Gender Differences in Sickness Absence and Family Responsibility*

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***** Preliminary Version *****

Abstract

Swedish women are on average more absent from work for health reasons while simultaneously having lower mortality rates. This conflicting pattern suggests that part of the gender gap in health-related absenteeism stems from differences between genders not related to actual health. One possible explanation could be that women, because of relatively more risk-averse behavior, utilize absence from work as a preventative measure to a higher degree than men, which effectively prolongs their relative life expectancy. Another reason, put forward by Paringer (1983), is that, due to traditional gender norms, households optimize by having a lower health threshhold of work absence for the wife than for the husband. We test these hypotheses using detailed Swedish register data on sickness absence, in-hospital care and mortality. We find that men and women's preventive health behaviors differ as women on average have more sickness absence than men given health. However, these different health thresholds of work absence are not driven by increased health investments from home production responsibilities.

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1 Introduction

Both prevalence and incidence levels of sickness absence are higher for women than for men in most countries with sickness insurance (see e.g. Figure A.1). This observation is also in line with other observed gender differences on morbidity measures such as health care utilization and self reported health. At the same time, male mortality rates are in general higher than for women. The global average difference in life expectancy is four years (cf. Lee (2010)). This *morbidity-mortality* paradox is, by now, well known (see e.g. Nathanson (1975), Verbrugge (1982), Sindelar (1982) and Schappert and Nelson (1999)). One common explanation for these apparently conflicting observations are gender differences in health-related behaviors such as lifestyles, in particular that women in general act more preventative than men (see e.g. Stronegger, Freidl, and Rásky (1997), Uitenbroek, Kerekovska, and Festchieva (1996)).[1] These potential behavioral differences may be inherent biological or stem from different social or cultural norms, where the latter explanation to some extent is supported by the large variation in gender differences in life expectancy across countries. The difference is over 14 years in Russia, five years in northern Europe, three in Asia and in South Africa men outlive women with 1.5 years (see Figure A.2). If women devote more attention to potential future illnesses by e.g. utilizing medical services more frequently or having higher absence rates than men, poor health may be detected and remedied at an earlier stage of health deterioration, counteracting further health deterioration and, as an effect thereof, increase relative life expectancy.

[1] Both experimental and observational studies have found that women in general tend to be more risk averse (cf. surveys by Bertrand (2010), Croson and Gneezy (2009) and Eckel and Grossman (2008)).

The primary aim of this paper is to investigate whether and to what extent different behavior of men and women (with and without children) can explain the prevailing gender gap in sickness absence. In our empirical analysis we make use of detailed Swedish register data on sickness absence, in-hospital care and mortality. As both employed and unemployed workers in Sweden are covered by public health and disability insurance, we observe the total population in our data. We sample men and women with an occurrence of a hospital admission (a health shock) and compare the relative changes in sickness absence between the genders using a difference-in-differences (DD) design. The idea is simple; if women increase their sickness absence more after the health shock than men, this supports the idea of women are acting more precautious than men. If women, in addition, also have lower ex-post mortality rates (i.e. better objective health), then this behavior cannot be caused by poorer health among the women. We find that women increase their sickness absence more than men after the hospital admission. Moreover, ex-post mortality rates are lower for women than for men. Hence, these findings support the idea that differences in health related behavior of men and women in general can explain at least some of the variation in the observed gender differences in sickness absence.

One potential source for behavioral differences between the genders regarding work absence is that women by tradition have the main responsibility for the household's production, performing dual roles as producers both in the labor market and at home These dual responsibilities implies that womens' health is relatively more important for the household than the health of their (male) spouses (see Paringer (1983)). In particular, costs associated with an illness include foregone earnings, but in addition also a cost of lost domestic production when the woman is ill. The implication is that, for a given level of health, women with household responsibilities (e.g. children) will be more absent from work for health reasons than men. Equivalently, these women invest in their health by staying home from work at a earlier stage of health deterioration than men. In her empirical application, Paringer finds the opposite relation. However, since she cannot control for the health selection among married and unmarried women, her result does not necessarily refute the theory.

In order to test the household investment hypothesis we study the effect of a health change for women with and without households by estimating the relative change in sickness absence following the hospital admission for men and women with children (proxying for having a household) compared to without children in a DDD (difference-in-difference-in-differences) design. Further, as with the male-female analysis, we also investigate whether the difference in sickness absence is caused by poorer health among women with children. We find that women with children increase their ex-post sickness absence more than women without children. This provide some support for the theory of household investments. However, we also find that women with children have higher relative mortality rates. Thus, we cannot confirm the health investment hypothesis of Paringer.

A potential drawback with our empirical strategy is that men and women (with and without households) might be affected by different health shocks, which in turn vary in their effect on individual health, as it could be contingent on e.g. occupation and level of health prior to the hospital admission. However, as we have access to detailed data on occupation, income, industry sector and health measures including diagnosis codes according to the ICD-10[2] classification this enables us to control for observed differences in diagnoses and occupations and to perform extensive sensitivty analyses.

The paper is organized as follows; The next section describes some important aspects of the Swedish sickness insurance system and discusses how sickness absence is associated with health. Section 3 describes the data and the sample we use in the estimation, which is discussed in Section 4. Section 5 presents the results from the estimations and Section 6 concludes.

2 Sickness absence and health

This study utilize detailed Swedish register data on sickness absence, in-hospital care and mortality. All workers in Sweden, both employed and unemployed, are covered by public health and disability insurance. The replacement rates are — in an international comparison — high (around 80%) and the degree of monitoring is lax (see e.g. Engström and Johansson (2012) for a recent description of the institutions).[3] In this setting it is reasonable to assume that sickness absence is not only determined by objective health, but that it also leaves room for the individuals' own judgement of his or her health. On the other hand, as in-hospital care requires an overnight stay at a hospital it is likely to be a more objective health measure than sickness absence. Finally, mortality data may be considered as an objective health measure

[2]The abbreviation ICD-10 is short for "International Statistical Classification of Diseases, tenth Revision 2" and is the WHO's classification system for different disease diagnoses (WHO, 2004).

[3]The length of a sick-spells is, according to Arrelöv, Edlund, and Goine (2006), largely controlled by the insured's own motivation. Englund (2001) also finds that physicians often make decisions contrary to their own belief (such as the prescribing of too long sickness absence spells).

as it is a definite indicator of an individual's poor health.

If sickness absence serve to improve the health of the absentee (e.g. through recuperation) and good health is positively related to productivity, then sickness absence serve as an instrument for investing in health.[4] Moreover, if health is also an input in the household production function, health maintenance should be important for households whose domestic production consist of a non-neglible part of the total household production (both market and domestic). Paringer (1983) examines whether the gender gap in sickness absence observed in the United States is driven by economic factors. She argues that a woman's traditional dual roles as producers both in the labor market and at home cause her health to be more important for the household than the health of her (male) spouse as a household engaging in both market and domestic production would suffer more than just foregone earnings if a member performing household production suffer from poor health. Consequently, the observed higher sickness absence rates of women could be an optimal response from households with large shares of domestic production. Moreover, as employees normally receive sick pay to cover the lost income while sick, lost household production is in general not possible to insure against. Finally, incentives to shirk when performing domestic production is non-existent.[5]

The discussion in the last paragraph suggests that the importance of health maintenance will differ across household members whose time allocations of domestic and market production are differently distributed. This will create a wedge in the health

[4]See e.g. Grossman (1972) for a theoretical model on the demand for health (investments).

[5]In principle, one could compare the situation of a household member performing domestic production to the situation of a self-employed firm-owner.

thresholds of work absence between members that engage primarily in domestic production and members primarily devoted to market work. Consequently, as women by tradition perform most of the domestic production in the household, we would expect more sickness absence among women with larger shares of domestic production.

3 Data

Our empirical analysis exploits micro data originating from administrative registers. The data, collected and maintained by Statistics Sweden, covers the entire Swedish population age 16–65 during the period 1987–2000, and individuals aged 16–74 during 2001-2010. It contains annual information on a wide range of educational and demographic characteristics as well as different income sources.

Information on hospital admissions was provided by the National Board of Health and Welfare and covers all inpatient medical contacts at public hospitals from 1987 through 1996. This is no major restriction since virtually all medical care in Sweden at that time was performed by public agents. From 1997 and onwards the register also includes privately operated health care. In order for an individual to be registered with an health impairment (s)he must have been admitted to a hospital. As a general rule, this means that he has to spend the night at the hospital. However, starting in 2002 the registers also cover outpatient medical contacts in the specialized care.

An important feature of the data is that it contains the exact cause for each admission and death. The diagnoses, made by physicians, are classified according to the World Health Organization's International Statistical Classification of Diseases and Related Health Problems (ICD). ICD is a four digit coding of diseases and signs, symptoms, abnormal findings, complaints, and external causes of injury or diseases. In our analysis we focus primarily on four common groups of diseases: ischaemic heart diseases, musculoskeletal diseases, cancer and mental health problems.

We sample 40 percent of all prime-aged men and women in the age range of 20-50 years, active in the labor market during 1992[6] who were observed to have an in-hospital care record at some point during the observation period, and follow them until 2004 or until they are marked as deceased in the data. We maintain the activity restriction for all years prior to — but relaxe it after — the hospital admission to avoid potential sample selection.[7]

One problem with our sampling procedure concern the definition of households, i.e. children. Since most individuals sooner or later have children, we study men and women who were between 40-45 years of age at the time of the hospitalization and define men and women having at least one child as having a household.[8] The advantage of this restriction is that few people change family status after the hospitalization (from not having a family to have a family). Individuals changing family status would be a problem in the household analysis because we would indirectly estimate the impact of people having small children while our study population is

[6] By "active" we mean individuals who are classified as employed in the tax registration files. Individuals are classified as employed in these data if they had employment earnings in November month of the current year.

[7] For example, one possible outcome of the health change may be e.g. disability and we do not want to systematically exclude people with more serious afflictions.

[8] We can observe individuals from 1990 and the data include variables for the number of children present in the household from 0-20+ years of age. Hence, we register any changes in family status over time and compute the total number of children for each individual.

the whole population of working age.[9] The disadvantage of restricting the sample in this way is naturally that the conclusions we can draw is limited to the specific population under study.

With these restrictions, our final sample consists of roughly 63,000 employed men and women with at least one hospital admission within the age span of 40-45 years. To get a grasp on how much the restrictions limit the inferences we can draw from the total population of working individuals, we construct a representative sample of active individuals having the same age distribution — but without a hospital admission record — during the observed period.[10]

Table A.2 and Figures A.3–A.5 present descriptive comparisons of our analysis sample and the matched comparison sample for some individual characteristics, disaggregated into averages for gender and the presence of children. While wages and the average number of sickdays is slightly higher for the comparison sample, indicating that our analysis sample have somewhat poorer health, the differences are quite small. In particular, from Figures A.3–A.5) it is evident that the average differences in the sickdays and income variables between the samples are small and have similar trends in age categories prior to the hospitalizations. We thus conclude that our analysis sample is similar to the comparison sample with regard to these variables despite the restrictions we apply.

[9]Moreover, this approach also lead to problems of common support since most have children at a younger age.

[10]Specifically, we match each sampled individual from our analysis sample (i.e. with a hospital admission record) with a person of the same age without a hospital admission record in the age range 40-45 years.

4 Econometric framework

We have the following stylized (Swedish) world in our minds; individuals belong to a household in which they consume both market and household goods. The market price of household goods are high due to high tax wedges (except for highly subsidized child care). This means that household members will perform both market and household work. There is also a public (or semi-private) sickness insurance that replace earnings if an individual has poor health and cannot work. In this stylized model[11] we assume that the wife performs both market and household work while the husband performs only market work in households having more than two members.[12] Productivity at both work and at home increases with health. However, while employee productivity at the workplace is difficult to monitor, home production is not subject to this type of asymmetrical information. The difference between the two types of productions is that it is possible to shirk at the workplace but not at home implying that absence incentives are greater for the wife than for the husband, given equal health conditions.

Our interest lies in studying whether the gender differences in sickness absence are driven by differences in health related investment behavior. However, there may also exist several other (non-health related) reasons why men and women would differ in their usage of the sickness insurance system. Women on average have lower earnings but higher non-labor incomes than men (see e.g. Broström, Johansson, and Palme

[11] A formal version of this model can be found in the Appendix, section A:III.

[12] This is of course an oversimplification, but it is not clear if a more realistic division of household production between the spouses would give substantially more insight into the health investment decision we model here.

