.

6.3.1 Share of household earnings.

Even though Sweden has one of the highest female participation rates in the world, men remain for the most part the main income earners in the household. We divide the sample in two groups referring to households where the spouse contributes more or less than 50 percent of household income respectively so as to assess whether share of household earnings lies behind gender differences in labour supply response.[13]

As shown in column 2 and 4 of Table 6, main income earners in the household have the same response to SSA irrespective of gender. They decrease their labour supply in response to long term current SSA, as well as last year's SSA. Women have however a stronger response than men, although not always significantly stronger.

The similar response to SSA across gender could depend on the fact that the sick spouse is not the main income earner meaning that the financial loss incurred by the household is relatively smaller – limiting the need to offset this income loss by increasing one's labour supply compared to if the sick spouse was the main income earner. Furthermore, if share of household earnings is an inverse proxy for time spent on household work, the healthy spouse may need to spend relatively more time at home taking care of the tasks usually accounted for by the sick spouse.

[13] There are alternative ways of defining these two groups. We choose to divide the households based on the spouse's average share of household income during the period studied. This approach could lead to a selection bias, but has the advantage of retaining a longer time series dimension within the groups. Alternatively dividing the sample based on the share of income in year t-1 would enable a more dynamic specification. This would have a few drawbacks though since one would loose a time series observation for the households who fluctuate between the two groups. Basing the division on one specific year might also give biased results, since that year might not be representative due to unemployment, sickness absence etc. The choice of how to define the groups doesn't however qualitatively change the results.

Table 6: Fixed effects estimation. Dependent variable: log earnings

	Women		Men	
	spousal share of household earnings >50 %	spousal share of household earnings <=50 %	spousal share of household earnings >50 %	spousal share of household earnings <=50 %
Spousal sickness absence				
In period t				
< 3 months	-0.011	0.000	-0.007	-0.001
	(0.007)	(0.007)	(0.014)	(0.003)
3-6 months	-0.029*	-0.012	-0.026	0.002
	(0.012)	(0.010)	(0.031)	(0.005)
6-12 months	-0.040*	-0.020+	-0.024	-0.015**
	(0.017)	(0.011)	(0.045)	(0.006)
In period t-1				
< 3 months	0.009	-0.003	-0.052+	-0.013**
	(0.013)	(0.012)	(0.028)	(0.005)
3-6 months	-0.008	-0.037*	-0.004	-0.016*
	(0.020)	(0.015)	(0.049)	(0.007)
6-12 months	0.000	-0.032*	-0.015	-0.017*
	(0.025)	(0.014)	(0.062)	(0.007)
Spousal disability pension				
In period t	-0.030	-0.016	-0.024	-0.010
	(0.029)	(0.013)	(0.076)	(0.007)
In period t-1	0.005	0.002	0.018	-0.005
	(0.037)	(0.015)	(0.095)	(0.008)
Observations	91964	19348	18597	99857
# households	23886	5239	5243	24638
R-squared	0.14	0.18	0.05	0.10

Note: Standard errors in parentheses;+ significant at 10 percent;* significant at 5 percent; **significant at 1 percent.

Labour supply response to SSA differs across gender, however, if the sick spouse is the main income earner in the household. Men do not react to their spouse's sickness absence whereas women react to middle and long term SSA spells the current year, as shown in column 1 and 3 of Table 6. The income loss incurred by the household is relatively larger when the sick spouse is the main income earner. Despite this, women still decrease their labour supply in response to SSA, whereas men do not respond to SSA. The result for men is partly in line with the expected outcome, i.e. that since the sick spouse is the main income earner, one would expect the Added Worker Effect would kick in, or at least partly offset any negative effect.

The fact that women decrease their labour supply could mean that they are more dedicated to home production and care-giving compared to men. (After all, the magnitude of women's response to SSA is stronger than that of men.) However decreasing ones labour supply to attend to the needs of the sick spouse can also be a way of contributing to a faster recovery of the sick spouse. In a sense it is then reasonable that women react faster – to current years SSA - if the spouse is the main income earner, so as to limit the length of the sickness spell.

6.3.2 Children.

Given that children entail more household work, one would expect the labour supply response to SSA to differ between households with and without children. On the one hand, if the spouse is on sickness absence and is not able to help out with household work one would expect the unaffected spouse to spend more time at home taking care of household work, and expect the effect to be stronger if there are children living at home. Households with children may, on the other hand, be more financially constrained and not able to decrease labour supply in the event of a negative health chock in the household. Furthermore, if the sick spouse is the one who initially has the main responsibility for household work (which is generally the case for women) one would expect the healthy spouse to decrease his labour supply by more than would otherwise have been the case.