(2004)). This means that, on average, the economic incentives of being on sickness absence are greater for women than for men. Another reason for different take up rates among men and women is that the Swedish labor market is highly gender segregated. For instance, women work in sectors and/or at establishments having poorer work environments than in more male oriented sectors and establishments. These and other reasons complicates testing for behavioral differences between genders.

Our approach to deal with these difficulties is to estimate the effect on sickness absence from a shock in individual health. This way we are able to control for differences in the levels of take up rates due to e.g. different economic incentives and labor market segregation. We assume that sickness absence can be determined by the following relation

$$S_{it} = \nu_i + \beta_1 F_i + \beta_2 H_{it} + \beta_3 F_i H_{it} + \alpha X_{it} + \epsilon_{it}, \tag{1}$$

where S_{it} is days of sickness absence for individual $i = 1, 2, \ldots, N$ at time $t = -l, \ldots, 0, \ldots, l$, ν_i are individual unobserved factors (such as the general health level of the individual), F_i is a bivariate dummy variable that equals unity if the individual is female and zero otherwise, H_{it} is an objective measure of a health change, X_{it} is a vector of control variables and ϵ_{it} is a random error term. The parameter of interest, β_3, measures the gender difference in response to the health change. The issue is that individuals with poor general health are likely to suffer from more (and more severe) health problems. Thus, if e.g. women invest more in health, ν_i will be correlated with both the female dummy and the health change.

We define the health change, H_{it}, by an indicator variable assuming unity for all time periods after an individual has a registered hospital admission occurring at $t = 0$ (i.e. $H_{it} = 1$ for $t > 0$ and 0 otherwise). The identifying assumption we maintain in order to consistently estimate β_3 is that the age trends in health are on average the same for men and women.[13] A potential problem with this specification is that the health changes, as measured by the hospital admissions, on average measures the actual health change differently for men and women. Importantly though, if women invest more in their health than men, the estimated gender effect of the health change on sickness absence will be conservative.

Next, we investigate whether objective health measures of men and women differ after the hospital admission by estimating Cox proportional hazard regression models to death

$$\Pr\left(Death_i = 1\right) = \lambda_0(t)\exp(\delta_1 F_i + \alpha X_i), \quad t > 0 \tag{2}$$

where $\lambda_0(t)$ is the baseline hazard (i.e. the hazard rate for men). A negative estimate of δ_1 in (2) then suggests a relatively better health of women than for men. In addition, we also estimate hazard regression models for the occurrence of a secondary hospital admission and for receiving disability benefits.

In order to study the household investment effects, we estimate a triple differences model by including a bivariate dummy variable for having children ($C_i = [0, 1]$) along with the three first level interactions of gender, the health shock and having children.

[13]That is, if v_i is not fixed but a function of age or $t, \nu_i(t)$, then $v_i(t)$ is not allowed to differ across genders.

Hence, for the sickness absence model we estimate

$$\begin{aligned} S_{it} =& \nu_i' + \beta_1' F_i + \beta_2' H_{it} + \beta_3' C_i + \beta_4' F_i H_{it} + \beta_5' F_i C_i \\ &+ \beta_6' H_{it} C_i + \beta_7' F_i H_{it} C_i + \epsilon_{it}' \end{aligned} \tag{3}$$

where β_7' is the parameter of interest, measuring the added impact of having children on sickness absence among women. Note that we in this specification allow for separate trends for being female and for having children as well as for separate gender impacts of having children. Thus, to consistently estimate β_7' we maintain the assumption that the average trends in sickness absence for women with and without children are the same.

Finally, we also estimate similar Cox-regression models by including the indicator variable for children and its interaction with gender; hence

$$\Pr(Death_i = 1) = \lambda_0'(t) \exp(\delta_1' F_i + \delta_2' C_i + \delta_3' F_i C_i + \alpha' X_i), \quad t > 0, \tag{4}$$

where $\lambda_0'(t)$ is the baseline hazard (i.e. the hazard rate for men without children). A negative estimate of δ_3' in (4) suggest a relatively better health of women with children.

If women increase their sickness absence relatively more than men after the health shock, this supports the idea that women act more precautiously than men. In addition, if women also have lower ex-post mortality rates (i.e. better ex-post health), then this behavior is not driven by poorer health among women. Moreover, if the differences in sickness absence and health can be primarily explained by women with households (children), this supports the view that the health investment hypothesis of Paringer (1983) play a role in explaining the gender gap in absenteeism. In contrast, if we find that women with households have more sickness absence but poorer health relative to other women after the hospitalization, we cannot refute the possibility that the increased sickness absence is rather caused by poor health arising in relation to domestic production responsibilities.[14]

5 Results

This section presents our estimation results. We first present the results on gender differences in sickness absence and health. Next, we discuss results from the estimation of differences in outcomes for individuals with and without households.

5.1 Gender differences

We outline this subsection by first presenting the results on gender differences in sickness absences. Next, we focus on the results from the estimation of gender differences in mortality, disability benefits and hospital admission.

5.1.1 Sickness absence

Before discussing the results from estimation we first present some graphical evidence. Figure A.6 plots the average number of sickdays for men (solid line) and women (dashed line). From this figure it is clear that women on average have more sickdays

[14]See e.g. Bratberg, Dahl, and Risa (2002) (and references therein) for empirical results suggesting that women with household may suffer from poorer health than other groups.

both before, but in particular after, the hospital admission relative to men. This basic descriptive evidence is suggestive of a behavioral effect on sickness absence.

Table A.5 present the estimation results. The first row in the table present the estimated coefficient from the interaction variable from equation (1) on the full analysis sample. The main result is given in column 3 of the table, showing that women have an additional twelve days of sickness absence after the hospital admission compared to men. Note that adding fixed year and age effects and additional control variables increases the gender difference in sickness absence. Given that the control variables capture some of the gender selection in health, this pattern indicates that women in our sample have better health than men on average.

The results presented so far suggests that women exert a more disease-preventive behavior through a more extensive utilization of the sickness insurance system. However, if the maintained assumption that men and women are affected by similar health changes is violated, these estimated effects might simply be the outcome of gender differences in the impact on health of the cause for the hospital admission. While the inclusion of fixed diagnosis and sector effects did not change the results qualitatively, there might still exist substantial heterogenous effects across different diagnosis categories and labor market sectors driving the results. Indeed, it is clear from observing Tables A.3 and A.4, presenting the shares of women by diagnosis categories and labor market sector in our analysis sample, that men and women are generally affected by different types of diseases and work in different sectors. The range is substantial, from a female share of .84 for cancers to only .37 for heart diseases and from a share of .87 in the health sector to .09 in the construction sector.

Figure A.7 plots the sickness absence of men and women before and after the observed hospital admission for the four most common diseases in our data; cancer, heart, mental and musculoskeletal diseases. The sickness absence of males is higher in the first year after the admission for cancer diagnosis but falls below that of women in the subsequent years. For the three other categories the pattern follows the aggregate results closely. The results from separate estimation of the model from equation (1) contingent on diagnosis category are displayed in in rows 2-5 of Table (A.5). As an example, the results indicate that women with a cancer diagnosis when being admitted to the hospital have roughly four more days of sickness absence than men with the same admission cause while over twenty days more if they have been admitted for a mental disease. Finally, the results from separate estimation of four different labor market sectors (manufacturing, public administration, education and health) displayed in rows 6-9 of (A.5) displays the same pattern as the full sample, showing remarkable consistency across sectors despite the inclusion of more than fifty additional control variables.

5.1.2 Mortality, hospital admission and disability benefits.

The previous section showed that women increase their sickness absence relatively more than men following a hospital admission. As it could be the case that men and women are differently affected by similar health shocks the question remains whether these differences in sickness absence are driven by poorer health among women rather than gender-specific health behaviors.[15] As a starting point for the analysis, the

[15]Recall, however, that both theory and the results in the previous section indicate that women rather seem to have better health in comparison to men in our sample.

histogram in Figure A.8 show the fraction of sampled men and women who died within three years after the hospital admission by diagnosis category. The figure is striking in the sense that for all included diagnosis types, men have a higher average mortality rate. In particular, the mortality rate for males is more than double as high as that of women for the subsample of cancer diagnosed patients (.27 compared to .12). Since cancer is a disease for which the mortality risk is highly dependent on time of detection, this extreme gender difference in mortality is indicative of how a more preventative health behavior among men potentially could reduce average mortality. Moreover, the large difference in mortality among men and women with cancer most likely also explains the small differences in sickness absence for men and women with cancer.

Figures A.9-A.11 display the cumulative risks of death, receiving disability benefits and a second hospital admission by years after the initial hospital admission for men and women, respectively. Women have a lower risk of death, but also higher risks of both retirement and having a second admission relative to men. However, results from the two latter could at least partially be the outcomes from differences in health behavior.

Table A.6 presents the coefficient of the gender dummy from estimating the Cox hazard regression models given in equation (2) using each of the three health measures as the dependent variable.[16] Column 1 for each outcome show the results when excluding all additional control variables while column 2 include the full set of

[16] We also estimated linear probability models for the probability of the specific outcome occurring within a specific time period after the initial hospital admission (e.g. three years). The estimation of these models yields essentially the same results.

controls.

The first row of Table A.6 show the estimation results from the full sample. Women have a significantly lower risk of death and a second admission but also a significantly higher risk of receiving disability benefits after the hospitalization. The inclusion of controls lower the parameter estimate for death (indicating that women on average seem to be in better health condition than men in our sample) and disability outcome while it renders the estimated coefficient for the second admission insignificant and close to zero. Thus, the empirical evidence is mixed if one consider both of the former outcomes as equally good proxies of objective health. However, if one is willing to accept that mortality risk is a less biased measure of objective health than disability status (since disability arguably could be an outcome of preventative health behavior), then these results are strongly in favor of women having better health than men in our sample.[17]

As with the analysis of sickness absence, we disaggregated the analysis contingent on the four diagnosis categories and labor market sectors discussed above. The results from the estimations are presented in rows 2-4 and 5-8 of Table A.6. The results by diagnosis categories are largely consistent with the aggregate results for the death and disability outcomes. For the risk of a second admission, there is some heterogeneity between cancer and musculoskeletal diseases where women have a lower risk of the former and a higher risk of the latter. Finally, the results are also largely consistent across industry sectors.

[17] One argument could go along these lines; as women might care more for their prospective health they use both more sickness absence and increase their likelihood of entering disability status in order to maintain good health.

5.2 Household differences

We outline this subsection by first presenting the results on differences in sickness absence for men and women with and without households. Next, we focus on the results from the estimation of gender differences in mortality, disability benefits and hospital admission.

5.2.1 Sickness absence

Before discussing the results from estimation we provide some initial graphical evidence. Figure A.12 show the average number of sickdays for men (left panel) and women (right panel) with (dashed line) and without children (solid line). The figure shows that both men and women with children have on average fewer sickdays after the hospitalization compared to men and women without children, but the difference is less pronounced for women. As individuals without children on average have poorer health than individuals with children, this selection effect needs to be taken into account for consistent estimation of our parameter of interest. In our econometric design, the effect of having children on sickness absence is identified through the comparison of men with and without children. Thus, as women with children use relatively more days of sickness after the hospitalization, compared to men with children, this descriptive statistic is consistent with the health investment hypothesis.

Table A.7 present the results for different samples. The results for men and women are displayed in columns 1-3 and columns 4-6, respectively. The main result, from estimating equation (3) above, is presented in column 7 and reports the second level interaction coefficient (the DDD estimator) from the estimation of a triple differences model of the female, child and post shock dummy variables. The specification in column 7 is also equivalent to taking the difference of columns 6 and 3 in the table, without conditioning the vector of control variables on gender.

The first row in column 7 of Table A.7 show that the relative difference between male and female sickness absence is postitive and significant of about five days per year. Notice that the estimated coefficients in the regressions separated by gender are lower when the control variables are included. This result indicate that controlling for selection move the estimates towards zero, which would be expected if individuals with children have better average health than individual's without children. The bias thus moves in the opposite direction as in the male-female comparison of the previous section, lending further support for our interpretation of the results.

To evaluate whether our results are driven by heterogenous effects we also estimated our models separately by diagnosis categories and labor market sectors. Figure A.13 and A.14 shows the sickness absence by family status for men and women, respectively. Moreover, rows 2-5 and 6-9 of Table A.7 presents the estimation results for each diagnosis type and labor market sector, respectively. The results are largely consistent over samples and specifications with the exception of the musculoskeletal disease and the health sector; whereas the former implies a substantially larger gender difference the latter shows no difference at all in the number of sickdays extracted after the hospital admission. Finally, it is interesting to note that the differences in sickness absence are largest for the diseases where one would expect the individual freedom in deciding whether or not to be absent is highest, i.e. for mental and musculoskeletal diseases.