As shown in Table 7, the overall results suggest that labour supply response to SSA is larger among households without children. Among women, there is a negative response in labour supply to SSA only in households without children, whereas households with children do not react to SSA. Among men there is no reaction to current year's SSA in either type of households, and a slightly stronger decrease in labour supply in reaction to last year's SSA in households without children.

The fact that households with children either do not react to SSA or decrease their labour supply by less than households without children, suggests that households with children are likely to be financially constrained given that they can not decrease consumption as easily as households without children. This could also explain the finding that households with children do not decrease their labour supply in response to current year's SSA irrespective of whether we look at men or women's behaviour.

If women are the main care-takers in the household and to a larger extent than men work part time, men need to increase the time they spend at home – so as to take care of the children if their spouse turns ill – whereas women do not need to increase time spent at home as much if their spouse turns sick. This may explain the fact that men decrease their labour supply in response to SSA, whereas women do not alter their labour supply.

Table 7: Fixed effects estimation, by type of household. Dependent variable: log earnings

	Women			Men		
	No Children	Children under 6	Children under 18	No Children	Children under 6	Children under 18
Spousal sickness absence						
In period t						
< 3 months	-0.011+	0.004	-0.004	-0.004	0.002	-0.002
	(0.006)	(0.023)	(0.008)	(0.005)	(0.008)	(0.004)
3-6 months	-0.021*	-0.053	-0.024+	-0.002	0.024	0.001
	(0.010)	(0.045)	(0.014)	(0.008)	(0.015)	(0.007)
6-12 months	-0.051**	0.075	-0.014	-0.018+	-0.007	-0.008
	(0.012)	(0.058)	(0.017)	(0.010)	(0.023)	(0.009)
In period t-1						
< 3 months	0.005	0.034	-0.003	-0.011	-0.048**	-0.021**
	(0.011)	(0.043)	(0.014)	(0.008)	(0.015)	(0.007)
3-6 months	-0.009	-0.045	-0.023	-0.024*	0.016	-0.004
	(0.015)	(0.076)	(0.022)	(0.011)	(0.028)	(0.011)
6-12 months	-0.010	0.002	-0.019	-0.026*	-0.032	-0.005
	(0.016)	(0.074)	(0.023)	(0.013)	(0.031)	(0.012)
Spousal disability pension						
In period t	-0.022	-0.063	-0.025	0.001	-0.045	-0.016
	(0.014)	(0.108)	(0.026)	(0.010)	(0.044)	(0.012)
In period t-1	-0.007	-0.031	0.010	-0.005	-0.054	-0.009
	(0.018)	(0.122)	(0.030)	(0.012)	(0.048)	(0.014)
Observations	36860	23731	74452	40335	25289	78119
# households	11181	9629	20979	11823	9941	21358
R-squared	0.08	0.25	0.16	0.03	0.12	0.11

Note: Standard errors in parentheses;+ significant at 10 percent;* significant at 5 percent; **significant at 1 percent.

6.3.3 Sector of employment.

Since the sector of employment typically differs across gender it is of interest to look at the various sector of employment separately so as to see to what an extent the differences in response across gender can be attributed to sector affiliation. Men are to a large extent employed within the private sector, whereas women are typically employed in the municipal or private sector. (See Table 2, descriptive statistics)

As presented in Table 8 both men and women employed in the municipality sector react to middle and longer term SSA. Private sector employees do not respond to current year's SSA but react to last year's SSA, irrespective of gender. Women employed in the government sector respond to last year's SSA whereas men in this sector do not respond.

The overall results are fairly similar across gender within sector of employment, which suggests that the sector of employment explains part of the gender differences in labour supply response to SSA. It is however not clear what the driving force behind these different labour supply responses is. One could argue that there is a selection bias in the sectors of employment, where people who have chosen occupations within the care sector, also choose to spend more time at home caring for a sick spouse.