5.2.2 Mortality, disability benefits and hospital admission.

Following the same logic as in the previous section we estimate the ex-post health outcomes for the different groups to evaluate whether the differences are driven by poorer health or health investments among women with children. Figures A.15-A.17 plots the cumulative risks of death, receiving disability benefits and being admitted a second time to a hospital for men and women with and without children, respectively. As expected, individuals without children have a higher estimated risk for all three health outcomes and for both genders. However, comparing the outcomes within gender suggests that the relative health differentials of women with and without children is lower than that of men with and without children. Thus, given that we can interpret the differences between men with and without children as the average effect of having children, women with children have poorer ex-post health than women without children. However, as we do not allow for heterogenous effects of having children for men and women in this model, consistent estimation of the parameter of interest is subject to a stronger identifying assumption than before. In particular, if men with and without children are more selected in terms of health compared to women with and without children, the coefficient of the interaction variable will be downward biased.

Table A.8 show the estimated coefficients from a regression of the model displayed in equation (4). Columns 1-3 and 4-6 of the table pertains to separate estimations of the model for males and females, respectively, including only an indicator variable for children (along with the vector of control variables) while the last three columns returns the results from the model specification in equation (4) for each of the health outcomes. The reported values are the estimated coefficient of the indicator variable for having children (for columns 1-6) and the interaction coefficient of gender and children (for columns 7-9).

The main result is displayed in the first row of the last three columns of Table A.8. Given the assumption that the effect of having children is the same for both genders, it is clear that women with children are not the driving factor behind the ex post gender difference in health as they have a higher risk fors all three health outcomes compared to women without children. In particular, the difference in mortality risk is positive and highly significant at the one percent level. This result is also largely robust to disaggregation of the sample into diagnosis and industry sector categories, as can be seen from rows 2-9.

Thus, women with children does not seem to have better health than other women, even though they use significantly more sickness absence. On the contrary, they seem to have poorer health, implying that the increased absence is due to that domestic production duties exacerbated the health change that caused the hospital admission. As a result, we cannot confirm from this analysis that the theory of health investments is the driving factor that underlies the ex-post increased gender difference in sickness absence.

6 Conclusion

This paper addresses the question of whether the observed gender difference in absenteeism, in addition to actual health differences, can be explained by differences in the behavior of men and women in reacting to poor health. In particular, previous reseach has found that women seem to exert a more risk-averse and preventative behavior in general compared to men. Moreover, we argue that a complementary reason for women's higher absenteeism could be the result from rational decisions made by optimizing households. These decisions originate from women's traditional dual roles as producers of both market and domestic goods within the household. In particular, an adverse effect on productivity caused by deteriorating health will have a greater impact on the household's combined utility if the woman is affected, compared to an equivalent deterioration of the health of her spouse, since both sources of production will be adversely affected.

To investigate whether preventative behavior and health investments can explain the gender gap in sickness absence, we utilize Swedish registry data on sickness absence, mortality and in-hospital care. We assume that sickness absence is being determined by both health and behavioral factors while data on mortality and in-hospital care are (more) objective measures of individual health. As the sickness absence of men and women may differ because of latent correlates of gender and sickness absence, parameter estimates from ordinary least squares models will generally be confounded. For this reason, we sample men and women with an incidence of an in-hospital care record (an observed health change) and compare the relative change of men and women in sickness absence after the health change while conditioning on the time prior to the hospitalization. Provided that the latent factors are constant between groups over time we can interpret any change in the ex-post gender difference in sickness absence as attributed to different behavior.

We find that women's sickness absence increases after the hospital admission relative to men, indicating that women exercise a more disease-preventive behavior. Moreover, comparing sickness absence of women with and without children we find, in line with the theory of health investments, that part of this relative increase in sickness absence can be explained by women with children (i.e. individuals with a non-trivial amount of domestic production). These results are robust to the inclusion of additional covariates and testing for heterogenous effects across sectors and diagnosis categories.

Since the estimated changes in sickness absence might stem from being differently affected by the health changes due to e.g. differences in prior general health, we estimate proportional hazard models for the risk of death after the hospitalization as a measure of ex-post health levels. We find that women have a lower risk of death than men after the hospitalization, but that this difference is driven by women without children. In particular, women with children seem to have poorer health than other women after the hospitalization.

In concluding, the traditional morbidity-mortality paradox is commonly explained by that women, by tradition, have an innate precautionary and risk-aversive behavior. The results obtained in this study lend support for the idea that differences in health-related behavior of men and women is an important factor in explaining the gap in male-female absenteeism. However, we find little support for the hypothesis that women with households, due to their dual roles as both market and home producers, invest more in their health by having a lower threshold of work absence. Rather, the increased difference in sickness absence for this group seem to be the result of actual health problems arising in relation to home production responsibilities.

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Appendices

A:I Tables

Table A.1.
Variable List

Variable	Description
Year	The year of observation.
Female	= 1 if the individual is female.
Child	= 1 if ever observed to have a child.
Age	The age in years of an individual.
Annual earnings	Annual earnings in 2001 BA:s
High Earner	Annual earnings > 7.5 BA:s
Disposable Income	Disposable income in 2001 BA:s
Virtual Income	The income of the spouse of the household in 2001 BA:s.
Not primary earner	= 1 if the individual has less earned income than the spouse of the household.
High Education	= 1 if the individual has tertiary level of education
SNI	Two digit industry sector code aggregated into 15 categories. SNI is short for Swedish Standard Industrial Classification, which is based on the EU standard classification NACE Rev. 2.
Death	= 1 if observed to die. Absorbing state variable.
Disability	= 1 if observed to draw disability income. Absorbing state variable.
Admission#2	= 1 if observed to have a second hospital admission.
SyssStat	= 1 if occupied during November the current year. Defined as income generating employment for at least one hour per week.
Post Shock	= 1 for years after an in-hospital care record.
Sickdays	Number of used insured sickdays during a year.
Diag	The primary diagnosed illness of the individual causing the hospital admission. Consist of 18 aggregated categories based on the ICD-10 classification.

TABLE A.2.

DESCRIPTIVE STATISTICS FOR THE ANALYSIS AND THE COMPARISON SAMPLES

	Analysis sample				Comparison sample			
	Men		Women		Men		Women	
	Kids	No Kids	Kids	No Kids	Kids	No Kids	Kids	No Kids
Age	36.556	36.566	36.851	36.629	36.299	36.29	36.513	36.305
	(2.246)	(2.251)	(2.085)	(2.245)	(2.339)	(2.344)	(2.238)	(2.354)
Annual earnings	7.05	6.567	4.62	5.676	7.435	6.855	4.83	5.931
	(3.993)	(2.526)	(1.96)	(2.142)	(4.147)	(2.645)	(2.127)	(2.06)
High wage	0.31	0.243	0.062	0.132	0.353	0.278	0.077	0.156
	(0.463)	(0.429)	(0.24)	(0.338)	(0.478)	(0.448)	(0.266)	(0.363)
Disposable income	5.267	4.68	4.338	4.172	5.412	4.845	4.326	4.241
	(3.82)	(1.72)	(3.858)	(2.014)	(3.03)	(1.637)	(1.64)	(1.386)
High education	0.209	0.171	0.316	0.332	0.241	0.195	0.348	0.355
	(0.406)	(0.376)	(0.465)	(0.471)	(0.428)	(0.396)	(0.476)	(0.479)
Not primary earner	0.072	0.011	0.573	0.09	0.067	0.014	0.61	0.083
	(0.259)	(0.105)	(0.495)	(0.286)	(0.25)	(0.116)	(0.488)	(0.276)
Virtual income	2.674	0.34	4.963	0.905	2.858	0.375	5.318	0.85
	(2.548)	(1.391)	(7.907)	(2.571)	(3.094)	(1.675)	(4.655)	(2.524)
Sickdays	4.127	5.526	8.306	9.968	1.99	2.215	4.515	4.794
	(23.439)	(29.237)	(35.285)	(42.247)	(15.665)	(16.069)	(25.494)	(28.034)
Observations	58,015	12,105	49,670	8,113	75,373	14,204	52,586	8,573

NOTE.—The table reports means and (standard deviations). The summary statistics is based on the share with age < 40. The analysis sample consist of employed prime-aged individuals with the occurrance of a in-hospital care record sometime during ages 40-45. Each of these sampled individuals are matched with an employed prime-aged individual of the same age that did not have a hospital admission during the same age frame. For more information, see the data section in the paper. The summary statistics is disaggregated into gender and the presence of children. One BA (basic amount) in 2001 was approximately 3,300€. See Table A.1 for detailed variable definitions.

Table A.3.
The share of females by diagnostic categories

Disease category	Number of Females	Number of Males	Total	Share of females
Accident	2,968	5,341	8,309	0.36
Blood	238	88	326	0.73
Cancer	5,085	985	6,070	0.84
Congential	150	127	277	0.54
Digestive	3,697	4,366	8,063	0.46
Ear	443	449	892	0.50
Endocrine	957	593	1,550	0.62
Eye	239	305	544	0.44
Factors	1,957	1,136	3,093	0.63
Genitourinary	5,084	1,231	6,315	0.81
Heart	1,710	2,899	4,609	0.37
Infection	651	941	1,592	0.41
Mental	1,402	1,783	3,185	0.44
Musculoskeletal	2,184	2,922	5,106	0.43
Nerve system	667	717	1,384	0.48
Perinatal	3	1	4	0.75
Respiratory	1,413	1,900	3,313	0.43
Skin	333	354	687	0.48
Symptoms	3,414	4,826	8,240	0.41
Total	32,595	30,964	63,559	0.51

Note.—The diagnosis categories are grouped according to the chapter division of the Swedish version of The International Statistical Classification of Diseases and Related Health Problems, Tenth Revision (ICD-10). Some of the categories does not pertain to specific diseases but are grouped for other reasons. These are; symptoms and signs of illnesses that cannot be classified differently (Symptoms), external causes such as injuries and poisoning (Accidents) and factors related to the contact with the medical establishment (Factors). Each cell value in columns 2-4 pertains to the number of sampled individuals with an registered hospital admission whose cause for the admission belonged to the specific category group at the time of the hospitalization. The female shares in the last column are the division of column 2 by column 4 for each row in the table.

Table A.4.
Share of females in the analysis sample by industry sector.

Industry sector	Number of Females	Number of Males	Total	Share of females
Agriculture	164	597	761	0.22
Construction	295	3,038	3,333	0.09
Education	3,225	1,486	4,711	0.68
Energy	125	486	611	0.20
Finance	782	594	1,37	0.57
Health	14,779	2,301	17,080	0.87
Services	406	316	722	0.56
Manufacturing	3,407	8,860	12,267	0.28
Mining	20	146	166	0.12
Other	123	288	411	0.30
Other Pers. Service	1,177	1,221	2,398	0.49
Public Administration	2,098	1,948	4,046	0.52
Real Estate and Renting	2,036	2,874	4,910	0.41
Retail and Wholesale	2,476	3,513	5,989	0.41
Transportation	1,482	3,296	4,778	0.31
Total	32,595	30,964	63,559	0.51

Note.—The table cover the two first digits of the industry sector code (SNI) aggregated into 15 categories covering the labour market. SNI is short for Swedish Standard Industrial Classification, which is closely based on the EU standard classification NACE Revision II. Each cell value in columns 2-4 pertains to the number of sampled individuals that are employed in november in the current year at an establishment classified within the specific industry sector in the first year they were sampled. As our sample only consist of employed individuals there are no missing sector codes for individuals in the sample. The female shares in the last column are the division of column 2 by column 4 for each row in the table.

Table A.5.
Difference-in-differences estimates of gender on sickness absence after a hospital admission

	(1)	(2)	(3)
Full sample	10.980***	11.401***	12.582***
	(0.319)	(0.318)	(0.317)
Diagnosis type			
Heart	7.727***	8.440***	9.328***
	(1.257)	(1.259)	(1.261)
Cancer	2.188	2.941**	4.019***
	(1.480)	(1.479)	(1.470)
Mental	17.799***	18.558***	21.251***
	(1.851)	(1.849)	(1.867)
Musculoskeletal	15.352***	17.153***	17.862***
	(1.438)	(1.431)	(1.435)
Industry Sector			
Manufacturing	9.798***	10.316***	11.100***
	(0.897)	(0.896)	(0.890)
Public	14.110***	14.513***	15.208***
	(1.097)	(1.097)	(1.095)
Education	13.667***	12.899***	12.672***
	(1.137)	(1.133)	(1.131)
Health	11.607***	12.045***	12.271***
	(0.966)	(0.965)	(0.959)
Year/Age FE	No	Yes	Yes
Additional controls	No	No	Yes

Note.—The table reports the estimated difference-in-difference parameter (standard error) from a regression of sickness absence on bivariate dummy variables for gender and post-hospital admission and their interaction for different samples. Robust standard deviations are reported in parentheses with significance levels *p<0.1, **p<0.05 ***p<0.01. The second column include year and age fixed effects and the last column also include 15 industry and 19 diagnosis category fixed effects along with additional controls for annual income and dummy variables for high earner and high education. See Table A.1 for detailed variable definitions.

Table A.6.
The estimated relationship between gender and ex-post health measures

	Death		**Disability**		**Admission#2**	
	(1)	(2)	(1)	(2)	(1)	(2)
Full sample	-0.101*	-0.253***	0.440***	0.294***	0.049***	-0.002
	(0.059)	(0.061)	(0.033)	(0.034)	(0.014)	(0.014)
Diagnosis type						
Heart	-0.906***	-1.089***	0.336***	0.199*	-0.049	-0.114**
	(0.280)	(0.285)	(0.105)	(0.108)	(0.048)	(0.050)
Cancer	-1.053***	-1.216***	0.027	-0.121	-0.370***	-0.459***
	(0.097)	(0.102)	(0.164)	(0.167)	(0.054)	(0.057)
Mental	-0.503**	-0.505**	0.436***	0.367***	0.046	0.036
	(0.196)	(0.201)	(0.093)	(0.096)	(0.048)	(0.050)
Musculoskeletal	-0.143	-0.216	0.811***	0.681***	0.326***	0.262***
	(0.299)	(0.311)	(0.084)	(0.086)	(0.049)	(0.051)
Industry Sector						
Manufacturing	-0.118	-0.289*	0.791***	0.590***	0.058	0.002
	(0.154)	(0.156)	(0.084)	(0.085)	(0.036)	(0.036)
Public	-0.268	-0.321	0.533***	0.175	0.110**	0.043
	(0.233)	(0.244)	(0.152)	(0.154)	(0.053)	(0.056)
Education	0.038	-0.037	0.562***	0.376**	0.050	0.027
	(0.229)	(0.235)	(0.150)	(0.152)	(0.055)	(0.057)
Health	-0.234	-0.321*	0.272**	0.085	-0.028	-0.107**
	(0.181)	(0.189)	(0.110)	(0.112)	(0.042)	(0.044)
Controls	No	Yes	No	Yes	No	Yes

Note.—The table reports the estimated coefficient (standard error) from a bivariate dummy variable for being female from a Cox proportional hazards regression for years after an observed hospital admission for different samples on three different ex-post health measures; the probability of death, disability status and a second hospitalization. Robust standard deviations are reported in parentheses with significance levels equal to *p<0.1, **p<0.05 ***p<0.01. The regressions in the second column of each dependent variable control for year and age fixed effects and additional controls for annual income and dummy variables for high earner and high education. See Table A.1 for detailed variable definitions.

Table A.7.
Difference-in-differences estimates of family status on sickness absence after a hospital admission, by gender

	Males			**Females**			**Both genders**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Full sample	-7.497***	-7.641***	-5.163***	-2.754***	-2.859***	-1.020	4.622***
	(0.541)	(0.540)	(0.542)	(0.729)	(0.728)	(0.727)	(0.905)
Diagnosis type							
Heart	-5.989***	-6.087***	-4.638***	-5.917*	-6.049*	-6.045*	-0.369
	(1.712)	(1.712)	(1.732)	(3.202)	(3.177)	(3.195)	(3.605)
Cancer	-12.274***	-12.752***	-10.335***	1.669	1.675	2.810*	14.477***
	(3.753)	(3.732)	(3.736)	(1.520)	(1.516)	(1.519)	(4.031)
Mental	-1.289	-3.322	-0.657	13.683***	10.701***	9.827***	15.334***
	(2.451)	(2.453)	(2.493)	(3.542)	(3.552)	(3.626)	(4.292)
Musculoskeletal	-11.917***	-12.775***	-10.383***	11.703***	9.777***	10.049***	23.729***
	(2.424)	(2.412)	(2.401)	(3.695)	(3.652)	(3.664)	(4.359)
Industry Sector							
Manufacturing	-8.499***	-8.585***	-8.313***	-2.194	-1.983	-2.583	6.380***
	(0.989)	(0.985)	(0.977)	(2.092)	(2.087)	(2.080)	(2.301)
Public	-8.743***	-9.280***	-7.587***	0.472	0.653	1.982	10.485***
	(1.976)	(1.988)	(1.968)	(2.447)	(2.444)	(2.439)	(3.143)
Education	-5.873**	-5.723**	-4.590*	-1.203	-1.672	-2.382	4.301
	(2.514)	(2.505)	(2.519)	(2.507)	(2.508)	(2.513)	(3.552)
Health	-7.009***	-7.289***	-7.870***	-8.575***	-8.634***	-7.721***	-0.731
	(2.391)	(2.385)	(2.376)	(1.323)	(1.319)	(1.312)	(2.723)
Year/Age FE	No	Yes	Yes	No	Yes	Yes	Yes
Additional controls	No	No	Yes	No	No	Yes	Yes

Note.—Columns 1-6 in the table reports coefficient (standard errors) from difference-in-differences regressions of bivariate dummy variables for having children and years after an observed hospital admission and their interactions on the number of days on insured sickness absence. The last column reports the triple interaction coefficient from a difference-in-difference-in-differences regression including the levels and first order interaction of the children and post-admission dummies along with a gender indicator variable. Robust standard deviations are reported in parentheses with significance levels equal to *p<0.1, **p<0.05 ***p<0.01. The second and fourth column include year and age fixed effects and the third, sixth and seventh column also include 15 industry and 19 diagnosis category fixed effects along with additional controls for annual income and dummy variables for high earner and high education. See Table A.1 for detailed variable definitions.

Table A.8.

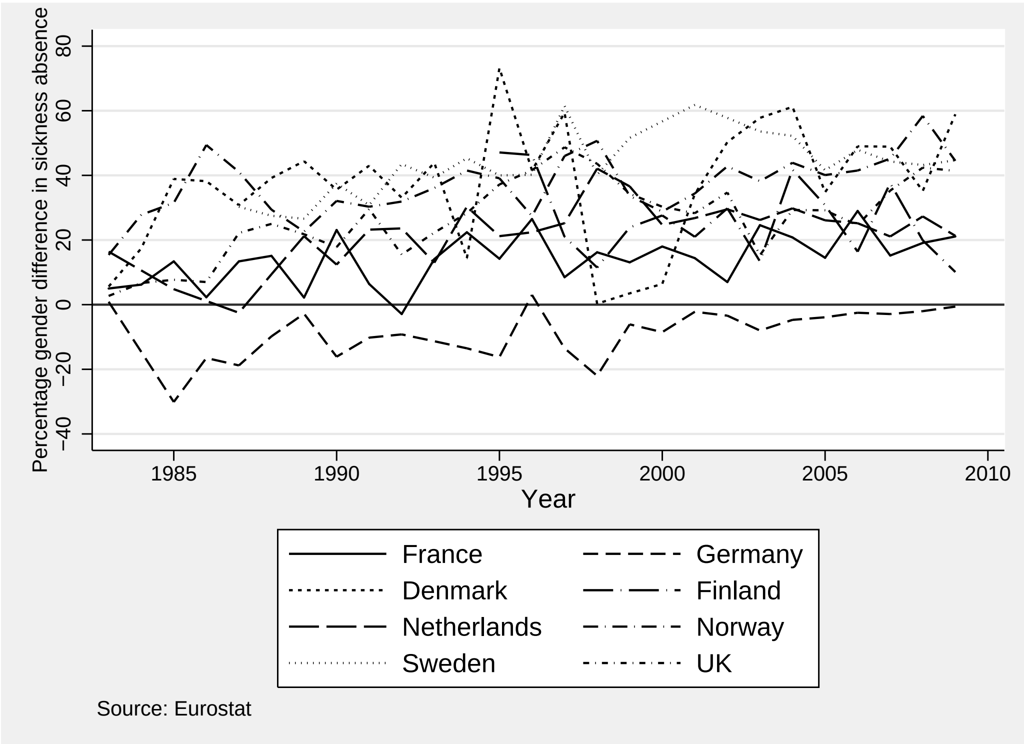
The estimated relationship between family status and ex-post health measures, by gender

	Males			Females			Both genders		
	Death	Disability	Admission#2	Death	Disability	Admission#2	Death	Disability	Admission#2
Full sample	-0.871***	-0.437***	-0.205***	-0.453***	-0.243***	-0.164***	0.405***	0.197**	0.043
	(0.086)	(0.057)	(0.023)	(0.100)	(0.053)	(0.025)	(0.131)	(0.077)	(0.034)
Diagnosis type									
Heart	-0.821***	-0.298*	-0.130*	-0.585	-0.117	-0.088	0.313	0.197	0.037
	(0.256)	(0.157)	(0.068)	(0.585)	(0.212)	(0.104)	(0.632)	(0.262)	(0.123)
Cancer	-0.620***	-0.111	-0.134	0.151	0.016	0.057	0.772***	0.080	0.196
	(0.174)	(0.361)	(0.117)	(0.150)	(0.168)	(0.063)	(0.229)	(0.397)	(0.132)
Mental	-0.676***	-0.250*	-0.290***	-0.651**	-0.124	-0.238***	-0.090	0.102	0.069
	(0.235)	(0.141)	(0.067)	(0.332)	(0.147)	(0.080)	(0.399)	(0.200)	(0.102)
Musculoskeletal	-1.356***	-0.294*	-0.136	-0.677	-0.463***	-0.265***	0.666	-0.121	-0.130
	(0.396)	(0.162)	(0.093)	(0.530)	(0.126)	(0.087)	(0.653)	(0.204)	(0.126)
Industry Sector									
Manufacturing	-0.553***	-0.427***	-0.198***	-0.479*	-0.165	-0.172**	-0.047	0.234	0.004
	(0.168)	(0.124)	(0.045)	(0.291)	(0.154)	(0.073)	(0.331)	(0.196)	(0.084)
Public	-0.836**	-0.930***	-0.117	-0.751**	0.253	-0.299***	0.058	1.228***	-0.179
	(0.347)	(0.260)	(0.101)	(0.364)	(0.261)	(0.087)	(0.499)	(0.365)	(0.131)
Education	-1.241***	-0.255	-0.206*	-0.210	0.219	-0.291***	1.066**	0.531	-0.037
	(0.401)	(0.313)	(0.113)	(0.358)	(0.234)	(0.084)	(0.533)	(0.389)	(0.138)
Health	-0.710**	-0.613***	-0.210**	-0.179	-0.346***	-0.124***	0.552	0.242	0.108
	(0.349)	(0.219)	(0.089)	(0.196)	(0.092)	(0.043)	(0.396)	(0.234)	(0.097)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note.—Columns 1-6 in the table reports the estimated coefficient (standard error) from a bivariate dummy variable for having children from a Cox proportional hazards regression for years after an observed hospital admission for different samples on three different ex-post health measures; the probability of death, disability status and a second hospitalization. Columns 1-3 pertain to the results for males and columns 4-6 to the results for females. Columns 7-9 reports the estimated interaction coefficient (standard error) of gender and having children from regressing the same model but instead including both genders and controlling for the level effects of both variables. Robust standard deviations are reported in parentheses with significance levels equal to *p<0.1, **p<0.05 ***p<0.01. All regressions include controls for year and age fixed effects and additional controls for annual income and dummy variables for high earner and high education. See Table A.1 for detailed variable definitions.