6.3.4 Education level.

Looking at various education groups separately enables us to investigate whether the difference in SSA response across gender is driven by differences in education levels. Even though men and women on average have a similar level of education, women in the labour force have a slightly higher education level than men.[14]

The results in Table 9 suggest that high educated individuals is the only group whose response to current year's SSA is significant at the 5% level. The magnitude of the effect remains stronger among women. High educated men and women respond to current year's long term SSA by decreasing labour supply by 3% and 7% respectively. Regarding the response to last year's SSA, it is high educated women as well as middle and high educated men who decrease their labour supply.

The difference in labour supply response to SSA across education groups is partly in line with our previous results that high income individuals respond more strongly to SSA, which is to be expected as higher education is often correlated with higher income. Especially for women, however, education level seems to play a clearer role compared to income level in determining the response to SSA. Recall that middle and high income earning women responded to SSA, whereas only high educated women respond to SSA. This could be explained by the fact that women tend to work part-time or that women's lower earnings can be partly attributed to the fact that they are more likely to be over-educated and thus underpaid compared to men who are more likely to be under-educated for the employment they have.[15]

The initial results suggested that, even though both men and women decrease their labour supply in response to SSA, certain differences arise across gender. The fact that women react stronger than men does not seem to be attributed to any of the above studied characteristics, which typically differ across gender, suggesting that women are more care-giving than men and more prone to decrease their market activity so as to provide care for a sick spouse. However, the findings that women typically react to current year's SSA whereas men react mostly to the previous year's SSA, and that women react to shorter and longer term SSA, whereas men respond to longer term SSA can partly be attributed to sector affiliation, education level and to whether or not the sick spouse is the main income earner in the household.

[14] See Table 2, descriptive statistics as well as Välfärdsbokslutet SOU 2001:53 p150
[15] See Johansson & Katz (2006) and Oscarsson & Grannas (2001)

Table 8: Fixed effects estimation, by employment sector. Dependent variable: log earnings

	Women			Men		
	Priv	Gov	Muni	Priv	Gov	Muni
Spousal sickness absence						
In period t						
< 3 months	-0.005	-0.012	-0.007	-0.003	-0.006	-0.006
	(0.010)	(0.018)	(0.007)	(0.004)	(0.008)	(0.007)
3-6 months	-0.018	-0.049	-0.027*	-0.000	-0.004	-0.014
	(0.018)	(0.032)	(0.013)	(0.007)	(0.013)	(0.011)
6-12 months	-0.022	0.007	-0.041**	-0.007	-0.033+	-0.040**
	(0.022)	(0.044)	(0.016)	(0.009)	(0.017)	(0.015)
In period t-1						
< 3 months	0.004	-0.013	0.014	-0.007	-0.025+	-0.046**
	(0.019)	(0.035)	(0.014)	(0.007)	(0.013)	(0.012)
3-6 months	-0.060*	-0.131*	0.001	-0.022*	-0.030	0.000
	(0.027)	(0.058)	(0.020)	(0.010)	(0.019)	(0.017)
6-12 months	0.001	-0.034	-0.039+	-0.032**	-0.006	-0.019
	(0.030)	(0.057)	(0.022)	(0.011)	(0.022)	(0.019)
Spousal disability pension						
In period t	-0.011	-0.065	-0.019	-0.016	-0.008	-0.011
	(0.030)	(0.049)	(0.021)	(0.010)	(0.018)	(0.017)
In period t-1	-0.026	-0.081	0.011	-0.003	-0.038+	-0.048*
	(0.036)	(0.058)	(0.026)	(0.012)	(0.020)	(0.020)
Observations	48655	12019	50464	79334	17544	21209
# households	21676	5658	17593	25899	8330	10779
R-squared	0.13	0.12	0.14	0.08	0.07	0.14

Note: Standard errors in parentheses;+ significant at 10 percent;* significant at 5 percent; **significant at 1 percent.

Table 9: Fixed effects estimation, by education levels. Dependent variable: log earnings