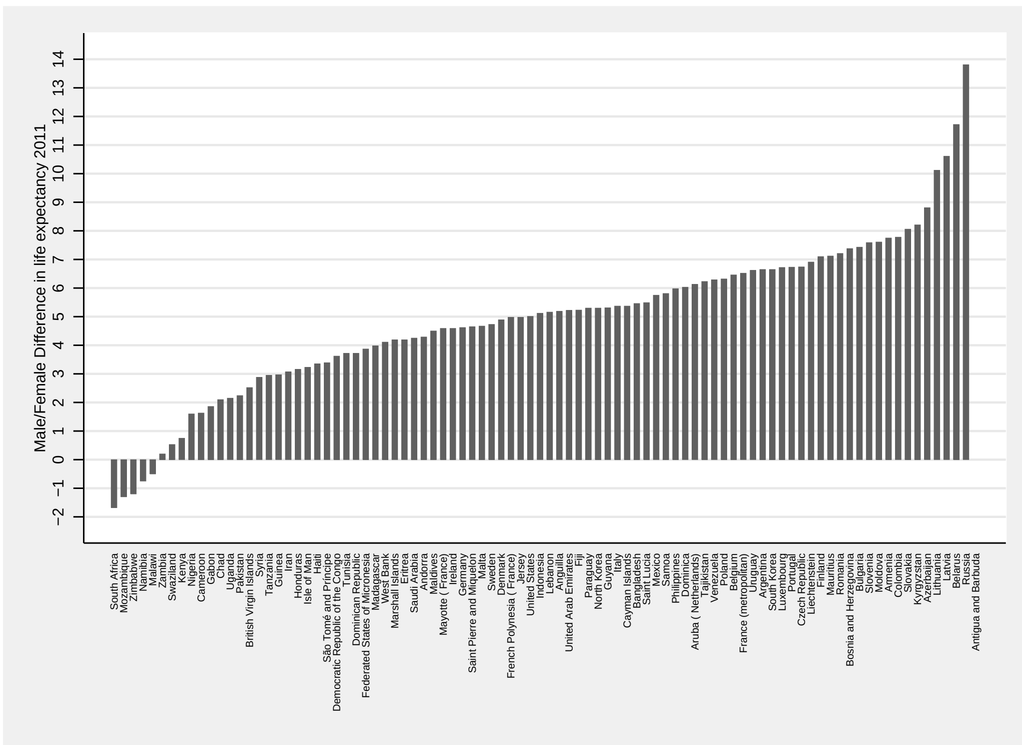
A:II Figures

Figure A.1.
Gender difference in the prevalence of sickness absence by country, 1980-2010



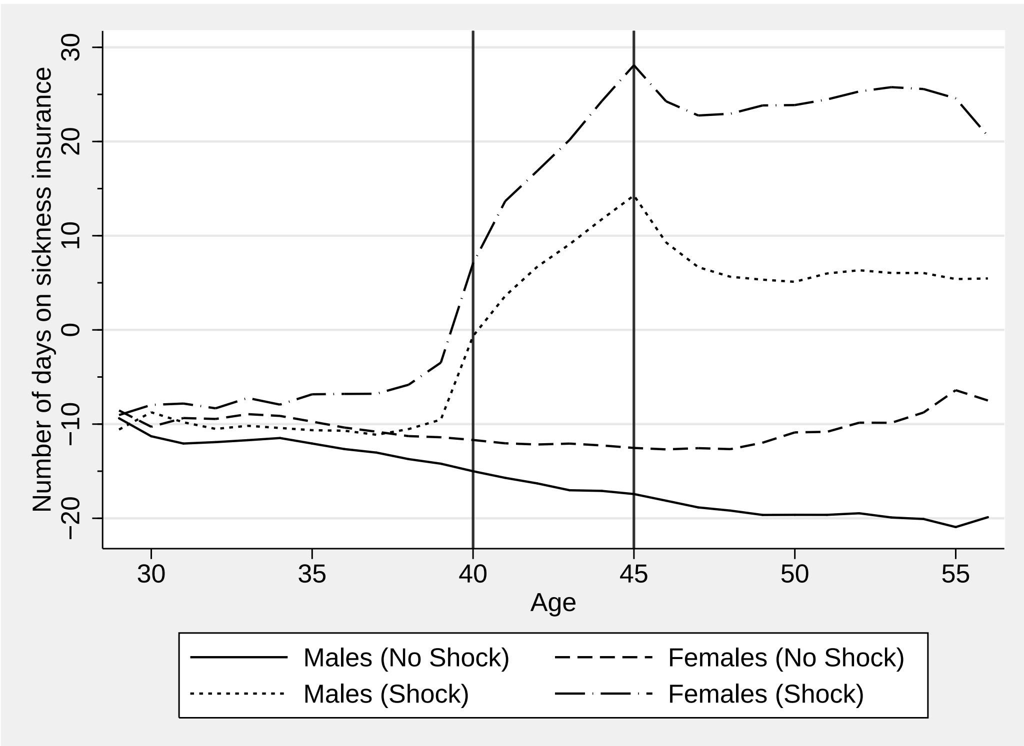
Note.—The source for the data come from annual survey data provided by Eurostat. The vertical axis is defined as the percentage difference in the share of women divided by the share of men that reported absence from work for health reasons sometime in a specific period of time.

Figure A.2.
Difference in Female-Male life expectancy by country, 2011



Note.—The source for the data come from the CIA factbook 2011. The vertical axis is measured as the difference in the Female-Male expected years of life for each country. The number of countries are a random sample of the total number of countries listed. The overall average among these countries are approximately four years.

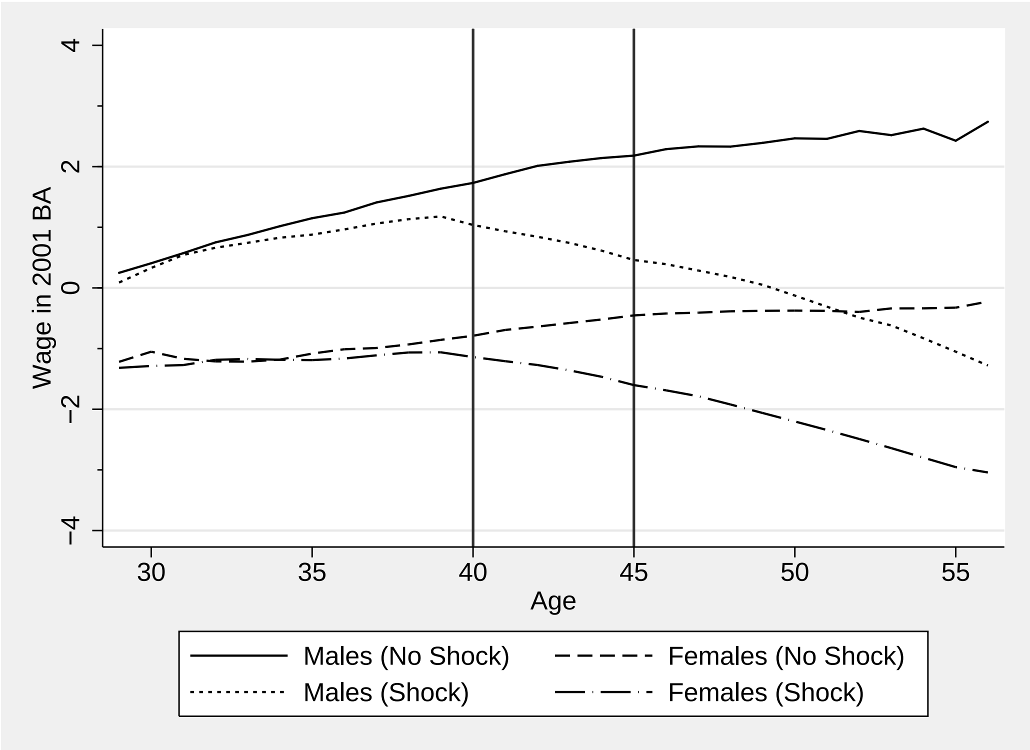
Figure A.3.
The average number of sickness absence for the analysis and the comparison samples over age and by gender



Note.—The figure is constructed by plotting the residuals from an ordinary least squares regression of year fixed effects on the outcome variable. Days of sickness are defined as the number of insured days an inividual is observed to withdraw during a year. The analysis sample include only individuals that had an observed hospital admission during age 40-45 while the comparison sample did not have any registered hospitalization during the same ages. The "shock" ("No shock") lines pertain to the sample with (without) a hospital admission.

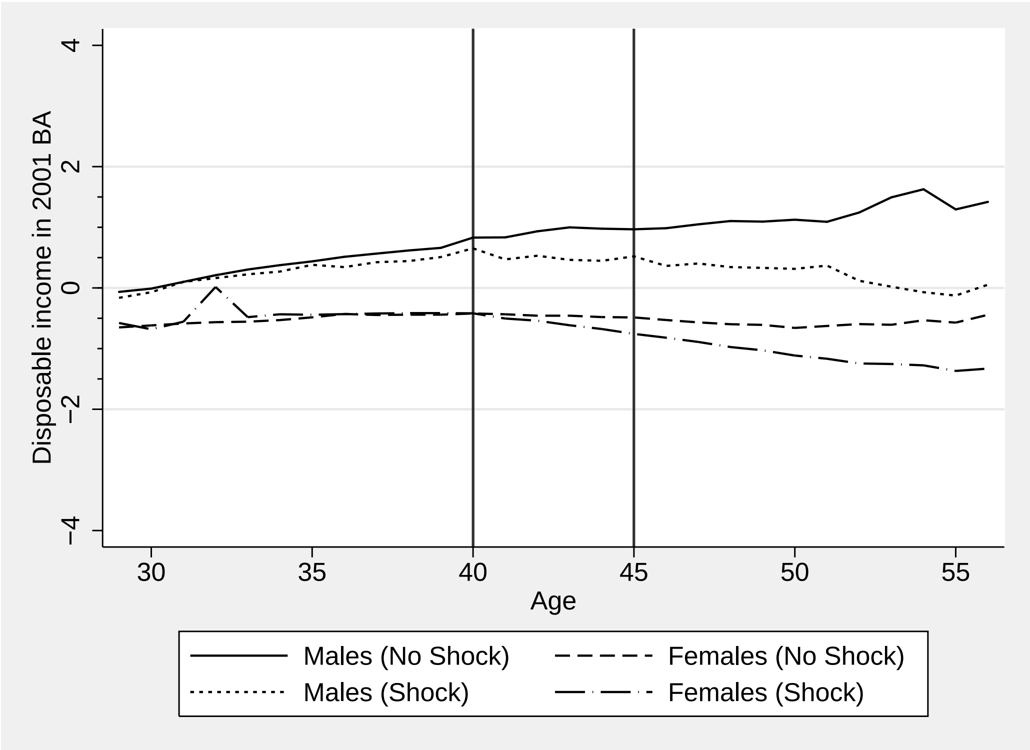
Figure A.4.

The average earnings for the analysis and the comparison samples over age and by gender



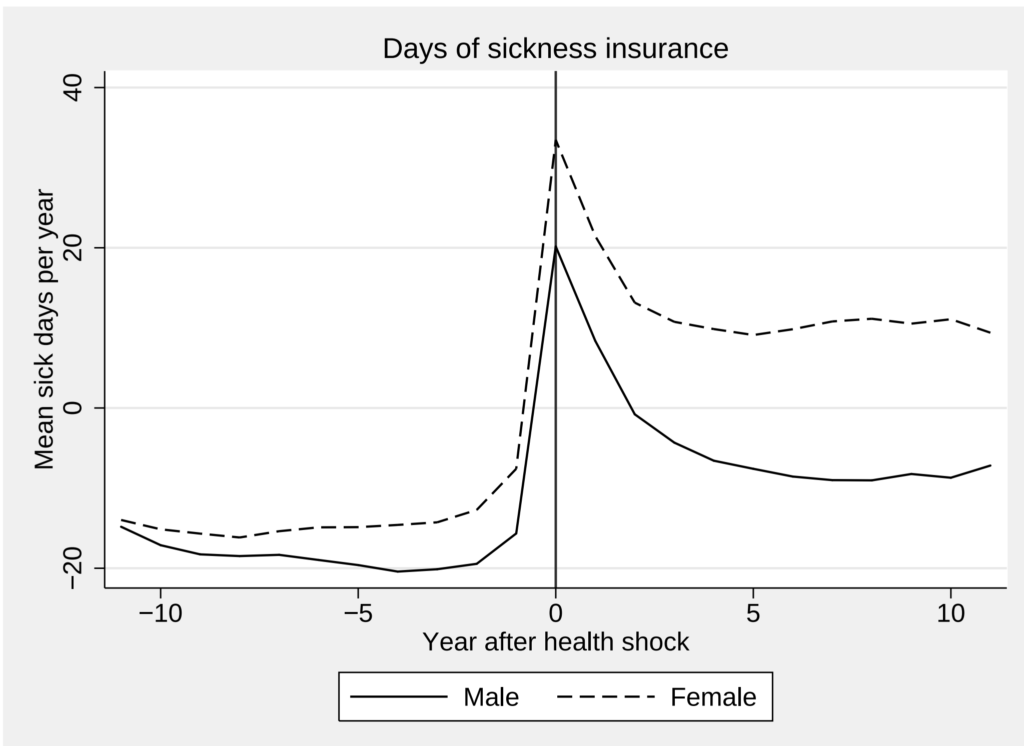
Note.—The figure is constructed by plotting the residuals from an ordinary least squares regression of year fixed effects on the outcome variable. Earnings are defined as gross cash earnings in the current year taken from the Swedish employment registry. The analysis sample include only individuals that had an observed hospital admission during age 40-45 while the comparison sample did not have any registered hospitalization during the same ages. The "shock" ("No shock") lines pertain to the sample with (without) a hospital admission.