	Women			Men		
	Low edu	Middle edu	High edu	low edu	Middle edu	High edu
Spousal sickness absence						
In period t						
< 3 months	-0.006	-0.008	-0.007	-0.007	0.001	-0.003
	(0.011)	(0.007)	(0.010)	(0.006)	(0.004)	(0.006)
3-6 months	-0.017	-0.021+	-0.032+	0.020+	-0.008	-0.002
	(0.019)	(0.012)	(0.018)	(0.010)	(0.007)	(0.010)
6-12 months	0.002	-0.023	-0.070**	-0.022+	-0.001	-0.031*
	(0.025)	(0.015)	(0.022)	(0.012)	(0.010)	(0.013)
In period t-1						
< 3 months	0.017	0.008	-0.008	-0.003	-0.017*	-0.028**
	(0.021)	(0.013)	(0.020)	(0.010)	(0.008)	(0.010)
3-6 months	-0.003	-0.031+	-0.009	-0.002	-0.041**	0.009
	(0.032)	(0.018)	(0.029)	(0.015)	(0.011)	(0.014)
6-12 months	-0.002	0.003	-0.072*	-0.022	-0.024*	-0.005
	(0.034)	(0.020)	(0.029)	(0.016)	(0.012)	(0.016)
Spousal disability pension						
In period t	-0.063*	-0.012	-0.035	-0.006	-0.010	-0.015
	(0.030)	(0.020)	(0.031)	(0.013)	(0.011)	(0.016)
In period t-1	-0.036	0.008	-0.011	0.013	-0.013	-0.011
	(0.039)	(0.024)	(0.038)	(0.016)	(0.013)	(0.019)
Observations	13134	54857	43080	22176	55331	40584
# households	3588	14348	11017	5650	14138	9880
R-squared	0.10	0.12	0.18	0.06	0.07	0.10

Note: Standard errors in parentheses;+ significant at 10 percent;* significant at 5 percent; **significant at 1 percent.

6.4 Sensitivity analysis

In this study we have focused on spousal sickness absence exceeding 28 days. Although this lower level constraint is due to limitations in the data we argue that shorter term sickness absence can be viewed as transitory with a limited impact on earnings loss and is less likely to affect longer run implications on the labour supply behaviour of the healthy spouse. However to the extent that the sickness absence spell is unexpected, the first days of the spell is likely to result in a decrease in the labour supply for the healthy spouse who needs to take care of additional household work, especially in the presence of young children. Including the first days of sickness absence should thus further strengthen the negative effects we find, unless the initial decrease in labour supply is later compensated by an increase in labour supply, in which case the overall effect would be unaffected. For the period 1999-2002 including SSA of exceeding 14 days (instead of 28 days) has shown not to alter the results qualitatively. The effects on SSA of less than 3 months remain significant and of the same magnitude as earlier.

We chose to include individuals whose spouses where on disability pension, since a majority of those on sickness absence exceeding one year have transferred to disability pension schemes. The coefficient estimate of spousal disability pension has shown to be negative when significant. Excluding the individuals whose spouses are on disability pension, has shown not to have any effect on the parameter estimates of SSA.

We have limited the sample to individuals and their spouses who have a yearly labour income of 30 000 SEK. The parameter estimates on SSA are typically not affected if these low income individuals are included, the main difference is that the R-square is significantly reduced. Including these low income individuals entails having a larger share of individuals on disability pension. The only difference here is that the effect of spousal disability pension appears significant more often, though still negative and of a smaller magnitude than SSA effects.

We also chose to include individuals who have unemployment spells during this period. It could be argued that part of the variation in earnings that these individuals incur could depend on transition from or to unemployment. However, excluding these individuals has not affected the results.

6.4.1 Contracted hours

In order to investigate whether our results hold for alternative measures of labour supply we estimate equation (1) using log of contracted hours as the dependent variable. The main differences compared to using yearly earnings as a proxy for labour supply is that contracted hours is not representative for the whole population since private sector employees, especially small firm employees are under-represented. Furthermore the information on contracted hours is based on survey information based on a month of measurement and is not necessarily representative for the whole year. (see footnote 3) Moreover, the individual's own sickness absence considerations do not affect contracted hours as an individual who is employed full time, is still considered to be a full time employee even if he/she is on full time sickness absence.

Our measure on contracted hours is available for employed individuals, and as previously mentioned, a large majority are full time employed, especially in the case of men. To account for the bunching of observations at 100, we estimate equation (1) as Tobits. Since Tobit estimations cannot be estimated using fixed effects we estimate using random effects, and include a set of time invariant individual specific variables. These additional variables are education level (the highest level of education achieved by the individual during this period) and sector of employment (government, private or municipality). Including county of residence does not affect the results.

The estimation results from contracted hours are presented in Table 10. Given that the coefficient estimates for current year SSA change when including previous year's SSA we present both estimation results with and without previous year's SSA.