Figure A.5.
The average disposable income for the analysis and the comparison samples over age and by gender



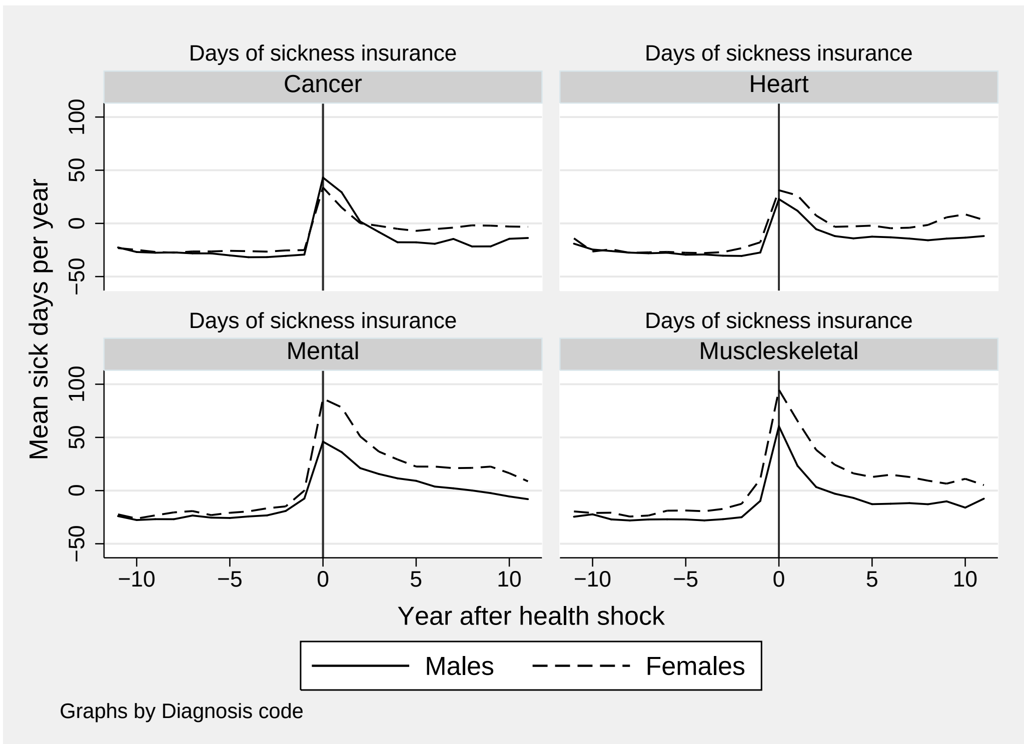
Note.—The figure is constructed by plotting the residuals from an ordinary least squares regression of year fixed effects on the outcome variable. Disposable income is defined as the total net-of-tax, benefits and reductions individualized income in the current year. The analysis sample include only individuals that had an observed hospital admission during age 40-45 while the comparison sample did not have any registered hospitalization during the same ages. The "shock" ("No shock") lines pertain to the sample with (without) a hospital admission.

Figure A.6.
The average number of days of sickness absence for men and women by years after a hospital admission



Note.—The figure is constructed by plotting the residuals from an ordinary least squares regression of year fixed effects on days of sickness absence. Days of sickness are defined as the number of insured days within one calendar year. Male (female) average number of sickdays are measured by the solid (dashed) line. The vertical line at zero indicate the year of the observed hospital admission.

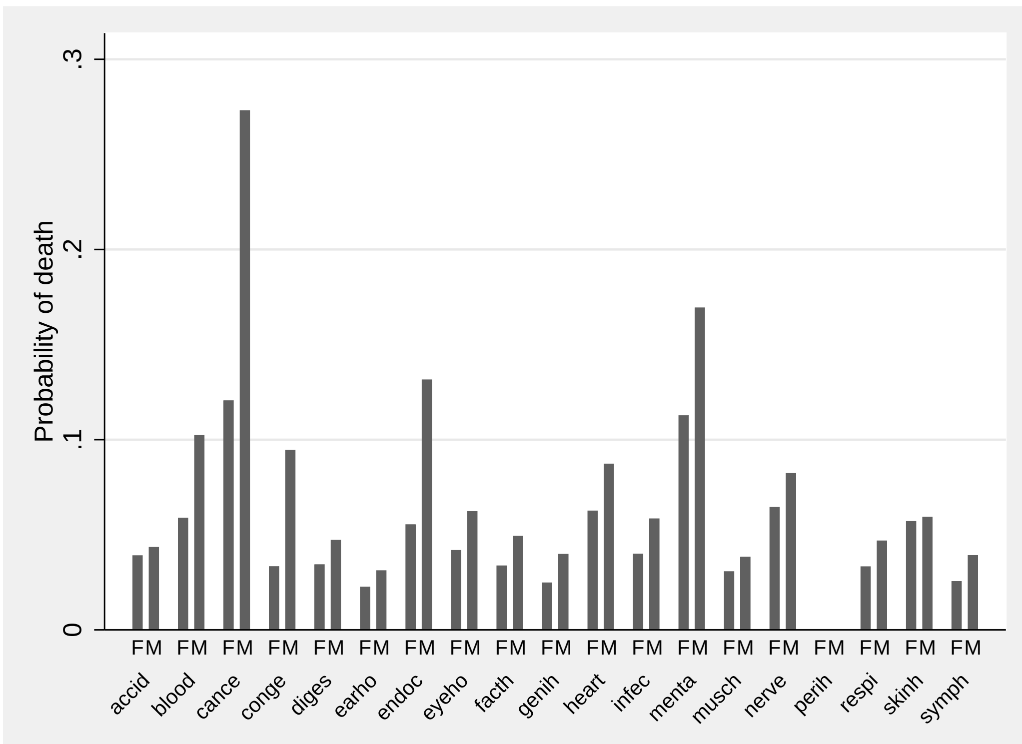
Figure A.7.
The average number of days of sickness absence by gender and years after a hospital admission, by diagnosis type



Note.—The figures are constructed by plotting the residuals from an ordinary least squares regression of year fixed effects on days of sickness absence. Days of sickness are defined as the number of insured days an individual is observed to withdraw during one year. Male (female) average number of sickdays are measured by the solid (dashed) line. Each panel plots pertains to a specific diagnosis type. The vertical line at time zero indicate the year of the observed hospitalization.

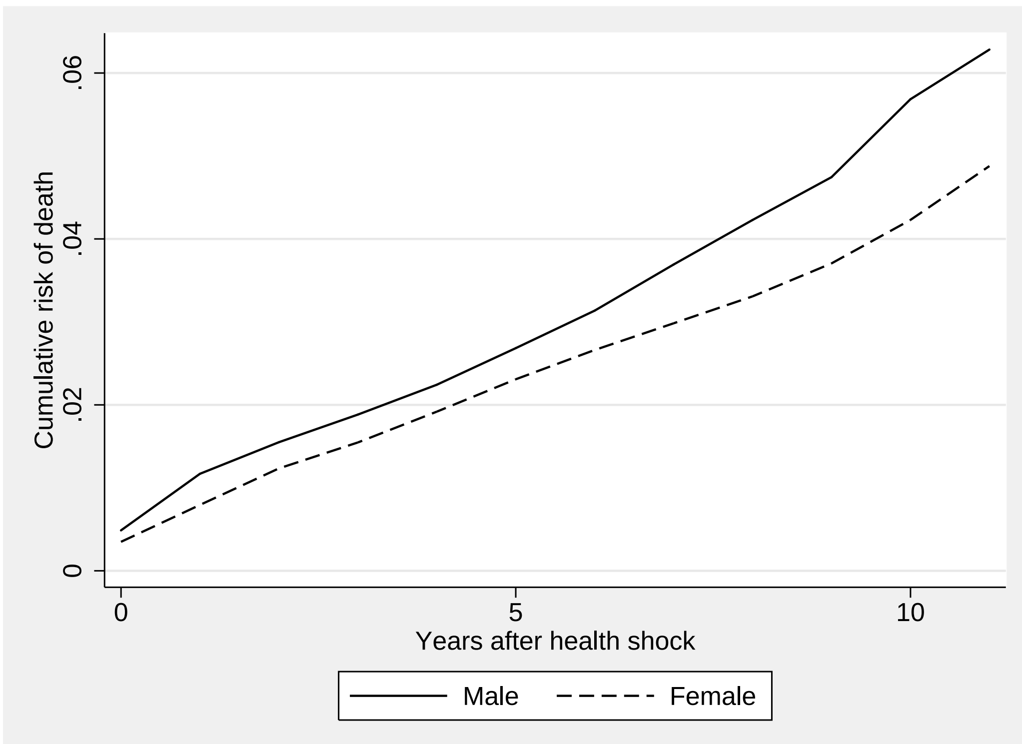
Figure A.8.

Ex-post mortality risk after a hospital admission, by gender and diagnosis type



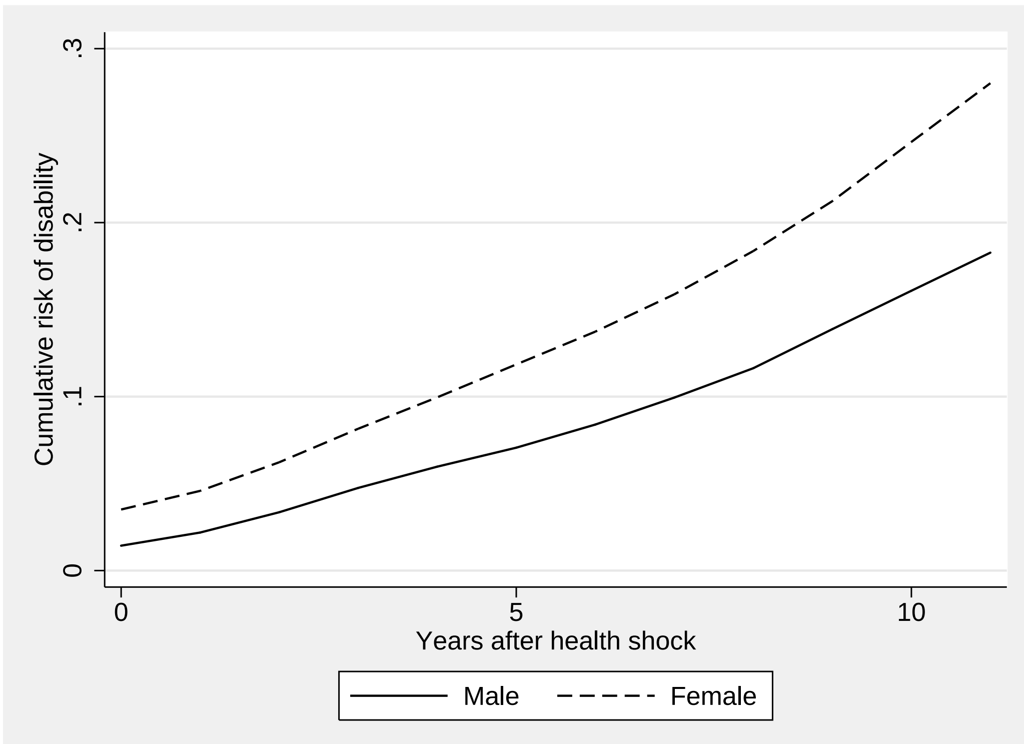
Note.—Mortality risk is defined as the probability of death within three years of the observed hospitalization. The bins of the histograms pertains to (F)emales and (M)ales for each of the 19 diagnosis categories in diagonal text under the x-axis as displayed in Table A.3.