Table 10: Tobit random effects estimation. Dependent variable: contracted hours, in % share of full time

	Women		Men	
Spousal sickness absence				
In period t				
< 3 months	0.010	0.002	-0.024	0.009
	(0.021)	(0.009)	(0.028)	(0.044)
3-6 months	**-0.070***	**-0.029+**	-0.025	-0.066
	(0.028)	(0.016)	(0.046)	(0.073)
6-12 months	-0.049	0.025	**-0.120***	-0.036
	(0.032)	(0.021)	(0.056)	(0.095)
In period t-1				
< 3 months		-0.008		-0.078
		(0.018)		(0.075)
3-6 months		-0.036		0.093
		(0.024)		(0.116)
6-12 months		-0.040		-0.053
		(0.027)		(0.118)
Spousal disability pension				
In period t	**-0.055+**	0.014	**-0.097***	-0.016
	(0.029)	(0.026)	(0.049)	(0.106)
In period t-1		0.005		-0.038
		(0.031)		(0.110)
Observations	19447	86177	80017	76410
# households	5403	26020	23416	25045

Note: Standard errors in parentheses;+ significant at 10 percent;* significant at 5 percent; **significant at 1 percent.

In line with earlier results based on annual earnings, we see that the overall negative labour supply response of SSA based on annual earnings can be found on estimation using contracted hours as well. This finding is interesting given that contracted hours have a limited variation over time and naturally do not include unexpected temporary over-time work, and are pre-set as opposed to actual working hours.

When only looking at current year's SSA, in column 1 and 3 in Table 10 we wee that men react stronger than women to SSA, by decreasing their labour supply by 12% in response to long term SSA, whereas women decrease their labour supply by 7% in response to middle term current SSA. The same holds for disability pension, where men decrease their labour supply by 9.7% whereas women decrease their labour supply by 5.5%, although the latter is significant only at the 10% level. The fact that men react stronger than women is to be expected in a sense, given that men are to a larger extent full time employed and have a larger scope of decreasing their labour supply compared to women.

When including previous year's SSA, as seen in column 2 and 3, the effect of SSA on men's labour supply disappears, whereas at the 10 percent significance level there is still evidence that women decrease their contracted hours, by 2.9 percent, in response to current year's middle term SSA. The fact that the significance of the effects disappears when including previous years SSA is

however surprising. Contracted hours are likely to be set prior to any new (current) information of spousal ill health and could be expected to vary based on information on the preceding year rather than the current year.

7 Concluding discussion

The evidence in this paper indicates that both men and women decrease both their yearly earnings and their contracted hours in response to spousal sickness absence, suggesting that individuals actually decrease their labour supply.

In an international comparison this robust negative result is not surprising. Any positive AWE would be expected to be mitigated by the presence of the generous sick leave compensation scheme which provides a state-contingent income stream. This might be the main reason why we get strong negative results compared to the studies in the US context.[16] The magnitude of the response increases with the earnings level of the individual and that of the spouse. This indicates that the income loss per se following sickness absence is not the driving factor behind how the individual responds to SSA. The fact that the response to spousal sickness absence is stronger than that of spousal unemployment further points out that other mechanisms than the Added Worker Effect are at work.

It is likely that the prevalence of sickness per se in the family is a determining factor in the choice to decrease labour supply so as to take care of the sick spouse. The finding that high income earners and those with high income earning spouses decrease their labour supply more in response to SSA than lower income groups supports the assumption that the extent of the income loss suffered by going on sick leave could be an indication of the gravity of the illness. Similarly, the length of sickness absence may also be an indication of the gravity of the illness, as our findings indicate that longer term spousal sickness absence usually leads to stronger labour supply responses. Individuals whose spouses are on disability pension - a continuation of long term sickness absence –seldom show a significant decrease in labour supply. This suggests that labour supply responses to sickness absence take place in earlier stages of the illness and not when the sickness absence has become permanent.

In the setting of a generous compensation framework, and depending on the extent of invalidity of the sick spouse, a decrease in labour supply on behalf of the healthy spouse could also be interpreted as being a joint decision of synchronizing time out of work and not just a means of spending more time with the sick spouse in order to give the sick spouse the needed extra assistance. However, to the extent that own sickness absence can be a means of adjusting ones labour supply, we have limited the labour supply decreases which can be attributed to joint leisure by disregarding sick spells which started during the sick spell of the spouse. When including these spells the decrease in labour supply in response to SSA is much stronger.