Figure A.9.
The ex-post cumulative risk of death by years from the first hospital admission, by gender



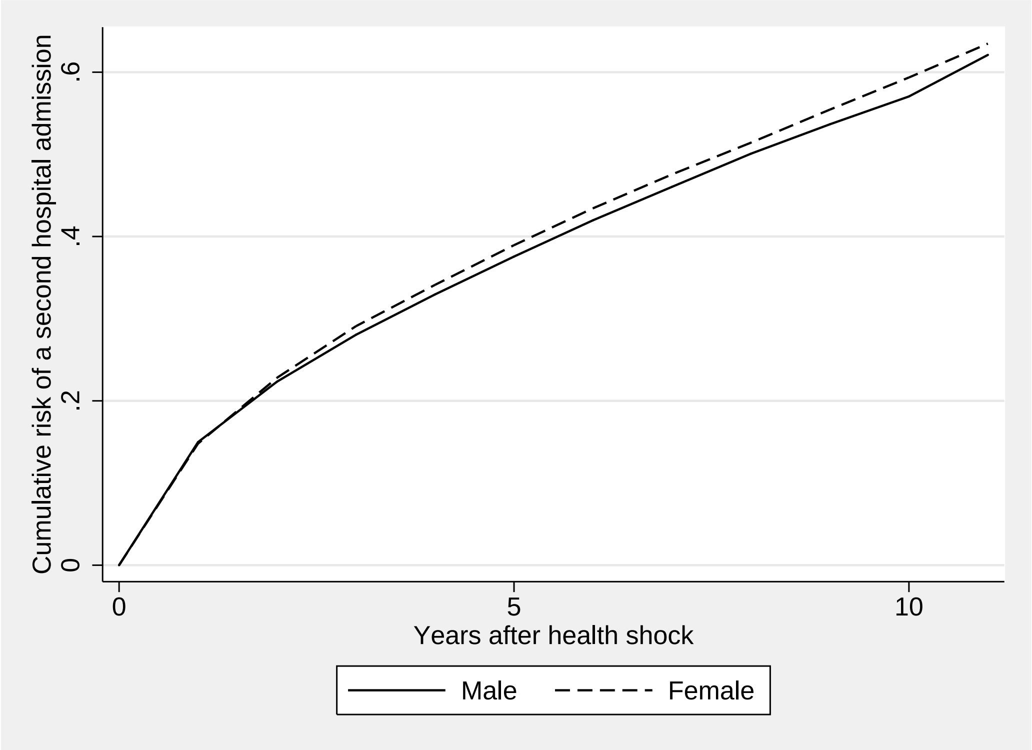
Note.—The cumulative risk is defined as the probability of death a given year, conditional on still being at risk, summed by the overall risk of death in the years prior to the current year. The solid (dashed) line indicate the cumulative risk of death for the males (females).

Figure A.10.
The ex-post cumulative risk of disability by years from the first hospital admission, by gender



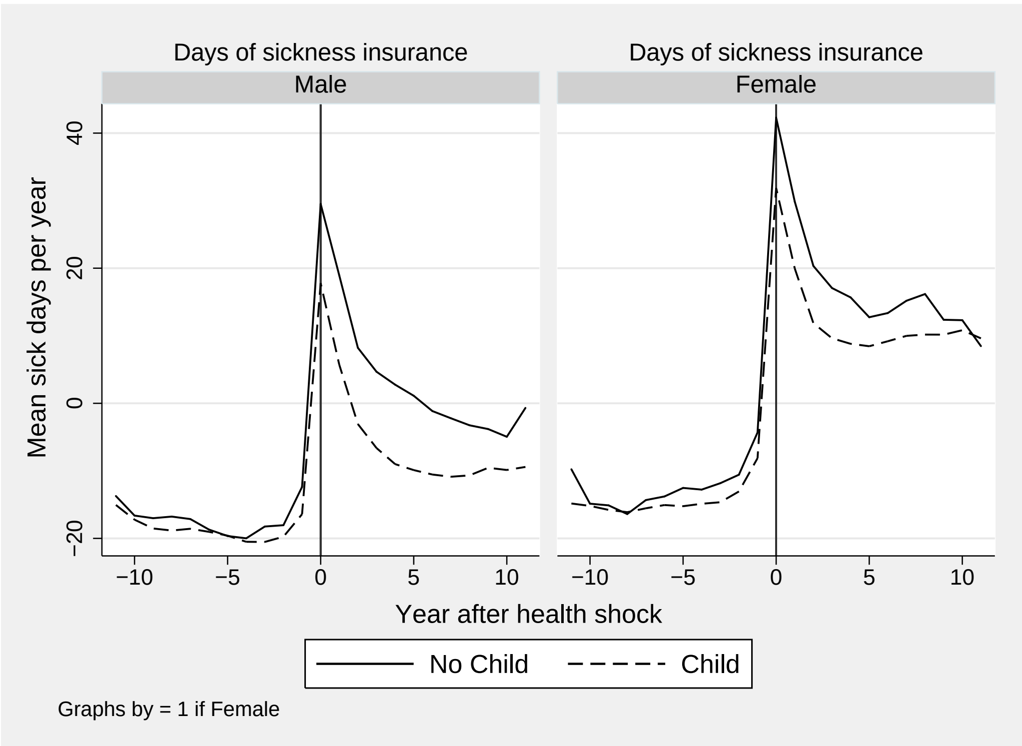
Note.—The cumulative risk is defined as the probability of disablement a given year, conditional on still being at risk, summed by the overall risk of disablement in the years prior to the current year. The solid (dashed) line indicate the cumulative risk of disability for the males (females).

Figure A.11.
The ex-post cumulative risk of a second hospitalization by years from the first hospital admission, by gender



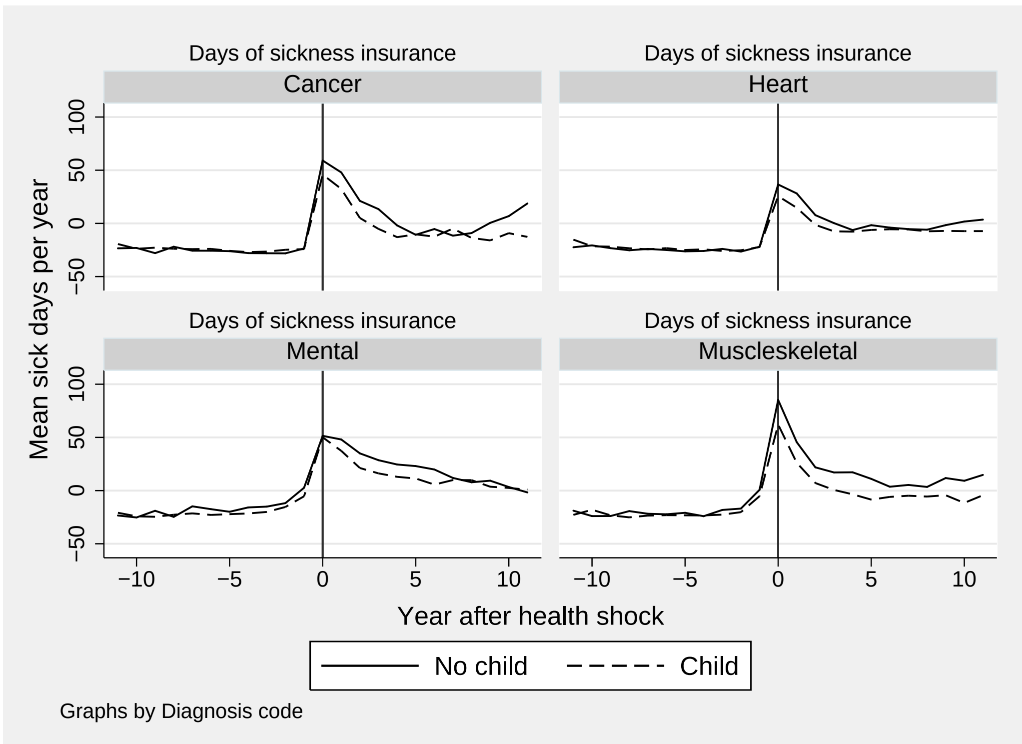
Note.—The cumulative risk is defined as the probability of a second hospitalization a given year, conditional on still being at risk, summed by the overall risk of hospitalization in the years prior to the current year. The solid (dashed) line indicate the cumulative risk of hopsitalization for the males (females).

Figure A.12.
The average number of days of sickness absence by children and years after a hospital admission, by gender



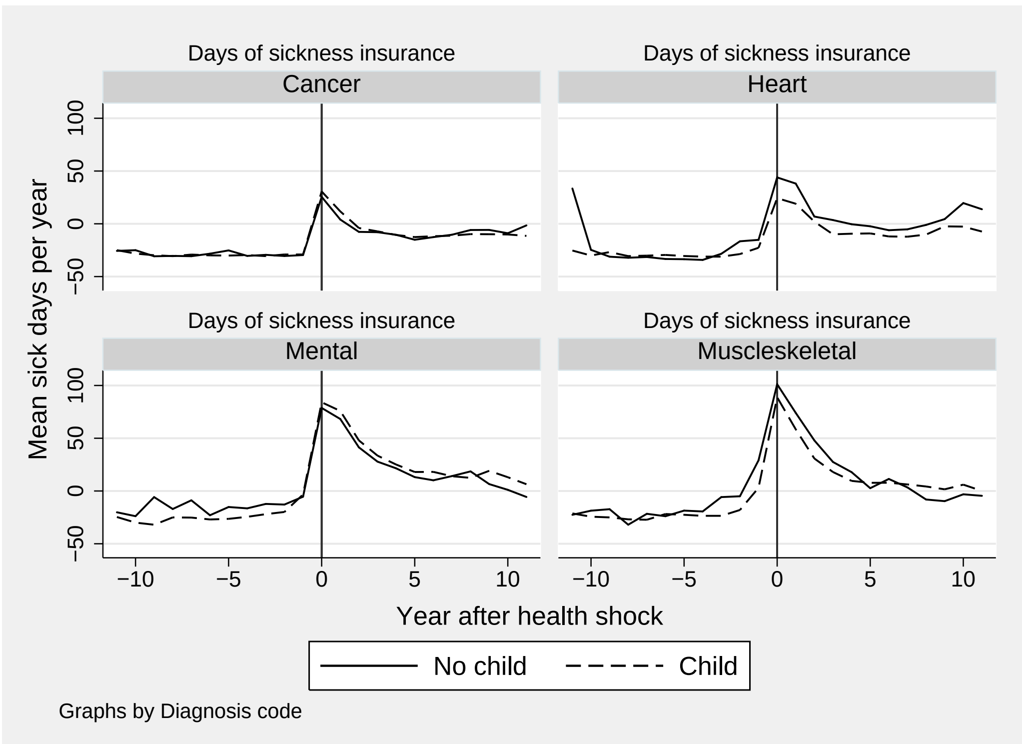
Note.—The figures are constructed by plotting the residuals from an ordinary least squares regression of year fixed effects on days of sickness absence. Days of sickness are defined as the number of insured days an individual is observed to extract a particular year. The left (right) panel pertains to the average number of sickness absence for males (females) for individuals with (without) children indicated by the dashed (solid) line. The vertical line at time zero indicate the year of the observed hospitalization.

Figure A.13.
The average number of days of sickness absence for men by family status and years after a hospital admission, by diagnosis type



Note.—The figures are constructed by plotting the residuals from an ordinary least squares regression of year fixed effects on days of sickness absence. Days of sickness are defined as the number of insured days an individual is observed to extract a particular year. Each panel plots pertains to a specific diagnosis type. The dashed (solid) line pertains to the average number of sickness absence individuals with (without) children. The vertical line at time zero indicate the year of the observed hospitalization.

Figure A.14.
The average number of days of sickness absence for women by family status and years after a hospital admission, by diagnosis type



Note.—The figures are constructed by plotting the residuals from an ordinary least squares regression of year fixed effects on days of sickness absence. Days of sickness are defined as the number of insured days an individual is observed to extract a particular year. Each panel plots pertains to a specific diagnosis type. The dashed (solid) line pertains to the average number of sickness absence individuals with (without) children. The vertical line at time zero indicate the year of the observed hospitalization.