Even though the results indicate that both men and women decrease their labour supply in response to SSA, a certain difference emerges across gender. (i) Women react stronger than men, suggesting that women a more care-giving

[16] Similarly the different results compared to the US, could be due to the fact that Sweden has a lower proportion of low income earners.

than men and more prone to decrease their market activity so as to provide care for a sick spouse. Time out of work that the healthy spouse spends taking care of the sick spouse could also be regarded as an investment in the recovery process, contributing to a shortening of the sickness absence spell. (ii) They react more to current year's SSA whereas men react to last previous year's SSA. Assuming that individuals decrease their labour supply so as to contribute more to home production and take care of their sick spouse our results suggest that women decrease their labour supply while their spouse is on sickness absence, whereas men adjust their labour supply behaviour after the sick spell has ended. (iii) Women react to shorter term SSA whereas men react to longer term or previous year's SSA. These two later findings can partly be attributed to sector affiliation, education level and to whether or not the sick spouse is the main income earner in the household.

Our results suggest that the institutional context, with the generous sickness compensation schemes, seems to play a role in the response to SSA. The generous sickness absence compensation scheme enables the individual on sickness absence to get more assistance from the spouse, than would probably otherwise have been the case. Given that the income loss faced by a household in case of sickness absence is limited this enables the healthy spouse to decrease his/her labour supply in response to spousal ill health, resulting in a reduction of both spouses' market activity, and a double earnings loss for families. From a macroeconomic point of view this comes at a cost of a decrease in labour supply on behalf of part of the labour market which is not personally affected by the sickness. This poses the question of whether we are looking for a family solution. From the standpoint of society, this implies that a larger share of the insurance cost is held by fewer. However, if being cared for by the spouse is an investment in a faster recovery, a the decrease in labour supply in response to SSA might still be beneficial to society.

Getting more detailed information on the actual income loss incurred by the sick spouse by using information on collective agreements that each individual is entitled to, as well as retrieving information from shorter sickness absence spells of less than 14 days, could further enlighten how the sickness compensation level affects the individual's decision to respond to SSA. Furthermore, more information on the type of illness and rehabilitation process the sick spouses are facing would help limit the existing variation in actual disability level and need of nursing assistance which we now have across individuals on sickness absence in our sample. Thus further research needs to be based on more detailed surveys.

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Appendix

Table A1: Fixed effects estimation for equation 1 (entire estimation). Dependent variable: log earnings

	Women		Men	
		Std.err		Std.err
Age	0.044**	(0.001)	0.030**	(0.000)
# children under 18	-0.034**	(0.003)	0.010**	(0.002)
# children under 6	-0.134**	(0.003)	-0.031**	(0.002)
Migration_dummy	0.001	(0.006)	-0.000	(0.005)
Dyear97	0.000	(0.000)	0.000	(0.000)
Dyear98	-0.006*	(0.002)	0.006**	(0.002)
Dyear99	0.029+	(0.015)	0.024**	(0.008)
Dyear00	0.006	(0.019)	0.027**	(0.009)
Dyear01	-0.002	(0.003)	0.016**	(0.002)
Dyear02	0.000	(0.000)	0.000	(0.000)
Spousal sickness absence				
In period t				
< 3 months	-0.008	(0.005)	-0.002	(0.003)
3-6 months	-0.024**	(0.009)	-0.001	(0.005)
6-12 months	-0.035**	(0.011)	-0.017*	(0.007)
In period t-1				
< 3 months	0.004	(0.010)	-0.017**	(0.005)
3-6 months	-0.022	(0.014)	-0.017*	(0.008)
6-12 months	-0.021	(0.015)	-0.018*	(0.008)
Spousal disability pension				
In period t	-0.032*	(0.015)	-0.014+	(0.008)
In period t-1	-0.007	(0.019)	-0.007	(0.009)
Spousal unemployment				
In period t				
< 3 months	-0.010	(0.007)	-0.000	(0.005)
3-6 months	0.004	(0.011)	-0.007	(0.008)
6-12 months	-0.017	(0.015)	-0.011	(0.011)
In period t-1				
< 3 months	-0.005	(0.007)	-0.010*	(0.004)
3-6 months	0.000	(0.010)	-0.021**	(0.006)
6-12 months	-0.014	(0.012)	0.007	(0.008)
Constant	10.250**	(0.028)	11.129**	(0.023)
Observations	111312	29125	118454	
# households	29125		29881	
R-squared	0.14		0.08	

Note: Standard errors in parentheses;+ significant at 10 percent;* significant at 5 percent; **significant at 1 percent.

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