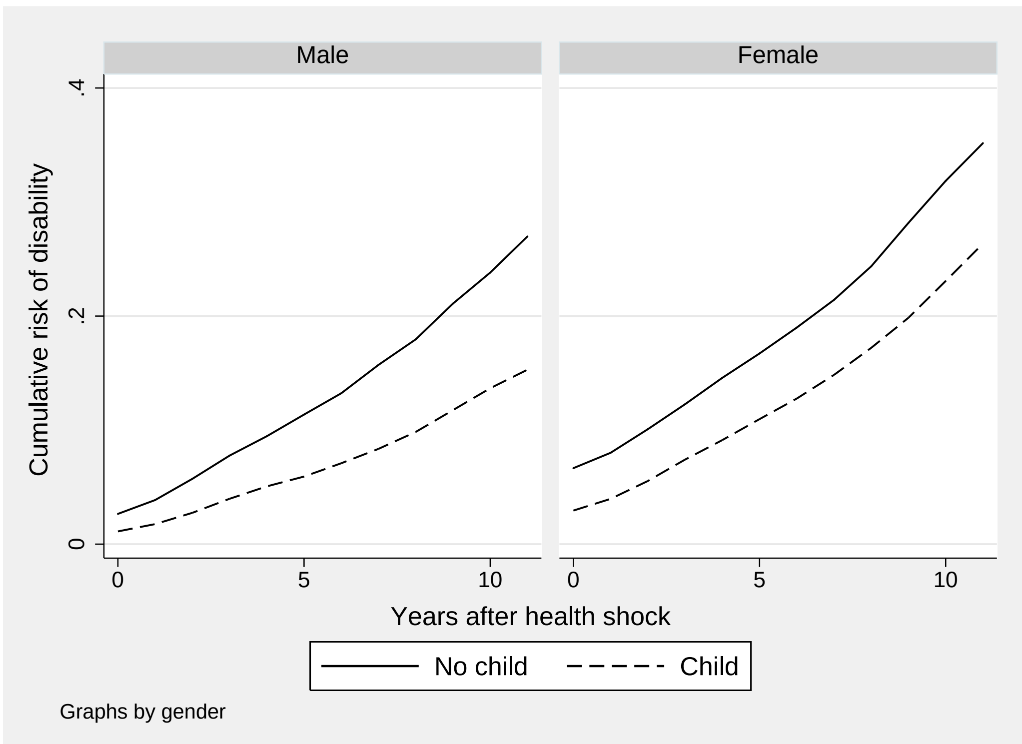
Figure A.15.

The ex-post cumulative risk of death by years from the first hospital admission, by gender and family status

Note.—The cumulative risk is defined as the probability of death a given year, conditional on still being at risk, summed by the overall risk of death in the years prior to the current year. The left (right) panel pertains to the average risk for males (females) with (without) children indicated by the dashed (solid) line.

Figure A.16.

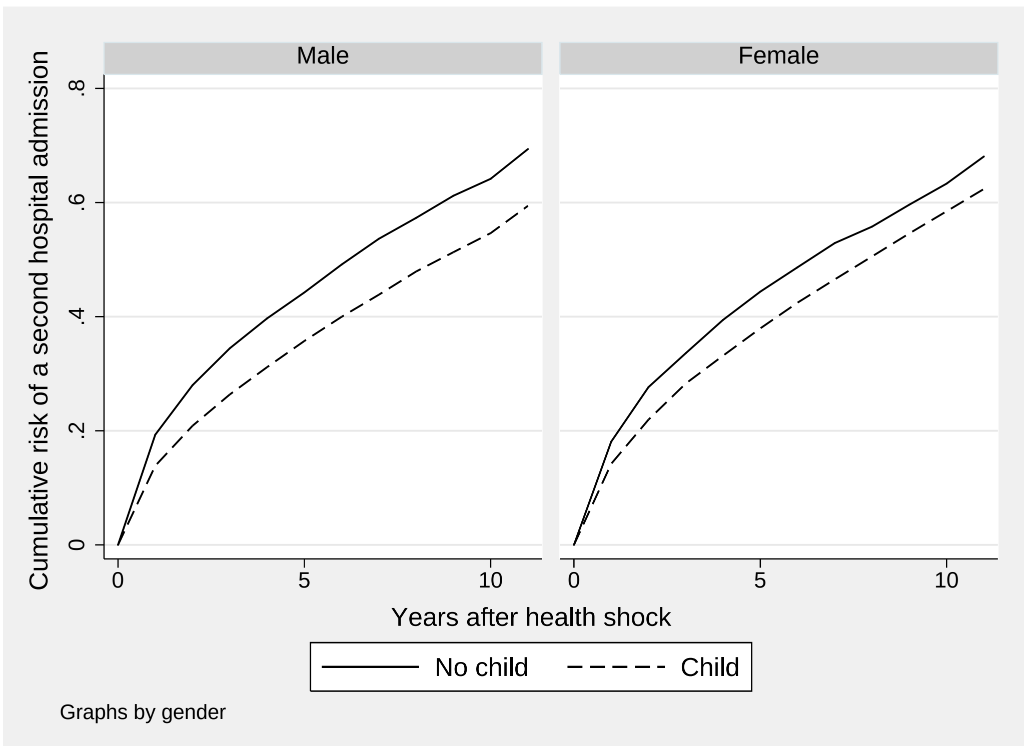
The ex-post cumulative risk of disability by years from the first hospital admission, by gender and family status



Note.—The cumulative risk is defined as the probability of disablement a given year, conditional on still being at risk, summed by the overall risk of disablement in the years prior to the current year. The left (right) panel pertains to the average risk for males (females) with (without) children indicated by the dashed (solid) line.

Figure A.17.

The ex-post cumulative risk of a second hospitalization by years from the first hospital admission, by gender and family status



Note.—The cumulative risk is defined as the probability of a second hospitalization a given year, conditional on still being at risk, summed by the overall risk of a second hospitalization in the years prior to the current year. The left (right) panel pertains to the average risk for males (females) with (without) children indicated by the dashed (solid) line.

A:III A two period household model of health investments

We have the following stylized (Swedish) world in our minds: Individuals belong to a household in which the members consume both market and household goods. The market price of household goods are high due to large tax wedges (except for highly subsidized child care). This means that household members will perform both market and household work. There is also a public (or semi-private) sickness insurance that replace earnings if an individual is absent from work for health reasons. In this stylized model we assume that the wife perform both market and household work while the husband only perform market work.[18]

Productivity at both work and home production is related to health. With good health the productivity is better than with bad health. At the work place the productivity of the worker is difficult to monitor by employer. In the home production however there is no asymmetric information since the wife in the household is doing the home production. This means that it can be possible to shirk at the work place but not in the home production. For a woman with bad health the household work will be less productive than in a state with good health. To simplify, we will argue that the lack of monitoring will make the relation between market work and health negligible relative to the relation between health and domestic production.

With background in the theoretical framework of absences outlined above, we model the decision to invest in health as a two-period collective household optimi-

[18]This is of course an oversimplification, but it is not clear if a more realistic division of household production between the spouses would give substantial additional insight into the health investment decision we model here.

zation problem where subjects optimize over the composite good (x) and leisure (l). We consider the household's total utility (U) to be the sum of the (u)tility for the (m)ale and (f)emale in the household in the two (t)ime periods, hence

$$U_t = \sum_i u_{it}(x_{it}, l_{it}),\ t = 1, 2;\ i = m, f$$

The household's total utility is the sum of the utility for each adult household member over time periods $t = 1, 2$. Thus, the quantity the household maximize is $U = \sum_{t=1}^{2} U_t$.

Consumption is expressed as a composite good x, consisting of consumption of market (c) and household (p) goods, respectively, so that $x = c + p$. It is, for each household member i, subject to a budget constraint of the following form

$$x_t \leq w_i h_{it}^w + \delta w_i h_{it}^a + \eta_{ft} h_{ft}^h,\ t = 1, 2;\ i = m, f,$$

where $x_t = x_{ft} + x_{mt}$. In this simple model, we assume that the wife perform all household production, i.e. $h_{mt}^h \equiv 0$, $t = 1, 2$, and that hours of market and household work and leisure are all fixed (contracted) in both periods.[19]

The budget constraint consist of the wage, w_i times the amount of working hours, h_{it}^w, number of hours on sick leave h_{it}^a multiplied by δw_i, where $(0 < \delta \leq 1)$ is the insurance replacement rate. Finally, the budget constraint also include time in home production h_{ft}^h, which is scaled by a productivity parameter η_{ft} defined as individual health at time period t.[20]

[19]With regard to market and household work this is less problematic as these measures can be argued to be beyond the agent's control. However, keeping leisure fixed is somewhat restrictive in this sense.

[20]One could argue that wage w_i should be a function of both health η_{it} and previous absence

Each household member are endowed with a number of contracted hours of work, h^*_{it} which can be used for either working or for work absence, i.e. $h^*_{it} = h^w_{it} + h^a_{it}$.[21] The total time endowment can be aggregated into time working in the market and at home, $H_{it} = h^w_{it} + h^h_{it}$, and time spent on leisure and recuperation, $L_{it} = h^a_{it} + l_{it}$. The time constraint is thus given by

$$T = H_{it} + L_{it} \equiv h^w_{it} + h^h_{it} + h^a_{it} + l_{it},\ t = 1, 2;\ i = m, f.$$

Finally, we assume that an agent can improve her future health by increasing his or her leisure[22] in the initial period through recuperation

$$\eta_{it} = g(L_{it-1}),\ t = 1, 2;\ i = m, f \tag{5}$$

where we assume that leisure improve future health but at a diminishing rate. Thus, we assume that $(\partial g(.)/\partial L_{it-1}) > 0$ and that $(\partial^2 g(.)/\partial L^2_{it-1}) < 0$.[23]

Given this setup, the husband will work all contracted hours both time periods and use the rest of the time on leisure. Thus, the utility contribution of the husband will be fixed in both time periods. Next, consider the wife's utility contribution. She perform all the home production with productivity measure η_{ft}, subject to (5).

h^a_{it}, i.e. that $w_i = w_i(\eta_{it}, h^a_{it-1})$. However, this complicates solving the model while not adding any fruitful intuition or implications. Specifically, we argue that the health effect on market productivity is negligible due to imperfect monitoring (relative to domestic production) and prior absence will only tend to increase the cost of the investment.

[21] Hours spent absent is used for recuperation only and has no utility-generating alternative use in this simple model.

[22] Note that since l_{it} is fixed the only way to increase the total amount of leisure is to recuperate by being absent from work.

[23] The second order assumption is critical to find an interior solution to the optimization problem outlined below. However, we believe that it is plausible in the context of our model.

Unlike the husband, she has an incentive in the initial period to adjust her absence hours to improve her health in the second period. This choice will depend on the health level in the initial period as well as the cost of investing in health by being absent. The cost of investing in health include the foregone earnings associated with being absent, $(1-\delta)w_f$, while the gain is the increase in home production productivity she obtain in the second period times the number of hours of household work she performs. If the woman does not invest, she will have a lower home production productivity in period two than if she invested (given that her health is not already at maximum), but she will not lose any foregone earnings.

Formally, the first order condition for an interior solution to this maximization problem is given by

$$\frac{\partial u_{f1}}{\partial x_{f1}} \cdot \delta w_f = \frac{\partial u_{f2}}{\partial x_{f2}} \cdot \frac{\partial x_f}{\partial \eta_{f2}} \cdot \frac{\partial \eta_{f2}}{\partial h^a_{f1}} h^h_{f2}.$$

Equivalently (assuming no discounting),[24]

$$\frac{\delta w_f}{h^h_{f2}} = \alpha(\eta_{f2}). \tag{6}$$

where

$$\alpha(\eta_{f2}) = \frac{\partial x_f}{\partial \eta_{f2}} \cdot \frac{\partial \eta_{f2}}{\partial h^a_{f1}}$$

From (6) we see that the woman should invest in health until the marginal utility of increasing her health (and thus household productivity) equals the foregone earnings when being absent from work normalized by the number of hours of home production.

[24] That is, we assume that $\partial u_{f1}/\partial x_{f1} = \partial u_{f2}/\partial x_{f2}$

Performing comparative statics on the FOC in (6) yields the following relationships,[25]

$$\frac{dh^a_{f1}}{dh^h_{f2}} > 0 \text{ and } \frac{d\eta_{f2}}{dh^h_{f2}} > 0.$$

The first inequality imply that more hours of home production hours the woman performs the lower the investment effect need to be in optimum because the investment effect is scaled by the number of hours in domestic production. Thus, the investment has a higher payoff for household members with a larger share of the household's home production. For a given illness, women with a larger share of household duties will in this model have lower thresholds to be work absent then women with a smaller share of household duties. The second inequality show that hours of home production will have an indirect positive effect on health through the direct effect on absence. That is, since women have a larger incentive to invest in health, they will have a higher level of health given the presumptions of the model.

From these results we obtain testable implications of the model; women in households with more domestic production should have both more sickness absence and better health than women with less or no domestic production.

[25]Moreover, $dh^h_{f2}/dw_f < 0$ and $dh^h_{f2}/d\delta < 0$. As the wage or the replacement rate increases, the cost of investing becomes higher. We do not investigate these model implications here but they provide an interesting rationale for why women contributes to most of the domestic production in the first place.